
New Taxa and Combinations in *Ocotea* (Lauraceae) from Central America

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ABSTRACT. In the course of preparing a treatment of the genus *Ocotea* for the *Flora Mesoamericana* the following novelties were found and are published in this contribution: three new combinations, *Ocotea amplifolia* (Mez & Donnell Smith) van der Werff, *O. parvula* (Lundell) van der Werff, *O. vanderwerffii* (Kostermans) van der Werff; and nine new species, *O. adela* van der Werff, *O. atlantica* van der Werff, *O. darcyi* van der Werff, *O. haberi* van der Werff, *O. jefensis* van der Werff, *O. klepperiae* van der Werff, *O. macrantha* van der Werff, *O. oblongifolia* van der Werff, and *O. pullifolia* van der Werff.

Key words: Central America, Lauraceae, *Ocotea*.

Ocotea Aublet is one of the larger genera of the Lauraceae, with an estimated 300 species. Most species occur in the American tropics, but the genus is also present in tropical Africa and Madagascar, with one species present in the Canary Islands. *Ocotea* is represented in Central America by 101 species and is by far the largest genus of Lauraceae in this region. This is a large increase over the number recognized by Carolyn Allen, who wrote a treatment of *Ocotea* in Central America in 1945. She included only 33 species; this low number was certainly influenced by the paucity of collections and the lack of access to the specimens in European herbaria. Since 1980, 37 Central American species of *Ocotea* have been described by various authors and herein, and most of these species were based on recent collections. This includes 2 species that will soon be published by F. Lorea-Hernandez and myself. The distribution of these 37 species is presented in Table 1. Most of these species (25) are found in only 1 country/region (S Mexico consists here of the area from the Isthmus of Tehuantepec southward); 8 species are restricted to southern Mexico, 9 to Costa Rica, 6 to Panama, but only 1 each to Nicaragua and Guatemala and none to Honduras or El Salvador. One might expect a decrease in the number of novelties from well-collected areas as our knowledge becomes more or less complete. The fact that the majority of the new species come

from the best-collected areas in Central America and the fact that nearly all recently described species are based on recent collections (the exception is *Ocotea oblongifolia* van der Werff from Guatemala, collected in 1966) strongly indicate that our knowledge of *Ocotea* species in Central America is far from complete and that more new species will come to light. Thirteen recently described species are known from more than 1 country. Nine are restricted to Panama and Costa Rica, 2 occur in Nicaragua and Honduras (+ El Salvador), while 2 species occur in Nicaragua and Costa Rica (see Table 1). Both (*O. atlantica* and *O. dentata* van der Werff) are restricted to lowland forests on the Caribbean slope. These figures suggest that quite a few species do not cross the Costa Rica–Nicaragua boundary. In order to see if this is a general tendency in *Ocotea*, I checked the distribution of all 101 species based on MO holdings and found the following: Known in Central America only from Panama and Costa Rica (some of these species occur also in South America): 42 species; known only from Nicaragua to southern Mexico: 41 species; widespread species, crossing the Nicaragua–Costa Rica boundary: 18 species. This last category includes a number of species with a very large distribution, such as *Ocotea cernua* (Nees) Mez, which ranges from Mexico to Bolivia and southern Brazil. Thus, the distribution of *Ocotea* species in Central America shows a distinct Panama–Costa Rica element and a distinct Nicaragua–southern Mexico one. There are, however, no indications from my survey that species groups (such as the *O. helicterifolia* group, the *O. heydeana* group, the *O. meziana* group, and *Ocotea* subg. *Dendrodaphne* (Beurling) Mez) are confined to either the northern or the southern area, but species of these groups are more or less equally distributed in Central America.

The novelties for this region are the following:

Ocotea adela van der Werff, sp. nov. TYPE: Panama. Panamá: Cerro Jefe, 6 Jan. 1971, T. Croat 13049 (holotype, MO; isotypes, HBG, PMA). Figure 1.

Ocoteae camphoromoeae affinis, sed indumento erect-

Table 1. Distribution of recently described *Ocotea* species in Central America.

