

A Fossil *Garcinia* Fruit from the New Hebrides, Melanesia¹

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A SERIES OF Pleistocene fossil fruits collected on the island of Santo, New Hebrides Archipelago, Western Melanesia (Figure 1), by T. R. Waller and W. Blow and given to me for study by Harry S. Ladd, seem to resemble most nearly the genus *Garcinia* L., of the family Guttiferae (Clusiaceae). This genus is entirely Old World tropical and subtropical, made up of trees and large shrubs, the most familiar of which is the mangosteen, *Garcinia mangostana* L. Five species of the genus are known from Western Melanesia, according to Smith and Darwin (1974); two of these occur in the New Hebrides. *Garcinia* fruits do not seem to be likely subjects for fossilization and, to the best of my knowledge, none have been hitherto reported.

The fruits were found in a semi-indurated clastic material, medium to coarse sandy in texture, composed of a mixture of volcanic ash or black sand and coral and mollusk shell fragments, said to have been deposited in an off-reef environment 15 to 30 meters or more deep near a river mouth. This has now been elevated so that the deposits occur along the Kere River some distance above its mouth. About 100 species of marine mollusks and one freshwater mollusk have been identified in the collections. The *Garcinia* fruits are the only terrestrial plant macrofossils recovered from the material so far. The deposits are Pleistocene, with a carbon-14 age of 25,000 years, according to Ladd.

Nine fruits, variously intact and crushed or broken, plus a number of fragments, were found in four collection lots. Mainly preserved are the external form and the brownish to blackish carbonaceous material of the

mesocarp of originally globose fleshy fruits 3 to 6 cm in diameter. The more intact fruits appear somewhat like large dried prunes, but not as wrinkled. Within the 0.5- to 1.5-mm-thick mesocarp in the broken fruits, no original material remains; the interior is filled with matrix. No evidence remains of indurated endocarp or seeds, and the nature of the crushing suggests that no hard internal structures existed. The present bent or warped appearance of edges and loose pieces of mesocarp suggests that this was originally a leathery or fleshy-leathery rind. Some of the fruits have traces of inconspicuous attachment scars and very slight prominences on the opposite end. The lack of the large disklike stigma of many species of *Garcinia* is notable. These may either have been detached or never existed.

A. C. Smith examined the material and agreed that it might belong to *Garcinia*. According to Smith, in Fiji, *Garcinia* species are common in lowland and riverine forest.

Detailed descriptions of the individual fruits follow.

Collection 1

Three somewhat intact fruits, a number of rind fragments. Original shape globose or subglobose, but one (1-1) has been crushed flat, the two others slightly compressed. The flattened fruit is about 6 × 6 cm, irregularly circular, crushed to about 1 to 1.5 cm thick. A piece of *Acropora* (?) protrudes from it in two directions.

The best preserved (1-2; Figures 2-5) is 5 cm long, 4.2 cm greatest width, 3.5 cm least width, irregularly broadly oblong, with what may be an attachment scar at one end, a slight wrinkling or undulation in the surface, one side fractured, and a segment of the surface and the matrix beneath it missing, another loose. The only obvious structure is

