

Portulaca molokiniensis (Portulacaceae), a New Species from the Hawaiian Islands¹

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ABSTRACT: *Portulaca molokiniensis* is a distinctive new species from the arid islands of Molokini and Kaho'olawe. It is clearly distinguishable from its closest relative, *Portulaca lutea*, by its spinose seeds, extended peduncle-like apical internodes, many-flowered capitate inflorescences, broad, decussate, imbricate leaves, larger flowers, long, sinuous style branches, and cespitose habit. *Portulaca molokiniensis* occurs in extremely dry coastal sites on leeward rainshadow islands in Hawai'i, well separated from *P. lutea* which occurs only on moist windward coastal sites.

The new species of *Portulaca* described here was first collected by Charles N. Forbes on Molokini in February 1913. In a publication appearing later that year (Forbes 1913) he identified it as *P. lutea* Soland. ex G. Forster. It was collected again at the same locality on 13 October 1925 by Harold S. Palmer and identified by Edward L. Caum (Caum 1930) again as *P. lutea*. It was not documented again until 1978-1984 when it was collected twice on Molokini and three times on Kaho'olawe by various individuals and botanical survey parties (Stemmermann, Char, Higashino and Yosida 1979; Corn, Char, Clarke and Cuddihy 1980; Clarke 1982).

It was only during the most recent surveys that these plants were recognized as being possibly distinct from *Portulaca lutea*. In order to evaluate their status, I initiated a study which included detailed observations and measurements of plants growing at both the Molokini and Kaho'olawe localities, similar observations and measurements of plants growing under cultivation on Maui, and herbarium studies at the Bishop Museum in Honolulu. These studies showed that the Molokini and Kaho'olawe plants possess a number of characteristics distinguishing them from *P. lutea* as it occurs throughout its entire Pacific range.

SYSTEMATIC TREATMENT

Portulaca molokiniensis R. W. Hobdy, sp. nov., Figure 1. TYPE: U.S.A., Hawaiian Islands, Molokini Islet, growing along the inner slope of the western end of this crescent shaped tuff cone among low, seasonally drying grasses and herbs, 20 m, 14 February 1982, R. W. Hobdy 1244 (holotype: BISH-459984).

Species haec a *P. lutea* Soland. ex G. Forster differt in semine spinatis, et in structura pedunculo longo, et in inflorescentiis capitularis multis floribus, et in foliis latis decussatis imbricatis, et in floribus magnis, et in ramis styli sinuosis longis, et in habitos caespitos.

Perennial herbs from a stout taproot, branching primarily at or beneath the ground surface with up to 30 tightly clustered ascending to spreading stems, plants 15-35 cm tall, forming clumps 25-50 cm across; stems succulent, 12-35 cm long, 15-25 mm in diameter at the base with smooth grayish bark, rapidly tapering to a narrower, bright-green apex. Leaves clustered along the apical portion of the stem, arranged in four imbricate, decussate ranks, succulent, broadly obovate, 20-45 mm long, 20-55 mm wide, glabrous, apex truncate, sessile or nearly so, each bearing a dense pectinate row of hairs 1.5-3.0 mm long

