Eight New Species of Lauraceae from Ecuador, Peru, and Panama

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Abstract. Eight new species of Lauraceae from Andean South America and Panama are described and illustrated. Two belong to the genus *Cinnamomum* Schaeffer, *C. lanigerum* van der Werff and *C. formicarium* van der Werff & Lorea-Hernández, both from Ecuador; one species belongs to *Ocotea* Aublet, *O. pacifica* van der Werff, from Ecuador and Colombia; and five belong to *Pleurothyrium* Nees, *P. bilocellatum* van der Werff, *P. cordatum* van der Werff, and *P. obscurinerve* van der Werff from Ecuador, *P. pascoense* van der Werff from Peru, and *P. triflorum* van der Werff from Panama.

Key words: *Cinnamomum*, Colombia, Ecuador, IUCN Red List, Lauraceae, *Ocotea*, Panama, Peru, *Pleurothyrium*.

During the continuing botanical exploration of Andean South America and adjacent Panama, several Lauraceae have been collected that did not match known species. Two of those species (*Ocotea pacifica* van der Werff and *Pleurothyrium obscurinerve* van der Werff) were collected for the Florula of Samama project (Los Ríos Province, Ecuador). A floristic inventory of the Cordillera del Cóndor in Ecuador yielded two species of *Pleurothyrium* Nees (*P. bilocellatum* van der Werff and *P. cordatum* van der Werff), while fieldwork in Cordillera de Yanachaga (Peru) and in lowland rainforest on the Atlantic slope of Panama led to the discovery of two new species of *Pleurothyrium*. Finally, among recent collections from central Ecuador, two new species of *Cinnamomum* Schaeffer were found. These discoveries demonstrate that our knowledge of the flora of Andean South America and adjacent Panama is still incomplete. Further collecting efforts will almost certainly result in finding additional undescribed species of Lauraceae.

Cinnamomum

The Neotropical species of *Cinnamomum* were recently revised by Lorea-Hernández (1996), who recognized 47 species. The number of Paleotropical species of *Cinnamomum* is much higher: Rohwer (1993) gave a total number of species of about 350. *Cinnamomum* has bisexual flowers with nine 4-celled stamens (infrequently six 4-celled and three 2-celled stamens) and conspicuous staminodia with a sagittate apex. The fruits are seated in a shallow or rather deep cupule, with the tepals frequently, but not always, persisting on the margin of the cupule. Common vegetative characters among the Neotropical species are the presence of domatia in the axils of the basal secondary veins and tripliveined leaves. *Cinnamomum* differs from *Ocotea* in its well-developed staminodia; in *Ocotea* staminodia are either lacking or small, stipitiform, always without a sagittate apex. A similar clear difference between *Cinnamomum* and *Persea* Miller, another genus with nine 4-celled stamens and bisexual flowers, is lacking, partly because *Persea* is so variable. Most species of Neotropical *Persea* have unequal tepals, with the outer three smaller than the inner three, whereas in *Cinnamomum* tepals are equal. Domatia and tripliveined leaves do not occur in *Persea*. However, a number of species with equal tepals, bisexual flowers, large staminodia, and pinnately veined leaves without domatia are difficult to place. Traditionally, the species in this group with persistent tepals are placed in *Persea*, while those with caducous tepals are placed in *Cinnamomum*. I accept these concepts and also acknowledge that more studies are needed to establish monophyletic genera or species groups.

1. **Cinnamomum formicarium** van der Werff & Lorea-Hernández, sp. nov. TYPE. Ecuador. Bolívar: along rd. Chillanes–El Tambo, 1700–2300 m, 19 July 1991, *H. van der Werff, B. Gray & G. Tipas 12498* (holotype, MO; isotype, MO). Figure 1.

Species nova quae a congeneris ramulis fistulosis valde angulatis et foliis magnis recedit.

Trees, to 20 m; twigs sharply angular, thick, to 1.5 cm diam., hollow, occupied by slow-moving, nonaggressive ants, stems covered with appressed hairs when young, the hairs matted and remaining as patches on older parts, eventually becoming sparse; terminal buds densely appressed pubescent. Leaves alternate, elliptic to broadly elliptic, 28–40(–60) × 14–28 cm, base acute to obtuse, apex obtuse to acute (often damaged due to the large size of the blade),

