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A REVIEW OF THE GENUS *CACTOPINUS*, WITH DESCRIPTIONS OF TWO NEW SPECIES AND A NEW GENUS (COLEOPTERA: SCOLYTIDAE)

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Abstract *Can. Ent.* 99: 917–925 (1967)

The bark-beetle genus *Cactopinus*, containing seven species, is reviewed. Distributional data, biological notes, a discussion of each species, and a key for the separation of all species are included. New species are: *C. desertus* (California) and *C. depressus* (San Luis Potosi, Mexico). *C. cactophthorus* Wood and *C. mexicanus* Wood are placed in a new genus, *Cactopinorus*.

The genus *Cactopinus* and the type species *C. hubbardi* were described by Schwarz (1899) for a very peculiar beetle collected by H. G. Hubbard from giant cactus in Arizona. Subsequently, Blackman (1938) added three species from California, and Wood (1957, 1967) described three more species from Mexico. Two additional species are described here. A new genus, *Cactopinorus*, is described to include *Cactopinus mexicanus* Wood and *C. cactophthorus* Wood, and a key to separate the two species is given. The seven species of *Cactopinus* are discussed and a key to the species is presented. New distributional data for several species are given, along with notes on the biology of *C. desertus* n. sp.

All members of the genus *Cactopinus* are small, black beetles measuring from 1.3 to 2.5 mm in length. The body is usually covered by an incrustation which obscures the details of the surface. In the male, the frons is deeply concave and possesses a prominent epistomal horn; in the female, the frons is convex and the horn is lacking. The antennal scape is sparsely pubescent; the funicle is five-segmented; and the club is small, oval, with straight sutures. The pronotum is strongly asperate on an elevated V-shaped area, with the posterior point of the "V" usually extending beyond the posterior margin of the pronotum. The elytra are punctured in regular rows and have prominent setae on the interspaces. On the declivity, the sutural interspaces are usually depressed below the discal surface (except *C. koebelei* Blackman); the lateral margins are elevated and variously armed with tubercules or spines. Each fore tibia has parallel sides and is armed on the apical margin by several small teeth.

Members of *Cactopinorus* differ from the description above by their generally smaller size, measuring from 1.3 to 1.6 mm; by their pronotal asperities not being confined to an elevated, V-shaped area; and by their round antennal club having curved sutures.

The most prominent character of these two genera is the peculiar hornlike process on the epistoma. Schwarz (1899) gave an excellent description of this structure so it will not be described here. In some cases, the length of this horn may be used to separate species when considered with other characters. The horns of *Cactopinus rhois* Blackman and *C. depressus* n. sp. are generally quite short, usually less than 0.3 mm long, while those of *C. pini* Blackman, *C. koebeli* Blackman, *C. hubbardi* Schwarz, and *C. desertus* n. sp. are longer and may reach 0.9 mm. Care should be exercised in using this character, however, since the length is variable. For instance, the horn of *C. koebeli* may range from 0.2 to 0.6 mm in length. The male of *Cactopinorus mexicanus* possesses two separate horns on the epistoma.

Variation occurs not only in horn length but in a number of other characters as well. The depth of the declivity, the prominence of the granules or spines on the declivity, the number and elevation of the asperities on the pronotum, and structural features of the frons all show a great deal of interspecific variation. In some instances, the extremes of variations might lead one into recognizing separate species but intergrades were observed in almost all cases.

Another unique characteristic of *Cactopinus* is the peculiar host relations displayed by various species. Almost all North American genera of Scolytidae restrict their attacks to some botanical group, i.e., to a single genus or family, such as *Pinus* or the Pinaceae. *Cactopinus,* however, contains species that occur in pines, giant cacti, woody shrubs, and desert trees, all widely separated phylogenetically. Perhaps when more information is available, the host relationships will reveal a more natural pattern.

The karyotypic number and formula was determined for *Cactopinus desertus* n. sp. by G. N. Lanier, University of California, Berkeley. In the meiotic stage it is $11AA + XO$ and at the mitotic stage it is $2N = 23$. Lanier (personal communication) states "At meiotic metaphase the largest bivalent assumes the shape of a circle; the remaining 10 bivalents form rods of descending size but without a conspicuous break in the series; the X is a dot. At mitosis the first bivalent is represented by a pair of heterobrachials with the ratio of arm length about 3 to 2; other chromosomes are small rods or dots except one, probably the X, may appear to be isobrachial."