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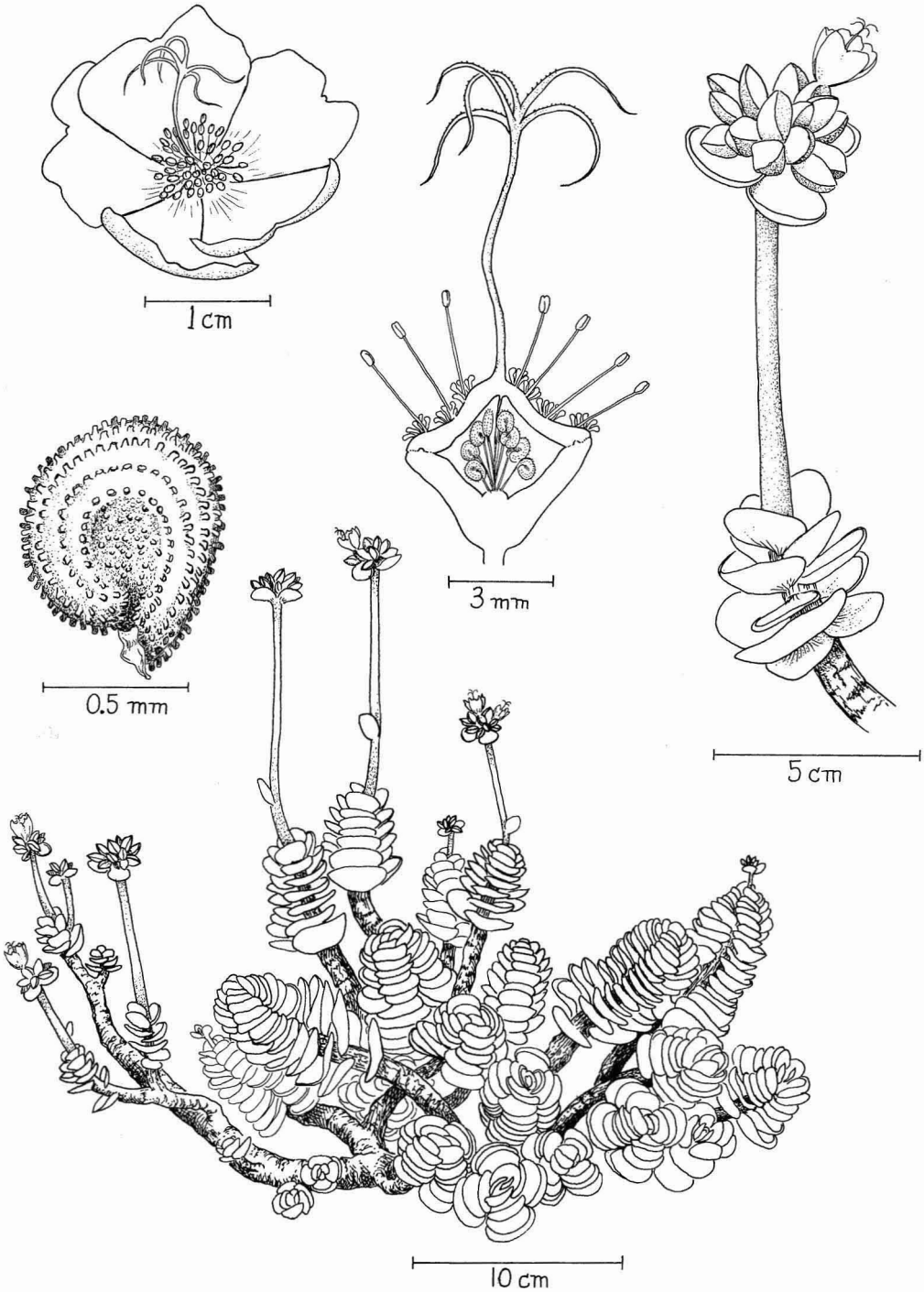


FIGURE 1. *Portulaca molokiniensis* Hobdy. a, habit, $\times \frac{1}{2}$; b, inflorescence, $\times 1$; c, flower, $\times 3$; d, cross-section of ovary, $\times 8$; e, seed, $\times 70$.

in the axil. Inflorescences of dense terminal heads on 3–20 cm long extended peduncle-like internodes and closely subtended by four reduced leaves. Flowers sessile, 17–25 mm in overall diameter, 15–22 per inflorescence in varying stages of maturity with up to three blooming simultaneously, opening at about 9:00 AM and wilting by mid-afternoon. Sepals two, carinate, 8–10 mm long, 8–9 mm wide, apex rounded. Petals bright lemon-yellow, obcordate, 12–18 mm long, 10–12 mm wide. Ovary half inferior, conic-hemispheric, 1.5 mm high, 4 mm wide, smooth, completely buried beneath a fleshy disk, an extension of the hypanthium, which supports the androecium. Stamens 40–55, are inserted in a scattered array over the entire surface of the disk and surrounded at their bases by a dense mat of minute yellow papillae which emit a faint fragrance; filaments yellow, 3–5 mm long; anthers 0.5 mm long; pollen orange. Style yellow, extending well beyond the stamens, at first erect, later nodding and coming into contact with the anthers, the column 8–9 mm long, style branches 5–6, 6–7 mm long and sinuously curling. Capsules 8–9 mm long, 3–4 mm in diameter, circumscissile slightly below the middle, lower portion broadly obconic, 4 mm long, operculum conic-hemispheric, 3 mm long with a 2 mm long apical beak. Seeds broadly reniform, 0.7–0.9 mm long, 0.4 mm thick, dark brown, cells of testa protruding to form a regular array of uniform 0.05 mm long blunt-tipped spines, surface of fresh seeds glistening and sticky.

Plants grown under cultivation with a regular water supply were larger and more robust in all respects than wild growing plants. Stems were up to 35 mm in diameter at the base, leaves were occasionally over 60 mm in both length and width, extended peduncle-like apical internodes reached 30 cm in length, inflorescences sometimes had over 40 buds per head with up to 6 flowers blooming simultaneously, and individual flowers had an overall diameter of up to 32 mm.

