

A revision of the genus *Ocotea* Aubl. (Lauraceae) in Madagascar and the Comoro Islands

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Madagascar,
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Exsiccatae,
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ABSTRACT

A revision of the genus *Ocotea* Aubl. in Madagascar and the Comoro Islands is presented. 35 species are recognized, all endemic to the region. Five species are described as new. A key to the species, descriptions, distribution maps and a list of specimens studied are presented.

RÉSUMÉ

Révision du genre Ocotea Aubl. (Lauraceae) de Madagascar et des Comores.

Le genre *Ocotea* Aubl. est revu pour Madagascar et les Comores, on y reconnaît 35 espèces, toutes endémiques de cette région. Parmi elles, cinq espèces nouvelles sont ici décrites comme nouvelles : *O. ambrensis* van der Werff, sp. nov., *O. glaberrima* van der Werff, sp. nov., *O. ivohibensis* van der Werff, sp. nov., *O. spanantha* van der Werff, sp. nov. et *O. zabamenensis* van der Werff, sp. nov. En raison d'un manque d'informations complémentaires, *O. macrorhiza* Kosterm. est considéré comme incomplètement connu, tandis que deux autres espèces demeurent provisionnelles. Une clé de détermination (avec une bifurcation évitant l'emploi parfois délicat du type de nervation), des descriptions, des cartes de répartition et une liste des spécimens étudiés sont fournies.

MOTS CLÉS

Madagascar,
Comores,
révision,
Exsiccatae,
espèces nouvelles.

INTRODUCTION

Lauraceae are a rather large family of mostly tropical trees and shrubs, best represented in the tropics of America and Asia. The family has the reputation of being a difficult one, largely due to the fact that species and genera are separated on minute floral characters, some of which are of doubtful value. The number of genera is currently estimated to be about 55 and the number of species about 3000 (van der Werff 2003), but these numbers are likely to increase due to continuing exploration of wet tropical forests. Lauraceae are of considerable economic interest; among the useful products are avocados, spices as cinnamon and bay leaves while the wood of many species is used in house and boat building and for making furniture. *Ocotea* Aubl. is among the larger genera of Lauraceae, estimated to include 350 (Rohwer 1993), but an additional 60-70 species have been described since 1993 by various authors. New species are still being found and the number of species is likely to reach between 400 and 450. Most members of the genus occur in the Neotropics; a few species are known from the African continent and 35 species are accepted here as occurring in Madagascar and the Comores. *Ocotea* is characterized by having a paniculate-cymose inflorescence with the lateral flowers of the terminal cymes strictly opposite, nine 4-locellate stamens with the locelli arranged in two superposed pairs and the fruits seated in a more or less well-developed cup. Staminodia, representing the innermost whorl of stamens are either present and stipitiform or lacking. As currently circumscribed, *Ocotea* includes both species with unisexual and bisexual flowers. While the combination of characters listed above is unique to *Ocotea*, each is individually present in other genera of Lauraceae and there are no features known to be exclusive for *Ocotea*. Thus, the genus is sometimes regarded as a dumping ground for species not fitting in better defined genera (Rohwer 1993) and, from phylogenetic perspective, it is likely to be polyphyletic (Chanderbali *et al.* 2001).

Our current concept of *Ocotea* dates largely from Mez (1889), who revised the neotropical Lauraceae. Earlier authors (Nees 1836; Meissner 1864) recognized several segregate genera in what is now

accepted as *Ocotea*. The earliest described species of *Ocotea* from Madagascar were thus placed in *Oreodaphne* Nees & Mart. by Nees (1836), and in *Mespilodaphne* Nees & Mart. by Meissner (1864), Baillon (1885) and Danguy (1920). Baker (1883, 1886) accepted a broader concept of *Ocotea* in his description of three new species. Kostermans (1939), in his revision of Lauraceae of Madagascar, accepted Mez's circumscription of *Ocotea*, recognizing 19 species. This revision formed the basis for the treatment of the family in the Flore de Madagascar et des Comores (Kostermans 1950). Subsequently, Kostermans (1957) described 13 additional species of *Ocotea* from Madagascar, without providing a key to species. Finally, van der Werff (1996) described five new species.

In addition to *Ocotea*, there are four other woody genera of Lauraceae native to Madagascar, *Aspidostemon* Rohwer & H.G. Richt., *Beilschmiedia* Nees, *Cryptocarya* R. Br. and *Potameia* Thouars. *Ocotea* is readily distinguished from these genera by several characters. All species of *Ocotea* have flowers with nine 4-locellate stamens, while the other genera have flowers with 2-locellate (in one case 1-locellate) stamens that vary in number (2, 3, 4, 6 or 9). The fruits of *Ocotea* are always seated in a shallow or deep cup, whereas those of the other genera have the fruits without any remnants of the hypanthium or are completely enclosed by the hypanthium, but are never seated in a cup. Vegetatively, the leaves of some (but not all) species of *Ocotea* have domatia in the form of slits or pockets in the axils of one or more pairs of lateral veins; these domatia may be fringed with hairs or glabrous (domatia are not known in the four other genera present in Madagascar). Thus, both flowering and fruiting specimens of *Ocotea* can be identified to genus without difficulty. Identification to species is more problematic. In general flowers are needed for identification. However, good collections with flowers are relatively rare, probably due to several factors: the flowering season of Lauraceae is short, many members of the family are sizable trees whose small flowers are difficult to see and out of reach of most collectors who cannot easily reach above 15 m high. Moreover, earlier collectors were often mainly interested in use of the plants and collected

sterile specimens with accompanying notes on usage and the common names. Thus, many older collections are sterile or have fruits making their identification in many cases next to impossible. The five new species described below are all based on recent collections with good flowers and it is very likely that additional new species will require description as more flowering specimens will become available.

Our knowledge of the *Ocotea* species in Madagascar is far from complete. Several factors have contributed to this. Type specimens of some of the older species, for instance *O. madagascariensis* (Meisn.) Palacký, are incomplete and lack flowers. Matching recent collections with such type material often cannot be done with much confidence and those names thus remain problematic. A second factor is that many localities in Madagascar are undercollected as shown by the number of species

reported from various localities. Probably the best collected locality is the Analamazaotra forest (also known as Perinet); of the 35 species accepted in this revision, eight have been recorded from there far exceeding the number from anywhere else. This site is located near the main highway from the coast to Antananarivo and French botanists historically worked in this region for years.

Of the species treated here, thirty four are endemic to Madagascar and one, *O. comoriensis* Kosterm., endemic to the Comoro Islands.

A list of collections with identifications is provided at the end of the systematic treatment. It should be noted that most sterile specimens cannot be identified to species and that many such collections in MO and P remain only identified to family or genus.

The complete label data of the cited collections can be found in the Tropicos data base of the Missouri Botanical Garden (<http://www.tropicos.org>).

KEY TO THE SPECIES OF *OCOTEA* AUBL. IN MADAGASCAR AND THE COMORO ISLANDS

The choice offered in couplet 26, reticulation raised or immersed on the upper leaf surface, is sometimes difficult to make. Therefore, I have added an alternative key from couplet 26 onwards that avoids the venation character and instead emphasizes the presence or absence of pubescence at the inner surface of the receptacle.

1. Plants from the Comoro Islands *O. comoriensis* Kosterm.
— Plants from Madagascar 2
2. Leaves with domatia (slits, pockets or tufts of hairs) in the axils of the lowermost lateral veins 3
— Leaves without domatia 16
3. Leaves opposite or subopposite 4
— Leaves alternate 5
4. Domatia consisting of tufts of reddish hairs; indument on lower leaf surface consisting of erect, straight or curled hairs, individual hairs clearly visible under a microscope
..... *O. thouvenotii* (Danguy) Kosterm.
— Domatia consisting of shallow pockets or deep pockets with a slit-like opening, never fringed by reddish hairs; lower leaf surface glabrous or with minute, ± appressed hairs, individual hairs scarcely visible *O. corethroides* Kosterm.
5. Lower leaf surface pubescent 6
— Lower leaf surface glabrous (some hairs may be present along the midrib) 8
6. Inflorescences 2-6 cm long; leaves to 9 cm long *O. ivohibensis* van der Werff, sp. nov.
— Inflorescences 5-12 cm long or more; leaves 9-19 cm long 7

7. Leaves pinnately veined; indument on leaves and twigs reddish (castaneous)
 *O. longipes* Kosterm.
 — Leaves tripliveined; indument on leaves and twigs pale yellow or gray .. *O. grayi* van der Werff
8. Domatia a depression, sometimes completely covered by hairs or with a slit-like opening,
 this covered by hairs 9
 — Domatia consisting of cavities with a narrow opening, not completely covered by hairs
 (the opening may have a fringe of hairs) 11
9. Inflorescences 8-12 cm long (Ft. Dauphin) *O. malcomberi* van der Werff
 — Inflorescences to 6 cm long 10
10. Flowers densely pubescent; midrib and lateral veins immersed on upper surface; domatia
 with a fringe of white hairs *O. trichantha* Baker
 — Flowers sparsely pubescent; midrib and lateral veins impressed on upper surface; domatia
 covered with reddish hairs *O. ivohibensis* van der Werff, sp. nov.
11. Domatia along lateral veins, often also at the junction of lateral veins and midrib; terminal
 buds glabrous *O. perforata* Kosterm.
 — Domatia restricted to junction of lateral veins and midrib or, if occasionally present along
 lateral veins, then terminal buds pubescent 12
12. Inflorescences and young twigs pilose, with erect hairs 13
 — Inflorescences and young twigs puberulous, with short appressed hairs or glabrous 14
13. Outer surface of tepals pubescent, inner surface with a few hairs in the center
 *O. tsaratananensis* van der Werff
 — Outer surface of tepals glabrous or nearly so; inner surface pubescent
 *O. humbertii* Kosterm.
14. Leaves tripliveined, to 6 cm long; young twigs and terminal buds sparsely pubescent
 *O. foveolata* Kosterm.
 — Leaves pinnately veined, 5-20 cm long; young twigs and terminal buds densely pubescent
 or puberulous 15
15. Flowers densely pubescent; leaves 10-20 × 4-8 cm *O. humblotii* Baill.
 — Flowers very sparsely pubescent; leaves 5-10 × 3-4.5 cm
 *O. zahamenensis* van der Werff, sp. nov.
16. Lower leaf surface pubescent with erect hairs; midrib and lateral veins impressed on upper
 leaf surface *O. trichophlebia* Baker
 — Lower leaf surface glabrous or with some appressed hairs; venation raised or immersed
 on upper leaf surface 17
17. Filaments of inner 3 stamens fused in a tube *O. faucherei* (Danguy) Kosterm.
 — Filaments of inner 3 stamens free 18
18. Plants entirely glabrous, including the outside of the flowers (terminal buds may have a
 fringe of hairs) 19
 — Plants with some pubescence, sometimes only on inflorescences and/or the outside of the
 flowers 22
19. Leaves 3-5.5 cm long, 1.5-2 cm wide *O. glaberrima* van der Werff, sp. nov.
 — Leaves 6-16 cm long, 2-7 cm wide 20

20. Leaf apices obtuse; leaf margin inrolled; tall tree *O. madagascariensis* (Meisn.) Palacký
 — Leaf apices acuminate or acute; leaf margin flat; shrub or small tree 21
21. Reticulation raised on both surfaces; lower surface minutely and densely gland-dotted; pedicels *c.* 5 mm long *O. sambiranensis* van der Werff
 — Reticulation immersed, not visible; lower surface not gland-dotted; pedicels 10-15 mm long *O. longipedicellata* van der Werff
22. Indument restricted to inflorescences and/or flowers; terminal buds glabrous 23
 — Indument not restricted to inflorescences and/or flowers; at least terminal buds pubescent 24
23. Leaf blades to 7 cm long; reticulation immersed on lower leaf surface *O. elliptica* Kosterm.
 — Leaf blades 7-12 cm long; reticulation raised on lower surface *O. cryptocaryoides* Kosterm.
24. Leaf blades decurrent on the petiole; the base of the leaf revolute-auriculate 25
 — Leaf blades not decurrent on the petiole, or if decurrent, not revolute-auriculate 26
25. Leaves 10-15 cm long, reticulation raised; leaf apices acute *O. auriculiformis* Kosterm.
 — Leaves to 7 cm long, reticulation immersed; leaf apices obtuse *O. involuta* Kosterm.
26. Reticulation raised on upper leaf surface 27
 — Reticulation immersed on upper leaf surface 31
27. Flowers sessile; bracts often present in the inflorescences at anthesis *O. sessiliflora* Kosterm.
 — Flowers pedicellate, the pedicels at least as long as the flowers; bracts absent at anthesis 28
28. Young twigs densely pubescent with short, erect hairs; leaf margin revolute and shortly decurrent on the petiole *O. rigidifolia* Kosterm.
 — Young twigs appressed pubescent or with ascending hairs; leaf margin not revolute and not decurrent on the petiole 29
29. Inflorescences 2-4 cm long; reticulation fine *O. cymosa* (Nees) Palacký
 — Inflorescences 3-7 cm long; reticulation lax 30
30. Mature leaves to 3 cm wide *O. eriothyrsa* Kosterm.
 — Mature leaves 5-10 cm wide *O. nervosa* Kosterm.
31. Leaves opposite or subopposite *O. racemosa* (Danguy) Kosterm. *s.l.*
 — Leaves alternate 32
32. Receptacle densely pubescent inside 33
 — Receptacle glabrous inside; leaves usually less than 10 cm long 34
33. Leaves 8-15 cm long, elliptic to narrowly elliptic, the margin flat *O. macrocarpa* Kosterm.
 — Leaves to 6 cm long, broadly elliptic to elliptic, the margin inrolled *O. rigidifolia* Kosterm.

34. Inflorescences in the axils of bracts at the base of recent year's growth; leaf apices rounded *O. brevipes* Kosterm.
 — Inflorescences in the axils of leaves or along leaf less short shoots; leaf apices mostly acute 35
35. Leaf apices caudate; leaves broadly elliptic, with immersed reticulation *O. caudatifolia* Kosterm.
 — Leaf apices (bluntly) acute; leaves elliptic, reticulation raised on lower surface or immersed 36
36. Inflorescences along leafless short shoots, these with persisting bracts, 3-6 mm long, near their tips 37
 — Inflorescences along leafless short shoots without persisting bracts or inflorescences in the axils of normal leaves *O. racemosa* (Danguy) Kosterm. *s.l.*
37. Flowers 6-8 mm in diameter; leaves 7-13 × 2.5-6 cm *O. spanantha* van der Werff, sp. nov.
 — Flowers 5-6 mm in diameter; leaves 5-9 × 1.5-3.5 cm *O. ambrensis* van der Werff, sp. nov.

ALTERNATIVE KEY FROM COUPLET 26 ONWARDS

26. Inside of the receptacle pubescent 27
 — Inside of the receptacle glabrous 30
27. Reticulation immersed on upper surface; leaves narrowly elliptic to elliptic *O. macrocarpa* Kosterm.
 — Reticulation raised on upper surface; leaves elliptic 28
28. Young twigs densely tomentellous; leaf apices obtuse *O. rigidifolia* Kosterm.
 — Young twigs appressed pubescent, often sparsely so; leaf apices mostly acute 29
29. Inflorescences 2-4 cm long; reticulation fine *O. cymosa* (Nees) Palacký
 — Inflorescences 3-7 cm long; reticulation lax *O. nervosa* Kosterm.
30. Reticulation coarse and raised on the lower leaf surface 31
 — Reticulation immersed on lower leaf surface or if somewhat raised, reticulation fine 32
31. Inflorescences and pedicels moderately to densely pubescent; leaves to 3,5 cm wide *O. eriothyrsa* Kosterm.
 — Inflorescences and pedicels subglabrous; leaves 6-10 cm wide *O. cryptocaryoides* Kosterm.
32. Flowers sessile *O. sessiliflora* Kosterm.
 — Pedicels about as long as the flowers 33
33. Inflorescences in the axils of bracts at the base of recent year's growth; leaf apices rounded *O. brevipes* Kosterm.
 — Inflorescences in the axils of leaves or along leaf less short shoots; leaf apices mostly acute 34
34. Leaf apices caudate; leaves broadly elliptic, with immersed reticulation *O. caudatifolia* Kosterm.

- Leaf apices (bluntly) acute; leaves elliptic, reticulation raised on lower surface or immersed 35
35. Inflorescences along leafless short shoots, these with persisting bracts, 3-6 mm long, near their tips 36
- Inflorescences along leafless short shoots without persisting bracts or inflorescences in the axils of normal leaves..... *O. racemosa* (Danguy) Kosterm. *s.l.*
36. Flowers 6-8 mm in diameter; leaves 7-13 × 2.5-6 cm *O. spanantha* van der Werff, sp. nov.
- Flowers 5-6 mm in diameter; leaves 5-9 × 1.5-3.5 cm *O. ambrensis* van der Werff, sp. nov.

SYSTEMATICS

1. *Ocotea ambrensis* van der Werff, sp. nov. (Figs 1, 2)

Ocotea racemosae similis, sed tepalis persistentibus, bracteis basi gemmarum terminalibus magnis recedit.

TYPUS. — Madagascar. Prov. Antsiranana, Parc National de Montagne d'Ambre, 12°32'S, 49°11'E, 900-1100 m, 16-20.XI.1992, fls, Malcomber, Leeuwenberg, van Bergen, Andriatiana & Randriamampionona 1817, (holo-, P!; iso-, MO! [6240678], TAN).

PARATYPES. — Madagascar. Antsiranana, Montagne d'Ambre PN, 12°32'S, 49°07'E, fr., Andrianantoanina & Solutiana 60 (MO, P[P01977609], TAN); s. loc., Andrianantoanina & Solutiana 69 (MO, TAN); Parc National de la Montagne d'Ambre, 12°27'S, 49°13'E, fr., Andrianantoanina & Rocsee 270 (MO, P[P01977608], TAN); Roussettes, Montagne d'Ambre, fls, Service Forestier 5467 (P[P01977610], TEF); Montagne d'Ambre, Service Forestier (Capuron) 11290 (P[P01977611], TEF); Montagne d'Ambre, Trigui *et al.* 518 (G, MO, P[P01976697]).

ALTITUDINAL DISTRIBUTION. — None of the collections of *O. ambrensis* sp. nov. gives a specific altitude; instead ranges of altitude are given. The lowest is from 250-500 m, the highest from 990-1100 m.

PHENOLOGY. — Flowering: November-December; fruiting: April (young fruits), August (older fruits).

DESCRIPTION

Trees, to 30 m. Twigs slightly angular, moderately appressed pubescent, becoming glabrous with age; terminal buds densely white pubescent, often with pubescent bracts, 4-6 mm long, at their base. Leaves 5-9 × 1.5-3.5 cm, elliptic, alternate, chartaceous, base and apex acute, margin flat, glabrous or nearly

so, the lower surface minutely gland-dotted, this less visible on older leaves, venation immersed on upper surface, slightly raised on lower surface, lateral veins poorly visible, 5-7 on each side, domatia absent. Inflorescences crowded along leafless short shoots, 2-4 cm long, racemose or paniculate-cymose, moderately to sparsely pubescent, some bracts persisting on the inflorescences, but these less conspicuous than the bracts near the terminal buds. Flowers cream white, 5-6 mm in diameter, the tepals spreading at anthesis; tepals 2-2.5 mm long, sparsely pubescent outside, densely pubescent inside, stamens 9, all 4-celled, 1 mm long, the filaments short, pubescent; glands present at the base of the inner stamens; staminodia clavate, 0.7 mm long, the thickened head glabrous, the filament pubescent; pistil glabrous, 1.5 mm long, the style as long as the ovary, stigma peltate, receptacle glabrous inside. Young fruits (1 cm in diameter) enclosed in the cupule, this crowned by the persisting tepals, resembling small rose hips, older fruits (approaching 2 cm in diameter) ⁴/₅ enclosed in the cupule, this splitting and with teeth-like remnants of the tepals; mature fruits 2.5 × 1.5 cm, cupule deeply cup-shaped, 1.8 cm in diameter, with teeth-like remnants of the tepals.

REMARKS

Ocotea ambrensis sp. nov. resembles the widespread and variable *O. racemosa* (Danguy) Kosterm. Kostermans (1957) annotated the sole specimen he saw of *O. ambrensis* sp. nov. as *O. laevis* Kosterm., which I treat as a synonym of *O. racemosa*. However, the four collections of *O. ambrensis* sp. nov. made in the last 15 years show consistent differences from

O. racemosa, viz. the large, persistent bracts at the base of the terminal buds (lacking in *O. racemosa*), the persistent tepals on the cupule (tepals deciduous in fruit in *O. racemosa*), the very deep cupule (vs shallow cupules), the thinner leaves and the minute, dense gland dots at the lower surface of the leaves, at least of the flowering specimens (gland dots lacking in *O. racemosa*). The new species, known only from the Montagne d'Ambre in the far North, is also geographically separated from *O. racemosa*.

2. *Ocotea auriculiformis* Kosterm.

(Fig. 2)

Communication (Pengumuman) of the Forest Research Institute, Indonesia 60: 6 (1957).

TYPUS. — Madagascar. Ivongo, Ambalavao, 27.V.1955, fls, *Réserves Naturelles* 7149 (holo-, P[P00541607]!; iso-, K!, P[P00541608]!, TEF).

SELECTED SPECIMENS SEEN. — Prov. Fianarantsoa, Talatakely, Parc national de Ranomafana, *Malcomber et al.* 2099 (MO, P[P01977604], TAN), *Rakoto* 367, (MO, P[P01977602], TAN); Iakora, Begogo, Bekora, forêt de Sahalava, *Andrianjafy et al.* 745 (MO, P[P02008016]); Toliara, Réserve Intégrale #11 (Andohahela), Parcelle 1, *Randriamampionona* 73 (MO, P[P01977601]).

