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New *Callicarpa* (Lamiaceae) taxa: Two species and a natural hybrid from Hahajima Island, Ogasawara Islands, Japan

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Abstract

Two newly identified species of *Callicarpa* (Lamiaceae), *C. boninensis* and *C. hahajimensis*, along with a new natural hybrid, *C.* × *chibusensis*, are described. All were identified on Hahajima Island in the Ogasawara Islands, Japan. A comprehensive key to *Callicarpa* taxa in the Ogasawara Islands is also provided. *Callicarpa boninensis*, morphologically most similar to *C. subpubescens*, is distinguished by persistent stellate hairs on mature leaves and elongated petioles. *Callicarpa hahajimensis*, resembling *C. parvifolia* in the Chichijima Islands, differs in having reduced stellate hair density on both leaf surfaces and thinner leaves. *Callicarpa* × *chibusensis*, considered a natural hybrid between *C. subpubescens* and *C. boninensis*, is characterized by intermediate stellate hair densities—higher than in *C. subpubescens* but lower than in *C. boninensis*—on both leaf surfaces, smaller leaves than those of *C. subpubescens*, and an earlier flowering phenology compared to *C. boninensis*.

Key words: Adaptive radiation, Bonin Islands, Endemic species, Oceanic island, Speciation, Taxonomy

Introduction

The genus *Callicarpa* L. (1753: 111), previously classified under the family Verbenaceae (e.g., Chen & Gilbert 1994, Yamazaki 1993), is now assigned to the family Lamiaceae (e.g., Cantino *et al.* 1992, Harley *et al.* 2004, Li *et al.* 2016, Yonekura 2017). The subfamily Callicarpoideae, which consists exclusively of *Callicarpa* (Li & Olmstead 2017), is sister to the Australian endemic subfamily Prostantheroideae and represents the most basal lineage within Lamiaceae (Li *et al.* 2016, Zhao *et al.* 2021). Callicarpoideae differs from other subfamilies by having a peltate or capitate stigma and a drupaceous fruit with four stony pyrenes (Li & Olmstead 2017). The genus comprises approximately 140 species, mostly shrubs or trees and rarely climbers, which are primarily distributed in temperate and tropical regions (Yonekura 2017). The center of species diversity for *Callicarpa* lies in the Old World, particularly in China and Malesia, each harboring approximately 50 species (Bramley 2013, Chen & Gilbert 1994). In Japan, 12 species, five varieties, and four natural hybrids have been reported (Yamamoto *et al.* 2023, Yamazaki 1993, Yonekura 2017). All Japanese species, except those in the Ogasawara Islands (including the Ryukyu Islands), are deciduous; only the species in the Ogasawara Islands are evergreen or semi-evergreen (Yonekura 2017). Furthermore, while most *Callicarpa* species worldwide are hermaphroditic (i.e., with bisexual flowers), those in the Ogasawara Islands are uniquely dioecious (Kawakubo 1998).

The Ogasawara Islands comprise about 30 oceanic islands in the northwestern Pacific Ocean, located approximately 1,000 km south of the main Japanese Archipelago. *Callicarpa* in the Ogasawara Islands represents a compelling

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example of adaptive radiation on oceanic islands (Ono 1991, Shimizu & Tabata 1991). Currently, three species are recognized: *Callicarpa subpubescens* Hook. et Arn. (1841: 305), *C. glabra* Koidz. (1918: en56), and *C. parvifolia* Hook. et Arn. (1841: 305). These species, occurring in the Chichijima Islands, inhabit a range of environments from dry scrubs to mesic forests. Among them, only *C. subpubescens* extends beyond the Chichijima Islands and is distributed throughout the archipelago. Notably, *C. subpubescens* exhibits considerable leaf morphological variation among populations in the Hahajima Islands (Kawakubo 1986). This species is a keystone component of the native vegetation in the Ogasawara Islands, particularly in mesic forests, and serves as a focal species in revegetation efforts aimed at ecosystem restoration. However, populations of *C. subpubescens* are declining due to the impacts of invasive alien species. Therefore, effective conservation planning requires a robust taxonomic framework for *Callicarpa* in the Ogasawara Islands.

To this end, we employed an integrative approach combining genetic analyses, ecological surveys, and morphological measurements. Using 14 microsatellite markers (Mori *et al.* 2008, Sugai *et al.* 2019), we detected genetic differentiation within *C. subpubescens* populations in the Hahajima Islands at a level comparable to that observed among the three *Callicarpa* species in the Chichijima Islands (Sugai *et al.* 2019). We also observed variation in flowering phenology within Hahajima Island (Sugai *et al.* 2019). Furthermore, by employing 17 microsatellite markers (Setsuko *et al.* 2018) and conducting a comprehensive field survey across the Hahajima Islands, we identified four ecotypes and mapped their distributions (Setsuko *et al.* 2024a), along with their respective morphological traits and flowering phenologies (Setsuko *et al.* 2024a). In addition, we performed phylogenetic and population demographic analyses of *Callicarpa* in the Ogasawara Islands, using RAD-seq for higher resolution (Setsuko *et al.* 2024b). As a result, we identified one of the four ecotypes in the Hahajima Islands as the previously known species, *C. subpubescens*, whereas the remaining three were proposed as new taxa.

Herein, we describe these newly identified taxa—*Callicarpa boninensis* Sugai & Setsuko, *sp. nov.*; *Callicarpa hahajimensis* Sugai & Setsuko, *sp. nov.*; and *Callicarpa* × *chibusensis* Sugai & Setsuko, *hybr. nat. nov.*—and provide detailed taxonomic accounts, including their distribution, habitat, etymology, and preliminary IUCN conservation status. In addition, we present an identification key to the six *Callicarpa* taxa in the Ogasawara Islands.

