

## THE WEST INDIAN SPECIES OF PHORADENDRON (VISCACEAE)

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In this paper we attempt to delimit morphological units and typify names for the West Indian species of *Phoradendron*. Such a revision is critical for any future work in the genus because many of the oldest names have been given to Caribbean plants. The taxonomy of the genus has long been confused because of variability in taxonomic characters and widespread misapplication of names. This situation was aggravated by Trelease's (1916) monograph, which created more problems than it solved. Our study has been based primarily on examination of herbarium specimens at A, BM, GH, ILL, K, NY, and P (see APPENDIX for an index to specimens seen). Several of the species have also been observed during field work in the Lesser Antilles. In publishing this treatment, we trust that it will not be taken as the final word on Caribbean *Phoradendron*. Many problems have been uncovered that will only be resolved by additional field observation or experimental developmental studies. We hope, however, that by clearing away some of the nomenclatural debris and by noting which characters reliably distinguish taxa, we can provide a foundation for the work of future monographers.

We have included here all taxa native to the West Indian islands. We have also included all synonyms that have appeared in the literature on West Indian *Phoradendron*, although some of them refer to South American plants. This has forced us to venture opinions on some Central and South American species, even though we have not studied all these species in detail. This is an inevitable problem in a regional study; we have attempted to mitigate its effect by noting where our conclusions are tentative and need further examination.

In this treatment we have recognized as species discrete morphological units within which all characters vary and covary continuously. In some cases the range of continuous variation is quite broad. All taxa are recognized at the species level, purely as a matter of convention. To give two taxa varietal status implies a close relationship between them, and we feel that any statements of relationship are premature. For example, *Phoradendron gracile* (Krug & Urban) Trel. may be better treated as a variety of *P. quadrangulare* (Kunth) Griseb., but this depends in part on the relationships of the other South American species close to *P. quadrangulare*. We are therefore not publishing any new names or combinations, although some of the latter may ultimately be necessary if any species are reduced to varietal status. Except in the case of *P. carneum*

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Urban, for which we have seen only two specimens from Trinidad, our descriptions are based on Caribbean material; in this instance the description was augmented with measurements from Mexican material.

The West Indian species of *Phoradendron* were revised by Krug and Urban, and their treatment was published by Urban in 1897. They recognized 24 taxa in the region, of which nine are shared with South or Central America, 14 are endemic to the Caribbean islands, and one (*Phoradendron tetrastachyum* Griseb.) is actually a *Dendrophthora*. Nineteen years later, Trelease (1916) published his monumental work encompassing the entire genus *Phoradendron*. Trelease apparently had a much narrower concept of species than did Krug and Urban; he separated taxa of specific rank by unusually fine distinctions. In the West Indies he recognized 36 taxa, of which only three were shared with South America. Although both Trelease and Urban published a number of new species of *Phoradendron* after 1916, no one has since attempted to revise the West Indian species and to evaluate the substantial differences between Krug and Urban's and Trelease's treatments.

This treatment is in many respects similar to Krug and Urban's. We recognize 25 species, of which ten are endemic to the West Indies and the remainder are shared with Central and/or South America. The lower number of West Indian endemics partly reflects increased collecting and the great number of floristic studies that have been undertaken since the turn of the century. We have found four pairs of taxa (*Phoradendron undulatum* (Pohl) Eichler/*P. herminieri* Trel.; *P. quadrangulare* (Kunth) Griseb./*P. randiae* Bello; *P. crassifolium* (Pohl) Eichler/*P. martinicense* (DC.) Griseb.; *P. ottonis* Eichler/*P. caeruleascens* Trel.) in which one (the first-listed) member is South American and one is Caribbean. For these pairs the South American name is older. If the two taxa in each pair are judged to be a single species, the South American name will take precedence and the Caribbean name will be relegated to synonymy. It is beyond the scope of this study, however, to analyze the full range of variation in the South American plants. We therefore point out these pairs of "species" as ones deserving further study. In our treatment of each, we have given the rationale for our taxonomic decision, but it should in all cases be regarded as preliminary.

### GENERIC RELATIONSHIPS

*Phoradendron* is a genus of woody parasites distributed from New Jersey to Oregon and Utah in the United States and south to Argentina and Bolivia; its greatest diversity is in the tropics. Many of the species were originally described in *Viscum* L., from which *Phoradendron* was distinguished by Nuttall in 1848 on the basis of its three-merous (vs. four-merous) flowers and its spicate inflorescences (vs. flowers in axillary clusters). Engler (1894) placed *Phoradendron* in the tribe Phoradendreae, along with *Dendrophthora* Eichler. The only reliable character separating these two genera is the nature of the anthers—unilocular in *Dendrophthora* and bilocular in *Phoradendron*. This character is difficult to evaluate on herbarium specimens unless the flowers are boiled and dissected; we have found it to be consistent in all West Indian species of both genera. Other distinctions between the two genera are less reliable. Most plants with flowers arranged in a single vertical rank above the bract belong in *Dendro-*



*phthora*, but other inflorescence types appear in that genus as well (Kuijt, 1961). Kuijt (1961, p. 5) noted that "one develops an intuitive feeling of relationships after scrutinizing a large number of species, a feeling which allows one to be reasonably sure that a certain specimen belongs in *Dendrophthora* and not in *Phoradendron*."

The Phoradendreae are members of the Viscaceae, a family distinguished from the Loranthaceae by numerous morphological, anatomical, and developmental characters (Kuijt, 1969, summarizing Barlow, 1964, and Dixit, 1962). Because some workers have suggested separate evolutionary origins for the Viscaceae and the Loranthaceae (Kuijt, 1968), we believe they should be recognized as separate families, rather than subfamilies.

### CHARACTERS STUDIED

**BRANCHING PATTERN.** Plants vary in the frequency with which the shoot apex aborts or is terminated by inflorescences. Most West Indian species are monopodial, with the main axis continuing to grow and branching occurring only at the lower nodes. However, in three West Indian taxa (*Phoradendron dichotomum* (Bertero) Krug & Urban, *P. northropiae* Urban, and *P. racemosum* (Aublet) Krug & Urban) the apex almost invariably aborts, establishing a bifurcate branching pattern.

**STEM SHAPE.** Young stems in *Phoradendron* may be quadrangular and more or less winged (*P. tetrapterum* Krug & Urban), flattened and clearly two-edged (*P. anceps* (Sprengel) Krug & Urban), or nearly terete (*P. carneum* Urban). Many intergrading forms exist. For example, many flattened stems not only are two-edged in the plane of the leaves, but also have slightly less prominent ridges at right angles, giving the stem an approximately rhombic cross section. Furthermore, plants in most species become increasingly terete with age.

**CATAPHYLLS.** The West Indian members of the genus all bear reduced, bractlike cataphylls in addition to normal expanded foliage leaves. They are tightly appressed to the stem in fresh material but flare out on drying. The cataphylls may be fused to form what has been called a "vagina cataphyllaris," or they may be partially separate. Occasionally they have a prominent white margin. In West Indian members of *Phoradendron* (unlike the condition in some species of *Dendrophthora*), the first pair of cataphylls is generally in the plane opposite to that of the prophylls, giving the plants a strictly decussate phyllotaxy. Each lateral branch has, as its first appendages after the prophylls, one or more pairs of cataphylls. In some taxa (Trelease's sect. *Continuae*) additional pairs of cataphylls occur distal to each subsequent pair of foliage leaves, producing a pseudodistichous phyllotaxy. In the species descriptions, we record the distance of the cataphylls above "the node"; this refers to the node with a pair of expanded leaves immediately below the cataphylls.

The first pair of appendages on the inflorescence is a pair of prophylls; these are commonly minute but occasionally prominent. In the latter case we have noted it in the species descriptions. Cataphylls distal to the prophylls may or may not occur on the inflorescence; when they do, they are often similar in morphology to the bracts subtending the flowers.



LEAVES. Leaves may be nearly linear to suborbicular, symmetrical to notably gibbous or falcate, obtuse to acuminate, and wider from above to below the middle. They may dry green to black or sometimes reddish or almost fluorescent yellow (*Phoradendron flavens* (Sw.) Griseb.). Several of the taxa described in this paper (e.g., *P. wattii* Krug & Urban, *P. anceps*) are highly variable in leaf shape and size. Field observations in the Lesser Antilles have revealed substantial variation within a single plant; one specimen of *P. anceps* (Howard *et al.* 18816) bore leaves characteristic of four previously recognized "taxa." In addition, all intermediate shapes can be found connecting "taxa" previously delimited on leaf shape. A biosystematic study should address the lability of this character; we have found it to be much less reliable than past treatments of the genus would indicate.

Leaves may be basinerved or penninerved, although there are cases (particularly in herbarium specimens) where the distinction becomes difficult. The separation of the three main basal nerves may be somewhat above the base on some leaves. Trelease (1916) used this character to distinguish his sections *Basinervae* and *Penninervae*; while it is sometimes a useful character, it should not be weighted so heavily.

TYPE OF INFLORESCENCE. Through careful morphological and anatomical study, Kuijt (1959) has documented the variation in inflorescence pattern in some members of the Viscaceae, and his 1961 revision of *Dendrophthora* has shown how useful it can be taxonomically. In the Caribbean species of *Phoradendron*, we have found six types of inflorescence (FIGURE 1), including Kuijt's types 1a and 1b and modifications of them. The inflorescence in tribe Phoradendreae is an articulated structure with two opposite bracts subtending each fertile internode. Above each bract the flowers are most commonly arranged in two parallel columns, with a single apical flower placed midway between the columns (type 1a). In other plants there are three full columns of flowers above the bract (type 1b). In some plants the three columns are reduced to one flower each, producing a triad of flowers above each bract. As Kuijt has noted, the triad cannot be assigned to either type; however, its occurrence is consistent within certain taxa (e.g., *P. mucronatum* (DC.) Krug & Urban), so we will refer to it simply as a triad. We use these types merely as short-hand descriptions of inflorescence patterns; we do not claim that they are "real" in any developmental sense. Types 1d and 1e may simply represent slightly aberrant forms of 1a, but we name them for convenience in referring to them (e.g., in *P. anceps*, where they are common).

STAMINATE AND PISTILLATE FLOWERS. Plants may be monoecious or dioecious. If monoecious, staminate and pistillate flowers both occur on the same inflorescence. Within this inflorescence they may occupy separate internodes (e.g., in *Phoradendron solandrae* Proctor), in which case the staminate internodes are generally above the pistillate. If they occupy the same internode, their position in the internode may be variable or regular; if the latter (e.g., in *P. mucronatum*), generally the apical flower is staminate and the lower flowers pistillate.

FLOWER ORIENTATION. Eichler (1868) attempted to use orientation of the flowers



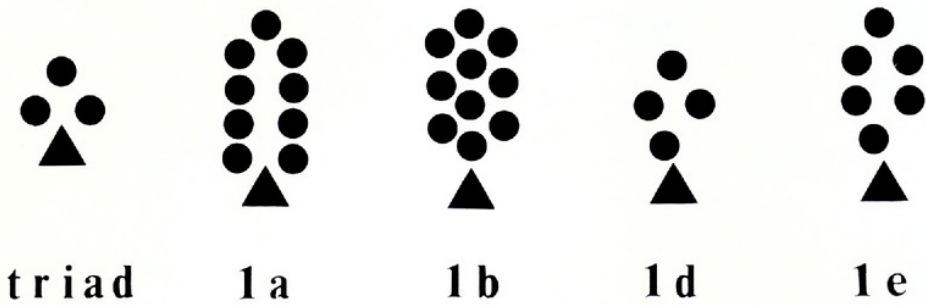


FIGURE 1. Inflorescence types (based on Kuijt, 1959). Type 1c inflorescence not found in West Indian species. Circles = flowers, triangles = bracts.

as a taxonomic character. One of the sepals is usually in line with the vertical axis of the inflorescence; if the central sepal is uppermost, then the flower is designated as "1/2," whereas if it is in the lower position the flower is designated as "2/1." Kuijt (1959) has shown that this character is not stable enough to be of much taxonomic value. It is, however, consistent within some inflorescence types. In 1a inflorescences, for example, the apical flower is generally 2/1, the lower ones 1/2.

**SEPALS.** The flowers of *Phoradendron* are extremely uniform, but whether the sepals are open or closed at fruit maturity is taxonomically useful information. If they are open (as in *P. trinervium* (Lam.) Griseb.), they stand erect and toothlike, making this character relatively easy to use on specimens with mature fruits.

**FRUIT COLOR AND SHAPE.** Fruit color varies from white through yellow to red and in some cases may be concordant with other characters. In general, however, mature fruits are absent from herbarium specimens, and collectors' notes frequently do not mention the character. Immature fruits may sometimes be helpful: in dry specimens of *Phoradendron anceps*, enlarging fruits have a distinct golden sheen when viewed under a 10× lens. Fruit shape has been mentioned in some descriptions but is difficult to use on herbarium specimens; *P. anceps* has notably pyriform young fruits, but other variations in fruit shape must be documented in the field. Some species (e.g., *P. mucronatum*) are characterized by warts on the pericarp. In other species (e.g., *P. gracile*) these warts do not appear on all fruits, and in still others (e.g., *P. trinervium*) the warts are reduced to an obscure ring around the fruit just below the sepals.

#### TAXONOMIC TREATMENT

**Phoradendron** Nutt. J. Acad. Nat. Sci. Philadelphia, ser. 2. 1: 185. 1848.

*Phoradendrum* auct. sphalm.

Woody parasites with flattened, rhombic, quadrangular, or terete stems. West Indian species all with expanded foliage leaves, cataphylls on all axes or only on lateral branches. Leaves opposite, petiolate or sessile, basinerved or penninerved, frequently drying coriaceous. Plants monoecious or dioecious; if monoecious, then staminate and pistillate flowers on same inflorescence but



not necessarily in same fertile internode. Inflorescences spikes, with or without basal cataphylls; fertile internodes 2 to several, each subtended by pair of opposite, decussate bracts. Flowers in pits along rachis, arranged in 1 to 3 ranks above each bract, singly (then pistillate), in triads, or in more complex arrangements. Perianth parts (sepals) in single whorl of 3, these closed or open and erect in fruit. Staminate flowers shed soon after anthesis; anthers 3, sessile, bilocular. Pistillate flowers with short style and inferior ovary. Fruits ovoid to globose or pyriform, white, yellow, or red, smooth, papillate, wrinkled, or warty. Seed 1, surrounded by fibrous viscid endocarp.

TYPE SPECIES: *Phoradendron californicum* Nutt.

#### KEY TO THE WEST INDIAN SPECIES OF PHORADENDRON

1. At least 1 pair of cataphylls distal to each pair of foliage leaves (on both main axes and laterals).
  2. Axes not terminated by an inflorescence; branching not bifurcate (plant monopodial).
    3. Leaves with 3 to 5 (to 7) basal or nearly basal nerves; inflorescences type 1b or triads.
      4. Inflorescences triads, formed in axils of cataphylls. . . . . 13. *P. martinicense*.
      4. Inflorescences type 1b, not in axils of cataphylls. . . . . 5. *P. flavens*.
    3. Leaves penninerved; inflorescences type 1a. . . . . 17. *P. piperoides*.
  2. Axes terminated by an inflorescence, branching thus appearing bifurcate.
    5. Leaves basinerved, nerves generally prominent.
      6. Sepals open, erect on mature fruits. . . . . 12. *P. inequidentatum*.
      6. Sepals closed on mature fruits. . . . . 4. *P. dichotomum*.
    5. Leaves penninerved, nerves obscure.
      7. Largest leaves < 6 cm long; fruits red; Bahamas. . . . . 15. *P. northropiae*.
      7. Largest leaves > 8 cm long; fruits white; Hispaniola and Puerto Rico. . . . . 19. *P. racemosum*.
1. Cataphylls only at base of lateral branches.
  8. Stems 4-winged; inflorescences type 1a; fruits white. . . . . 22. *P. tetrapterum*.
  8. Stems terete, compressed, or 4-ridged, but not winged; inflorescence type and fruits various.
    9. Leaves strap shaped, their bases meeting; fruits warty throughout, set in spreading cup with glandular margin. . . . . 3. *P. carneum*.
    9. Leaves not as above, petiole more or less well-developed; fruits warty or not; spreading cup, if present, lacking glandular margin.
      10. Flowers 1 per bract (2 per fertile internode).
        11. Leaves wider above middle, obovate to oblanceolate, basinerved; fruits drying dark or light, but not glaucous with paler sepals. . . . . 23. *P. trinervium*.
        11. Leaves wider at or below middle, lanceolate to elliptic or oblong (only rarely oblanceolate), penninerved; fruits drying dark, glaucous, with paler sepals. . . . . 25. *P. wattii*.
      10. Flowers more than 1 per bract.
        12. Inflorescence internodes appearing tetrastichous with 4 pistillate flowers (flowers actually in 2 triads, each triad with upper flower staminate, lower 2 pistillate); fruits warty throughout.
          13. Leaves suborbicular, glaucous; Trinidad. . . . . 16. *P. ottonis*.
          13. Leaves obovate to oblanceolate, not glaucous; widespread. . . . . 14. *P. mucronatum*.



12. Inflorescence internodes with more than 4 pistillate flowers (if flowers in triads, then pistillate flower uppermost or entire internode unisexual); fruits smooth or wrinkled, or warty only on upper part.
14. Inflorescences type 1b, prominently hexastichous, clavate.
  15. Most flowers pistillate, forming white fruits; bracts forming bilobed "cup"; leaf margin slightly revolute. .... 11. *P. hexastichum*.
  15. All flowers staminate (pistillate plants of this species have inflorescence type 1a); bracts fully fused to form cup with horizontal rim; leaf margin plane. . . 7. *P. grisebachianum*.
14. Inflorescences type 1a, 1d, 1e, or triads, slender, linear.
16. All flowers in triads.
  17. Leaves penninerved; sepals closed in mature fruit.
    18. Leaf apex acute to acuminate, apiculate; only pistillate flowers borne in upper half of fertile internode. .... 7. *P. grisebachianum*.
    18. Leaf apex rounded to obtuse, not apiculate; both staminate and pistillate flowers borne throughout fertile internode. .... 8. *P. gundlachii*.
  17. Leaves basinerved; sepals open and erect in mature fruit.
    19. Stem flattened, flaring below nodes; internodes often < 3 cm long; fruits red-orange to scarlet; Cuba and Bahamas. .... 20. *P. rubrum*.
    19. Stem quadrangular, not flaring; internodes often > 3 cm long; fruits yellow to orange or red-orange; Antilles other than Cuba. .... 23. *P. trinervium*.
16. Inflorescences type 1a, 1d, or 1e, at most only few inflorescences on plant triads.
  20. Leaves > 3 times as long as wide, lance-linear to oblanceolate.
    21. Some fruits warty above; leaves < 1 cm wide. . . . 6. *P. gracile*.
    21. Fruits smooth; leaves various.
      22. Leaf apex rounded. .... 9. *P. haitense*.
      22. Leaf apex apiculate.
        23. Young fruits drying with golden sheen, pyriform. .... 10. *P. hartii*.
        23. Young fruits drying dark, only obscurely (if at all) golden, globose to oblong. .... 18. *P. quadrangulare*.
  20. Leaves < 3 times as long as wide, shape variable.
    24. Dry immature fruits pyriform or lageniform, with golden sheen when viewed under 10× lens. .... 1. *P. anceps*.
    24. Dry immature fruit globose or cylindrical, not golden.
      25. Largest leaves ≥ 8 cm long.
        26. Leaf apex acuminate. .... 24. *P. undulatum*.
        26. Leaf apex rounded, sometimes apiculate.
          27. Fertile internodes narrowly cylindrical, not flaring distally; flowers 7 to 15 per bract; Cuba, Hispaniola, and Puerto Rico. .... 2. *P. barahonae*.



