A New Species of Hawaiian *Phyllostegia* (Lamiaceae) from Kaua'i and Recognition of a Wai'anae Mountain, O'ahu, Endangered Variety of *Phyllostegia parviflora*

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ABSTRACT. A rare new species of the Pacific genus *Phyllostegia*, *P. renovans*, is described. It is unique in the genus in that the stems resume vegetative growth after flowering. It is relatively rare, with 23 small populations known only from three adjacent valleys on the northeastern part of the island of Kaua'i, Hawaiian Islands. A new combination is also provided for the Wai'anae Mountains, O'ahu, endangered endemic variety of *Phyllostegia parviflora* now known from only one extant population of about 20 individuals.

The intensive collecting effort by the National Tropical Botanical Garden collectors during the past decade has shown that Kaua'i was one of the least effectively collected Hawaiian Islands. Kaua'i is among the most interesting because it has the highest level of single-island endemism in the archipelago (Wagner et al., 1990; Sakai et al., 1995; Wagner & Funk, 1995). Especially in need of intensive survey effort was the northeastern quadrant of Kaua'i. A number of new species and many range extensions have been made in the past several years of work in this region of the island. One of these new species is a *Phyllostegia* with a unique growth habit, in which the vegetative stem reinitiates growth after flowering. Two additional basic inflorescence patterns occur in the genus: short, congested inflorescences on usually leafless lateral branches in the axils of or below the lowermost leaves (e.g., *P. floribunda* Bentham, *P. wawrana* Sherff); and leafy, terminal, racemose inflorescences on the central stem and upper lateral branches (most of the genus, including *P. parviflora* (Gaudichaud) Bentham). The renewal of vegetative growth can be viewed as an intermediate stage between the usual type in *Phyllostegia* and the short, congested, lateral type in two species of *Phyllostegia*. The lateral type in turn has evolved further into the axillary verticillasters in *Stenogyne*, a closely related Hawaiian genus of primarily bird-pollinated vines.

Phyllostegia renovans W. L. Wagner, sp. nov. TYPE: Hawaiian Islands (U.S.A). Kaua'i: Hanalei District, headwaters of Wainiha River, NE fork, just SW of Mahinakehau Ridge, lowland wet forest with *Metrosideros polymorpha* Gaudichaud dominant, slopes moderate to steep, occasional in clearings, wet soil, 680–825 m, 29–30 Jan. 1993, *D. H. Lorence, S. Perlman & K. Wood 7315* (holotype, US-3362751; isotypes, BISH, PTBG). Figure 1.

Caulibus brevihirsutis, post anthesin recrescentibus; floribus (4)6 in quoque verticillastro; calyce 8–12 mm longi, marginibus loborum uni-paucidentatis, corolla alba, 19–22 mm longa.

Erect subshrub when young, becoming scandent and the stems up to 3–4 m long, short-hirsute. Leaves narrowly ovate to ovate, sometimes broadly so, 12.5–20 cm long, 5.0–8.8 cm wide, spreading hirsute on both surfaces, the hairs primarily concentrated on the veins on the lower surface, the veins usually red-tinged, margins coarsely dentate or serrate-dentate, apex acuminate, base truncate, broadly rounded or broadly cuneate, petioles reddish green, 3.2–5 cm long, moderately to densely hirsute, sometimes somewhat retrorsely so. Flowers (4)6 per verticillaster, sometimes the terminal one with 8 flowers, in an open, unbranched, racemose inflorescence 18–34 cm long, apparently the stem resuming vegetative growth after flowering, pedicels 9–10 mm long, sometimes on a common peduncle up to 4 mm long, moderately to densely short-hirsute, bracts ovate, the lower ones 6–11 cm long, the upper ones 2.5–3 cm long; calyx campanulate, 8–12 mm long, green, short-hirsute on both surfaces, the hairs spreading to somewhat antrorsely appressed, the lobes 4–7 mm long, widely spreading, the margins with 1–several coarse teeth, apex acute; corolla white, ca. 19–22 mm long, short-hirsute mostly on the upper side, upper lip 6–7 mm long, the lower lip 9–12 mm long. Nutlets ca. 8–9 mm long, greenish black.