Materials and methods

We examined the morphology of type specimens collected from Hahajima Island, as well as dried specimens deposited in the Makino Herbarium at Tokyo Metropolitan University, Japan (MAK). Some diagnostic characters of the four *Callicarpa* taxa in the Hahajima Islands were derived from data presented in Setsuko *et al.* (2024a, b). Specifically, tree height was measured for 13–24 individuals per ecotype, identified as core trees (i.e., representative individuals of each taxon) on Hahajima Island, as reported in Setsuko *et al.* (2024a). Leaf morphological traits were measured for 7–13 individuals per taxon, with 2–5 intact leaves sampled per individual from both Hahajima and Imoutojima Islands (Setsuko *et al.* 2024b). Leaf blade thickness was measured using calipers on FAA-fixed leaves, with three measurements taken per leaf. Hair density on the upper and lower leaf surfaces was quantified by counting the number of hairs per 4 mm^2. Additionally, the leaf surfaces were photographed using a high-magnification digital microscope (Leica DVM5000, Leica Microsystems, Wetzlar, Germany). Flowering phenology was described based on monthly observations conducted from May 2014 to January 2015 for 9–18 individuals per taxon, categorized as core trees in Setsuko *et al.* (2024a). Elevational ranges of each taxon were calculated based on core tree individuals identified on Hahajima and Imoutojima Islands, following Setsuko *et al.* (2024a). In total, we compiled data from 66 individuals of *C. boninensis*, 91 individuals of *C. hahajimensis*, and 77 individuals of *C.* × *chibusensis*.

Taxonomy

Callicarpa boninensis Sugai & Setsuko *sp. nov.* Figure 1.

TYPE:—JAPAN. Tokyo Metropolis: Ogasawara Islands, Hahajima Island, Sekimon, 26°40'59.7"N, 142°09'43.0"E, elev. 248 m, 18 July 2023, *Kayo Hayama* (holotype: MAK472470!, isotypes: MAK472470! and TI00265245!).

Diagnosis:—*Callicarpa boninensis* is morphologically most similar to *C. subpubescens*, but can be distinguished by its persistent stellate hairs on mature leaves and longer petioles. A comparative summary of *C. subpubescens*, *C. boninensis*, *C. hahajimensis,* and *C.* × *chibusensis* is presented in Figure 4 and Table 1.

TABLE 1. Comparison of four *Callicarpa* taxa in the Hahajima Islands (adapted from Setsuko *et al.* 2024a).

Characters	*C. subpubescens*	*C. boninensis*	*C. hahajimensis*	*C.* × *chibusensis*
Life form	semi-evergreen, erect shrub	semi-evergreen, erect tree	evergreen, shrub, often caespitose	semi-evergreen, erect shrub
Height (m)	2–5	3–11	0.3–2	2–5
Blade thickness (mm)	0.1	0.1	0.3	0.2
Petiole length (cm)	1–5	2–6	0.5–4	2–4
Blade length (cm)	7–21	7–16	2–11	8–13
Blade width (cm)	3–11	4–8	2–5	4–9
Hair density of upper surface (hairs / mm2)	1 (90% glabrous)	13	8	4 (40% glabrous)
Hair density of lower surface (hairs / mm2)	0 (70% glabrous)	16	9	3
Flowering phenology (range, peak)	summer (Jun.–Jul., Jul.)	autumn (Jul.–Dec., Oct.)	summer–winter (Jul.–Jan., Aug. & Nov.)	summer (Jun.–Aug, Jul.)

Semi-evergreen trees, erect, 3–11 m tall; shorter on limestone substrates. Branches terete, with elliptic lenticels and raised leaf scars, densely covered with yellowish-brown soft stellate tomentum when young, later glabrescent. Leaves decussate-opposite, chartaceous, 0.1 mm thick; petiole 2–6 cm long, stellate-pubescent; blade elliptic, oblong, or ovate, 7–16 cm long, 4–8 cm wide; apex acute or acuminate, base obtuse, shortly attenuated into the petiole; margins serrulate in upper half or subentire. Upper surface stellate-pubescent (average density: 13 hairs / mm^2); lower surface densely stellate-pubescent (average density: 16 hairs / mm^2), with a raised midrib and 7–8 pairs of obscure lateral veins. Flowers from July to December, peaking in October. Inflorescences in axillary, dichasial cymes, densely many-flowered, 3–4.5 cm long, 2–3.5 cm wide. Peduncle 1.5–2 cm long; rachis 1–2 cm long; both densely stellate-tomentose. Pedicel ca. 1 mm long, glandular hairs. Bracts narrowly ovate, ca. 2 mm long, apex obtuse. Calyx cup-shaped, ca. 1.5 mm long, glandular hairs; shallowly four-lobed, lobes widely deltate, obtuse, ca. 0.5 mm long. Corolla funnel-shaped, pale purple, ca. 5 mm long, sparsely covered with sessile glands on the outer surface; tube ca. 3 mm long, ca. 1 mm in diameter at the throat; four-lobed, lobes orbicular, ca. 2 mm long. Heterostylous, functionally dioecious. Male flowers: Four stamens, ca. 5 mm exserted from corolla; filament ca. 7 mm long; anther ellipsoid, ca. 1 mm long, glandular-punctate, longitudinally dehiscent throughout. Style filiform, 0.5–1.5 mm long; stigma capitate. Female flowers: Four stamens, ca. 5 mm exserted from corolla; filament ca. 7 mm long; anther ellipsoid, ca. 1 mm long, glandular-punctate, longitudinally dehiscent throughout. Style filiform, ca. 7 mm long; stigma capitate. Fruit a drupe, globose, purple, ca. 3 mm in diameter, with four 1-seeded pyrenes.