- 27. Fertile internodes strongly clavate, distally flaring; flowers 3 to 5 per bract; Jamaica. . . . . 21. *P. solandrae*.
- 25. Largest leaves < 6.5 cm long.
- 28. Leaves basinerved; sepals open, erect in mature fruit; fruits yellow, orange, or red. . . . . See couplet 18.
- 28. Leaves penninerved; sepals closed in mature fruit, or opening only slightly; fruits white. . . . . See couplet 17.

1. **Phoradendron anceps** (Sprengel) Krug & Urban *in* Urban, Bot. Jahrb. Syst. **24**: 41. 1897. FIGURE 2a, b.

*Viscum anceps* Sprengel, Syst. Veg. ed. 16 [17]. **1**: 487. [1824] 1825. TYPE: Santo Domingo, Bertero 439, *pro parte* (lectotype (Trelease, 1916), B, destroyed; isolecotypes, G-DC, IDC 800. 664: I. 3 (left)!, PR; photo of PR specimen at ILL!).

*Viscum flavens* Sprengel, *ibid.* 488, *pro parte*; not Sw. 1788. ?*Phoradendron flavens* Eggers, Fl. St. Croix, 123. 1876; Fl. St. Croix & Virgin Is. 59. 1879; not Griseb. 1860. TYPE: Porto Rico, 1820, Bertero s.n. (holotype, B, destroyed; isotype, G-DC, IDC 800. 664: I. 7!).

*Phoradendron martinicense* sensu Griseb. Fl. Brit. W. Indian Is. 314. 1860, *pro parte* (as to Imray 217 from Dominica, *fide* Nicolson (unpubl. MS)).

*Phoradendron chrysocarpum* Krug & Urban *in* Urban, Bot. Jahrb. Syst. **24**: 39. 1897.

*Phoradendron chrysocarpum* Krug & Urban var. *typicum* Trel. *in* Stehlé, Bull. Soc. Bot. France **1953-54**: 27. 1954. TYPE: Porto Rico, Bertero 439, *pro parte* (lectotype (Trelease, 1916), G-DC, IDC 800. 664: I. 3 (right)!).

*Phoradendron crenulatum* Urban, Symb. Antill. **5**: 332. 1907. TYPE: Jamaica prope Halberstadt, Harris 6659 (holotype, B, destroyed, photo at ILL!; isotypes, BM!, NY!).

*Phoradendron chrysocarpum* Krug & Urban var. *dussii* Urban, *ibid.* 333. *Phoradendron dussii* (Urban) Trel. Genus *Phoradendron*, 100. 1916. *Phoradendron dussii* (Urban) Trel. var. *typicum* Stehlé, Bull. Soc. Bot. France **92**: 262. 1945. TYPE: Guadeloupe, Duss 3904, *pro parte* (holotype, B, destroyed, photo at ILL!; isotype, NY!; specimen at US is holotype of *P. herminieri* Trel.).

*Phoradendron albovaginatum* Urban, Symb. Antill. **7**: 504. 1913. TYPE: Jamaica prope Ewarton, Harris 6703 (holotype, B, destroyed; isotype, NY!).

*Phoradendron helleri* Trel. Genus *Phoradendron*, 100. 1916. TYPE: Puerto Rico, E of Ponce, 3 Dec. 1902, Heller 6188 (holotype, NY!, photo at ILL!; isotypes, GH!, US; photo of US specimen at ILL!).

*Phoradendron cauliflorum* Trel. Repert. Spec. Nov. Regni Veg. **26**: 343. 1929, from description. TYPE: Haiti, Morne Rochelois prope Miragone ad Icard cr., 750 m alt., Ekman H6492 (holotype, B, destroyed).

*Phoradendron dussii* (Urban) Trel. var. *pauli* Stehlé, Bull. Soc. Bot. France **92**: 262. 1945. TYPE: Guadeloupe, Bena, Quentin, & Stehlé 5834 (holotype, P?, not found; isotype, NY!).

*Phoradendron chrysocarpum* Krug & Urban var. *parvifolium* Trel. *in* Stehlé, *ibid.* TYPE: Martinique, Tunnel des Deux-Choux, 23 March 1939, H. & M. Stehlé 3368 (holotype, ILL!; isotype, NY!).

*Phoradendron berterianum* sensu Bello, Apuntes Fl. Puerto-Rico **1**: 278. 1881, *fide* Urban (1897); not Griseb. 1860, or Eichler, 1868.

Stems flattened, ancipital, sometimes more or less rhombic; cataphylls 1 or 2 pairs, ca. 2 mm above node, at base of lateral branches only, scarcely fused, flaring ovate or truncate, white edged. Leaves with petiole 5–10 mm long; blade



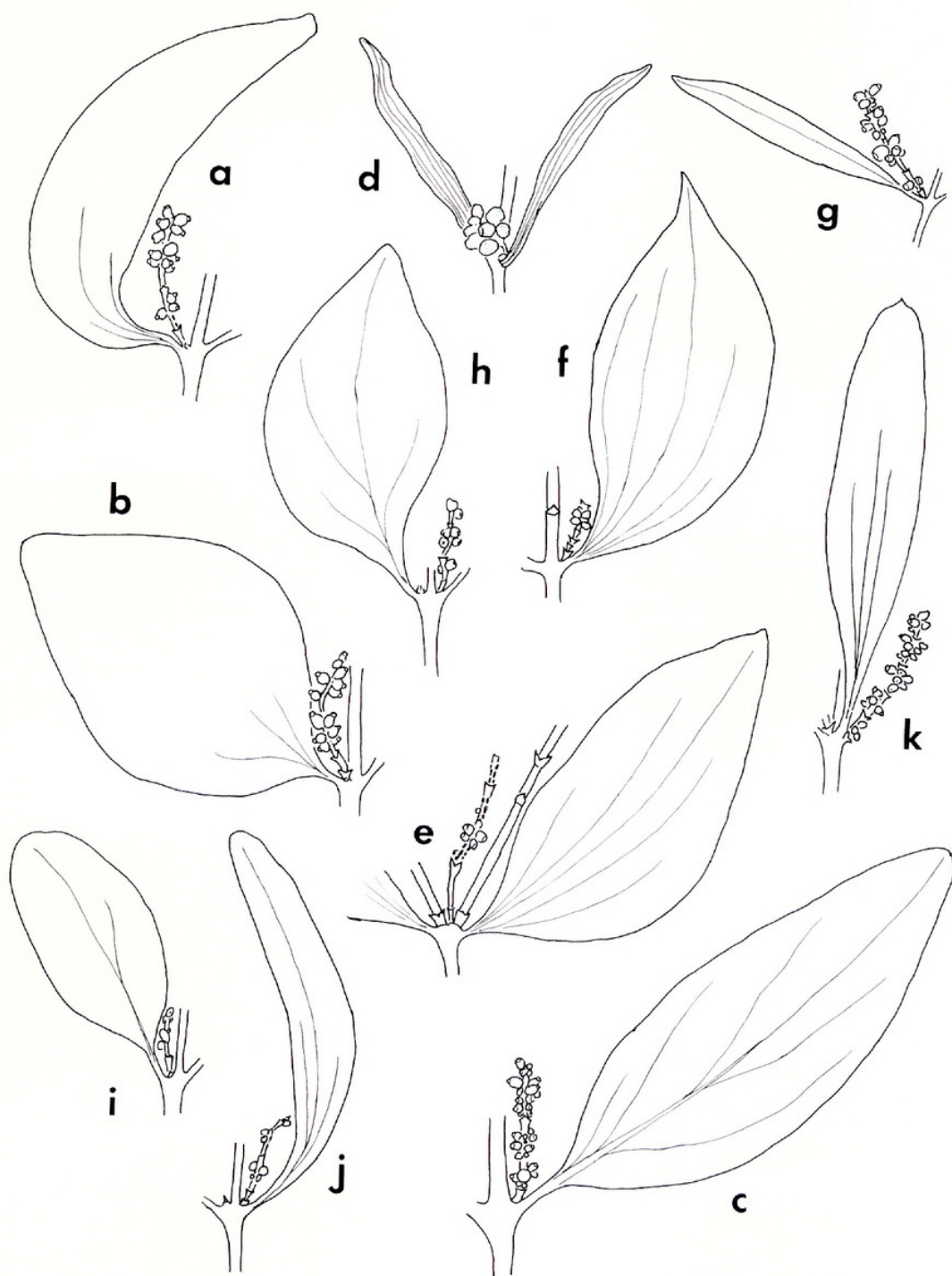


FIGURE 2. Leaves and inflorescences,  $\times 0.53$ . a, b, *Phoradendron anceps*: a, Ekman 9615 (GH); b, Duss 101 (GH). c, *P. barahonae*, Fuertes 927 (A). d, *P. carneum*, Eggers s.n., 12/83 (GH). e, *P. dichotomum*, Sintenis s.n., 12/85 (GH). f, *P. flavens*, Wilbur 7973 (GH). g, *P. gracile*, Rehder s.n., 15 Feb. 1903 (A). h, *P. grisebachianum*, Harris 10861 (GH). i, *P. gundlachii*, Wright 2650 (GH). j, *P. haitense*, Ekman 9604 (GH). k, *P. hartii*, Wiles W30 (K).



ovate, elliptic, or lanceolate, sometimes laterally asymmetric or falcate, 2.7–11.5(–13.5)  $\times$  (1.1–)1.7–5.9 cm, apex obtuse, base cuneate, nerves all basal or laterals slightly suprabasal. Inflorescences 2 to 5 per leaf axil, to 4 cm long, axis ca. 1 mm thick when dry; cataphylls lacking or 1 pair, these and lower bracts 3-lobed; upper bracts more nearly entire and navicular, prominently white margined; fertile internodes 1 to 4, type 1d or 1e, less frequently type 1a or triads (or on upper internodes single pistillate flower per bract); flowers 3 to 12 per bract, unisexual or with staminate and pistillate flowers intermixed; apical flower 2/1, lower ones 1/2. Young fruits pyriform, drying with golden sheen visible under 10 $\times$  lens; mature fruits creamy white to yellowish; sepals partially open but not stiffly upright at maturity.

DISTRIBUTION. Venezuela, Cuba, Hispaniola, Jamaica, Puerto Rico, St. Thomas, St. Croix, Guadeloupe, Dominica, Martinique, St. Lucia, St. Vincent, Trinidad.

*Phoradendron anceps* has been divided into several species distinguished on the basis of leaf shape. Our field observations, however, have shown that leaf shape is so variable even within a single individual that the distinctions among the taxa break down. Also, all inflorescence types can be found on a single plant. *Phoradendron dussii* var. *pauli*, from the Lesser Antilles, and *P. albavaginatatum*, from Jamaica, appear to be small-leaved forms of *P. anceps*. *Phoradendron anceps* is similar to *P. haitense* and *P. hartii*, which are distinguished by their much longer, narrower leaves.

*Phoradendron helleri* var. *sanguinea* Trel. is better referred to *P. barahonae*.

2. ***Phoradendron barahonae*** Urban & Trel. Repert. Spec. Nov. Regni Veg. **13**: 444. 1914. TYPE: Hispaniola, *Fuertes* 275, *pro parte* (B, destroyed; lectotype (here designated), G, photo at ILL!; isolectotypes, A!, NY!, P!) (excluding *Fuertes* 275 at BM!, GH!, K!, which is *Phoradendron racemosum*). FIGURE 2c.

*Phoradendron cerinocarpum* C. Wright ex Trel. Genus *Phoradendron*, 139. 1916, *nomen illegit.*

*Phoradendron helleri* Trel. var. *sanguinea* Trel. *ibid.* 100. TYPE: Hispaniola, *Fuertes* 1531b (holotype, B, destroyed, photo at ILL!; isotypes, GH!, NY!).

Stems flattened when young but rapidly becoming terete; cataphylls 1 or 2 pairs, on lateral branches only, 1–2 and 5 mm above node, subannular, white margined. Leaves with petiole 5–10 mm long; blade lanceolate, somewhat falcate, 4.4–15  $\times$  1.4–5.5 cm, the apex tapering but ultimately obtuse, the base cuneate, the lateral nerves with 1 pair basal and 1 pair suprabasal, or all basal (Puerto Rico). Inflorescences 1 to 4 per leaf axil, more or less clavate, to 4 cm long, ca. 2 mm thick when dry; cataphylls lacking or 1 pair, like bracts entire or 3-lobed, flaring, forming infundibular tube; fertile internodes 3 to 5, type 1a; flowers 7 to 15 per bract, deeply sunken into rachis, unisexual or with staminate and pistillate flowers intermixed; apical flower 2/1, lower ones mostly 1/2, occasionally 2/1. Fruits globose, white; sepals closed.



DISTRIBUTION. Venezuela, Cuba, Hispaniola, Puerto Rico, St. Lucia.

Although it is somewhat inconvenient to lectotypify a species with a representative of a mixed collection, *Fuertes 275* at G is the only extant specimen that was definitely seen by the authors of the species.

The Puerto Rican plants are more consistently basinerved than are plants from elsewhere in the range. The one collection from St. Lucia (*Proctor 18089*) is unusual in that many of the fertile internodes have type 1b rather than type 1a inflorescences; however, fruit shape and texture and leaf shape and nervation all suggest placement in this species.

*Phoradendron barahonae* is similar to *P. anceps* but is often more clearly penninerved and tends to have more robust inflorescences with more flowers per internode. The fruits of *P. barahonae* are globose and somewhat flattened apically; the sepals often dry a color different from the rest of the fruit. In *P. anceps* the fruits are always pyriform until maturity, when they become globose but not flattened; the sepals are generally the same color as the fruit. The fruits of *P. anceps* have a pronounced golden sheen (visible under a 10× lens) when young, whereas those of *P. barahonae* are never golden. Trelease (1916), in his description of *P. cerinocarpum*, and Léon and Alain (1951) recorded the fruit color as red, but data on all specimens we have seen list it as white.

3. **Phoradendron carneum** Urban, Bot. Jahrb. Syst. 23: 1. 1897. TYPE: Mexico, Jalisco, hills near Guadalajara, 1888, *Pringle 1854* (holotype, B, destroyed; isotypes, GH!, NY!). FIGURE 2d.

Stems flattened, rough-striate; internodes flaring above; prophylls prominent; cataphylls 1 pair on lateral branches only, basal, scarcely fused, thick, fleshy, acute. Leaves sessile; blade linear, straplike, 4.8–7.5 × 0.5–0.7 cm, apex obtuse, bases meeting, nerves all basal. Plants dioecious; inflorescences 1 or 2 per leaf axil, to 2.5 cm long, axis ca. 2 mm thick when dry; cataphylls lacking; prophylls prominent; bracts nearly fused, forming infundibular tube; fertile internodes 2, type 1a; flowers 5 to 11 per bract, orientation irregular. Fruits globose, in spreading cup with papillate margins, red-orange, warty, sepals closed.

DISTRIBUTION. Mexico (Guanajuato, Jalisco, Michoacán, Oaxaca, Puebla, Querétaro), Trinidad.

There are two possible explanations for the apparent disjunction: if the species has often been misidentified in herbaria the range may be more continuous than is evident here; or the two Trinidad specimens may be mislabeled. Both collected by Eggers, they are dated 12/83 and 2/83 but are otherwise unnumbered. Most of Eggers's other Caribbean collections are numbered. Eggers was in Trinidad in 1883, but he had been in Veracruz and Oaxaca from April 1865 to November 1867 when he was in the Danish army. Urban (1902) did not discuss any Eggers collections from Mexico, but these "Trinidad" specimens may have actually been collected while Eggers was in Oaxaca or traveling through southern Mexico after his discharge from the army.



4. **Phoradendron dichotomum** (Bertero) Krug & Urban *in* Urban, Bot. Jahrb. Syst. **24**: 48. 1897. FIGURE 2e.

*Viscum dichotomum* Bertero *in* Sprengel, Syst. Veg. ed. 16 [17]. **1**: 488. [1824] 1825, excluding synonyms and distribution in North America; not D. Don, 1825 (= *Viscum articulatum* Burman var. *dichotomum* Kruz ex Hooker, 1886) or *Loranthus dichotomus* Ruiz & Pavon, 1802 (= *Psitticanthus*). LECTOTYPE (Trelease, 1916): Santo Domingo, Bertero 710 (PR, photo at ILL!).

*Viscum berterianum* DC. Prodr. Syst. Nat. Regni Veg. **4**: 281. 1830. *Phoradendron berterianum* (DC.) Griseb. Fl. Brit. W. Indian Is. 313. 1860 (as to name only—*P. berterianum* Griseb. = *P. grisebachianum* Eichler). TYPE: Santo Domingo, 1821, Bertero s.n. (G-DC, IDC 800. 663: III. 3!).

*Phoradendron martinicense* sensu Griseb. *ibid.* 314, *pro parte* (as to Wright 1251).

*Phoradendron dichotomum* (Bertero) Krug & Urban var. *ovatifolium* Krug & Urban *in* Urban, Bot. Jahrb. Syst. **24**: 49. 1897. *Phoradendron ovatifolium* (Krug & Urban) Urban, Symb. Antill. **8**: 188. 1920. TYPE: "in Sto. Domingo in sylvis Sierra del Palo Quemado 600 m. alt.," Eggers 1845 (holotype, B, destroyed, photo at ILL!; isotypes, BM!, K!).

*Phoradendron anceps* sensu G. Maza, Anal. Inst. Seg. Enseñ. Habana **2**: 170. 1895, *fide* Urban (1897); not (Sprengel) Krug & Urban, 1897.