	S. Mex- ico	Guat- emala	Hon- duras	El Sal- vador	Nica- ragua	Costa Rica	Panama
<i>O. congregata</i> van der Werff	x						
<i>O. corrugata</i> van der Werff	x						
<i>O. heriberto</i> T. Wendt	x						
<i>O. iridescens</i> Lorea-Hernandez & van der Werff, ined.	x						
<i>O. rovirosae</i> Lorea-Hernandez & van der Werff, ined.	x						
<i>O. uxpanapana</i> T. Wendt & van der Werff	x						
<i>O. vanderwerffii</i> (Kostermans) van der Werff	x						
<i>O. verticillata</i> Rohwer	x						
<i>O. oblongifolia</i> van der Werff		x					
<i>O. strigosa</i> van der Werff					x		
<i>O. rhytidotricha</i> Rohwer			x	x	x		
<i>O. jorge-escobarii</i> C. Nelson			x		x		
<i>O. klepperiae</i> van der Werff						x	
<i>O. lentii</i> W. Burger						x	
<i>O. macrantha</i> van der Werff						x	
<i>O. morae</i> Gomez-Laurito						x	
<i>O. monteverdensis</i> W. Burger						x	
<i>O. multiflora</i> van der Werff						x	
<i>O. gomezii</i> W. Burger						x	
<i>O. patula</i> van der Werff						x	
<i>O. rufescens</i> van der Werff						x	
<i>O. adela</i> van der Werff							x
<i>O. arcuata</i> Rohwer							x
<i>O. darcyi</i> van der Werff							x
<i>O. gordonii</i> van der Werff							x
<i>O. jefensis</i> van der Werff							x
<i>O. pausiaca</i> Rohwer							x
<i>O. haberi</i> van der Werff						x	x
<i>O. hartshorniana</i> Hammel						x	x
<i>O. holdridgeiana</i> W. Burger						x	x
<i>O. pharomachrosorum</i> Gomez-Laurito						x	x
<i>O. praetermissa</i> van der Werff						x	x
<i>O. pseudopalmana</i> W. Burger						x	x
<i>O. pullifolia</i> van der Werff						x	x
<i>O. valeroides</i> W. Burger						x	x
<i>O. dentata</i> van der Werff					x	x	x
<i>O. atlantica</i> van der Werff			x		x	x	

tiusculo ramulorum gemmarumque, foliis minoribus recedit.

Dioecious shrub or small tree, to 8 m. Twigs ridged, solid, sparsely to moderately puberulous, the hairs very short (ca. 0.2 mm long) and ascending to erect; terminal buds densely yellowish pubescent, the hairs very short and ascending to erect, completely covering the buds. Leaves 4–11 × 2.3–5 cm, chartaceous, elliptic to ovate-elliptic, alternate, the base acute, the margin plane, the apex acute or shortly acuminate, both surfaces glabrous, or a few minute, erect hairs present along the midrib; midrib and lateral veins slightly impressed, tertiary venation immersed and not discernable on the upper surface, midrib and lateral veins raised, ter-

tiary venation scarcely raised or immersed on the lower surface; domatia lacking; lateral veins 4 to 6; petioles 5–10 mm, flat or shallowly canaliculate above, with an indument like that of the twigs. Inflorescences 3–7 cm, racemose or with short lateral branchlets terminating in a cyme, the pistillate inflorescences shorter and with fewer flowers than the staminate ones, sparsely pubescent to subglabrous, in the axils of leaves. Flowers 3–4 mm diam., greenish yellow, unisexual. Male flowers: tepals 1.5 mm, broadly elliptic to triangular, glabrous on both surfaces or with a few appressed hairs near the base of the inner surface, erect or half-erect; stamens 9, 4-celled, the outer six 1.2 mm, the filament 0.4 mm, glabrous, the cells arranged in 2 rows, introrse,



Figures 1—4 (clockwise from top left). —1. *Ocotea adela* van der Werff, holotype photo (MO). —2. *Ocotea atlantica* van der Werff, holotype photo (MO). —3. *Ocotea darcy* van der Werff, isotype photo (MO). —4. *Ocotea haberi* van der Werff, isotype photo (CAS).

inner 3 the same size, but the cells extrorse, glands present at the base of the filaments, staminodia not seen, pistillode 1.6 mm, glabrous, slender, sometimes with a dark tip, receptacle narrow, rather deep, with some appressed hairs inside; female

flowers: tepals as in male flowers, staminodia 9, 0.6 mm, pistil glabrous, 2.5 mm, the style 0.5 mm, receptacle deep, sparsely appressed pubescent inside. Fruits subglobose, 8 × 7 mm, the cupule shallowly bowl-shaped, 6 mm diam., the tepals per-

sistent on the cupule, the margin simple, pedicel conically thickened toward the cupule.

Phenology. Flowers November–February; fruits January, March.

Ocotea adela is, as the name suggests, not a striking species. The shallow cupule with persistent tepals and the conically thickened pedicel are the best clues to its relationships, and these characters point toward *O. camphoromoea* Rohwer, a species known from Amazonian Brazil. Like *O. adela*, this species is a shrub or a small tree, has short, little-branched inflorescences, and somewhat impressed midribs and lateral veins on the upper leaf surface. *Ocotea camphoromoea* differs, however, in its larger leaves, appressed hairs on the terminal buds and young twigs, and its distribution. According to Rohwer (1986), *O. camphoromoea* and its relatives have a pistillode with a distinct stigma in the staminate flowers, but he cautioned that this character can be variable. In *O. adela* the stigma on the pistillode is lacking in some flowers; in others it is only indicated by a discoloration at the tip of the pistillode. Currently, *O. adela* is only known from the Cerro Jefe–Cerro Azul area near Panama City. Among the Panamanian species it is best recognized by its unisexual flowers, short, nearly glabrous inflorescences, leaves with slightly impressed lateral veins and midrib, the shallow cupules with persistent tepals, and the thickened pedicels in fruit.

Paratypes. PANAMA. **Panamá:** Cerro Jefe, *Duke 9434* (MO), *Dwyer 7091* (MO), *Valdespino & Solis 259* (MO); Cerro Azul, P.N. Chagres, *Carrasquilla & Rios 3345* (MO); Cerro Azul Lake, *Folsom et al. 1973* (MO); La Eneida, *Galdames & Guerra 1940* (MO).