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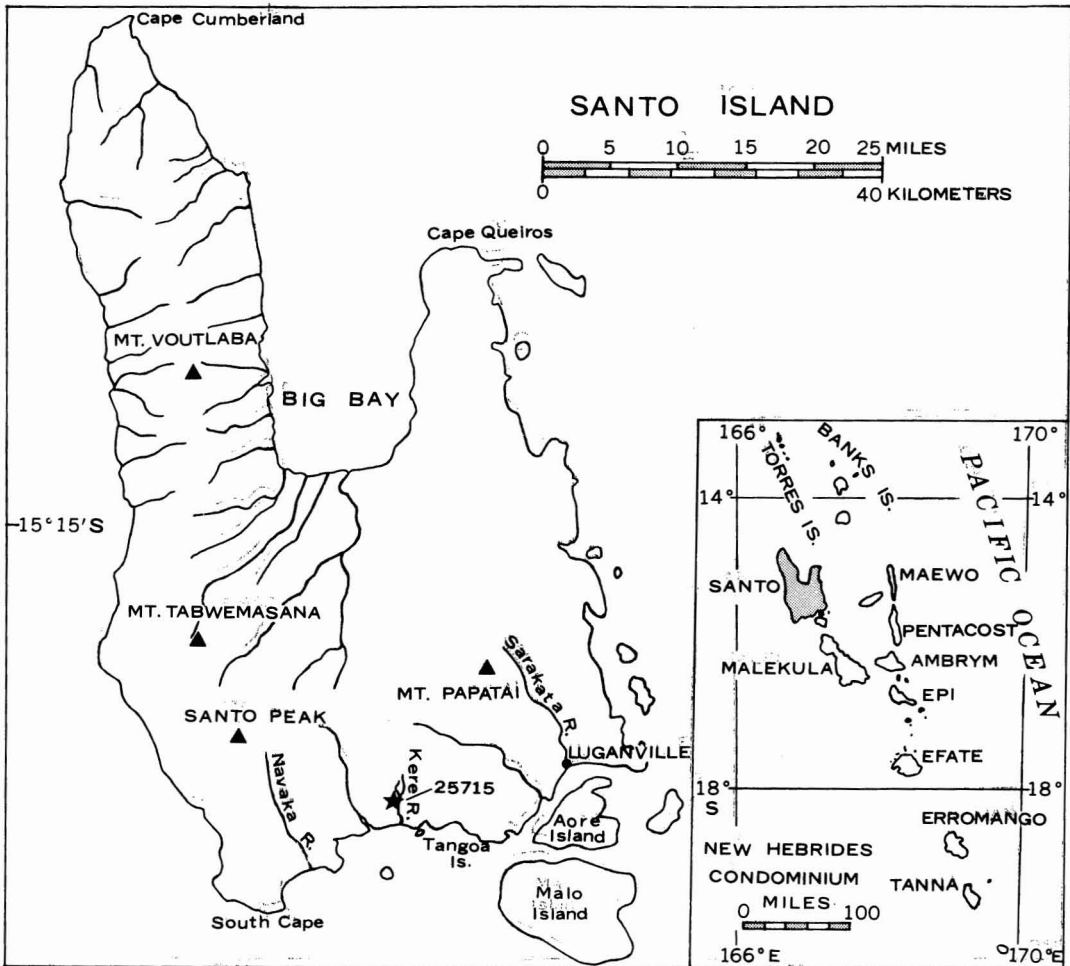


FIGURE 1. Locality map of Santo Island (after Robinson 1969).

a "rind" about 0.5–1.5 mm thick, layered (about three layers), tending to loosen from the interior portion which may be a mold.

A third fruit (1-3; Figure 13) is smaller, again slightly compressed, about $3.5 \times 4 \times 2.5$ cm, one side with about one-quarter broken off and missing; about one-third of the remaining rind peeled off, leaving a black smooth surface to the inner cast. Surface slightly irregular from crushing.

Five large and several small fragments (1-4) of rind 1×1 to 2×3 cm, irregularly broken and bent as though from partial drying; some matrix adhering; the actual rind mostly 1 mm or less thick.

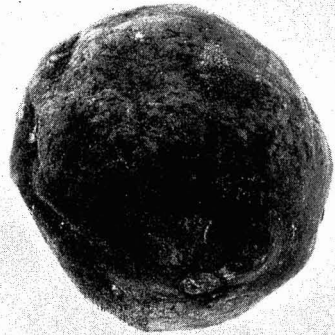
Collection 2

Three fruits, apparently globose, slightly to badly crushed. One (2-1) badly crushed, $5 \times 4.5 \times 2.8$ cm; only structure preserved is the "rind" which is ruptured in three directions on one side; surface loosely wrinkled, especially on the periphery; considerable matrix adhering; general color blackish.

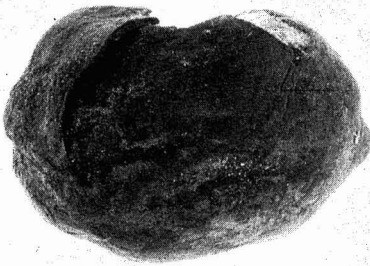
Second fruit (2-2; Figures 6–7) smaller, slightly compressed, a part missing from one side, $4 \times 4 \times 3$ cm; surface loosely and irregularly wrinkled, brown, rind layered, somewhat cracked; much matrix adhering, matrix inside much finer.