Stems flattened to terete, drying with characteristic long wrinkled furrows; branching bifurcate; cataphylls 1 or 2 pairs between pairs of foliage leaves, lower pair just above node, upper pair 1–3 cm above first, separate or slightly fused, broadly ovate to deltate, often white margined. Leaves with petiole indistinct, < 5 mm long; blade ovate, elliptic, or lanceolate, 4.6–12.5 × 2.4–6 cm, thin, apex acute to acuminate, base cuneate, nerves basal and prominent. Inflorescences terminal or axillary, in fascicles of 1 to several, up to 7 cm long, axis 2–4 mm thick when dry; cataphylls 1 or 2 pairs, cupuliform like bracts; basal internode sterile, to 8 mm long; fertile internodes 4 to 7, varying from type 1a to type 1b, both types on same plant, or upper part of internode type 1a and lower part hexastichous; flowers 14 to 21 per bract; internodes with staminate flowers above, pistillate below; apical flower 2/1, lower ones 1/2 or irregular. Fruits globose, white; sepals closed.

DISTRIBUTION. Panama, Cuba, Hispaniola, Jamaica, Puerto Rico.

The Jamaican members of this species have rounder leaves and only six to ten flowers per internode. One collection from San Juan Province, Dominican Republic (*Howard & Howard* 8732) has leaves with an obtuse apex, but in other respects it matches the species description.

*Viscum dichotomum* Bertero ex Sprengel was actually published in late 1824, according to Van Steenis-Kruseman and Stearn (1954) and so takes precedence over *V. dichotomum* D. Don, which was published on 1 February 1825 (Stearn, 1945).

5. **Phoradendron flavens** (Sw.) Griseb. Fl. Brit. W. Indian Is. 313. 1860.

FIGURE 2f.

*Viscum flavens* Sw. Nova Gen. Sp. Pl. Prodr. 32. 1788, excluding *Viscum aliud racemosum, foliis latissimis* Plumier (= *Phoradendron hexastichum*) and *V. racemo-*



*sum* Aublet (= *P. racemosum*); not Sprengel, [1824] 1825, or Macfad. 1850. TYPE: Jamaica, Swartz *s.n.* (holotype, s, not seen; isotype, BM!).

*Viscum macrophyllum* Macfad. Fl. Jamaica 2: 195. 1850; not Sprengel, [1824] 1825, or DC. 1830 (both = *P. racemosum*), or *Phoradendron macrophyllum* Ule, 1915. TYPE: Jamaica, Macfadyen *s.n.* (K!).

*Phoradendron flavum* Eichler in C. Martius, Fl. Brasil. 5(2): 106. 1868. Error for *P. flavens* (Sw.) Griseb.

*Phoradendron flavens* (Sw.) Griseb. var. *australe* Trel. Genus *Phoradendron*, 155. 1916. TYPE: St. Vincent, Eggers 6746 (location of holotype not designated, not at ILL; isotype, P!).

*Phoradendron chrysocladon* A. Gray, U. S. Expl. Exped., Phan. 15: 743. 1854. TYPE: Brazil, near Rio de Janeiro, 1838–1842, Wilkes *Exped. s.n.* (holotype, US; isotype, GH!).

Stems flaring and somewhat flattened above, sometimes ribbed below leaves; cataphylls 1 or 2 pairs between each pair of foliage leaves, 1–2 cm above node (to 4 cm at base of lateral branches), not fused, large and flaring, deltate. Plants drying fluorescent yellow. Leaves with petiole indistinct; blade ovate to elliptic, often oblique, 5.2–16 × 2.2–8.5 cm, the apex acute to acuminate, the base cuneate, the nerves basal, prominent, reticulate adaxially. Inflorescences 1 to 3 per leaf axil, to 6 cm long, axis ca. 2 mm thick when dry; cataphylls 2 or 3 pairs, large, flaring like bracts; fertile internodes 3 to 5 (to 7), type 1b, flowers 11 to 18 per bract, staminate and pistillate intermixed; all flowers 1/2. Fruits globose, white to yellowish, drying rough-wrinkled; sepals closed.

DISTRIBUTION. Central and South America, Jamaica, Hispaniola, Guadeloupe, Dominica, St. Lucia, St. Vincent, Grenada, Trinidad.

*Phoradendron flavens* var. *australe* is the name applied by some authors to small-leaved plants of *P. flavens*; on the type specimen at P, the largest leaves are 6.5 × 2.5 cm. However, we have found that variation in leaf size is continuous within the species; *P. flavens* var. *australe* is not a discrete taxon.

Nicolson (unpublished MS) claims that the inflorescences have up to 12 joints. We have seen no specimens with this many fertile internodes.

6. ***Phoradendron gracile*** (Krug & Urban) Trel. Genus *Phoradendron*, 112. 1916. FIGURE 2g.

*Phoradendron quadrangulare* (Kunth) Krug & Urban var. *gracile* Krug & Urban in Urban, Bot. Jahrb. Syst. 24: 37. 1897. *Phoradendron rubrum* Griseb. var. *gracile* (Krug & Urban) Fawcett & Rendle, Fl. Jamaica 3: 96. 1914. TYPE: Jamaica, 1896, Harris 6392 (lectotype (Trelease, 1916), B, destroyed, photo at ILL; isolectotype, NY!).

*Phoradendron gracile* (Krug & Urban) Trel. var. *ballii* Trel. Genus *Phoradendron*, 113. 1916. TYPE: Jamaica, 1882, Ball *s.n.* (holotype, B, destroyed, photo at ILL!).

Stems rhomboid to quadrangular; cataphylls 1 pair at base of lateral branches only. Leaves with petiole < 5 mm long; blade oblong-linear, 3.3–6.5 × 0.5–0.9 cm, the apex obtuse to acute, sometimes apiculate, the base tapering, the nerves basal. Inflorescences 1 or 2 per leaf axil, to 4 cm long, axes 1 mm thick when dry; cataphylls lacking; fertile internodes 3 to 5, type 1a; flowers 7 to 9



per bract; internodes staminate, pistillate, or mixed; apical flower 2/1, lower ones 1/2. Fruits globose, color not reported, at least some rough-wrinkled or warty-tuberculate before maturity; sepals closed.

DISTRIBUTION. Cuba, Jamaica.

Krug and Urban (*in* Urban, 1897) reported plants with 11 to 15 flowers per bract.

This taxon should perhaps be returned to varietal status under *Phoradendron quadrangulare*. Development of warty fruits is a consistent character for distinguishing other taxa in the genus, however, so we have weighted it more heavily than some authors have. Developmental and genetic studies would be helpful here to determine the likelihood of parallel evolution of warty fruits.

7. ***Phoradendron grisebachianum*** Eichler *in* C. Martius, Fl. Brasil. 5(2): 127, 134m. 1868. FIGURE 2h.

*Phoradendron berterianum* (DC.) Griseb. Fl. Brit. W. Indian Is. 313. 1860, excluding plant from St. Vincent, which is *P. hexastichum*. In his description of *P. berterianum*, Grisebach cited *Alexander s.n.*, *McNab s.n.*, *Purdie s.n.*, and *Macfadyen s.n.*, all from Jamaica. Krug and Urban (*in* Urban, 1897) claimed that these were not in Grisebach's herbarium at Göttingen but at K, where Grisebach is known to have worked. Of the four, we found only the Alexander specimen, which we designate as the lectotype. Trelease neotypified the species with *Harris 6341* (GH!, NY!), but this neotypification is superseded by the discovery of authentic material at K.

*Phoradendron fici* Urban, Symb. Antill. 5: 333. 1907. TYPE: Jamaica, Great Goat Island, alt. 50', 19 April 1906, *Harris 9220* (holotype, B, destroyed, photo at ILL!; isotypes, BM!, NY!).

Stems flattened to rhombic, somewhat flaring above; cataphylls 1 or 2 pairs, at base of lateral branches only, lower pair 1–2 mm above node, second pair 5–10 mm above first, flaring-ovate and scarcely fused to subannular. Leaves with petiole 6–12 mm long; blade lanceolate to lance-elliptic, 5–14 × 1.5–4.5 (–7.5) cm, membranaceous, apex acute to sharply acuminate and apiculate, base cuneate, nerves pinnate. Plants dioecious; inflorescences 1 to 5 per leaf axil, to 3.5 mm long, axis < 1 mm thick when dry; cataphylls lacking or 1 pair, fused with bracts to form straight horizontal collar; fertile internodes 3 or 4, on pistillate plants type 1d or triads, with flowers 3 to 5 per bract, apical flower 2/1, lower ones 1/2, on staminate plants type 1b, with flowers 10 to 13 per bract. Fruits borne in top half of fertile internode, globose, red to red-orange, drying distinctively rough-wrinkled; sepals closed.

DISTRIBUTION. Endemic to Jamaica.

Léon and Alain (1951) reported that this species was cited by Urban (no reference given) as having been collected by Paul Serre in 1909 in the province of Habana. We have seen no Cuban specimens and believe that the report may be in error.

Some specimens of this species may be confused with those of *Phoradendron hexastichum*. The leaves are very similar in size, shape, and venation, but those of *P. grisebachianum* are more membranous and are generally smaller. The



pistillate spikes of the two species are not at all alike. In *P. grisebachianum* they are slender with three or four fertile internodes; the flowers are mostly in triads borne well above the midpoint of the internode and produce red to red-orange berries that dry rough-wrinkled. In *P. hexastichum* they are thick and clavate with four or five fertile internodes; the flowers are in a type 1b arrangement and extend to the bottom of the internode, producing white berries that dry more or less smooth and blackish. The confusion is created by the staminate spikes, which are type 1b in both species. The only difference between the two that we have been able to discover is that the members of a pair of bracts in *P. grisebachianum* are fused to form a straight-edged flaring cup and are not at all distinguishable; in *P. hexastichum* the "cup" is clearly bilobed and frequently white margined. Also, because *P. hexastichum* is monoecious, developing fruits are present on all but very young specimens. Defined in this way, the two species have nonoverlapping ranges: *P. grisebachianum* is endemic to Jamaica, whereas *P. hexastichum* does not appear to occur on that island.

8. **Phoradendron gundlachii** Krug & Urban in Urban, Bot. Jahrb. Syst. 24: 44. 1897. TYPE: "habitat in Cuba in summitate Guayabon m. Jun.," C. Wright 2650 (holotype, B, destroyed; isotypes, G, GH!, K!; photo of G specimen at ILL!). FIGURE 2i.

"*Phoradendron flavescens forma foliis majoribus*," Griseb. Catal. Pl. Cubens. 120. 1866; not *P. flavescens* Nutt. Type the same as for *P. gundlachii*.

Stems flattened, rapidly becoming terete; cataphylls 1 or 2 pairs at base of lateral branches only, second pair < 1 cm above first, ovate, spreading. Leaves with petiole 4–9 mm long; blade elliptic to ovate, 4.6–6.5 × 1.6–4.5 cm, apex rounded to obtuse, base cuneate, nerves obscure, 3 basal veins and 2 lateral veins joining midvein above base. Inflorescences solitary in leaf axils, to 3 cm long, axis ca. 1 mm thick when dry; cataphylls 1 pair; bracts shallowly cleft and white margined; fertile internodes 2 or 3, type 1d, 1e, or triads; flowers 3, 4, or 6 per bract; pistillate only or both sexes intermixed; flower orientation irregular. Fruits globose, white; sepals closed.

DISTRIBUTION. Endemic to Cuba.

See discussion under *Phoradendron rubrum*. Urban (1897) noted that this species is very similar to *P. acinacifolium* C. Martius.

9. **Phoradendron haitense** Urban, Symb. Antill. 5: 334. 1907. LECTOTYPE (Trelease, 1916): Haiti, ad Petite Rivière de l'Artibonite, Picarda 1666 (B, destroyed, photo! in Trellease, 1916, pl. 135). FIGURE 2j.

Stems flattened; cataphylls 1 pair at base of lateral branches only, not fused, ovate. Leaves with petiole 5 mm long; blade lance-linear to oblanceolate, often somewhat falcate, 5–12 × 1–2 cm, the apex acute to truncate, often mucronate, the base tapering, the nerves basal. Inflorescences 1 per leaf axil, to 3 cm long, axis ca. 1 mm thick when dry; cataphylls lacking or 1 pair, like bracts flaring, navicular, entire, and white margined; fertile internodes generally 2, type 1d



or 1e (1a); flowers 4 to 7 per bract; apical flower 2/1, lower ones 1/2. Young fruits pyriform, with golden sheen visible under  $10\times$  lens when dry; color of mature fruits not recorded; sepals partially open.

DISTRIBUTION. Endemic to Hispaniola.

This species is distinguished from *Phoradendron anceps* by its narrower leaves, and from *P. hartii* by its flattened stems and rounded leaf apices.

10. **Phoradendron hartii** Krug & Urban in Urban, Bot. Jahrb. Syst. **24**: 40. 1897. TYPE: Trinidad ad St. Anne's, 8/1896, *Hart 6101* (holotype, B, destroyed, photo at ILL!; isotype, P!). FIGURE 2k.

Stems terete to compressed; cataphylls 1 pair on lateral branches only, ca. 1 mm above node, separate, flaring, broadly ovate. Leaves with petiole 5–10 mm long, distal end indistinct; blade lance-linear to oblong, somewhat falcate, 6–13.6  $\times$  1.3–3.2 cm, apex rounded to more often acute with apical thickening 1 mm long, base tapering, nerves all basal or inner ones suprabasal. Inflorescences 1 to 4 per leaf axil, 2–3 cm long, axis ca. 1 mm thick when dry; cataphylls 1 pair, they and bracts 3-lobed to entire, white margined, navicular; fertile internodes 3 to 6, type 1a or 1e; flowers 3 to 7 per bract, mostly pistillate but some internodes with staminate and pistillate intermixed; apical flower 2/1, lower ones 1/2. Young fruits pyriform, drying with golden sheen visible under  $10\times$  lens; color of mature fruits not reported; sepals closed.

DISTRIBUTION. Dominica, Trinidad.

This species is distinct from *Phoradendron quadrangulare* on the basis of its fruit (golden, pyriform), and from *P. anceps* because of its long, slender (more than three times as long as wide) leaves and acute apical thickenings.

11. **Phoradendron hexastichum** (DC.) Griseb. Fl. Brit. W. Indian Is. 313. 1860. FIGURE 3a.

*Viscum hexastichum* DC. Prodr. Syst. Nat. Regni Veg. **4**: 282. 1830. *Phoradendron hexastichum* (DC.) Griseb. var. *ovatum* Stehlé, Bull. Soc. Bot. France **34**: 28. 1954, *nomen illegit.* TYPE: Cuba, Havana, 1825, *De la Ossa s.n.* (holotype, G-DC, IDC 800. 664: I. 4!).

*Viscum cornifolium* Presl, Epimel. Bot. 254. 1849. Included in *Phoradendron latifolium* Griseb. f. *hexasticha* Krug & Urban in Urban, Bot. Jahrb. Syst. **24**: 50. 1897. Although Urban placed this species in the synonymy of *P. latifolium* (= *P. piperoides*), it appears from the description and photo to be referable here. TYPE: Mexico, Haenke s.n. (holotype, PR, photo at ILL!).

*Phoradendron hexastichum* (DC.) Griseb. var. *longispica* Eichler in C. Martius, Fl. Brasil. **5**(2): 129. 1868. TYPE: "ad S. Gabriel de Cachoeira secundum Fl. Rio Negro, prov. do Alto Amazonas," *Spruce 2112* (holotype, hb. Delessert, G, photo at ILL!; isotypes, GH!, NY!, P!). Trelease erected a new species, *P. productipes* (TYPE: *Gardner 1676*, photo at ILL!), for this and other Brazilian members of *P. hexastichum*.

*Phoradendron hexastichum* C. Wright in Sauvalle, Anales Acad. Ci. Méd. Habana **7**: 345. 1870, *nomen nudum*. Sauvalle cited C. Wright 1252. This name is probably an error for *P. hexastichum*.



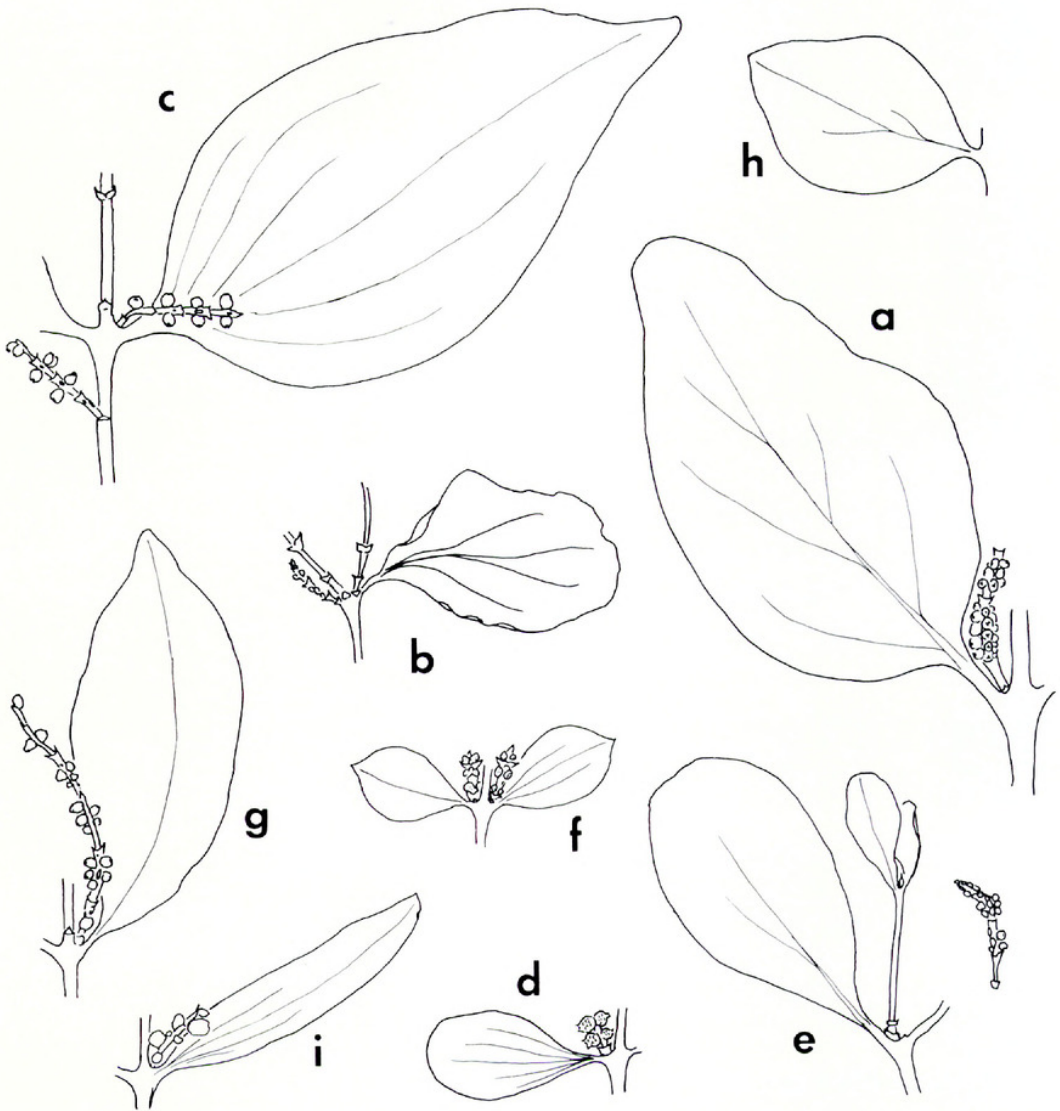


FIGURE 3. Leaves and inflorescences,  $\times 0.53$ . a, *Phoradendron hexastichum*, Wright 1252 (GH). b, *P. inequidentatum*, Ayliffe, hb. Trin. 14320 (K). c, *P. martinicense*, Beard 1132 (GH). d, *P. mucronatum*, Fuytes 240 (A). e, *P. northropiae*, Brace 5325 (GH). f, *P. ottonis*, Britton & Freeman 2708 (GH). g, h, *P. piperoides*: g, Howard & Proctor 14244 (A); h, Sintenis 339 (GH). i, *P. quadrangulare*, Heller 6186 (GH).