Additional specimens examined (paratype):—JAPAN. Tokyo Metropolis: Ogasawara Islands, **Hahajima Island**: Sekimon, 26°40'39.2"N, 142°09'26.8"E, 24 June 2006, *Keigo Mori* (MAK472402!); loc. cit., 26°40'39.5"N, 142°09'27.4"E, 4 October 2006, *K. Mori* (MAK472427!); loc. cit., 26°40'44.4"N, 142°09'31.7"E, 4 October 2006, *K. Mori* (MAK472428!, MAK472429!, MAK472430!, MAK472431! and MAK472432!); loc. cit., 26°40'44.9"N, 142°09'32.2"E, 4 October 2006, *K. Mori* (MAK472433!, MAK472434!, MAK472435!, MAK472436! and MAK472437!); loc. cit., 26°41'04.6"N, 142°09'38.6"E, 5 October 2006, *K. Mori* (MAK472412!); loc. cit., 26°41'05.9"N, 142°09'38.4"E, 5 October 2006, *K. Mori* (MAK472413!); loc. cit., 26°41'05.3"N, 142°09'39.8"E, 5 October 2006, *K. Mori* (MAK472414!); loc. cit., 26°41'05.0"N, 142°09'39.9"E, 5 October 2006, *K. Mori* (MAK472415!); loc. cit., 26°41'03.5"N, 142°09'39.8"E, 5 October 2006, *K. Mori* (MAK472416!); loc. cit., 26°41'03.2"N, 142°09'40.1"E, 5 October 2006, *K. Mori* (MAK472418!, MAK472419!, MAK472421!, MAK472422!, MAK472423! and MAK472424!); loc. cit., 26°41'02.9"N, 142°09'40.1"E, 5 October 2006, *K. Mori* (MAK472425!); loc. cit., 26°40'21.5"N, 142°09'21.6"E, 5 October 2006, *K. Mori* (MAK472446!); loc. cit.,26°40'25.1"N, 142°09'20.5"E, 5 October 2006, *K. Mori* (MAK472447! and MAK472458!); loc. cit., 26°40'20.1"N, 142°09'21.0"E, 18 June 2007, *K. Mori* (MAK472366!); loc. cit., 26°40'25.1"N, 142°09'20.5"E, 18 June 2007, *K. Mori* (MAK472367!); loc. cit., 26°40'52.5"N, 142°09'35.0"E, 18 June 2007, *K. Mori* (MAK464596! and MAK472467!); loc. cit., 17 March 1972, *Yasuichi Momiyama et al.* (MAK125161!); loc. cit., 26°40'24.9"N, 142°09'20.2"E, 29 June 2024, *Shota Sakaguchi et al.* (KYO00029254! and KYO00029255!); loc. cit., 26°40'45.5"N, 142°09'34.1"E, 29 June 2024, *S. Sakaguchi et al.* (KYO00029258! and KYO00029259!); Mt. Chibusa, 26°39'27.6"N, 142°09'45.9"E, 6 October 2006, *K. Mori* (MAK472275!); loc. cit., 26°39'23.8"N, 142°09'52.7"E, 6 October 2006, *K. Mori* (MAK472277!); loc. cit.,

26°39'24.6"N, 142°09'51.7"E, 6 October 2006, *K. Mori* (MAK464585!); loc. cit., 26°39'23.8"N, 142°09'52.6"E, June 2014, *Satoshi Narita* and *Hidetoshi Kato* (MAK472496!). **Anejima Island**: 24 August 1980, *Mikio Ono et al.* (MAK184059!); loc. cit., 18 July 1992, *Takaya Yasui* (MAK268398!).

Distribution:—Japan. Tokyo Metropolis: Ogasawara Islands, Hahajima and Anejima Islands.

Habitat:—Mesic forests in the Hahajima Islands, dominated by *Elaeocarpus photiniifolia* Hook. et Arn., *Pisonia umbellifera* (J.R. et G.Forst.) Seem., *Ardisia sieboldii* Miq., and *Bischofia javanica* Blume, at elevations of 210–430 m.

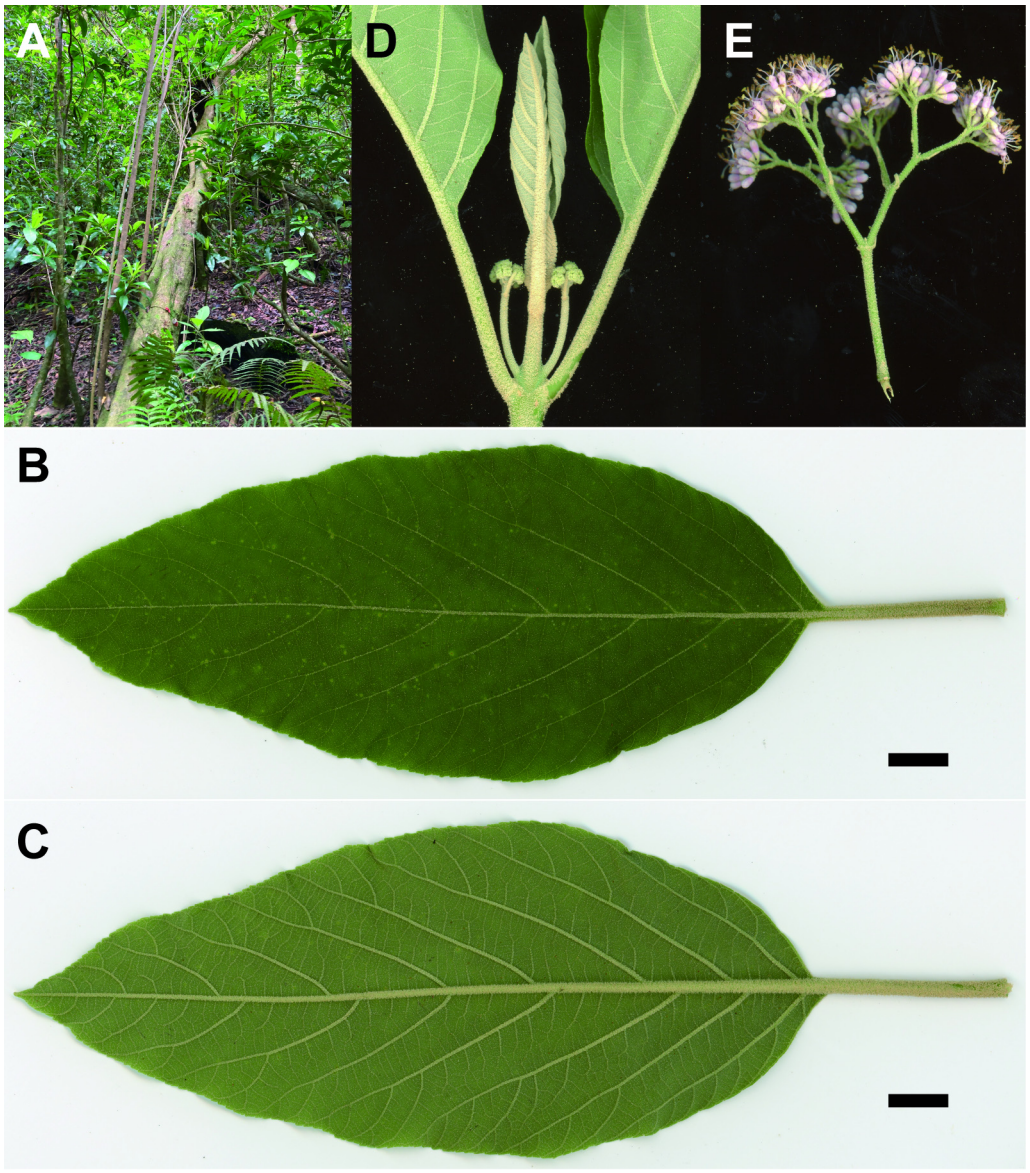

FIGURE 1. *Callicarpa boninensis* Sugai & Setsuko *sp. nov.* A, Habit; B, Upper leaf surface; C, Lower leaf surface; D, Branch apex with buds; E, Inflorescence (a female individual). Scale bars are 1 cm for B & C. Photographs: A by K. Hayama; B and C by S. Setsuko; D and E by S. Sakaguchi.

