

VISCACEAE - MISTLETOE FAMILY

Frank G. Hawksworth
 U. S. Forest Service
 Rocky Mountain Forest and Range Experiment Station
 Fort Collins, CO 80526

and

Delbert Wiens
 Department of Biology
 University of Utah
 Salt Lake City, UT 84112

Perennial shrubs, aerial parasites on dicotyledonous plants and conifers; implanted by means of a primary penetrating organ (haustorium), elaborating laterally in the water-conducting tissues of the host (through the endophytic system); dioecious (in ours) or monoecious. SHOOTS woody or nonwoody, brittle, densely branched. LEAVES simple, entire, decussate, or absent. INFLORESCENCES axillary spikes (in ours) or cymules (sometimes terminal). FLOWERS minute (2-4 mm), with a single series of 2-7 tepals; staminate flower with anthers opposite perianth segments; pistillate flower with an inferior ovary, the style unbranched. FRUIT a single-seeded mucilaginous berry. SEED without a thickened seed coat, eaten and distributed primarily by birds or dispersed explosively in *Arceuthobium*. --7 genera, 450 spp., north temperate, subtropical, or tropical regions. Includes the common European mistletoe, *Viscum album*. These mistletoes were formerly considered to be a subfamily of the Loranthaceae but family status for the Viscaceae is now generally recognized. Calder, M. and F. Bernhardt. 1983. *The Biology of Mistletoes*. Academic Press, Sydney.

- 1. Parasites on *Pinus*, *Abies*, *Pseudotsuga*, or *Picea*; stems greenish-yellow, yellow or brownish, leafless, usually less than 15 cm high, non-woody, quadrangular, at least when young; flowers on short pedicels, these recurved at maturity; berry compressed, bicolored (distal and basal portions of different shades), same color as shoots, 3-4 mm in diameter, explosive; anthers 1-loculed
 *Arceuthobium*
- 1' Parasites on woody dicots or *Juniperus*, *Cupressus*, or *Abies*; stems green, leafy or leafless, usually over 20 cm high, woody, terete; flowers sunken along the axis; berry globose, sessile, uniformly colored (white, pink, or reddish), 3-6 mm in diameter, not explosive; anthers 2-loculed
 *Phoradendron*

Arceuthobium M. Bieb. Dwarf Mistletoe

Aerial shrubs parasitic on Pinaceae, 2-25 cm high, glabrous, dioecious. SHOOTS variously colored, greenish-yellow to orange, reddish, and black, quadrangular, at least when young. LEAVES reduced to minute scales. INFLORESCENCES of axillary spikes. FLOWERS decussate (sometimes whorled), short pedicellate; staminate flowers with a central nectary, the perianth segments (2-)3-4(-5), each segment bearing a sessile, circular, uniloculate anther; pistillate flowers with a single style and rounded stigma, the perianth segments 2, persistent. FRUIT mostly 3-5 mm long, bicolored, dehiscing explosively (to 15 m); pedicels curved at maturity. --33 spp. in U.S. and Mex., 8 in the Old World. (Greek: *Arceuthos* = juniper + *bios* - living). Hawksworth, F.G., & D. Wiens. 1972. *Biology and Classification of Dwarf Mistletoes (Arceuthobium)*. U.S.D.A. Agricultural Handbook 401.

- 1. Pistillate plants 2-4 cm high, the shoots scattered along host stem near the apex; hosts forming systemic witches brooms; parasitic on *Pseudotsuga* *A. douglasii*