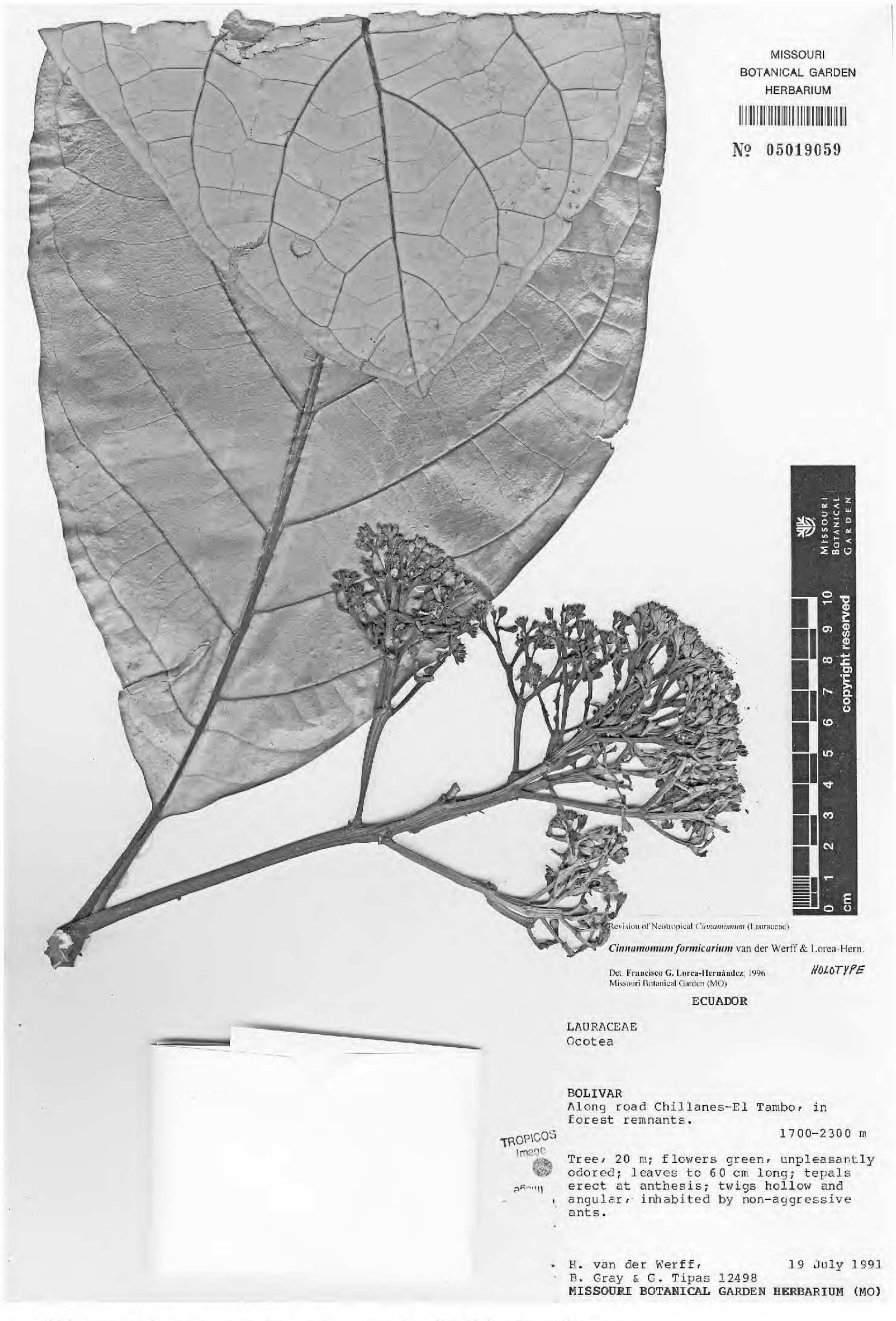

Figure 1. Holotype of *Cinnamomum formicarium* van der Werff & Lorea-Hernández.

abaxially minutely tomentulose, glabrescent with age, adaxially glabrous, pinnately veined, secondary veins in 7 to 12 pairs, midrib and secondary veins slightly impressed adaxially, raised abaxially, domatia lacking; petioles 3–7 cm, canaliculate, with the same indument as the twigs. Inflorescences 15–25 cm, paniculate-cymose, in the axils of leaves, glabrous or nearly so; pedicels 2.5–3.5 mm, glabrous. Flowers green, ca. 3 mm diam.; tepals 6, equal, elliptic, ca. 2.5 mm, glabrous on the outer surface, pubescent on

the inner surface, with an abscission line near the base; stamens 9, 2.3–3 mm, filaments pubescent, anthers glabrous, outer 6 stamens 4-celled, inner 3 stamens 2-celled and with 2 globose glands near the base; staminodia present, 1.5–2 mm, filament pubescent, the tip triangular-sagittate; pistil 2–3 mm, glabrous, style about as long as the ovary, receptacle cup-shaped, glabrous inside. Immature fruit ca. 10 × 7.5 mm, ellipsoid, cupule cup-shaped, ca. 11 × 7 mm, tepals not persisting in fruit.

Discussion. The new species is very distinct due to its large leaves (to 40–60 cm long), the fistulose and sharply angled twigs, and the densely flowered, glabrous inflorescences. The hollow center in the fistulose twigs can range from 5–7 mm in diameter. Other characters of the new species infrequently found in Neotropical *Cinnamomum* species are the absence of domatia, tepals not persistent in fruit, the inner three stamens 2-celled, and pinnately veined leaves. The flowers have an unpleasant odor, reminiscent of urine.

IUCN Red List category. *Cinnamomum formicarium* is known from very few collections and is therefore listed as Data Deficient (DD) according to IUCN Red List criteria (IUCN, 2001).

Paratypes. COLOMBIA. **Cauca:** Cordillera Occidental, La Gallera, Micay Valley, 1500–1800 m, *E. Killip 7904* (NY). **Valle:** Hoya del Río Cali, Río Pichindé, entre Los Cárpatos y El Olivo, 2025–2920 m, *J. Cuatrecasas 21726* (F); monte La Guarida, filo de la cordillera sobre La Carbonera, entre Las Brisas y Albán, 1950–2000 m, *J. Cuatrecasas 22176* (F). ECUADOR. **Bolívar:** along rd. Chillanes–Bucay, *V. Zak & J. Jaramillo 2564* (MO); along rd. Chillanes–El Tambo, 1700–2300 m, *H. van der Werff, B. Gray & G. Tipas 12478* (MO).

2. Cinnamomum lanigerum van der Werff, sp. nov. TYPE: Ecuador. Carchi: Espejo, Faldas del Cerro Golondrinas Hembra, 00°51′N, 78°07′W, 2300–2400 m, 20 Aug. 1994, *W. Palacios 12721* (holotype, QCNE; isotypes, AAU, HBG, MO, NY, US). Figure 2.

Species nova *Cinnamomo floccoso* van der Werff similis, sed ab eo floribus pubescentibus, indumento foliorum lanoso et petiolis longioribus (usque ad 1.5 cm, nec 0.5 cm) recedit.

