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A NEW VARIETAL DESIGNATION IN *SILENE DOUGLASII*

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ABSTRACT

Silene douglasii var. *rupinae* ("of a rocky chasm") is described as a new variety, based on fieldwork in Washington, Oregon, and California and herbarium study of specimens throughout the range of *Silene douglasii* Hook. Plants of var. *rupinae* are endemic to rocky cliffs and promontories in the Columbia River Gorge region of Oregon and Washington. They differ from other varieties by their markedly linear leaves, with length:width ratios typically exceeding 15:1, by their sometimes glandular calyces and stems, and by petal limbs that average 1–2 mm shorter and narrower than in vars. *douglasii* and *oraria*. Corolla appendages are also shorter than in var. *oraria*. Var. *rupinae* encompasses a portion of the former var. *monantha* (Wats.) Robins. located in the Columbia River Gorge but does not include its *douglasii*-like type or those plants found in the Sierra Nevada, both of which we place in synonymy with var. *douglasii*.

Recognized since 1830 when Hooker described it from the collections of explorer David Douglas, *Silene douglasii* Hooker has historically included a number of varieties; at least eight were once accorded specific status. In their most recent revision of North American *Silene*, Hitchcock and Maguire (1947) reduced *S. douglasii* to four varieties, helping to clarify often confusing and overlapping descriptions of the taxa. Hitchcock et al. (1964) later placed one of these taxa, var. *villosa*, in synonymy with var. *douglasii*, thereby retaining this latter widespread variety and two narrowly restricted varieties, var. *oraria* and var. *monantha*.

Kruckeberg (1954, 1955, 1960, 1961, 1962, 1964) studied *Silene* cytotaxonomically and performed extensive experimental hybridizations. His artificial crosses within *S. douglasii* yielded fertile offspring, supporting the treatment of morphotypes as infraspecific categories. Yet, in spite of this work and earlier revisionary and floristic studies, taxonomic problems remain (Hitchcock and Maguire 1947; Showers 1987). In our attempt to resolve some of the difficulties in *S. douglasii* with additional biosystematic and ecological investigations, we discovered the nomenclatural complications reported here.

¹ Authors' names are presented alphabetically.

VARIETAL RELATIONSHIPS AND TAXONOMIC HISTORY

Douglas described *Silene douglasii* as "abundant in mountain vallies, above the Grand Rapids of the Columbia, and among the Rocky Mountains, on their western declivity." Thus, it is not surprising that both Robinson (1893) and later, Hitchcock and Maguire (1947), created infraspecific names as a means of organizing the diversity they observed over this wide geographic range. In our field studies at type localities and sites of earlier collections, however, we found that some of the published morphological and geographical descriptions of the taxa did not reflect our observations. Furthermore, in the course of examining all the known types for taxa associated with *S. douglasii*, we discovered errors and inconsistencies between the designated types of the varieties and their published descriptions.

We identify two principal nomenclatural problems; one centers on the delineation of the types for var. *monantha* (Wats.) Robins. and for *S. douglasii* Hook. A second concern arises from the geographic circumscription and morphological description of var. *monantha* by different investigators.

Delineation of type for var. douglasii. Hooker based his description of *S. douglasii* on material collected by Douglas, but failed to clearly label a holotype from among three sheets now located at Kew. Unfortunately, the most likely candidate, and indeed the only Douglas sheet originally from Hooker's herbarium, is a mixed collection bearing two separate Douglas labels dated from 1825 and 1826 (Fig. 1). These separate collections on one herbarium sheet represent specimens that, in numerous descriptions written both before and after Hitchcock and Maguire's (1947) revision, correspond morphologically to at least two different varieties. Furthermore, we find no evidence that Hitchcock and Maguire examined any of these specimens at the time of their 1947 revision of the genus *Silene* (presumably the three Kew specimens were unavailable during World War II), so this problem has remained. Thus, we have now designated one of the *douglasii*-like stems on this herbarium sheet as the *douglasii* lectotype for *S. douglasii*, which thereby serves also as the type for var. *douglasii*. The specimen selected is more complete than the other possible choices and its label description ("common in the mountain vallies between Spokane and Kettle Falls and in the vallies of the Rocky Mountains near the source of the Columbia") accurately describes the broad distribution of this taxon. Moreover, the remaining *douglasii*-like specimens on this sheet are of ambiguous origin since some bear handwritten notations by Nuttall and, in fact, may represent his, rather than Douglas' collections.