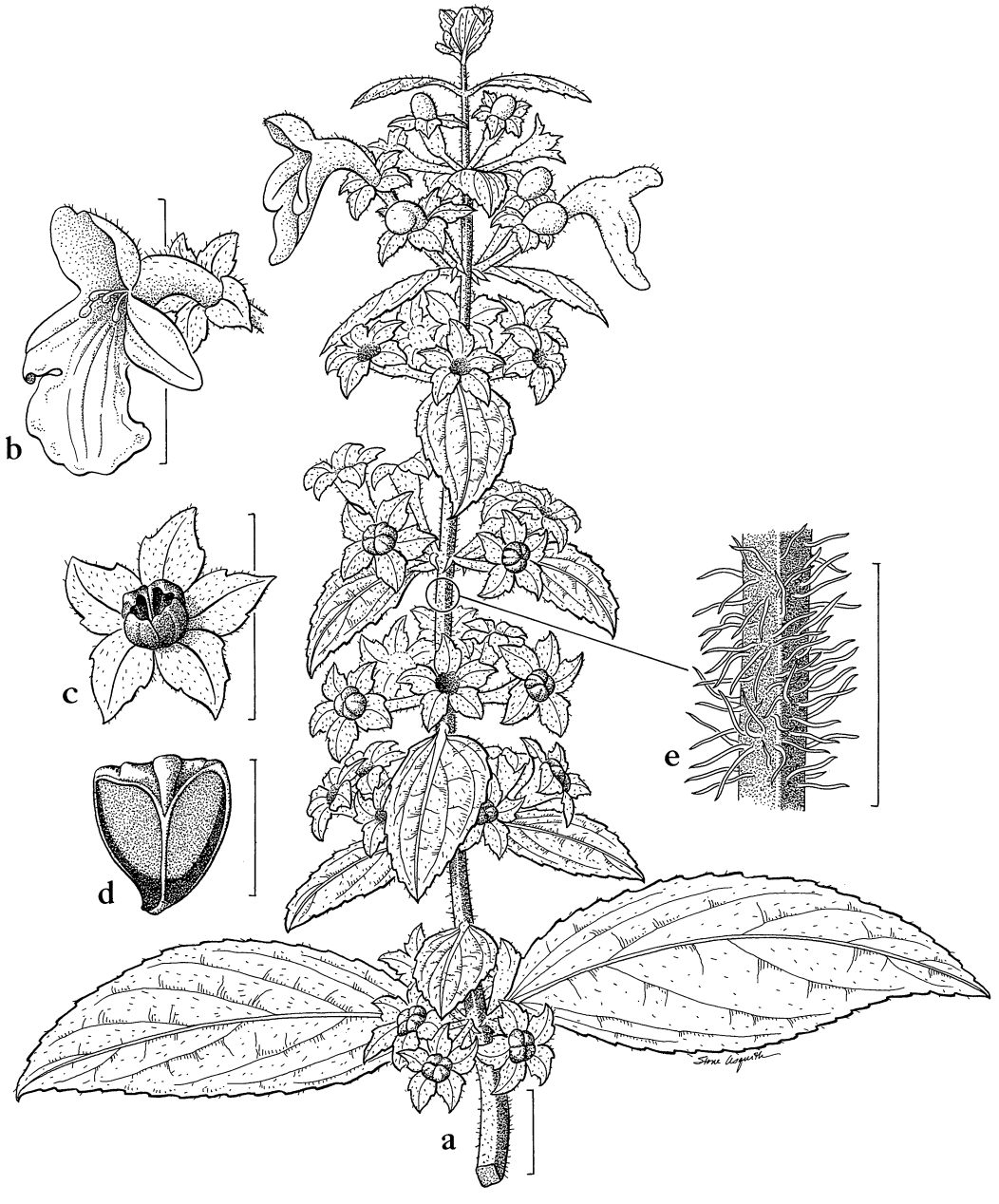

Figure 1. *Phyllostegia renovans* W. L. Wagner (*Lorence et al. 7315*). —a. Inflorescence showing the apex resuming vegetative growth. —b. Flower. —c. Calyx with maturing fleshy nutlets. —d. Nutlet. —e. Pubescence of the inflorescence. Scale bar: a–c = 2 cm; d = 1 cm; e = 2 mm. The original illustration is on indefinite loan to the Hunt Institute for Botanical documentation and featured in their 8th International Exhibition.

Distribution. Known only from the upper parts of three valleys on the northeastern side of Kaua'i, Hanakoa, Limahuli, and Wainiha, at 680–1040 m, where it grows along the watercourses and at the bases of waterfalls. A collection with only young flower buds from Wai'oli Valley (*Perlman et al. 13256,* BISH, US) may also represent this species, but is somewhat more pubescent; it should be recollected in flower or fruit for verification of its status. *Phyllostegia renovans* occurs in scattered patches; Wood (pers. comm., 1997) noted about 20 small populations in the area explored in upper Li-