DISTRIBUTION. — *Ocotea auriculiformis* is known from forests on the E. slope from Ambositra to Andohahela at altitudes from 600-1300 m.

PHENOLOGY. — Flowers: December-February; fruits: June (immature), October.

VERNACULAR NAMES. — Varongy, varongy mavo, varongy mainty, varony revinamontana.

DESCRIPTION

Tree, to 30 m tall. Twigs angular, minutely tomentellous, becoming glabrous with age; terminal buds densely brown-tomentellous. Leaves alternate, firmly chartaceous, (narrowly) elliptic, 10-15 × 3-6 cm, glabrous above, lower surface glabrous or with some scattered hairs or towards the base slightly tomentellous, gland-dotted, lateral veins 6-10, venation immersed or raised on upper surface, raised on lower surface, apex acute, base decurrent on petiole and with two inrolled lobes at the very base, margin inrolled (sometimes only in basal third of the leaf),

domatia absent. Petioles tomentellous or subglabrous, canaliculate, 1-2 cm long. Inflorescences in the axils of bracts or along leaf less short shoots, tomentose, 3-12 cm long. Flowers 7-8 mm in diameter, white or yellow, tepals 6, equal, pubescent on both surfaces, c. 3 mm long, spreading to reflexed, stamens 9, 4-celled, filaments pubescent, inner three stamens with 2 glands at the base, staminodes 3, their base pubescent; pistil glabrous, c. 2.5 mm long, the ovary gradually narrowed into the style, receptacle deep, densely pubescent inside. Young fruits included in cupule, mature fruits 2.5 × 1.5 cm, cupule shallowly cupshaped, 18 mm in diameter, 9 mm high, pedicel not thickened.

REMARKS

Ocotea auriculiformis is characterized by its inrolled leaf margins, tomentellous twigs and raised reticulation on the lower leaf surface. Other species with inrolled leaf margins have smaller leaves and often lack the raised reticulation or tomentellous twigs. It resembles *O. macrocarpa* Kosterm. strongly and the main difference is that the latter species lacks the inrolled leaf margin.

3. *Ocotea brevipes* Kosterm.

(Fig. 6)

Notulae systematicae 8: 84 (1939).

TYPUS. — Madagascar. Pic de Farafangana, 18.IX.1926, fls, *Decary* 5365 (holo-, P[P00573377]!; iso-, MO!, P[P00573375]!).

DISTRIBUTION. — *Ocotea brevipes* is known only from the type from the Pic de Farafangana.

PHENOLOGY. — Flowers: September, December.

DESCRIPTION

Small tree, to 8 m tall. Twigs angular, moderately densely pubescent when young, becoming glabrous with age; terminal buds densely pubescent. Leaves alternate, coriaceous, 3-7 × 2-4 cm, elliptic or broadly elliptic, base obtuse or acute, tip obtuse, adult leaves glabrous on both surfaces, immature leaves sparsely pubescent, lateral veins 4-7, midrib and lateral veins immersed, tertiary venation raised in very young leaves



Fig. 1. — Isotype of *Ocotea ambrensis* van der Werff, sp. nov.

and finely reticulate, but in mature leaves immersed and indistinct; domatia absent. Petioles glabrous, 3-7 mm long, canaliculate. Inflorescences in axils of bracts or normal leaves, rather densely pubescent, 2-5 cm long, few-flowered, flowers white, 4-5 mm in diameter. Tepals 6, spreading or half-erect at anthesis; sparsely appressed pubescent outside, *c.* 2 mm long, elliptic, pubescent on inner surface; stamens 9, 4-celled, filament pubescent, those of inner three stamens with 2 large glands at the base, staminodia present, small, stipitiform, pubescent, pistil glabrous, receptacle glabrous inside. Fruits and cupule unknown.

REMARKS

Ocotea brevipes is an inconspicuous species best recognized by its small leaves with obtuse tip and small pubescent inflorescences. In leaf size and shape it resembles *O. foveolata* Kosterm., but that species differs in having large domatia in the axils of the basal lateral veins, in less pubescent twigs and inflorescences and its longer petioles.

Kostermans (1939, 1950) cited *Mespilodaphne madagascariensis* Sc. Ell. as a synonym of *O. brevipes*. Scott Elliot never published this name; he used the name *Mespilodaphne madagascariensis* Meissner. The specimen to which he applied this name, *Scott Elliot 2422*, was cited by Kostermans as a paratype of *O. brevipes*. I exclude this collection from *O. brevipes*. It differs from *O. brevipes* in having glabrous twigs and terminal buds and in having larger leaves with an acute apex.

A collection from the Massif du Vohibe, S-SE of Ambositra, at high elevation (between 1600 and 1869 m) might belong here. This collection, *SF 23862 Capuron*, differs from *O. brevipes* in its appressed indument on twigs and inflorescences, its inflorescences along leafless short shoots and slightly obovate leaves. However, due to lack of more collections, we do not have a good idea of the range of variation in vegetative characters of *O. brevipes*.

4. *Ocotea caudatifolia* Kosterm.

(Fig. 2)

Communication (Pengumuman) of the Forest Research Institute, Indonesia 60: 8 (1957).

TYPUS. — Madagascar. Bassin de la Fananehana, II.1964, fls, *Service Forestier (Capuron) 8995*, (holo-, P[P00541614]); iso-, MO, P[P00541615, P00541616]].

MATERIAL EXAMINED. — Antsiranana, WNW of Andapa, *McPherson 17183* (MO), *17226* (MO); Toamasina, Environs de la baie d'Antongil, *Service Forestier (Capuron) 8995* (MO, P); *Service Forestier (Capuron) 9034* (K, MO, P[P01991960]); Parc national de Zahamena, *Randrianjanaka et al. 747* (MO, P).

PHENOLOGY. — Flowering: February; fruiting: August.

VERNACULAR NAME. — Tafonona, antafonana.

DESCRIPTION

Tree, to 30 m. Twigs angular, minutely appressed pubescent, becoming glabrous with age; terminal buds appressed pubescent. Leaves 3-8 × 2-5 cm, broadly elliptic, glabrous, alternate, the base obtuse or acute, apex acute to acuminate, upper surface smooth, shiny, with immersed venation; lower surface with venation almost completely immersed; domatia absent, lateral veins 5-7 on each side. Petioles 1-1.5 cm, canaliculate, glabrous. Inflorescences 2-4 cm long, paniculate-cymose, appressed pubescent, in the axils of bracts or leaves. Flowers 5 mm in diameter; tepals spreading, pubescent on both surfaces or inner surface glabrous, *c.* 2 mm long; stamens 9, all 4-celled, 1 mm long, filaments distinct, glands present at the base of the inner stamens; staminodia stipitiform, pubescent. Pistil glabrous, receptacle glabrous inside. Green fruit *c.* 1.5 cm long, cupule deeply cup-shaped, 1.5 cm wide, 1 cm high.

REMARKS

Ocotea caudatifolia can be recognized by its leaves with immersed venation, with a shiny upper surface, relatively long petioles and deep cupules. Most leaves of the fruiting collections have the leaves conduplicate, whereas the flowering specimens have most leaves flat, although a few are conduplicate.

DISTRIBUTION

Infrequently collected and known from the type and paratype collection made in the upper Rentabe area to the west of the Baie d'Antongil, two fruiting collections in the Andapa area and a fruiting collection from Zahamena, between 500 and 1300 m.

5. *Ocotea comoriensis* Kosterm.

Notulae systematicae 8: 91 (1939).

TYPUS. — **Comores.** Anjouan, *Humboldt 1561* (holo-, P[P00751075]!).

SELECTED SPECIMENS SEEN. — Anjouan, 1 km E of Dindi, *Hunter 75* (MO); Grande Comore, Forêt de la Grille, *Brionnaud et al. 6* (MO, P[P00213218, P00213219]); Mayotte, Grande Terre-Chiconi, *Barthelat et al. 1502* (MO, P[P00631158]); Moheli, Forêt de Voundrouvou, *Floret 1234* (MO, P[P00184896]).

DISTRIBUTION. — Known from Anjouan, Grande Comore, Mayotte and Moheli, without indication of altitude.

PHENOLOGY. — Flowers: June-July and November-December; fruits: October, November, February.

VERNACULAR NAMES. — M'Roboué, Mrébé, Mkanouhou, M'Faperou.

DESCRIPTION

Tree, to 25 m tall. Twigs terete or slightly angled, puberulous when young, but soon becoming glabrous; terminal buds rather densely appressed pubescent. Leaves alternate, chartaceous, elliptic to ovate-elliptic, 7-17 × 2.5-5 cm, the base acute or obtuse, tip acute, glabrous above, glabrous or with some appressed hairs near the base and along midrib below; lateral veins 4-7 on each side, the basal lateral veins strongly developed and with conspicuous slit domatia in the axils, sometimes domatia also present in axils of more distal veins; midrib and lateral veins immersed on upper surface, raised on lower surface. Petioles glabrous, canaliculate, 8-13 mm long. Inflorescences axillary, 5-12 cm long, sparsely puberulous, the indument becoming denser towards the flowers. Flowers white. Tepals 6, equal, pubescent or nearly glabrous on both surfaces, *c.* 2 mm long; stamens 9, all 4-celled, the cells arranged in two rows, inner 3 stamens with two glands near the base; staminodia 3, pubescent, 0.8 mm long, linear; ovary *c.* 1 mm long, glabrous or sparsely pubescent, style *c.* 1.5 mm long, glabrous or with a few lines of hairs. Receptacle glabrous inside. Fruits ellipsoid, 2 × 1 cm, cupule deeply cup-shaped, 1 cm high, the pedicel in fruit markedly swollen.

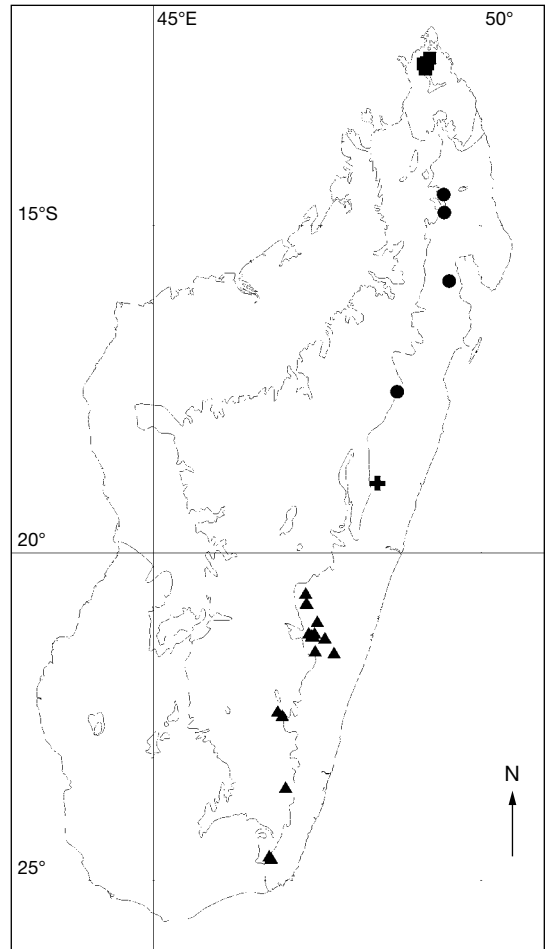


FIG. 2. — Distribution of *Ocotea ambrensis* van der Werff, sp. nov. (■), *O. auriculiformis* Kosterm. (▲), *O. caudatifolia* Kosterm. (●) and *O. rigidifolia* Kosterm. (+).

REMARKS

Ocotea comoriensis is the only species of *Ocotea* known from the Comores. Characteristic is the combination of tripliveined, alternate, rather large leaves and the slit-domatia. It can only be confused with *O. humblotii* Baill., but the latter species has pinnately veined, not tripliveined leaves. *Ocotea comoriensis* is rather variable in leaf dimensions, and degree of pubescence on flowers and pistil, but characters listed above and its distribution make correct identification simple.

6. *Ocotea corethroides* Kosterm.
(Fig. 3)

Communication (Pengumuman) of the Forest Research Institute, Indonesia 60: 9 (1957).

TYPUS. — Madagascar. Ivongo, 27.XII.1949, fls, *Service Forestier* 2429 (holo-, P[P00541606]!).

SELECTED SPECIMENS SEEN. — Toamasina, Tamatave, Mangabe, Réserve Naturelle 3, *Réserves Naturelles* 4472 (MO, P[P01991958], TAN); Tamatave, Ambodiriana, *Réserves Naturelles* 5918 (MO, P[P01991959]).

DISTRIBUTION. — This species occurs in forests on the eastern slope from Ivongo to Marojejy; between 100-600 m elevation.

PHENOLOGY. — Flowers: November-December, fruits: March, June, September, October.

VERNACULAR NAMES. — Varongy, varongy fotsy, anta-fofona, varongy mainty, tafoho.

DESCRIPTION

Tree, to 20 m. Twigs angular, minutely tomentellous when young, becoming glabrous with age; terminal buds tomentellous. Leaves (sub)opposite, firmly chartaceous, 10-20 × 3-7 cm, elliptic or ovate-elliptic, base and tip acute, lateral veins 5-8 on each side; upper leaf surface glabrous, midrib and lateral veins immersed, tertiary reticulation slightly raised; lower leaf surface with some appressed or erect pubescence, especially along midrib, or nearly glabrous, midrib, lateral veins and reticulation raised, domatia present, consisting of shallow to deep pockets, when deep often with a slit-like opening, domatia glabrous or with a fringe of short, pale hairs. Petioles with same indument as twigs, 1.4-2.0 cm long. Inflorescences axillary, paniculate, 5-10 cm long, tomentellous. Tepals densely pubescent on both surfaces, 2-3 mm long. Stamens 9, 4-celled, c. 2 mm long, filaments pubescent, anthers ± glabrous, staminodia 3, minute, stipitiform, pubescent. Ovary pubescent, receptacle pubescent inside. Cupule deeply cup-shaped, 2-3 cm wide, fruit 2.4 × 2 cm, pedicel thickened.

REMARKS

Ocotea corethroides can be and has been confused with *O. humblotii*. However, the latter species

has alternate leaves and is restricted to the area N of the Baie d'Antongil. There are two collections of *O. corethroides* from such a northern locality, but these specimens have clearly opposite leaves. The specimens previously identified as *O. humblotii* differ slightly from typical *O. corethroides* in having wider leaves, longer tepals and more pubescence on the leaves. Geographically, the two forms overlap and based on the available material I don't think it is warranted to recognize two taxa. I include in *O. corethroides* the collection *Service Forestier (Capuron)* 9125, cited by Kostermans as paratype of *O. capuronii* Kosterm. (synonym of *O. thouvenotii* (Danguy) Kosterm.); its indument fits *O. corethroides* better.

7. *Ocotea cryptocaryoides* Kosterm.
(Fig. 3)

Communication (Pengumuman) of the Forest Research Institute, Indonesia 60: 10 (1957).

TYPUS. — Madagascar. Massif du Beanjada (N de la presqu'île Masoala), 1100 m, 31.XII.1953, fls, *Service Forestier (Capuron)* 8839 (holo-, P[P00541610]!; iso-, K, P[P00541609, P00541611]!).

MATERIAL EXAMINED. — Toamasina, Masoala National Park, N ridge of Ambohitsitondroinan Mahalevona, *Lowry et al.* 6207 (MO, P[P01991945]); Massif de Beanjada, *Service Forestier (Capuron)* 8853 (MO, P[P01991941]); Toamasina, Fiv. Maroantsetra, Comm. Ambinanitelo, Fok. Marovovonana, *Antilabimena* 2696 (MO).

DISTRIBUTION. — *Ocotea cryptocaryoides* is known from 4 collections just N of the Masoala Peninsula (Massif de Beanjada, Massif de Ambohitsitondroina near Mahalevona) between 800 and 1200 m altitude.

PHENOLOGY. — Flowers and fruits collected in December.

DESCRIPTION

Tree, to 20 m tall. Twigs angular, glabrous; terminal buds glabrous or with a few hairs. Leaves alternate, coriaceous, 7-15 × 6-10 cm, glabrous, base acute, cuneate or obtuse, apex obtuse or acute, lateral veins 5-7, not very prominent, tertiary venation forming a rather fine reticulum, veins raised on both surfaces but more strongly so on the lower surface, domatia lacking, margins slightly inrolled. Petioles

glabrous, 1-2 cm long. Inflorescences glabrous or nearly so, in the axils of leaves or in the axils of bracts at the base of young shoots, 5-10 cm long. Flowers conical, tepals more or less erect at anthesis, 4 mm in diameter. Tepals 6, equal, glabrous outside, pubescent inside, 2.5 mm long; stamens 9, 4-celled, 1-1.5 mm long, the slender filaments sparsely pubescent, filaments of the inner stamens with two glands at the base, staminodia present, stipitiform, as long as the filaments of the outer stamens, pistil glabrous, 3 mm long, ovary as long as the style; receptacle deeply cup-shaped, glabrous inside. Cupule almost completely enclosing the fruit; roundish, *c.* 2 cm in diameter, with six longitudinal ribs or wings on the outside.

REMARKS

Ocotea cryptocaryoides is best recognized by the glabrous leaves with raised reticulation, glabrous twigs and (nearly) glabrous flowers. Its fruit is almost completely enclosed by the large cupule with six prominent wings or ribs, which is unique in the genus *Ocotea*. Size of the fruits strongly suggests that the fruits are mature. On one of the fruits two old stamens were found, and these show convincingly that these remarkable fruits belong to an *Ocotea* species. Several recent collections from Marojejy, Anjanaharibe, Ankirindro (NW of Maroantsetra), and the Vohitaly forest (W of Maroantsetra) are vegetatively (coriaceous, alternate leaves with raised reticulation) very similar to *O. cryptocaryoides*. They differ in having narrower leaves, slightly smaller flowers and deeply cup-shaped cupules that are not strongly ribbed. One of these collections came from Ambohitsitondroina, where one of the three collections of *O. cryptocaryoides* was made. I am reluctant to describe these collections as a new species. Additional good collections may show more differences and thus warrant description of a new species, but for the time being I have annotated these specimens as *O. cryptocaryoides* vel aff.

8. *Ocotea cymosa* (Nees) Palacký (Fig. 4)

Catalogus plantarum madagascariensium 2: 9 (1907).

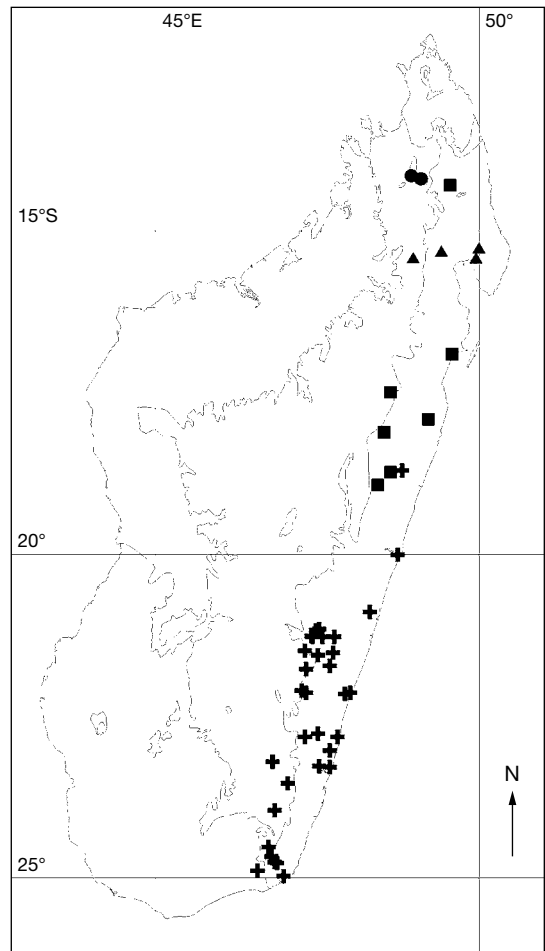


FIG. 3. — Distribution of *Ocotea corethroides* Kosterm. (■), *O. cryptocaryoides* Kosterm. (▲), *O. elliptica* Kosterm. (●) and *O. grayi* van der Werff (✚).

Oreodaphne cymosa Nees, *Systema Laurinarum*: 437 (1836). — *Mespilodaphne cymosa* (Nees) Meissner, *Prodromus systematis naturalis regni vegetabilis* 15: 105 (1864). — Typus: Madagascar, without further data, fls, *du Petit-Thouars s.n.* (holo-, B [Willd. 7813]; iso-, MO, P[P00573379]).

Agathophyllum lindleyanum Blume, *Museum Botanicum* 1: 340 (1851). — *Mespilodaphne lindleyana* (Bl.) Meissner, *Prodromus systematis naturalis regni vegetabilis* 15: 105 (1864). — *Ocotea lindleyana* (Bl.) Palacký, *Catalogus plantarum madagascariensium* 2: 9 (1907). — Typus: Madagascar, without further data, fls, ex Herb. Lindley (holo-, L!).

Ravensara tapak Baillon, *Bulletin mensuel de la société linéenne de Paris* 1: 448 (1885). — *Agathofyllum tapak* (Baillon) Palacký, *Catalogus plantarum madagascariensis* 2: 9 (1907). — *Mespilodaphne tapak* (Baillon) Danguy, *Bulletin du Muséum d'Histoire naturelle, Paris* 26: 650 (1920). — Typus: Madagascar, without further data, fls, *Poivre s.n.* (holo-, P[P00541573]!; iso-, P[P00497920]!).