- 1' Pistillate plants usually more than 4 cm high; shoots in individual clusters; host generally not forming systemic witches brooms; parasitic on *Abies*, *Picea*, and *Pinus*.
2. Flowering in spring (Mar-Jun); internodes usually less than 4 times as long as wide; parasitic on hard pines (*Pinus* subgenus *Pinus*).
3. Fruit markedly whitish-blue glaucous at base; shoots green; staminate plants often markedly divaricate, the pistillate plants erect; parasitic on *Pinus leiophylla* var. *chihuahuana* *A. gillii*
- 3' Fruit not markedly glaucous at base; shoots orange; parasitic on *P. ponderosa*, *P. arizonica*, or *P. engelmannii* *A. vaginatum* subsp. *cryptopodium*
- 2' Plants flowering in late summer (Aug-Sep); internodes at least 5 times as long as wide; parasitic on soft pines (*Pinus* subgenus *Strobus*), *Abies* or *Picea*.
4. Parasitic on *Pinus strobiformis* or pinyon pines.
5. Shoots olive green to brownish; parasitic on pinyon pines *A. divaricatum*
- 5' Shoots generally yellowish green to light gray or purplish; parasitic on *Pinus strobiformis*.
6. Plants over 6 cm high; staminate spikes in summer over 10 mm long; shoots not densely clustered, straw to light gray; Huachuca Mts *A. blumeri*
- 6' Plants under 5 cm high; staminate spikes in summer 5-7 mm long; shoots densely clustered, yellowish; c and se Arizona *A. apachecum*
- 4' Parasitic on *P. aristata*, *Abies* or *Picea*.
7. Shoots yellowish; parasitic on *Abies*; mean height ca. 8 cm, up to 22 cm *A. abietinum*
- 7' Shoots green or purple; parasitic on *Picea* or *Pinus aristata*; mean height ca. 5 cm, up to 10 cm *A. microcarpum*

Arceuthobium abietinum Engelm. ex Munz (on *Abies*). Fir Dwarf Mistletoe. --SHOOTS 6-15(-22) cm high, 2-6 mm wide at base, yellow to yellow-green. STAMINATE FLOWERS ca. 2.5 mm in diameter; tepals 3(-4). FRUIT ca. 4 mm long, 2 mm wide. --2 formae specialis (host races). w U.S.; n Mex.

f. sp. **concoloris** Hawksworth and Wiens. SHOOT ca. 10(-22) mm long. HOSTS: *Abies concolor*, rarely associated *A. lasiocarpa*. [*A. campylopodum* Engelm. f. *abietinum* (Engelm.) L. S. Gill]. --Mixed conifer forests: Cochise Co.: Mormon Canyon, Chiricahua Mts.; Coconino Co.: n rim Grand Canyon, very rare s rim; Pima Co.: Marshall Gulch, Santa Catalina Mts; 2200-2900 m (7200-8800 ft); Aug-Sep; CA, NV, OR, s UT, s WA; Chih., Mex.

Arceuthobium apachecum Hawksw. & Wiens (of Apache). Apache Dwarf Mistletoe. --SHOOTS 3-4(-7) cm high, 1-2 mm wide at base, yellow-green. STAMINATE FLOWERS 2.7 mm in diameter; tepals 3-4. FRUIT 4 mm long, 2.5 mm wide. HOST: *Pinus strobiformis*. [*A. campylopodum* Engelm. f. *blumeri* (A. Nels.) L. S. Gill, in part]. --Mixed conifer forests: Apache, Cochise, Graham, Greenlee, Pima, Santa Cruz cos.; 2000-3000 m (6500-9800 ft); Sep; s NM; n Coah., Mex.

Arceuthobium blumeri A. Nelson (for J. C. Blumer). Blumer's Dwarf Mistletoe. --SHOOTS 5-7(-18) cm high, 1-3 mm wide at base, gray or straw-colored. STAMINATE FLOWERS 2.5-3 mm diameter; tepals 4-6. FRUIT 4 mm long, 2.5 mm wide. HOST: *Pinus strobiformis*. [*A. campylopodum* Engelm. f. *blumeri* (A. Nelson) L. S. Gill, in part]. --Mixed conifer forests: only in Huachuca Mts., Cochise Co., now quite rare because of recent host losses to destructive fires; 2100-2600 m (7000-8600 ft); Aug; Son., Chih., Dgo., Mex.