Etymology:—The specific epithet *boninensis* refers not only to its type locality—the Bonin (Ogasawara) Islands—but also to the fact that, according to population demographic analysis (Setsuko *et al.* 2024b), this species represents an older lineage compared to the other *Callicarpa* taxa in the Ogasawara Islands.

Japanese name:—Ogasawara-murasaki

Conservation status:—This species is currently known only from Hahajima Island, which has a total area of approximately 20 km^2. The mesic forests on Hahajima Island have been invaded by the alien species, *Bischofia javanica*, since the late 20th century, likely contributing to the decline of *C. boninensis* populations. Genetically similar populations belonging to the same genetic cluster or clade have been identified in the Mukojima and Volcano Islands (Setsuko *et al.* 2024b, Sugai *et al.* 2019); however, their morphological characteristics and flowering phenology

remain insufficiently understood, preventing definitive species identification. Two specimens (MAK184059 and MAK268398) collected in 1980 and 1992 from Anejima Island were deposited in MAK, but its current growth status is unknown. Consequently, we assign its conservation status as Vulnerable (VU) under the IUCN Red List criteria (IUCN 2012), specifically under criteria D1—indicating fewer than 1,000 mature individuals capable of flowering—and D2—indicating an area of occupancy of less than 20 km^2, corresponding to its known distribution range on Hahajima Island.

Callicarpa hahajimensis Sugai & Setsuko *sp. nov.* Figure 2.

TYPE:—JAPAN. Tokyo Metropolis: Ogasawara Islands, Hahajima Island, Mt. Kensaki, 26°38'47.5"N, 142°09'57.7"E, elev. 206 m, 18 July 2023, *K. Hayama* (holotype: MAK472471!, isotypes: MAK472471! and TI00265246!).

Diagnosis:—*Callicarpa hahajimensis* is morphologically most similar to *C. parvifolia* but can be distinguished by its lower density of stellate hairs on both leaf surfaces and thinner leaves. A comparative summary of *C. subpubescens*, *C. boninensis*, *C. hahajimensis*, and *C.* × *chibusensis* is presented in Figure 4 and Table 1.

Evergreen shrubs, 0.3–2 m tall, often caespitose. Branches terete, with elliptic lenticels and raised leaf scars, densely covered with yellowish-brown soft stellate tomentum when young, later glabrescent. Leaves decussate-opposite, thickly chartaceous, 0.3 mm thick; petiole 0.5–4 cm long, stellate-pubescent; blade elliptic, broadly elliptic, or ovate, 2–11 cm long, 2–5 cm wide; apex acute, base obtuse, shortly attenuated into the petiole; margins serrulate in upper half, upper surface sparsely stellate-pubescent (average density: 8 hairs / mm^2); lower surface stellate-pubescent (average density: 9 hairs / mm^2), with a raised midrib and 5–8 pairs of obscure lateral veins. Flowers from July to January, peaking in August and November. Inflorescences in axillary, dichasial cymes, densely many-flowered, 3–4 cm long, 2–3.5 cm wide. Peduncle 1.5–2 cm long; rachis 1–2 cm long; both densely stellate-tomentose. Pedicel ca. 1 mm long, glandular hairs. Bracts narrowly ovate, ca. 2 mm long, apex obtuse. Calyx cup-shaped, ca. 1.5 mm long, glandular hairs; shallowly four-lobed, lobes widely deltate, obtuse, ca. 0.5 mm long. Corolla funnel-shaped, pale purple, ca. 5 mm long, sparsely covered with sessile glands on the outer surface; tube ca. 3 mm long, ca. 1 mm in diameter at the throat; four-lobed, lobes orbicular, ca. 2 mm long. Heterostylous, functionally dioecious. Male flowers: Four stamens, ca. 5 mm exserted from corolla; filament ca. 7 mm long, anther ellipsoid, ca. 1 mm long, glandular-punctate, longitudinally dehiscent throughout. Style filiform, ca. 0.5 mm long; stigma capitate. Female flowers: Four stamens, ca. 5 mm exserted from corolla; filament ca. 7 mm long, anther ellipsoid, ca. 1 mm long, glandular-punctate, longitudinally dehiscent throughout. Style filiform, ca. 7 mm long; stigma capitate. Fruit a drupe, globose, purple or white, ca. 3 mm in diameter, with four 1-seeded pyrenes.