Ocotea atlantica van der Werff, sp. nov. TYPE: Honduras. Atlántida: La Ceiba, 28 Nov. 1991, *N. Zamora 1744* (holotype, MO). Figure 2.

Ocoteae leucoxyton affinis, sed foliis subtus pilosis, ramulis inflorescentiisque tomentellis recedit.

Trees to 25 m tall. Twigs terete or slightly angular, densely brown tomentose when young, the surface not visible, glabrescent with age; terminal buds densely brown tomentose. Leaves 12–23 × 3.5–9 cm, alternate, chartaceous, (narrowly) elliptic, the base acute to obtuse, the apex acuminate or acute, the acumen to 1 cm long, the upper surface glabrous except for the tomentellous midrib, the lower surface pilose and soft to the touch, the indument denser along the veins and the midrib tomentose; midrib, lateral veins, and tertiary venation immersed or the major veins slightly impressed on the upper surface, midrib and lateral veins raised, tertiary venation slightly raised on the

lower surface; domatia lacking; lateral veins 5 to 8, the distal ones sometimes loop-connected near the margin; petioles 1–2.5 cm, terete, with an indument like that of the twigs. Inflorescences 2–10 cm, brown tomentellous, paniculate-cymose or by reduction racemose, in the axils of leaves. Flowers unisexual, cream colored, 3–3.5 mm diam., moderately to sparsely appressed pubescent, the indument less dense than on the inflorescence branchlets. Male flowers: tepals ca. 1 mm long, broadly elliptic, sparsely appressed pubescent outside, glabrous inside, outer 6 stamens ca. 0.8 mm long, glabrous, the anther ca. 0.6 mm long, the cells introrse, arranged in 2 pairs, a sterile tip lacking; inner 3 stamens like the outer ones, but with 2 globose glands near the base of the filaments and the anther cells extrorse; staminodia not seen; pistillode 1 mm long, glabrous, threadlike, with a stigma; receptacle small, pocket-like, pubescent inside; female flowers: tepals as in male flowers or with some pubescence on the inner surface, united at the base and falling off as one unit in old flowers, staminodia 9, 0.5 mm long, the inner 3 with 2 glands near the base; pistil 1.5 mm long, glabrous, with a distinct stigma; receptacle glabrous inside. Fruits roundish, ca. 8 × 6 mm, cupule shallowly bowl-shaped, lenticellate, the pedicel swollen.

Phenology. Flowers November–February; fruits April–May.

Ocotea atlantica is restricted to wet lowland forests on the Atlantic slopes of Costa Rica, Nicaragua, and Honduras. It is one of the two *Ocotea* species with unisexual flowers endemic to Central America, the other being *O. adela*. The shallow, lenticellate cupules and the flowers with a much sparser indument than found on the peduncles and inflorescence branchlets point to a relationship with the widespread *Ocotea leucoxyton* (Swartz) Lanesan. However, the latter species lacks the pilose indument on the lower leaf surface and the tomentose or tomentellous indument on the young twigs and inflorescences. I have earlier annotated a few of the cited paratypes as *O. leucoxyton*, and duplicates may have been distributed under this name.

Paratypes. COSTA RICA. **Alajuela:** Boca Tapado, *Jimenez et al. 1124* (MO). **Heredia:** Cuenca del Sarapiquí, *Hammel 20664, 20708 & 20710* (all MO); Finca El Bejuco, *Grayum et al. 4611* (MO). NICARAGUA. **Río San Juan:** *Rueda et al. 5653* (MO). HONDURAS. **Atlántida:** Municipio de Esparta, *Brant & Hazlett 2868* (MO); Montana del Rayo, *Nelson 5494* (MO), *Martinez 178* (MO); Campamento Grande, at the N base of Pico Bonito, *Liesner 26149, 26174 & 26366* (all MO), *Evans 1064 & 1655* (MO), *Nelson et al. 19124* (TEFH). **Yoro:** valley of the Rio Lean, vicinity of Las Lomas, *Davidse et al. 34465*

(MO); Cordillera Nombre de Dios, S of San Jose de Texiguat, *Davidse et al.* 34505 (MO).

Ocotea darcyi van der Werff, sp. nov. TYPE: Panama. Panamá: Parque Nacional Altos de Campana, 3 Sep. 1999, *M. Correa, M. Sanchez & J. Deago 11554* (holotype, PMA; isotypes, BM, CR, HBG, MEXU, MO). Figure 3.

Ab Ocotea pseudopalmana floribus minoribus, inflorescentiis multifloris indumentoque ferrugineo differt.