Small tree, to 8 m; twigs angular, solid, densely pubescent, the indument covering the surface completely, light brown, the hairs short, curled, stems glabrescent with age; terminal buds densely pubescent as the young twigs. Leaves alternate, broadly ovate-elliptic to elliptic, 8–15 × 5–11 cm, stiffly chartaceous, base obtuse to rounded, apex obtuse or acute, margin flat, young leaves adaxially moderately densely pubescent with short, curled hairs, soon becoming glabrous and lustrous, abaxially densely woolly pubescent, the curled hairs completely covering the surface, the hairs becoming light brown on older leaves but not wearing off, domatia lacking; secondary veins in 4 to 6 pairs, impressed adaxially and raised abaxially, the older leaves somewhat bullate, the basal 2 pairs of secondary veins crowded near the base of the leaf; petioles 10–14 mm, canaliculate or flat above. Inflorescences 5–15 cm, in the axils of leaves, paniculate-cymose, rather densely tomentose, the surface largely covered. Flowers green, 4–5 mm diam.; pedicels ca. 1 mm, tomentose, much shorter than the flowers; tepals 6, equal or the outer 3 slightly shorter, 2.5–3 × ca. 1 mm, pubescent on both surfaces, half-erect at anthesis and spreading in older flowers, with an abscission line near the base and breaking off in old flowers; stamens 9, outer 6 4-celled, inner 3 2-celled, 2.5–3 mm, filaments pubescent, ca. 1.5 mm, anthers glabrous, inner 3 stamens with 2 round glands near the base; staminodia present, ca. 1.5 mm, filament pubescent, the glabrous apex triangular-sagittate, wider than the filament; pistil glabrous, ca. 3 mm, ovary round, ca. 1 mm, style slender, ca. 2 mm; receptacle cup-shaped, with a few appressed hairs inside. Fruits not known.

Discussion. *Cinnamomum lanigerum* is closely related to *C. floccosum* van der Werff from northern Peru. The two species share the impressed venation, a dense indument, leaves with an obtuse or rounded base, and presence at relatively high altitudes. They differ as follows: *C. lanigerum* has pubescent flowers, short pedicels (much shorter than the flowers), petioles at least 10 mm long, and a woolly indument on the abaxial leaf surface, while *C. floccosum* has glabrous flowers, pedicels as long as the flowers or slightly longer, petioles ca. 5 mm long, and a shaggy indument on the abaxial leaf surface (hairs mostly straight, 0.5–0.7 mm long). Less closely related is *C. palaciosii* van der Werff, also from rather high altitudes (ca. 3000 m) in Ecuador; it has large (to 25 cm), tripliveined leaves, impressed midrib and secondary veins, an indument of more or less straight hairs, and glabrous flowers.

Although most species of *Cinnamomum* have all stamens 4-celled, the presence of two locules on the inner three stamens is not rare. Lorea-Hernández (1996) recognized 47 species in his revision of Neotropical *Cinnamomum* and, of those, 12 had inner stamens with two locules. In *C. floccosum* the inner stamens have two or four locules with the upper pair greatly reduced.

IUCN Red List category. This species is known only from the type collection and is listed as Data Deficient (DD) according to IUCN Red List criteria (IUCN, 2001).

Figure 2. Holotype of *Cinnamomum lanigerum* van der Werff.

Ocotea

Ocotea is the largest genus of Lauraceae in the Neotropics, with an estimated 300 species (Rohwer, 1993). It is an assemblage of species characterized by having paniculate-cymose inflorescences and flowers with nine 4-celled stamens with the locelli arranged in two superposed pairs. *Ocotea* has been and still is the holding place for many species that do not fit in any of the other, better-defined genera ("*Ocotea* is the dustbin

of the Perseeae," Rohwer, 1993: 382). Rohwer (1986) published an overview of *Ocotea* based on an extensive study of type specimens and included keys to species or species groups. This publication has greatly increased our understanding of *Ocotea*. Since then, an estimated 60 additional species of *Ocotea* have been published by various authors. A synopsis of the 102 Central American species, including a key, was published by van der Werff (2002). A phylogenetic analysis of the genera of Lauraceae (Chanderbali et al., 2001) strongly suggested that *Ocotea* in its current concept is polyphyletic and consists of at least five species groups. The new species described below is one of many new ones from northern South America; its description is needed for the preparation of the Lauraceae treatment for the florula of Cerro Samama in Ecuador.

3. Ocotea pacifica van der Werff, sp. nov. TYPE: Ecuador. Pichincha: along rd. Nanegal–Palmitopamba, 1200 m, 10 July 1991, *H. van der Werff, B. Gray & G. Tipas 12269* (holotype, QCNE; isotype, MO). Figure 3.

Species nova *Ocoteae stenoneurae* Mez & Pittier similis, sed ab ea tepalis intus sparse pubescentibus, basi foliorum plana, staminodiis dense pubescentibus et fructu ellipsoideo recedit.

Tall trees, to 45 m; twigs densely brown tomentulose, the surface completely covered when young, indument sparser with age, solid; terminal buds densely brown tomentulose. Leaves alternate, elliptic to obovate, 9–21 × 3–8 cm, chartaceous, gradually narrowed toward the base, but not decurrent on the petiole, flat or faintly inrolled near the base, the tip shortly acuminate, adaxially glabrous except for some pubescence on the midrib, abaxially sparsely to moderately pubescent, the hairs appressed or ascending, axillary tufts of hairs lacking, venation immersed adaxially, raised abaxially, tertiary venation scalariform, lateral veins 9 to 12 on each side; petioles 5–10 mm, flat on the upper surface. Inflorescences 9–23 cm, cymose-paniculate, in the axils of distal leaves, densely tomentulose, the surface not visible. Flowers funnel-shaped, the base gradually narrowed in the petioles; pedicels ca. 2 mm; tepals ca. 1.5 mm, half-erect, densely pubescent on the outer surface, sparsely pubescent on the inner surface, the surface largely visible; stamens 9, all 4-celled, 0.8–1 mm, outer 6 with the cells opening introrse, inner 3 with cells opening extrorse, filaments pubescent, ca. 1/3 as long as the anther, anthers glabrous; staminodia representing whorl IV present, stipitiform, ca. 0.5 mm, pubescent; pistil ca. 2 mm, glabrous, style ca. 0.5 mm; receptacle deep, pubescent inside. Fruit ca. 3.5 × 1.8 cm, ellipsoid, cupule near maturity shallowly cup-shaped, ca. 15 × 8 mm, less mature cupules relatively deeply cup-shaped.