mahuli Valley. The habitat is *Metrosideros polymorpha* Gaudichaud var. *glaberrima* (H. Léveillé) H. St. John wet forest near streams associated with *Antidesma platyplyllum* H. Mann, *Boehmaria grandis* (Hooker & Arnott) A. Heller, *Broussaisia arguta* Gaudichaud, *Cheirodendron, Cibotium, Cyanea, Cyrtandra, Dicranopteris linearis* (N. L. Burmann) Underwood, *Diplazium sandwichianum* (C. Presl) Diels, *Dubautia knudsenii* Hillebrand, *Freycinetia arborea* Gaudichaud, *Gunnera kauaiensis* Rock, *Hedyotis terminalis* (Hooker & Arnott) W. L. Wagner & Herbst, *Ilex anamola* Hooker & Arnott, *Labordia, Machaerina angustifolia* (Gaudichaud) T. Koyama, *Peperomia, Perottetia sandwicensis* A. Gray, *Pipturus, Psychotria, Sadleria, Sceavola, Syzygium sandwicense* (A. Gray) Niedenzu, and *Tetraplasandra.* Threats to these populations are introduced animals and plants such as *Clidemia hirta* (L.) D. Don, *Hedychium gardenarianum* Ker Gawler, and *Rubus argutus* Link.

The red coloration in the leaves occurs at least when plants are in sunny sites and apparently is less intense in shaded sites. Lorence (pers. comm., 1995) noted that the flowers are not fragrant in the morning (10–11 a.m.), but have a light fragrance at 5 p.m., suggesting moth pollination.

Paratypes. HAWAIIAN ISLANDS (U.S.A.). **Kaua'i:** Hanalei District, upper Hanakoa Valley, Honoonapali Natural Area Reserve, 3500 ft., *Perlman & Hill 10830* (BISH, PTBG, US); below and S of Pihea Peak, steep slopes with hanging valleys, along drainage, 1060 m, *Wood 1341* (AD, BISH, F, K, MO, PTBG [2]); upper Hanakoa Valley, below Pihea, on stream banks and slopes, 3400 ft., *Perlman 13998* (BISH, MO, NY, P, PTBG, US); Hanakoa drainage, 1100–1170 m, *Wood et al. 1750* (PTBG); Wainiha Valley, below Hinalele Falls, 2500 ft., *Wood et al. 2255* (PTBG, US), 2180 ft., *Perlman et al. 13215* (BISH, PTBG, US); NE fork of Wainiha River, SW of Mahinakehau Ridge, 2340 ft., *Perlman et al. 13302* (BISH, PTBG, US); upper Limahuli Valley above falls, Hono'onapali, 2600–3200 ft., *Wood et al. 3265* (PTBG), 2560 ft., *Perlman et al. 14256* (BISH, NY, PTBG, US); Limahuli Valley, back of valley below Pali Ele'ele, along stream, 2800 ft., *Perlman & Wood 15617* (BISH, PTBG, US).

When the most recent revision of *Phyllostegia* was nearing completion (Wagner et al., 1990), Steve Perlman collected *P. parviflora* in the Wai'anae Mountains, O'ahu, between Palikea and Pohakea Pass (*Perlman 5679,* BISH, PTBG). It differed from populations of this species in the Ko'olau Mountains, O'ahu, where it was historically most common, and from Maui and Hawai'i populations in its shorter pedicels 2–5(–6) mm long, spreading hairs on the petioles, slightly smaller flowers, and relatively few gland-tipped hairs in the inflorescence. Wagner et al. (1990) thought that it represented a new variety, but also that it may have already been named as *Phyllostegia mollis* var. *lydgatei* Sherff. At that time this name could not be definitely placed under *P. parviflora* since the type material is not extant. However, based on the description by Sherff (1935) and examination of the Hillebrand specimen at US annotated by Sherff, it appeared to represent the Wai'anae Mountains variety of *P. parviflora.* I have studied the US sheet cited and determined that it apparently represents the only original material of Sherff's taxon extant and that it is the same taxon as *Perlman 5679* and other subsequent collections from the Wai'anae Mountains. I therefore here make the new combination in *P. parviflora,* lectotypifiy Sherff's name, and provide a full description.

Phyllostegia parviflora (Gaudichaud) Bentham var. **lydgatei** (Sherff) W. L. Wagner, comb. nov. Basionym: *Phyllostegia mollis* Bentham var. *lydgatei* Sherff, Amer. J. Bot. 21: 700. 1934. *Phyllostegia lydgatei* (Sherff) H. St. John, Phytologia 63: 177. 1987. TYPE: Hawaiian Islands (U.S.A.). O'ahu: Wai'anae Mts., 1869, *J. M. Lydgate s.n.* (B destroyed, photo F). Sherff cited two other collections from the Wai'anae Mountains of O'ahu in addition to the type: Makaleha: *J. M. Lydgate s.n.* (B destroyed); and O'ahu: *s.l., s.d., W. Hillebrand s.n.* (lectotype, here designated, US-809370). The lectotype was annotated by Sherff.