Trees to 20 m. Twigs angular, densely ferruginous tomentellous, the surface completely covered by the indument, terminal buds densely ferruginous tomentellous. Leaves 9–15 × 4–7 cm, alternate, coriaceous, obovate to obovate-elliptic, the base acute to cuneate, flat, the apex obtuse or with a very short acumen, the upper surface sparsely or moderately pubescent, but soon becoming glabrous except for the tomentellous major veins, the lower surface densely ferruginous pubescent, the hairs erect, the surface visible between the hairs, the major veins densely tomentellous and completely covered by the indument; midrib, lateral veins, and tertiary venation immersed on the upper surface, raised to prominently raised on the lower surface; lateral veins 6 to 8, domatia lacking; petioles 5–8 mm long, with an indument like that of the twigs. Inflorescences 10–20 cm, paniculate-cymose, many-flowered, densely ferruginous tomentellous, the surface completely covered by the indument, mostly in the axils of bracts near the tips of the twigs, less frequently in the axils of leaves. Flowers 4–4.5 mm diam., perfect. Tepals 1.5 mm long, densely pubescent on both surfaces, half-erect at anthesis; stamens 9, 4-celled, the outer six 0.9 mm long, the filament ca. 0.4 mm long, pubescent, the anther glabrous, the cells arranged in 2 pairs, opening introrse, a sterile tip lacking, inner 3 stamens 1.1 mm long, the filament and the base of the anther pubescent, the cells arranged in 2 pairs, the lower pair opening extrorse, the upper pair lateral, glands present at the base of the filaments, staminodia not seen, pistil glabrous, 2 mm long (but already developing into young fruit); receptacle cup-shaped, with a ring of hairs in the upper part, otherwise glabrous. Fruits globose, 1–1.4 cm diam., cupule very shallow to plate-like, 9 mm diam., with a single margin, the tepals not persisting.

Phenology. Flowers (old) November; fruits May.

Ocotea darcyi is known from a few collections, all from Cerro Campana in Panama. The new species can be confused with *O. pseudopalmana* W. Burger, but differs in its multi-flowered and much-branched inflorescences, its ferruginous indument,

and smaller flowers. *Ocotea darcyi* is probably more closely related to *O. stenoneura* Mez & Pittier; the two species share a similar indument (the hairs on the leaves of *O. pseudopalmana* are much shorter and not as straight), fruit shape and cupule shape, the dense pubescence on inner and outer surface of the tepals, and the ladder-like pattern of the intersecondary veins. However, *O. stenoneura* differs in its inrolled and decurrent leaf bases, its acute leaf apices, and its elliptic leaf shape.

I dedicate this species to William G. D'Arcy as a tribute to his life and work. His involvement with the *Flora of Panama* was very deep; his contributions will always be with us.

Paratypes. PANAMA. Panamá: Parque Nacional Altos de Campana, *Correa & Montenegro 9558, 10176, 10389* (all MO), *Correa & Sanchez 11556* (MO), *Galdames et al. 3891* (MO).

Ocotea haberi van der Werff, sp. nov. TYPE: Costa Rica. Guanacaste: 4–5 km NW of Monteverde, 11 Apr. 1992, *W. Haber, C. Guindon & D. Brenes 11093* (holotype, MO; isotype, CAS). Figure 4.

Ocoteae mezianae similis, sed floribus pubescentibus, receptaculo intus pubescenti et domatiis folliculis recedit.

Trees, to 20 m tall. Twigs angular, moderately to sparsely appressed pubescent, becoming glabrous with age, solid; terminal buds densely appressed pubescent. Leaves 6–16 × 2–5 cm, chartaceous to papyraceous, alternate, elliptic to obovate-elliptic, the base acute to cuneate, margin plane, the apex obtuse, acute or shortly acuminate, acumen to 8 mm long, upper leaf surface glabrous except the sometimes appressed pubescent midrib, lower surface sparsely appressed pubescent to glabrous, the indument denser along the midrib; midrib, lateral veins, and tertiary venation immersed on the upper surface, midrib and lateral veins raised, tertiary venation slightly raised or immersed on the lower surface; pit or pocket domatia present in the axils of the basal lateral veins, these usually visible as small bumps on the upper leaf surface; lateral veins 3 to 6; petioles 6–13 mm long, canaliculate, sparsely appressed pubescent or glabrous. Inflorescences 4–10 cm long, racemose or with several cymes near the base of the inflorescences and the distal part racemose, moderately to sparsely appressed pubescent, in the axils of leaves. Flowers 4 mm diam., yellow, perfect. Tepals ca. 1.7 mm, sparsely appressed pubescent outside, sparsely to moderately pubescent inside, half-erect at anthesis, stamens 4-celled, the cells arranged in 2 pairs, outer six 1.2 mm, glabrous, the anthers 0.7 mm, without a sterile

tip, the cells opening introrse; inner three 1.4 mm, glabrous or with the filaments pubescent, the anthers ca. 1 mm long, as wide as the filaments, the cells opening extrorse, the filaments with 2 glands at the base; staminodia 3, narrowly cylindrical, pistil slender, 1.7 mm long, glabrous, the ovary much shorter than the style; receptacle deeply cup-shaped, pubescent inside. Fruits 25×13 mm, ellipsoid or ovoid; cupule deeply cup-shaped when young, the tepals sometimes persisting, at maturity plate-like, 1 cm diam., with a single margin.

Phenology. Flowers March–May; fruits November–February.