Discussion. *Ocotea pacifica* is so named because of its distribution in lowland or premontane forest from 50–1200 m on the Pacific side of the Andes. The taxon has been confused with *O. stenoneura* Mez & Pittier, and duplicates of most collections, including the type collection, have been distributed under that name. The two species differ as follows: *O. pacifica* has the inner surface of the petals sparsely pubescent, with most of the surface visible, the base of the leaves are flat or nearly so and scarcely decurrent on the petiole, the staminodia are densely pubescent, the fruit is ellipsoid and the cupule is cup-shaped, while *O. stenoneura* has the inner surface of the tepals densely pubescent, with the surface not visible, the base of the leaves are strongly decurrent and inrolled, the staminodia are sparsely pubescent, the fruit is round or nearly so and the cupule is a flat plate. *Ocotea stenoneura* has also a glaucous abaxial leaf surface. Although the staminodial character is difficult to see, differences in leaf base, fruit shape, and cupule shape allow identification without problems. The new species is known from Colombia and Ecuador, while *O. stenoneura* is only known from Costa Rica and Panama.

IUCN Red List category. *Ocotea pacifica* is known from several collections in Ecuador and Colombia and occurs in several protected areas. Given this distribution, it is listed as Least Concern (LC) according to IUCN Red List criteria (IUCN, 2001).

Paratypes. COLOMBIA. **Antioquia:** Yali, Hac. Martabana, *J. Fernández & P. Jiménez 45* (MO); El Humbo, 130 mi. N of Bogota, *A. Lawrence 728* (MO). ECUADOR. s. prov.: Santo Domingo, *Benoist 3041* (P). **Esmeraldas:** Fila de Bilsa, E of San José de Bilsa, *A. Gentry & C. Josse 72764* (MO); Río Pambil, Estero Pena Lisa, *C. Jativa & C. Epling 1068* (MO); Río Hoja Blanca, *E. Little & R. Dixon 21067* (MO); Quininde, Bilsa Biol. Station, Mache Mtns., *J. Clark & C. Watt 925* (MO); Quininde, Bilsa Biol. Station, Reserva Ecol, Mache-Chindul, *J. Clark, C. Pallis & J. West 4604* (MO). **Carchi/Esmeraldas:** near Lita, *H. van der Werff, C. Dodson & W. Palacios 9562* (MO). **Los Ríos:** Hac. Clementina, Cerro Samama, *B. Ståhl, S. Petterson & T. Tranefors 5732, 5739, 5775* (MO, S), *B. Ståhl & X. Cornejo 5959* (S), *6048* (MO, S), *B. Ståhl & S. Pettersson 6363* (MO, S). **Pichincha:** Reserva Guaycuyacu, *J. Clark, C. Clark, S. Nazarro & J. West 4984* (MO); along rd. Nanegal–Palmitopamba, *H. van der Werff, B. Gray & G. Tipas 12284* (MO); Parroquia Puerto Quito, Reserva Forestal Endesa, 10 km N de Alvaro Perez Intriago, *C. Ceron & J. Ayala 10077* (MO, QCNE).

Pleurothyrium

Pleurothyrium is a medium-sized, Neotropical genus of 48 species characterized by the strongly

Figure 3. Isotype of *Ocotea pacifica* van der Werff.

enlarged glands at the base of the inner stamens. The glands conspicuously protrude between the outer stamens in some species, while in others they become united, forming a pillowlike mass surrounding the stamens. All previously described species in *Pleurothyrium* have nine 4-celled stamens and fruits that are seated in a well-developed cupule. The inflorescences originate generally, but not always, in the axils of bracts and are infrequently found in the axils of normal leaves. The genus was revised by van der

Werff (1993), who recognized 40 species. Since then, three additional species have been described. In this contribution five species are added, one of which is the first in the genus with 2-celled stamens. Three novelties are known from Ecuador only, one from the Pacific side of the Andes and the other two from the Cordillera del Cóndor, the fourth species is only known from Panama, and the fifth was recently collected in central Peru.

4. **Pleurothyrium bilocellatum** van der Werff, sp. nov. TYPE: Ecuador. Zamora-Chinchipe: along rd. Guayzimi–Pachicutza, in forest on white sand shortly before reaching Pachicutza, 04°08′27″S, 78°38′25″W, 900 m, 2 Nov. 2006, *H. van der Werff, B. Gray & W. Quizhpe 21882* (holotype, QCNE; isotypes, AAU, B, BRIT, COL, F, G, GB, GH, HBG, HUT, K, L, LE, LOJA, MO, NY, P, PE, QCA, US, XAL). Figure 4.

Species nova quae a congeneris staminibus bilocellatis recedit.

Tree, to 12 m; twigs angular, solid, sparsely or very sparsely pubescent with short, spreading, white hairs, terminal buds densely pubescent, the hairs spreading. Leaves alternate, elliptic, 10–18 × 4–7 cm, very sparsely pubescent when young, soon becoming glabrous, but some short, erect hairs persisting along the major veins, base flat, acute, apex acute, lateral veins 6 to 9 on each side, reticulation weakly raised adaxially, more so abaxially, domatia lacking; petioles 1–1.7 cm, terete, glabrous or with some appressed hairs. Inflorescences 5–8 cm, red, in axils of bracts or in axils of leaves, paniculate-cymose. Flowers cream, 3.5–4.5 mm diam.; pedicels 4–5 mm; tepals 6, equal, ca. 2 × 1 mm, with some appressed hairs outside and some small papillae on the inner surface, appearing almost glabrous, spreading in young flowers, becoming reflexed in older flowers; stamens 9, all 2-celled, outer 6 with a very short filament attached at the base of the tepals, anther flat, bent upward and pressed against the enlarged glands, the locelli introrse-apical, inner 3 stamens ± columnar with the apex enlarged and bent outward, the locelli extrorse-apical; glands enlarged and separating stamens from each other, but not forming a pillowlike mass and enclosing the stamens; staminodia not seen; pistil 1–1.5 mm, style very short, stigma conspicuous. Cupule shallowly cup-shaped, with a broad hat-shaped rim with a scalloped edge, ca. 2.5 cm diam. when dry; fruit ellipsoid, ca. 2 × 1.5 cm.