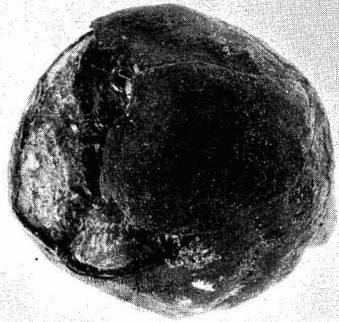
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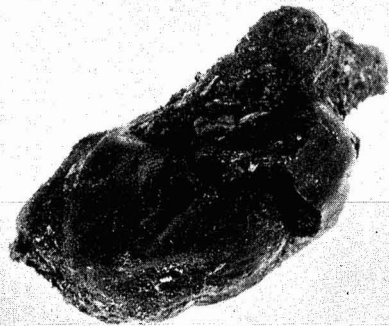
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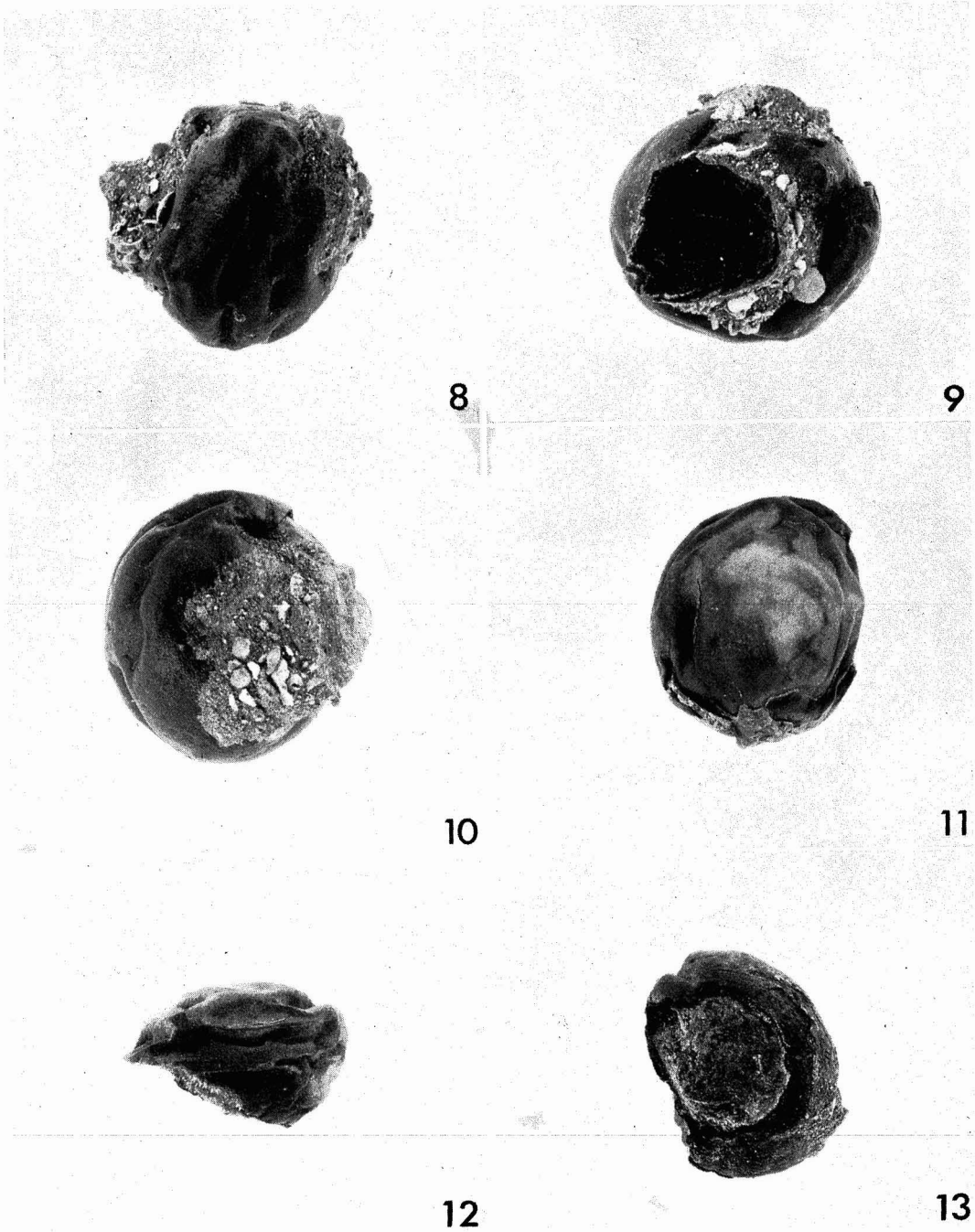


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FIGURES 2-5. Views of specimen USNM 222801, holotype of *Garcinia laddii*, part of rind loosened, part missing. FIGURES 6 AND 7. Views of specimen USNM 222797, irregularly crushed, with rind ruptured.