Ocotea haberi is an inconspicuous species, best recognized by the combination of pubescent flowers, pit or pocket domatia (often the opening is much smaller than the domatium), and the pubescent inside of the receptacle. The other species with pit domatia have glabrous flowers and a glabrous inside of the receptacle. The immature cupules are deeply cup-shaped unlike cupules of the other species with pit domatia, but mature cupules become plate-like. The twigs of dried specimens have frequently very light-colored bark, while the other species in the *O. meziana* group tend to have darker-colored twigs. *Ocotea holdridgeana* W. Burger also has conspicuous domatia in the axils of the basal lateral veins, but it differs in having much larger flowers (1 cm diam.) and anthers with a sterile tip. *Ocotea haberi* is only known from montane forests in Costa Rica and Panama.

This species is named after W. Haber, whose excellent collections have added much to our knowledge of the flora of the Monteverde area in Costa Rica.

Paratypes. COSTA RICA. **Alajuela:** Monteverde, *Guindon 49* (MO); Bosque Eterno de Los Ninos, *Haber & Zuchowski 11158* (MO). **Guanacaste:** Cordillera de Tilaran, *Guindon 39* (MO). **Puntarenas:** Bosque Eterno de Los Ninos, *Bello et al. 2155* (MO); Monteverde, *Penneys 461* (MO); Monteverde, Rio Guacimal, *Bello 2095* (MO); Las Cruces, *Vargas et al. 1318* (MO); Canas Gordas, *Croat 22246* (MO). PANAMA. **Coclé:** N rim of El Valle, *Allen 1907* (MO).

Ocotea jefensis van der Werff, sp. nov. TYPE: Panama. Panamá: Cerro Jefe, 12 Sep. 1985, *L. Carrasquilla 2123* (holotype, MO). Figure 5.

Ex affinitate *Ocoteae insularis*, sed ramulis angulatis fistulosisque diversa est; ab *O. atirrense* inflorescentiis floribusque tomentellis recedit.

Small tree, to 15 m. Twigs thick, prominently angled, minutely and rather densely appressed pubescent when young, glabrescent with age, hollow, with exit holes for the twig-inhabiting ants; terminal

buds densely appressed pubescent. Leaves 16–21 \times 8–12 cm, alternate, broadly obovate, coriaceous, the base decurrent on the short petiole, the apex obtuse to rounded, glabrous on both surfaces, midrib broad and immersed, lateral veins immersed and tertiary venation raised on the upper surface, midrib, lateral veins, and tertiary venation raised on the lower surface, domatia lacking, lateral veins 7 to 9; petioles not distinct due to the decurrent, inrolled leaf bases, 5–10 mm long, flat. Inflorescences 15–20 cm long, sparsely pubescent near the base but toward the flowers progressively more densely tomentellous, the hairs very short and spreading; in the axils of leaves; paniculate-cymose; the branchlets angular or flattened. Flowers hermaphrodite, ca. 4 mm diam. Tepals 1.3 mm long, ovate to elliptic, rather densely and minutely pubescent outside, glabrous inside, outer 6 stamens ca. 1 mm long, glabrous, the filament ca. 0.3 mm long, the anther cells introrse in two pairs; inner three as long as the outer ones, with a few hairs on the distal part of the filament, the lower two cells extrorse, the upper two latrorse, glands present at the base of the filaments of the inner three stamens; staminodia not seen; pistil ca. 1.5 mm long, glabrous; receptacle cup-shaped, glabrous inside. Immature fruits largely enclosed in the deeply cup-shaped cupule, at maturity fruits narrowly ellipsoid, 15×6 mm, the cupule small, bowl-shaped, 5–6 mm tall and 6 mm wide.

Phenology. Flowers August–September; fruits January–February.

Ocotea jefensis is a member of the *Ocotea insularis* group sensu Rohwer (1986) based on the flattened inflorescence branches and the tuft of hairs on the adaxial side of the filaments of the inner 3 stamens. Within this group it shares with *O. atirrensis* Mez & J. D. Smith s.l. the hollow, ant-inhabited twigs, but differs in its tomentellous flowers and inflorescences, in its indistinct petioles due to the decurrent, incurved leaf bases and the coriaceous, broadly obovate leaves with the raised tertiary venation. With *O. insularis* (Meisner) Mez s.l. the new species shares the obovate leaf shape with decurrent base, but it differs from *O. insularis* in its thick, hollow twigs, the coriaceous leaves with raised tertiary venation, and the tomentellous flowers and inflorescences. *Ocotea tonduzii* Standley, a montane species from Costa Rica, can also be confused with *O. jefensis*. Like *O. jefensis*, *O. tonduzii* has glabrous, obovate leaves with raised tertiary venation and tomentellous flowers, but it differs in its solid, glabrous twigs, its largely or entirely glabrous terminal buds, the less pubescent inflorescences,



Figures 5—8 (clockwise from top left). —5. *Ocotea jefensis* van der Werff, holotype photo (MO). —6. *Ocotea klepperiae* van der Werff, isotype photo (MO). —7. *Ocotea macrantha* van der Werff, holotype photo (MO). —8. *Ocotea oblongifolia* van der Werff, holotype photo (US).

and the pubescence on the inner surface of the tepals.

Ocotea jefensis is only known from Cerro Jefe and the El Llano–Carti Rd. in Panama; the collection

from San Blas differs from the others in having less coriaceous leaves.