Discussion. Traditionally, the number of locelli (two vs. four) has been used as a character defining genera. Some genera, however, can be readily recognized by vegetative characters or characters of the tepals, and in these genera the number of locelli and number of stamens is often found to be variable (van der Werff & Richter, 1996). Examples of such genera in the Neotropics are *Caryodaphnopsis* Airy Shaw (with opposite, often tripliveined leaves and strongly unequal tepals) and *Persea* (group with unequal tepals), both of which have the majority of their species with 4-locular stamens and a few with 2-locular stamens. In other cases, generic pairings differing only in number of locelli are still recognized, such as *Mezilaurus* Kuntze ex Taubert and *Williamodendron* Kubitzki & H. G. Richter, *Ocotea/Rhodostemonodaphne* Rohwer & Kubitzki and *Endlicheria* Nees, as well as *Litsea* Lamarck and *Lindera* Thunberg. The new species described above could thus be placed in a new genus or included in *Pleurothyrium* as the only 2-locular species among the other 4-locular species. I prefer the latter position; the enlarged glands and the position of the inflorescences partly in the axils of bracts indicate a placement in *Pleurothyrium*.

IUCN Red List category. This species is known from two collections, made from the same tree, and is listed as Data Deficient (DD) according to IUCN Red List criteria (IUCN, 2001).

Paratype. ECUADOR. **Zamora-Chinchipe:** along rd. Guayzimi–Pachicutza, in forest on white sand, *H. van der Werff, B. Gray & J. C. Ronquillo 19575* [same tree as type collection] (AAU, K, LOJA, MO, NY).

5. **Pleurothyrium cordatum** van der Werff, sp. nov. TYPE: Ecuador. Zamora-Chinchipe: in vic. of mining camp at Río Tundaime, 03°34′44″S, 78°24′11″W, 1000–1200 m, 12 Nov. 2004, *H. van der Werff, B. Gray, J. C. Ronquillo & W. Quizhpe 19537* (holotype, QCNE; isotypes, AAU, CANB, HBG, K, L, LOJA, MO, NY, P, US, USM). Figure 5.

Species nova quae a congeneris foliis ellipticis rigide chartaceis basi cordatis recedit.

Trees, to 15 m; twigs terete, solid, densely brown tomentulose, the surface fully covered; terminal buds densely brown tomentulose. Leaves alternate, evenly distributed along the twigs, elliptic to elliptic-oblong, 12–21 × 4.5–8 cm, stiffly chartaceous, base cordate to rounded, lamina flat, apex acute to acuminate, adaxially glabrous, venation slightly impressed, abaxially appearing glabrous but covered with fine, tightly appressed, light-colored hairs, the midrib and major veins with brown, spreading hairs, midrib and lateral veins raised, dark reticulation contrasting with the light lamina, lateral veins 8 to 14 pairs, weakly loop-connected in the distal half of the leaf; petioles 1.5–3 cm, brown tomentulose as the twigs, canalicu-

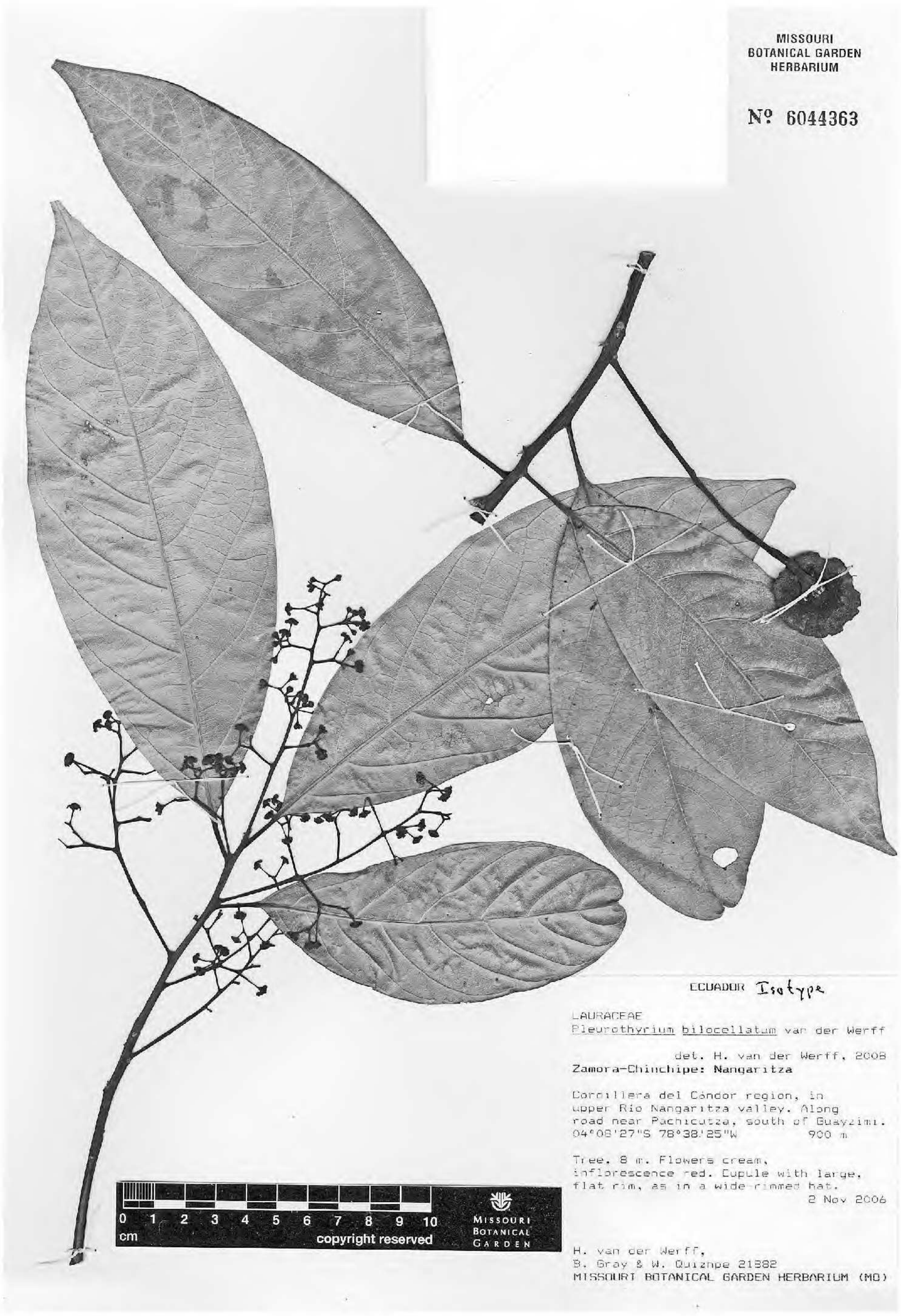

Figure 4. Isotype of *Pleurothyrium bilocellatum* van der Werff.