Additional specimens examined (paratype):—JAPAN. Tokyo Metropolis: Ogasawara Islands, **Hahajima Island**: Mt. Kensaki, 26°38'43.4"N, 142°09'55.6"E, 11 November 2006, *H. Kato* (MAK472459! and MAK472460!); loc. cit., 26°38'45.1"N, 142°09'56.7"E, 11 November 2006, *H. Kato* (MAK472461!); loc. cit., 26°38'45.8"N, 142°09'56.3"E, 11 November 2006, *H. Kato* (MAK472462! and MAK472463!); loc. cit., 26°38'45.9"N, 142°09'56.4"E, 11 November 2006, *H. Kato* (MAK472464!); loc. cit., 26°38'43.4"N, 142°09'55.6"E, 17 June 2007, *K. Mori* (MAK464593!); loc. cit., 26°38'44.4"N, 142°09'56.1"E, 17 June 2007, *K. Mori* (MAK464594!); loc. cit., 26°38'45.1"N, 142°09'56.7"E, 17 June 2007, *K. Mori* (MAK472317! and MAK472318!); loc. cit., 26°38'45.4"N, 142°09'56.8"E, 17 June 2007, *K. Mori* (MAK472319!); loc. cit., 26°38'45.5"N, 142°09'56.9"E, 17 June 2007, *K. Mori* (MAK472320! and MAK472321!); loc. cit., 26°38'45.8"N, 142°09'56.9"E, 17 June 2007, *K. Mori* (MAK472322! and MAK472323!); loc. cit., 26°38'44.5"N, 142°09'56.2"E, 17 June 2007, *K. Mori* (MAK472324! and MAK472325!); loc. cit., 26°38'44.5"N, 142°09'56.2"E, 17 June 2007, *K. Mori* (MAK472326!); loc. cit., 26°38'44.4"N, 142°09'56.0"E, 17 June 2007, *K. Mori* (MAK472327!); loc. cit., 26°38'44.5"N, 142°09'56.0"E, 17 June 2007, *K. Mori* (MAK472328!); loc. cit., 26°38'44.6"N, 142°09'55.9"E, 17 June 2007, *K. Mori* (MAK472329!, MAK472330! and MAK472331!); loc. cit., 26°38'44.5"N, 142°09'56.0"E, 17 June 2007, *K. Mori* (MAK472332!); loc. cit., 26°38'45.3"N, 142°09'56.9"E, June 2014, *S. Narita* and *H. Kato* (MAK472476!); loc. cit., 26°38'44.6"N, 142°09'56.2"E, June 2014, *S. Narita* and *H. Kato* (MAK472477!); loc. cit., 26°38'44.7"N, 142°09'56.0"E, June 2014, *S. Narita* and *H. Kato* (MAK472478!); Mt. Kensaki-Mt. Chibusa, 13 March 1988, *Motomi Ito et al.* (MAK299166!); Minamizaki, 26°37'23.3"N, 142°10'37.6"E, 15 September 2023, *K. Hayama* (MAK472474!); Mt. Higashi, 26°41'54.2"N, 142°08'53.1"E, 15 September 2023, *K. Hayama* (MAK472475!). **Imoutojima Island**: 26°33'35.6"N, 142°12'39.5"E, 23 June 2006, *K. Mori* and *H. Kato* (MAK464583!, MAK464584!, MAK472301!, MAK472302!, MAK472303!, MAK472304!, MAK472305!, MAK472306!, MAK472307! and MAK472308!); loc. cit., 26°33'35.2"N, 142°12'39.2"E, 15 June 2014, *Suzuki Setsuko* and *H. Kato* (MAK472480!); loc. cit., 26°33'35.7"N, 142°12'39.5"E, 15 June 2014, *S. Setsuko* and *H. Kato* (MAK472481!); loc. cit., 26°33'35.9"N, 142°12'39.5"E, 15 June 2014, *S. Setsuko* and *H. Kato* (MAK472482!); loc. cit., 26°33'35.3"N, 142°12'39.5"E, 15 June 2014, *S. Setsuko* and *H. Kato* (MAK472483!); loc. cit., 26°33'33.5"N, 142°12'34.5"E, 15 June 2014, *S. Setsuko* and *H. Kato* (MAK472484!);

loc. cit., 26°33'36.0"N, 142°12'39.5"E, 15 June 2014, *S. Setsuko* and *H. Kato* (MAK472485!); loc. cit., 24 August 1980, *M. Ono et al.* (MAK183983!). **Meijima Island**: 24 August 1980, *M. Ono et al.* (MAK184005!).

Distribution:—Japan. Tokyo Metropolis: Ogasawara Islands, Hahajima, Imoutojima, and Meijima Islands.

Habitat:—Dry scrubs in the Hahajima Islands, with forests dominated by *Rhaphiolepis indica* (L.) Lindl. var. *umbellata* (Thunb.) H.Ohashi, *Planchonella obovata* (R.Br.) Pierre, *Syzygium cleyerifolium* (Yatabe) Makino, and *Pandanus boninensis* Warb., at elevations of 100–280 m.

Etymology:—The specific epithet *hahajimensis* refers to its type locality: Hahajima Island.

Japanese name:—Hahajima-murasaki.

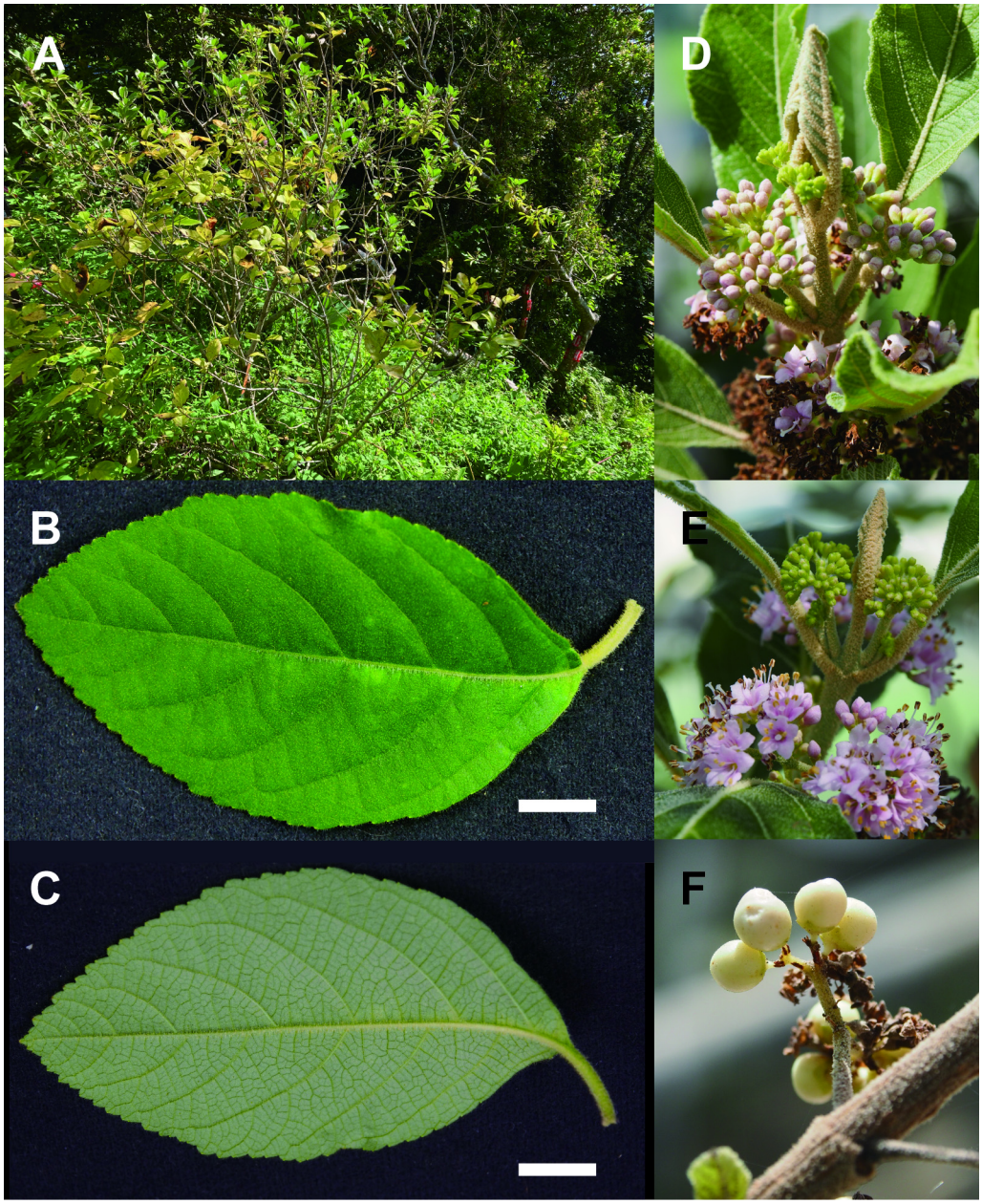

FIGURE 2. *Callicarpa hahajimensis* Sugai & Setsuko *sp. nov.* A, Habit; B, Upper leaf surface; C, Lower leaf surface; D, Branch apex with buds and flowers; E, Inflorescences (a female individual); F, Fruits. Scale bars are 1 cm for B & C. Photographs: A by K. Hayama; B–F by S. Setsuko.