FIGURES 8-10. Views of specimen USNM 222795 showing matrix.

FIGURES 11 AND 12. Views of specimen USNM 222802 showing degree of crushing of this fruit.

FIGURE 13. Specimen USNM 222798 with piece of rind removed to show matrix.

Another fruit (2-3; Figures 8–10) is less crushed, $4 \times 3.8 \times 3.2$ cm; strongly wrinkled on one side; some matrix adhering, a concave piece of rind about 2×2 cm embedded in this matrix; inside black, smooth; layering of this rind very conspicuous, light brown, rind of the fruit intact.

Collection 3

Two fruits, smaller than others. One (3-1; Figures 11–12) is slightly crushed, one side ruptured and open, crescent-shaped segment of rind missing, one edge of rind slightly bent back, inside of rind and whole surface of interior matrix densely drusy with calcite (?) crystals; $3.5 \times 3 \times 2$ cm; surface, especially edges, strongly wrinkled from crushing, sides irregularly loosely wrinkled, brown; layers in rind not visible because of drusiness, a small bit of matrix or deposit, superficially suggesting a calyx, adherent to one end, in this a small circular protuberance that could be a pedicel attachment. This fruit suggests a dried prune, but less wrinkled.

A second fruit (3-2) is very slightly compressed, not at all wrinkled except on a very minute scale on one edge, about half the surface and the matrix beneath it is missing; $3.5 \times 3(?) \times 2.8$ cm. The rind is not evident and it seems likely that this is only a cast. The matrix inside is a very fine sand.

Collection 4

One fruit (4-1), probably a cast, no rind evident; apparently fruit was slightly crushed, but very little wrinkled; matrix mostly very fine sand; one elongate coarse wrinkle, also what appears to be a folded piece, forming a curved overlap that is somewhat broken; a large cavity at other end; overall dimensions $4 \times 3.1 \times 2.3$ cm, one side flatter than the other.

In general, as nearly as I can reconstruct these fruits, they must have been globose or nearly so, with no persistent calyx or stigma, with a thin leathery rind, and with slight resistance to crushing. There is no sign of a putamen (hardened endocarp) nor of seeds.

The significant features are the leathery

mesocarp and the lack of either hard seeds or putamen. Fruits of *Garcinia* sect. *Mangostana*, such as the edible mangosteen, have a leathery, firm but not indurate mesocarp and endocarp, and fleshy seeds. No other large fruit that I know of in the Pacific Islands has these characteristics. This seems to justify assigning these fossils to *Garcinia* sect. *Mangostana*. It matches, in most respects, *Garcinia pseudoguttifera* Seem., found in Fiji, Tonga, and the New Hebrides. It grows in forests from near sea level to 1000 meters. Lack of a contracted, protruding apex bearing the large disklike stigma distinguishes the present material from this species and probably justifies describing it as a new, closely related extinct species.

Garcinia laddii Fosberg, n. sp.

Fructus globosus 3–6 cm diametro apicem non productem mesocarpis 0.5–1.5 mm crassis coriaceis endocarpis nec seminibus non induratis.

This species is dedicated to the eminent geologist and paleontologist, Harry S. Ladd, of the U.S. Geological Survey, whose distinguished studies have added enormously to our knowledge and understanding of Pacific coral islands and biogeography.

Collections examined: Santo Island, New Hebrides; U.S. Geological Survey locality 25715; Kere River, left bank about 6.5 km above the mouth; *T. R. Waller and W. Blow* 5 June 1974. They are deposited in the paleobotany collection of the U.S. National Museum. They have received code numbers as follows: Collection 1: 1-1, USNM 222800; 1-2, USNM 222801 (holotype); 1-3, USNM 222798; 1-4, USNM 222799. Collection 2: 2-1, USNM 222796; 2-2, USNM 222797; 2-3, USNM 222795. Collection 3: 3-1, USNM 222802; 3-2, USNM 222803. Collection 4: 4-1, USNM 222804.

LITERATURE CITED

- SMITH, A. C., and STEVEN P. DARWIN. 1974. Studies of Pacific Island plants. XXVII. The Guttiferae of the Fijian region. *J. Arn. Arb.* 55:215–263.