Paratypes. PANAMA. **Panamá:** Cerro Jefe, Aranda B. 386 (MO); El Llano–Carti Rd., Mori 7745 (MO). **Com-**

arca de San Blas: Cerro San Jose, *de Nevers & Herrera* 6952 (MO).

Ocotea klepperae van der Werff, sp. nov. TYPE: Costa Rica. Puntarenas: Valle del Pelo Seco, 21 Feb. 2000, *B. Hammel* 22068 (holotype, INB; isotype, MO). Figure 6.

A ceteris speciebus *Ocoteae* subgeneris *Dendrodaphne* floribus, inflorescentiis ramulisque dense pubescentibus pilis erectis praeditis recedit.

Trees, to 8 m. Twigs terete, solid, densely pubescent, the hairs erect and completely covering the surface; terminal buds similarly densely pubescent. Leaves 8–16 × 3–6 cm, elliptic, chartaceous, alternate, the base obtuse or acute, the margin plane, the apex acute or slightly acuminate, the upper surface glabrous, the lower surface sparsely pubescent, the hairs erect and discernable to the touch, the indument denser along the lateral veins and largely or entirely covering the midrib; midrib and lateral veins immersed but visible, tertiary venation immersed and not visible on the upper surface, midrib and lateral veins raised, tertiary venation moderately raised on the lower surface; domatia absent; lateral veins 5 to 7 pairs; petioles 5–8 mm long, with an indument like that of the twigs, canaliculate, the indument wearing off with age and then petioles darker in color than the twigs. Inflorescences 5–8 cm long, in the axils of bracts mostly near the tips of the twigs, less frequently in the axils of bracts along the twigs, paniculate-cymose, densely pubescent, the surface completely covered by the erect hairs. Flowers 1 cm diam., perfect. Tepals 4–4.5 mm long, narrowly elliptic to oblong, spreading at anthesis, densely pubescent on both surfaces, stamens 9, densely covered with hair-like papillae, the outer six 2.5 mm long, tongue-shaped, the sterile tip ca. 1 mm long, the cells arranged in 2 pairs and introrse, the inner three 2.5 mm long, columnar, the cells extrorse-lateral, in 2 pairs, with 2 glands 1–1.5 mm long at their base, the glands covering part or most of the lower pair of anther cells; staminodia absent or rarely one present, then 1.5 mm long, stipitate; pistil 2.5 mm long, glabrous, the style 1 mm long; receptacle deeply cup-shaped, densely pubescent inside. Fruit and cupule unknown.

Phenology. Flowers February, March.

The tongue-shaped, papillose stamens with a sterile tip, large flowers, and the position of the inflorescences in axils of bracts near branch tips places this new species in *Ocotea* subg. *Dendrodaphne*. It differs from the other species in this subgenus in its dense indument on twigs, inflorescences,

and flowers. *Ocotea klepperae* further differs from the common *O. veraguensis* (Meisner) Mez and *O. dendrodaphne* Mez in having shorter inflorescences with fewer flowers.

The indument of twigs, inflorescences, and flowers is less dense on the paratype; in other characters, such as the few-flowered inflorescences and obtuse leaf base, it agrees with the type collection.

It is a pleasure to name this species after Nancy Klepper in recognition of her keen interest in the people and culture of Latin America.

Paratype. COSTA RICA. **Puntarenas:** P.N. Manuel Antonio, *Harmon* 82 (MO).

Ocotea macrantha van der Werff, sp. nov. TYPE: Costa Rica. Puntarenas: Canton de Osa, 8 Sep. 1996, *R. Aguilar* 4688 (holotype, MO; isotype, INBIO). Figure 7.

Ocoteae rubriflorae affinis, sed floribus majoribus recedit.

Trees, 20 m. Twigs ridged to angular, solid, densely and minutely brown tomentellous, the surface completely covered and individual hairs scarcely recognizable; terminal buds completely covered with the same type of indument. Leaves 19–26 × 7–12 cm, alternate, chartaceous, elliptic, the base obtuse, rarely acute, the margin flat, the apex acuminate or acute, acumen to 2 cm long, the upper surface glabrous except for some minute hairs on the major veins, the lower surface sparsely to moderately minutely puberulous, the individual hairs scarcely visible, the indument denser and becoming tomentellous along the major veins, midrib and lateral veins immersed, tertiary veins slightly raised on the upper surface, midrib prominently raised, lateral veins raised and tertiary venation weakly raised on the lower surface; domatia absent; lateral veins 7 to 10; petioles 2–3 cm, sulcate, with a dense, brown indument like that of the twigs. Inflorescences 9–17 cm, in the axils of normal leaves, paniculate-cymose, the axes densely and minutely brown tomentellous, the surface completely covered. Flowers 10–12 mm diam., pale green, perfect. Tepals 4–5 mm, elliptic, spreading at anthesis, the outer 3 sparsely to moderately puberulous outside and with a basal triangular papillose patch, otherwise glabrous inside, the inner 3 tepals densely and coarsely papillose on both surfaces, sometimes appearing floccose on the outer surface; stamens 1.6 mm, densely papillose, the outer 6 with the cells arranged in 2 pairs, opening introrse, the cells filling nearly the entire anther, the inner 3 with the lower pair of cells extrorse, the upper pair lateral, small glands present at the base of the filaments of

the inner 3 stamens, staminodia not seen; pistil 3–4 mm, glabrous, the style a little shorter than the ovary; receptacle deeply cup-shaped, densely appressed pubescent inside. Fruit ellipsoid, 28×14 mm, the cupule bowl-shaped, 14 mm diam., the tepals not persisting and with a single margin; pedicel slightly thickened in fruit.