Arceuthobium divaricatum Engelm. (divaricate branching). Pinyon Dwarf Mistletoe. --SHOOTS 7-12 cm high, 2-4 mm wide at base, olive-green to brown. STAMINATE FLOWERS 2.5 mm in diameter; tepals 3. FRUIT 4 mm long, 2.5 mm wide. HOSTS: pinyon pines, mainly *Pinus edulis*, but also *P. discolor* and *P. californiarum* subsp. *fallax* (= *P. edulis* var. *fallax*). [*A. campylopodum* Engelm. f.

divaricatum (Engelm.) L. S. Gill]. --Pinyon-juniper woodlands: Apache, Coconino, Gila, Graham, Greenlee, Mohave, Navajo, and Yavapai cos.; 1400-2400 m (4600-7800 ft); Aug-Sep; CA, CO, NV, UT, w TX; Baja C., Mex.

Arceuthobium douglasii Engelm. (for David Douglas). Douglas-fir Dwarf Mistletoe. --SHOOTS 2-3(-7) cm high, 1 mm wide at base, green. STAMINATE FLOWERS 2.3 mm in diameter; tepals 3(-4). PISTILLATE FLOWERS 1.5 mm in diameter. FRUIT olive green, 3.5-4.5 mm long, 1.5-2 mm wide. HOSTS: *Pseudotsuga menziesii*, rarely associated with *Abies concolor* and *A. lasiocarpa*. --Mixed conifer forests: Apache, Cochise, Coconino, Gila, Graham, Greenlee, Navajo, Pima, Yavapai cos.; 1900-3000 m (6300-9800 ft); May-Jun; s British Columbia to CA and NM; Chih., Coah., Dgo., N.L., Mex.

Arceuthobium gillii Hawsw. & Wiens (for L. S. Gill). Chihuahua Pine Dwarf Mistletoe. --SHOOTS 10-15(-25) cm high, 3-8 mm wide at base, greenish-yellow to dark brown; pistillate plants erect; staminate plants spreading. STAMINATE FLOWERS 3-3.5 mm long, 2-4 mm in diameter, the tepals 3. PISTILLATE FLOWERS ca. 1.5 mm long. FRUIT whitish-blue, glaucous on base, 4-5 mm long, 2-3 mm wide. HOST: *Pinus leiophylla* var. *chihuahuana*. --Chihuahua pine woodlands: Cochise, Pima, Santa Cruz cos.; 1700-2450 m (550-8000 ft); Mar-Apr; sw NM; Chih., Sin., e Son., Mex.