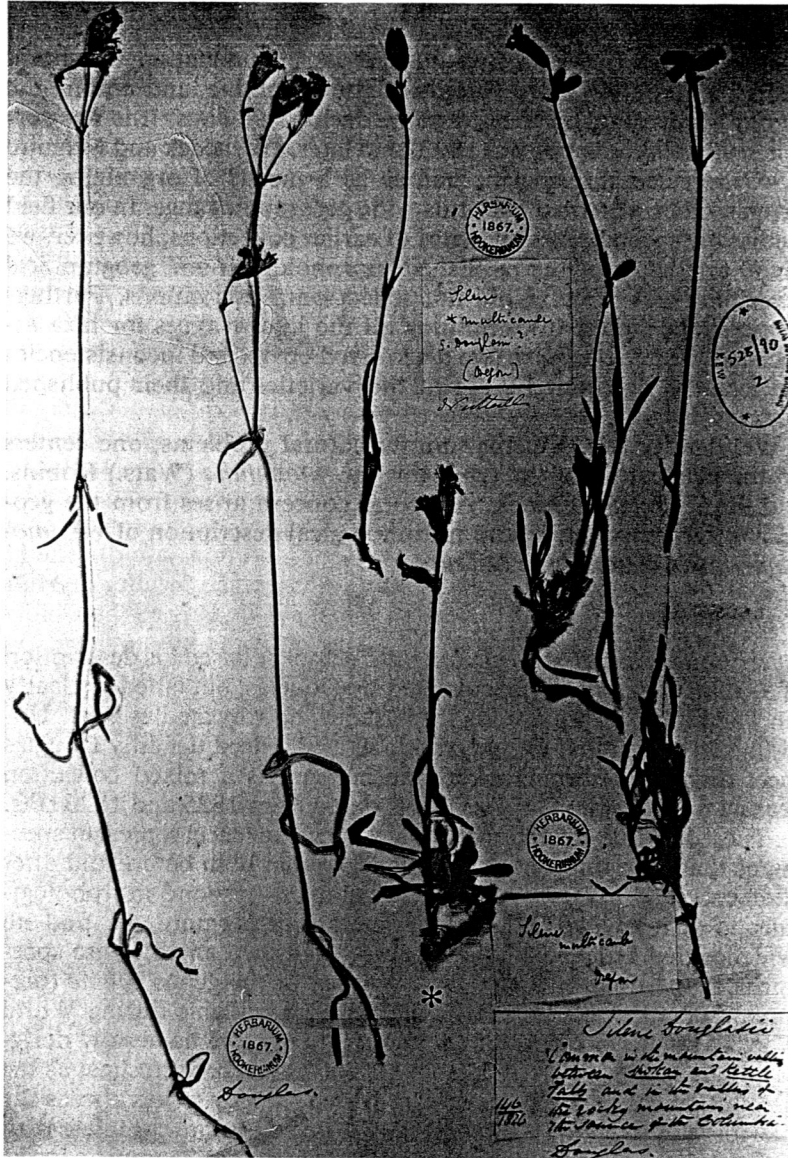


FIG. 1. Kew herbarium sheet. Asterisk at base of stem in photo denotes newly designated lectotype of *S. douglasii* var. *douglasii*, selected from the four *douglasii* stems at right. The two leftmost stems are now paratypes of var. *rupinae*.

Delineation of type, description, and range of var. monantha. Another problem arose when we inspected the Kellogg and Harford (GH) type for var. *monantha* (= *S. monantha* Watson) collected from Castle Rock, Washington and when we compared it to descriptions of this taxon by Watson (1875), Robinson (1893), Howell (1897), and Hitchcock and Maguire (1947). Specifically, we found that the morphology and geography of plants designated as var. *monantha* were similar to var. *douglasii*. For example, key characters in Watson's original description were weak, elongated stems, glabrous vestiture, and inflated calyces. Yet inflated calyces and presence of stems of varying stature are also typical of var. *douglasii* (Hitchcock and Maguire 1947). In addition, close inspection of the holotype for var. *monantha* revealed that it is not strictly glabrous, as Watson had indicated, and that is virtually inseparable from var. *douglasii* collections throughout the Northwest.

