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DRABA (CRUCIFERAE) IN MEXICO AND GUATEMALA

REED C. ROLLINS

In North America, *Draba* occurs primarily in temperate, mountainous, and arctic areas. There are no native species in Central America south of Guatemala, but in South America, beginning in the mountains of Colombia and Venezuela, the genus is well represented southward, especially in the Andes. *Draba* is the largest genus of the Cruciferae in the western hemisphere and in many ways it is taxonomically the most difficult. Part of this is attributable to the complexity associated with the large number of species involved, but to some degree it is due to the lack of adequate specimens of some of the taxa. This will be evident in the treatment that follows.

In contrast to the situation north of Mexico, the Mexican representation of *Draba* is often an attenuation of the distribution of species with a wider geographic range. For example, *D. standleyi* Macbride & Payson and *D. platycarpa* T. & G. are presently known only in northeastern Coahuila from the Sierra Maderas del Carmen. *Draba stanleyi* occurs otherwise from Texas to Arizona and *D. platycarpa* ranges from Arkansas to Washington; *D. cuneifolia* Nutt., in the wide sense, is limited to northern Mexico but is widely distributed from Florida to Kentucky and westward to California. Some taxa follow the cordillera southward as does *D. helleriana* Greene, but again the southward extension is an attenuation of its total geographic range. There is, however, a group of interrelated species in south central Mexico and in Guatemala that is unrelated to those species found further north. Some tend to be associated largely with volcanic peaks: the disparate populations on these isolated peaks have posed taxonomic problems beginning with the earliest botanical exploration of the region.

There are at least 12 species names available for *Draba* of the high volcanic mountains of south central Mexico and Guatemala, yet our evaluation of the available specimens allows only two taxa at the specific level. Part of the difficulty arises from the inherent variation that characterizes the two species, *D. jorullensis* Kunth ex H.B.K. and *D. nivicola* Rose; but part is the evaluation and interpretation of the variation found. Bentham (1841) and Hemslley (1879) had too little material for study to chart the variations of the isolated populations accurately. Apparently Rose (1903) minimized variation and emphasized diversity, for he described five new species from the area at one time. Unfortunately, he did not satisfactorily distinguish any one from another; or for that matter, from the other four putative species previously described from the same peaks. The fate of Rose's proposed species has been about as might have been expected. One species and two taxa at the varietal level were recognized by Schulz (1927), and Hitchcock (1941) accepted one species and one variety from the lot. My own evaluation allows only one specific name to survive, *D. nivicola* Rose.

Some confusion appears to have been introduced by the name *Draba jorullensis*, the type of which, according to the field books of Humboldt and Bonpland, did not come from "volcano de Jorullo" as implied, but rather from Nevado de Toluca. Contrary to what was formerly supposed, the types of both *D. jorullensis* and *D. toluensis* Kunth ex H.B.K. came from the same volcanic mountain, Nevado de Toluca. Although in growth form specimens of the type collection of *D. toluensis* are more compact, and appear to be perennial instead of clearly biennial, as compared to those of *D. jorullensis*, both collections fall within the range of variation of a single species.

With a much greater array of material than was available to Hitchcock (1941), we still came out with about the same evaluation of the taxonomic situation as he presented. Building on his treatment, the present contribution extends the coverage to include newly discovered taxa and provides a presentation of all presently known taxa of *Draba* in Mexico and Guatemala.