Additional Specimens Examined: Molokini Islet, same as above, *Forbes s.n.* (BPBM), *Palmer s.n.* (BPBM), *Clarke 408* (BPBM); Kaho'olawe, on detritus at base of sea cliff, Kamohio Bay, 10 m, *Higashino and Stemmer-*

mann 8050 (BPBM); Kaho'olawe, Pu'u Koa'e Islet, 25–115 m, *Higashino, Stemmermann, Morgan and Stemmermann 8061* (BPBM), *Hobby 1946* (BPBM).

DISCUSSION

Portulaca molokiniensis grows along the coasts of the dry islands of Molokini and Kaho'olawe in areas that receive only about 25–40 cm (10–16 in.) of rainfall annually. It occurs on volcanic tuff (Molokini), on steep rocky slopes (Pu'u Koa'e Islet, Kaho'olawe), and on detritus at the base of sea cliffs (Kamohio Bay, Kaho'olawe) at elevations ranging from 10–115 m above the sea, growing in association with *Panicum nubigenum*, *Heteropogon contortus*, *Capparis sandwichiana*, *Jacquemontia ovalifolia* subsp. *sandwicensis*, *Sida fallax*, and a number of other less common native coastal plants.

Portulaca molokiniensis belongs to subg. *Portulaca* sect. *Portulaca* subsect. *Portulaca*, which is characterized by obovate leaves, pectinate axillary hairs, and carinate sepals (Geesink 1969). Included are such species as *P. lutea*, *P. howellii* of the Galapagos Islands, and the now nearly cosmopolitan *P. oleracea*.

The fleshy disk covering the ovary of *Portulaca molokiniensis* is covered with scattered stamens surrounded at their bases by a mat of papillae. This characteristic is also present in *P. lutea* and *P. oleracea* although in a progressively reduced proportion in each respectively, and is further evidence that these species are closely related.

Portulaca lutea, the closest relative of *P. molokiniensis*, occurs over a vast area of the Pacific Ocean ranging from Mangarewa and Pitcairn islands in the southeast and Fiji and the Solomon Islands in the southwest, to Hawai'i and the Marshall Islands in the north. It varies in habit from a prostrate plant (Hawai'i), to a plant up to 30 cm tall with an erect stem and spreading branches (Line and Phoenix islands and several islands further south), to a strongly succulent plant nearly 1 m tall (Marquesas Islands). Its 1–1.5 mm long pectinate axillary hairs fall midway between the smaller and scarcely noticeable axillary

TABLE 1
COMPARISON OF *Portulaca lutea* AND *Portulaca molokiniensis*

CHARACTERS	<i>P. lutea</i>	<i>P. molokiniensis</i>
Stems	Single stemmed, much branched above	Many stemmed, caespitose from a basal cluster, usually unbranched above ground
Leaves	Arranged along entire length of stems, sub-opposite, two-ranked, 15–25 mm long, 10–15 mm wide	Arranged along apical third of stems, imbricate, decussate in four ranks, 20–60 mm in both length and width
Axillary hairs	Pectinate, 1–1.5 mm long	Densely pectinate, 1.5–3.0 mm long
Apical internodes	Not elongate, 0.5–3.0 cm long	Elongate, peduncle-like, 3–30 cm long
Inflorescence	1–3 flowers per inflorescence, flowers blooming singly	Capitate clusters of 15–40+ buds, flowers and fruits, as many as six flowers blooming simultaneously
Petals	10–12 mm long	12–18 mm long
Pistils	Style columns 5 mm long, style branches five, 3 mm long, arching, scarcely exerted beyond stamens	Style columns 8–9 mm long, style branches 5–6, 6–7 mm long, sinuously curling, long exerted beyond stamens
Seeds	Cells of testa smooth to stellulate-tessellate to slightly tuberculate	Cells of testa protruding to form a regular array of uniform 0.05 mm long bluntpointed spines

hairs found in *P. oleracea* and the dense and more prominent 1.5–3.0 mm axillary hairs found in *P. molokiniensis*. Its seed ornamentation varies from smooth to stellulate-tessellate or slightly tuberculate.

In the main Hawaiian Islands *Portulaca lutea* occurs along windward coastlines where annual precipitation ranges from 100–200 cm (40–80 in.). It is well separated geographically from *P. molokiniensis* which only occurs on the leeward coastlines and is obviously adapted to extremely dry conditions. *Portulaca molokiniensis*, while probably derived from *P. lutea*, differs from it in several important characters, and stands as a distinct new species (see Table 1).

The name *molokiniensis* refers to the 22.4 acre semi-circular islet between Maui and Kaho‘olawe islands where this species was first collected and on which it attains its best development.

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