

New Records of Naturalized Orchids for the Hawaiian Islands

JAMES D. ACKERMAN, WILFREDO FALCÓN & WILNELIA RECART (Faculty of Natural Sciences,
Department of Biology, University of Puerto Rico, PO Box 70377, San Juan, Puerto Rico 00936-
8377, USA; emails: ackerman.upr@gmail.com, wilfredo.falcon@upr.edu,
wilnelia.recart@gmail.com)

We present data for two new records of naturalized Orchidaceae, *Cymbidium dayanum* from the island of Hawai'i, and a hybrid population of *Dendrobium* from O'ahu. We report fruit and seed set for both species and evidence of pollinator visitation for the *Dendrobium*.

Orchidaceae

Cymbidium dayanum Rchb. f.

New naturalized record

Cymbidium dayanum, a native of Bhutan, Burma, Cambodia, China, India, Indonesia, Japan, Laos, Malaysia, Philippines, Ryukyus, Taiwan, Thailand and Vietnam (<http://www.tropicos.org/NameDistributions.aspx?nameid=23513279>; Du Puy & Cribb 1988), was first noted on the island of Hawai'i by Caccia (2005) who had photographed plants in flower in the Kalopa State Recreation Area but had not made a collection. We found plants in two areas in the north Hamakua coast region: Akaka Falls State Park, loop trail; and Kalopa State Recreation Area in the garden-like grounds, and along the road just outside the entrance to the park. We observed only juveniles and fruiting individuals (early July). At Kalopa, we found 11 plants with fruits, and average fruit set was 31.5%. Seed set (proportion of seeds with visible embryos) was 91.5%. Very little is known of *Cymbidium* pollination but most, if not all species offer no reward, and use deception to attract bee pollinators (Kjellsson *et al.* 1985; Sugahara & Tsutsui 1998; Tsuji & Kato 2010). However, the callus ridges on the lip of *C. dayanum* have a pubescence of glandular hairs with swollen tips. Conceivably, these may serve either as a reward or as a means of attraction through fragrance production to bees (Sasaki *et al.* 1991; Sasagawa *et al.* 2004; Sugahara 2006; Tsuji & Kato 2010). In Hawai'i the pollinators are likely introduced *Apis mellifera* (Apidae). there are native *Hylaeus* bees (see Magnacca 2007), but all are substantially smaller and less robust than *Apis*. The most likely alternative is one of the introduced megachilid bees, but they are uncommon and most frequently seen along the coast (K. Magnacca, pers. comm.). Alternatively, *C. dayanum* in Hawai'i may be self-pollinating as is another naturalized Asiatic orchid in Hawai'i, *Spathoglottis plicata* Bl. Evidence from fruit set is equivocal: it is relatively low for autogamous plants, fairly high for deception species, but closer to that observed in orchids offering rewards (Tremblay *et al.* 2005). An abridged version of the *C. dayanum* description published by Du Puy & Cribb (1988) is as follows: Plants epiphytic herbs. Pseudobulbs fusiform, 4 × 2.5 cm, covered by persistent leaf sheaths. Leaves distichous, 4–8 per pseudobulb, linear, asymmetrically acute to acuminate, 30–115 × 0.7–2.4 cm. Inflorescence suberect to horizontal (pendent in fruit), 18–35 cm long, 5–20 flowered. Flowers 4–5 cm wide; pedicellate ovary green, 2–4 cm long; sepals white or cream, rarely suffused maroon, with a median maroon stripe, narrowly elliptic to oblong-lanceolate, 21–34 × 5–8 mm; petals similarly colored, narrowly oblong to elliptic, 18–28 × 5.0–7.5 mm;

lip white, strongly marked with maroon, yellow or orange spotted at base, tri-lobed, 15–22 × 10–15 mm when flattened, lateral lobes as long as column, erect and weakly clasping the column with perfect triangular tips, mid lobe with yellow stripe, entire, strongly recurved, callus ridges white or cream, 2, from the base of the lip to the base of the midlobe, covered in glandular hairs ca 0.2 mm long; column dark maroon with a pale yellow anther cap, arching, 11–14 mm long, pollinia 2, triangular. Capsules ellipsoidal, tapering to pedicel and apical beak, 4–6 × 1.5–2.0 cm.

Material examined. **HAWAII:** Honoka'a, Waka'alulu Rd, ca 400 m N of Kalopa State Recreation Area, N20.04225, W155.43316, 570 m, occasional on *Eucalyptus* tree trunks and logs along roadside, more common in the recreation area, 11 Jul 2010, *J.D. Ackerman, W. Recart, & W. Falcón 4534* (UPRRP).