KEY TO THE SPECIES

- A. Plants obviously annual; styles scarcely evident or only forming a weak apiculation on mature siliques; ovules more than 10 in each loculus; basal leaves in a flat rosulate cluster.
 - B. Siliques elliptical to obovate, rounded at apex, pubescent with simple trichomes, 2.5-3.7 mm. wide 1. *D. platycarpa*.
 - B. Siliques oblong, acute to somewhat obtuse at apex, pubescent with simple or branched trichomes or glabrous, 1.2-2.8 mm. wide 2. *D. cuneifolia*.
- A. Plants biennial or perennial; styles strongly evident on mature siliques (except in *D. beamanii* where the stigmas may be nearly sessile); fewer than 10 ovules in each loculus; basal leaves not rosulate or if so not flat.
 - C. Flowers conspicuous; petals at least twice the length of the sepals; styles slender, more than 1 mm. long; fruiting pedicels mostly divaricately ascending to erect (except in *D. rubricaulis* where they are widely spreading).
 - D. Basal leaves petiolate, linear or oblanceolate, 3-8 cm. long, hirsute or at least margined with large mostly simple trichomes.
 - E. Basal leaves linear to narrowly oblanceolate, mostly less than 5 mm. wide; pedicels erect to divaricately ascending; caudex clothed in dead leaf bases ... 3. *D. standleyi*.
 - E. Basal leaves oblanceolate, up to 1 cm. wide; pedicels widely spreading, from slightly ascending to slightly descending; caudex free of leaf bases 6. *D. rubricaulis*.
 - D. Basal leaves spatulate to broadly oblanceolate without a defined petiole, mostly less than 3 cm. long; pubescent with either branched or simple trichomes or both.
 - F. Plants matted and with numerous flowering stems barely emergent from mat of leaves, stems less than 3 cm. long; caudex branches covered with marcescent leaves and leaf bases; styles 2.5-3.5 mm. long 5. *D. implexa*.
 - F. Plants not matted; flowering stems clearly exerted above leaves, few to several, mostly 1 dm. or more tall; caudex not covered by dead leaves or leaf bases (except in *D. helleriana*); styles less than 2mm. long.
 - G. Stamens exerted; petals linear; fruiting pedicels 5 mm. or less long 4. *D. corrugata* var. *demareei*.
 - G. Stamens included; petals obovate to broadly spatulate; fruiting pedicels 7 mm. or more long 7. *D. helleriana*.
 - C. Flowers inconspicuous; petals barely exceeding to much less than twice the length of sepals; styles stout, less than 1 mm. long; fruiting pedicels at right angle to rachis.
 - H. Petals whitish when dry; cauline leaves ovate to broadly elliptical, less than 1 cm. long; stems simple 8. *D. beamanii*.

- H. Petals yellow; cauline leaves oblanceolate or none, when present more than 1 cm. long; stems branched or simple.
- I. Leaves oblanceolate, narrowed toward base; at least some stems branched; plants mostly biennial 9. *D. jorullensis*.
- I. Leaves linear to oblong, not narrowed toward base; stems mostly simple, branching rare; plants perennial.
- J. Leaves densely pubescent at least on lower surface with minute dendritic trichomes, usually silvery-gray, oblong, taproot usually very thick 10. *D. nivicola*.
- J. Leaves glabrous to sparsely hirsute on the margins with coarse simple or forked trichomes, greenish, linear; taproot slender to moderately thickened 11. *D. hidalgensis*.

1. *D. platycarpa* Torrey & Gray, Fl. N. Amer. 1: 108. 1838.

D. cuneifolia Nutt. var. *platycarpa* (T. & G.) S. Watson, Proc. Amer. Acad. 23: 256. 1888.

GEOGRAPHIC RANGE IN U.S.A.: Arkansas and Texas west to Arizona, north to Washington.

Mexico. Coahuila: Laguna Peak-El Uno road, on steep N-facing rhyolitic slopes, 29°01'30" N, 102°31'30" W, Sierra Maderas del Carmen, April 4, 1974, *Wendt, Lott & Riskind 132H* (TEX-LL). This is the only specimen of *D. platycarpa* we have seen from Mexico.

2. *D. cuneifolia* Nuttall in Torrey & Gray, Fl. N. Amer. 1: 108. 1838.

For synonyms (none based on Mexican material) and a map showing the geographic distribution of var. *integrifolia* and var. *sonorae*, see Hartman et al. (1975).

KEY TO THE VARIETIES

- Siliques with simple trichomes; lower stems hirsute with at least some coarse simple or merely forked trichomes; styles scarcely evident 2a. var. *cuneifolia*.
- Siliques with branched trichomes; stems pubescent throughout with 3- to 4-branched trichomes; styles apiculate.
- Siliques (5-)7-12 mm. long, occurring on the distal one-half to two-thirds of infructescence axis 2b. var. *integrifolia*.
- Siliques 3-6 (-8) mm. long, occurring on nearly entire length of infructescence axis 2c. var. *sonorae*.

2a. *D. cuneifolia* Nuttall var. *cuneifolia*

GEOGRAPHIC RANGE IN U.S.A.: Ohio to northern Florida, west to California.