late. Inflorescences 5–12 cm, paniculate-cymose, densely brown tomentulose, in the axils of bracts. Flowers 6–7 mm diam., white; pedicels ca. 4 mm; tepals 2–3 mm, ovate-elliptic, spreading at anthesis, outer 3 tepals tomentulose on the outside, inner 3 tepals with a triangular, basal, tomentulose patch, otherwise papillose, inner surface of the tepals papillose; stamens 9, all 4-locular, outer 6 with a short (ca. 0.3 mm) filament, the anther twice as long, bent toward the center of the flower, the locelli in 2

Figure 5. Isotype of *Pleurothyrium cordatum* van der Werff.

pairs, lateral, at maturity the anthers raised above the glands; inner 3 stamens barely raised above the glands, the anther bent outward, the locelli lateral; glands at base of the inner stamens enlarged, growing outward between the outer stamens, but not surrounding those and not fused in a pillowlike mass; staminodia not seen; pistil ca. 1 mm, densely pubescent, ovary gradually narrowed into the style, receptacle deeply cup-shaped, pubescent inside. Fruits and cupules not known.

Discussion. *Pleurothyrium cordatum* can be easily recognized by its elliptic, stiffly chartaceous leaves with a cordate base. A few other species of *Pleurothyrium* also have leaves with a cordate base, but these species (*P. insigne* van der Werff, *P. maximum* O. C. Schmidt) have large (20–60 cm long), obovate leaves, gradually narrowed toward the base and at the base abruptly cordate or rounded. *Pleurothyrium panurense* (Meisner) Mez and *P. bifidum* Nees have a similar finely appressed indument on the abaxial leaf surface, but those species differ in having the outer stamens completely enclosed by the enlarged glands. The pubescent pistils and the rather small flowers with the outer stamens separated by the enlarged glands, but not surrounded by them, are also useful characters.

IUCN Red List category. *Pleurothyrium cordatum* is known only from the type collection and is listed as Data Deficient (DD) according to IUCN Red List criteria (IUCN, 2001).

6. Pleurothyrium obscurinerve van der Werff, sp. nov. TYPE: Ecuador. Los Ríos: Hac. Clementina, Cerro Samama, 79°19′W, 01°39′S, 400 m, 11 Dec. 1996, *J. T. Knudsen, B. Ståhl, Å. Johannessen & S. Roponen 706* (holotype, S; isotype, MO). Figure 6.

Species nova *Pleurothyrio immerso* van der Werff similis, sed ab eo ovario pubescenti, floribus majoribus (7–9 mm, non 5 mm diam.) et glandulis basi staminum internorum liberis (non confluentibus) recedit.

Small tree, to 15 m; twigs terete, solid, moderately but inconspicuously appressed pubescent; terminal buds densely appressed pubescent. Leaves alternate, elliptic, 5.5–13 × 2–5.5 cm, papyraceous, base acute to obtuse, apex acuminate, acumen to 1 cm, flat, adaxially glabrous and gland-dotted, abaxially glabrous or with a few appressed hairs, axillary tufts of hairs lacking, venation immersed on both surfaces, lateral veins ca. 7, but scarcely visible; petioles 7–10 mm, narrowly canaliculate on the upper surface. Inflorescences 3–5.5 cm, in the axils of bracts or leaves, with 2 to 6 flowers, sparsely appressed pubescent, the indument denser distally. Flowers 7–9 mm diam., white or yellowish; pedicels ca. 5 mm; petals 6, spreading to somewhat reflexed at maturity, papillose on both surfaces, elliptic, ca. 3 mm; stamens 9, all 4-celled, outer 6 with the anther bent inward and the locelli lateral; glands at the base of the inner stamens strongly enlarged and grown outward, surrounding the stamens, but not fused; pistil glabrous, ca. 2 mm, style half as long as the ovary; receptacle cup-shaped, appressed pubescent inside. Immature fruit ellipsoid, ca. 1.7 × 1.3 cm, cupule trumpet-shaped, with a double margin, the outer margin somewhat spreading and exceeding the inner margin.

Discussion. Distinctive vegetative characters for *Pleurothyrium obscurinerve* are the thin leaves with very inconspicuous venation and gland dots on the adaxial surface. With the exception of *P. immersum* van der Werff, all other species of *Pleurothyrium* have chartaceous or firmly chartaceous leaves with readily visible venation. However, *P. immersum*, endemic to Costa Rica, differs from *P. obscurinerve* in its smaller flowers (ca. 5 mm vs. 7–9 mm diam.), pubescent ovaries, pubescent inner surface of the tepals (vs. papillose inner surface of the tepals), and the glands and stamens that form a domelike structure in the center of the flower with the glands strongly enlarged and fused (vs. glands that are enlarged but free and stamens raised above the glands, not forming a domelike structure). Cupules and fruits are not yet known for *P. immersum*. Another close relative is *P. glabritepalum* van der Werff, known from Chocó, Colombia, and Esmeraldas, Ecuador; this species has relatively thin leaves, gland-dotted on the adaxial surface, with the same shape as *P. obscurinerve* and short (2–4 cm), few-flowered (1 to 3 flowers) inflorescences. There are, however, clear differences between the two species: *P. glabritepalum* has brown tomentose or tomentulose twigs, flowers ca. 13 mm in diameter, a sparse, erect indument on the abaxial leaf surface, and clearly visible venation on the abaxial leaf surface.