Conservation status:—Dry scrubs in the Hahajima Islands have a limited local distribution (Shimizu 2008). On Hahajima Island, these habitats are under pressure from alien species such as *Leucaena leucocephala* (Lam.) de Wit, *Kalanchoe pinnata* (Lam.) Pers., and *Bidens pilosa* L. var. *radiata* Sch. Bip., and have also been invaded by *Bischofia javanica*. In contrast, the satellite islands of Hahajima Island show little evidence of impact from alien species. The total area of dry scrub habitats across the Hahajima Islands, including its satellite islands, is estimated to be less than 10 km^2. Consequently, we assign its conservation status as Endangered (EN) under the IUCN Red List criteria (IUCN

2012), specifically under criterion D, indicating that the number of mature individuals capable of flowering is fewer than 250.

Callicarpa* × *chibusensis Sugai & Setsuko *hybr. nat. nov.* Figure 3.

TYPE:—JAPAN. Tokyo Metropolis: Ogasawara Islands, Hahajima Island, Mt. Chibusa, 26°39'29.1"N, 142°09'44.5"E, elev. 413 m, 30 April 2023, *S. Setsuko* and *K. Hayama* (holotype: MAK472472!, isotypes: MAK472472! and TI00265244!).

Diagnosis:—*Callicarpa* × *chibusensis* is considered a natural hybrid between *C. subpubescens* and *C. boninensis* (see Notes for details). It is morphologically similar to both parental species, but can be distinguished by its intermediate density of stellate hairs on both leaf surfaces—higher than in *C. subpubescens* and lower than in *C. boninensis*—as well as by its smaller leaves compared to *C. subpubescens*. It also exhibits an earlier flowering phenology compared to *C. boninensis*. A comparative summary of *C. subpubescens*, *C. boninensis*, *C. hahajimensis*, and *C.* × *chibusensis* is presented in Figure 4 and Table 1.

Semi-evergreen shrubs, erect, 2–5 m tall. Branches terete, with elliptic lenticels and raised leaf scars, densely covered with yellowish-brown soft stellate tomentum when young, later glabrescent. Leaves decussate-opposite, thickly chartaceous, 0.2 mm thick; petiole 2–4 cm long, stellate-pubescent; blade elliptic, oblong, broadly elliptic, or ovate, 8–13 cm long, 4–9 cm wide; apex acute or acuminate, base obtuse, shortly attenuated into the petiole; margins serrulate in upper half, upper surface glabrescent except for sparsely stellate-pubescent on midrib and lateral veins (average density: 4 hairs / mm^2, ca. 40% glabrous); lower surface sparsely stellate-pubescent (average density: 3 hairs / mm^2), with a raised midrib and 5–7 pairs of obscure lateral veins. Flowers from June to August, peaking in July. Inflorescences in axillary, dichasial cymes, densely many-flowered, 3–5.5 cm long, 2.5–4 cm wide. Peduncle 1.5–2 cm long; rachis 1–2 cm long, both densely stellate-tomentose. Pedicel ca. 1 mm long, glandular hairs. Bracts narrowly ovate, ca. 2 mm long, apex obtuse. Calyx cup-shaped, ca. 1.5 mm long, glandular hairs; shallowly four-lobed, lobes widely deltate, obtuse, ca. 0.5 mm long. Corolla funnel-shaped, pale purple, ca. 5 mm long, sparsely covered with sessile glands on the outer surface; tube ca. 3 mm long, ca. 1 mm in diameter at the throat; four-lobed, lobes orbicular, ca. 2 mm long. Heterostylous, functionally dioecious. Male flowers: Four stamens, ca. 5 mm exserted from corolla; filament ca. 7 mm long, anther ellipsoid, ca. 1 mm long, glandular-punctate, longitudinally dehiscent throughout. Style filiform, 0.5–1 mm long; stigma capitate. Female flowers: Four stamens, ca. 5 mm exserted from corolla; filament ca. 7 mm long, anther ellipsoid, ca. 1 mm long, glandular-punctate, longitudinally dehiscent throughout. Style filiform, ca. 7 mm long; stigma capitate. Fruit a drupe, globose, purple, ca. 3 mm in diameter, with four 1-seeded pyrenes.