Mexico. Baja California: Sierra Juárez, 1.6 mi. SE of San Fuastino, *Moran 14926* (GH); 21 mi. S of Santo Tomás, *Wiggins 4274* (GH). Chihuahua: near Chihuahua, 6 April 1886, *Pringle s.n.* (GH); *Purpus 1026* (GH). Coahuila: Sierra de las Cruces, 5 km. above Tinaja Blanca, *Stewart 2261* (GH); near Tinaja Blanca, *Stewart 2240* (GH); ca. 2 km. N of Estacion Carneros, M. C. *Johnston et al. 10497C* (TEX); 15 mi. S of Saltillo, *Rollins & Tryon 58150* (GH, TEX); Sierra de Parras, *Purpus 1026a* (GH); Cañon del Agua, 0.7 mi. S from ranchito at mouth of canyon, Lat. 27°05'15" N, Long. 102°24'05" W, *Tom Wendt et al. 1945* (ENCB). Zacatecas: 5 km. W of Concepcion del Oro, M. C. *Johnston et al. 10480D* (TEX); Puerto de Rocamontes, M. C. *Johnston et al. 10487A* (TEX).

2b. *D. cuneifolia* Nuttall var. *integrifolia* S. Watson. Proc. Amer. Acad. 23: 256. 1888.

GEOGRAPHIC RANGE IN U.S.A.: Texas to southwestern Utah, southern Nevada and central California.

Mexico. Baja California: vicinity of Bahia de los Angeles, ca. 4 mi. S of Las Flores, *Wiggins & Thomas 253* (GH); near highway in mountains ca. 15 mi. S of Ensenada, *Gentry 7926* (ENCB,

MEXU); Sierra Juárez, 5 km. W of La Rumorosa, *Moran 24110* (GH). Nuevo Leon: 24 mi. E of Saltillo, *Rollins & Tryon 58104* (ENCB, GH, TEX); San Juan, *Pringle 13719* (GH, MSC); 9.6 km. W of Ojo de Agua de Sabinas Hidalgo, Villaldama, C. P. *Cowan 3775 et al.* (GH, TEX); just N of Cañon de Potrerillos, *M. C. Johnston et al. 1024A* (TEX).

- 2c. *D. cuneifolia* Nuttall var. *sonorae* (Greene) Parish, Bull. S. Calif. Acad. Sci. 2: 81. 1903, based on *D. sonorae* Greene, Bull. Calif. Acad. Sci. 2: 59. 1886.

GEOGRAPHIC RANGE IN U.S.A.: southern Arizona to southern California.

Mexico. Baja California: Cañada la Matanza, 4 km. S of Colonet, *Moran 26830* (GH); Las Trincheras, *Moran 12610* (GH); San Quentin, *Palmer 611* (GH); Santa Maria plains, 23.5 mi. S of Hamilton Ranch, *Wiggins 4321* (GH); Santa Agueda, *Palmer 207* (GH); margin of Laguna Chapala, *J. R. & C. G. Reeder 6804* (ENCB); first cove east of Puerto Refugio, Isla Angel de la Guarda, *Moran 8630* (GH); El Terminal, *Moran 7930* (GH); Santo Domingo, (Hamilton's Ranch and vicinity) *Wiggins 4498* (GH, TEX-LL). Sonora: northwestern mountains, 24 March 1884, *Pringle s.n.* (GH, isotype); 1 mi. S of Pinacate Peak, Sierra Pinacate, *Felger et al. 19346* (ENCB); Hourglass Canyon, ca. 2 mi. NE of Hurache (Pyramid) Tank, W side of Pinacate region, *Felger 19158* (ENCB); 4 mi. W of Caborca, *Keck 4037* (GH); San Bernardo, Rio Mayo, *Gentry 1361* (GH).

3. *D. standleyi* Macbride & Payson, Ann. Mo. Bot. Gard. 5: 150. 1918, based on *D. gilgiana* Wooton & Standley, Contr. U.S. Nat. Herb. 16: 124. 1913, not *D. gilgiana* Muschler, Fedde Rep. Nov. Sp. 3: 212. 1906.

GEOGRAPHIC DISTRIBUTION IN U.S.A.: Texas to Arizona.

Mexico. Coahuila: Sierra Maderas del Carmen, ¼ mi. N of Campo Dos along trail to Campo Tres, 28°59'30" N, 102°36'30" W, 7 Aug. 1974, *Wendt & Adamcewicz 524* (GH, MEXU, TEX).

4. *D. corrugata* S. Watson var. *demareei* (Wiggins) C. L. Hitchcock, Univ. Wash. Publ. Bot. 11: 33. 1941, based on *D. demareei* Wiggins, Contr. Dudley Herb. 1: 168. 1933.

Variety *corrugata*, *D. corrugata* var. *saxosa* (Davidson) Munz & Johnston and *D. corrugata* f. *vestita* (Davidson) C. L. Hitchcock apparently occur only in southern California, U.S.A. Variety *demareei* appears to be restricted to the Sierra San Pedro Martir of northern Baja California.