Pleurothyrium obscurinerve grows at altitudes of 400–600 m. Specimens without flowers would almost certainly not be recognized as *Pleurothyrium*; fruiting specimens would very likely be placed in *Licaria* due to the double-margined cupule.

IUCN Red List category. *Pleurothyrium obscurinerve* is known from a few collections along the lower western slope of the Andes in Ecuador and is listed as Vulnerable (VU) according to IUCN Red List criteria (IUCN, 2001).

Paratypes. ECUADOR. **Esmeraldas:** Bilsa Biol. Station, *J. Clark & P. Nutt 4111* (MO, QCNE, US), *J. Clark, K. Berg & J. Leffingwell 2397* (MO). **Los Ríos:** Hac. Clementina, Cerro Samama, *B. Ståhl & S. Pettersson 6354* (MO, S), *B. Ståhl, M. Ehn & S. Pettersson 6598* (MO, S).

7. Pleurothyrium pascoense van der Werff, sp. nov. TYPE: Peru. Pasco: Oxapampa, Distr. Huancabamba, Zona de amortiguamiente del Parque Nac. Yanachaga–Chemillén, Sector Tunqui–Agua Salada, 10°16′47″S, 75°32′31″W, 1480 m, 26 Sep. 2007, *A. Monteagudo, A. Peña,*

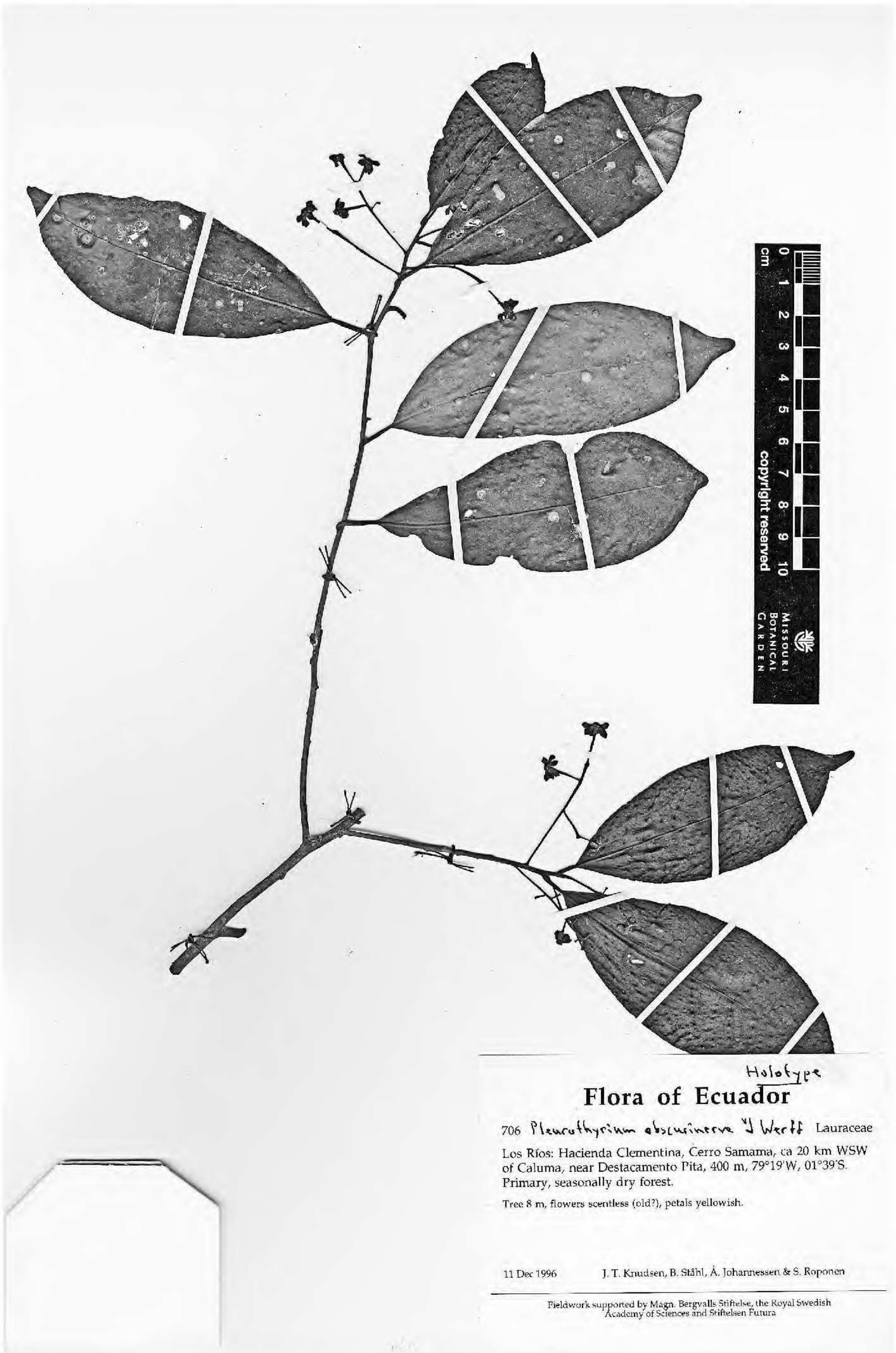

Figure 6. Holotype of *Pleurothyrium obscurinerve* van der Werff.

J. Mateo, V. Flores & C. Rojas 15339 (holotype, MO). Figure 7.

Species nova *Pleurothyrio trianae* (Mez) Rohwer affinis, sed ab eo ramulis inflorescentiisque dense pubescentibus trichomatibus erectis, nervis secundariis et tertiariis in pagina inferiore elevatis et venatione brochidodroma recedit.