Later, Robinson (1893) treated *S. monantha* as a variety of *S. douglasii*, retaining the features noted by Watson, adding a description of the leaves as "grass-like," and extending the geographic range of var. *monantha* to include populations from California and Utah. He also described a new variety *brachycalyx* whose leaves were narrowly-oblongate, but puberulent (and non-viscid). The holotype is a Howell specimen from an unspecified locality in Multnomah County, Oregon, a region that includes part of the Columbia River Gorge. Four years later, Howell (1897) himself elevated var. *brachycalyx* to *S. columbiana*, describing it as smooth or puberulent and growing on "cliffs and rocky banks along the lower Columbia and Willamette Rivers." Thus, by this time, the epithets *monantha*, *brachycalyx*, and *columbiana* had been variously applied by Watson, Robinson, and Howell to populations of plants that remained indistinct in their morphology and geography.

Even Hitchcock and Maguire (1947) found it difficult to characterize the variability within *S. douglasii*. They gave little credence to either Robinson's var. *brachycalyx* or Howell's *S. columbiana*, placing both of these taxa in synonymy partly with var. *douglasii* and partly with var. *monantha*. In their monograph, they now delineated the once glabrous var. *monantha* from var. *douglasii* by its sparse, short hairs that are sometimes glandular. They further recognized var. *monantha* as a disjunct taxon with populations in the lower Columbia River Gorge near Mt. Hood and in the Sierra Nevada in California. Yet Hitchcock and Maguire (1947) still disagreed as to whether the nearly glabrous, broader-leaved plants from the Sierra Nevada (often designated as an unpublished name var. *glabrata* on herbarium sheets) might constitute yet another variety distinct from the narrow-leaved, sometimes glandular material found near the Columbia River Gorge.

Furthermore, var. *monantha* is apparently extinct in its type locality, with no known isotypes available for comparison. Although Hitchcock and Maguire (1947) had implied that there existed some glandular specimens from the type locality, most of the specimens they cite are from the Columbia River Gorge. Yet Castle Rock, Washington, the type locality of var. *monantha*, lies outside this region. Thus, the collections they cite are clearly not isotypes, and we have been unable to locate either valid isotypes or extant plants from Castle Rock. Even Howell (1897) noted that plants bearing the epithet *monantha* had not been located in the type locality subsequent to Watson's original description in 1875.

Finally, in summary, the epithet *monantha*, based on the Kellogg and Harford type, has been used for at least two different morphotypes from three separate localities. It has been inconsistently applied to sparsely pubescent (mostly eglandular), broad-leaved, *douglasii*-like material in Washington, Utah, and the Sierra Nevada and to narrow-leaved, pubescent, glandular or eglandular plants collected in the Columbia River Gorge. The epithet *brachycalyx* (= *S. columbiana*) has been variously applied to glabrous or puberulent plants that are *not* viscid. Thus, neither *monantha* nor the epithet *brachycalyx* adequately delimits any entity that is consistently distinct from var. *douglasii*.

NEW VARIETAL DESIGNATIONS

Based on our fieldwork throughout California, Oregon, and Washington, on studies of herbarium specimens throughout the range of *S. douglasii*, including our examination of all types (CSPU, DAV, GH, K, OSC, ORE, UC, WILLU, AND WTU), and on recent bio-systematic studies (in progress), we propose retention of both vars. *douglasii* and *oraria* as distinct taxa. As indicated in the key below, var. *oraria* differs from other named varieties of *S. douglasii* by its shorter stature, broader and thicker leaves, more inflated calyces and larger flowers. We further designate as var. *rupinae* ("of a rocky chasm") those populations of narrow-leaved, glandular or eglandular plants (Fig. 2) restricted to rocky sites in the Columbia River Gorge region of Washington and Oregon. Because plants of var. *rupinae* are most readily distinguished from other named varieties by their vegetative features (i.e., discriminant functions correctly classified 95% of the individuals based on vegetative characters and only 56% based on reproductive traits) and because intervarietal crosses within *S. douglasii* yield fertile offspring (Kruckeberg 1961), we believe the rank of variety is appropriate.