SELECTED SPECIMENS SEEN. — Antsiranana, WNW of Andapa, NW of village of Ambodisatrana, *McPherson 17171* (MO); Toamasina, petit village Ambodiforaha, à 6 km Sud d'Ambanizana, *Rabe et al. 68* (MO, P[P02009673]); Toamasina, Parc National de Zahamena, Antanandava, Ankosy, *Ratovoson et al. 251* (MO); Toamasina, Fiv. Moramanga, Fir. Ampitambe, Forêt d'Analamay, *Rakotomalaza et al. 1368* (MO, P[P00497886]).

DISTRIBUTION. — *Ocotea cymosa* has a wide distribution along the eastern slope, from Farafangana in the south to Andapa in the north. It ranges from the coast to 1500 m altitude.

PHENOLOGY. — Flowering: May–August, mostly in June–July; fruiting specimens collected throughout the year.

VERNACULAR NAMES. — Varongy, varongy mainty, antafonana, tafonona, tafononana.

DESCRIPTION

Trees, to 20 m. Twigs ridged, appressed pubescent, becoming glabrous with age; terminal buds densely appressed pubescent. Leaves 6–17 × 2–8 cm, alternate, chartaceous, elliptic, glabrous, the base acute, apex shortly acuminate, densely and minutely gland-dotted on the lower surface, lateral veins 5–8, reticulation fine and raised on both surfaces, domatia absent. Petioles glabrous, flat above. Inflorescences appressed pubescent, paniculate-cymose, 2–4 cm long, grouped along leafless short shoots in the axils of leaves. Pedicels appressed pubescent, as long as the flowers. Flowers *c.* 5 mm in diam., tepals half-erect. Tepals elliptic, 3 mm long, sparsely pubescent on both surfaces, stamens 9, all 4-celled, 1–1.5 mm long, glabrous or nearly so; staminodia 3, small, stipitiform, pubescent; pistil glabrous, 2 mm long, receptacle cup-shaped, appressed pubescent inside. Fruit ovoid, 20 × 18 mm, cupule cup-shaped, 2.5 cm wide, 1.5 cm deep, tepals not persistent on the cupule.

REMARKS

Ocotea cymosa is a frequently collected species, best recognized by the minute and raised reticulation on both surfaces of the leaves, the short inflorescences arranged along leafless short shoots and the gland-dotted lower leaf surface. It can be confused with *O. nervosa* Kosterm., but that species has a lax (and raised) reticulation and longer inflorescences. *Ocotea nervosa* is also infrequently collected.

9. *Ocotea elliptica* Kosterm. (Fig. 3)

Communication (Pengumuman) of the Forest Research Institute, Indonesia 60: 13 (1957).

TYPUS. — Madagascar. Montagnes au nord de Mangindrano, 2000–2200 m, 1951, fls, *Humbert & Capuron 25215* (holo-, P!; iso-, K!, MO!, P[P00541568]!).

SPECIMENS EXAMINED. — Peaks of Ambohimirahavavy, *Humbert & Capuron 25215* (K, MO, P); same locality, *Humbert & Capuron 25130* (MO, P[P02002151]), *Massif d'Ambohimirahavavy, Service Forestier (Capuron) 960* (MO, P[P02033241]); same locality, *Service Forestier (Capuron) 971*, (MO, P[P02033242, P02033243], TEF); Mahajanga, Bealanana, Mangindrano, Forêt d'Analamalalaka, *Razaftsalama et al. 223* (MO, P, TEF); Mahajanga, Fiv. Bealanana, Commune Mangindrano, *Razaftsalama 339, 362* (MO, P[P02033239], TEF).

REMARKS. — *Ocotea elliptica* is best recognized by its broadly elliptic, coriaceous leaves, glabrous terminal buds and flat cupules with six teeth. Kostermans (1957) compared *O. elliptica* with *O. platydisca* Kosterm.; this and other similar species differ in having pubescent terminal buds and leaves with acute tips or bases.

DISTRIBUTION. — *Ocotea elliptica* is only known from a few collections from the Massif de l' Ambohimirahavavy, where the Mahavavy and Androranga rivers originate at about 2000 m altitude.

PHENOLOGY. — Flowers: January, Fruits: February.

DESCRIPTION

Tree to 20 m. Twigs glabrous, somewhat ridged or angular; terminal buds glabrous. Leaves alternate, coriaceous, broadly elliptic, 4–7 × 2.5 × 4.5 cm, glabrous, base obtuse, apex obtuse or broadly, shortly acuminate, lateral veins 5–7, immersed on upper surface, very slightly raised on lower surface,

tertiary venation not visible in upper surface, barely visible on lower surface, domatia absent. Petioles glabrous 1-1.5 cm long. Inflorescences mostly in axils of bracts clustered near tips of branches, occasionally in axils of leaves, 4-7 cm long, very sparsely appressed pubescent. Pedicels 4-5 mm long. Tepals 6, equal, spreading at anthesis, subglabrous outside, pubescent inside, especially towards the base, 2-2.5 mm long; stamens 9, 4-celled, outer six *c.* 1.5 mm long, the filaments pubescent, *c.* 0.5 mm long; inner three stamens the same size as outer six, but the pubescent filaments with two large glands near the base; staminodia three, very small, pubescent; pistil glabrous, 2-2.5 mm long, style about as long as ovary; receptacle cup-shaped, glabrous inside. Fruits 2 cm long, 1.3 cm wide, ellipsoid to ovoid-ellipsoid, cupule flat, plate-like, 1-1.5 cm in diameter, tepals initially persisting, falling off from older cupules, the cupules then with six teeth.

10. *Ocotea eriothyrsa* Kosterm.
(Fig. 4)

Communication (Pengumuman) of the Forest Research Institute, Indonesia 60: 12 (1957).

TYPUS. — Madagascar. Ambomitombo, Ambositra, 29.IX.1952, fls, *Service Forestier* 6356 (holo-, P[P00541612]!; iso-, P[P00541613]!), TEF).

DISTRIBUTION. — *Ocotea eriothyrsa* is only known from the type collection, made near Ambohimombo. The altitude is not mentioned on the label; the Gazetteer to Malagasy collecting Localities gives an altitude of 1300 m for Ambohimombo.

PHENOLOGY. — Flowers: September.

VERNACULAR NAME. — Varongy mainty.

DESCRIPTION

Tree of unknown size. Twigs angular, brown pubescent when young, but soon becoming glabrous; hairs \pm appressed; terminal buds densely appressed pubescent. Leaves alternate, coriaceous, 5-8 \times 2.3-3.2 cm elliptic, glabrous, base acute, apex shortly acuminate, lateral veins 5-8, these and tertiary venation raised on both surfaces, domatia absent. Petioles 4-8 mm long, glabrous, canaliculate. Inflorescences

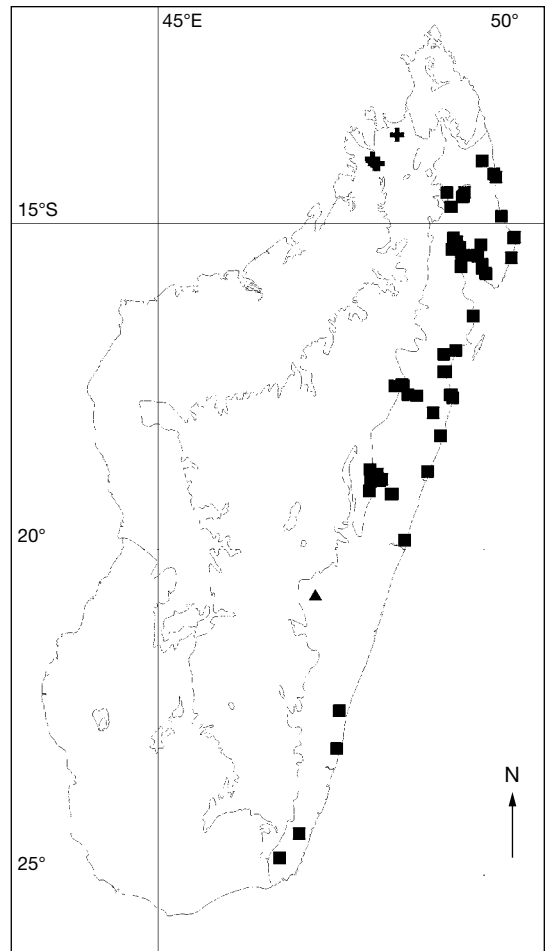


FIG. 4. — Distribution of *Ocotea cymosa* (Nees) Palacký (■), *O. eriothyrsa* Kosterm. (▲) and *O. sambiranensis* van der Werff (✚).

in axils of bracts, 5-8 cm long, appressed brown-pubescent. Pedicels 2-3 mm long, gradually widened towards the flowers, densely pubescent. Tepals 6, equal, the basal part and floral tube densely pubescent, the upper $\frac{2}{3}$ sparsely pubescent; 2-2.5 mm long, inside sparsely pubescent; stamens 9, 4-celled, *c.* 1.5 mm long, filament *c.* 0.5 mm long, sparsely pubescent, anthers of outer stamens incurved, inner three stamens erect, with 2 large glands at base of filaments, staminodia 3, stipitiform, pubescent, *c.* 1 mm long; pistil glabrous 2 mm long, ovary as long as style, receptacle cup-shaped, mostly

glabrous, but with a patch of hairs at the bottom. Cupule bowl-shaped, 1.3 cm in diameter, 0.5 cm tall. Fruit unknown.

REMARKS

Ocotea eriothyrsa can be recognized by the combination of leaves with lax reticulation raised on both surfaces and the brown-pubescent inflorescences and flowers with pedicels longer than the flowers themselves. Its closest relative is *Ocotea sessiliflora* Kosterm. and differences between the two species are discussed under that species. It shares the lax, raised reticulation with *O. nervosa*, but the latter species differs in its larger, wider leaves.

11. *Ocotea faucherei* (Danguy) Kosterm. (Fig. 5)

Notulae systematicae 8 : 79 (1939).

Mespidodaphne faucherei Danguy, *Bulletin du Muséum d'Histoire naturelle, Paris* 26: 551 (1920).

TYPUS. — **Madagascar**. Analamazaotra, fls, *Thouvenot 160* (holo-, P[P00541559]!; iso-, MO!, P[P00541558, P00541560]!, TAN).

SPECIMENS EXAMINED. — Analamazaotra, *Thouvenot 160* (MO, P, TAN); Fianarantsoa, Ranomafana National Park, *Turk et al. 475* (MO).

DISTRIBUTION. — Central Madagascar, Analamazaotra and Ranomafana. The collection from Ranomafana was collected between 950 and 1150 m.

PHENOLOGY. — Flowers: March, May.

VERNACULAR NAME. — Varongy; Varongy fotsy.

DESCRIPTION

Tree to 16 m. Twigs terete or ridged, very sparsely appressed pubescent; terminal buds finely appressed pubescent. Leaves 6-15 × 2-5 cm, opposite or sub-opposite, firmly chartaceous, elliptic to narrowly elliptic, glabrous, the base sharply acute, the tip acute, domatia absent, the upper surface shiny, lower surface dull, lateral veins 6-9 on each side, tertiary venation laxly reticulate, weakly raised. Petioles 1-1.5 cm long, canaliculate, glabrous. Inflorescences 4-7 cm long, paniculate-cymose,

minutely and sparsely appressed pubescent. Flowers 4-5 mm in diameter; tepals 6, half-erect, equal, 2 mm long, sparsely pubescent outside, finely pubescent inside; stamens 9, all 4-celled, c. 1.5 mm long, the inner three with the filaments united, glands present at the base of the inner stamens; staminodia not seen. Pistil glabrous, 2.5 mm long, stigma discoid; receptacle shallow, glabrous inside. Fruit and cupule unknown.

REMARKS

Ocotea faucherei can only be recognized by the fused filaments of the inner stamens. The tepals remain half-erect at anthesis, in contrast to other species where the tepals are spreading to sometimes reflexed. Vegetative characters defining this species have not been found, which makes identification of fruiting or sterile specimens very difficult. Although the type comes from a relatively well collected locality, this species has only been once collected at this site. There is a second collection from the Ranomafana National Park. This species differs only from the variable *O. racemosa* in the fused filaments of the inner stamens and I am not sure this is really a good character. Two other collections from Perinet were annotated by Kostermans as *O. faucherei*, one in bud (*SF 12886*) and one sterile (*SF 10941*). Without good flowers it is not possible to confirm these identifications and I place these collections in *O. racemosa*.

12. *Ocotea foveolata* Kosterm. (Fig. 6)

Notulae systematicae 8: 85 (1939).

TYPUS. — **Madagascar**. Centre, Tsinjoarivo, vers 1400 m. 25.II.1925, fls, *Perrier de la Bâthie 16950* (holo-, P[P00541554]!; iso-, P[P00541553]!).

SELECTED SPECIMENS SEEN. — Antsiranana. Andapa, Doany, Andranomilolo, *Rakotovoao et al. 3343* (MO, P[P01753196]!); Centre (Nord), Massif de Marivorahona, *Service Forestier (Capuron) 3062* (MO, P[P02033230]!, TE); Fianarantsoa, Manjarivolo, *Guillaumet 3363* (MO, P[P02033235]!); Réserve Naturelle Intégrale d'Andringitra, 50 km S of Ambalavao, *Nicoll 233* (MO, P[P02033238]!).

DISTRIBUTION. — *Ocotea foveolata* is known from a few collections made at higher (1300–2000 m) altitudes from Ambalavao in the south to Ambilobe in the north. This is a wide range for an infrequently collected species and it is possible that more than one species is involved. The type is from Tsinjoarivo, SE of Tananarive.

PHENOLOGY. — Flowers; February; fruits: May, July.

VERNACULAR NAME. — Varongy mainty.

DESCRIPTION

Small tree, 5–6 m tall. Twigs angular, glabrous or with some appressed hairs when young. Terminal buds appressed pubescent. Leaves alternate, firmly chartaceous, 2.5–5 × 1.2–2.5 cm, elliptic to broadly elliptic, base acute or obtuse, apex acute or obtuse, glabrous on both surfaces, midrib, lateral veins and reticulation immersed on upper surface, reticulation immersed on lower surface, midrib and lateral veins weakly raised below; lateral veins 3–4 on each side, all except the basal pair faintly visible; domatia present in axils of basal lateral veins, consisting of deep pits with a slit-like opening. Petioles glabrous, 4–9 mm long. Inflorescences mostly in axils on normal leaves, with a few appressed hairs, 2–3 cm long, few flowered. Tepals 6 with few appressed hairs on outside, inside pubescent, *c.* 2 mm long. Stamens 9, 4-celled, *c.* 1.3 mm long, filaments pubescent, anthers glabrous, staminodia 3, stipitiform, pubescent. Ovary and inside of receptacle glabrous. Cupule deeply cup-shaped, 1.1 cm wide, 0.7 cm high; fruit (probably not yet mature) ellipsoid, 0.7 cm high.

REMARKS

This species differs from the other montane, small-leaved *Ocotea* species with pit domatia in the combination of appressed pubescent terminal buds, subglabrous twigs, small inflorescences, tripliveined leaves with domatia almost exclusively in axils of basal lateral veins and the weakly developed lateral veins, with exception of the basal pair. The leaves of the flowering specimens are immature and have a clearly raised reticulation. When mature, the leaves are thicker and the reticulation is fully immersed.

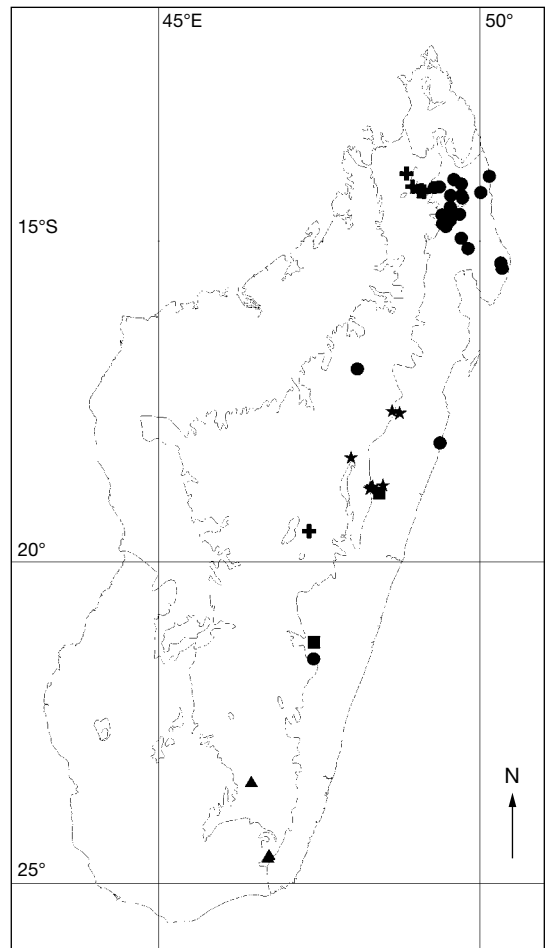


FIG. 5. — Distribution of *Ocotea faucherei* (Danguy) Kosterm. (■), *O. humbertii* Kosterm. (▲), *O. humblotii* Baill. (●), *O. involuta* Kosterm. (✚) and *O. zahamenensis* van der Werff, sp. nov. (★).

13. *Ocotea glaberrima* van der Werff, sp. nov. (Figs 7, 8)

Inter species madagascariensis glabras foliis parvis, obtusis et statura humili recedit.

TYPUS. — Madagascar. Toamasina, path from Ambatondradama to Beanjada, 15°15'57"S, 50°00'02"E, 375–1311 m, 9.X.1997, fls, Birkinshaw, Ralimanana & Ranavojoana 500 (holo-, MO [2061516]!; iso-, TAN).

PARATYPES. — Madagascar. Toamasina, Maroantsetra, comm. Ampokafo, village Amabatoledama, 15°17'S,

50°00'E, without altitude, VI.2003, fls, *Antilabimena* 2017 (MO, P, TAN); same loc., without altitude, VI.2003, fr., *Antilabimena* 2035 (MO, TAN).

DISTRIBUTION. — *Ocotea glaberrima* sp. nov. is only known from three collections made at the northern edge of the Masoala Peninsula. Altitudinal data are incomplete, reported between 375 and 1311 m.

PHENOLOGY. — Flowers have been collected in June and October, immature fruits in June.

DESCRIPTION

Shrub, 0.5-2 m. Twigs terete, glabrous; terminal buds glabrous. Leaves 3-5.5 × 1.5-2 cm, glabrous, stiffly chartaceous, elliptic, the base and apex obtuse, venation immersed on the upper surface, reticulation finely raised on the lower surface, lower surface finely and minutely gland-dotted, domatia absent, lateral veins difficult to discern, 4-6 on each side. Inflorescences 2-3 cm long, in the axils of bracts, racemose. Flowers 4 mm in diameter, white, tepals half-erect at anthesis; tepals 1-1.5 mm long, glabrous outside, sparsely pubescent inside; stamens 9, all 4-celled, glabrous, 1 mm long; inner three stamens with 2 large glands at the base, the glands half as long as the stamens; staminodia not seen; pistil *c.* 2 mm long, glabrous, the style half as long as the ovary; receptacle cup-shaped, glabrous inside. Cupule cup-shaped, 5 mm wide, 8 mm high, fruit (immature) *c.* 7 × 8 mm.

REMARKS

Ocotea glaberrima sp. nov. is an inconspicuous shrub. It stands out among the entirely glabrous *Ocotea* species from Madagascar by its small leaves with an obtuse base and apex. The other glabrous species differ as follows: *Ocotea longipedicellata* van der Werff has flowers with a pedicel of 1 cm; pedicels in *O. glaberrima* sp. nov. are 5 mm long; *Ocotea sambiranensis* van der Werff has larger leaves with an acute apex and raised reticulation on both surfaces of the leaves; *O. glaberrima* sp. nov. has only raised reticulation on the lower surface and *O. madagascariensis* is poorly known, but it has large leaves and is a large tree, in contrast with the small size of *O. glaberrima* sp. nov.

14. *Ocotea grayi* van der Werff (Fig. 3)

Novon 6: 465 (1996).

TYPUS. — Madagascar. Toliara, Réserve Intégrale 11 (Andohahela), van der Werff *et al.* 12732 (holo-, MO!; iso-, B, G, GH, K, L, LE, MO!, NY, P, PRE, QRS, TAN).

SELECTED SPECIMENS SEEN. — Fianarantsoa, Midongy du Sud, Beharana II, forêt d'Anamangy, *Andrianjafy et al.* 1203 (MO, P); Fianarantsoa, Ranomafana National Park, *Malcomber et al.* 1610 (MO, P[P02009657], TAN); Toliara, NW of Fort Dauphin along road to Ranomafana, *McPherson & Raveohitra* 14975 (MO, P[P02009658], TAN, TEF); Toliara, Réserve Intégrale 11 (Andohahela), van der Werff *et al.* 12745 (MO, P, QRS, TAN); Vestiges de forêt orientale très dégradée sur la route de Farafangana à Ambalatany, *Service Forestier (Capuron)* 23564 (MO, P[P01991762], TEF).

DISTRIBUTION. — *Ocotea grayi* is known from forests on the eastern slope from Brickaville south to Ft. Dauphin and inland to Ranomafana and Fianarantsoa, up to 1000 m elevation.

PHENOLOGY. — Flowers: August–November (mostly September–October); fruits throughout the year.

VERNACULAR NAMES. — Varongirwinbakoka, varongy, varongy fotsy, varongi mainty.