*Phoradendron berterianum* sensu Griseb. Fl. Brit. W. Indian Is. 313. 1860, *pro parte* (as to *Guilding s.n.*, St. Vincent, excluding synonyms).

*Viscum verticillatum foemina* Sieber, Pl. Mart. 227 (BM!, K!, P!). Not the specimen supposedly at G-DC, which is the type of *V. martinicense* DC.

*Phoradendron hexastichum* (DC.) Griseb. var. *angustifolium* Krug & Urban in Urban, Bot. Jahrb. Syst. 24: 46. 1897. TYPE: Grenada, prope Plaisance in monte St. Catharine, 600 m alt., Dec. 1889, Eggers 6140 (holotype, B, destroyed, photo at ILL!; isotypes, GH!, P!).

*Phoradendron lapatanum* Trel. Bull. Torrey Bot. Club 54: 476. 1927. TYPE: Cuba, Península de Zapata, Santo Tomas, El Corte, 23 July 1920, Roig & Cremata 2198 (holotype, NY!; fragment of holotype, ILL!).



*Phoradendron stehlei* Trel. in Stehlé, Bull. Soc. Bot. France **85**: 575, *nomen nudum*; *ibid.* **92**: 261. 1945. TYPE: Martinique, Calvaire du Gros-Morne aux Deux-choux, 4 September 1937, *Stehlé 2162* (holotype, ILL!). Isotypes at NY! and P! are *P. undulatum* (Pohl) Eichler; *Stehlé & Stehlé 2462* (P!) is labeled "co-typus" of *P. stehlei* but is *P. anceps*.

Stems strongly flattened, internodes dilated upward; cataphylls 1 (or 2) pair(s) at base of lateral branches only, separate, thick. Leaves with petiole 5–10 mm long; blade lanceolate to ovate, 5–12.2 × 2.2–8.5 cm, thick, apex and base rounded, base decurrent onto petiole, margin weakly revolute, nerves pinnate and prominent. Inflorescences 1 (or 2) per leaf axil, clavate, to 5 cm long, axis 1–2 mm thick when dry; cataphylls lacking (rarely 1 pair); bracts flaring, large, thick; fertile internodes up to 5, type 1b, obviously hexastichous, entirely pistillate, or staminate and pistillate flowers intermixed; if fertile internode bisexual, staminate flowers in separate vertical rank and internode sometimes > 6-ranked; flowers 6 to 10 per bract, mostly 1/2, but upper center 1 sometimes 2/1. Fruits globose, white; sepals closed.

DISTRIBUTION. Mexico, Venezuela, Brazil, Cuba, Hispaniola, Jamaica, Puerto Rico, Guadeloupe, Dominica, Martinique, St. Lucia, St. Vincent, Grenada.

Staminate individuals of *Phoradendron grisebachianum* may be confused with this species. See *P. grisebachianum* for discussion.

12. ***Phoradendron inequidentatum*** Rusby, Bull. Torrey Bot. Club **27**: 137. 1909. TYPE: Bolivia, Guanai, 2000 ft, May 1886, *Rusby 1544* (holotype, NY; isotype, GH!). FIGURE 3b.

*Phoradendron jenmani* Trel. Genus *Phoradendron*, **85**. 1916. TYPE: British Guiana, Demerara, *Jenman 4678* (holotype, K, photo! in Trelease, 1916, *pl. 114b*). On p. 85, Trelease designated this specimen as the holotype; on p. 174, he listed *Jenman 2541* as the type and this specimen as a paratype.

Stems terete or only slightly compressed when young, monopodial or with branching bifurcate; cataphylls 1 to 3 pairs, first pair 2–3 mm above node, second 9–20 mm above first, separate to subannular, broadly ovate and flaring. Leaves with petiole 5–8 mm long; blade obovate, 4–7 × 2.3–5 cm, apex rounded to obscurely emarginate, base tapering, nerves basal. Inflorescences terminal or axillary, 1 or 2 per leaf axil, to 4 cm long, axis 2–3 mm thick when dry; cataphylls 1 or 2 pairs, flaring like bracts to form broad cup; fertile internodes 3 to 6; flowers 1 per bract or in triads (sometimes 3 flowers in 1 vertical rank), set in broad cup extending 0.3–0.5 mm up fruit; upper internodes pistillate, lower flowers of lower internodes staminate; most flowers 2/1, some 1/2. Fruits ovoid, yellow to red (*vide* Philcox, 1978); sepals erect.

DISTRIBUTION. Bolivia, Guyana, Trinidad.

Philcox (1978) listed this species as being from Trinidad and Guyana; however, Rusby's type is from Bolivia and appears more robust than the Trinidad specimens. Study of South American phoradendrons should clarify whether the distribution is indeed as discontinuous as it appears, if the two groups of



plants are separate taxa, or if they are connected by conspecifics currently masquerading under other names.

13. **Phoradendron martinicense** (DC.) Griseb. Fl. Brit. W. Indian Is. 314. 1860 (as to name only; Grisebach's description refers to *P. anceps*).

FIGURE 3c.

*Viscum martinicense* DC. Prodr. Syst. Nat. Regni Veg. 4: 280. 1830. TYPE: Martinique, Sieber 227, pro parte (G-DC, photo not in microfiche). Type not seen, but the description is diagnostic. Other specimens of Sieber 227 seen are *P. hexastichum*.

Stems terete; cataphylls 2 to 5 pairs between pairs of foliage leaves, first pair 1–5 mm distal to node, subsequent pairs 10–30 mm apart, small, generally distinct, on all axes. Leaves with petiole indistinct, 4–7 mm long; blade lanceolate to ovate, 5–17.7 × 2–8.8 cm, the apex acute to acuminate, ultimately obtuse, the base tapering, the nerves basal. Inflorescences 1 to 3 in axils of both leaves and cataphylls, to 6 cm long, axis ca. 1 mm thick when dry; cataphylls 1 to 3 pairs, like bracts flaring and navicular; fertile internodes 3 to 8 (to 11); in Lesser Antilles, flowers mostly in triads with uppermost flower staminate, lower 2 pistillate, sometimes 2 more pistillate flowers formed in 1a pattern, most pistillate flowers forming fruits so spikes tending to appear tetrastichous; in Trinidad, inflorescences type 1a, or occasionally type 1d, with 5 flowers per bract; flower orientation irregular but generally apical flower 1/2, lower ones 2/1. Fruits globose, yellow to orange, rough; sepals open.

DISTRIBUTION. Colombia, Venezuela, the Guianas, Peru, Guadeloupe, Dominica, Martinique, St. Lucia, Trinidad.

*Phoradendron martinicense* is distinguished from *P. crassifolium* on the basis of inflorescence morphology. At the northernmost limit of *P. martinicense*, in the Lesser Antilles, flowers are borne in triads or (rarely) five per bract in a 1a pattern. The 1a pattern becomes more common in Trinidad. North of the Amazon (Roraima, Pará, the Guianas, and parts of Venezuela and Colombia), plants with longer (more than ten flowers per internode) 1a inflorescences occur. Plants with triads (which are therefore more like *P. martinicense*) occur in Peru, Colombia, Venezuela, and Panama, mixed with plants with type 1a inflorescences. Plants from southern and eastern Brazil (Mato Grosso, Goiás, and southward) and Bolivia are more variable, with triads only on the upper internodes; the lower internodes are type 1b. The type of *P. crassifolium*, from southeastern Brazil, was drawn by Eichler with a type 1b inflorescence. The berries were drawn as smooth, whereas those of *P. martinicense* are rough-warty.

Other characters separating the two species are not reliable. Trelease (1916) claimed that plants of *Phoradendron martinicense* have shinier leaves than those of *P. crassifolium*, a character impossible to evaluate from herbarium specimens. He also said that *P. martinicense* has red fruits, while those of *P. crassifolium* are yellow. Most specimens of *P. martinicense* for which we have data have yellow to orange fruits, but labels on two specimens from Guyana at NY record the fruits as white; we have seen no record of red ones.



*Phoradendron ayacuchanum* Trel. ex J. F. Macbr. (Publ. Field Mus. Nat. Hist., Bot. Ser. **13**: 385. 1937) also appears to be part of this complex. The holotype (Killip & Smith 22713, ILL!) was collected in Peru and has a type 1a inflorescence.

This group is well-defined and would repay more careful investigation of the variability of the inflorescence type.

**14. *Phoradendron mucronatum* (DC.) Krug & Urban** *in* Urban, Bot. Jahrb. Syst. **24**: 34. 1897. FIGURE 3d.

*Viscum mucronatum* DC. Prodr. Syst. Nat. Regni Veg. **4**: 282. 1830. TYPE: Santo Domingo, Bertero s.n. (G-DC, IDC 800. 664: II. 1!).

*Phoradendron emarginatum* C. Martius *in* Eichler *in* C. Martius, Fl. Brasil. **5**(2): 118. t. 38, fig. 1. 1868. TYPE: in silvis Catingas prov. Minarum et Piauh, 1839, Claussen 252 (lectotype (Trelease, 1916), B, destroyed; isoelectotype, hb. Delessert, G, photo at ILL!).

*Phoradendron emarginatum* C. Martius var. *minor* Eichler *in* C. Martius, *ibid.* 119. *Phoradendron minor* (Eichler) Trel. Genus *Phoradendron*, 117. 1916. TYPE: Brazil, inter Olho d'Agoa et Alegre, praedia prov. Piauiensis, M. Vaga s.n. (holotype, B, destroyed; isotype, M, photo! in Trelease, 1916, pl. 172).

*Phoradendron chaguaramasanum* Trel. *in* Britton, Bull. Torrey Bot. Club **48**: 330. 1921. TYPE: Trinidad, Chaguaramas, Britton 2718 (holotype, NY!; isotypes, GH!, K!).

*Viscum myrtilloides* sensu Sprengel, Syst. Veg. ed. 16 [17]. **1**: 488. [1824] 1825, *pro parte*; *Phoradendron myrtilloides* sensu Griseb. Fl. Brit. W. Indian Is. 314; not *V. myrtilloides* Willd. (see synonymy of *P. trinervium*).

Stems flattened but soon becoming terete, minutely glandular-papillate; internodes frequently < 2 cm long; cataphylls 1 pair at base of lateral branches only, separate or if fused then deeply cleft. Leaves with petiole indistinct; blade oblanceolate to obovate, 1.2–4.5 × 0.9–2.2 cm, the apex obtuse to truncate, sometimes apiculate, the base cuneate, the median nerve strong, 2 lateral basal nerves less prominent. Inflorescences generally solitary in leaf axils (rarely paired), much shorter than subtended internode, < 1.5 cm long, axis 1–3 mm thick when dry; prophylls prominent; cataphylls absent; bracts fused, broadly ovate; fertile internodes 2 to 4; flowers in triads, upper 1 staminate and lower 2 pistillate, most of latter producing fruit so that fruiting inflorescence appears tetrastichous; apical flower 2/1, lower ones 1/2. Fruits globose, white to orange, pericarp prominently warty; sepals erect.

DISTRIBUTION. Panama, Venezuela, Brazil, Hispaniola, Antigua, Guadeloupe, Dominica, Martinique, Trinidad.

**15. *Phoradendron northropiae* Urban** *in* Northrop, Mem. Torrey Bot. Club **12**: 33. pl. 4. 1902. TYPE: Bahamas, Andros Island, Conch Sound, 1890, Northrop & Northrop 551 (lectotype (Gillis, 1976), F, not seen; isoelectotypes, GH!, K!, NY!). FIGURE 3e.

Stems flattened, rapidly becoming terete; branching mostly bifurcate; cataphylls 1 pair near base of lateral branches only, appearing truncate on older specimens. Leaves with petiolar region short; blade oblanceolate to obovate (rarely obcordate), 3–6(–9) × 1.7–4(–6) cm, the apex rounded, truncate, or



emarginate, the base tapering, the nerves pinnate, obscure. Inflorescences 1 to 3 per leaf axil, to 3.5 cm long, axis ca. 2 mm thick when dry; cataphylls generally 1 pair, these and bracts partially or wholly fused, flaring-ovate, white margined; fertile internodes up to 5, type 1a; flowers 5 to 11 per bract, upper one(s) staminate, lower ones pistillate; apical flower 2/1, lower ones 1/2. Young fruits globose, golden, mature fruits white(?) to red; sepals erect. (Fruit color *fide* Correll & Correll, 1982.)

DISTRIBUTION. Bahamas.

Gillis (1976) merged this with *Phoradendron racemosum*, but Correll and Correll (1982) maintained the two species as distinct because of the difference in fruit color. Our specimens have no data on fruit color, but *P. northropiae* is distinctive in having consistently smaller leaves that are never acute but frequently emarginate at the apex. Rizzini (1978) reported this species from Venezuela and Brazil. See also discussion under *P. racemosum* and *P. inequidatum*, which may be related.

16. **Phoradendron ottonis** Eichler in C. Martius, Fl. Brasil. 5(2): 119. 1868.

TYPE: Venezuela, Orituca, *Otto* 565 (holotype, B, destroyed).

FIGURE 3f.

*Phoradendron caerulescens* Trel. in Britton, Bull. Torrey Bot. Club 48: 330. 1921.

TYPE: Trinidad, Chacachacare Island, 13 April 1920, *Britton & Hazen* 1726 (holotype, NY!; isotype, GH!).

Stems flattened and 2-winged to more or less rhombic; internodes often only 1–2 cm long, flaring above; cataphylls 1 or 2 pairs, on lateral branches only, immediately above node, not strongly spreading, more or less deltate. Leaves with petiole indistinct; blade ovate, elliptic, or suborbicular, 1.4–3 × 1.1–2.1 cm, glaucous, the apex obtuse to acute, mucronate, the base cuneate, the nerves basal, finely reticulate. Inflorescences solitary in leaf axils, shorter than internode they subtend, to 1.4 cm long, axis 1–2 mm thick when dry; prophylls large and obvious, cataphylls lacking; bracts broadly navicular, erose margined; fertile internodes 2 to 4; flowers in triads; apical flowers 2/1, lower ones 1/2 or irregular. Fruits ovoid, warty; sepals erect, open.

DISTRIBUTION. Trinidad, Venezuela.

This species is very similar to *Phoradendron mucronatum*, from which it is distinguished by its suborbicular, glaucous leaves.

17. **Phoradendron piperoides** (Kunth) Trel. Genus *Phoradendron*, 145. 1916.

FIGURE 3g, h.

*Loranthus piperoides* Kunth in Humb., Bonpl., & Kunth, Nova Gen. Sp. Pl. 3: 443.

1818. *Viscum piperoides* (Kunth) DC. Prodr. Syst. Nat. Regni Veg. 4: 281. 1830.

TYPE: Colombia, Papayan, 1871, *Bonpland s.n.* (P-HBK!; IDC 6209-2. 88: III. 6!).

*Viscum latifolium* Sw. Fl. Ind. Occ. 1: 268. 1797. *Phoradendron latifolium* (Sw.) Griseb.

Fl. Brit. W. Indian Is. 314. 1860, excluding synonyms of Macfadyen, *V. flavens*; not



Lam. 1789. TYPE: "habitat in arboribus Jamaicae," Swartz *s.n.* (holotype, s, not seen).

*Viscum schottii* Pohl in DC. Prodr. Syst. Nat. Regni Veg. **4**: 281. 1830. *Phoradendron schottii* (Pohl) A. Gray, U. S. Expl. Exped., Phan. **15**: 742. 1854. TYPE: Brazil, "on the Organ Mountains," 1828, Pohl *s.n.* (holotype, G-DC, IDC 800. 663: III. 4!). Trelease (1916, p. 147) cited Pohl 4319 as the type, but on p. 184 listed the type as Pohl 246, PR (photos!, plate 217 and ILL).

*Viscum tereticaule* DC. Prodr. Syst. Nat. Regni Veg. **4**: 280. 1830. *Viscum teretifolium* "DC." in Hemsley, Biol. Centr.-Amer., Bot. **3**: 85. 1882, probably an error for *tereticaule*. "*Phoradendron tereticaule*," Index Kew. **3**: 503. 1894, not Lam. 1789.

*Viscum tereticaule* DC. var. *cubense* DC. Prodr. Syst. Nat. Regni Veg. **4**: 280. 1830. TYPE: Cuba, De la Ossa *s.n.* (G-DC, IDC 800. 663: II. 4, 5!).

*Viscum fockeanum* Miq. Linnaea **18**: 60. 1844, from description. TYPE: "species ut videtur Surinami in Citris aurantis vulgaris . . .," Focke *s.n.* (holotype, L or U, not seen).

*Viscum laurifolium* Presl, Epimel. Bot. 255. 1849. *Phoradendron laurifolium* (Presl) Eichler in C. Martius, Fl. Brasil. **5**(2): 107. 1868. TYPE: Mexico, "in regione temperata," Leibold *s.n.* (holotype, PR, photo at ILL!).

*Phoradendron biolleyi* K. Krause, Notizbl. Königl. Bot. Gart. Berlin **5**: 264. 1912, *fide* Burger, Fieldiana Bot. **13**: 75. 1983. TYPE: Costa Rica, San Mateo, 1892, Biolley 7078 (holotype, B, destroyed).

*Phoradendron piperoides* (Kunth) Trel. f. *composita* Trel. Genus *Phoradendron*, 148. 1916. TYPE: Brazil, Rio de Janeiro, Ule 4800 (holotype, B, destroyed).

*Phoradendron ficulneum* Trel. Repert. Spec. Nov. Regni Veg. **25**: 55. 1928. TYPE: Haiti, La Selle, Pétionville, Tête de l'Eau, 500 m, Ekman 9370 (location of holotype not cited, no specimen at ILL; isotype, K!).