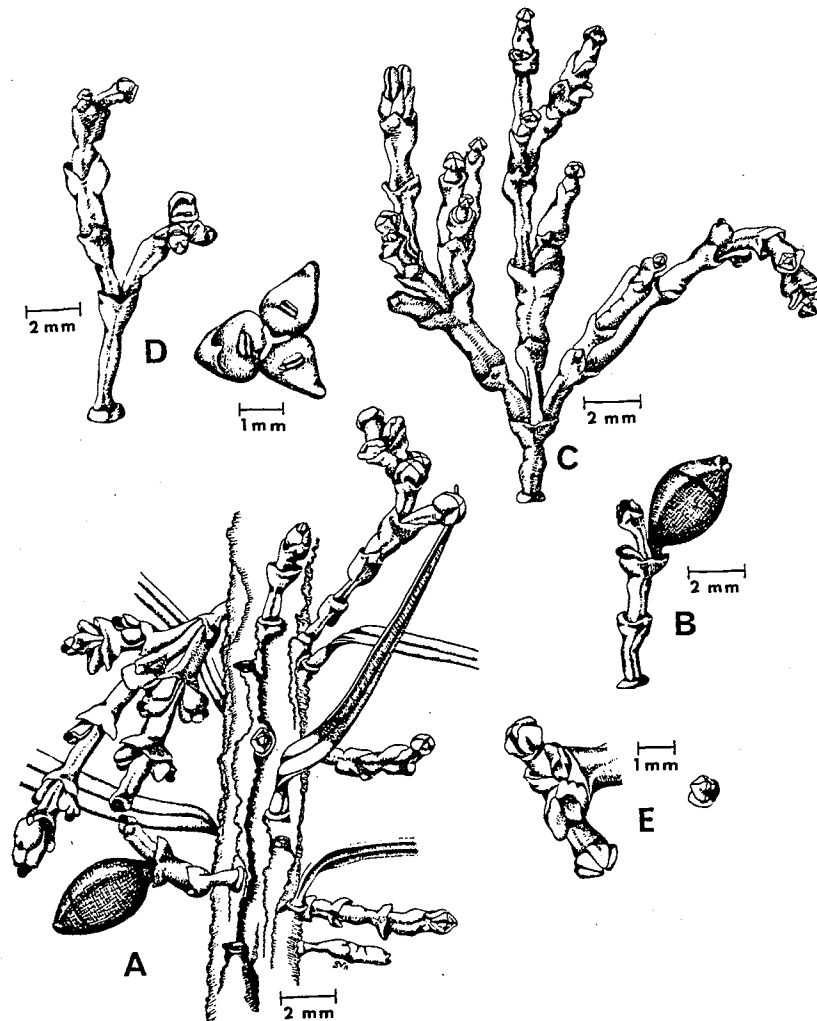


Figure 1. *Arceuthobium douglasii* in spring: A, pistillate (left) and staminate (right) plants on the same host twig; B, detail of nearly mature fruit; C, staminate shoot; D, staminate shoot with mature buds and open flower (left) and detail of open flower (right); E, staminate shoots showing characteristic rounded buds. Reproduced from Hawsworth and Wiens (1972), *Biology and Classification of Dwarf Mistletoes (Arceuthobium)*.

Arceuthobium microcarpum (Engelm.) Hawksworth & Wiens (small fruits). Western Spruce Dwarf Mistletoe. --SHOOTS 4-6(-10) cm high, 1.5-2.5 mm wide at base, green to purple. STAMINATE FLOWERS 2.3 mm in diameter, the tepals 3(-4). PISTILLATE FLOWERS 1 mm in diameter, 1 mm long. FRUIT 3.5 mm long, 2 mm wide. HOSTS: *Picea engelmannii* and *Picea pungens*, also on *Pinus aristata* on the San Francisco Peaks, Coconino Co. [*A. campylopodum* Engelm. f. *microcarpum* (Engelm.) Gill]. --Mixed conifer forests: Apache, Coconino, Graham, and Greenlee cos.; 2400-3150 m (7900-10400 ft); Aug-Sep; s NM.

Arceuthobium vaginatum (Willd.) Presl (sheathed, referring to shoots). --SHOOTS: 10-30(-50) cm high, 3-10 mm wide at base, bright orange, reddish, dark brown or black, densely branched, usually erect. STAMINATE FLOWERS 3.5 mm long, to 3.5 mm in diameter; tepals 3(-4). FRUIT 4-6 mm long, 2-3 mm wide, elliptic to obovate. --2 subsp; sw U.S.; w and c Mex.

subsp. **cryptopodum** (Engelm.) Hawksw. & Wiens. Southwestern Dwarf Mistletoe. --SHOOTS 10-20(-27) cm high, 3-10 mm wide at base, orange to reddish-brown. STAMINATE FLOWERS 2.5-3 mm in diameter. FRUIT 4.5-5.5 mm long. HOSTS: mainly *Pinus ponderosa*, but also *P. arizonica* and *P. engelmannii* in s AZ. [*A. vaginatum* f. *cryptopodum* (Engelm.) L. S. Gill]. --Ponderosa Pine forests: all AZ cos. except La Paz and Yuma; 1750-2950 m (5800-9700 ft); May-Jun; n CO to s NM, w TX, s UT; Son., Chih., Coah., Mex.

Phoradendron Nutt. Mistletoe

Aerial shrubs parasitic on dicot or coniferous shrubs and trees, 2-15 dm high, woody, glabrous or hairy, dioecious in AZ (some tropical species monoecious). SHOOTS usually some shade of green, but sometimes reddish. LEAVES simple, entire, decussate, but reduced to minute scales in 2 species. INFLORESCENCES axillary spikes with 1-7 fertile segments. FLOWERS sunken along the axis; perianth segments usually 3, persistent in fruit; staminate flower with a sessile minute (less than 2 mm), 2-chambered anther; pistillate flower with a single style and rounded stigma. FRUIT 3-6 mm in diameter, sessile, white, pink, or reddish; eaten and dispersed by birds. (Greek: *phor* = thief + *dendron* = tree). --ca. 200 spp. in the U.S., north temperate, tropical and subtropical distribution in the New World. Trelease, W. 1916. The Genus *Phoradendron*, Univ. Ill. Press; Wiens, D. 1964. Brittonia 16:11-54.