DESCRIPTION

Tree, to 25 m. Twigs terete, yellow-brown tomentellous when young, glabrescent; terminal buds tomentellous. Leaves 9-19 × 4-9 cm, alternate, tripliveined, chartaceous, elliptic to broadly elliptic, base acute or obtuse, apex acute or acuminate, lateral veins 3-5; upper leaf surface initially pubescent, soon becoming glabrous, venation immersed, lower surface with a sparse to dense indument of erect, curled hairs, venation clearly raised; domatia present, consisting of shallow pockets covered by a dense tuft of hairs. Petioles 0.8-1.5 cm long, with a similar indument as the twigs. Inflorescences (densely) pubescent, paniculate-cymose, in axils of leaves, to 12 cm long. Flowers creamy white to pale yellow, tepals 6, pubescent on both surfaces, *c.* 2 mm long; stamens 9, all 4-celled, 1 mm long, filaments pubescent, anthers glabrous, glands present at the base of the inner stamens, staminodia stipitiform, pubescent. Ovary and inside of the receptacle gla-

brous. Fruit roundish, *c.* 2 cm in diameter, cupule deeply cup-shaped, to 2.5 cm wide, 1.5 cm high.

REMARKS

Ocotea grayi is characterized by the presence of domatia, tripliveined leaves, erect indument on lower leaf surface and its rather long inflorescences. Most collections placed in this species were previously identified as *Ocotea trichophlebia* Baker. This latter species differs from *O. grayi* in its pinnately veined leaves, lack of domatia and smaller leaves and inflorescences. *Ocotea trichophlebia* also occurs at higher elevations than *O. grayi*.

15. *Ocotea humbertii* Kosterm.
(Fig. 5)

Notulae systematicae 8: 86 (1939).

TYPUS. — Madagascar. Massif de l'Andohahela, 1800-1900 m, I.1934, fls, *Humbert 13613* (holo-, P[P00541569]); iso-, MO!, P[P00541570, P00541571]).

SPECIMENS EXAMINED. — Massif de l'Andohahela, *Humbert 13613* (P); Toliara, RNI 11 Andohahela, *Rakotomalaza 555* (MO, P[P01991759]); Toliara. Betroka, Ivahona, Befarafara, *Andrianjafy et al. 1093* (MO, P[P06241566]).

DISTRIBUTION. — This species is known from two collections made in the Massif of Andohahela at 1800-1900 m elevation and one collection near Betroka at 1360 m altitude.

PHENOLOGY. — Flowers and fruits: January.

DESCRIPTION

Tree, to 18 m tall. Twigs angular, when very young brown-tomentellous, but soon glabrescent; terminal buds brown-tomentellous. Leaves alternate, firmly chartaceous, 5.5-9 × 2.3-3.5 cm, base acute, tip obtuse or acute, midrib slightly raised, lateral veins immersed on both surfaces, fine reticulation raised on lower surface, very slightly raised on upper surface, glabrous on both surfaces except for some curled reddish hairs along midrib on lower surface, lateral veins not very prominent, 5-6 on each side; domatia present, as deep pockets or cavities with a slit-like opening. Petioles 6-8 mm long, flat on upper side, with similar indument as twigs. Inflorescences in

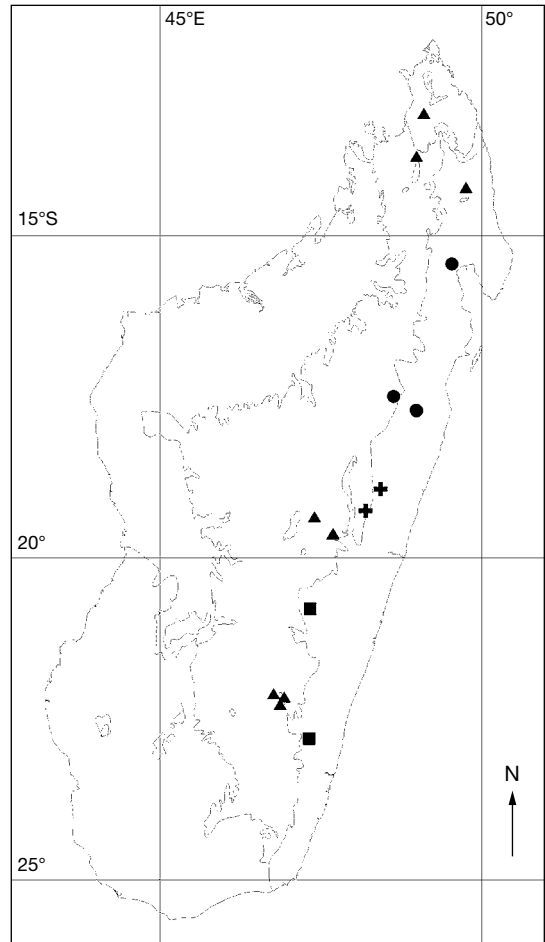


FIG. 6. — Distribution of *Ocotea brevipes* Kosterm. (■), *O. foveolata* Kosterm. (▲), *O. longipedicellata* van der Werff (●) and *O. sessiliflora* Kosterm. (✚).

axils of deciduous bracts near tips of twigs, glabrous or pubescent, to 2 cm long, few-flowered. Tepals 6, glabrous outside, pubescent inside, *c.* 1.5 mm long. Stamens 9, 4-celled, filaments with a few hairs, anthers glabrous, staminodia 3, stipitiform with a few hairs. Ovary and inside of receptacle glabrous. Cupule bowl-shaped, shallow, 1.3 cm wide, 0.5 cm high, fruit ellipsoid, *c.* 2 × 1.5 cm.

REMARKS

Ocotea humbertii is readily recognized by the erect hairs on young twigs and terminal buds, the very

short inflorescences, and the leaves with rather deep pocket-domatia. The type collection has stunted and glabrous inflorescences, and the second collection has better developed, pubescent inflorescences. In other characters, such as indument on twigs and flowers, domatia type, they are a good match. Kostermans (1957) cited three other collections under *O. humbertii*; he already suggested that these could belong to a different species. I exclude these collections from *O. humbertii*, they differ in their appressed pubescence on the terminal buds, absence of tomentellous indument on young twigs and their distribution. *Rakotomalaza 1082* (MO) is provisionally placed here; its domatia are rather shallow and the leaves wider, but it has the typical indument of erect, short hairs on the young twigs.

16. *Ocotea humblotii* Baillon (Fig. 5)

Bulletin mensuel de la Société linnéenne de Paris 1: 453 (1885).

Ocotea domatifera Kosterm., *Communication (Pengumuman) of the Forest Research Institute*, Indonesia, 60: 12 (1957). — Typus: Madagascar. Vallée de l'Andalany, 200-800 m, 12-14.XI.1950, fr., *Humbert & Capuron 24212*, (holo-, P[P00573372]!; iso-, P[P00573373, P00573374]!).

Ocotea pedunculata Kosterm., *Communication (Pengumuman) of the Forest Research Institute*, Indonesia, 60: 20 (1957). — Typus: Madagascar. Massif de l'Anjanaharibe, 3.XII.1950, fr., *Service Forestier 957* (holo-, P[P00541624]!; iso-, K, P[P00541625, P00541626]!), TEF.

TYPUS. — Madagascar. Antsianaka. 21.XII.1882, fls., *Humblot 536* (holo-, P[P00541631]!; iso-, K, MO, P[P00541632, P00541633]!).

SELECTED SPECIMENS SEEN. — Antsiranana. Réserve Spéciale Anjanaharibe-sud, N of Andapa, *Malcomber et al. 2682* (MO, P); Antsiranana. Sava, Sambava, Bevontrô, forêt d'Antsahandroboka, *Razakamalala et al. 3164* (MO, P); Toamasina. Fiv. Maroantsetra, Comm. Antakotako, along Andramofotsy river, *Antilabimena et al. 2263* (MO, P).

DISTRIBUTION. — *Ocotea humblotii* occurs in forest along the eastern escarpment from Perinet north to Sambava and Vohémar, at altitudes from 250-1100 m.

PHENOLOGY. — Flowers: September -December; fruits: February, May, August.

VERNACULAR NAMES. — Varongy mainty, tafononana, tafononana fotsy, tafononana mavo.

DESCRIPTION

Tree, to 40 m tall. Twigs angular, light brown-tomentellous; terminal buds light brown-tomentellous. Leaves alternate, chartaceous, 8-19 × 3.5-8 cm, base acute or obtuse, tip acute, upper surface glabrous, lower surface glabrous or with a sparse, minute indument, hairs appressed, venation on upper surface immersed or midrib and lateral veins slightly impressed, lower surface with raised midrib and lateral veins, tertiary venation immersed, scarcely visible; lateral veins 4-7 on each side; domatia present, consisting of deep cavities with a slit-like opening (but see discussion) often with flaps at the opening, without conspicuous tufts of hairs (sometimes minute hairs present). Petioles 1.2-2.3 cm long, with similar indument as twigs. Inflorescences in axils of normal leaves and of deciduous bracts at tip of twigs or along leafless short shoots, tomentellous, to 15 cm long. Tepals 6, 2-3 mm long, pubescent on both surfaces; stamens 9, 4-celled, 1-1.5 mm long, filaments pubescent, anthers glabrous, staminodia 3, stipitiform, pubescent. Ovary glabrous or with a few hairs; receptacle inside pubescent or glabrous. Cupule deeply cup-shaped, c. 3 cm wide, 1.5 cm tall; fruit ellipsoid, 3 × 2 cm.

REMARKS

The circumscription of *Ocotea humblotii* is unsatisfactory. As accepted here, it includes all specimens with alternate, large, nearly glabrous leaves which have domatia consisting of deep cavities with a slit-like opening. However, as already noted by Kostermans, the type of *O. humblotii* lacks these domatia. The indument of the inside of the receptacle, usually a constant character, varies from densely pubescent to glabrous. With the available material no correlation has been found between presence/absence of domatia, pubescence of receptacle and distribution. Therefore, the choice is either to maintain the species as circumscribed by Kostermans (this includes probably more than one species) or to

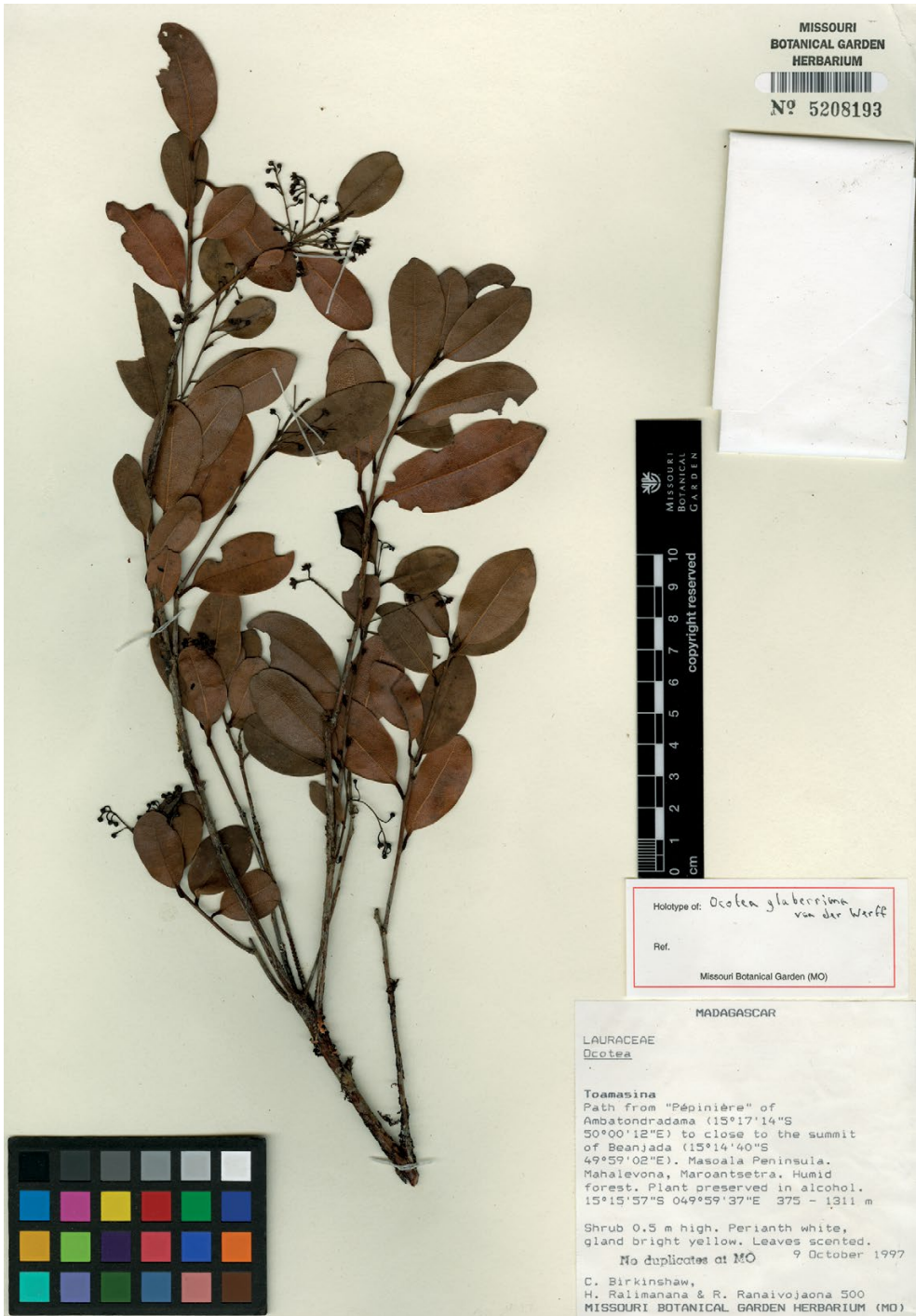


Fig. 7. — Holotype of *Ocotea glaberrima* van der Werff, sp. nov.

recognize one or more new species based on variation of a single character. I prefer the former and accept *O. humblotii* in a very wide sense. See also note under *Messmer 749* in the section on probably undescribed species at the end of this treatment. *Ocotea domatifera* and *O. pedunculata* are placed in synonymy; both have fruiting types and cannot be separated from *O. humblotii*.

17. *Ocotea involuta* Kosterm.
(Fig. 5)

Communication (Pengumuman) of the Forest Research Institute, Indonesia 60: 16 (1957).

TYPUS.— **Madagascar.** Ambatolampy. 12.XII.1949, fls, *Service Forestier 1051* (holo-, P[P00541627]!; iso-, TAN, TEF).

SELECTED SPECIMENS SEEN. — Mahajanga. Mangindrano, petit plateau dans la forêt dense humide de montagne. *Callmander et al. 427* (MO, P[P02002154], TAN); Mahajanga, forêt de crête au Nord du campement Bemafo, *Buerki et al. 110* (MO, P); Antsiranana, SAVA Region, Ambohimirahavy, *Rakotovo et al. 2536* (MO, P[P02002153], TAN); Antsiranana, Tsaratanana Massif, 12 km north of Mangindrano, *Birkinshaw 922* (MO, P[P01991806]).

DISTRIBUTION. — *Ocotea involuta* is known from the type locality, Ambatotsipihina, district of Ambatolampy and the Tsaratanana-Mangindrano area much further north. Altitudinal distribution is only known for the northern populations and is between 1700 and 2200 m.

PHENOLOGY. — Flowers: October-December; fruits: October.

DESCRIPTION

Tree, 15-25 m. Twigs angular, pubescent, the indument largely covering the surface, but wearing off with age; terminal buds brown-tomentellous. Leaves alternate, coriaceous, elliptic, 4-6 × 1.5-2 cm, apex obtuse, base decurrent on petiole with two inrolled lobes, upper surface glabrous, venation immersed, scarcely visible, lower surface sparsely appressed pubescent, becoming glabrous, midrib slightly raised, otherwise venation immersed and

scarcely visible, somewhat glaucous, margin inrolled, more strongly so towards the base with two inrolled lobes; lateral veins scarcely visible, 5-6; domatia lacking. Petioles appressed pubescent, flat, 5-6 mm from twig to inrolled lobes. Inflorescences in axils of leaves or bracts, brown-tomentellous, 3-5 cm long. Flowers 5 mm in diameter, tepals 6, equal, spreading at anthesis, c. 1.8 mm long, outside sparsely pubescent to almost glabrous, inside pubescent; stamens 9, 4-celled, 1.5 mm long; filaments pubescent, inner stamens with a gland near the base, staminodes 3, stipitiform, the lower half pubescent, pistil glabrous, receptacle glabrous or pubescent inside. Tepals deciduous in old flowers. Fruit ellipsoid, c. 1 × 0.8 cm; cupule bowl-shaped, 1 cm wide and 0.5 cm high.

REMARKS

Ocotea involuta is best recognized by the inrolled lobes at the base of the leaves, the small leaves and the brown-tomentellous twigs. Differences with *O. rigidifolia* Kosterm. are mentioned under that species. It can also be mistaken for a small-leaved *O. auriculiformis*, but that species has larger leaves with the reticulation raised and auriculate lobes are smaller. *Ocotea involuta*, as accepted here, is a variable species. The type is from Ambatolampy, south of Antananarivo and has the receptacle glabrous inside. The other collections are from the Tsaratanana-Mangindrano much further north and have the inside of the receptacle appressed pubescent. The northern collections vary somewhat in leaf shape and inflorescence length among themselves and it seems for the time being best to accept *O. involuta* in a broad sense. However, if additional collections from the type locality show consistent differences between the northern and southern populations, the northern populations may be described as an additional species.

18. *Ocotea ivohibensis* van der Werff, sp. nov.
(Figs 8, 9)

Ocoteae trichanthae similis, sed floribus sparse pubescentibus, foliis acuminatis, domatiis trichomatibus rubris ornatis recedit.

TYPUS. — Madagascar. Fianarantsoa, Ivohibe, Réserve spéciale d'Ivohibe, 22°29.8'S, 46°57.3'E, 1600 m, 25.X.1997, fl., *Messmer et al.* 506 (holo-, P[P00648795]); iso-, G, MO[2299151]).

PARATYPES. — Madagascar. Pic d'Ivohibe, 1500-2000 m, 5-11.XI.1924, fl., *Humbert* 3332 (MO, P[P01991805], TAN); Toliara. Betroka, Ivahona, Réserve spéciale de Kalambatritra, *Andrianjafy et al.* 594 (MO, P, TAN); Fianarantsoa. Iakora, Begogo, Bekora, forêt de Sahalava, *Andrianjafy et al.* 770 (MO, P, TAN).

DISTRIBUTION. — *Ocotea ivohibensis* sp. nov. is known from few collections from the Ivohibe massif and the special reserve Kalambatritra in south-central Madagascar between 1200 and 1600 m altitude.

PHENOLOGY. — Flowers: October-November; fruits: June, August.

VERNACULAR NAMES. — Antafonana, Valotra, Varongi mainty.

DESCRIPTION

Tree, 12 m. Twigs terete, moderately to densely pubescent, the hairs short, erect, becoming glabrous with age. Terminal buds densely pubescent, the surface not visible. Leaves alternate, 4-10 × 2-6 cm, chartaceous, the upper surface sparsely pubescent or glabrous, lower surface moderately pubescent, the hairs erect, curly, denser along the major veins or glabrous except for some hairs along the major veins; the base acute to obtuse, the apex acute to acuminate, acumen to 1 cm long; gland dots not visible on the leaves; lateral veins 2 to 5 pairs, impressed on the upper surface, raised on the lower surface, tertiary venation raised on the lower surface, immersed or impressed on the upper surface; domatia present in the axils of the basal 2-3 pairs of lateral veins, consisting of a depression largely covered by reddish hairs, the domatia visible as bumps on the upper surface. Petioles 4-7 mm long, flat above, with a similar indument as the twigs. Inflorescences slender, 2-6 cm long, racemose or with 1 or 2 cymes basally, few-flowered, moderately to sparsely pubescent, the hairs ascending to erect, in the axils of leaves or in the axils of deciduous bracts near the tips of the branches. Flowers greenish yellow, 3-4 mm in diameter, the tepals half-erect, spreading in old flowers. Tepals 6, equal, sparsely pubescent outside, pubescent inside, 2 mm long;

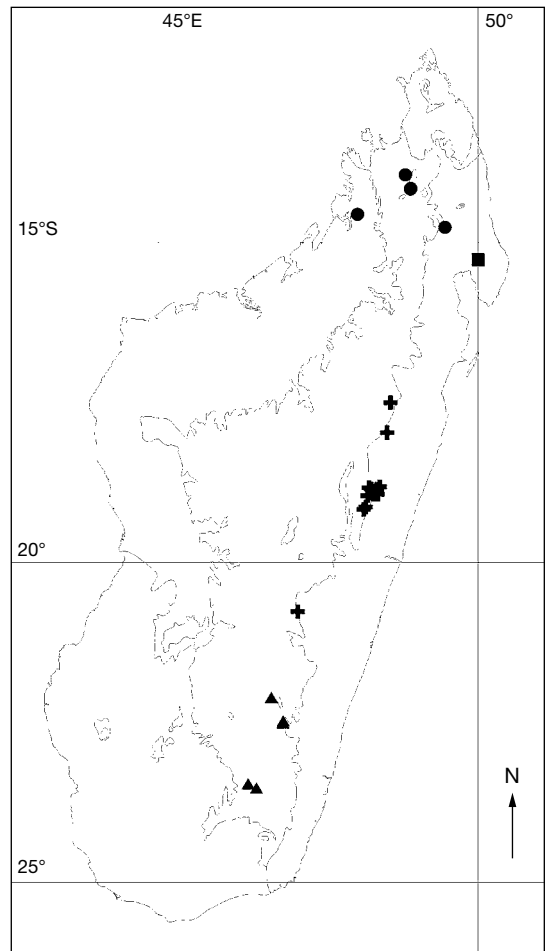


FIG. 8. — Distribution of *Ocotea glaberrima* van der Werff, sp. nov. (■), *O. ivohibensis* van der Werff, sp. nov. (▲), *O. longipes* Kosterm. (●) and *Ocotea macrocarpa* Kosterm. (+).

stamens 9, all 4-celled, *c.* 1 mm long, glabrous; staminodia stipitiform, pubescent; two globose glands present at the base of the inner 3 stamens; pistil 1.5 mm long, glabrous; receptacle deeply cup-shaped, glabrous inside. Fruit 1.3 cm wide, 1 cm high; cupule 1.6 cm in diameter, 6 mm high.