A new varietal name was chosen because no previously published epithet corresponds to this entity in both geographic location and

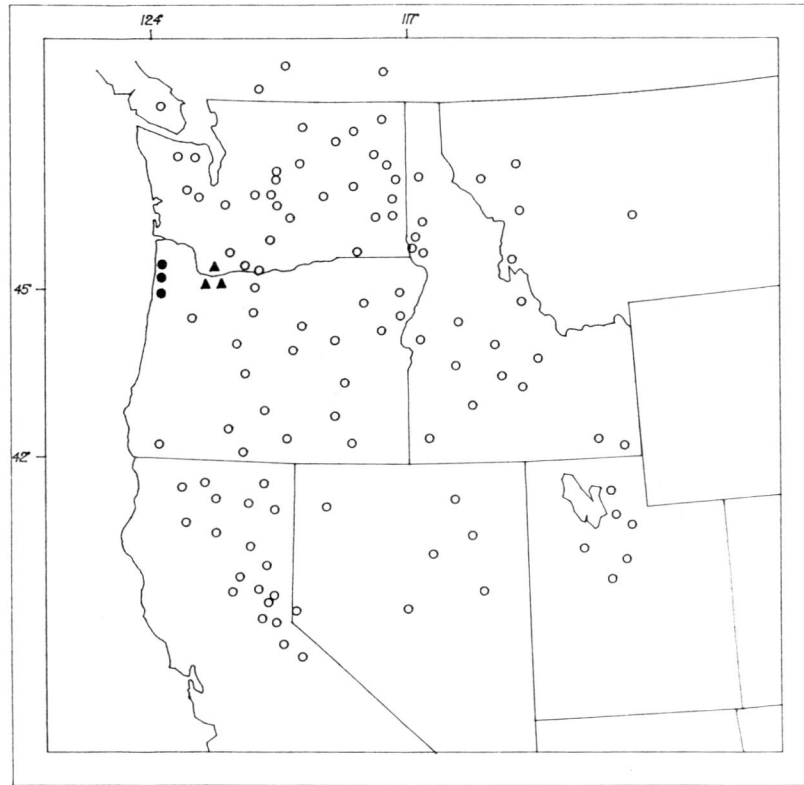


FIG. 2. Map showing distribution of varieties of *S. douglasii*. Triangles denote *var. rupinae*, closed circles *var. oraria*, and open circles *var. douglasii*.

morphology. In *var. rupinae*, we include that part of the prior-named *var. monantha* that was restricted to the Columbia River Gorge and its vicinity. We place in synonymy with *var. douglasii* that part of *var. monantha* located outside of this region because these specimens, including the Kellogg and Harford holotype and the California collections, are indistinguishable from those of *var. douglasii*. We also reject *S. douglasii var. brachycalyx* (= *S. columbiana*) as a name for the new variety because its lectotype is morphologically *douglasii*-like and of uncertain locality. We place other taxa previously proposed at the varietal level in synonymy with *var. douglasii* or *S. parryi* in agreement with Hitchcock and Maguire (1947). We concur with Hitchcock et al. (1964) who treat *var. villosa* Hitchc. & Mag. as synonymous with *var. douglasii*.