1. Plants with leaves reduced to minute scales.
 2. Parasitic mostly on desert legumes (*Prosopis*, *Olneya*, *Acacia*); shoots canescent, often reddish *P. californicum*
 - 2' Parasitic on *Juniperus*; shoots glabrous, green *P. juniperinum*
- 1' Plants with well developed leaves.
 3. Leaves less than 1 cm wide; parasitic on coniferous trees.
 4. Parasitic on *Abies*; leaves usually more than 3 cm long *P. pauciflorum*
 - 4' Parasitic on *Juniperus* or *Cupressus*; leaves usually less than 3 cm long.
 5. Parasitic on *Juniperus*, leaves pubescent *P. capitellatum*
 - 5' Parasitic on *Cupressus*, leaves glabrous *P. densum*
 - 3' Leaves more than 1 cm wide; parasitic on broad-leaved angiosperm trees.
 6. Parasitic primarily on *Quercus*; leaves pubescent, 2-4 cm long *P. coryae*
 - 6' Parasitic primarily on *Populus*, *Platanus*, *Salix*, and *Fraxinus*; leaves glabrous, 3-6 cm long *P. macrophyllum*

Phoradendron californicum Nutt. (of California). Desert Mistletoe. --SHOOTS 4-10 dm high, often pendulous with age, green-reddish, with internodes ca. 2 cm long, canescent (especially apical internodes). LEAVES reduced to minute scales. INFLORESCENCES: staminate spikes with 2-3 fertile segments, ca. 6 flowers per fertile segment; pistillate spikes with ca. 3 fertile segments, 2-3 flowers per segment. FLOWERS moderately canescent. FRUIT white-reddish, glabrous, ca. 3 mm in diameter. HOSTS: *Prosopis*, *Cercidium*, *Olneya*, *Acacia*, *Condalia*, *Parkinsonia*, rarely *Larrea* and *Simmondsia*. --Sonoran Desert; all AZ cos. except Apache and Navajo; 15-1400 m (50-4600 ft); Jan-Mar; CA, s NV, sw UT; Baja

C., Sin., Son., Mex.

Phoradendron capitellatum Torr. (densely clustered). Hairy Mistletoe. --SHOOTS 3-8 dm high, often pendulous with age, yellow green, the internodes 7-12 mm long. LEAVES oblanceolate-linear, 1-1.5 cm long, 2-3 mm wide; densely pubescent. INFLORESCENCES: staminate spikes with 2-3 fertile segments, 6-10(-15) flowers per segment; pistillate spikes with usually 1 fertile segment, with 2-3 flowers per segment. FLOWERS pubescent. FRUIT pink-white, ca. 3 mm in diameter. HOST: *Juniperus*. [*P. bolleanum* (Seem.) Eichler var. *capitellatum* (Torr.) Kearney & Peebles]. --Pinyon-juniper woodlands: Cochise, Coconino, Gila, Graham, Greenlee, Maricopa, Pima, Pinal, Santa Cruz, Yavapai cos.; 800-1700 m (2800-5500 ft); Dec-Feb; se NM; n Chih., n Son., Mex.

Phoradendron coryae Trel. (for K. T. Cory). Oak Mistletoe. --SHOOTS up to 1 m high, mostly short pubescent, gray-green, the internodes 2-3 cm long. LEAVES obovate-elliptic to circular, 1.5-3 cm long, 1.5-2.5 cm wide, densely pubescent. INFLORESCENCES: staminate spikes with 2-3 fertile segments, with 25-40 flowers in 3 rows per segment; pistillate spikes with 2-3 fertile segments, with 6-10 flowers per segment. FLOWERS pubescent. FRUIT white, short hairy around the persistent perianth segments, ca. 3 mm in diameter. HOSTS: *Quercus*, rarely *Condalia*, *Berberis*, *Vaquelinia* and *Sideroxylon*. --Sub-Mogollon oak woodlands: all AZ cos. except Apache, La Paz, and Yuma; 1200-2700 m (4000-8800 ft); Jul-Sep; NM, w TX; Chih., Coah., Son., Mex.