Mexico. Baja California, Sierra San Pedro Martir: Vallecitos, *Wiggins & Demaree 4970* (GH); ridge NW of Corona, 35°59' N, 115°35' W, *Moran 11279* (GH); east slope of Cerro, 31°02' N, 115°27' W, *Moran 15267* (GH); Yerba Buena, 31°00' N, 115°27' W, *Moran & Thorne 14142* (GH, TEX-LL); La Encantada, *Wiggins & Demaree 4875* (GH).

5. *D. implexa* Rollins, sp. nov.

Herba perennis; caudicibus ramosis; caulibus simplicibus, 3-5 cm. longis; foliis basalibus, pubescentibus, oblanceolatis, 1.5-3 cm. longis, 2-3 mm. latis, integris vel sparse denticulatis; foliis caulinis spathulatis, vel oblongis, cuneatis, integris, pubescentibus; pedicellis divaricatus, 3-5 mm. longis; sepalis erectis, oblongis, sparse pubescentibus, 3.5-4mm. longis, 1.5-2 mm. latis; petalis spathulatis, luteis, 5-6 mm. longis, ca. 1.5 mm. latis; siliquis immaturis oblongis, acutis, glabris vel sparse pubescentibus; stylis 2.5-3.5 mm. longis; seminibus ignotis.

Holotype in the Gray Herbarium. Mexico, Durango: N slopes of Cerro Huehueto (Huehueto), south of Huachicheles, about 75 mi. W of C. Durango; abundant on exposed rocks, rich, deep, woodland soil in dense pine forest; elevation 2900-3150 m., 2 July 1950, *James H. Maysilles 7290*. Isotype: MICH.

Matted perennial; caudex branches several to many, thickened with remnants of dead leaves and leaf bases; stems leafy, simple, densely pubescent

with a mixture of small dendritically branched trichomes and fewer large simple or forked ones, 3-5 cm. tall; basal leaves oblanceolate, petiolate, entire or with one or two remote small teeth, obtuse, pubescent with coarse dendritic trichomes on blade surfaces, often margined with larger simple or forked trichomes particularly on the petioles, 1.5-3 cm. long, 2-3 mm. wide; cauline leaves overlapping, extending to inflorescence, spatulate to oblong, obtuse, entire, cuneate at base, 1-1.5 cm. long; inflorescence condensed, flowers congested; pedicels divaricately ascending, pubescent, 3-5 mm. long; sepals erect, hirsute with simple or rarely forked trichomes, 3.5-4 mm. long, 1.5-2 mm. wide, inner pair plain, outer pair slightly saccate and somewhat boat-shaped; petals spatulate with a narrow claw, truncate to slightly retuse above, yellowish, drying nearly white, 5-6 mm. long, ca. 1.5 mm. wide; stamens strongly tetradynymous, filaments slender, paired filaments ca. 3.5 mm. long, anthers oval to broadly oblong, ca. 1 mm. long; glandular tissue well-developed, surrounding base of single filaments, subtending base of paired filaments; immature siliques oblong, acute to acuminate at apex; glabrous on valve surfaces, usually pubescent with simple trichomes on the margins; styles slender, 2.5-3.5 mm. long; siliques of previous season twisted, ovate-lanceolate, 7-10 mm. long, 3-4 mm. wide; seeds wingless, oblong, ca. 1.5 mm. long, ca. 1 mm. wide, 6-8 in each loculus; cotyledon position not determinable.

Draba implexa is not closely related to any other known North American species of the genus. The matting habit of growth is somewhat like that of *D. smithii* Gilg, a species of southern Colorado, but any close similarity stops there except that both have twisted fruits, a feature of many species of *Draba*. In having a cushion of dead leaf bases covering the caudices, *D. implexa* is similar to *D. standleyi* Macbride & Payson and *D. petrophila* Greene, but in most other characteristics these species have very little in common.

The flower color of *Draba implexa* was indicated to be yellow by the collector. However, the dried specimens show the petals to be nearly white and I have assumed that the yellow pigmentation was lost during drying. An interesting feature of the holotype specimen is that there are successive tufts of dead leaf bases along the caudex branches. This probably indicates that, in successive years, the leaf bases have persisted but that after each deposition, some growth of the caudex branch has taken place before the following year's remnants were left behind. Unfortunately, *D. implexa* is known only from the one collection cited and very little of the variation presumably present in this species can be assessed.

6. *D. rubricaulis* Heller, Bull. Torr. Bot. Club 26: 262. 1899.