All species of these two genera occur in southwestern North America. Four species occur in southern California, four more are found in Mexico, and one species occurs in Arizona. More species, as yet undescribed, probably occur in Mexico, especially in the desert regions, in the endemic woody plants or cacti.

The specimens reported on in this paper are deposited in the following collections indicated by the abbreviations: U.S. National Museum, Washington, D.C. (USNM); Ohio State University, Columbus (OSU); University of California, Berkeley (CIS); University of California, Davis (UCD); California Academy of Sciences, San Francisco (CAS); Canadian National Collection, Ottawa, Ont. (CNC); Long Beach State College, Long Beach, Calif. (LBSC); Charles W. O'Brien, University of California, Berkeley (CWO); S. L. Wood, Brigham Young University, Provo, Utah (SLW); and D. E. Bright, Ottawa, Ont. (DEB).

Key to the Genera

1. Asperities on pronotum confined to an elevated, V-shaped area on disk; antennal club with straight sutures; size larger, 1.3–2.5 mm ..... *Cactopinus* Schwarz
   Asperities on pronotum scattered, not confined to an elevated, V-shaped area; antennal club with angulate or bisinuate sutures; size smaller, 1.3–1.6 mm ..... *Cactopinorus* new genus

These two genera are in the subfamily Ipidae and, for the present, should be included in the tribe Micracini.

Cactopinorus new genus

Frons distinctly concave in male, only slightly concave in female. Epistoma with one or two hornlike processes in male, devoid of these in female. Antenna with scape short; funicle longer, five-segmented; club circular, as wide as long, sutures angulate to bisinuate at middle and marked by rows of setae. Pronotum asperate over most of surface, but less strongly so at sides. Scutellum small,

depressed below elytral surface. Elytra striate; interspaces smooth or granulate, with a few short setae. Declivity sulcate; lateral margins elevated and granulate.

Type species: *Cactopinus cactophthorus* Wood, 1957, present designation.

KEY TO THE SPECIES OF *Cactopinorus*

1. Male epistoma with a single hornlike process; pronotum of both sexes with asperities sparse on lateral areas; sutures of antennal club bisinuate ..... *cactophthorus* (Wood)
   Male epistoma with two widely separated hornlike processes; pronotum of both sexes with asperities rather numerous on lateral areas; sutures of antennal club angulate at middle ..... *mexicanus* (Wood)

Cactopinorus cactophthorus (Wood) new combination
(Fig. 2)

Cactopinus cactophthorus Wood, 1957, p. 105 (type ♂; 10 miles southeast of Tehuitzingo, Puebla, Mexico; Univ. of Kansas).

This small species appears to be closely related to *C. mexicanus*, differing chiefly in the structure of the male epistomal horn. It may be further recognized by the more elongate body (2.8 times longer than wide) and by the less strongly granulate elytral declivity.

It is known only from the type locality where it was collected in giant cactus, *Cereus giganteus* Engelm.

Cactopinorus mexicanus (Wood) new combination
(Fig. 1)

Cactopinus mexicanus Wood, 1967, p. 37 (type ♂; 13 miles north of Juchitlan, Jalisco, Mexico; SLW).

This unique Mexican species is easily recognized by the characters given in the key. In addition, it is characterized by the stouter body (2.0 times longer than wide) and by the deeply sulcate, granulate elytral declivity.

It is known only from the type locality, also collected from giant cactus, *C. giganteus* Engelm.