Phyllostegia waianaeensis H. St. John, Phytologia 63: 182. 1987. Syn. nov. TYPE: Hawaiian Islands (U.S.A.). O'ahu: Wai'anae Range, small gulch bottom inside of South Palawai Gulch, 2300 ft., 28 Mar. 1948, *R. L. Wilbur 609* (holotype, BISH-53699).

Shrubby perennial herbs; stems densely antrorsely strigose, becoming hirtellous and glandular hirtellous toward and throughout the inflorescence (hairs straight or slightly curved, 0.1–0.6 mm long). Leaves rugose, ovate to broadly ovate, (15–)19–33 cm long, (6–)7.5–15.3 cm wide, both surfaces conspicuously (at least when dry) and usually densely glandular-dotted, adaxial surface appressed long-hirsute, abaxial surface hirsute to antrorsely strigose, densely so along veins, margins crenate, apex acuminate, base truncate to rounded or subcordate, petioles (5–)6–13.5 cm long, densely hirtellous. Flowers (4)6(10) per verticillaster, in leafless, usually compound, racemose inflorescences usually 10–20 cm long, consisting of the terminal primary stem and numerous secondary and tertiary lateral branches immediately below, hirtellous and sparsely to moderately glandular hirtellous throughout, pedicels 2–5(–6) mm long, bracts narrowly ovate to elliptic-ovate, 6–9 mm long; calyx campanulate, 3–

6 mm long, nerves conspicuous, hirtellous and sparsely to moderately glandular hirtellous, and glandular-dotted, the teeth narrowly deltate to linear-deltate or linear-elliptic, 1.5–2 mm long, apex attenuate to acute; corolla 10–13 mm long, white, purple-tinged at least on the upper lip, the tube curved, ca. 8–10 mm long, glandular-dotted, short-hirtellous, and glandular hirtellous, especially on the upper side, the upper lip ca. 2–3 mm long, the lower lip ca. 5–7 mm long. Nutlets ca. 3–6 mm long.

Distribution. Occurring in diverse mesic forest with *Acacia koa* A. Gray, *Antidesma, Claoxylon sandwicense* Müller Argoviensis, *Cyanea membranaceae* Rock, *Melicope, Metrosideros polymorpha* Gaudichaud, *Pittosporum, Pipturus albidus* (Hooker & Arnott) A. Gray, *Pouteria sandwicensis* (A. Gray) Baehni & O. Degener, *Pteralyxia macrocarpa* (Hillebrand) K. Schumann, *Solanum sandwicense* Hooker & Arnott, *Strebulus pendulinus* (Endlicher) F. Mueller, *Urera glabra* (Hooker & Arnott) Weddell, and *U. kaalae* Wawra, 730–825 m, from Napepeiauolelo Gulch and North Palawai Gulch, Wai'anae Mountains, O'ahu. This taxon appears to be restricted to north-facing slopes and is quite rare, with a current estimate of one extant population in North Palawai Gulch with about 20 individuals. *Phyllostegia parviflora* is U.S. federally listed as endangered (Russell & Bruegmann, 1996). The final rule included the Wai'anae Mountains populations here treated as *P. parviflora* var. *lydgatei* as well as those restricted to *P. parviflora* var. *parviflora* from the Ko'olau Mountains (O'ahu), West Maui, and Hawai'i. *Phyllostegia parviflora* var. *parviflora* from the Ko'olau Mountains, O'ahu, and formerly Maui is apparently now restricted to one locality and four individuals, while *P. parviflora* var. *glabriuscula* A. Gray from the island of Hawai'i has not been collected since the late 1800s and is also apparently extinct.

Specimens examined. HAWAIIAN ISLANDS (U.S.A.). **O'ahu:** Wai'anae Mountains, Napepeiauolelo Gulch, N-facing slope, 2400 ft., *Perlman 5679* (BISH, PTBG[2], US), 14 Mar. 1990, *Obata s.n.* (BISH), *Perlman & Obata 10831 pro parte* (BISH) [additional sheets under the same label at PTBG, US are *P. hirsuta* Bentham, but Perlman (pers. comm., 1997) indicated the material was not mixed when collected and no *P. hirsuta* occurs at this locality]; Honouliuli, North Palawai Gulch, N-facing slope, two subgulches down the valley, 2400 ft., *Perlman & Obata 6162* (BISH, PTBG, US), 10 Feb. 1991, *Obata & Lau s.n.* (PTBG); Honouliuli, North Palawai Gulch, N-facing slope, one subgulch down the valley, 2700 ft., *Perlman & Obata 6165* (BISH, PTBG, US).

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