Stems terete; cataphylls 1 pair on percurrent axes, 3–6 mm above node, generally 2 pairs on lateral branches, 1 pair just above node, the other 1–2 cm above first, separate, triangular, grayish. Leaves with petiole  $\leq 5$  mm long; blade elliptic to lanceolate, appearing distichous because of interspersed cataphylls, 3–10  $\times$  1.2–4.1 cm, apex acuminate, base cuneate, nerves pinnate and obscure. Inflorescences 1 to 5 per leaf axil, standing erect on fresh specimens, to 5(–7) cm long, axis 1–2 mm thick when dry; cataphylls usually 1 or 2 pairs, crateriform like bracts; fertile internodes up to 7, type 1a or sometimes triads; flowers 3 to 5 per bract, staminate and pistillate intermixed in same internode; apical flower 2/1, lower ones 1/2. Fruits ovoid, yellow to orange, drying wrinkled; sepals stiffly erect.

DISTRIBUTION. Mexico to Argentina, Hispaniola, Cuba, Jamaica, Puerto Rico, St. Bart's (Wikström, 1826), Guadeloupe, Dominica, Martinique, St. Lucia, St. Vincent, Grenada, Trinidad, Tobago.

This species is well named; the upright stance of the inflorescences and the apparently distichous phyllotaxy make it look from a distance like a species of *Piper*.

*Phoradendron ficulneum* is the name given to the round-leaved forms of *P. piperoides*. The two leaf shapes fully intergrade (see FIGURE 3g, h).

18. *Phoradendron quadrangulare* (Kunth) Griseb. Fl. Brit. W. Indian Is. 711. 1864 (as to name only—Grisebach cited a Crueger specimen from Trinidad, which is *P. trinervium*). FIGURE 3i.



- Loranthus quadrangularis* Kunth in Humb., Bonpl., & Kunth, Nova Gen. Sp. Pl. 3: 444. 1818. *Viscum quadrangulare* (Kunth) DC. Prodr. Syst. Nat. Regni Veg. 4: 283. 1830. TYPE: "regni Novo-Granatensis, prope Pandi et Fusagasuga, alt. 940 h.," Bonpland s.n. (holotype, P-HBK!; IDC 6209-2. 89: I. 2!).
- Viscum angustifolium* Bertero ex Sprengel, Syst. Veg. ed. 16 [17]. 1: 487. [1824] 1825, fide Urban (1897); not *Loranthus angustifolius* Kunth, 1818, or *Phoradendron angustifolium* Eichler, 1868. LECTOTYPE (Trelease, 1916): Portorico, Bertero 1234 (B, destroyed).
- Viscum trigonum* D. Dietr. Syn. Pl. 1: 546. 1839, pro parte (excluding synonym *Loranthus sessilis* H. Balbis), fide Urban (1897). TYPE: "ad sylvas maritimas Portorici et Guadelupae 1. Bertero [s.n.]" (JE, not seen). See also *Phoradendron trinervium*.
- Viscum tetragonum* A. Rich. Hist. Phys. Pol. Nat. Cuba, Pl. Vasc. 647. 1845, not DC. 1830, or *Phoradendron tetragonum* Ule, 1915. TYPE: Cuba, Sagra s.n., hb. Richard (P!). See also *P. trinervium*.
- Viscum randiae* Bello, Apuntes Fl. Puerto-Rico, 278. 1881. *Phoradendron randiae* (Bello) Britton, Bot. Porto Rico 5: 257. 1924, fide Urban (1897). TYPE: "en el cerro de la mesa, Mayagues," Bello s.n. (holotype, B, destroyed).
- Phoradendron antillarum* Trel. Genus *Phoradendron*, 111. 1916. TYPE: Cuba, Wright 1302 (holotype, n.v., photo at ILL!; isotypes, GH!, K!, NY!, P!). Trelease did not record where he photographed the holotype; the specimen in the photograph is not the one at GH or NY. Wright's Cuban specimens were widely distributed, and the photograph might have been taken at B.
- Phoradendron antillarum* Trel. var. *orientalis* Trel. *ibid.* 112. TYPE: eastern Cuba, Guantanamo Bay, 17-30 March 1909, Britton 2119 (holotype, NY!, photo at ILL!).
- Phoradendron antillarum* Trel. var. *orientalis* Trel. f. *longa* Trel. *ibid.* TYPE: Cuba, Camaguey to Santayana, 4 April 1909, Britton 2415 (holotype, NY!, photo at ILL!).
- Phoradendron venezuelense* Trel. *ibid.* 111. TYPE: Venezuela, Tovar, Fendler 1810 (holotype, K, photo at ILL!; isotype, GH!).
- Phoradendron moringicola* Trel. Repert. Spec. Nov. Regni Veg. 26: 343. 1929. TYPE: Haiti, Monfleury on Moringa, 27 October 1927, Ekman 9180 (holotype, ILL!; isotype, A!).
- Phoradendron rubrum* sensu Griseb. Fl. Brit. W. Indian Is. 314. 1860, and other authors, not L.

Stems flattened to more or less rhombic when young; cataphylls 1 pair at base of lateral branches only, small, annular, scarcely spreading. Leaves with petiole indistinct; blade linear, oblong to more or less oblanceolate, 3-9(-13) × 0.4-1.8(-2.5) cm, ca. 5 times longer than wide, the apex acute to obtuse, sometimes apiculate, the base tapering, the nerves basal, obscure. Inflorescences 1 to 3 per leaf axil, 2-2.5(-5) cm long, axis ≤ 1 mm thick when dry; cataphylls lacking (occasionally 1 pair on some branches); bracts small, fused, collarlike; fertile internodes up to 5, type 1a<sup>2</sup>, flowers 7 to 9 (to 12) per bract, not deeply sunken in rachis, staminate and pistillate intermixed or pistillate only; apical flowers 2/1, lower ones 1/2, but orientation not wholly consistent. Young fruits oblong with golden sheen; mature fruits globose, bright yellow; sepals closed.

DISTRIBUTION. Guatemala, Costa Rica, Panama, Ecuador, Peru, Colombia, Venezuela, Argentina, Cuba, Hispaniola, Jamaica, Puerto Rico, Bahamas, Antigua (Trelease, 1916, *Nicholson* 16), Guadeloupe (Urban, 1897, *Bertero*

<sup>2</sup>Winters 562 (GH) is type 1b.



s.n., the type of *Viscum trigonum*; Stehlé, 1954, *Sprengel s.n.*), St. Vincent (Grisebach, 1860, *Guilding s.n.*), Trinidad.

*Phoradendron quadrangulare* has smooth to wrinkled fruits with closed sepals, as well as type 1a inflorescences and small, narrow leaves. It can thus be easily distinguished from *P. gracile*, which has warty fruits, from *P. rubrum*, which has erect sepals, and from *P. haitense* and *P. hartii*, both of which have larger leaves and at least some type 1d or 1e inflorescences.

The holotype of *Phoradendron moringicola* has unusually large (10–13 cm) leaves, but in all other respects it agrees with this species. The isotype at A is more nearly typical, with leaves 4–9 cm long.

Krug and Urban's (*in Urban*, 1897) species description is based on Antillean specimens; in South American plants spikes can be up to 5 cm long with seven fertile internodes. The holotype of *Loranthus quadrangularis* at P has leaves measuring 5–6 × 1.5 cm that are somewhat more lanceolate than those of Antillean plants, spikes 3.4–4 cm long with four or five fertile internodes, and 11 to 13 flowers per bract. Krug and Urban (*in Urban, ibid.*) reported that all flowers on this specimen are pistillate. Plants with spikes as large as those of the type are uncommon in both South America and the Greater Antilles.

Trelease (1916) claimed that the epithet *quadrangulare* should be applied only to South American plants because of the larger spikes on the type. Based on the range of variation in both South American and Antillean specimens, there seems no rationale for placing them in separate species. If, however, it is decided that they are different, then the earliest Caribbean name is *Phoradendron randiaae*.

It is not clear where Trelease obtained his information on fruit color—he recorded white for *Phoradendron quadrangulare*, whereas label data on all specimens we have seen indicate that the fruits are yellow to orange. This is confirmed by the field observations of Wiens (pers. comm.), who has seen the species in both Ecuador and Mexico. He also notes that the species is common in seasonally dry coastal habitats.

Rizzini (1978) suggested uniting *Phoradendron quadrangulare* and *P. rubrum* because the Venezuelan material has orange to red fruits and semierect sepals, supposedly intermediate characters. He also claimed that the number of flowers per internode, leaf size, and leaf shape are approximately the same in both species. We have found that the two species are easily distinguished in the Caribbean by the red-orange to scarlet fruits, flattened stems, broad leaves, and open sepals of *P. rubrum* vs. the yellow to orange fruits, quadrangular stems, narrow leaves, and closed sepals of *P. quadrangulare*. Part of the confusion may be attributed to Grisebach's misapplication of the name *P. rubrum*.

19. ***Phoradendron racemosum*** (Aublet) Krug & Urban *in Urban*, Bot. Jahrb. Syst. **24**: 46. 1897. FIGURE 4a.

*Viscum racemosum* Aublet, Hist. Pl. Guiane Fr. **2**: 895. 1775. LECTOTYPE (Gillis, 1976): Guiana (P, specimen not found).

*Viscum macrophyllum* Sprengel, Syst. Veg. ed. 16 [17]. **1**: 488. [1824] 1825; not DC. 1830, Macfad. 1850, or *Phoradendron macrophyllum* Ule, 1915. TYPE: Porto Rico, 1820, Bertero s.n. (holotype, B, destroyed; isotype, G-DC, IDC 800. 664: I. 6!).



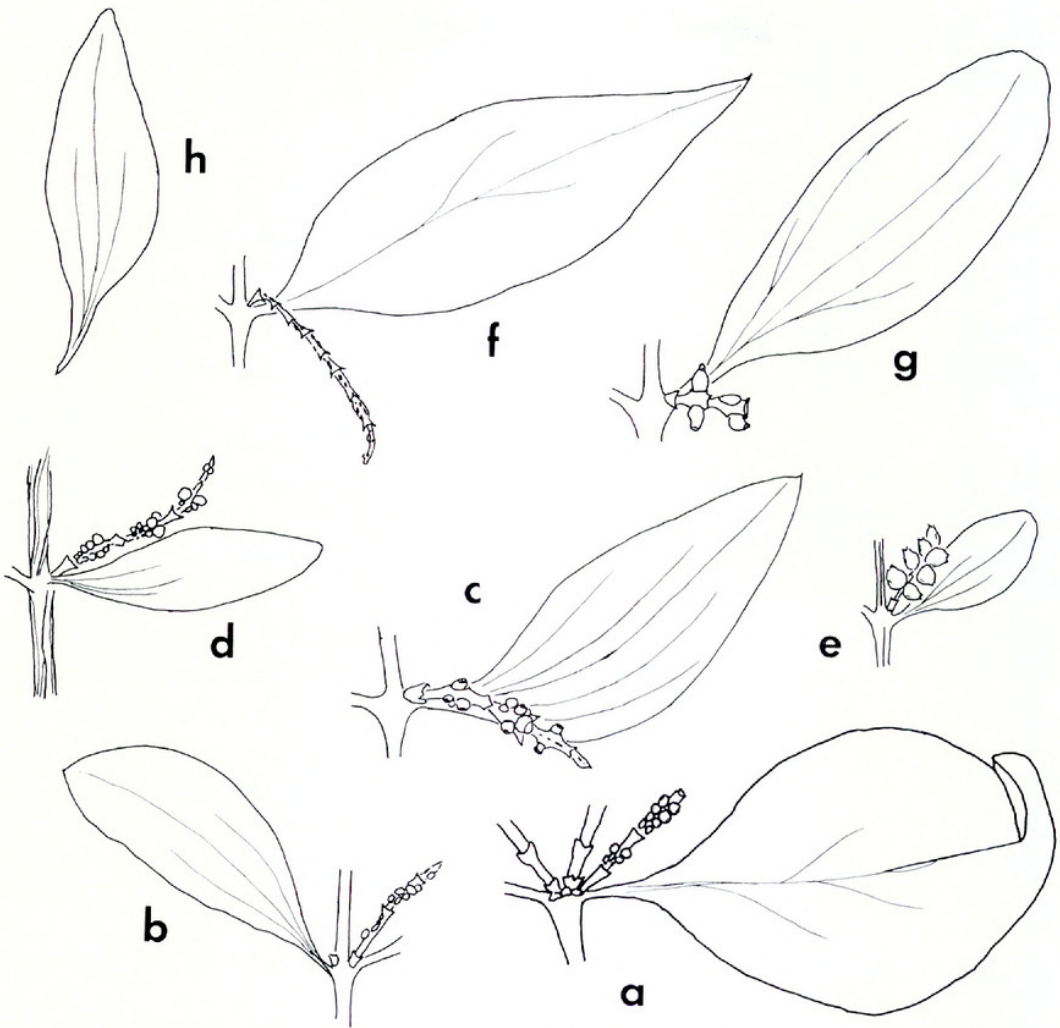


FIGURE 4. Leaves and inflorescences,  $\times 0.53$ . a, *Phoradendron racemosum*, Sintonis s.n., 1/86 (GH). b, *P. rubrum*, Britton & Millspaugh 5867 (NY). c, *P. solandrae*, Proctor 37603 (A). d, *P. tetrapterum*, Proctor 15680 (A). e, *P. trinervium*, Correll 43845 (GH). f, *P. undulatum*, anon. s.n. (GH). g, h, *P. wattii*: g, Proctor 27631 (GH); h, Maxon & Killip 1055 (A).

*Viscum glandulosum* Miq. *Linnaea* **18**: 60. 1844. *Phoradendron glandulosum* (Miq.) Eichler in C. Martius, *Fl. Brasil.* **5**(2): 134m. 1868. TYPE: Surinam, Focke s.n. (holotype, U; photo! of possible isotype at K).

*Phoradendron pennivenium* Eichler in C. Martius, *ibid.* 128. t. 42 (excluding synonyms of De Candolle); not *Viscum pennivenium* DC. (TYPE: French Guiana, 1820, Perrottet s.n., G-DC, IDC 800. 664: II. 2!, which is a species of *Oryctanthus*). SYNTYPES: Spruce 185, 733, 788; Hostman 729; Wulfschlägel s.n.; Schomburgk 554 (all at B, destroyed). Eichler's figure clearly agrees with *P. racemosum*.

Stems flattened but soon becoming terete; branches often bifurcate; cataphylls generally 2 pairs on lateral branches only, 1 pair just above node, second pair less than 1 cm above first, large, flaplike or somewhat fused. Leaves with petiole 8–15 mm long; blade ovate to nearly orbicular, 5–14  $\times$  2.9–10 cm, thick, the apex subacute, obtuse, or rounded, the base rounded and tapering, the margin occasionally somewhat revolute, the nerves pinnate. Inflorescences terminal or



axillary, often appearing in dense clusters of up to 15, to 6 cm long, axis 2–4 mm thick when dry; cataphylls 1 pair, thick and flaring like bracts; fertile internodes generally 4 or 5 (or 6), type 1a; flowers 7 to 9 (to 11) per bract, apical one staminate, lower ones pistillate; apical flower 2/1, lower ones 1/2. Fruits ovoid, white; sepals erect.

DISTRIBUTION. Venezuela, Surinam, Brazil, Cuba, Hispaniola, Puerto Rico, Bahamas, St. Croix, Trinidad.

This species is similar to *Phoradendron hexastichum*, but the inflorescence is type 1a, the leaves are more nearly orbicular, and branching is bifurcate. Two specimens at  $\kappa$  from Trinidad, *Baker 14593* and *Ayliffe 16499*, are apparently referable to this species, but most leaves of both are obovate and emarginate. The largest leaf of *Ayliffe 16499* is only 6 cm long, and the specimen appears similar to *P. northropiae*, a species endemic to the Bahamas. Also at  $\kappa$  is *Smith 2967*, from the Brazil-Guyana boundary, which resembles the *Ayliffe* specimen. *Phoradendron racemosum* and the similar *P. northropiae* may be part of a much more widespread group that may also include *P. inequidentatum*.

20. ***Phoradendron rubrum*** (L.) Griseb. Fl. Brit. W. Indian Is. 314. 1860 (as to name only—*P. rubrum* sensu Griseb. = *P. quadrangulare*). FIGURE 4b.

*Viscum rubrum* L. Sp. Pl. 1023. 1753, not Sprengel, [1824] 1825. LECTOTYPE (Dandy, 1958): Catesby, Nat. Hist. Carolina 2: pl. 81. 1743. TYPOTYPE (Gillis, 1976): BM!, Herb. Sloane 232: 2 (initialed R.H.S.), 8 (initialed R.H.D., lectotype), 16 (not initialed). No specimen in LINN. See also Howard & Staples (1983).

*Phoradendron tetrastachyum* Griseb. var. *spathulifolium* Griseb. Catal. Pl. Cubens. 120. 1866. *Phoradendron spathulifolium* (Griseb.) Krug & Urban in Urban, Bot. Jahrb. Syst. 24: 41. 1897. TYPE: *Wright 1300b* (holotype, GOET, not found; isotype, GH!).

Stems flattened to obscurely rhombic but not quadrangular, becoming terete; internodes often < 3 cm; cataphylls generally 1 pair on lateral branches only, 1–2 mm distal to node, separate or only slightly fused. Leaves with petiole indistinct; blade elliptic to oblanceolate, 2.4–7.5 × 0.9–3 cm, the apex obtuse to rounded, the base tapering, the nerves basal, obscure to prominent. Inflorescences up to 2 per leaf axil, occasionally branching, to 5 cm long, axis ca. 1 mm thick when dry; prophylls deltate, cataphylls 0 (or 1) pair(s); bracts not at all separate, forming infundibular cup; fertile internodes 2 to 4, commonly type 1a or 1d, rarely triads; flowers 3 to 9 per bract, staminate and pistillate intermixed; apical flower 2/1, lower ones 1/2. Fruits globose, red-orange to scarlet; sepals triangular, erect.

DISTRIBUTION. Cuba, Bahamas, Cayman Islands.

The *Phoradendron rubrum* complex is a group of one to six species characterized by erect sepals, cataphylls on lateral branches only, inflorescences triads or type 1a, and pistillate or mixed spikes. The leaves are consistently obovate to oblanceolate, with basal nervation, but vary from 2 to 7.5 cm in length. Variation in other characters appears to have a geographic basis. In this



group we recognize two species, *P. rubrum* and *P. trinervium*, but the latter appears to comprise at least five poorly delimited entities (see *P. trinervium* for more detailed discussion of these). *Phoradendron rubrum* is most easily distinguished from *P. trinervium* by its flattened stem, its frequently longer leaves, and its scarlet fruits. It is often parasitic on *Swietenia mahogani* (L.) Jacq.