D. helleriana Greene var. *patens* (Heller) Schulz f. *rubricaulis* (Heller) O. E. Schulz. Pflanzenreich IV, 105: 185. 1927.

Perennial; stems several from a loosely branching caudex, simple or branched above, hirsute below with a mixture of simple and forked spreading

trichomes, usually glabrous above, 2.5-4.5 dm. tall; basal leaves petiolate, mid-vein prominent, oblanceolate, obtuse at apex, remotely dentate, sparsely pubescent with simple or forked trichomes (2-)3-7 cm. long, (5-)7-12 mm. wide; cauline leaves 3-6, sessile, oblong, entire to dentate, non-auriculate, sparsely pubescent with simple or forked (sometimes few-branched) trichomes, 2-5 cm. long, (5-)8-15 mm. wide; sepals yellowish, outer saccate pair wider than inner non-saccate pair, glabrous except for two or three large simple or forked trichomes toward apex, 3.5-4 mm. long; petals yellow, narrowly lingulate, erect, not unguiculate, not differentiated into blade and claw, 7-9 mm. long, 1.5-2 mm. wide; glandular tissue well-developed flanking base of single stamen filament, otherwise obscure; anthers oval, ca. 1.5 mm. long; fruiting raceme elongated, up to 2 dm. long; pedicels spreading at right angle to rachis to slightly ascending, nearly straight, glabrous, 8-15 mm. long; siliques ascending, oblong, twisted, acute at apex, glabrous or with short simple trichomes on the valve surfaces, 8-11 mm. long, 2-3 mm. wide; styles 2-3 mm. long; seeds light brown, plump, wingless, slightly longer than wide, ca. 1.3 mm. long; cotyledons accumbent.

Mexico. Chihuahua: summit of Sierra Mohinora, *Correll & Gentry 23160* (GH, TEX-LL); Mt. Mohinora, *E. W. Nelson 4880* (GH); cool ledges, Sierra Madre, *Pringle 1529* (GH, holotype).

Draba rubricaulis is apparently restricted to the Sierra Madre of Chihuahua. Hitchcock (1941) followed Schulz in his treatment of this taxon. However, the petiolate basal leaves of *D. rubricaulis* and consistent simple or rarely forked trichomes on the leaves, stems, and pedicels are distinctive as compared with *D. helleriana*. Variety *patens* of that species is closest to *D. rubricaulis* but there is a large difference in flower size: those of *D. rubricaulis* are much larger than those of var. *patens*.

7. *D. helleriana* Greene, *Pittonia* 4: 17. 1899.

As interpreted by Hitchcock (1941), *Draba helleriana* consists of four varieties and one form, and has a combined distribution that includes southern Colorado, New Mexico, Arizona, and the Sierra Madre of Chihuahua. I recognize forma *rubricaulis* as a species distinct from *D. helleriana* as indicated above, but it is clear there is a close relationship between these two species. That *D. helleriana* is a complex of infraspecific taxa is also recognized. Material from Nuevo Leon not seen by Hitchcock extends the distribution and complexity of this species. The two varieties described below are strong perennials with branching caudices and simple stems quite unlike most varieties of *D. helleriana* where the caudices are simple and the stems branched. This is particularly true in *D. helleriana* var. *patens* (Heller) O. E. Schulz, to which the two following varieties appear to be most closely related. These varieties represent the species as it is presently known in Mexico.

KEY TO THE VARIETIES

- Plants with closely branching caudices and a thick taproot; stems mostly 1.5 dm. or less tall 7a. var. *potosiensis*.
 Plants sprangely in caudex area; stems 2 dm. or more tall 7b. var. *viejoensis*.

7a. *D. helleriana* Greene var. *potosiensis* Rollins, *var. nov.*

Herba perennis, caespitosa; caudicibus ramosis; caulibus erectis, 6-18 cm. altis; siliquis glabris vel sparse pubescentibus.

Holotype in the Gray Herbarium. Mexico, Nuevo Leon: Cerro Potosí, top of mtn., ca. 3650 m. alt., in alpine meadow, abundant, 1 July 1959, *John H. Beaman* 2665. Isotype: MSC.

Mexico. Nuevo Leon: Cerro Potosí, Galeana, *G. B. Hinton et al.* 17037 (ENCB, TEX), 17038 (ENCB, MSC), 17050 (ENCB, MSC, TEX); near summit of Cerro Potosí, Galeana, *Sharp* 45753 (GH); *Dorr* 2279 (TEX); *C. H. Mueller* 2241, 2273 (GH); *Beaman* 4457 (MSC); ascent of Sierra Potosí by N hogback, ca. 20 mi. NE of Galeana, *C. H. & M. T. Mueller* 1252 (GH, MEXU, TEX); Sierra La Marta, *G. B. Hinton et al.* 17973 (TEX).