Tree, to 18 m; twigs solid, angular, densely brown pubescent, the hairs erect, covering the surface

Figure 7. Holotype of *Pleurothyrium pascoense* van der Werff.

completely, wearing off with age; terminal buds densely brown pubescent, the hairs erect and covering the surface completely. Leaves alternate, elliptic, 13–19 × 5–8 cm, subcoriaceous, base acute, apex obtuse or shortly acute, mature leaves glabrous adaxially, young leaves moderately pubescent adaxially, mature leaves with scattered, erect hairs abaxially, these much denser along the midrib and secondary veins; major veins slightly impressed adaxially, prominently raised abaxially, tertiary veins parallel, raised abaxi-

ally, secondary veins 15 to 20 on each side, arching upward near the margin and loop-connected; petioles 9–19 mm, flat or shallowly canaliculate, with a similar indument as the twigs. Inflorescences 7–12 cm, narrowly paniculate-cymose, densely brown pubescent, the hairs erect and completely covering the surface, in the axils of bracts, above last year's mature leaves and below the current year's immature leaves. Flowers densely pubescent, yellow-green, ca. 6 mm diam.; pedicels very short, ca. 1 mm, flowers appearing almost sessile; tepals equal, ca. 3 mm, the margin slightly recurved, the inner surface densely papillose with a few hairs mixed in; outer 6 stamens ca. 1 mm, glabrous, the anther curved toward the pistil, 4-celled, but occasionally 1 or 2 locelli not developed; inner 3 stamens straight, 4-celled, filaments with a few hairs, otherwise glabrous; glands at the base of the inner stamens enlarged, protruding between the stamens, free, not fused in a disc; staminodia of whorl IV not seen; pistil ca. 2 mm, glabrous, style ca. 1 mm; receptacle deep, glabrous inside. Fruits and cupule not known.

Discussion. The affinities of *Pleurothyrium pascoense* are with a small group of species characterized by the presence of half-erect tepals, these often with a recurved margin, and stamen glands that are enlarged but not fused in a disc. Neither brochidodromous venation nor the erect indument on the abaxial leaf surface have been reported for any of the other species in this group. The raised, scalariform tertiary venation is also a distinguishing character for the new species. Four species in this group are fairly common: *P. parviflorum* Ducke, a lowland species of flooded forests with glabrous leaves and fistulose twigs from Bolivia, Brazil, Ecuador, and Peru; *P. trianae* (Mez) Rohwer, known from Venezuela, Colombia, Ecuador, and northern Peru, with appressed pubescence on twigs and inflorescences and usually with fistulose twigs; and *P. cuneifolium* Nees and *P. poeppigii* Nees, two similar species with minute indument on twigs and leaves, fistulose twigs, and large (to 30 cm) leaves. The last two species have a wide distribution and occur in the Cordillera de Yanachaga in Peru. The remaining species in this group are rarely collected and poorly known: *P. acuminatum* van der Werff is known from a few collections in the lowlands of northeastern Peru (Jenaro Herrera) and adjacent Brazil; *P. amapaense* C. K. Allen is known with certainty only from the type collection made in Amapa, Brazil; *P. intermedium* (Mez) Rohwer, which has a sparse, appressed indument, is a lowland species collected a few times in Acre, Brazil, Bolivia, and Peru; *P. undulatum* (Meisner) Rohwer, which has glabrous leaves, is only known from the type collection made in the lower Rio Negro in Amazonian Brazil; and *P. amplifolium* (Mez) Rohwer is only known from the Glaziou type collection from Rio de Janeiro. In leaf characters the new species resembles *P. vasquezii* van der Werff, a lowland species from eastern Peru with spreading tepals, larger glands, and inflorescences clustered in the axils of bracts at the tips of the branches.

IUCN Red List category. *Pleurothyrium pascoense* is known only from the type collection and is listed as Data Deficient (DD) according to IUCN Red List criteria (IUCN, 2001).

8. Pleurothyrium triflorum van der Werff, sp. nov. TYPE: Panama. Colón: Teck Cominco Petaquilla mining concession, 08°49′56″N, 080°41′05″W, 250 m, 7 Mar. 2008, *G. McPherson 20452* (holotype, PMA; isotype, MO). Figure 8.

Species nova *Pleurothyrio glabritepalo* van der Werff similis, sed ab eo tepalis aequalibus intus dense papillosis et laminis subtus glabris recedit.

Tree, to 18 m; twigs terete, minutely brown tomentulose, glabrescent; terminal buds densely brown tomentulose. Leaves alternate, elliptic or slightly obovate, 6–12 × 2.5–4.5 cm, chartaceous, base and apex acute, adaxially glabrous, abaxially glabrous or with some curved hairs along the major veins; midrib and secondary veins slightly impressed, tertiary venation immersed adaxially, midrib and secondary veins raised, tertiary venation immersed abaxially, secondary veins 5 to 7, the distal ones loop-connected; petioles 9–16 mm, flat above, with an indument similar to the twigs. Inflorescences 1–1.5 cm, 3-flowered, in the axils of bracts immediately below the terminal buds, densely brown tomentulose. Flowers 8–10 mm diam.; pedicels ca. 3 mm; tepals equal, rotate, ca. 3.5 × 2 mm, the outer surface brown tomentulose, inner surface densely gray papillose; stamens 9, all 4-celled, the locelli lateral, glands strongly enlarged, fused or nearly so, forming a disc ca. 3 mm diam. surrounding the stamens; receptacle pubescent inside; ovary globose, the lower 2/3 pubescent. Fruit and cupule not known.

Discussion. Several other species of *Pleurothyrium* have few-flowered inflorescences like *P. triflorum*. Among those are *P. glabritepalum*, which differs in having unequal tepals, the inner surface of the tepals glabrous, and a pilose indument on the abaxial leaf surface, and *P. pauciflorum* van der Werff & Hammel, which differs in its larger leaves (16–35 cm) with 14 to 20 pairs of lateral veins and an erect indument on the abaxial leaf surface. The inflorescences of *P. pauciflorum* are not strictly 3-flowered as they are in *P. glabritepalum* and *P. triflorum*.

Figure 8. Isotype of *Pleurothyrium triflorum* van der Werff.

IUCN Red List category. *Pleurothyrium triflorum* is only known from the type collection and is assessed as Data Deficient (DD) according to IUCN Red List criteria (IUCN, 2001).

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