Phenology. Flowers September; fruits December.

The large, perfect flowers with spreading tepals, the tepals at least partially papillose on the inner surface, and the short indument point to a placement of *O. macrantha* in the *O. heydeana* group as defined by Rohwer (1991). Vegetatively, *O. macrantha* is very similar to *O. rubriflora* Mez. The peculiar short and dense indument of the twigs and inflorescences is not found in any other species of the *O. heydeana* group, and the pubescent outer surface of the tepals, shared by both species, is also very unusual in the group. Flowering material of *O. macrantha* can be readily identified by the size of the flowers: 10–12 mm in diameter for *O. macrantha* vs. 6–7 mm in *O. rubriflora*.

Paratype. COSTA RICA. **Puntarenas:** Canton de Osa, Aguilar 4785 (MO).

Ocotea oblongifolia van der Werff, sp. nov.

TYPE: Guatemala. Quezaltenango: Finca St. John, ca. 5 km S of Sta. Maria de Jesus, 17 May 1966, *J. W. Walker 442* (holotype, US; isotype, BR). Figure 8.

A congeneris foliis basi obtusis vel subcordatis, ramulis paginisque inferioribus foliorum dense pubescentibus et floribus parvis, hermaphroditis recedit.

Small tree, 6 m. Twigs terete, solid, densely light brown pubescent with mostly erect, straight hairs, the surface of the twigs completely covered or nearly so; terminal buds completely covered by the dense, light-brown, erect indument. Leaves $9\text{--}13 \times 3\text{--}5$ cm, oblong to slightly ovate-oblong, chartaceous, alternate, the base obtuse to subcordate, the apex gradually acute, the upper surface sparsely pubescent with erect hairs, the indument much denser along the major veins, the lower surface densely pubescent with erect hairs, these soft to the touch, the surface partially visible between the hairs, the pubescence denser along the major veins and these clearly visible; midrib, lateral veins, and tertiary venation immersed on the upper surface, midrib and lateral veins raised, tertiary venation immersed on the lower surface; domatia lacking; lateral veins 7 to 10; petioles 6–8 mm long, terete, with the same dense indument as the twigs. Inflo-

rescences 4–6 cm long, in the axils of leaves, paniculate-cymose, rather few-flowered, sparsely to moderately pubescent with erect hairs. Flowers 2–3 mm diam., cream colored, perfect. Tepals 1–1.2 mm long, erect to half-erect at anthesis, hypanthium and tepals sparsely pubescent on the outer surface, glabrous inside, stamens 9, all 4-celled, ca. 0.7 mm long, glabrous, anthers sessile or nearly so, the cells arranged in 2 superposed pairs, filling the entire anther and a sterile tip absent, outer 6 stamens with the cells opening introrse, inner 3 with the cells opening lateral-extrorse, glands present at the base of the inner 3 stamens, staminodia small, triangular, glabrous; pistil 1.5 mm, glabrous, receptacle deep, cup-shaped. Fruits and cupules not seen.

Phenology. Flowers May.

Ocotea oblongifolia can be readily recognized by the combination of oblong, densely pubescent leaves with an obtuse to subcordate base, and the small, hermaphroditic flowers. The soft, villous indument is similar to that found in the *O. helicterifolia* group (van der Werff, 1999), but the small flowers with erect to half-erect tepals that lack the papillose indument so typical of the *O. helicterifolia* group, suggest it is not related to that group. Morphologically, *O. oblongifolia* is quite distinct and it is described based on only the type collection. Its relationships are not clear.

Ocotea pullifolia van der Werff, sp. nov. TYPE:

Costa Rica. Puntarenas: Canton de Golfito, 24 Aug. 1990, *G. Herrera 4119* (holotype, INB). Figure 9.

Ocoteae jorge-escobarii similis, sed domatiis paucis, magnis profundisque et foliis apice obtusis recedit.

Trees, to 25 m. Twigs angular, solid, the very tip sparsely to moderately appressed pubescent, but soon becoming glabrous; terminal buds densely appressed pubescent, the hairs white and often contrasting with the dark leaves and twigs. Leaves $7\text{--}15 \times 2.5\text{--}5$ cm, coriaceous, elliptic to obovate-elliptic, alternate, becoming close together near the tips of the branches, the base acute to cuneate, the margin flat or slightly inrolled, the apex obtuse or rounded, glabrous on both surfaces or with a few appressed hairs on the lower surface; midrib, lateral veins, and tertiary venation immersed to raised on the upper surface, raised on the lower surface; domatia, as deep pits, usually present, few, in the axils of the basal lateral veins, not along the secondary veins, glabrous, visible as bulges on the upper surface; lateral veins 4 to 7;