Cactopinus Schwarz

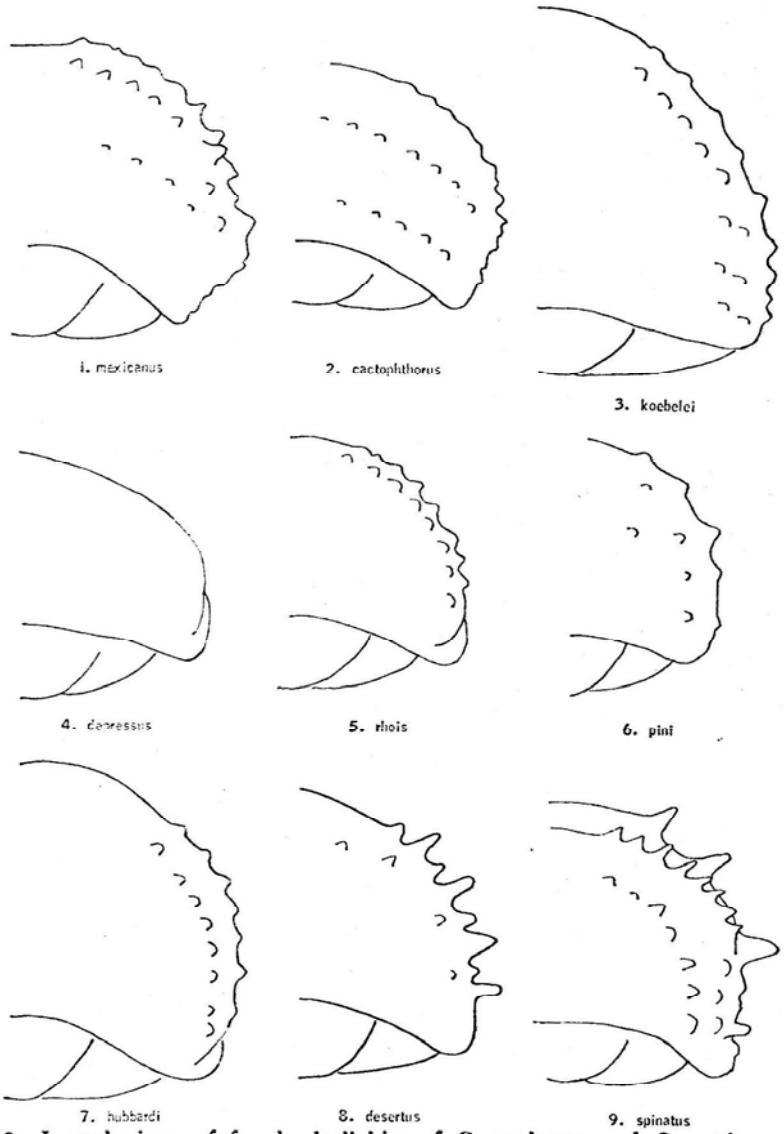
Cactopinus Schwarz, 1899, p. 11; Blackman, 1938, p. 151.

Frons deeply concave from the epistomal margin to well above the eyes in male, convex in female. Epistoma with a prominent hornlike process in male, devoid of this in female. Antenna with scape and funicle as in *Cactopinorus*; club oval, longer than wide, sutures nearly straight. Pronotum asperate on an elevated, V-shaped area; lateral areas smooth. Scutellum small, slightly depressed below elytral surface. Elytra feebly striate; interspaces smooth, with a few, rather long, curved setae. Declivity sulcate; lateral margins usually armed with tubercles or teeth.

Type species: *Cactopinus hubbardi* Schwarz, 1899, by monotypy.

KEY TO THE SPECIES OF *Cactopinus*

1. Lateral margins of declivity smooth or granulate (Figs. 3–7); from various hosts, except *Bursera* 2
   Lateral margins of declivity with large teeth (Figs. 8–9), except male of *C. spinatus*, in which the teeth are reduced to sharply pointed tubercles; from *Bursera* 6
2. Elytral declivity definitely sulcate, or at least first interspaces definitely depressed on declivity below level of second and third interspaces; epistoma of female unarmed .. 3
   Elytral declivity evenly convex, first interspaces very slightly or not at all depressed below general elytral surface; epistoma of female with two downward-curved teeth ..... *koebelei* Blackman



FIGS. 1–9. Lateral views of female declivities of *Cactopinorus* and *Cactopinus* species.