Field notes accompanying some of the specimens indicate that var. *potosiensis* grows abundantly on boulders and in open areas and that the flowers are bright yellow.

7b. *D. helleriana* Greene var. *viejoensis* Rollins, *var. nov.*

Herba perennis; caulibus 2-6 dm. altis; foliis basalibus late oblanceolatis vel obovatis; pedicellis 1-2 cm. longis; siliquis glabris vel sparse pubescentibus.

Holotype in the Gray Herbarium. Mexico, Nuevo Leon: Sierra Madre Oriental, Cerro del Viejo, 15 mi. W of Dulces Nombres, municipality of Zaragoza, on open, nearly barren, limestone outcrops, 18 August 1948, *F. G. Meyer & D. J. Rogers* 2984. Isotype: GH.

Mexico. Nuevo Leon: San Antonio Peña Nevada, Dr. Arroyo, *G. B. Hinton et al.* 17331 (ENCB); area of Cerro Peña Nevada, ca. 12 km. NE of San Antonio Peña Nevada, 30 km. E of Dr. Arroyo, N slopes of mt. known locally as Picacho Onofre, *Wells & Nesom* 452 (GH), *Beaman* 2700 (MSC); Picacho San Onofre, Zaragoza, *G. B. Hinton et al.* 17384 (ENCB); Cerro Potosí, open forested area near microwave tower, shaded moist ravine, *McGregor et al.* 340 (GH).

8. *D. beamanii* Rollins, *sp. nov.*

Herba biennis; caudicibus simplicibus; caulibus 1-6, erectis, simplicibus, pubescentibus, 5-16 cm. altis; foliis basalibus oblanceolatis, integris vel parce denticulatis, nonpetiolatis, pubescentibus, 1-1.5 cm. longis, 4-6 mm. latis; foliis caulinis 3-5, ovatis vel late oblongis, integris, vel parce denticulatis, dense pubescentibus, 4-10 mm. longis; sepalis late oblongis, nonsaccatis, sparse hirsutis, ca. 2 mm. longis, ca. 1.5 mm. latis; petalis spathulatis, ca. 2.5 mm. longis, ca. 1.2 mm. latis; pedicellis divaricatis, rectis, dense pubescentibus, 2-5 mm. longis, siliquis oblongis vel anguste ovatis, glabris vel sparse pubescentibus, 4-6 mm. longis, 2-3 mm. latis, loculis 4-7 ovulatis; seminibus immaturis oblongis, exalatis.

Holotype in the Gray Herbarium. Guatemala, Huehuetenango: Sierra de los Cuchumatanes, near lake at east end of Llano de Tierra, ca. 2.5 mi. W of Llano de San Miguel; ca. 3500 m. alt.; in wet meadow near lake shore, 2 August 1960, *John H. Beaman* 3965. Isotypes: DUKE, ENCB, MSC, TEX.

Biennial or possibly perennial with 1-6 unbranched stems arising from a cluster of basal leaves, pubescent nearly throughout with dendritically branched and scattered simple or forked trichomes; caudex simple; stems erect or slightly curved upward at base, 5-16 cm. tall; basal leaves oblanceolate, obtuse, nonpetiolate, entire or with a few remote denticulations, usually pubescent above with a mixture of larger simple or forked and smaller

dendritic trichomes, uniformly pubescent below with dendritic mostly 4-branched trichomes, 1-1.5 cm. long, 4-6 mm. wide; cauline leaves 3-5, ovate to broadly oblong, entire or with a few remote denticulations, densely pubescent with dendritic 3-5 branched trichomes, 4-10 mm. long; sepals broadly oblong to nearly elliptical, nonsaccate, hyaline-margined, hirsute with a few forked or simple trichomes, ca. 2 mm. long, ca. 1.5 mm. wide; petals whitish when dry, spathulate, truncate to slightly retuse, ca. 2.5 mm. long, ca. 1.2 mm. wide; stamens subequal, anthers nearly oval, ca. 0.2 mm. in diameter; glandular tissue well-developed above petal base and subtending single stamen filaments; pedicels widely spreading to slightly ascending, straight, densely pubescent, 3-5 mm. long; siliques oblong to narrowly ovate, strongly compressed parallel to plane of septum, glabrous to sparsely pubescent along margins, 4-6 mm. long, 2-3 mm. wide; styles barely visible; stigmas nearly sessile; ovules 4-7 in each loculus; funiculi slender, ca. 1 mm. long; seeds immature, plump, wingless; ca. 1.2 mm. long, ca. 1 mm. wide; cotyledons accumbent.