REMARKS

Ocotea ivohibensis sp. nov. has been confused with *O. trichantha* Baker from which it differs as follows: *Ocotea ivohibensis* sp. nov. has sparsely pubescent flowers (densely pubescent in *O. trichantha*),

domatia covered with reddish hairs (white hairs in *O. trichantha*), and the major veins slightly impressed on the upper leaf surface (immersed in *O. trichantha*). In the older collection made by Humbert the hairs covering the domatia have largely fallen off; leaf shape, venation and the sparse indument on the flowers allow identification as *O. ivohibensis* sp. nov. The indument on the lower leaf surface of *O. ivohibensis* sp. nov. is variable. Some specimens have a sparse indument of erect hairs on the lamina, others have only some hairs along the major veins or are glabrous with the exception of the domatia.

19. *Ocotea longipedicellata* van der Werff
(Fig. 6)

Novon 6: 465 (1996).

TYPUS. — Madagascar. Canton Sahatavy, District Vavatenina, 17.X.1960, *Réserves Naturelles 11386 Rakotondramisa* (holo-, P[P00648796]).

SPECIMENS EXAMINED. — Canton Sahatavy, District Vavatenina, RN 11386 *Rakotondramisa* (P); Toamasina, Zahamena, Réserve Intégrale 3, *Randrianjanaka* 8 (MO, P[P01991803], TAN); Toamasina, Zahamena, *Randrianjanaka* 225 (MO, P [P01991804], TAN); Toamasina, Maroantsetra, Antsirabesahatany, *Antilahimena et al.* 1625 (MO, P).

DISTRIBUTION. — Known from Vavatenina, Zahamena and the Maroantsetra district at altitudes of 600-1000 m.

PHENOLOGY. — Flowers: October; fruits December.

DESCRIPTION

Shrub. Twigs terete, slender, glabrous; terminal buds glabrous. Leaves 6-11 × 2-3.5 cm, alternate, chartaceous, elliptic or narrowly elliptic, glabrous, the base acute, apex acuminate, upper surface smooth, lower surface with the 7-9 lateral veins weakly raised; domatia lacking. Petioles glabrous, 6-10 mm long. Inflorescences in the axils of deciduous bracts, glabrous, paniculate-cymose, 5-8 cm long, laxly flowered. Pedicels slender, 1-1.5 cm long. Flowers glabrous, tepals spreading; tepals 6, 2-2.5 mm long, the inner surface with a few hairs near the base; stamens 9, all 4-celled, *c.* 1.3 mm long, filaments about as long as the anthers, inner stamens with 2 glands at the base; pistil 2 mm long,

glabrous; receptacle deep, glabrous inside. Cupule cup-shaped, 1.5 cm wide, 0.8 cm high, pedicel scarcely thickened; fruit ellipsoid, 2 × 1.5 cm.

REMARKS

This species is readily recognized by its glabrous condition, acuminate leaves and the slender inflorescences with long-pedicelled flowers. Only three other species with the glabrous condition: *O. madagascariensis*, which has obtuse, somewhat obovate leaves with coarse, raised reticulation, *O. sambiranensis*, which can be recognized by its raised reticulation, presence of small gland dots on the lower leaf surface and shorter pedicels and *O. glaberrima* sp. nov., a small shrub with small, obtuse leaves.

20. *Ocotea longipes* Kosterm.
(Fig. 8)

Notulae systematicae 8: 78 (1939).

TYPUS. — Madagascar. Massif de Tsaratanana, 1600 m, I.1923, fr., *Perrier de la Bâthie 15252* (holo-, P[P00541602]).

SELECTED SPECIMENS SEEN. — Mahajanga. Tsaratanana Massif, N of Mangindrano, *Lowry et al.* 5465 (MO); Antsiranana. Tsaratanana Massif, along path from Mangindrano to Mahatsabory Mica, *Birkinshaw et al.* 971 (MO, P[P01991796]); Majunga Province, 13 km SW de Befingotra, *Rakotomalaza & Ravelomanantsoa PJ 2141* (G, MO).

DISTRIBUTION. — This species has been collected in the Tsaratanana Massif, at elevations from 1400-1700 m.

PHENOLOGY. — Flowers (old): January; fruits: February-June.

VERNACULAR NAMES. — Tafono, tafonana.

DESCRIPTION

Tree, to 30 m tall. Twigs angular, rufous tomentellous, indument wearing off with age; terminal buds rufous tomentellous. Leaves alternate, firmly chartaceous, 10-18 × 4-7 cm, elliptic, tip acute, base acute or lamina slightly decurrent along petiole, upper surface glabrous, somewhat shiny, venation immersed, lower leaf surface sparsely or moderately pubescent, the hairs erect and curled, midrib, lateral veins and tertiary venation raised, domatia present, consisting of (shallow)



MISSOURI
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N° 6240679

TYPE SPECIMEN
Missouri Botanical Garden (MO)

Duplicatum ex Conservatorio
Botanico Genavensi

Lauraceae
Ocotea ivohibensis van der Werff
det by Henk van der Werff, 2007
Missouri Botanical Garden (MO) *Isotype*

HERBARIUM GENAVENSE, G

Lauraceae

Ocotea trichophlebia Baker

MADAGASCAR, Province de Fianarantsoa, Fiv. Ivohibe, Fir. Ivohibe, Réserve Spéciale d'Ivohibe, 6.5 km ESE d'Ivohibe, à la source de la rivière Andranomainty, 3ème camp.

22°29.8' S; 46°57.3' E, alt. 1600 m.

Forêt dense humide de montagne. Sur une crête.

Arbre de 12 m. Fleur à 6 tépales (?) verts, presque jaune au bout, 9 (?) étamines avec chacune 4 clapets jaune. Fruit vert.

Echantillon fixé à l'alcool avant séchage.

25 - X - 1997

N. Messmer, P. J. Rakotomalaza, C. Rakotovoao, NM 506

Fig. 9. — Isotype of *Ocotea ivohibensis* van der Werff, sp. nov.

pockets covered by a dense tuft of reddish hairs; lateral veins 6-7 on each side. Petioles with similar indument as twigs, 1.6-2.5 cm long. Inflorescences in the axils of leaves, paniculate, brown tomentellous, to 5 cm long. Tepals 6, densely pubescent on both surfaces, 2-2.5 mm long. Stamens 9, 4-celled, *c.* 1.5 mm long, filaments pubescent, anther glabrous; staminodia 3, stipitiform, pubescent. Ovary glabrous and receptacle appressed pubescent on the inner surface. Fruit globose, cupule cup-shaped, 1.8 cm wide.

REMARKS

Ocotea longipes was a poorly known species. The type collection has old, somewhat mouldy flowers and other specimens seen by Kostermans were either sterile or in fruit. Recently, a few good flowering specimens have been collected and the description of the flowers is largely based on those. This species resembles *O. thouvenotii* (Kostermans [1957] treated *O. longipes* as a synonym of *O. thouvenotii*), but the latter species has opposite leaves, a pubescent ovary – and receptacle – and a different distribution. *Ocotea longipes* has also a pubescent receptacle, but the ovary is glabrous. Characteristic for this species is the combination of alternate, pubescent leaves, domatia consisting of a depression, often with a fringe of hairs, and pubescent twigs.

21. *Ocotea macrocarpa* Kosterm. (Fig. 8)

Notulae systematicae 8: 90 (1939).

TYPUS. — **Madagascar.** Forêts montagneuses de l'Est. *Service des Forêts 81* (holo-, P[P00541601]!; iso-, P[P00541566, P00541567]!).

SELECTED SPECIMENS SEEN. — Toamasina. Mantadia National Park, 13 km N of Andasibe, *Malcomber & Hemingway 2748* (MO, P[P02008110]); between 9.5-11 km N of Andasibe, *Birkinshaw et al. 290* (MO); Moramanga, Andasibe, Menalamba, 11 km E of Ampitambe, *Rakotvoava & Edmond 1848* (MO, P[P06837213]).

DISTRIBUTION. — Most collections with adequate label information are from Périnet, Analamazaotra, Moramanga, road Moramanga-Anosibe and R.N. III. Altitude, when indicated, is about 800 m. There is a single collection from Zahamena, north of Périnet.

PHENOLOGY. — Flowers: February-March and July-August; fruits: May.

VERNACULAR NAMES. — Varongy mavo, varongy, varongy fotsy, varongy mainty, varongy ravimanga.

DESCRIPTION

Tree, to 25 m. Twigs angular, densely (rufous) brown-tomentellous, often with conspicuous scars of old leaves or bracts, becoming glabrous with age; terminal buds densely tomentellous. Leaves alternate, subcoriaceous, lanceolate-elliptic to elliptic, 8-15 × 2-5.5 cm, base acute, apex acute or slightly acuminate, margin flat or slightly inrolled, but base of leaves plane, upper surface glabrous, lower surface sparsely appressed pubescent or glabrous, lateral veins 8-11, immersed on both surfaces and poorly visible, reticulation immersed, not or scarcely visible, domatia absent. Petioles tomentellous, glabrous with age, 1.5-2.5 cm long, striate, flat on upper side. Inflorescences along leaf less short shoots, or in axils of bracts near tip of twigs, brown-tomentellous, 3-8 cm long. Flowers 8-9 mm in diameter, tepals 6, equal, pubescent on both surfaces, 3-4 mm long; stamens 9, 4-celled, 1.5 mm long with short (0.5 mm), pubescent filaments, inner three with 2 globose glands, near the base, staminodia 3, minute pubescent; pistil glabrous, ovary gradually narrowed into style, receptacle deep, densely pubescent inside. Tepals deciduous in old flowers. Fruits ellipsoid, 25 × 18 mm, cupule cup-shaped, 2 cm in diameter, 1 cm deep, the pedicel not thickened.

REMARKS

Characteristic for *O. macrocarpa* are the tomentellous twigs, densely pubescent inner surface of the receptacle and narrowly elliptic leaves with a flat (not inrolled) base. This species resembles *O. auriculiformis*, but that species has inrolled leaf bases. These two species have a different distribution. *O. macrocarpa* is only known from Périnet-Moramanga or further north, while *O. auriculiformis* occurs from Ambositra southwards. Kostermans (1957) cited also *SF 5238* under *O. macrocarpa*; this collection however has a glabrous interior wall of the receptacle and I exclude it from *O. macrocarpa*.

22. *Ocotea madagascariensis* (Meissner) Palacký
(Fig. 10)

Catalogus plantarum madagascariensium 2: 9 (1907).

Mespilodaphne madagascariensis Meissner, *Prodromus systematis naturalis regni vegetabilis* 15: 105 (1864). — Typus: Madagascar, *Bernier 69* (syn-, MO, NY, P[P00541563, P00541564, P00541565]).

Mespilodaphne bernieri Baillon, *Bulletin mensuel de la Société linnéenne de Paris* 1: 453 (1885).

Ocotea bernieri (Baillon) Palacký, *Catalogus plantarum madagascariensium* 2: 9 (1907). — Typus: Madagascar, S. Maria, *Bernier 69* (syn-, MO, NY, P[P00541563, P00541564, P00541565]), *Boivin 1731* (syn-, P[P00541636]).

SPECIMENS EXAMINED. — Toamasina. Île Sainte Marie, *Bernier 69* (MO, P); same location, *Boivin 1731* (P), Antsir-anana. Parc National de Masoala, forêt d'Antanandavahely, *Rahajaso et al. 772* (MO, P[P02008093]).

PHENOLOGY. — Fruiting: August.

VERNACULAR NAME. — Voane sila.

DESCRIPTION

Large trees. Twigs angular, glabrous; terminal buds glabrous. Leaves 6–16 × 3–7 cm, alternate or somewhat clustered, stiffly chartaceous, elliptic or obovate-elliptic, base acute often lamina shortly decurrent on the petiole, apex obtuse; lateral veins inconspicuous, 6–8; upper surface smooth, lower surface with rather lax, raised reticulation; margin often slightly inrolled; domatia lacking. Flowers unknown. Infructescences 3–4 cm long. Fruits not seen. Cupule deeply cup-shaped, 1.8 cm wide, 1 cm deep, with persistent tepals.

REMARKS

Ocotea madagascariensis is only known from the two older collections cited above and one recent collection, all in fruit. The glabrous, somewhat clustered, obovate-elliptic leaves with raised reticulation allow identification. Flowers are not yet known. Kostermans cited several other collections under this species, but these specimens differ in characters as venation type and indument from the syntypes and I exclude them from *Ocotea madagascariensis*. Meissner (1864) did not cite specimens in his de-

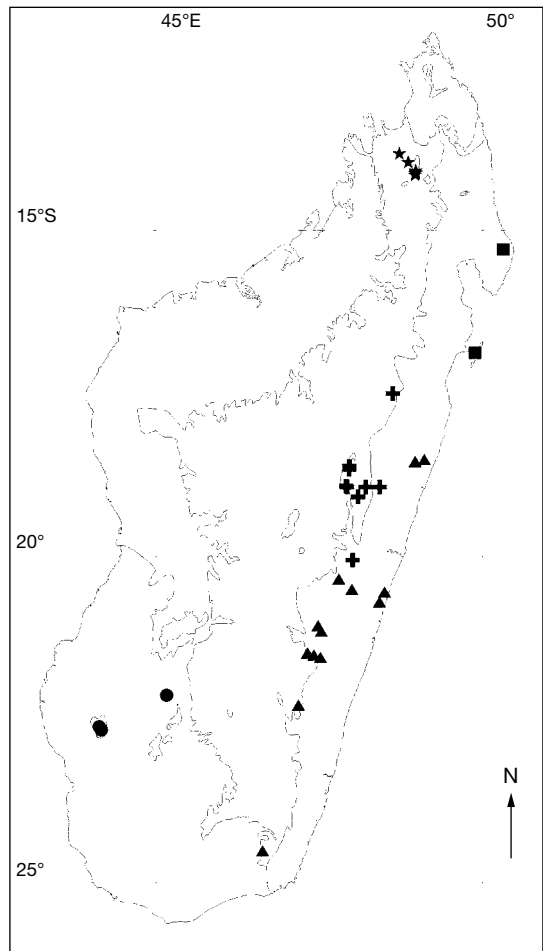


FIG. 10. — Distribution of *Ocotea madagascariensis* (Meissner) Palacký (■), *O. nervosa* Kosterm. (▲), *O. trichantha* Baker (●), *O. trichophlebia* Baker (◆) and *O. tsaratananensis* van der Werff (★).

scription of *Mespilodaphne madagascariensis*. He gave a description of cupules and fruits and stated he had seen material in P and G. In the Paris herbarium are two collections that predate Meissner's description, *Bernier 69* and a *Boivin* collection without a number. The *Boivin* collection is sterile, while the *Bernier* collection has detached cupules matching Meissner's description. Therefore, I accept *Bernier 69* as the type collection of *M. madagascariensis*. None of the *Bernier* specimens in Paris is annotated as *Mespilodaphne madagascariensis*. Therefore, the six specimens of *Bernier 69* in P and

the MO specimen recently received from P should all be considered syntypes. Because all specimens of *Bernier 69* clearly belong to the same species, I see no reason to designate a lectotype.

23. *Ocotea malcomberi* van der Werff
(Fig. 11)

Novon 6: 467 (1996).

TYPUS. — Madagascar, Toliara, Andohahela, *van der Werff et al. 12756* (holo-, MO!; iso-, B, BR, G, GH, K, L, LE, NY, QRS, TAN, TEF, TNS, US).

SELECTED SPECIMENS SEEN. — Toliara. Réserve intégrale 11, Andohahela, *Randriamampionona 429* (MO, P[P02008100], TAN); Toliara, Ambahibe, Isaka-Ivondro, *Randriamampionona 613* (MO, P[P02008092], TAN); Forêt Orientale, versant sud de col du Maningotry, *Service Forestier (Capuron) 8509* (MO, P[P02008018, P02008017], TEF).

DISTRIBUTION. — This species is restricted to SW corner of Madagascar (Andohahela, Col du Maningotry, Ifarantsa) between 300–600 m elevation. A few collections, including the type, were made along roads, suggesting this species tolerates disturbed habitats quite well.

PHENOLOGY. — Flowers: August–October; fruits: January, September, November.

VERNACULAR NAMES. — Varongy fotsy, varongy mavokely.

DESCRIPTION

Tree, 20 m tall. Twigs terete or slightly angular, when young covered with a very fine, gray indument, the hairs very short and individually scarcely visible, becoming glabrous with age; terminal buds light brown-tomentellous. Leaves alternate, chartaceous, 6–10 × 2.5–5 cm, elliptic to broadly elliptic, base and apex acute, upper surface shiny, glabrous, lower surface dull, glabrous, but very young leaves pubescent, venation immersed on upper surface, midrib and lateral veins slightly raised on lower surface, lateral veins 4–6, domatia present, consisting of mostly shallow pockets with a fringe of hairs or entirely covered by hairs. Petioles 0.8–0.3 cm long, glabrous or minutely puberulous, usually darker colored than the twigs. Inflorescences 5–13 cm long, in axils of deciduous bracts near the apices of twigs or along short, leafless shoots in axils of normal leaves, but

rarely in axils of normal leaves, paniculate, gray-pubescent. Flowers pale yellow or white. Tepals 6, pubescent both surfaces, *c.* 1.3 mm long, connect at their base and in old flowers falling off as a ring, together with the stamens. Stamens 9, 4-celled, the outer six 0.8 mm long, the filaments very short or almost absent, anthers dorsally with some hairs; inner three stamens *c.* 1.1 mm long, with 2 glands attached near the base, staminodia 3, stipitiform, pubescent. Receptacle deep, glabrous inside, ovary and style each 1 mm long, with a few hairs on upper part of ovary and along style or glabrous. Cupule deeply cup-shaped, 2 cm wide, 1.4 cm high, fruit ellipsoid, 2.2 × 1.6 cm.

REMARKS

Ocotea malcomberi has been confused with *O. trichantha*, but can be readily identified by the combination of sparse indument of the inflorescences, shallow domatia, and rather large inflorescences. The flowers and twigs are less conspicuously pubescent than in *O. trichantha*, and petioles darker than the twigs occur frequently in *O. malcomberi* and very rarely in *O. trichantha*. Distribution of the two species is also quite different. Both species have their inflorescences in axils of deciduous bracts, an uncommon character of Malagasy *Ocotea* species. Another uncommon character are the basally connate tepals, which fall off as a unit in older flowers.

24. *Ocotea nervosa* Kosterm.
(Fig. 10)

Notulae systematicae 8: 80 (1939). — Typus: Madagascar, Vondrozo, Farafangana, 1.IX.1926, fr., *Decary 4914* (holo-, P[P00541635]!; iso-, P[P00541634]!).

SELECTED SPECIMENS SEEN. — Fianantsarona, Ampama-herana, *Service Forestier 3184* (MO, P[P01955960], TEF); Fianarantsoa, Parc national de Ranomafana, *Rakoto & Turk 104* (MO, P[P01955965], TAN); Fianarantsoa, Ranomafana National Park, near village of Miaranomy, Anosimasina, *Malcomber et al. 1604* (MO, P[P01955963], TAN).

DISTRIBUTION. — *Ocotea nervosa* has been collected on the eastern escarpment from Vatomandry to Farafangana between 600 and 1350 m altitude.

PHENOLOGY. — Flowers: August; fruits: December, March, June.

VERNACULAR NAMES. — Varongy, varongy mainty, varongy fotsy, taforona, varongyvaza.

DESCRIPTION

Tree, to 20 m. Twigs angular, finely appressed pubescent with whitish hairs, quickly becoming glabrous; terminal buds densely appressed pubescent. Leaves alternate, firmly chartaceous, elliptic or broadly elliptic, 7-21 × 5-11 cm, glabrous, base acute or obtuse, apex obtuse or acute, lateral veins 6-9, not very strongly developed, arching upwards near the margin, midrib and lateral veins raised, tertiary venation forming a lax reticulum on both surfaces, domatia absent. Petioles glabrous 1.2-1.5 cm long. Inflorescences axillary along leafless short shoots, pubescent, 3-8 cm long, cymose-paniculate. Flowers 5-6 mm in diameter, the tepals half-erect. Tepals 6, equal, sparsely appressed pubescent on outer surface, the inner surface more densely pubescent, 2 mm long; stamens 9, 4-celled, 1.5-2 mm long. Filaments pubescent, inner 3 stamens with 2 glands at the base of the filaments.

Pistil glabrous, 2.5 mm long, style as long as ovary, receptacle deep, cup-shaped, appressed pubescent inside. Fruit initially enclosed in the receptacle, at maturity cupule cup-shaped, *c.* 2 cm in diameter, 1-1.5 cm high, often with 3 pronounced ribs on the outside, mature fruit ellipsoid, 2.5 × 1.7 cm.

REMARKS

Ocotea nervosa is one of the three *Ocotea* species with rather large leaves which have a raised reticulation on the upper leaf surface. *Ocotea cryptocaryoides* has glabrous inflorescences and glabrous twigs (pubescent in *O. nervosa*), while *O. cymosa* differs in having a finer reticulation on the leaves. The cupules of *O. nervosa* have sometimes three ribs on the outside and resemble in this the 6-ribbed cupules of *O. cryptocaryoides*.

The type of *O. nervosa* consists of a twig with leaves and detached fruits. The leaves of the type are large and oblong and do not quite match the other collections placed here.