The complex is distributed throughout the West Indies, although it is curiously rare on Hispaniola. *Phoradendron rubrum* occurs in Cuba, the Bahamas, and the Cayman Islands. The Cuban specimens of *P. rubrum* are frequently difficult to distinguish from *P. gundlachii* Krug & Urban, apparently a Cuban endemic with white fruits and closed sepals; *P. gundlachii* may not be at all closely related to the rest of *P. rubrum*, but it looks similar when mature fruits are absent. Cooley (1963) has reported this species from Key Largo, Florida, but a search several years later (Wiens, pers. comm.) failed to re-locate it.

21. ***Phoradendron solandrae*** Proctor, J. Arnold Arbor. **63**: 228. 1982. TYPE: Jamaica, Clarendon Parish, Knox Woodland, ca. 1.3 mi due southeast of Spaldings P.O., alt. 2800–3000 ft, 19 November 1977, Proctor 37430 (holotype, U; isotype, A!). FIGURE 4c.

Stems flattened, becoming terete; cataphylls 1 pair, at base of lateral branches only, separate or only partially fused, spreading, broadly ovate, white margined. Leaves with petiole 5–10 mm long; blade lanceolate, oblong, or elliptic, falcate, 5–12(–15) × 1.4–3(–5) cm, apex tapering but ultimately obtuse, base cuneate, nerves predominantly basal. Inflorescences 1 to 3 (to 6) per leaf axil, fleshy, clavate, to 5 cm long, drying yellow-brown with axis 1–3 mm thick; cataphylls lacking or 1 pair, entire to 3-lobed, flaring infundibular, white margined; bracts more nearly fused, also flaring and infundibular; fertile internodes 2 to 4, type 1a or triads; flowers 3 to 5 per bract, sunken in large cupules, terminal joint staminate, others pistillate; apical flower generally 2/1, sometimes 1/2, the lower ones 1/2, sometimes 2/1. Fruits globose, orange; sepals closed.

DISTRIBUTION. Endemic to Jamaica.

This species is similar to *Phoradendron barahonae*, from which it is distinguished by its fewer flowers per internode, its prominent cupules around each fruit, and its characteristic yellow color on drying.

22. ***Phoradendron tetrapterum*** Krug & Urban in Urban, Bot. Jahrb. Syst. **24**: 35. 1897. TYPE: Jamaica, between Hope and Grove, 267 m, 4 August 1896, Harris 6393 (lectotype (Trelease, 1916), B, destroyed; islectotype, NY!). FIGURE 4d.

*Phoradendron multifoveolatum* sensu Kuntze, Rev. Gen. Pl. **2**: 587. 1891, *fide* Urban (1897); not Eichler, 1868.

Stems obviously 4-angled and winged; cataphylls 1 pair on lateral branches only, 1–2 mm above node, thick and flaring, annular, bifid. Leaves with petiole 4–10 mm long, clasping stem; blade variable, lanceolate to elliptic to broadly



oblanceolate, 2.6–10.3 × 1.1–2.1(–3) cm, the apex acute to rounded, apiculate, the base tapering, the nerves basal to subbasal. Inflorescences 1 to 3 per leaf axil, to 7.5 cm long, axis 1–2 mm thick when dry; cataphylls lacking (occasionally 1 pair), like bracts fused and navicular; fertile internodes up to 6, type 1a; up to 15 flowers per bract; apical flower 2/1, lower ones 1/2. Fruits globose, white; sepals closed but not meeting.

DISTRIBUTION. Cuba, Hispaniola, Jamaica, Puerto Rico, Martinique (Urban, 1897, *Isert s.n.*, 1787, hb. Haun), St. Vincent, Trinidad.

Krug and Urban (*in* Urban, 1897) described this as distinct from *Phoradendron multifoveolatum* Eichler and *P. crulsii* Urban, both of which have six-seriate inflorescences, and *P. towarensense* Urban, which is eight- to ten-seriate. Kuijt (*pers. comm.*) suggests that *P. tetrapterum* is synonymous with *P. dip-terum* Eichler. Resolution of these questions will require detailed study of the South American phoradendrons.

*Phoradendron tetrapterum* is reported to grow exclusively on other mistle-toes.

23. **Phoradendron trinervium** (Lam.) Griseb. Fl. Brit. W. Indian Is. 314. 1860. FIGURE 4e.

*Viscum trinervium* Lam. Encycl. Méth. Bot. 3: 57. 1789; not Sprengel, [1824] 1825.

LECTOTYPE (Trelease, 1916): Martinique, "près de Fort Royal," 1787, *Isert s.n.* (P-LAM!; IDC 6207-15. 578: III. 4!, 7!).

*Viscum myrtilloides* Willd. Sp. Pl. ed. 4. 2: 739. 1806. *Dendrophthora myrtilloides* (Willd.) Rolfe, Bull. Misc. Inform. 81: 274. 1893. *Phoradendron myrtilloides* (Willd.) Griseb. Mem. Amer. Acad. Arts 8: 191. 1861. TYPE: "habitat in Martinicae," hb. Willd. no. 18296 (IDC 7440. 1330: II. 9!). Type not as suggested by Kuijt (1961), *Isert s.n.* (P-LAM), the same specimen as the lectotype of *V. trinervium*.

*Loranthus domingensis* Ham. Prodr. Pl. Indiae Occ. 33. 1825. *Phthirusa domingensis* (Ham.) Eichler *in* C. Martius, Fl. Brasil. 5(2): 134i. 1868. *Dendropemon domingensis* (Ham.) Tieghem, Bull. Soc. Bot. France 42: 1170. 1895. *Phoradendron trinervium* (Lam.) Griseb. var. *domingense* (Ham.) Krug & Urban *in* Urban, Bot. Jahrb. Syst. 24: 38. 1897. *Phoradendron domingense* (Ham.) Trel. Genus *Phoradendron*, 102. 1916. TYPE: Hispaniola, hb. Desvaux. No specimen found at P. Urban (1920) cited the type as "Hb. Desv. (nunc Paris).—Jamaica."

*Viscum tetragonum* DC. Prodr. Syst. Nat. Regni Veg. 4: 282. 1830; not A. Rich. 1845, or *P. tetragonum* Ule, 1915. TYPE: in sylvis maritimis Porto Rico, February 1820, *Bertero s.n.* (holotype, G-DC, IDC 800. 664: I. 8!). See also *Phoradendron quadrangulare*.

*Viscum oblongifolium* DC. *ibid.* 283. *Phoradendron oblongifolium* (DC.) Eichler *in* C. Martius, Fl. Brasil. 5(2): 134m. 1868. TYPE: "montagnes de la Guadeloupe le 20 juin, 1824," *Perrottet s.n.* (holotype, G-DC, IDC 800. 664: II. 3, 4!).

*Viscum trigonum* D. Dietr. Syn. Pl. 1: 546. 1839, *pro parte, fide* Urban (1897). See also *Phoradendron quadrangulare*.

*Viscum jamaicense* Macfad. Fl. Jamaica 2: 195. 1850. TYPE: Jamaica, Port Royal Mountains, *Macfadyen s.n.* (κ!).

*Phoradendron quadrangulare* sensu Griseb. Fl. Brit. W. Indian Is. 711. 1864, *fide* Urban (1897).

*Phoradendron rubrum* var. *brevispica* Eichler *in* C. Martius, Fl. Brasil. 5(2): 121. 1868 (excluding synonym *Viscum mucronatum* DC. and location Santo Domingo).



SYNTYPES: "in insulis Martinica, Antigua, Porto Rico et S. Domingo; *Bertero s.n.*, *Wulfschlägel s.n.*, *Isert s.n.* (*Hb. Willd.* 18296)." (IDC 7440. 1330: II. 9! = type of *P. trinervium* and *P. myrtilloides*.)

*Phoradendron rubrum* var. *latifolia* Eichler in C. Martius, *ibid.*, *fide* Urban (1897).

TYPE: in Antigua insula, *Wulfschlägel s.n.* (holotype, B, destroyed).

*Viscum rubrum* sensu Sprengel, *Syst. Veg.* ed. 16 [17]. 1: 488. [1824] 1825, and other authors, not L.

*Phoradendron verticillatum* sensu Fawcett & Rendle, *Fl. Jamaica* 3: 96. 1914, not Druce, 1914. *Viscum verticillatum* Mayc. *Fl. Barbados* 384. 1830, not L. 1753.

Stems quadrangular, becoming terete; internodes often < 3 cm; cataphylls generally 1 pair, on lateral branches only, 1–2 mm distal to node, partially fused, white edged. Leaves with petiole indistinct; blade elliptic, obovate, or oblanceolate, widest at or above middle, 1.5–6 × 0.8–2.7(–3.2) cm, the apex truncate, obtuse, or rounded, occasionally minutely apiculate, the base tapering, the nerves basal, obscure. Inflorescences 1 (or 2) per leaf axil, to 5 cm long, generally shorter than subtended internode, axis ≤ 1 mm thick when dry; prophylls triangular, caducous; cataphylls 0 (or 1) pair(s), like bracts 3-lobed or nearly entire, partially fused, often notched at joint, and white margined; fertile internodes 2 to 4, in some specimens flowers only in upper half of internode, mostly in triads or varying within same plant to type 1a, or single pistillate flower per bract, or (rarely) type 1d; flowers 3 to 5 (to 7) per bract; internodes wholly pistillate, wholly staminate, or staminate and pistillate flowers intermixed; flower orientation variable. Fruits globose, yellow to orange or red-orange; smooth, or with ring of obscure papillae or warts near base of sepals around top of fruit, sepals triangular, erect.

DISTRIBUTION. Costa Rica, Panama, Venezuela, Jamaica, Cayman Islands, Hispaniola, Puerto Rico, Bahamas, Anguilla, St. Martin, St. Bart's, Antigua, Saba, St. Eustatius, Montserrat, Guadeloupe, La Désirade, Dominica, Martinique, St. Lucia, St. Vincent, the Grenadines, Barbados (Maycock, 1830; Fawcett & Rendle, 1914), Trinidad, Tobago, Curaçao, Margarita.

Although some authors have referred these plants to *Viscum verticillatum* L., Fawcett and Rendle (1914) claimed that Linnaeus's descriptions of *V. verticillatum* are based on diseased and monstrous specimens of *Cissus* sp. (LINN 1166.10). Nicolson and Jarvis (1984) have confirmed this fact and have formally transferred the epithet to *Cissus*.

According to Urban (1897), the Venezuelan record of *Phoradendron trinervium* in Grisebach (1860) is *Fendler 1809* and is referable to *P. mucronatum*.

This species is very similar to *Phoradendron rubrum*, *q.v.* As defined here, *P. trinervium* includes five poorly delimited entities. The first group is characterized by oblanceolate leaves somewhat longer than in *P. trinervium* sensu stricto and inflorescences somewhat longer than in other members of the species. The uppermost internode of the inflorescence has one pistillate flower per bract, while the lower internodes are either wholly pistillate, wholly staminate, or mixed—with the upper flower staminate and the lower two pistillate. Plants in this group tend to have flowers borne in the upper half of the internode only, giving the inflorescence an elongate appearance. This form is the predominant one on Jamaica, but we have also found it (although less frequently) in the



Bahamas and Lesser Antilles. Where fruit color has been recorded, it is described as yellow to orange. The fruits often have a ring of obscure warts or papillae around the top just below the sepals. (These are often hidden by the wrinkling of dried fruits and are therefore only consistently visible when the fruits are boiled.)

Some authors have referred to these plants as *Phoradendron domingense* (Ham.) Trel., a name for which we have been unable to find the type. (Types for most of Hamilton's species are said to be in Paris, but many have not been located (Howard *et al.*, 1981)). The protolog of *P. domingense* cites the specimen as coming from Hispaniola, although Urban (1920) later claimed that it was from Jamaica. If it is indeed from Hispaniola, then it seems likely that the type of *P. domingense* will be assignable not to the group of Jamaican plants described above, but rather to the second entity, made up of a group of rather odd plants from Hispaniola. These have uniformly short (often much less than 2 cm) internodes, small leaves, and mostly type 1a inflorescences, with staminate and pistillate flowers intermixed within an internode. The Hispaniolan plants appear to be much stouter and more rigidly upright than the rest of the group. If future workers conclude that the Jamaican plants are a distinct taxon, then the Hispaniolan plants may be distinct as well. However, on the basis of the characters used here, we find full intergradation with the other members of *P. trinervium*.

A third group of plants occurs throughout the Bahamas and the Lesser Antilles. These plants have inflorescences that are predominantly type 1a, with staminate and pistillate flowers intermixed in the same internode. The fruits are orange to red and are generally smooth. This group includes the type of *Phoradendron trinervium* (collected on Martinique), on which the fruits are red. Unlike many of the other members of this entity, the type specimen has minute warts below the sepals.

A fourth group of plants is predominantly Lesser Antillean and has leaves that are broadly ovate or even suborbicular. Sterile specimens often cannot be reliably distinguished from small-leaved specimens of *Phoradendron anceps*. *Phoradendron trinervium* rarely has the type 1d or 1e inflorescence common in *P. anceps*, and the stem is rhombic and soon terete (vs. clearly compressed in *P. anceps*). In more mature plants the distinction becomes clear, because the fruits of *P. anceps* soon develop their characteristic golden sheen and pyriform shape; the sepals remain closed or only slightly open, but not stiffly erect as in *P. trinervium*. The mature fruits of *P. anceps* are white to cream colored, whereas those of *P. trinervium* are yellow, orange, or red-orange.

A fifth group of plants occurs on Jamaica; it has leaves that are widest at the middle and tapering to both ends, rather than obovate or oblanceolate. These plants often have only one pistillate flower per bract and include the isotypes (but not the holotype) of *Phoradendron campbellii*.

24. ***Phoradendron undulatum*** (Pohl) Eichler in C. Martius, Fl. Brasil. 5(2): 122. t. 39. 1868. FIGURE 4f.

*Viscum undulatum* Pohl in DC. Prodr. Syst. Nat. Regni Veg. 4: 282. 1830. TYPE: Brazil, 1828, Pohl 868 (holotype, G-DC, IDC 800. 664: I. 5!).



*Phoradendron herminieri* Trel. Genus *Phoradendron*, 131. 1916. TYPE: Guadeloupe, Duss 3904, *pro parte* (holotype, US, photo at ILL!); specimen at NY is designated *P. chrysocarpum* var. *dussii* but is *P. anceps*.

*Phoradendron chrysocarpum* Krug & Urban var. *stehlei* Trel. in Stehlé, Bull. Soc. Bot. France 92: 262. 1945. TYPE: Guadeloupe, H. & M. Stehlé 2459 (holotype, ILL!; isotypes, GH!, NY!, P!).

Stems flattened; cataphylls generally 2 pairs on lateral branches only (these sometimes confused with main axes because 1 of pair often aborts), first pair 2–3 mm above node, second ca. 25 mm above first, shallowly 3-lobed, spreading. Leaves with petiole 4–5 mm long; blade lanceolate, 6–12.5 × 2.2–4.3 cm, thin, apex acuminate, base cuneate, nerves pinnate. Inflorescences 1 to 3 per leaf axil, to 5 cm long, axis < 1 mm thick when dry; cataphylls 1 to 5 pairs, boat shaped to crateriform like bracts; fertile internodes up to 9, type 1a; flowers 5 to 7 per bract, staminate and pistillate intermixed; apical flower 2/1, lower ones 1/2. Fruits globose, white, becoming rough-wrinkled when dry; sepals somewhat parted.

DISTRIBUTION. Costa Rica, Panama, Venezuela, Peru, Brazil, Bolivia, Guadeloupe, Dominica, Martinique.

We have found no way to distinguish the Caribbean from the South American members of this taxon and therefore place Trelease's name, *Phoradendron herminieri*, in synonymy; Kuijt (1964) reached a similar conclusion. Trelease erected the species on the basis of its glossy leaves on dried specimens, a character we have not found distinctive.

25. ***Phoradendron wattii*** Krug & Urban in Urban, Bot. Jahrb. Syst. 24: 43. 1897. TYPE: Jamaica, 14 December 1890, A. Hitchcock s.n. (lectotype (Trelease, 1916), B, destroyed; isolectotype, MO, photo at ILL!).

FIGURE 4g, h.

*Phoradendron wattii* Krug & Urban var. *producta* Trel. Genus *Phoradendron*, 100. 1916. TYPE: Jamaica, Portland Point and Rocky Point, 5 March 1908, Harris 10188 (holotype, B, destroyed, photo at ILL!; isotypes, K!, NY!, P!).

*Phoradendron campbellii* Krug & Urban in Urban, Bot. Jahrb. Syst. 24: 44. 1897. TYPE: Jamaica, Wareka Road, 10 August 1896, Campbell 6398 (holotype, B, destroyed, photo at ILL!). Isotypes at BM! and NY! are *P. trinervium*. Note by Trelease on NY specimen: "This, however, is really *P. domingense*; and probably part of no. 6383 of same place and date."

*Viscum flavens* Macfad. Fl. Jamaica 2: 195. 1850; not Sw. 1788, or Sprengel, [1824] 1825. TYPE: Jamaica, Macfadyen s.n. (holotype, K!).

*Phoradendron berterianum* sensu A. Hitchc. Annual Rep. Missouri Bot. Gard. 4: 125. 1893, *fide* Urban (1897).

Stems flattened; internodes frequently only 10–15 mm on lateral branches; cataphylls 1 to 3 pairs, on lateral branches only, 2–4 mm distal to node, broadly deltate to ovate, flaring, lobed to bifid. Leaves with petiole 5–10 mm long; blade lanceolate to elliptic, oblong, or oblanceolate, 3–8 × 1.1–3 cm, the apex rounded and truncate to tapering and somewhat acute or acuminate, occasionally apiculate, the base tapering, the nerves basal. Plants dioecious; inflorescences 1 to 3 per leaf axil, to 2 cm long in pistillate plants, axis 2–3 mm



thick when dry, 3.5 cm long in *Harris 10188* (a staminate plant); cataphylls lacking or 1 pair, spreading like bracts; fertile internodes 2 to 4 (or 5); pistillate inflorescence with 1 flower in 1-mm-deep cup above each bract (sometimes in triads); staminate inflorescence type 1a, with 5 to 11 flowers per bract; orientation 2/1 if flowers solitary, apical flower 2/1 and lower ones 1/2 if in triads or type 1a arrangement. Young fruits pyriform, drying blue-glaucous with lighter-colored sepals; mature fruits pale yellow; sepals closed, parting slightly at maturity.

DISTRIBUTION. Endemic to Jamaica.

As described here, this species is unusually variable in leaf shape but can easily be recognized by the distinctive fruits.

#### NOMINA EXCLUDENDA

*Loranthus sessilis* Sprengel, MS in hb. Balbis, *nomen nudum*. Cited in Trelease (1916).