Guatemala. Huehuetenango. Sierra de los Cuchumatanes: at Chermal, Km. 318 on Ruta Nacional 9N, *Beaman* 3077 (GH, MSC); between Tojiah and Chermal at Km. 317 on Ruta Nacional 9N, *Beaman* 3824 (GH, MSC); between Paquix and Chermal, *Beaman* 3006 (MSC); about 10.5 mi. SW of San Juan Ixcoy, *W. D. Stevens* 1254 (MSC).

Because of its biennial to short-lived perennial habit and unbranched caudex, *Draba beamanii* must be compared with *D. jorullensis*, which is probably its nearest known relative. But the stems are few and unbranched in *D. beamanii* while *D. jorullensis* has numerous branched stems in all well-developed plants. The siliques of *D. jorullensis* bear short but definite styles while in *D. beamanii*, the stigmas are practically sessile with styles scarcely visible. And the trichome pattern is very different in these two species. The basal leaves especially are covered or at least margined with large simple trichomes in *D. jorullensis* whereas in *D. beamanii* the predominating trichomes are dendritically branched and although simple trichomes are often present, they do not fringe the leaves as in *D. jorullensis*. Also, the petals fade to white in *D. beamanii* but are yellow in *D. jorullensis*. The latter species does occur in Guatemala as shown below, but I have not seen any specimens from the Dept. of Huehuetenango.

9. *D. jorullensis* Kunth ex H.B.K., Nov. Gen. et Sp. Pl. 5: 78. 1821.

For synonymy see Hitchcock (1941). $n = 12$, Beaman, et al. (1962).

Guatemala. Chimaltenango: Volcán de Fuego, *Beaman* 4034 (MSC); Volcán Acatenango, *Beaman* 3285, 4034 (GH, MSC). **Sacatepequez:** Volcán de Agua, *Hartweg* 571 (GH, isotype of *D. volcanica* Benth.); *Beaman* 2923 (MSC); *Harmon* 3663 (ENCB). **San Marcos:** Volcán Tacna, *Beaman* 3137, 3222 (GH, MSC). **Quezaltenango:** Volcán Santa Maria, *Skutch* 850 (GH); *Beaman* 4106 (MSC); *Matuda* 2348 (MEXU, TEX-LL).

Mexico. Chiapas: Mt. Tacaná, *E. Matuda* s.n. (GH), *Matuda* 2348 (MEXU); near summit of Volcán Tacaná, Union Juárez, *D. E. Breedlove* 26720 (ENCB); *Breedlove* 29376 (MEXU). Jalisco: Nevado de Colima, *McVaugh* 11650 (GH); *Beaman* 2346 (MSC, TEX); *Goldsmith* 61 (GH); *Gregory & Eiten* 271 (GH), 297 (GH, MSC). **Mexico:** Sierra de las Cruces, 11 Sept. 1892, *Pringle* 5260

(GH, MEXU, type no. but wrong date for isotype of *D. confusa* Rose); Serrania de Ajusco (Cerro de Ajusco), *Pringle* 7385 (GH), 10266 (GH, MEXU, MSC), 15623 (GH, MSC); *Beaman* 2783 (GH, MSC); Crucero Agua Blanca, *Hinton* 4921 (GH); Iztaccihautl, *Beaman* 1984 (GH, MSC), 2847 (GH, MSC, TEX), 3502 (GH, MSC); Nevado de Toluca, *Hernández X.* X10164 (CHAPA); *Beaman* 1679, 1695 (GH), 1891 (GH, MSC), 2448 (GH, MEXU, MSC), 1890 (MEXU, MSC, TEX); *Pringle* 4248 (GH, MEXU, MSC, TEX-LL, isotypes of *D. pringlei* Rose); Cerro Tláloc, Sierra Nevada, *Wendt & Atkinson* 3440 (CHAPA, ENCB). **Mexico-Puebla:** Popocatepetl, *H. Cristie s.n.* (GH, photo); *Koch* 7466 (CHAPA); *Correll* 14308 (GH); *Beaman* 1728, 2106 (GH, MSC); *Rose & Hay* 5980 (GH). **Michoacan:** Cerro Tancitaro, *W. C. Leavenworth* 276 (GH); Cerro San Andres, *Beaman* 4289 (GH, MSC). **Puebla-Vera Cruz:** Pico de Orizaba, *Beaman* 1762 (GH, MSC), 2271 (GH, MSC, TEX-LL); *Pringle* 8581 (ENCB, GH, MEXU, MSC, TEX, TEX-LL). **Puebla:** Sierra Negra (SW of Pico de Orizaba), *Beaman* 2521 (MSC). **Tlaxcala:** Malinche, *Beaman* 2229, 2257 (MSC). **Veracruz:** Cofre de Perote, *Beaman* 2162 (GH, MSC); *Dorantes Lopez* 329 (GH); *Dorantes et al.* 01563 (ENCB); *Balls & Gourlay* B4614 (CHAPA).