Additional specimens examined (paratype):—JAPAN. Tokyo Metropolis: Ogasawara Islands, **Hahajima Island**: Mt. Chibusa, 26°39'33.4"N, 142°09'39.9"E, 22 June 2006, *K. Mori* (MAK472398!); loc. cit., 26°39'31.8"N, 142°09'42.2"E, 6 October 2006, *K. Mori* (MAK464586!); loc. cit., 26°39'32.2"N, 142°09'37.5"E, 6 October 2006, *K. Mori* (MAK472257!); loc. cit., 26°39'33.4"N, 142°09'39.9"E, 6 October 2006, *K. Mori* (MAK472258!); loc. cit., 26°39'31.7"N, 142°09'42.5"E, 6 October 2006, *K. Mori* (MAK472259!); loc. cit., 26°39'31.4"N, 142°09'42.4"E, 6 October 2006, *K. Mori* (MAK472260!); loc. cit., 26°39'27.9"N, 142°09'46.0"E, 6 October 2006, *K. Mori* (MAK472261!); loc. cit., 26°39'27.2"N, 142°09'46.0"E, 6 October 2006, *K. Mori* (MAK472262!); loc. cit., 26°39'25.1"N, 142°09'51.4"E, 6 October 2006, *K. Mori* (MAK472263!); loc. cit., 26°39'24.1"N, 142°09'52.1"E, 6 October 2006, *K. Mori* (MAK472264!); loc. cit., 26°39'22.4"N, 142°09'53.8"E, 6 October 2006, *K. Mori* (MAK472265!); loc. cit., 26°39'33.1"N, 142°09'38.6"E, 6 October 2006, *K. Mori* (MAK472266!); loc. cit., 26°39'33.1"N, 142°09'39.0"E, 6 October 2006, *K. Mori* (MAK472267! and MAK472268!); loc. cit., 26°39'33.5"N, 142°09'39.4"E, 6 October 2006, *K. Mori* (MAK472269!); loc. cit., 26°39'31.7"N, 142°09'42.5"E, 6 October 2006, *K. Mori* (MAK472270!); loc. cit., 26°39'31.4"N, 142°09'42.4"E, 6 October 2006, *K. Mori* (MAK472271!); loc. cit., 26°39'29.1"N, 142°09'44.0"E, 6 October 2006, *K. Mori* (MAK472272!); loc. cit., 26°39'25.7"N, 142°09'49.9"E, 6 October 2006, *K. Mori* (MAK472276!); loc. cit., 19 November 1970, *M. Ono* and *Sumiko Kobayashi* (MAK123833!); loc. cit., 29–30 June 1975, *S. Kobayashi* (MAK138410! and MAK138409!); loc. cit., 19 June 1979, *S. Kobayashi* and *Yuji Ohmori* (MAK180608! and MAK180609!); loc. cit., 19 November 1997, *Jin Murata et al.* (MAK293812!); loc. cit., 13 December 1998, *Tetsuo Ohi* (MAK306701!); loc. cit., 28 April 2001, *H. Kato* (MAK319233!); loc. cit., 26°39'21.6"N, 142°09'50.4"E, 30 June 2024, *S. Sakaguchi et al.* (KYO00029260!, KYO00029261!, KYO00029262!, KYO00029263! and KYO00029264!); Mt. Chibusa-Sakaigatake, 25 March 1971, *M. Ono* and *S. Kobayashi* (MAK124956! and MAK124957!).

Distribution:—Japan. Tokyo Metropolis: Ogasawara Islands, Hahajima Island.

Habitat:—Mesic scrubs and the edge of mesic forests (cloud forests) on the main ridge at >350 m elevation on Hahajima Island. The forests are dominated by *Freycinetia formosana* Hemsl. var. *boninensis* Nakai, *Dendrocacalia crepidifolia* (Nakai) Nakai, *Fatsia oligocarpella* Koidz., and *Melastoma tetramerum* Hayata var. *pentapetalum* Toyoda, at elevations of 320–460 m.

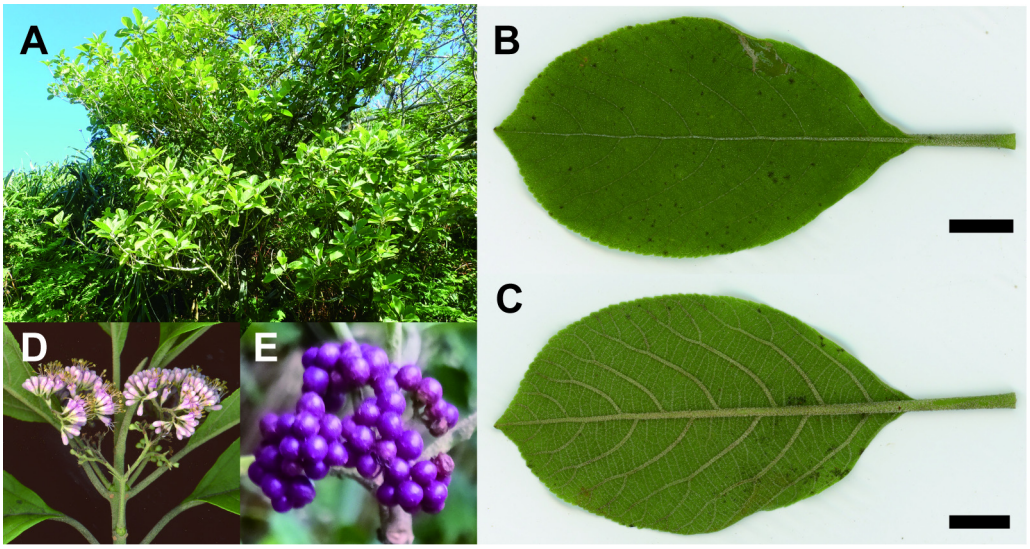

FIGURE 3. *Callicarpa* × *chibusensis* Sugai & Setsuko *hybr. nat. nov.* A, Habit; B, Upper leaf surface; C, Lower leaf surface; D, Inflorescences (a female individual); E, Fruits. Scale bars are 1 cm for B & C. Photographs: A by K. Hayama; B and C by S. Setsuko; D by S. Sakaguchi; E by Y. Yoshii.

Etymology:—The specific epithet *chibusensis* refers to its type locality: Mt. Chibusa.

Japanese name:—Chibusa-shima-murasaki

Conservation status:—As a natural hybrid, this species occupies slightly different environments compared to its parent species and is exclusively found in cloud forests at higher elevations on Hahajima Island. Although the population size is not small, it is likely declining due to encroachment of the alien species *Bischofia javanica*. Therefore, we assign its conservation status as Vulnerable (VU) under the IUCN Red List criteria (IUCN 2012), specifically under criteria D1—indicating fewer than 1,000 mature individuals capable of flowering—and D2—indicating an area of occupancy of less than 20 km^2, corresponding to its known distribution range on Hahajima Island.

Notes:—The recognition of *C.* × *chibusensis* as a natural hybrid is supported by both genetic and morphological evidence. This taxon is referred to as ecotype M in Setsuko *et al.* (2024a) and as ecotype SH in Setsuko *et al.* (2024b). Population genetic analyses using SSR markers and RAD-seq data revealed that this taxon exhibits an admixed genetic pattern intermediate between *C. subpubescens* (ecotype G in Setsuko *et al.* (2024a) and ecotype SG in Setsuko *et al.* (2024b)) and *C. boninensis* (ecotype T in Setsuko *et al.* (2024a) and ecotype ST in Setsuko *et al.* (2024b)). STRUCTURE analysis (Setsuko *et al.* 2024a) and ADMIXTURE analysis (Setsuko *et al.* 2024b) both showed admixture between the two parental clusters, and neighbor-net network analysis (Setsuko *et al.* 2024b) also placed *C.* × *chibusensis* (ecotype SH) between its parental species (ecotypes SG and ST). Morphologically, *C.* × *chibusensis* displays leaf traits and hair densities intermediate between those of the parental species, as confirmed by principal component analysis (Setsuko *et al.* 2024a). Furthermore, *C.* × *chibusensis* occupies a unique ecological niche in high-elevation cloud forests and exhibits a flowering phenology similar to *C. subpubescens* but distinct from *C. boninensis* (Setsuko *et al.* 2024a). Collectively, these findings strongly support the interpretation that *C.* × *chibusensis* is a natural hybrid between *C. subpubescens* and *C. boninensis*.