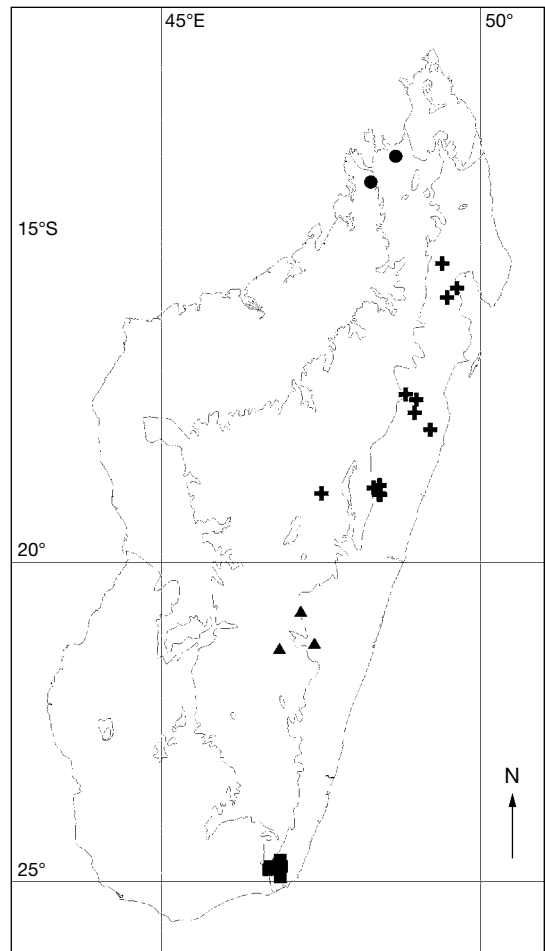


Fig. 11. Distribution of *Ocotea malcomberi* van der Werff (■), *O. perforata* Kosterm. (▲), *O. spanantha* van der Werff (●) and *O. thouvenotii* (Danguy) Kosterm. (✚).

25. *Ocotea perforata* Kosterm. (Fig. 11)

Communication (Pengumuman) of the Forest Research Institute, Indonesia 60: 20 (1957).

Ocotea oligantha van der Werff, *Novon* 6: 469 (1996). — Typus: Madagascar, Massif de Vohibe-Antoetra, 1.XII.1964, fls, *Service Forestier (Capuron)* 23856 (holo-, MO!; iso-, P[P00074126]!).

TYPUS. — Madagascar. Ambositra. 22.II.1955, fls, frts, *Service Forestier* 12463 (holo-, P[P00573370]!; iso-, P[P00573369, P00573371]).

SELECTED SPECIMENS SEEN. — Centre: Massif de l'Ankaratra, *Service Forestier (Capuron) 11961*, (MO, P[P01955950, P01955951], TEF); Massif du Vohibe-Antoetra, S-SE d'Ambositra, *Service Forestier (Capuron) 23856* (MO, P); Fianarantsoa, Parc National de Ranomafana, *Rakoto 377* (MO, P[P01955949], TAN); Fianarantsoa, forêt de Ankazomirady *Rakotomalaza 709* (MO).

DISTRIBUTION. — *Ocotea perforata* is known from several collections, made from Ambositra, to the Ankaratra mountains, between 1300 and 1800 m altitude.

PHENOLOGY. — Flowers: December, (old) February; young fruits: April; mature fruits: February.

VERNACULAR NAMES. — Varongy, varongy mainty.

DESCRIPTION

Small tree, to 12 m. Twigs somewhat angular, glabrous, the bark gray and warty; terminal buds glabrous. Leaves alternate, firmly chartaceous, 7-10 × 2-4 cm, elliptic or narrowly elliptic, base acute or gradually narrowed into the petiole, apex acute, glabrous on both surfaces, midrib, lateral veins and tertiary venation immersed in both surfaces, lateral veins 5-8 on each side, faintly visible; domatia present, consisting of deep pits, with a glabrous, small, slit-like opening, in the axils of the lateral veins as well as along the lateral veins. Petioles glabrous, 5-8 mm long, sometimes poorly differentiated from the lamina because of the decurrent base. Inflorescences axillary, basally glabrous, distally becoming pubescent, 4-7 cm long. Flowers puberulous. Tepals 6, spreading to reflexed in old flowers, pubescent on inner surface *c.* 2.5 mm long. Stamens 9, 4-celled, 1.3 mm long, glabrous, except for few hairs at base of filaments, staminodia glabrous. Inside of receptacle and ovary glabrous. Detached fruits 1.9 × 1.4 cm: detached cupule shallowly cup-shaped, 1.3 cm in diameter, *c.* 4 mm deep.

REMARKS

Ocotea perforata, as here accepted, is characterized by the presence of pit domatia along the lateral veins and glabrous twigs and terminal buds. Domatia may also be present in the axils of the basal lateral veins. It is a species known from the high mountains in central-south Madagascar. I have decided to place the recently described *O. oligantha* in synonymy

of *O. perforata*; its distribution is the same as for *O. perforata*, and it shares the glabrous twigs and terminal buds as well as the presence of domatia along the lateral veins. It was recognized largely on its wider leaves. A recent collection has leaves intermediate in width between *O. oligantha* and *O. perforata*, which makes the vegetative characters used to separate the two species tenuous.

26. *Ocotea racemosa* (Danguy) Kosterm. (Fig. 12)

Notulae systematicae 8: 86 (1939).

Mespilodaphne racemosa Danguy, *Bulletin du Muséum d'Histoire naturelle, Paris* 26: 650 (1920). — Typus: Madagascar, Analamazaotra, III.1919, fls, *Thouvenot 140*, (lecto-, P[P00541561], designated by Kostermans [1939]).

Ocotea laevis Kosterm., *Notulae systematicae* 8: 82 (1939). — Typus: Madagascar, Tampina, 3.XII.1934, fls, *Ursch 90* (holo-, P[P00074160]); iso-, L, P[P00497868]).

Ocotea platydisca Kosterm., *Notulae systematicae* 8: 87 (1939). — Typus: Madagascar. Bords du Mangoro, 700 m, 25.II, fls, *Perrier de la Bâthie 17192* (holo-, P[P00541556]); iso-, MO, P[P00541555]).

Ocotea alveolata Kosterm., *Communication (Pengumuman) of the Forest Research Institute, Indonesia* 60: 5 (1957). — Typus: Madagascar, Tokakandra, Distr. Farafangana, 12.X.1951, fls, *Service Forestier 4837* (holo-, P[P00541621]).

Ocotea discoidea Kosterm., *Communication (Pengumuman) of the Forest Research Institute, Indonesia* 60: 12 (1957). — Typus: Madagascar, Massif de l'Anjanaharibe, fr., *Service Forestier (Capuron) 955* (holo-, P[P00541628]; iso-, K, P[P00541629, P00541630]).

Ocotea similis Kosterm., *Communication (Pengumuman) of the Forest Research Institute, Indonesia* 60: 23 (1957). — Typus: Madagascar, Perinet-Moramanga, 22. XII.1954, fls., *Service Forestier 12467*, (holo-, P[P00541622]); iso-, MO, P[P00541623]).

SELECTED SPECIMENS SEEN. — Antsiranana. Réserve Spéciale d'Anjanaharibe-Sud, Sud-Ouest d'Andapa, *Ravelonarivo et al. 87* (MO, P[P01977738], TAN); Antananarivo, Ambohitantely RS, à 36 km au NE d'Ankazobe, *Randrianaivo et al. 74* (MO, P[P01977743]); Antananarivo, Road Antananarivo-Mahajanga, 4 km past crossing of Manankazo River, *Zarucchi et al. 7537*

(MO, P[[P01955932](#)]); Mahajanga, Forêt domaniale à Anjiamazava, *Ravelonarivo et al.* 1065 (MO, P); Fianarantsoa, Parc National de Ranomafana, *Kotozafy & Randriamanantena* 12 (MO, TAN); Toamasina, Commune Amparafaravola, Fkt. Vohimena, *Randrianasolo et al.* 293 (MO); Toamisina, Masoala Peninsula, near village Ambanizana, *van der Werff et al.* 12787 (MO); Toliara, 5 km N of Ilaka-Est forest, between Ambodisakoana village and Antandrainiminty, *Randrianasolo* 287 (MO).

DISTRIBUTION. — *Ocotea racemosa* is a widespread species, from Ft. Dauphin in the south to Antalaha in the north from sea level up to 1200 m.

PHENOLOGY. — Most flowering collections were made between January and June ; most fruiting collections between June and January.

VERNACULAR NAMES. — Varongy, Varongy mavo, varongy mainty, varongy fotso, varongy faza, tefimoa, tafonana, rotr'ala.

DESCRIPTION

Trees, to 20 m. Twigs angular or terete, appressed pubescent or glabrous, terminal buds appressed pubescent to subglabrous. Leaves 5-14 × 2-5.5 cm, opposite or subopposite, elliptic, stiffly chartaceous to coriaceous, glabrous or with a few appressed hairs on the lower surface, the base acute to obtuse, apex obtuse to acute, margin plane or inrolled, lateral veins 5-8, immersed, poorly visible, reticulation immersed or raised. Inflorescences usually in axils of deciduous bracts along leafless short shoots, paniculate cymose, sparsely pubescent, to 10 cm long. Flowers 4-5 mm in diameter, the tepals half-erect to spreading, sometimes reflexed in old flowers. Tepals 6, 2-3 mm long, sparsely pubescent outside, pubescent or densely pubescent on the inner surface, stamens 9, all 4-celled, c. 2 mm long, the filaments usually pubescent, anthers glabrous, staminodia present, 3, stipitiform and pubescent ; pistil 2 mm long, glabrous ; receptacle cup-shaped, glabrous inside. Fruit ellipsoid, 8-15 mm long, cupule 1-2 cm wide, cup-shaped or bowl-shaped.

REMARKS

As accepted here, *O. racemosa* is a very variable species occurring in a wide range of habitats and comprising all specimens with opposite or subopposite leaves as well as a number of specimens with alternate leaves. It is very likely that more than one

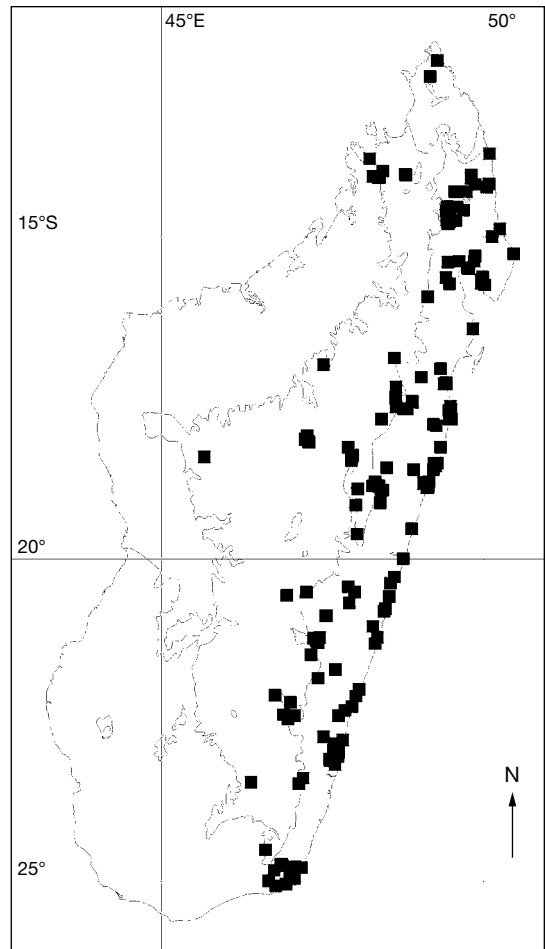


FIG. 12. — Distribution of *Ocotea racemosa* (Danguy) Kosterm.

entity is involved, given the variation in leaf shape, venation, cupule and fruit shape or size. Plants from the same locality may look similar and differ slightly in minor vegetative characters from plants from other localities, but there is also variation among plants from the same locality. For instance, the types of *O. racemosa* and *O. similis* are both from the Perinet region. They seem to differ in only one character, the density of indument on the inner surface of the tepals. With more specimens now available from that area than when these species were originally described, a full range of density of pubescence can be seen, from sparse to dense.

Initially I had separated specimens with alternate leaves as *O. laevis*; most of which are from lowland sites. The type of *O. laevis* however has both opposite and alternate leaves. Two collections in P, SF 13390 and SF 13392, both from Nosy Varika, are very similar and differ only in leaf position; SF 13390 has opposite leaves whereas SF 13392 has alternate leaves, suggesting that leaf position is variable and should not be used to separate *O. laevis* from *O. racemosa*.

Circumscribing *O. racemosa* broadly to include specimens with opposite and alternate leaves has its shortcomings. For instance, two quite distinct forms from the Masoala peninsula, one with opposite leaves and one with alternate leaves, both end up in *O. racemosa* s.l. despite the fact that they almost certainly represent different species. Geographically, several slightly distinct forms can be recognized among the specimens with opposite leaves; it is possible, however, that these forms reflect better collected sites more than taxonomic entities. These forms are as follows: a coastal form ranging from Tampolo south to Fort Dauphin; a second lowland form from further north around the Baie d'Antongil to Antalaha with larger leaves and inflorescences than the first form, a form at mid-elevation ranging from Ranomafana to Andapa, and a mid to high altitude form from the Sambirano area with larger, thinner leaves. I have not found floral differences between these forms and the vegetative differences are slight and not consistent. It is tempting to try to separate taxa geographically because certain localities are quite well collected (for instance Ranomafana, Perinet, Andapa among the mid-elevation sites). However, once the intervening areas are better collected, I expect that the minor vegetative differences that can now be discerned between the populations will evaporate. There is also some variation among specimens with alternate leaves, but this is not as pronounced as among the specimens with opposite leaves. The types of *O. racemosa*, *O. discoidea*, *O. platydisca* and *O. similis* are from mid-elevation, that of *O. alveolata* is from the southern coastal area and that of *O. laevis* is from Tampolo, a coastal site further north. Kostermans described *O. alveolata* as having alternate leaves;

the type and paratype have both some leaves opposite and others alternate or subopposite. Other collections, vegetatively similar, and from near the type locality, have opposite leaves.

27. *Ocotea rigidifolia* Kosterm.
(Fig. 2)

Notulae systematicae 8: 91 (1939). — Typus: Madagascar. Forêt d'Analamazaotra, *Ursch 65* (holo-, P[P00573378]), iso-, MO!).

SPECIMENS EXAMINED. — Toamasina. Ambatovy, *Rakotomalaza 1253* (MO); Analamazaotra, *Ursch 65* (MO, P[P00573378]).

DISTRIBUTION. — It is only known from the type collection made in Analamazaotra and a collection from Ambatovy between 800 and 1000 m.

PHENOLOGY. — Flowers: March.

DESCRIPTION

Tree, of unknown size. Twigs angular, densely brown tomentellous, on young twigs the surface not visible, the indument wearing off on older twigs; scars of fallen bracts conspicuous; terminal buds densely tomentellous. Leaves alternate, coriaceous, elliptic to broadly elliptic, 4-7 × 1.5-3.5 cm, base decurrent on the petiole, apex obtuse, margin inrolled, especially near the base, somewhat glaucous on lower surface; at maturity glabrous on both surfaces, but young leaves with some scattered hairs on lower leaf surface, especially along midvein; lateral veins 6-9; lateral veins and tertiary venation raised on both surfaces; domatia lacking. Petioles 5-8 mm long, brown-pubescent, becoming glabrous with age, shallowly canaliculate. Inflorescences in axils of leaves, rather densely brown-tomentellous, to 6 cm long. Flowers 5-7 mm in diameter, tepals 6, equal, spreading at anthesis, subglabrous on outside, pubescent inside, stamens 9, 4-celled, c. 1.5 mm long, the filaments pilose, inner 3 stamens with 2 globose glands near the base, staminodia stipitiform, the lower half-pubescent. Pistil glabrous, c. 2 mm long, ovary gradually narrowed into style, receptacle densely pubescent inside. Tepals deciduous in old flowers. Fruit unknown.

REMARKS

Ocotea rigidifolia is best recognized by its broadly elliptic leaves with inrolled margins, glaucous lower leaf surface and the brown-tomentellous young twigs. One of the two known collections is tentatively placed here; it has flat leaves and lacks a decurrent base, but it has the dense tomentellous indument and the inside of the receptacle is pubescent. It can be confused with *Ocotea involuta*, which differs in having narrower leaves with an inrolled, auriculate base and in having the receptacle nearly glabrous inside. The pubescent receptacle and the decurrent leaf base are characters shared with *O. auriculiformis*; the latter species differs in its longer, narrower leaves. Both *O. rigidifolia* and *O. auriculiformis* occur in the Perinet-Analamazaotra region. Kostermans (1957) cited three fruiting collection under *O. rigidifolia*, but these specimens lack revolute leaf margins and the base of the leaves is not decurrent on the petiole. I exclude these specimens from *O. rigidifolia*.

28. *Ocotea sambiranensis* van der Werff
(Fig. 4)

Novon 6: 470 (1996). — Typus: Madagascar, Antsiranana, Massif du Manongarivo, *van der Werff & McPherson 13502* (holo-, MO!; iso-, GH, K, L, LE, P, PRE, TAN).

SELECTED SPECIMENS SEEN. — Antsiranana, Massif de Manongarivo, *van der Werff & McPherson 13472, 13490, 13501, 13502 & 13523* (MO, P, TAN); Antsiranana, Piste d'Antsatrotro, Réserve spéciale de Manongarivo, *Andriatsiferana et al. 1703* (MO, P[P06837098]).

DISTRIBUTION. — Reported from the Manongarivo Massif from 1000 to 1600 m and from the forêt de Kalabenono near Ambilobe between 700 and 800 m.

PHENOLOGY. — Flowers from October to December, fruits in August and October.

DESCRIPTION

Shrub or small tree to 6 m. Twigs terete or angular, glabrous; terminal buds glabrous. Leaves 8-16 × 3-7 cm, alternate, narrowly elliptic or slightly ovate, glabrous, firmly chartaceous, base acute or rarely obtuse, apex sharply acute or acuminate, lateral veins weakly developed, 7-11 on each side, secondary and tertiary venation raised on both surfaces; lower surface

densely and minutely gland-dotted; domatia absent. Petioles glabrous, canaliculate, 7-13 mm long. Inflorescences in axils of deciduous bracts near the tips of the branches or along leafless short shoots, 3-7 cm long. Pedicels 3-6 mm long. Flowers white, fragrant, tepals spreading at anthesis, 6-7 mm diam. Tepals 6, glabrous outside or with a fringe of hairs, minutely puberulous inside, stamens 9, all 4-celled, *c.* 2 mm long, the filaments a little shorter than the anthers, glabrous; inner stamens with 2 glands at the base, staminodia very small, pubescent; pistil glabrous, 3 mm long, receptacle deep, glabrous inside. Fruit ellipsoid, 2.5-3 × 1.5 cm, cupule deeply cup-shaped, 2 cm wide, with 6 lobes or teeth.

REMARKS

Ocotea sambiranensis can be easily recognized by the combination of glabrous vegetative parts, the raised reticulation on both surfaces of the leaves, the acute to acuminate leaves and the numerous, small gland dots on the lower leaf surface. This species is only known from the mountains in the NW of Madagascar. A recent collection from the chaîne de Galoko near Ambilobe differs from the specimens from Sambirano in the much finer reticulation on the leaves and a more pronounced line of hairs at the margin of the tepals; in other characters (glabrous leaves, twigs and terminal buds, leaf shape, presence of gland dots) it agrees with typical *O. sambiranensis*.

29. *Ocotea sessiliflora* Kosterm.
(Fig. 6)

Communication (Pengumuman) of the Forest Research Institute, Indonesia 60: 22 (1957). — Typus: Madagascar, Forêt de Analamazaotra, près de Perinet, 15.X.1953, fls, *Service Forestier (Capuron) 8564* (holo-, P[P00541620]!; iso-, P[P00541619]!), TEF).

SPECIMENS EXAMINED. — Befoza, Périnet, *Réserves Naturelles 1444* (MO, P[P01955922, P01955923]); Forêt d'Analamazaotra, Périnet, *Service Forestier (Capuron) 8564* (P[P00541619, P00541620], TEF); Ankazomanitra, PK 45 route Moramanga-Anosibe, forêt sèche, *Service Forestier 26806* (MO, P[P00346374]); ouest du village d'Antanandava (PK 45 de la route Moramanga-Anosibe), *Service Forestier 28424* (MO, P[P01955921]).

DISTRIBUTION. — *Ocotea sessiliflora* is only known from four collections from the Périnet area; altitude not mentioned on any of the collections.

PHENOLOGY. — Flowers collected in July and August.

VERNACULAR NAME. — Varongy fotsy.

DESCRIPTION

Tree, to 20 m tall. Twigs angular, glabrous or somewhat pubescent near the apex; terminal buds appressed pubescent. Leaves alternate, coriaceous, 4-7 × 1.8-3.5 cm, glabrous, base and apex acute, sometimes base obtuse, lateral veins 5-6, these and tertiary venation raised on both surfaces, margin flat or recurved, domatia lacking. Petioles 4-8 mm long, glabrous, canaliculate. Inflorescences in axils of deciduous bracts, 3-6 cm long, puberulous-tomentose, especially towards the flowers, bracts subtending flowers present at anthesis, these to 3 mm long, densely pubescent outside, glabrous inside. Tepals more or less erect at anthesis, 6, equal, densely pubescent near base, sparsely on upper 2/3, c. 3 mm long, stamens 9, 4-celled, c. 1.5 mm long, filaments sparsely pubescent, inner three stamens with 2 glands at base of filaments, staminodia 3, stipitiform, 0.8 mm long, pubescent; pistil glabrous, 2.5-3 mm long, ovary about as long as the style, receptacle deep, cup-shaped, glabrous inside. Immature fruit enclosed in the cupule (0.5 cm long); young cupule with persistent tepals; bracts still present in young fruiting stage.