*Loranthus torulosus* Kunth in Humb., Bonpl., & Kunth, *Nova Gen. Sp. Pl.* 3: 443. 1818. TYPE: Colombia, Popayán, *Bonpland 3808* (P-HBK!, IDC 6209-2. 88: III. 7). This has been placed by some authors in the synonymy of *Phoradendron piperoides*. It is excluded because the type has a type 1b inflorescence on some internodes and the leaves are rounded.

*Loranthus viscifolius* Kunth in Humb., Bonpl., & Kunth, *ibid.* *Phoradendron viscifolium* (Kunth) Trel. *Genus Phoradendron*, 109. 1916. "Crescit cum praecedente." TYPE: [Ecuador, Guayaquil,] *Bonpland 3798* (P-HBK!, IDC 6209-2. 89: I. 1). Although this name was placed in the synonymy of *P. quadrangulare* by Krug and Urban (*in* Urban, 1897), we believe it to be distinct because of the strongly oblanceolate leaves.

*Phoradendron antillarum* Trel. var. *latum* Trel. *Repert. Spec. Nov. Regni Veg.* 26: 343. 1929, *nomen nudum*. In synonymy of *P. cauliflorum*.

*Phoradendron buxifolium* (Lam.) Griseb. *Mem. Amer. Acad. Arts* 8: 191. 1861. = ***Dendrophthora buxifolia*** (Lam.) Eichler. Although Grisebach transferred *Viscum buxifolium* Lam. to *Phoradendron*, Kuijt (1961) followed Eichler in correctly placing this species in *Dendrophthora*. He also neotypified Lamarck's name with *C. Wright 220a* (GH!).

*Phoradendron buxifolium* (Lam.) Griseb. var. *rotundata* C. Wright ex Griseb. *Catal. Pl. Cubens.* 120. 1866. TYPE: Cuba, *C. Wright 2649* (holotype, GH!). = ***Dendrophthora buxifolia*** (Lam.) Eichler.

*Phoradendron cayennense* Eichler in C. Martius, *Fl. Brasil.* 5(2): 129, 134m. 1868. TYPE: "e silvis Cayennae," hb. L. C. Rich. Trelease (1916) assigned this species to the synonymy of *P. racemosum*. There are several specimens labeled *P. cayennense* in hb. Rich. at P, but none is referable to *P. racemosum*.

*Phoradendron constrictum* Griseb. *Mem. Amer. Acad. Arts* 8: 192. 1861. TYPE: in Cuba Orientali, prope Monte Verde, *C. Wright 220b* (holotype, K!; isotype, GH!). = ***Dendrophthora constricta*** (Griseb.) Eichler.

*Phoradendron crassifolium* (Pohl) Eichler in C. Martius, *Fl. Brasil.* 5(2): 125.



1868. This was figured by Eichler as having inflorescences with triads at the top and the bottom, and a type 1b arrangement at the middle internodes. Eichler described the spikes as being "2 × (7-5-) floris, floribus 2 × 2 vel 2 × 3 seriatis." This inflorescence arrangement is different from that of *P. martinicense*. Eichler also drew the berries as smooth; those of *P. martinicense* are rough-warty. See also discussion under *P. martinicense*.

*Phoradendron giordanae* Warb. Tropenpflanzer 9: 635. 1905, *nomen nudum*. Cited by Trelease (1916) in the synonymy of *P. dichotomum* and "lectotypified" by him with a Venezuelan plant, *Knoop iii, a* (B, destroyed, photo at ILL!). The lectotype appears to have an abnormally enlarged globose inflorescence. Either the plant is galled, or the inflorescence morphology is very different from that of *P. dichotomum*.

*Phoradendron hexastichum* (DC.) Griseb. var. *latifolium* Griseb. Catal. Pl. Cubens. 120. 1866. Cited in Trelease (1916) as a synonym of *P. racemosum*, apparently an error. Grisebach described no varieties under *P. hexastichum*, although on the same page he listed *P. latifolium*, which is referable to *P. piperoides* (Kunth) Trel.

*Phoradendron juniperinum* Engelm. Mem. Amer. Acad. Arts, n.s. 4: 58. 1849. TYPE: New Mexico, Santa Fe, 1847, *Fendler 281* (holotype, MO, not seen). In the first edition of the *Index Kewensis*, this species is listed as occurring in the West Indies, but this is obviously in error. We have seen no specimens or any other reports of its occurrence there.

*Phoradendron lamprophyllum* Urban, Repert. Spec. Nov. Regni Veg. 21: 54. 1925. TYPE: Cuba, Prov. Oriente, sierra de Cristal, 1100-1325 m, *Ekman 15983* (s, not seen). = ***Dendrophthora hians*** Urban, *fide* Kuijt (1961).

*Phoradendron macrostachyum* (Jacq.) Griseb. Fl. Brit. W. Indian Is. 314. 1860. Type of *Viscum macrostachyon* Jacq. is Collectanea, t. 5, fig. 3. 1789. Kuijt (1961) incorrectly reported the transfer of the epithet to *Phoradendron* as "*P. macrostachyum* (Sprengel) Griseb., Cat. Pl. Cub. 120, 1866." Sprengel ([1824] 1825) attributed *V. macrostachyon* to Jacquin (1789), who first published the epithet and cited a plant from Martinique. Grisebach then transferred the name to *Phoradendron* in 1860 (cited above), and Eichler transferred Jacquin's name to *Dendrophthora* in 1868. The type should be Jacquin's plate. Although Kuijt (1961) placed these names in the synonymy of *Dendrophthora flagelliformis* (Lam.) Krug & Urban, that species does not occur on Martinique. Jacquin's plate depicts a plant fitting the description of *D. martinicensis* Kuijt. The Jacquin name thus takes priority, and *D. martinicensis* should be relegated to the synonymy of *D. macrostachya* (Jacq.) Eichler.

*Phoradendron macrostachyum* (Jacq.) Griseb. f. *parvifolia* Griseb. Catal. Pl. Cubens. 120. 1866. TYPE: C. Wright 2652 (holotype, GOET!; isotype, GH!). = ***Dendrophthora serpyllifolia*** (Griseb.) Krug & Urban.

*Phoradendron pepericarpum* A. Gray, U. S. Expl. Exped., Phan. 742. 1854. TYPE: Brazil, Wilkes Exped. s.n. (GH!). This species has been cited as being synonymous with both *P. crassifolium* (Pohl) Eichler and *P. mar-*



- tinicense* (DC.) Griseb., but it has a type 1b inflorescence. It may be synonymous with the former, but it is not with the latter.
- Phoradendron rehderianum* Urban, Ark. Bot. **23A**(5): 62. 1930. TYPE: Cuba, Gavián, prov. Santa Clara, 12 March 1928, *Rehder 1209* (holotype, B, destroyed; isotype, NY!). Kuijt (1961) determined this as a species of *Dendrophthora*.
- Phoradendron serpyllifolium* Griseb. Mem. Amer. Acad. Arts **8**: 192. 1861. TYPE: Cuba, near Monte Verde, *C. Wright 1254* (holotype, GOET!; isotype, GH!). = ***Dendrophthora serpyllifolia*** (Griseb.) Krug & Urban.
- Phoradendron serpyllifolium* Griseb. var. *aphyllum* Griseb. *ibid.*, *nomen nudum* (*C. Wright 224* cited in original publication). = ***Dendrophthora cupressoides*** (Macf.) Eichler.
- Phoradendron sessilifolium* Griseb. *ibid.* 191. TYPE: Cuba, near La Perla, *C. Wright 1301* (holotype, GOET!; isotype, GH!). = ***Dendrophthora sessilifolia*** (Griseb.) Krug & Urban.
- Phoradendron testifolium* C. Wright ex Griseb. Catal. Pl. Cubens. 120. 1866. TYPE: in Cuba Orientali, prope Monte Verde, *C. Wright 2648* (holotype, GOET!; isotype, GH!). = ***Dendrophthora constricta*** (C. Wright ex Griseb.) Eichler.
- Phoradendron tetrastachyum* Griseb. Mem. Amer. Acad. Arts **8**: 191. 1861. TYPE: in Cuba Orientali, prope Monte Verde, *C. Wright 218*, *pro parte* (holotype, GOET, not found; isotype, GH!). = ***Dendrophthora tetrastachya*** (Griseb.) Urban.
- Phoradendron zuloagae* Trel. Genus *Phoradendron*, 105. 1916. TYPE: Venezuela, Caracas, 1915, *Zuloaga s.n.* (photo! in Trelease, 1916, *pl. 150a*). No herbarium cited, not at ILL. This has been placed by some authors in the synonymy of *P. quadrangulare* (Kunth) Krug & Urban; we exclude it because of its erect sepals.
- Viscum ellipticum* Presl, Epimel. Bot. 254. 1849, *nomen nudum*. Cited by Trelease (1916), with an unnumbered Haenke specimen from Mexico as "type" (PR, photo at ILL!). This is an error because Presl never published a species by this name.
- Viscum kunthianum* DC. Prodr. Syst. Nat. Regni Veg. **4**: 283. 1830. TYPE: "in arboribus prope Guayaquil Quitensium." No specimen in G-DC. Based on *V. trinervium* Sprengel, *pro parte*, and *Loranthus viscifolius* Kunth, both placed in the synonymy of *Phoradendron quadrangulare* by Krug and Urban (*in Urban*, 1897). We have excluded *L. viscifolius* from *P. quadrangulare* because of leaf shape, and we thus exclude *V. kunthianum* pending designation of a type.
- Viscum latifolium* Lam. Encycl. Méth. Bot. **3**: 57. 1789; not Sw. 1797, or others. TYPE: P-LAM, IDC 6207-15. 578: I. 7!. Not found at P. = ***Phthirusa*** sp. Has been cited as a synonym for *Phoradendron racemosum*.
- Viscum salicifolium* Presl, Epimel. Bot. 254. 1849. *Phoradendron salicifolium* (Presl) Eichler in C. Martius, Fl. Brasil. **5**(2): 110. 1868. TYPE: Quito, Haenke (holotype, PR, photo!). Placed in the synonymy of *P. quadrangulare* by Trelease (1916). The protolog is not diagnostic, and the pho-



tograph of the type does not show enough detail for certain identification; however, the leaves appear to be the wrong shape for *P. quadrangulare*. *Viscum saururoides* DC. Prodr. Syst. Nat. Regni Veg. 4: 280. 1830. *Phoradendron latifolium* (Sw.) Griseb. var. *saururoides* (DC.) Griseb. Fl. Brit. W. Indian Is. 314. 1860, *nomen confusum*. TYPE: in Cayenne, *Patris s.n.* De Candolle based his species in part on *V. latifolium* Lam., for which the type is a specimen of *Phthirusa*, and in part on "*V. racemosum* Aubl.?" The specimens of *V. saururoides* in G-DC (IDC 800. 663: II. 2, 3) can be referred to *Phoradendron piperoides*. Urban (1897) placed this name in the synonymy of *P. racemosum*, based on De Candolle's citation of Aublet.

*Viscum trinervium* Sprengel, Syst. Veg. ed. 16 [17]. 1: 488. [1824] 1825, not Lam. Type not found. This species was associated with *Loranthus viscifolius* in the synonymy of *V. kunthianum* DC.

Philcox (1978) also listed *Phoradendron ayliffii* (as *ayliffi*) Philcox, *P. fan-shawei* Maguire, *P. obtusissimum* (Miq.) Eichler, and *P. perrottetii* (DC.) Eichler as occurring on Trinidad. We found no Trinidad specimens of these at K and have been unable to obtain the specimens at TRIN cited by Philcox. Since the first is endemic to Trinidad and the latter three are predominantly South American, they would be better treated in a monograph including the South American phoradendrons.

#### UNPLACED SPECIMENS

Grand Cayman: alt. 10–20', Aug. 1938, *Kings GC-388* (NY). In some respects similar to *Phoradendron rubrum*, but sepals closed and leaf apices acute; also close to *P. quadrangulare*, but leaves unusually broad for their length.

Hispaniola: wet woods near Ciénaga de la Culata, Constanza, alt. 1500–1600 m, parasitic on *Symplocos berterii*, 29 Nov. 1969, *Liogier 17139* (GH, NY). Sterile; venation not apparent; cataphylls small, unusually far above the node.

Trinidad: heights of St. Anne, 11 April 1920, *Britton & Hazen 1691* (GH). Sterile; leaf shape variable; not obviously assignable to any species.

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## APPENDIX. Index to specimens seen.

(1) *Phoradendron anceps*; (2) *P. barahonae*; (3) *P. carneum*; (4) *P. dichotomum*; (5) *P. flavens*; (6) *P. gracile*; (7) *P. grisebachianum*; (8) *P. gundlachii*; (9) *P. haitense*; (10) *P. hartii*; (11) *P. hexastichum*; (12) *P. inequidentatum*; (13) *P. martinicense*; (14) *P. mucronatum*; (15) *P. northropiae*; (16) *P. ottonis*; (17) *P. piperoides*; (18) *P. quadrangulare*; (19) *P. racemosum*; (20) *P. rubrum*; (21) *P. solandrae*; (22) *P. tetrapterum*; (23) *P. trinervium*; (24) *P. undulatum*; (25) *P. wattii*.

Abbott 400 (1), 950 (18), 2777 (19).

Alexander s.n. at κ (7).

Allard 15757 (18).

Anderson & Sternberg 3077 (17), 3429 (5).

Arnoldo 1023 (23).

Augusto 418 (17), 623 (18), 761 (18), 822 (18), 1253 (4), 1418 (18).

Ayliffe 14320 (12), 14371 (17), 14699 (16), 16499 (19).

Baker 2559 (18), 2602 (17), 14595 (19), 14606 (13).

Ball s.n. in 1882 (6).

Barclay & Proctor 38471 (23).

Barkley 3870 (25).

Baudin s.n. at p (23).

Beard 620 (23), 1103 (23), 1132 (13), 1420 (23).

Belanger 267 (23).

Bena 555 (23), 556 (23), s.n. in 1944–1946 (5, 23).

Bertero 439 (1), 710 (4), 1234 (18), s.n. in 1820 (19, 23), s.n. in 1821 at G-DC (14), s.n. at G-DC (14).

Biolley 7078 (17).

Boldingh 1660B (23).

Bonpland s.n. at P-HBK (17), s.n. at P-HBK (18).

Brace 3428 (20), 4461 (20), 4643 (20), 5325 (15).

Britton 180 (5), 355 (25), 807 (23), 813 (22), 965 (7), 977 (7), 1889 (19), 1895 (23), 1927 (23), 1950 (18), 1985 (18), 2052 (18), 2119 (18), 2415 (18), 2687 (17), 2718 (14), 2719 (1), 2840 (18), 2991 (18), 3068 (23), 3144 (7), 3215 (7), 3283 (18), 3383 (7), 3668 (18), 3703 (25), 3734 (25), 3765 (25), 3773 (23), 3795 (23), 3905 (23), 3968 (5).

Britton & Brace 832 (20).

Britton & Britton 7352 (1), 7425 (19), 7837 (17), 7904 (17), 8058 (1), 8799 (19), 9561 (1), 10049 (18).

Britton, Britton, & Boynton 8292 (1).

Britton, Britton, & Brown 5817 (18), 5850 (1), 5854 (23), 6012 (2), 6235 (1), 6423 (23).

Britton, Britton, & Cowell 10241 (18), 13106 (8).

Britton, Britton, & Hazen 1001 (13).

Britton, Britton, & Marble 1946 (1).

Britton, Britton, & Wilson 4687 (18), 5579 (18).

Britton & Bruner 7547 (11).

Britton & Cowell 1293 (23), 1301 (1), 1352 (1), 1940 (18), 4127 (11), 4131 (4), 12553 (18).



- Britton, Cowell, & Brown* 3918 (19), 4348 (18), 4570 (1), 4578 (18), 4814 (23), 4816 (1).  
*Britton, Cowell, & Shafer* 12919 (18), 12928 (17).  
*Britton, Earle, & Wilson* 4585 (18).  
*Britton, Freeman, & Brown* 2760 (23).  
*Britton, Freeman, & Watts* 2701 (16), 2708 (16).  
*Britton & Hazen* 1691 (23), 1726 (16).  
*Britton, Hazen, & Mendelson* 1288 (5), 1800 (5).  
*Britton & Hollick* 1861 (7), 1890 (23), 2772 (7).  
*Britton & Marble* 2245 (18), 2248 (23).  
*Britton, Matz, & Chardon* 6873 (11).  
*Britton & Millspaugh* 5867 (20), 6325 (20).  
*Britton & Shafer* 1640 (1), 1644 (18), 1831 (1), 1844 (23).  
*Britton, Stevens, & Hess* 2470 (17), 2535 (19), 2564 (22), 2569 (11).  
*Britton & Wilson* 4886 (18), 5147 (4), 5327 (4), 5644 (18).  
*Britton, Wilson, & Léon* 15313 (18).  
*Broadway* 1843 (17), 1864 (11), 1873 (17), 2265 (18), 2596 (13), 3982 (17), 4528 (17), 6013 (17), 6145 (1), 6626 (13), 6945 (18), 7396 (5), 7468 (5), 7546 (17), 7574 (16), 7617 (23), 7708 (13), 7709 (23), 7914 (1), 8084 (23), 8976 (10), 9088 (1), 9148 (18), 9692 (18), 9693 (17), *s.n.* in 1895 (11), *s.n.* in 1918 (17), *s.n.* on 19 Sept. 1918 (18).  
*Broeder* 1972 (23).  
*Brown* 51 (7), 394 (18).  
*Campbell* 6398 (B, 25; BM, NY, 23), 6604 (1), 6605 (23).  
*Claussen* 252 (14).  
*Clemente* 2705 (6), 3443 (18), 4327 (18), 4406 (17), 6082 (18), 6417 (17), 6445 (18), 7178 (18).  
*Clemente & Liogier* 4075 (17).  
*Coker* 303 (20), 558 (20).  
*Combs* 299 (18), 347 (20), 348 (20).  
*Cooley* 8217 (23), 8718 (17).  
*Correll* 41617 (23), 41719 (23), 43463 (20), 43845 (23), 44495 (20), 45843 (23), 45851 (23), 46047 (23), 46410 (23), 47412 (23), 47418 (23), 48366 (20), 48382 (23), 49396 (15), 49954 (23), 49975 (23).  
*Correll & Correll* 48129 (20), 50546 (20), 51033 (18).  
*Correll & Evans* 43978 (20).  
*Correll & Popenoe* 42708 (20), 51421 (20).  
*Correll & Proctor* 47802 (20), 47812 (15), 47876 (20), 48709 (20), 48890 (20).  
*Correll & Saulea* 50452 (23).  
*Cowan* 1403 (17), 1449 (23), 1536 (17), 1594 (23).  
*Cowan & Forster* 1466 (17).  
*Cowell* 626 (19), 753 (18).  
*Crawford* 783 (7).  
*Crosby, Hespenheide, & Anderson* 249 (25), 466 (7).  
*Crueger* 111 (5), *s.n.* at K (18).  
*Curran & Haman* 87 (23).  
*Day* 320 (18), 331 (17).  
*Dunbar* 60 (23), 298 (23).  
*Duss* 100 (14), 101 (A, 24; GH, 1), 1372 (14), 1373 (23), 1374b (NY, 1; NY, 13), 1375 (11), 2966 (NY, 13; NY, 24), 2968 (GH, 23; NY, 1), 2969 (NY, 1; NY, 13), 2969b (1), 3852 (14), 3891 (13), 3902 (NY, 1; NY, 13), 3904 (24), 4099 (23), 4137 (11), 4137a (13), 4156 (14), 4157 (GH, 13; NY, 24), 4415 (11), 4417 (NY, 1; NY, 23), 4418 (GH, 24; NY, 1).  
*Eggers* 93 (23), 661 (5), 880 (1), 926 (1), 946 (5), 1184 (18), 1651 (18), 1682 (2), 1741 (19), 1845 (4), 1895 (2), 2011 (19), 3847 (20), 4668 (17), 4778 (18), 4840 (17), 4902