Dendrobium hybrid (antelope-type)

New naturalized record

Dendrobiums are native to tropical Australasia and have been popular in the horticultural trade. Frohlich & Lau (2010) reported naturalized populations of two *Dendrobium* species on O'ahu, one of which was *D. antennatum* L., an antelope-type dendrobium characterized by erect, twisted petals (Frohlich & Lau 2009101401, BISH!). Such species have been commonly cultivated in Hawai'i and have been used extensively in the formation of artificial hybrids (Kamemoto *et al.* 1999). We report a highly variable population of hybrid antelope dendrobiums, naturalized along the Mau'umae Ridge Trail above Honolulu. Based on a sample of photographs that we took of flowers from various plants Phillip Cribb, an authority on *Dendrobium* taxonomy, thought that the hybrids may involve *D. lasianthera* J.J. Sm., *D. conantherum* Schltr., *D. discolor* Lindl., and/or *D. lineale* Rolfe parentage (personal communication 2010). We estimate that there were approximately 50 adult and juvenile plants scattered in the area growing on rocks among *u'ulei*, *Osteomeles anthyllidifolia* (Sm.) Lindl. (Rosaceae). We examined 101 flowers from 9 plants (all those that had flowers) and noted 57.4% had their pollinaria removed. This is an extraordinarily high rate of pollinarium removal. At the National Tropical Botanical Garden on Kaua'i, we observed *Apis mellifera* inside a similar sized flower of a hybrid antelope *Dendrobium* where the bee had died, not being strong enough to back itself out with the pollinarium attached to its thorax. *Apis* may well be the pollinators of this hybrid population of dendrobiums along Mau'umae Ridge Trail. Despite the high pollinarium removal rates, fruit set was only 11.4% suggesting that either pollinator return visits were uncommon or some pollinations resulted in abortions. Seed set was variable (range: 39.3–87.2) and averaged 62.6%. Along this trail, we found four other naturalized orchids: *Epidendrum xobrienanum* Rolfe, *Spathoglottis plicata*, and two other *Dendrobium*. One was an erect *Dendrobium phalaenopsis* Fitzg. hybrid type (only one plant seen in flower which had no evidence of pollinator visitation–pollinarium removals, pollinations or fruits), and the other was a small population of a rock-dwelling pendent species (or hybrid) perhaps of the *D. nobile* type, that lacked either flowers or fruits during our visits (July–August). We made no herbarium collections of either one. Our description is based on material we had collected and photographed. Plants epilithic herbs. Pseudobulbs cane-like, erect, asymmetrically fusiform, apically attenuate, 0.50–1.00 (–2) m, 1–2 cm diam. Leaves 16–48, sheaths persistent, scarious with age, blades deciduous, distichous, thick, coriaceous, stiff, broadly elliptic, smaller towards apex of stem, ca 10 × 5 cm. Inflorescences lateral from upper nodes of pseudobulbs, produced in succession, racemose, 10–30-flowered, usually about half in flower at one time. Flowers

resupinate; sepals and petals vary from yellow to yellow-brown, dark brown or pale greenish brown with yellow margins, usually twisted, rarely, flat, with both types sometimes on the same plant; sepals similar to petals but much shorter, ca 21 × 6 mm; petals extended as horns of an antelope, often darker than sepals, ca 38 × 7 mm; lip similar in color to sepals and petals, sometimes darker, sometimes concolorous, or with reddish veins, and/or a purple disc, its longitudinal ridges sometimes white, lip trilobed, overall ca 24 mm long, mentum ca 10 mm long, apical half a narrow spur, lateral lip lobes elongate, flanking column, ca 9 mm long, isthmus ca 2 mm long, mid lobe broadly ovate, apiculate, margins undulate, ca 6 mm long; column semiterete, straight, greenish, ca 5 mm long. Fruits pendulous, pedicels ca 35 mm long, capsules green, obovoid, ca 35 × 12 mm.

Material examined. O'AHU: Honolulu, Mau'umae Ridge Trail above Maunalani Circle. N21°18.276', W157°46.750', 320 m, open area, along ridge tops, mostly on the east side, on rocks and among *Osteomeles anthyllidifolia* (Rosaceae), 30 Jun 2010, J.D. Ackerman, W. Recart & W. Falcón 4531 (UPRRP).

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