REMARKS

Diagnostic for this species is the combination of glabrous leaves with raised reticulation on both surfaces, the sessile flowers with a densely pubescent base and the persistent bracts at the base of the flowers. The bracts persist even in young fruiting stage. It can be readily confused with *O. eriothyrsa*, but this species had pedicellate (not sessile) flowers, the base of the receptacle pubescent (not glabrous) and has the young twigs more pubescent. Also, in *O. sessiliflora* the basal lateral veins are frequently more ascending than the more distal ones. *Ocotea sessiliflora* seems restricted to Périnet, one of the best collected areas in Madagascar and it is therefore surprising that only 4 collections are known from this species.

30. *Ocotea spanantha* van der Werff, sp. nov. (Figs 11, 13)

Ocotea ambrensis similis, sed foliis floribusque majoribus, inflorescentiis paucifloris recedit.

TYPUS. — Madagascar, Antsiranana, Réserve spéciale de Manongarivo, à l'est d'Ankaramibe Bekolosy, 14°03'05"S, 48°17'07"E, 700-900 m, XII.1993, fls, fr., Rakotomalala & Fernand 92, (holo-, MO[2299154]; iso-, P[P00713427]).

PARATYPE. — Madagascar, Antsiranana, Ambilobe, Bermanja, Anketrabe, forêt de Kalabenono, 818 m, fr., Callmander, Vasaba & Malaza 562 (MO).

DISTRIBUTION. — This species is only known from the two collections listed above.

PHENOLOGY. — Flowers: December; fruits: November, December.

DESCRIPTION

Tree, 15 m. Twigs angular, minutely appressed pubescent, soon becoming glabrous; terminal buds densely appressed pubescent with a few persistent bracts at the base. Leaves 7-13 × 2.5-6 cm, elliptic, glabrous, firmly chartaceous, the base acute or obtuse, the apex bluntly acute, venation immersed on the upper surface, weakly raised on the lower surface, lower surface densely and minutely gland-dotted, lateral veins 5-7 on each side, domatia absent. Inflorescences along leafless short shoots, 2-7 cm long, with a few cymes basally, distally racemose; short shoots with pubescent, persistent bracts, these 3-6 mm long. Flowers 6-8 mm in diameter, tepals spreading at anthesis; tepals 2-3 mm long, sparsely pubescent outside, densely pubescent inside; stamens 9, all 4-celled, dorsally pubescent, the outer six 1 mm long, inner three 1.5 mm long, glands present at the base of the inner stamens; staminodia 3, stipitiform, pubescent; pistil glabrous, 2 mm long, with a short style; receptacle deep, glabrous inside. Fruit 2.5 × 2 cm, cupule deeply cup-shaped, 3 cm wide, 1.5 cm high, without remnants of tepals.

REMARKS

Ocotea spanantha sp. nov. shares with *Ocotea ambrensis* sp. nov. the presence of bracts along the leafless short shoots. It differs from that species in its larger leaves and flowers, in its few-flowered inflo-

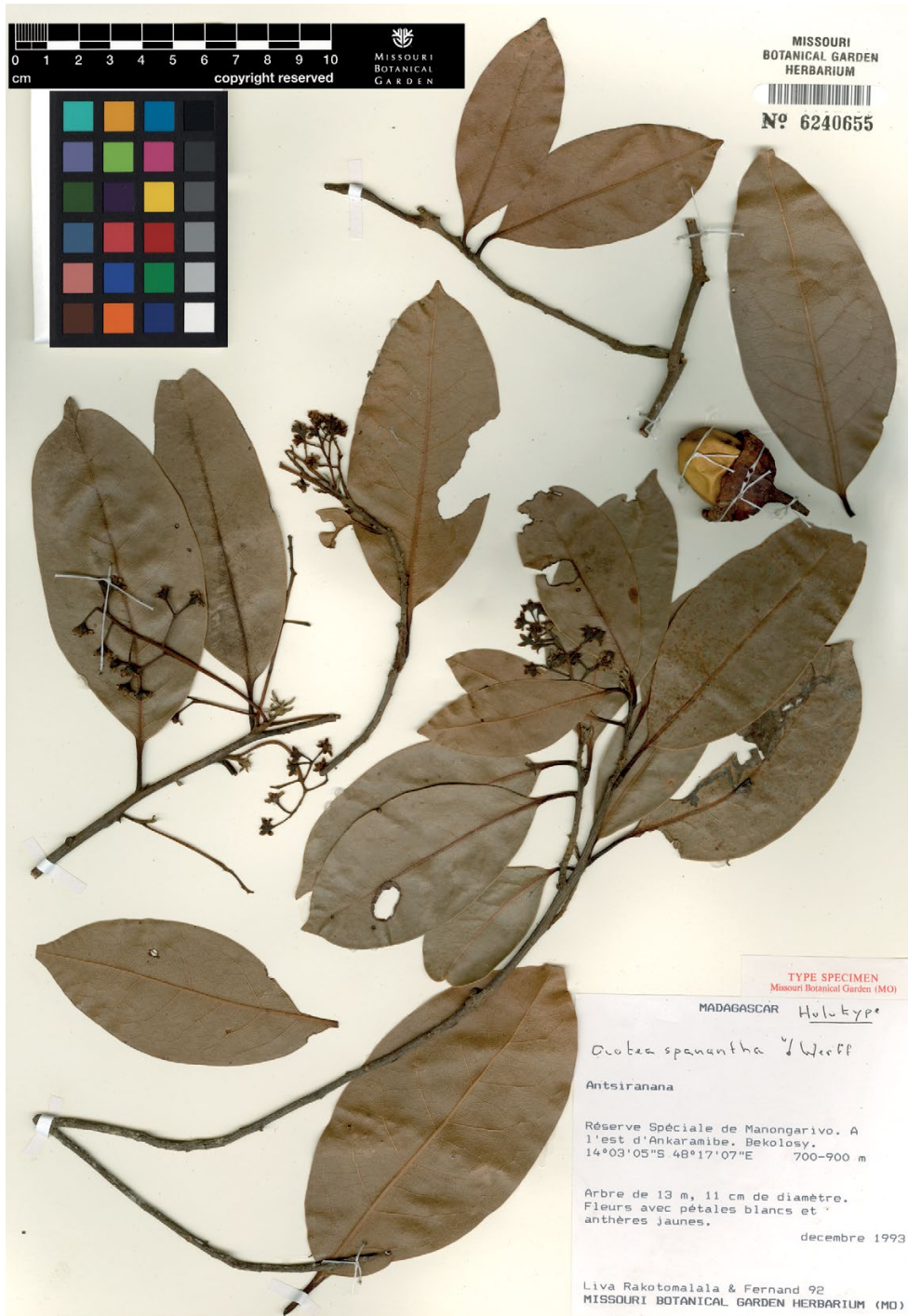


FIG. 13. — Holotype of *Ocotea spanantha* van der Werff, sp. nov.

rescences and the entire margin of the cupule. The side branches of the inflorescences leave the main axis almost under a 90 degree angle in *O. spanantha* sp. nov., whereas these branches are ascending, under a sharp angle in *O. ambrensis* sp. nov. The widespread and variable *O. racemosa* has often also inflorescences along leafless short shoots, but in that species the somewhat persistent bracts below the terminal buds are lacking.

31. *Ocotea thouvenotii* (Danguy) Kosterm.
(Fig. 11)

Notulae systematicae 8: 78 (1939).

Mespilodaphne thouvenotii Danguy, *Bulletin du Muséum national d'Histoire naturelle, Paris* 26: 561 (1920). — Typus: Madagascar, Analamazaotra, XI.1919, fls, *Thouvenot 33* (holo-, P[P00573067]); iso-, K, MO, P[P00541557, P00573066]!).

Ocotea capuronii Kosterm., *Communication (Pengumuman) of the Forest Research Institute, Indonesia*, 60: 7 (1957). — Typus: Madagascar, Bassin de Fananehana, 600 m, II.1954, fr., *Service Forestier (Capuron) 8978* (holo-, P[P00541603]); iso-, K, MO!, P[P00541604, P00541605]!).

SELECTED SPECIMENS SEEN. — Toamasina. Fiv. de Toamasina II, commune Anterina, RNI Zahamena, *Andrianjafy et al. 238* (MO); Toamasina. 7.5 km E of the turnoff to Andasibe on Route nationale 2, at km 144, *Miller et al. 8766* (MO, TAN); Toamasina, Préf. Fénérive Est, Vavatenina, Commune Ambodimangavalo, *Andrianjafy 307* (MO, P[P01977677]).

DISTRIBUTION. — This species occurs in eastern forests, collected in Périnet, Ambatondrazaka, vicinity of Tamatave north to the basin of the Fananehana between 600 and 1100 m altitude.

PHENOLOGY. — Flowers: November-January; fruits: February, June, September, October.

VERNACULAR NAMES. — Varongy ravimanga, antafonana, varongy fotsy, varongy, antafonana.

DESCRIPTION

Tree or shrub, to 22 m tall. Twigs angular, densely (rufous) brown-tomentellous, terminal buds densely tomentellous. Leaves (sub)opposite, firmly chartaceous, 11-20 × 5-8 cm, elliptic, apex and base acute,

upper surface glabrous or with remnants of a tomentellous indument on midrib and lateral veins, lower surface with a short, erect indument, surface visible, indument much denser along midrib and lateral veins, domatia present in axils of the main lateral veins, consisting of a shallow pocket covered by a tuft of reddish hairs; lateral veins 6-8 on each side, immersed on upper surface, raised on lower surface, tertiary venation raised on lower surface. Petioles 1.4-1.8 cm long, with similar indument as twigs. Inflorescences in the axils of leaves, paniculate, brown-tomentellous, 5-10 cm long. Flowers 5 mm in diameter, tomentellous; tepals 6, densely pubescent on inner surface, 2 mm long, half-erect at anthesis. Stamens 9, all 4-celled, 1 mm long, filaments short, pubescent, anthers papillose, staminodia 3, pubescent. Receptacle densely pubescent inside, ovary sparsely pubescent, *c.* 1 mm long, gradually narrowed into the 1 mm long style. Cupule cup-shaped, 1.5 cm in diameter, pedicel somewhat thickened in fruit.

REMARKS

Ocotea thouvenotii is one of the two *Ocotea* species with (sub) opposite leaves and domatia. The other species, *O. corethroides*, differs in its very short, ± appressed indument on the lower leaf surface or glabrous leaves, in its generally deep domatia with slit-like opening, and the absence of a tuft of red hairs in or surrounding the domatia. The papillose anthers are unusual among the *Ocotea* species from Madagascar. Vegetatively, *O. thouvenotii* is similar to *O. longipes*, but the latter species has alternate leaves and is restricted to the Massif de Tsaratanana and the adjacent basin of the Maeverano. Kostermans (1957) considered *O. longipes* a synonym of *O. thouvenotii*. The differences between these two species are not very strong. The leaf position is not always easy to verify, especially when some of the leaves have fallen off and leaf position is only indicated by their scars. The geographic separation is also not absolute. A collection from Vavatenina, *Rakotondrafara 127*, (in the distribution range of *O. thouvenotii*) has alternate leaves, while *Antilabimena 2714* from Maroantsetra has opposite leaves. Because the great majority of the collections show that mid-altitude plants with a southern distribu-

tion have opposite leaves and high-altitude plants with a northern distribution have alternate leaves, I recognize *O. thouvenotii* and *O. longipes* as distinct species. Kostermans (1939) indicated that *O. thouvenotii* was possibly only a variety of *O. humblotii*, but this latter species has slit-domatia and alternate, nearly glabrous leaves.

Kostermans recognized *O. capuronii* based on differences in leaves and indument, but did not indicate what these differences were. In my opinion, *O. capuronii* falls within the variation of *O. thouvenotii*.

32. *Ocotea trichantha* Baker (Fig. 10)

Journal of the Linnaean Society 22: 515 (1887). — Typus: Madagascar. Without further data, fls, *Baron 4373* (holo-, K; iso-, P[P00541637 (under erroneously *Baron 4979* in SONNERAT), P00541638]!).

SELECTED SPECIMENS SEEN. — Centre, Ravin boisé dans l'Isalo au NW de Ranohira, *Service Forestier (Capuron) 28280* (MO, P[P01977641], TEF); Toliara, Forêt d'Analavelona, 1.5 km NO d'Andranoheza, *Randrian-tafika & Rakotovoava 227* (MO, P[P01977644]).

DISTRIBUTION. — This species has been collected at Andiamanero (Ihosy), near Isalo and the Massif d'Analavelona at altitudes from 600-1300 m.

PHENOLOGY. — Flowers: August, September, December; fruits: December.

VERNACULAR NAMES. — Maroanaka (Bara dialect), varongy.

DESCRIPTION

Tree, to 25 m tall. Twigs terete, densely light brown-tomentellous, becoming glabrous with age; terminal buds densely tomentellous. Leaves alternate, firmly chartaceous, 5-9 × 2.5-5 cm, elliptic to broadly elliptic, base acute or obtuse, tip obtuse or acute, upper surface shiny, glabrous or with some hairs near base of midrib, lower surface dull, glabrous or with some scattered, small, appressed hairs; lateral veins 3-5, venation immersed on upper surface, raised on lower surface, domatia present, often several pairs on a leaf, consisting of rather shallow pockets, this sometimes with

a fringe of hairs. Petioles 0.9-1.3 cm long, with similar indument as twigs. Inflorescences in axils of bracts close to terminal buds (sometimes appearing in axils of normal leaves, but on closer inspection along a leafless short shoot), densely pubescent, to 4 cm long. Flowers white. Tepals 6, pubescent on both surfaces, 1.5-2 mm long; stamens 9, 4-celled, filaments and anther dorsally pubescent, 1.5 mm long, filament shorter than anther; staminodia 3, stipitiform, pubescent. Ovary and inside of receptacle glabrous. Cupule deeply cup-shaped, 1.5 cm wide, 1.1 cm high, fruit ellipsoid, 2 × 1.5 cm.

REMARKS

This species can be recognized by its short, densely pubescent inflorescences, alternate, few-veined leaves (at times approaching the tripliveined condition) and the densely tomentellous twigs. Most collections of this species are sterile or with fruits; the description of the flowers is based on the collection *SF 28280 Capuron*. The presence of inflorescences in axils of deciduous bracts and not in axils of normal leaves, is unusual among *Ocotea* species in Madagascar, but occurs also in the related *O. malcomberi*. This species differs from *O. trichantha* in its much longer and less densely pubescent inflorescences. More similar to *O. trichantha* is *O. ivohibensis* sp. nov., which differs in its sparsely pubescent flowers, erect hairs on lower leaf surface and the reddish hairs covering the domatia.

33. *Ocotea trichophlebia* Baker (Fig. 10)

Journal of the Linnaean Society 20: 242 (1883).

Mespilodaphne trichophlebia (Baker) Baillon, *Bulletin mensuel de la Société linnéenne de Paris* 56: 448 (1885). — Typus: Madagascar. Without further data, *Baron 1776* (fls) (lecto-, K, designated by Kostermans [1939]; iso-, P[P00541577, P00573382]!).

Ocotea acuminata Baker, *Journal of the Linnaean Society* 20: 242 (1883). — *Mespilodaphne acuminata* (Baker) Baillon, *Bulletin mensuel de la Société linnéenne de Paris* 56: 448 (1885). — Typus: Madagascar, *Baron 1970*, fls, (holo-, K; iso-, P[P00573380]!).

SELECTED SPECIMENS SEEN. — Antananarivo. Fiv. Anjozorobe, forêt d'Amparafarantany, *Raharijaona et al.* 34 (MO) ; Toamasina. Fiv. Moramanga, Fok. Ambohibato, forêt de Rianan'i Galy, *Raharijaona et al.* 44 (MO, P, TAN).

DISTRIBUTION. — Upper part of eastern slope, mostly along road Antananarivo-Tamatave near Mandraka, but N to Miakadaza, also Périnet, at elevations between 900 and 1200 m.

However, most older collections have very incomplete label information.

PHENOLOGY. — Flowers: November-January; fruits: June, August, November.

VERNACULAR NAMES. — Varongy mavo, varongy mainty, varongy, varongivoara.

DESCRIPTION

Large shrub or small tree, to 10 m tall. Twigs terete, densely pubescent, the hairs erect, the indument wearing off with age; terminal buds densely pubescent. Leaves alternate, chartaceous, 6-13 × 2.5-7 cm, elliptic to broadly elliptic, base obtuse or acute, tip acute or acuminate, lateral veins 5-6 on each side, midrib and lateral veins impressed above, tertiary venation immersed, midrib, lateral veins and tertiary venation raised on lower surface; upper surface with scattered, erect hairs, the indument denser on midrib and lateral veins, lower surface pubescent, the hairs erect; domatia lacking. Petioles 0.4-1.2 cm long, with similar indument as twigs. Inflorescences axillary, pubescent, *c.* 5 cm long, rather few-flowered, bracts sometimes present at anthesis. Tepals pubescent on both surfaces, but less so on inner surface, 1.5-2 mm long. Stamens 9, 4-celled, 1.5 mm long, filaments pubescent, anther glabrous, staminodia 3, pubescent, stipitiform. Ovary and inside of receptacle glabrous. Cupule deeply cup-shaped, 1.4 cm wide, 1 cm high, fruit ellipsoid, 1.6 × 1.2 cm.

REMARKS

This species has frequently been confused with *Ocotea grayi* and differences between the two are discussed under *O. grayi*. Vegetatively, the impressed midrib and lateral vein on the upper leaf surface and the pilose lower leaf surface are characteristic.

34. *Ocotea tsaratananensis* van der Werff (Fig. 10)

Novon 6: 472 (1996).

TYPUS. — Madagascar. Massif de Tsaratanana, aux abords de l'Andohanisambirano, 2450 m, 8.XI.1966, fls, *Service Forestier (Capuron)* 27010 (holo-, MO!; iso-, P[P00074158, P00074159], TEF).

SELECTED SPECIMENS SEEN. — Mahajanga. Fiv. Bealanana, Commune Mangindrano, massif du Tsaratanana, *Razafitsalama et al.* 259 (MO, P); Antsiranana. Tsaratanana massif N of Mangindrano, *Lowry et al.* 5397 (MO, P[P01977634]); Antsiranana, Fiv. Ambanja, Comm. Marotolana, forêt de Montagne de Bepiana, *Ludovic et al.* 336 (MO, P, TAN).

DISTRIBUTION. — This species is known from few collections, made on the upper slopes of the Massif de Tsaratanana, at 2300-2500 m elevation.

PHENOLOGY. — Flowers: November; fruits: April, November.

DESCRIPTION

Tree, to 10 m (said to reach 15-20 m in valleys). Twigs angular, brown tomentellous when young, glabrescent with age, with conspicuous scars from fallen twigs or bracts; terminal buds densely tomentellous. Leaves alternate, coriaceous, 3-5.5 × 2-2.5 cm, (broadly) elliptic, base acute, obtuse or rounded, tip obtuse or acute, glabrous on both surfaces or with a few hairs along midrib on lower surface, midrib and lateral veins immersed on both surfaces, reticulation immersed or weakly raised on both surfaces, lateral veins 4-5 on each side, poorly visible, domatia as deep pits present in the axils of the basal lateral veins, sometimes smaller pit domatia present in axils of distal veins, margin of domatia glabrous. Petioles 0.7-1.0 cm long, with similar indument as twigs or, on older twigs, darker in color than the twigs. Inflorescences to 5 cm long, densely pubescent, mostly in axils of deciduous bracts. Tepals 6, pubescent at base, becoming glabrous towards the tip, inner surface glabrous or nearly so, *c.* 2 mm long. Stamens 9, 4-celled, glabrous or with a few hairs near base of filaments, *c.* 1.5 mm long, staminodia 3, stipitiform, pubescent. Pistil and inside of the deep receptacle glabrous. Cupule flat, *c.* 1.1 cm in diameter, pedicel strongly swollen,

0.8 cm long; fruit roundish, 1.6 × 1.4 cm, almost completely exerted.

REMARKS

Ocotea tsaratananensis differs from the other montane, small-leaved *Ocotea* species with pit domatia in its tomentellous terminal buds, young twigs and inflorescences. The other species in this group are either glabrous or have some appressed pubescence, but never the erect, dense pubescence of *O. tsaratananensis*. The large number of scars from fallen leaves and bracts are also striking and suggest this is a slow-growing species. It is likely that on trees growing in more sheltered places, this character is less pronounced.

35. *Ocotea zahamenensis* van der Werff, sp. nov. (Figs 14, 5)

Ocotea perforatae similis, sed ramulis gemmisque terminalibus pubescentibus, domatiis axillis venarum lateralium restrictis recedit.

TYPUS. — **Madagascar**, Toamasina, Parc National de Zahamena, Manakambahiny-Est, 17°38'25"S, 48°38'34"E, 989 m, 27.III.2000, fl., S. Randrianasolo, T. Razafindrabeaza, L. M. Randrianjanaka & A. Razakanirina 155 (holo-, P[P00713426]; iso-, MO[2299153]).

PARATYPES. — **Madagascar**. Antananarivo. c. 7 km E of Anjozorobe, Lowry & Randrianasolo 4387 (MO, P[P01977631]); Toamasina. Parc National de Mantady, Rabajaso et al. 167 (MO, P[P01977630], TAN); Toamasina, Moramanga, Commune Ambohibary, 22 km NE de Moramanga, Rakotovo et al. 1287 (MO, P[P06837194]); Toamasina, PN de Zahamena, Rokotondrajaona 148 (MO, P[P01977626]); Toamasina, c. 15 km NE of Moramanga, Phelps Dodge project site, Rakotomalaza 1082 (MO, P[P01977629]); Toamasina, Route Analamy Rakotomalaza et al. 1328 (MO, P).