- (17), 6140 (11), 6396 (17), 6398 (14), 6746 (5), *s.n.* in Feb. 1883 (3), *s.n.* in Dec. 1883 (3).
- Egler* 39-169 (14).
- Ehrenberg s.n.* at NY (18).
- Ekman* 340 (9), 413 (1), 706 (18), 1495 (18), 1523 (18), 1954 (17), 2186 (18), 2828 (19), 4136 (17), 4460 (1), 5076 (11), 5150 (11), 5750 (11), 6243 (18), 6443 (14), 6492 (1), 6666 (17), 6708 (14), 7217 (19), 9083 (22), 9180 (18), 9370 (17), 9589 (14), 9601 (1), 9604 (9), 9615 (1), 9626 (18), 9978 (20), 10482 (17), 10695 (4), 10696 (17), 11342 (4), 11402 (18), 12343 (18), 13710 (18), 14306 (17), 14462 (8), 14721 (20), 14795 (17), 14919 (17), 16276 (11), 18382 (18), 19134 (1).
- Ernst* 1107 (17), 1180 (23), 1202 (13), 1365 (23), 1572 (23), 1583 (13), 1640 (14).
- Eyerdam* 317 (14), 363 (5), 506 (4).
- Faris* 158 (18).
- Fendler* 651 (18), 654 (17), 1810 (18).
- Fishlock* 52 (23).
- Focke s.n.*, photo at K (19).
- Forsstrom s.n.* at NY (23).
- Fuertes* 240 (14), 275 (A, NY, P, 2; BM, K, 19), 383 (18), 827 (18), 927 (2), 1393 (14), 1531b (2).
- Gallo* 522 (23).
- Garber* 11 (2), 24 (18).
- Gillis* 8980 (17), 8992 (7), 11683 (23), 12076 (23), 12990 (20).
- Gillis & Proctor* 11548 (20).
- Guilding s.n.* in 1826 at GH (23), *s.n.* at K (5), *s.n.* at K (11), *s.n.* at K (23).
- Haenke s.n.* at PR (11).
- Hahn* 296 (BM, K, P, 14; GH, K, P, 23), 298 (13), 550 (1), 733 (1), 1092 (23), 1385 (14), 1386 (11), 1870 (23).
- Haney* 1824 (23).
- Hansen s.n.* at NY (18).
- Harris* 6203 (5), 6341 (7), 6376 (7), 6383 (23), 6392 (6), 6393 (22), 6395 (25), 6599 (25), 6659 (1), 6676 (23), 6680 (25), 6703 (1), 6781 (23), 6926 (22), 7264 (23), 8138 (23), 9220 (7), 9568 (23), 9696 (25), 10175 (23), 10188 (25), 10202 (7), 10339 (17), 10861 (7), *s.n.* at NY (25).
- Harris & Britton* 10519 (25), 10529 (23).
- Harris & Lawrence* C155283 (5).
- Hart s.n.* in 1896 at P (10), 6113 (17), 6117 (10).
- Heller* 6161 (23), 6186 (18), 6188 (1).
- Heller & Heller* 205 (18), 514 (19).
- Hess* 675 (11).
- Hill* 121 (17), 3172 (15), 3181 (20).
- Hioram* 1306 (18), 1832 (18), 1910 (17), 2021 (17), 2080 (18), 2112 (17), 4093 (11), 7593 (1), 7596 (17), *s.n.* at NY (1), *s.n.* at NY (18).
- Hioram & Maurel* 2418 (17), 2508 (17).
- Hitchcock s.n.* in 1890 at B (destroyed; photo at ILL) (25).
- Hodge* 650 (23), 1149 (1), 1439 (13), 3981 (5).
- Hodge & Hodge* 1832 (5), 2085 (13), 2231 (14), 2233 (14), 2524 (23), 2975 (5), 3784 (23).
- Holdridge* 1002 (9), 1842 (11).
- Howard* 4805 (18), 4806 (18), 6627 (18), 10760 (23), 10853 (23), 11023 (23), 11191 (5), 11349 (23), 11510 (1), 11670 (5), 12091 (18), 18243 (23), 18375 (23).
- Howard & Howard* 8213 (14), 8732 (4), 8782 (19), 8837 (2), 9504 (18), 9676 (18), 18037 (17), 18798 (11), 18853 (23), 18871 (11), 18888 (17), 19384 (13), 19427 (5), 19530 (17).
- Howard, Howard, & Howard* 18933 (23), 19041 (23).



- Howard & Nevling* 15950 (1), 16013 (11).  
*Howard & Proctor* 13541 (17), 14244 (17).  
*Howard, Proctor, & Stearn* 14744 (23), 14916 (7).  
*Hunnewell* 18824 (17).  
*Hunnewell & Griscom* 14301 (17).  
*Imray* 212 (1), 217 (1), 386 (5).  
*Isert* s.n. at P-LAM (23).  
*Jack* 4089 (18), 4571 (18), 4708 (18), 5582 (18), 7001 (11), 7778 (11), 8533 (6).  
*Jenman* 4678 (12).  
*Jérémie* 1131 (5), 1158 (23), 1206 (23).  
*Jiménez* 1745 (18), 5163 (18), 8110 (18).  
*Johnston* 127 (23), 999 (23), 2029 (19), 2057 (22).  
*Judd* 614 (7).  
*Kimber* 917 (23).  
*Kings* 14 (18), 365 (18), CB91 (18), CB91A (18), LC36 (20), LC43 (20).  
*Kostermans* A15042 (13).  
*Kuntze* 210 (19), 363 (4), 415 (19), 426 (22), 495 (18).  
*Laudat* s.n. at κ (24).  
*Lavastre* 1904 (14), 1909 (18).  
*Leibold* s.n. at PR (17).  
*Léon* 162 (17), 352 (18), 3738 (18), 7249 (18), 7842 (18), 8128 (18), 11075 (8), 22820 (20), 72380 (18).  
*Léon & Cazanans* 5909 (18).  
*Léon & Roca* 7249 (18), 7400 (22), 7842 (18), 7849 (17), 8128 (18).  
*Léon & Victorin* 20508 (17).  
*Léon, Victorin, Clemente, & Liogier* 20015 (17).  
*Leonard* 2939 (18), 3209 (18), 3402 (14), 3579 (18), 3595 (18), 3978 (4), 4077 (14), 7170 (14), 7395 (11), 7788 (9), 8635 (4), 9045 (1), 9298 (14), 9648 (18), 9689 (4), 9813 (14), 9846 (18), 9989 (14), 12574 (18).  
*Leonard & Leonard* 12198 (κ, 19; NY, 11), 12574 (18), 12670 (18), 13144 (18), 13661 (1), 14710 (14), 14760 (14).  
*Linden* 1960 (17).  
*Liogier* 1085 (17), 1631 (23), 4077 (18), 9122 (23), 9137 (23), 9215 (17), 9305 (1), 9729 (18), 9876 (17), 10000 (11), 10563 (1), 10593 (1), 10634 (1), 10635 (22), 10763 (11), 11045 (4), 11112 (18), 11256 (4), 11305 (11), 11682 (14), 12351 (18), 12361 (4), 12490 (17), 12531 (18), 12649 (14), 12730 (2), 12969 (4), 13204 (19), 13393 (22), 13553 (4), 13593 (18), 13911 (18), 13939 (4), 13969 (4), 14037 (14), 14141 (14), 14317 (4), 14962 (14), 15208 (14), 15570 (14), 15837 (11), 16294 (2), 17043 (1), 17582 (2), 17583 (4), 17585 (18), 17880 (14), 18459 (11), 18541 (17), 19842 (18), 20810 (18), 20831 (4), 21318 (18), 21685 (11), 22515 (2), 26742 (23), 26877 (4).  
*Liogier & Clemente* 978 (17).  
*Liogier & Liogier* 1940 (17), 18737 (19), 18895 (18), 19397 (4), 20493 (23), 20514 (14), 21612 (14), 22518 (14), 22521 (19), 23477 (4), 23945 (4), 24492 (19), 24892 (18), 25170 (1), 25401 (23), 25486 (4), 26742 (23), 29500 (17), 29929 (17), 30895 (11), 30936 (17), 30941 (11).  
*Liogier, Liogier, & Jiménez* 8244 (23).  
*Liogier, Liogier, & Martorell* 28178 (19), 28362 (1).  
*Liogier, Liogier, & Solano* 30776 (2), 30780 (18), 30795 (2).  
*Liogier, Vivaldi, & Diaz* 27924 (23).  
*Lloyd* 207 (24), 208 (5), 463 (23), 764 (14), 765 (11), 913 (23).  
*Luna* 163 (2), 358 (11), 596 (8), 692 (11), 8059 (2).  
*Lunt* 6616 (18).  
*Macfadyen* s.n. at κ (5), s.n. at κ (23), s.n. at κ (25).  
*Marble* 231 (25).



- Marcano & Jiménez* 5451 (11).  
*March* 938 (18), 942 (17), 1316 (23).  
*Maxon* 1675 (18), 4337 (17).  
*Maxon & Killip* 681 (5), 1055 (25).  
*McDale* s.n. at BM (20).  
*Morton* 5682 (23), 5729 (23).  
*Mouret* 275 (23).  
*Nash* 98 (14), 150 (19), 633 (4).  
*Nash & Taylor* 947 (23), 1021 (23), 1151 (4), 1251 (17), 1314 (23), 1322 (18), 1342 (23), 1529 (14), 1580 (14).  
*Nicholson* s.n. (23).  
*Norman* 191 (18), 247 (5).  
*Northrop & Northrop* 551 (15), 740 (19).  
*Orcutt* 3867 (25).  
*De la Ossa* s.n. in 1825 at G-DC (11), s.n. at G-DC (17).  
*Perrottet* s.n. in 1824 at G-DC (23).  
*Philcox* 7549 (17).  
*Philcox & Kalloo* 7171 (22), 7172 (18), 7180 (13), 7211 (5), 7321 (17).  
*Philcox, Kalloo, & Jurawan* 7387 (13).  
*Philcox & Wood* 7069 (17).  
*Philcox, Wood, & Kalloo* 7517 (10).  
*Phillipson* 696 (7), 792 (5).  
*Picarda* 1666 (9).  
*Plée* 218 (18), 501 (17), 576 (18), s.n. at P (19), s.n. at P (1), s.n. at P (23).  
*Poeppig* s.n. at K (18), s.n. at P (18).  
*Pohl* 868 (24), 4319 (17).  
*Prax* s.n. in 1859 at P (18).  
*Preneloup* 507 (19), 570 (18).  
*Pringle* 80 (18), 1854 (3).  
*Prior* 607 (6).  
*Proctor* 6116 (7), 6503 (23), 9172 (23), 9484 (23), 9521 (5), 10179 (25), 10253 (25), 11628 (7), 11696 (1), 15111 (23), 15259 (20), 15680 (22), 16099 (23), 16703 (7), 17037 (5), 17589 (13), 17876 (23), 17983 (11), 18016 (23), 18089 (2), 18564 (1), 19043 (23), 20319 (24), 20731 (23), 21252 (23), 24783 (25), 26042 (11), 27521 (6), 27540 (23), 27608 (25), 27615 (25), 27631 (25), 28020 (23), 28959 (20), 31710 (17), 33544 (6), 33545 (1), 33646 (4), 33812 (7), 34197 (23), 34967 (1), 35075 (23), 35100 (23), 35194 (18), 35463 (25), 36352 (4), 36454 (1), 36898 (20), 37276 (25), 37430 (21), 37474 (21), 37592 (21), 37603 (21).  
*Proctor & Gillis* 33352 (23), 33917 (23).  
*Proctor & Mullings* 21983 (7).  
*Questel* 223 (23), 2293 (13), 4102 (1), 4193 (23).  
*Ramage* s.n. at BM (17), s.n. at K (24).  
*Raynal-Roques & Jérémie* 21294 (1).  
*Rehder* 1214 (18), s.n. on 13 Feb. 1903 (A, 6; A, GH, 25).  
*Ricksecker* 302 (1), 304 (19), s.n. at GH (1).  
*Roig* 3889 (18).  
*Roig & Cremata* 2198 (11).  
*Rose, Fitch, & Russell* 3353 (23), 3701 (18), 3852 (23), 3993 (14).  
*Rugel* 165 (18), 269b (18), 270 (17).  
*Rusby* 1544 (12).  
*Sagra* s.n. at P (18).  
*Sandwith* 1741 (17), 1809 (23).  
*Sastre* 5394 (23), 6520 (11).  
*Sastre & Fournet* 2519 (23), 2656 (A, 24; P, 1).



*Sastre & Sastre* 4309 (5).

*Shafer* 159 (18), 296 (20), 314 (23), 320 (23), 331 (17), 363 (18), 371 (20), 563 (18), 600 (23), 607 (23), 815 (18), 1109 (18), 1622 (18), 2003 (23), 3270 (17), 3427 (17), 8116 (17), 8517 (17), 8582 (17), 8590 (11), 8601 (17), 8737 (17), 8817 (4), 11823 (18), 11828 (18), 12109 (18), 12178 (8), 12403 (18).

*Shafer & Fitch* 1472 (1).

*Sieber* 227 (BM, K, P, 11; G-DC, 13).

*Sintenis* 339 (17), 339b (1), 885 (18), 887 (23), 1270 (17), 2347 (19), 2348 (4), 2836 (11), 3035 (18), 3058 (4), 3246 (23), 3428 (23), 4154 (17), 4288 (4), 4614 (17), 5383 (11), 5562 (18), 5926 (19), 6060 (1), 6114 (4), 6758 (22), *s.n.* in Jan. 1885 (18), *s.n.* in Feb. 1885 (1), *s.n.* in Dec. 1885 (4), *s.n.* on 1 Jan. 1886 (23), *s.n.* in Jan. 1886 (19), *s.n.* in Feb. 1886 (4), *s.n.* in April 1886 (22), *s.n.* in Oct. 1886 (2), *s.n.* in Feb. 1888 (4).

*Small & Carter* 8479 (15).

*Smith* 10154 (23), 10189 (23), 10315 (14), 10492 (23).

*Smith & Smith* M34 (23), 245 (17), 248 (17), 297 (11), 374 (5), 1305 (1), 1306 (23), 1623 (22).

*Snow s.n.* at K (13).

*Spruce* 2112 (11).

*Squire s.n.* on 12 June 1938 (14).

*Stearn* 805 (23).

*Stehlé* 49 (17), 70 (23), 73 (23), 117 (23), 373 (1), 374 (14), 375 (14), 1016 (13), 1021 (13), 1035 (NY, P, 13; NY, P, 24), 1130 (13), 1637 (17), 2074 (NY, 13; P, 14), 2162 (24), 2458 (17), 2462 (1), 2489 (23), 2560 (24), 2561 (23), 2562 (24), 2899 (14), 2900 (1), 2903 (14), 2904 (14), 2944 (23), 5627 (13), 6249 (23), 6450 (11), 6608 (17), 7228 (11), *s.n.* at A (23).

*Stehlé & Stehlé* 2452 (1), 2459 (24), 3368 (1), 6585 (11), 77/25 (23).

*Stevens & Hess* 3107 (1), 3301 (1).

*Stevenson* 2098 (1).

*Stimson* 1484 (19), 2033 (17), 3346 (1), 3459 (17).

*Stoffers* 2555 (23), 3541 (23).

*Sturrock* 377 (23), 559 (13).

*Swartz s.n.* at BM (5), *s.n.* at s (5), *s.n.* at s (17).

*Taylor* 28 (19), 223 (18), 328 (11), 338 (18), 415 (19), 479 (18), 481 (18).

*Toepffer* 661 (5), 880 (1), 965 (18).

*Türkheim* 2616 (18), 3284 (11).

*Ule* 4800 (17).

*Underwood & Earle* 1311 (17).

*Underwood & Griggs* 211 (18), 383 (18), 554 (23), 671 (1).

*Vaga s.n.* at B (destroyed; photo in Trelease, 1916) (14).

*Valeur* 429 (19), 707 (14), 800 (18).

*Van Hermann* 4887 (17), 809 (17).

*Varanne s.n.* in 1851 (14).

*Wagner* 472 (17), 1372 (1), 1704 (1).

*Watt* 6219 (5), 6221 (25).

*Webster* 5598 (5).

*Webster & Wilson* 4829 (18), 4859 (6).

*Weir s.n.* on 16 Jan. 1925 (18), *s.n.* on 17 Jan. 1925 (14).

*Weir & Faris s.n.* on 14 Nov. 1924 (18).

*West & Arnold* 167 (25), 564 (6), 882 (17), 941 (18).

*Wilbur* 7713 (10), 7973 (5), 8113 (23), 8280 (23).

*Wiles* W9 (10), W30 (10), W35 (18).

*Wilkes Exped. s.n.* in 1838–1842 (5).

*Wilson* 1405 (17), 1748 (18), 7250 (23), 7254 (23), 7315 (23), 7449 (20), 7457 (20), 7532 (20), 7579 (20), 7814 (23), 7851 (23), *s.n.* at K (25).



*Winters* 562 (18).

*Wolcott* 2633 (18).

*Wood & Atchison* 7405 (18).

*Woodbury* s.n. at NY (17), s.n. at NY (18).

*Wright* 217 (17), 1251 (4), 1251a = 216 (17), 1252 (11), 1300 (κ, 20; other *Wright* 1300 = *Dendrophthora*), 1300b (20), 1302 (18), 2650 (8), s.n. at BM (17).

*Wright, Parry, & Brummel* 458 (1), 459 (2).

*York* 253 (5).

*Yuncker* 17005 (6), 17085 (6).

*Zuloaga* s.n. at ILL (18).





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