Phoradendron densum Torr. (densely branched). Dense Mistletoe. --SHOOTS 3-5 dm high, green, glabrous, the internodes 8-15 mm long. LEAVES oblanceolate to oblong, sessile, 1.5-2.5 cm long, 2-3 mm wide, glabrous. INFLORESCENCES: staminate spikes with usually 1 fertile segment, with 6-10 flowers per segment; pistillate spikes with usually 1 fertile segment, with 2 flowers per segment. FLOWERS glabrous. FRUIT white-pinkish, glabrous, 4 mm in diameter. HOST: *Cupressus arizonica*. [*P. bolleanum* (Seem.) Eichler var. *densum* (Torrey) Fosberg]. --Arizona cypress forests: local in c AZ: Coconino, Gila, Maricopa, Yavapai cos.; 1050-1600 m (3500-5300 ft); Jun-Aug; CA, s OR; Baja C., Mex.

Phoradendron juniperinum Engelm. ex A. Gray (on juniper). Juniper Mistletoe. --SHOOTS 2-4 dm high, greenish, glabrous, the internodes 6-10 mm long. LEAVES reduced to minute scales. INFLORESCENCES: staminate spikes with usually 1 fertile segment, ca. 6 flowers per segment; pistillate spikes with 1 fertile segment, with 2 flowers. FLOWERS glabrous. FRUIT white-pinkish, glabrous, ca. 4 mm in diameter. HOSTS: *Juniperus*, rarely on *Cupressus* and very rarely on *Chamabaetiaria*. --Pinyon-juniper woodlands: all AZ cos. except La Paz, Yuma; 1000-2300 m (3200-7500 ft); Jun-Jul; s CA, CO, n NV, OR, n UT, w TX; Chih., Son., Mex.

Phoradendron macrophyllum (Engelm.) Cockerell (large-leaved). Big-leaf Mistletoe. --SHOOTS 1 m or more high, short-pubescent, especially near apices, green to pale-green, the internodes 3-4 cm long. LEAVES obovate to elliptic-circular 3-5 cm long, 1.5-3 cm wide, mostly glabrous. INFLORESCENCES: staminate spikes with 4-5(-7) fertile segments, with 20-40 flowers per segment in 3 rows; pistillate spikes with 3-5 fertile segments, with 6-15 flowers per segment. FLOWERS slightly pubescent. FRUIT white, glabrous, ca. 5 mm in diameter. HOSTS: *Populus*, *Salix*, *Platanus*, *Fraxinus*, *Alnus*, *Juglans*, and other deciduous trees. [*P. flavescens* (Pursh) Nutt., in part]. --Sub-Mogollon Riparian woodlands: all AZ cos. except Apache; 50-1700 m (100-5500 ft); Dec-Mar; CA, s NM, w TX; Baja C., Chih., Son., Mex.

Phoradendron pauciflorum Torr. (few flowered). Fir Mistletoe. --SHOOTS 3-6 dm long, glabrous, green; internodes 1-2 cm long. LEAVES oblanceolate, 1.5-3 cm long, 5-10 mm wide, glabrous. INFLORESCENCES: staminate spikes with usually 1-2 fertile segments, with 8-12 flowers; pistillate spikes with 1 fertile segment, with 2 flowers. FLOWERS glabrous. FRUIT white-pinkish, glabrous, ca. 4 mm in diameter. HOST: *Abies concolor*. [*P. bolleanum* (Seem.) Eichler var. *pauciflorum* (Torr.) Fosberg]. --Mixed conifer forests: in AZ known only in Pima Co. (Santa Catalina & Rincon Mts.); 2250-2600 m (7400-8500 ft); Jul-Aug; CA; Baja C., Mex.