KEY TO THE VARIETIES OF *SILENE DOUGLASII*²

- a. Plants coastal in Oregon; leaves³ broad, 3–13 mm wide, 0.3–0.7 mm thick; flowers typically large, calyx strongly inflated, (4)7–10(12) mm in diameter at anthesis, petal limb 5–11 mm wide, often with a lateral tooth on margin.
 var. *oraria* (Peck) Hitch. & Maguire
- a'. Plants distributed throughout coastal and interior mountainous regions of western North America or restricted to the Columbia River Gorge in both Oregon and Washington; leaves variable in width 1.5–9 mm, not so thickened (0.1–0.5 mm); calyx narrower (3)5–8(10) mm in diameter, petal limb narrower, 1–5 mm wide, often not toothed.
- b. Cauline leaves narrow, 1.5–5.0 mm wide, typically over 15× longer than wide, often markedly linear; stem and calyx vestiture glandular or eglandular; plants distributed in rocky sites with shallow soils, in crevices and on cliff ledges along the Columbia River Gorge in Oregon and Washington.
 var. *rupinae*, var. nov.
- b'. Cauline leaves variable in width, 2–9 mm wide, and typically no more than 5–10× longer than wide; stem and calyx vestiture eglandular; plants distributed in dry sagebrush plains, open woods, and in mountainous regions from the Rocky Mountains westward to the Coast Ranges of British Columbia, Washington, and Oregon, south to central (Alpine County, California).
 var. *douglasii*

***Silene douglasii* var. *rupinae* Kephart and Sturgeon, var. nov.—**

TYPES: USA, Oregon, Multnomah County, Angel's Rest, elevation 1600', rocky promontory and slopes above the Columbia River Gorge, with *Lomatium*, *Allium*, *Eriophyllum*, and *Cerastium*, June 28, 1988. Kephart and Sturgeon #125 (holotype, OSC; isotypes, DAV, GH, K, ORE, OSC, CSPU, UC, WILLU, WTU).

A varietatibus ceteris foliis linearioribus 2–3 mm latis plerumque plus quam 40 mm longis, caulibus et calycibus interdum glandulosus differt; flores ad var. *douglasii* similes sed limbo petalorum circa 1 mm brevioribus angustioribus; flores a var. *oraria* limbo petalorum circa 2 mm brevioribus angustioribus, appendicibus 1.5 mm brevioribus differant.

Perennial herb (13)25–30(47) cm tall; multiple stems arising near base of plant above a deep taproot; pubescence simple, glandular or eglandular varying within and among populations; leaves linear-oblongate; cauline leaves (14)35–75(84) mm long to (1.5)2–3(5) mm wide (length : width ratio approximately 20:1), 0.1–0.4 mm thick; margins entire, tips acute tapering gradually to petiole-like bases; inflorescence cymose with 1–3(6) flowers; pedicels of central flowers

² Measurements are mid-ranges for fresh material collected identically from 131 plants representing a total of seven sites and ≥ 2 populations per variety.

³ Standardized to third node beneath open center flower of cyme. Most measurements rounded to nearest whole integer for endpoints of range.

(3)15–30(59) mm long; calyces inflated, glandular or eglandular, (8)11–14(15) mm long, (4)6–7(10) mm wide, lobes (2)2.5–3(4) mm long; corolla white, often red-tinged beneath; petal claw (9)11–16(17) mm long, exerted beyond calyx; petal limb (2)4.0–7(8) mm long, (1)2.5–4.5(5) mm wide, bilobed, incised to (1)1.5–2.5(3) mm; appendages variable, (0.5)1–3(4) mm long, (0.5)1–2 (3)mm wide; styles (2)3; carpophore at base of ovary (1)2.5–4(5) mm long surrounded by nectaries and becoming stipitate in fruit; fruit a capsule; seeds many with papillate margins.

Found in rocky places on both sides of the Columbia River Gorge in Oregon and Washington; centered in the region between Portland and The Dalles; common in the vicinity of Bridal Veil Falls, Oneonta Gorge, and Cape Horn.

PARATYPES: Douglas [two sheets, one mixed collection from 1825 and 1826, second has no date] (K), Howell 575 [6-1886] (GH), Howell [no number, 7-12-1881] (ORE), Suksdorf [6-28-1882] (GH), Suksdorf 2436 [8-18-1894] (GH), Suksdorf 10526 [1920–22] (WTU, GH).