3. Elytral interspaces granulate or tuberculate on declivity; point of V-shaped asperate region on pronotum extending beyond posterior margin 4
   Elytral interspaces smooth on declivity; point of V-shaped asperate area not extending beyond posterior pronotal margin ..... *depressus* n. sp.
4. Size smaller, 1.3–1.8 mm; horn of male generally very short, usually less than 0.3 mm in length; declivity with first interspace not deeply impressed, granulate; second interspace not widened toward elytral apex, granulate ..... *rhois* Blackman
   Size larger, 1.4–2.5 mm; horn of male usually longer than 0.3 mm; declivity with first interspace deeply depressed, not granulate; second interspace widened toward elytral apex, not granulate 5
5. Larger, 1.6–2.5 mm, stouter (2.3 times longer than wide); sutural interspaces less deeply depressed on declivity, lateral margins of declivity lower and less strongly granulate; elytral setae shorter and finer, about as long on disk as the width of an interspace; Arizona, in giant cactus ..... *hubbardi* Schwarz

Smaller, 1.4–2.0 mm, more elongate (2.5 times longer than wide); sutural interspaces deeply impressed on declivity, lateral margins of declivity more strongly elevated and granulate; elytral setae longer and coarser, 2–3 times longer than width of interspace; southern California, in pines ..... *pini* Blackman

6. Declivity with 6–10 teeth, these large and prominent in both sexes; epistoma of male smooth between horn and antennal insertions; posterior point of asperate area of pronotum extending beyond pronotal margin ..... *desertus* n. sp.

Declivity with less than five teeth, these reduced to sharply pointed tubercles in male; epistoma of male with a prominent, bifurcate process on each side between horn and antennal insertions; posterior point of asperate area of pronotum not extending beyond pronotal margin ..... *spinatus* Wood

Cactopinus koebelei Blackman

(Fig. 3)

Cactopinus koebelei Blackman, 1938, p. 156 (type ♂; Argus Mountains, Inyo Co., California; USNM).

Cactopinus koebelei can be most readily distinguished by the almost evenly convex elytral declivity, with the impressed sutural striae forming a very slight depression. In addition, the epistoma of the female bears two downward-curved, sharply pointed tubercles, which may be reduced or absent in some specimens.

Distribution and Hosts: Known only from southern California, Baja California, and Utah, from *Pinus monophylla* Torr. & Frem. (*P. lambertiana* Dougl. is a possible host.) Specimens examined from: CALIFORNIA: Argus Mountains, Inyo Co., May 1891, A. Koebele (USNM); Valyermo, Los Angeles Co., various dates 1936–1940, C. R. Bruck and A. T. McClay, *Pinus monophylla* (CIS, CAS, OSU); Mt. Hawkins, 23 July 1940, C. R. Bruck, *Pinus lambertiana* (OSU); Mt. Pinos, Ventura Co., 30 August 1941, C. R. Bruck, *Pinus monophylla* (OSU); Lockwood Creek, Ventura Co., 13 March 1913, A. D. Hopkins, *Pinus monophylla* (USNM); Piru Creek, Ventura Co., 13 March 1913, A. D. Hopkins (USNM); Walker Pass, 15 miles west of Inyokern, Kern Co., 12 June 1961, H. F. Howden (CNC); and Guatay, San Diego Co., 12 September 1965, D. E. Bright and D. N. Kinn (CAS). UTAH: Deep Creek Mountains, near Calleo, Juab Co., 24 July 1957, D. E. Bright, *Pinus monophylla* (DEB). BAJA CALIFORNIA: Laguna Hanson, 27 August 1958, E. L. Sleeper (LBSC).

Cactopinus depressus n. sp.

(Fig. 4)

This species may be recognized most easily by the deeply impressed elytral suture on the posterior half of the disk and on the upper half of the declivity and by the smooth, unarmed lateral margins of the declivity. The epistomal horn of both specimens in the type series is very short (.15 mm) but this may be a variable character.

Male

Length 1.5 mm; 2.8 times longer than wide. Black but with the typical surface coating.

Frons deeply concave on a large circular area, this depression fringed by short yellowish setae; surface shining black, with a few, widely scattered, short yellowish setae; epistomal margin straight, with ventrally directed yellowish setae nearly as long as mandibles; epistomal horn .15 mm in length, granulate and setose except at tip, setae extending beyond tip; antennal club 1.3 times longer than wide.

Pronotum as long as wide; asperate region not extending beyond posterior margin, asperities erect and prominent; surface of lateral portions shining black.

but details obscured by surface coating; setae rather long and stout, except on asperate portion.

Elytra 1.6 times longer than wide; narrowly rounded, almost acuminate, behind; surface details obscured; interspaces narrower than striae; suture impressed below discal surface on posterior half; continuing to half-way over declivity; second interspace slightly elevated. Declivity with suture impressed on upper half, becoming flush with surface at elytral apex; second interspace elevated, unarmed.