DISTRIBUTION. — This species is known from the middle and upper eastern slopes from Ranomafana to Zahamena between 900 and 1500 m altitude.

PHENOLOGY. — Flowering: February; fruiting: May to October.

DESCRIPTION

Trees, 9-15 m. Twigs terete, densely grey or brown appressed pubescent, the indument wearing off

with age; terminal buds densely pubescent. Leaves 5-10 × 2.5-4.3 cm, firmly chartaceous, alternate, elliptic to broadly elliptic, glabrous or with a few scattered, appressed hairs when young, base obtuse to acute, apex acute, lower surface densely and minutely gland-dotted, lateral veins c. 5 on each side, immersed and only faintly visible, reticulation weakly raised on the lower surface, not visible on upper surface, domatia consisting of pits in the axils of the lowermost lateral veins, glabrous, not present on all leaves. Petioles 1-1.5 cm, flat or shallowly canaliculate. Inflorescences 4-7 cm long, laxly branched, paniculate-cymose, sparsely pubescent, mostly in the axils of deciduous bracts. Flowers green or white-yellow, 5-6 mm in diameter, tepals 6, equal, 2 mm long, moderately to densely pubescent outside, pubescent inside, spreading at anthesis; stamens 9, all 4-celled, 1.5 mm long, the filaments pubescent, half as long as the mostly glabrous anthers, staminodia stipitiform, 1 mm long, pubescent, glands present at the base of the inner stamens; pistil 2.5 mm long, glabrous, ovary 1 mm long, stigma discoid, receptacle deeply cup-shaped, appressed pubescent inside. Fruit, when young, completely enclosed in the cupule, larger immature fruit 1 × 1 cm, ¾ enclosed in the cupule.

REMARKS

Ocotea zahamenensis sp. nov. is known from several collections along the upper part of the wet eastern slope of Madagascar. It is characterized by the conspicuous domatia in the axils of the basal lateral veins, the appressed indument on the twigs and terminal buds and its pinnate venation. Somewhat similar species are *O. perforata*, which has glabrous twigs and terminal buds and which has pit domatia along the lateral veins, *O. foveolata*, which has tripliveined leaves and *O. humbertii* and *O. tsaratananensis*, both of which have an erect, pilose indument along the young twigs and inflorescences. *Ocotea tsaratananensis* also differs in the presence of close, conspicuous bract scars at the beginning of seasonal growth; such conspicuous scars are lacking in *O. zahamenensis* sp. nov. All are species of higher altitudes. Provisionally placed here are three collections from Fianarantsoa: one from Parc National de Andingitra (Messmer & Randrambololona NM

877) with somewhat larger leaves; it has a mature fruit, 3 × 2 cm, and a cupule 2 cm wide and 1 cm deep and two sterile collections (*Kotozafy et al.* 890 and 892) from the National Park Ranomafana near Vohiparara.

Incompletely known species

Ocotea macrorhiza Kosterm.

Communication (Pengumuman) of the Forest Research Institute, Indonesia 60: 18 (1957).

TYPUS. — Madagascar, Gorges de la Maeverano, vers 1400 m, *Service Forestier (Capuron)* 3009 (holo-, P![P00541618]).

REMARK

The type, *Service Forestier (Capuron)* 3009, is in bud; the second collection cited by Kostermans has young fruits. Kostermans compared this species with *O. similis* from which it differs in the clearly alternate leaves, and with *O. faucherei*, a poorly known species with the filaments of the inner three stamens fused. Because the type is in buds, it is not possible to verify if *O. macrorhiza* has free or fused filaments of the inner stamens. I doubt also that the paratype is conspecific with the type.

UNDESCRIBED SPECIES

A number of collections represent probably undescribed species. They are listed below.

Ocotea sp. A.

Represented by seven collections from the Sambirano-Manongarivo area. It has relatively large, glabrous leaves (8–13 cm) and long petioles (2–3 cm). Venation is immersed, the upper leaf surface often shiny. Domatia are lacking. Vegetative buds are appressed pubescent. Infructescences are to 15 cm long, the cupules 1.5 cm in diameter and about 1 cm high without remnants of tepals. Fruits measure 2.5 × 1.3 cm. Flowers are not known. Kostermans (1957) cited five of the collections as *O. racemosa*; he did not see the sixth

collection. It differs from *O. racemosa* in leaf shape and size, the shiny upper surface of the leaves, long petioles and the large cupules. The specimens are *Service Forestier* 2567, 3792, 11084, 11501, 12281, and *Perrier de la Bâthie* 10130, 10131, all in P; they were made in July (one collection), September (two coll.), October (two coll.) and November (one coll.).

Ocotea sp. B.

Represented by 3 fruiting collections from the Montagne d'Ambre. Leaves are 4–7 × 1.5–2.5 cm, glabrous, petioles to 6 mm long, domatia lacking. Terminal buds are slender and appressed pubescent. Fruits are 3 × 1.5 cm, cupules shallow, bowl-shaped, c. 1.5 cm across and 4 mm high. The black fruits are almost fully exposed on the red cupule; this color combination suggests the fruits were mature. It differs mainly from *O. racemosa* in the large fruits and shallow, wide cupules. Flowers are not known. The three collections are *Andrianantoanina & Roc-sce* 365 (MO, P), *Malcomber et al.* 982 (MO, P) and *Schatz et al.* 1497 (MO, P) and were made in September and October.

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FIG. 14. — Isotype of *Ocotea zahamensis* van der Werff, sp. nov. ("zahamensis" on the label).

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APPENDIX

Collections studied. Numbers in parentheses correspond to the number of the species in the text and in the List of Species below. When specimens were collected by more than one person, only the name of the first collector is listed.

LIST OF SPECIES

1. *O. ambrensis* van der Werff, sp. nov.
2. *O. auriculiformis* Kosterm.
3. *O. brevipes* Kosterm.
4. *O. caudatifolia* Kosterm.
5. *O. comoriensis* Kosterm.
6. *O. corethroides* Kosterm.
7. *O. cryptocaryoides* Kosterm.
8. *O. cymosa* (Nees) Palacký
9. *O. elliptica* Kosterm.
10. *O. eriothyrsa* Kosterm.
11. *O. faucherei* (Danguy) Kosterm.
12. *O. foveolata* Kosterm.
13. *O. glaberrima* van der Werff, sp. nov.
14. *O. grayi* van der Werff
15. *O. humbertii* Kosterm.
16. *O. humblotii* Baillon
17. *O. involuta* Kosterm.
18. *O. ivohibensis* van der Werff, sp. nov.
19. *O. longipedicellata* van der Werff
20. *O. longipes* Kosterm.
21. *O. macrocarpa* Kosterm.
22. *O. madagascariensis* (Meissner) Palacký
23. *O. malcomberi* van der Werff
24. *O. nervosa* Kosterm.
25. *O. perforata* Kosterm.
26. *O. racemosa* (Danguy) Kosterm.
27. *O. rigidifolia* Kosterm.
28. *O. sambiranensis* van der Werff
29. *O. sessiliflora* Kosterm.
30. *O. spanantha* van der Werff, sp. nov.
31. *O. thouvenotii* (Danguy) Kosterm.
32. *O. trichantha* Baker
33. *O. trichophlebia* Baker
34. *O. tsaratananensis* van der Werff
35. *O. zahamenensis* van der Werff, sp. nov.

COLLECTION NUMBERS

D'Alleizette s.n. (12), (33); *Andriamihajarivo* 995 (21), 1316 (8); *Andrianantoanina* 60 (1), 69 (1), 270 (1); *Andrianjafy* 73 (26), 182 (31), 238 (31), 280 (8), 307 (31), 465 (26), 745 (2), 1093 (15); *Andriatsiferana* 1703 (28); *Antilabimena* 1125 (26), 1254 (8), 1342 (8), 1516 (26), 1656 (7 vel aff.), 1885 (7 vel aff.), 2017 (13), 2035 (13), 2263 (16), 2567 (8), 2696 (7), 2730 (7 vel aff.), 3379 (31), 3593 (26), 3692 (8), 3911 (26), 4189 (26), 4570 (7 vel aff.), 5081 (8); *Aridy* 325 (8).

Baron 1289 (33), 1310 (33), 1776 (33), 1970 (33), 1972 (26), 2823 (33), 3217 (33), 3756 (33), 4373 (32), 6685 (8), 6701 (8); *Bernardi* 11764 (5), 11739 (5); *Bernier* 69 (22); *Birkinshaw* 270 (26), 290 (21), 328 (8), 344 (26), 349 (8), 398 (26), 500 (13), 781 (26), 922 (17), 971 (20), 1165 (26); *Boiteau s.n.* (33), *Boivin* 1731 (22); *Bojer s.n.* (8); *Buerki* 110 (17).

Callmander 427 (17), 441 (17), 562 (30); *Campenon s.n.* (33); *Canaby* 14 (5); *Carlson* 239 (26); *Cours* 828 (33), 1170 (31), 1955 (31), 2605 (26), 3637 (7 vel aff.), 4894 (6); *Cremers* 1284 (33); *Croat* 32226 (33).

Debray 1879 (8), 10740 (33); *Decary* 4737 (14), 4914 (24), 5231 (14), 5365 (3), 5424 (14), 13786 (26), 18468 (26); *Descoings* 64 (8); *Dorr* 3173 (31), 3977 (26), 4481 (26); *Dumetz* 1023 (16).

Eaux et Forêts 3-R-5 (23), *3-R-399* (5), *26-R-240* (26), *30-R-68* (5), *40-R-304* (12), *73-R-15* (5), *92-R-15* (5), *124-R-161* (32), *150-R-123* (32), *227-R-239* (32).

Faber-Langendoen 3045 (26); *Faliniaina* 96 (26), *Fosberg* 52338 (33).

Gautier 3233 (26), 3436 (26), 3461 (26); *Geay* 7591 (26), 7389 (26), 7390 (26); *Gentry* 11258 (26), 11334 (26); *Goettel s.n.* (5).

- Hildebrandt* 3680 (33); *Homolle* 274 (31), 2605 (26); *Humbert* 3332 (18), 6061 (14), 6673 (14), 13613 (15), 13982 (32), 20611bis (8), 22115 (26), 23940 (16), 23962 (26), 24212 (16), 24325 (12), 24383 (8), 24425 (26), 24438 (26), 24490 (7 vel aff.), 24546 (16), 25130 (9), 25215 (9), 25712 (12); *Humbolt* 536 (16), 1391 (5), 1466 (5), 1561 (5), 1980 (5).
- Iambana* 134 (26).
- Jacquemin* 846-J (5), H663J (6); *Jongkind* 923 (?).
- Kiener* 7 (26); *Koopman* 119 (8), 120 (26); *Kotozafy* 12 (26), 892 (35).
- Lam* 5869 (31); *Lavanchie s.n.* (5); *Lewis* 717 (26), 889 (26), 1363 (26); *Louvel* 32 (26), 124 (26), 222 (31); *Lowry* 4387 (35), 5397 (34), 5465 (20); *Ludovic* 336 (34); *Lyall* 262 (8).
- Malcomber* 893 (28), 896 (26), 1289 (26), 1604 (24), 1610 (14), 1817 (1), 2099 (2), 2236 (26), 2604 (28), 2682 (16), 2748 (21); *McPherson* 14138 (26), 14422 (23), 14471 (26), 14975 (14), 17171 (8), 17181 (26), 17183 (4), 17226 (4), 17248 (26), 17270 (26), 17305 (26); *McWhirter* 24 (32), 230 (23); *Messmer* 484 (26), 506 (18), 877 (35); *Miller* 3681 (26), 3706 (26), 8766 (31), 8837 (26).
- Nicoll* 233 (12), 576 (8), 657 (7 vel aff.); *Noyes* 946 (8).
- Overdorf* 35 (2).
- Perrier de la Bâthie* 4486 (14), 5260 (21), 5264 (26), 5266 (26), 5268 (8), 6694 (14), 10135 (8), 10145 (24), 10164 (26), 10167 (26), 10172 (21), 10173 (33), 10181 (26), 11837 (14), 14209 (26), 15252 (20), 16950 (12), 17192 (26), 18171 (26), 18235 (14), 18340 (33); *Petit-Thouars s.n.* (8), *Poivre s.n.* (8), (26).
- Rabe* 68 (8), 107 (8); *Rabenantoandro* 223 (7 vel aff.), 531 (8), 537 (26), 939 (8); *Rabevohitra* 2242 (23), 2250 (8), 3677 (26), 3730 (26), 3849 (26); *Rahajao* 167 (35), 306 (8), 600 (8), 772 (22), 978 (8); *Raharijaona* 44 (33); *Raharimalala* 179 (26); *Rakoto* 104 (24), 358 (14), 367 (2), 375 (26), 377 (25), 410 (2); *Rakotomalaza* 92 (30), 111 (31), 451 (8), 555 (15), 622 (26), 709 (25), 711 (31), 988 (31), 1082 (15 vel aff.), 1140 (26), 1233 (26), 1328 (35), 1359 (26), 1361 (26), 1368 (8), 1375 (26), 1430 (2), 1522 (2), 2141 (20); *Rakotondrafara* 127 (31); *Rakotondrajoana* 148 (35), 272 (26); *Rakotovao* 1287 (35), 1424 (26), 1848 (21), 2536 (17), 3343 (12); *Ralimanana* 12 (26); *Ranaivojoana* 374 (8), 746 (26), 794 (26), 1200 (8); *Randriamampionona* 73 (2), 207 (23), 381 (14), 429 (23), 472 (23), 536 (24), 609 (2), 613 (23); *Randriambololona* 118 (28); *Randrianaivo* 13 (2), 14 (26), 18 (26), 45 (26), 74 (26), 687 (26), 1772 (14), 1773 (14); *Randrianasolo* 155 (35), 164 (26), 177 (31), 287 (26), 297 (8), 431 (8), 454 (26), 600 (26), 946 (8), 987 (8); *Randrianjanaka* 8 (19), 188 (26), 225 (19), 542 (26), 549 (8), 747 (4); *Randriantafika* 192 (14), 227 (32); *Rasoavimbahoaka* 242 (8), 248 (16), 267 (26), 271 (16), 332 (26), 420 (26), 503 (8), 652 (8), 751 (7 vel aff.); *Ratovoson* 251 (8), 259 (8), 269 (31), 649 (35); *Ravelonarivo* 52 (20), 87 (26), 198 (26), 257 (8), 293 (26), 372 (26), 419 (26), 662 (7 vel aff.), 745 (8), 843 (16), 2101 (8), 2523 (aff. 12); *Razafimandimbison* 167 (8), 239 (16), 248 (8), 259 (26); *Razafindrabe* 16 (35); *Razafitsalama* 223 (9), 339 (9), 443 (34), 1126 (28); *Razakamalala* 3065 (16), 3164 (16), 3284 (16); *Razanatsoa* 615 (21); *Réserves Naturelles* 52 (16), 1253 (31), 1258 (21), 1316 (26), 1444 (29), 1497 (26), 1503 (26), 2432 (26), 3139 (26), 3196 (14), 3431 (26), 3433 (14), 3745 (21), 4136 (8), 4472 (6), 4472bis (6), 4541 (26), 4544 (31), 5806 (20), 5918 (6), 6174 (20), 6260 (20), 7148 (26), 7149 (2), 7457 (23), 7728 (31), 7935 (23), 9135 (31), 8891 (26), 9370 (31), 9362 (26), 9461 (8), 9942 (12), 10009 (26), 10754 (8), 11255 (8), 11386 (19); *Rogers* 23 (aff. 27).
- Sauquet* 17 (8), *Schatz* 1806 (8), 1871 (26), 1916 (26), 1954 (26), 2245 (26), 2341 (26), 2588 (26), 2761 (8), 2858 (26), 3141 (26), 3423 (33), 3609 (26), 3835 (26), 3851 (8), 3897 (7 vel aff.); *Service Forestier* 81 (21), 625 *Capuron* (12), 692 *Capuron* (26), 788 (26), 798 (26), 815 *Capuron* (16), 860 *Capuron* (16), 877 *Capuron* (26), 900 (8),

- 924 *Capuron* (7 vel aff.), 955 *Capuron* (26), 957 *Capuron* (16), 960 *Capuron* (9), 971 *Capuron* (9), 1051 (17), 1094 (26), 1143 (16), 1150 (16), 1151 (26), 1155 (26), 1344 (26), 1400 (26), 1412 (31), 1566 (26), 1599 (26), 1601 (31), 1644 (26), 1706 (26), 1788 (26), 1802 (26), 1870 (16), 1881 (33), 1906 (33), 2022 (26), 2244 (26), 2429 (6), 2512 (26), 2538 (31), 2798 (26), 2864 (26), 2995 (26), 3010 *Capuron* (20), 3062 *Capuron* (12), 3182 (14), 3183 (24), 3184 (24), 3199 (26), 3332 (8), 3333 (26), 3524 (21), 3676 (26), 3742 (8), 3743 (26), 3745 (21), 3751 (8), 3767 (8), 3783 (26), 3785 (21), 3787 (14), 3803 (26), 3813 (26), 4152 (24), 4155 (8), 4385 (21), 4386 (26), 4685 (26), 4837 (26), 4896 (14), 5078 (26), 5140 (24), 5227 (14), 5267 (21), 5467 (1), 5474 (26), 5608 (14), 5665 (26), 5899 (26), 5942 (24), 5950 (26), 5967 (24), 6013 (12), 6084 (26), 6379 (14), 6456 (10), 6460 (26), 6494 (24), 6542 (14), 6633 (26), 6666 (2), 6688 (14), 6970 *Capuron* (14), 7103 (14), 7228 (33), 7263 (26), 7288 (26), 7363 (26), 7364 (26), 7603 (8), 7866 (21), 8194 (26), 8421 (26), 8509 *Capuron* (23), 8564 *Capuron* (29), 8599 (16), 8633 (8), 8706 *Capuron* (7), 8808 *Capuron* (7 vel aff.), 8839 *Capuron* (7), 8853 (7), 8978 *Capuron* (31), 8995 *Capuron* (4), 9034 *Capuron* (4), 9082 (26), 9089 (26), 9121 *Capuron* (31), 9219 (8), 9221 *Capuron* (6), 9371 (26), 9515 (26), 9530 (26), 9675 (14), 9678 (14), 9756 (21), 9791 (32), 10087 (26), 10380 (8), 10562 (8), 10732 (8), 10754 (24), 10902 (8), 10962 (26), 10989 (2), 10990 (14), 11000 (26), 11109 (8), 11290 (1), 11456 *Capuron* (28), 11489 (26), 11756 (26), 11786 (26), 11961 *Capuron* (25), 12160 (8), 12186 (26), 12189 (8), 12211 (26), 12212 (8), 12323 (5), 12463 (25), 12464 (8), 12467 (26), 12468 (31), 12727 (26), 12880 (5), 12884 (26), 13162 (26), 13169 (6), 13390 (26), 13392 (26), 13396 (14), 13395 (26), 13398 (26), 13999 (26), 13400 (26), 13403 (2), 13410 (32), 13832 (32), 13852 (8), 13855 (26), 13863 (26), 13865 (26), 14000 (26), 14001 (26), 14152 (2), 14153 (8), 14159 (26), 14163 (26), 14166 (26), 14170 (26), 14171 (26), 14297 (26), 14406 (26), 14644 (26), 14647 (26), 14774 (26), 14987 (8), 14990 (26), 15251 (26), 15252 (14), 15331 (26), 15479 (26), 15504 (16), 15625 (23), 15630 (23), 15893 (26), 15934 (26), 16223 (14), 16528 (5), 16595 (5), 16596 (5), 16619 (26), 16670 (5), 16738 (5), 17146 (32), 17714 (8), 17939 (26), 18228 *Capuron* (6), 18402 *Capuron* (33), 19157 (8), 19212 (14), 19276 (16), 19298 (14), 19425 (26), 19744 (2), 19794 (14), 19954 (24), 20305 *Capuron* (33), 21223 (8), 21228 (33), 21271 (26), 21502 (8), 21832 (26), 21850 (16), 21929 (8), 22165 *Capuron* (32), 23564 (14), 24989 (17), 23856 *Capuron* (25), 25036 (8), 25565 (33), 25664 (26), 25665 (26), 25666 (26), 25667 (26), 25669 (8), 25670 (8), 25671 (26), 25672 (8), 25848 (26), 26255 (31), 26299 (21), 26368 (26), 26621 (26), 26622 (26), 26630 (26), 26633 (26), 26645 (2), 26647 (2), 26651 (2), 26687 (8), 26691 (26), 26706 (21), 26707 (21), 26726 (21), 26730 (33), 26806 (29), 26902 (8), 26909 (26), 26958 (8), 27010 (34), 27051 (34), 27661 (26), 27764 (26), 28020 *Capuron* (26), 28140 *Capuron* (26), 28280 *Capuron* (32), 28346 *Capuron* (23), 28424 (29), 34405 (8), 34408 (26).
- Thouvenot* 33 (31), 140 (26), 148 (26), 160 (11); *Trigui* 518 (1); *Turk* 119 (14), 120 (14), 138 (26), 174 (26), 175 (26), 197 (2), 234 (26), 291 (26), 443 (26).
- Ursch* 4 (26), 14 (8), 44 (8), 45 (26), 65 (27), 78 (6), 90 (26).
- Van der Werff* 12670 (26), 12674 (2), 12676 (26), 12677 (26), 12697 (26), 12727 (26), 12732 (14), 12739 (26), 12745 (14), 12756 (23), 12779 (26), 12787 (26), 12810 (8), 12813 (26), 12860 (2), 13472 (28), 13490 (28), 13501 (28), 13502 (28), 13523 (28), 13597 (31), 13646 (8), 13660 (31), 13698 (26); *Vasey* 106 (26), 247 (26); *Viguiier* 1043 (8).
- Zarucchi* 7395 (26), 7460 (26).