Figure 9. *Ocotea pullifolia* van der Werff, holotype photo (INB).

petioles 6–11 mm, glabrous, strongly ridged above. Inflorescences 4–7 cm, in the axils of leaves, paniculate-cymose, glabrous or very sparsely appressed pubescent. Flowers 4–5 mm diam., green, perfect. Tepals 1.8 mm, glabrous on both surfaces, spreading in old flowers; stamens 9, 4-celled, the outer six 1.2 mm, glabrous, the filaments as long as the anthers, anther cells arranged in 2 pairs, introrse; inner 3 stamens as long as the outer 6, the anther cells opening extrorse, the filaments broad, as long as the anthers, with a patch of white hairs at the base of the anther on the side facing the pistil; filaments with 2 large glands at the base; staminodia not seen; pistil 1.5 mm, glabrous, the style about as long as the ovary; receptacle cup-shaped, glabrous inside. Fruits ellipsoid, 2.6×1.8 cm, cupule cup-shaped, 2 cm diam., 1 cm high, with a simple margin, the tepals not persisting.

Phenology. Flowers June, August; fruits during most of the year.

Ocotea pullifolia is closely related to *O. jorge-escobarii* C. Nelson but differs in having domatia restricted to the axils of the basal lateral veins, in the small number of domatia, and in having the leaf

apices obtuse. In *O. jorge-escobarii* the small domatia are found along the lateral veins, and the leaf apices are bluntly acute.

The domatia are more common in collections from Costa Rica than in those from Panama; sometimes only one leaf from a Panamanian specimen might show 1 or 2 domatia, and in a few collections domatia are lacking altogether. In that case, the dark-drying leaves, the raised reticulation, and the obtuse leaf apices make an identification possible. On Cerro Jefe in Panama *O. pullifolia* occurs together with *O. whitei* Woodson s.l., and the two can resemble each other strongly. They can be separated by the much larger cupules of *O. pullifolia*, and the more scalariform reticulation on the upper leaf surface found in *O. whitei* s.l.

Several collections here placed in *O. pullifolia* have been previously distributed as *O. jorge-escobarii*.

Paratypes. COSTA RICA. **Puntarenas:** Osa Peninsula, *Thomsen 22* (MO), *Hammel et al. 16874* (MO), *Aguilar 1211* (MO), *Hammel & Robles 16777* (MO). PANAMA. **Chiriquí:** *McPherson 9131* (MO), *McPherson 9608* (MO). **Coelé:** *Hammel & Kress 11300* (MO, CAS). **Colón:** *McPherson 10266* (MO), *Mori & Kallunki 5059* (MO). **Panamá:** *McPherson 8494, 10007* (both MO), *McPherson & Merello 8121* (MO), *D'Arcy & Hamilton 14798* (MO), *Carrasquilla et al. 3246* (MO), *Carrasquilla & Zapata 3621* (MO), *Correa & Dressler 731* (MO), *Montenegro 1400* (MO).

Ocotea amplifolia (Mez & Donnell Smith) van der Werff, comb. nov. Basionym: *Phoebe amplifolia* Mez & Donnell Smith, Bot. Gaz. 19: 261. 1894. *Cinnamomum amplifolium* (Mez & Donnell Smith) Kostermans, Reinwardtia 6: 20. 1961. TYPE: Guatemala. El Jute, *E. T. Heyde & E. Lux 3033* (isotype, GH).

The presence of relatively large staminodia probably led Mez to describe this species as a *Phoebe*. Currently the neotropical species formerly placed in *Phoebe* are considered to belong to *Cinnamomum*. However, *Ocotea amplifolia* differs from *Cinnamomum* in having densely pubescent, spreading tepals, which do not persist on the cupule, in having a shallowly cup-shaped cupule (ex descr. Mez & Donnell Smith), and in lacking domatia or tripliveined leaves.

Ocotea parvula (Lundell) van der Werff, comb. nov. Basionym: *Phoebe parvula* Lundell, Wrightia 5: 343. 1977. *Cinnamomum parvulum* (Lundell) Kostermans, Reinwardtia 10: 448. 1988. TYPE: Mexico. Chiapas: *Ton 605* (holotype, LL).

This species was excluded from *Cinnamomum* by Lorea-Hernandez (1996) and is closely related to *Ocotea strigosa* van der Werff from Nicaragua.

Ocotea vanderwerffii (Kostermans) van der Werff, comb. nov. Basionym: *Phoebe glabra* van der Werff, Ann. Missouri Bot. Gard. 74: 406. 1987. *Cinnamomum vanderwerffii* Kostermans, Reinwardtia 10: 454. 1988. TYPE: Mexico. Oaxaca: T. Wendt et al. 4813 (holotype, MO).

This species was excluded from *Cinnamomum* by Lorea-Hernandez (1996), and I agree with him that it is better placed in *Ocotea*. It is closely related to *O. bernoulliana* Mez. Kostermans (1988) published a nomen novum for this species because *Cinnamomum glabrum* Hort. ex Ettingshausen had already been used for a different species. Similarly, *Ocotea glabra* van der Werff precludes a new combination of *P. glabra* in *Ocotea* and makes it necessary to continue the use of Kostermans's epithet.

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