Female

Unknown.

Type Material

Holotype, male, 46 miles north of San Luis Potosi, San Luis Potosi, Mexico; 2 September 1958, E. Mockford; on Yucca. No. 9391 in the Canadian National Collection, Ottawa. Paratype, one male, same data as holotype.

Cactopinus rhois Blackman
(Fig. 5)

Cactopinus rhois Blackman, 1938, p. 154 (type ♂; Ventura Co., California; USNM).

This species is intermediate between *C. koebelei* on the one side and *C. pini* and *C. hubbardi* on the other. From *C. koebelei* it may most easily be distinguished by the deeper, more strongly sulcate declivity, by the less strongly impressed female frons, by the unarmed epistomal margin, by the generally smaller size (1.3–1.8 mm), and by the host. It may be distinguished from the other members of the genus by the slightly granulate, relatively shallow elytral declivity and by the host.

Known only from southern California, from *Rhus* spp. Specimens examined from: CALIFORNIA: Montrose, 19 March 1934, C. R. Bruck, *Rhus diversaloba* (OSU); Montrose, 16 December 1934, C. R. Bruck, *Rhus trilobata* (OSU); Henniger Flat, Mt. Wilson, 9 December 1934, C. R. Bruck and Hughes Lake, 22 August 1936, A. T. McClay, *Pinus sabinianae* (OSU).

Remarks

The two specimens labelled as from *Pinus sabinianae* are undoubtedly *C. rhois*. This may possibly be a perching record or an error.

Cactopinus rhois occurs under the bark of dying branches of *Rhus* spp. where it constructs its brood galleries. The parental gallery is a broad, frass-filled chamber. The walls of this chamber are excavated into large egg niches from which the larval mines arise. The mines made by the larvae are meandering, engraving the wood rather deeply. Pupal cells are enlarged portions at the ends of the mines and from these, meandering feeding galleries of the new adults are evident.

Cactopinus hubbardi Schwarz
(Fig. 7)

Cactopinus hubbardi Schwarz, 1899, p. 11 (lectotype ♂; Tucson, Arizona; USNM).

C. hubbardi appears to be more closely related to *C. pini* than to other species in the genus. It is, however, larger and stouter and the declivity is less deeply

excavated. The host and distribution immediately distinguish it from the other species in the genus.

The type series of several hundred specimens was collected by H. G. Hubbard from the woody scar tissue of a cavity made by a bird in giant cactus.

Distribution and host: Known only from the region around Tucson, Arizona. Specimens examined from: ARIZONA: Tucson, 31 December 1896, H. G. Hubbard, *Cercus gigantea* (USNM); Mile 0, Hitchock Highway, Santa Catalina Mountains, 6 September 1964, C. W. O'Brien, scar tissue of Saguaro (CWO and DEB).

Cactopinus pini Blackman
(Fig. 6)

Cactopinus pini Blackman, 1938, p. 153 (type ♂, Griffen, Kern Co., California; USNM).

This is a pine-inhabiting species that closely resembles *C. hubbardi*. It is distinguished from that species by the deeper elytral declivity with higher and more strongly granulate lateral margins. It is also slightly smaller and more elongate than *C. hubbardi*.

Distribution and hosts: Known only from southern California, from *Pinus jeffreyi* Grev. Balf. Specimens examined from: CALIFORNIA: Griffen, Kern Co., 4 April 1909, A. D. Hopkins, Jeffrey pine (USNM); Ventura Co., 13 November 1915, A. D. Hopkins, Jeffrey pine (USNM) and Santa Rosa Peak, Riverside Co. (CIS).

Cactopinus desertus n. sp.
(Figs. 8, 10)

This is the only species in the genus north of Mexico that bears very prominent teeth on the second declivital interspaces. This characteristic and its larger size will distinguish it at once.

Male

Length 1.6–2.1 mm; 2.4 times longer than wide. Shining black, with the typical surface incrustation.