DISCUSSION

Hitchcock and Maguire (1947) called attention to much morphological variability in North American *Silene*. Such diversity is to be expected in geographically widespread species, and particularly where, as in *S. douglasii*, populations are isolated from one another on mountain-tops, along coastal headlands, and in rocky gorges in otherwise forested areas. More surprising, perhaps, is the degree of polymorphism we observed within many populations of this species (Fig. 3) (Kephart and Sturgeon unpublished). One population in the Columbia River Gorge, for example, exhibits polymorphism for glandularity of calyx and stem pubescence; also a single plant at the same locality shows leaf and floral characters that could imply placement in var. *oraria* were it not for the overwhelming preponderance of narrow-leaved plants at that locality. Similarly, at Cascade Head, the type locality for var. *oraria*, occasional plants are found that, in the absence of the geographical and population context, could be assigned morphologically to varieties *rupinae* or *douglasii* (Kephart 1986).

Many of the past difficulties in delineating infraspecific taxa in *S. douglasii* stem from this high level of polymorphism (similar difficulties also characterize Western American *Silene* generally). For example, Hitchcock and Maguire (1947) used density and length of trichomes, glandularity, and the presence or absence of pubescence to distinguish among varieties within *S. douglasii*, using them in their key. Yet within a single variety, *monantha*, they included specimens which were glabrous or pubescent, and glandular or eglan-

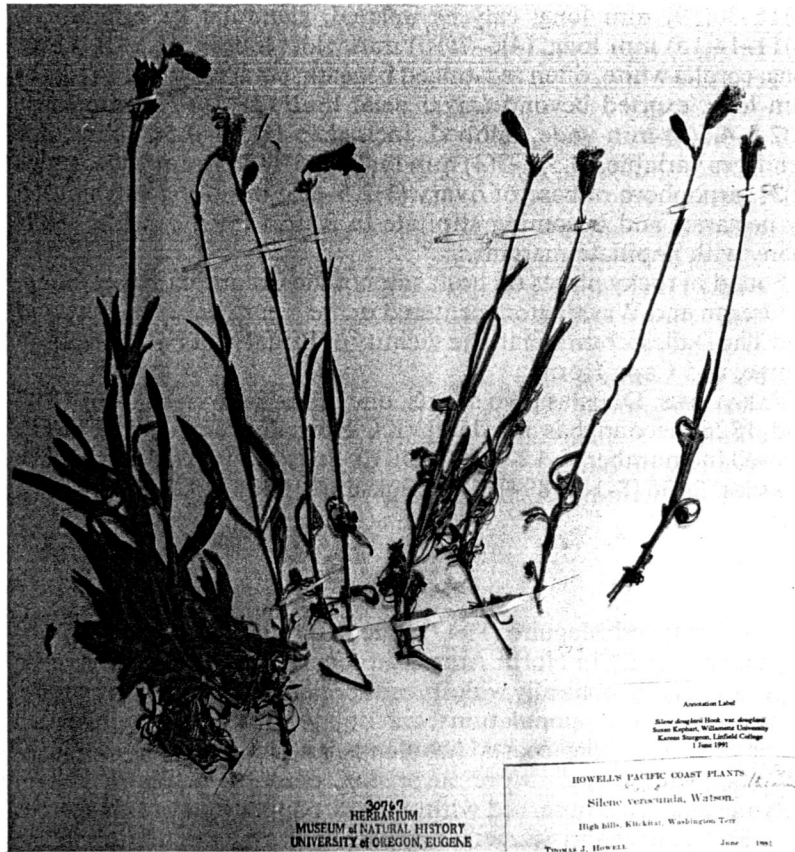


FIG. 3. Variation in leaf morphology within *S. douglasii* var. *douglasii* at a single locality.

dular. Similarly, one of several characters that differentiates *S. douglasii* from *S. parryi* is the copious glandularity of the latter taxon, yet glandular hairs occur within both species. In fact, two varieties, *viscida* and *macounii*, formerly ascribed to *S. douglasii*, were later transferred to *S. parryi* (Hitchcock and Maguire 1947). Floral characters, including the number of petal lobes, and style number, also vary within and among species of *Silene* (e.g., *S. parryi* was first described as a species of *Lychnis*, based on style number, until it was recognized that this character varied within the genus *Silene*).