Key to *Callicarpa* taxa in the Ogasawara Islands [partly based on Yamazaki (1993) and Yonekura (2017)]

1a. Deciduous shrub; flowers hermaphroditic.....Species in Japan, except the Ogasawara Islands
1b. Evergreen or semi-evergreen shrub or tree; flowers unisexual (dioecious, morphologically heterostylous).....2
2a. Branches, petioles, and leaves glabrous; leaves thick-membranaceous or slightly fleshy, blade narrowly oblong..... *C. glabra*
2b. Branches and petioles covered with stellate hairs; leaves chartaceous or coriaceous, blade elliptic, oblong, or ovate.....3
3a. Leaves coriaceous (ca. 0.6 mm thick); lower surface densely stellate-tomentose..... *C. parvifolia*
3b. Leaves chartaceous (less than 0.3 mm thick); lower surface not tomentose.....4
4a. Evergreen shrub 0.3–2.0 m tall, often caespitose; flowers over a prolonged period (July–January)..... *C. hahajimensis*
4b. Semi-evergreen erect tree or shrub taller than 2 m; flowers in a short period (summer or autumn).....5
5a. Tree 3–11 m tall, often taller on well-developed soils; flowers in autumn (peaking in October)..... *C. boninensis*
5b. Shrub less than 5 m tall; flowers in summer (peaking in June and July).....6
6a. Leaves larger (7–21 cm long, 3–11 cm wide); both surfaces sparsely pubescent or glabrous..... *C. subpubescens*
6b. Leaves smaller (8–13 cm long, 4–9 cm wide); lower surface sparsely stellate-pubescent..... *C.* × *chibusensis*

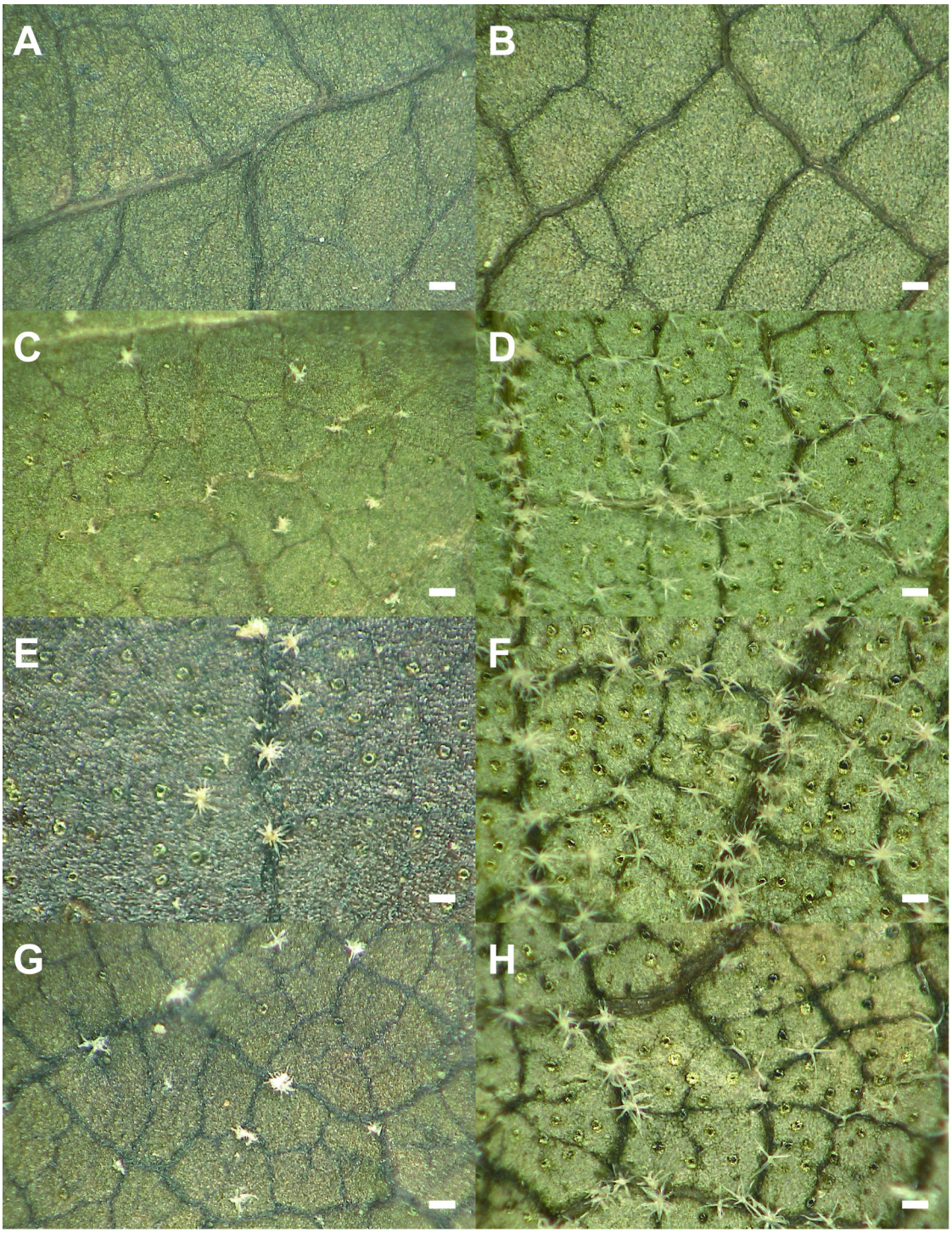

FIGURE 4. Comparison of the upper and lower leaf surfaces of the four *Callicarpa* taxa in the Hahajima Islands. A and B, *C. subpubescens*; C and D, *C. boninensis*; E and F, *C. hahajimensis*; G and H, *C.* × *chibusensis*. A, C, E, and G show the upper surfaces; B, D, F, and H show the lower surfaces. Scale bars are 1 mm for all images. All photographs taken by S. Setsuko.

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