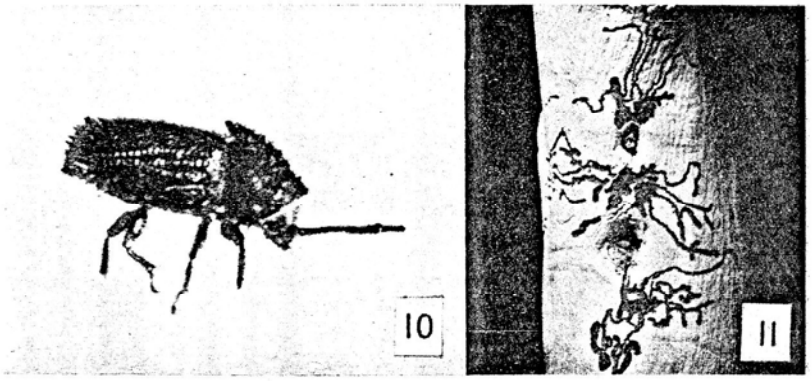
Frons distinctly concave on a large circular area, the upper margin of this area bordered by short yellowish setae; surface subopaque, with a few widely scattered, short yellowish setae; epistomal margin straight, with a dense brush of yellow setae nearly concealing mandibles; epistomal horn varying from 0.3 to 0.8 mm in length, granulate and setose except at tip, which is smooth, shining, and setose; antennal club 1.5 times longer than wide.

Pronotum 1.1 times longer than wide; asperate region extending over scutellum, asperities erect, sharp, and isolated; surface of lateral portions shining black, details obscured by surface coating; setae rather long, scattered, confined to asperate region.

Elytra 1.3 times longer than wide; broadly rounded behind; surface details obscured; interspaces slightly narrower or equal to width of striae, minutely punctured; first striae slightly impressed near suture. Declivity steep, sulcate slightly; second interspace prominently elevated and armed with six to nine prominent teeth, alternating between long and short; other interspaces unarmed.

Female

Very similar to male but the frons is less deeply concave and the epistomal horn is lacking.



FIGS. 10–11. *Cactopinus desertus*: 10, lateral view of male; 11, gallery patterns.

Type Material

Holotype, male, 7 miles south of Ocotillo Wells, Anza-Borrego Desert State Park, San Diego Co., Calif.; 11 March 1965; G. L. Downing; on *Bursera microphylla*. Allotype, female, same data as holotype. Paratypes, 111 specimens: 10, same data as type; 64, from type locality; 11 April 1965; C. W. O'Brien; same host as type; 37, Torote Canyon, Anza – Borrego Desert State Park, San Diego Co., Calif.; 12 April 1965; C. W. O'Brien; same host as type.

The holotype, allotype, and eight paratypes are deposited in the California Academy of Sciences, San Francisco, and additional paratypes are deposited in the collection of the California Insect Survey, University of California, Berkeley; the Pacific Southwest Forest and Range Experiment Station, U.S. Forest Service, Berkeley; S. L. Wood, Brigham Young University, Provo, Utah; the U.S. National Museum, Washington, D.C.; the Canadian National Collection, Ottawa; C. W. O'Brien, University of California, Berkeley; and the author.

Remarks

This species was first collected from the cambium region of a medium-sized broken branch (4–7 cm in diameter) of an Elephant tree, *Bursea microphylla* Gray, and subsequently from the trunk and smaller branches.

Gallery patterns could be determined only where the insects confined their activities to the cambium region or where the bark was thin. In thick bark, such as on the trunk, the beetles bore throughout the material, evidently producing several generations. Gallery patterns in this area become completely obliterated because of the aimless boring of the insects.

The gallery pattern (Fig. 11) consists of an enlarged, irregular chamber from which radiate several larval mines. Eggs are laid in large niches carved in the sides of the chamber and are covered with frass and boring dust. The meandering larval mines are not orientated in any particular direction and are packed with boring dust and frass. Pupation occurs in enlarged cells at the end of the larval mines.

Cactopinus spinatus Wood

(Fig. 9)

Cactopinus spinatus Wood, 1957, p. 106 (type ♂; 1 mile southeast of Cameron, Oaxaca, Mexico; Univ. of Kansas).

This distinctive Mexican species is easily distinguished by the large teeth on the female declivity, which are reduced to mere tubercules in the male.

Distribution and host: Known only from south-central Mexico from *Bursera* sp. Specimens examined from: OAXACA: One mile southeast of Cameron, 7 July 1963, S. L. Wood. JALISCO: One mile north of Altenquique, 24 June 1965, S. L. Wood, *Bursera* sp.

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