Thus, considerable population and geographic variation in the frequency of various morphotypes occurs within *Silene* and *S. douglasii* (e.g., as noted above, narrow-leaved forms, which occur in high

frequency in Columbia River Gorge populations, may be found elsewhere albeit in much lower frequency). Yet recognizable taxa exist at the varietal and species levels. Therefore, in defining the appropriate taxonomy, we chose to delineate var. *rupinae* both by its morphology and its geographic location; i.e., we restrict the designation var. *rupinae* to only those narrow-leaved, glandular or eglandular individuals that are found in the Columbia River Gorge region of Oregon and Washington. Two alternatives were considered: (1) recognizing a single, polymorphic species without varietal distinctions, and (2) treating the varietal groups as species. The latter alternative is untenable because no apparent barriers to interbreeding exist among taxa (Kruckeberg 1961). The former obscures the clear geographic differences in frequency of multiple characters; in addition, Kephart and Sturgeon (1989) found these characters to correctly predict varietal groups (*douglasii*, *oraria*, and *rupinae*) for 94% of the individuals classified.

ACKNOWLEDGMENTS

We extend special thanks to Kenton Chambers for the Latin translation of the diagnosis, for interpreting cryptic handwriting and other aspects of type specimens from Kew and Harvard, and for his comments on the manuscript. We thank Art Kruckeberg, Geoffrey Levin, and David Wagner for their suggestions; some of our field collections were based on sites visited earlier by the former. We also appreciate the technical assistance of Pat Gildersleeve, the computer graphics of John Caputo, and the cooperation of the Yamhill Department of Public Works. We thank former students at Linfield College and Willamette University for field and laboratory assistance, including Darcie Flanagan, RoxAnn Ingersoll, Rachel Krueger, Jenifer Kuykendall, Judy Lum, Melissa Peterson, and Karen Solonika. Linfield College, Willamette University, and The Nature Conservancy also provided support in the form of summer research grants to faculty and students.

LITERATURE CITED

- HITCHCOCK, C. L. and B. MAGUIRE. 1947. A revision of the North American species of *Silene*. University of Washington Publications in Biology 13:1-73.
- , A. CRONQUIST, M. OWNBY, and J. W. THOMPSON. 1964. *Silene* L. In Vascular plants of the Pacific Northwest, Vol. 2. University of Washington Press, Seattle, WA.
- HOOKE, W. J. 1830. Flora Boreali-Americana. 1:88. Treuttel and Würtz, London.
- HOWELL, T. 1897. A flora of Northwest America 1:78. Portland, Oregon.
- KEPHART, S. 1986. Systematics and reproductive biology of *S. douglasii* var. *oraria*. Proceedings of the Botanical Society of America 73:771. [Abstract.]
- and K. STURGEON. 1989. Morphometric analysis of variability within *S. douglasii* (Caryophyllaceae). Proceedings of the Botanical Society of America. 76:251. [Abstract.]
- KRUCKEBERG, A. R. 1954. Chromosome numbers in *Silene* (Caryophyllaceae): I. Madroño 12:238-246.
- . 1955. Interspecific hybridizations of *Silene*. American Journal of Botany 42:373-378.

- . 1960. Chromosome numbers in *Silene* (Caryophyllaceae): II. *Madroño* 15: 205–215.
- . 1961. Artificial crosses of western North American *Silenes*. *Brittonia* 13: 305–333.
- . 1962. Intergeneric hybrids in the Lychnideae (Caryophyllaceae). *Brittonia* 14:311–321.
- . 1964. Artificial crosses involving Eastern North American *Silenes*. *Brittonia* 16:95–105.
- ROBINSON, B. L. 1893. The North American Sileneae and Polycarpeae. *Proceedings of the American Academy* 28:124–155.
- SHOWERS, M. 1987. A systematic study of *Silene suksdorfii*, *S. grayi*, and *S. sargentii* (Caryophyllaceae). *Madroño* 34:29–40.
- WATSON, S. 1875. A revision of the genus *Ceanothus* and description of new plants with a synopsis of the western species of *Silene*. *Proceedings of the American Academy* 10:333–350.

(Received 21 Mar 1992; revised version accepted 10 Dec 1992.)