Evidently *Draba jorullensis* is very abundant on the volcanic peaks where it occurs for there are 52 specimens of it in the Gray Herbarium alone and I have examined well over 100 different collections. The popular peaks, such as Iztaccihautl, Orizaba, Popocatepetl, and Toluca have been collected most heavily with more than 15 different collections represented in some instances. I mention this because with as many samples as this to work with, it is clear, as it was to Hitchcock (1941), that this species is exceedingly variable. Without doubt, this is the basic reason for the unusual number of redundant names proposed for it. The habit ranges from compact individuals of low growth to those with greatly elongated stems and a sprangly growth form. Other features are similarly variable. I endorse the conclusions reached by Hitchcock (1941) and refer the reader to his paper for a further discussion of the variation present.

10. *D. nivicola* Rose, Contr. U. S. Nat. Herb. 8: 29. 1903.

D. orbiculata Rose, *ibid.* *D. nivicola* var. *orbiculata* (Rose) O. E. Schulz, Das Pflanzenreich IV, 105: 166. 1927.

Mexico. Mexico: parte alta Cerro Tláloc, *Rzedowski* 31559 (ENCB); *Beaman* 2328 (MSC); Iztaccihautl, *Purpus* 78, 1650 (GH); *E. Matuda* 26126 (GH, MEXU); Nevado de Toluca, *Pringle* 4234 (GH, MEXU, MSC, isotypes of *D. orbiculata* Rose); *Balls & Gourlay* B4082 (CHAPA); *Paray* 3323 (ENCB); *Lyonnet* 1393 (MEXU); *Beaman* 1693 (GH, MSC), 1902 (GH), 2447 (MEXU, MSC). **Tlaxcala:** Malinche, *Beaman* 2230 (GH, MEXU, MSC, TEX). **Puebla-Veracruz:** Pico de Orizaba, *Rose & Hay* 5766 (GH, MEXU, isotypes); *Beaman* 1767 (ENCB, GH, MSC, TEX); 2270, 3629 (GH, MSC, TEX); *Purpus* 2800a (GH). **Veracruz:** Cofre de Perote, *Beaman* 2142 (GH, MEXU, MSC); *Ortega-Oetiz* 206 (GH); *Dorantes-Lopez* 328 (GH, MEXU); *M. G. Zola et al.* 72 (ENCB, MEXU).

The specimens from Nevado de Toluca show silique variation from orbicular, as in the type collection of *Draba orbiculata*, to ovate, as in the type collection of *D. nivicola*. Most of the specimens are of the ovate type. I agree with Hitchcock (1941) that *D. orbiculata* makes a weak variety at best, but now with more and better material available for study than was available to him, it is difficult to make a case for recognizing two taxa. For this reason, I have listed *D. orbiculata* as a straight synonym of *D. nivicola*.

11. *D. hidalgensis* Calderón, Bol. Soc. Bot. Mexico 31: 109, fig. 1. 1970.

Mexico. Hidalgo. Pachuca: 6 km. al N de Pachuca, Cerro de las Ventanas, *Rzedowski* 26804

(holotype and an isotype ENCB); above Pueblo Nuevo on road from Real del Monte to El Chico, Moore & Wood 4086 (GH); Cerro de las Ventanas, El Chico, Al Gentry et al. 32176 (GH); Rzedowski 16999 (ENCB).

The flowers and siliques of *Draba hidalgensis* are, in general, similar enough to *D. jorullensis* and *D. nivicola* to be allied with these species. However, it is distinctive and certainly merits recognition as a species. Its linear, nearly glabrous greenish leaves, are longer and not at all rosulate as in the densely pubescent rosulate and grayish leaves of *D. nivicola*. Even when the unusually wide variability of *D. jorullensis* and the lesser but substantial range of variation of *D. nivicola* are taken into account, the characteristic features of *D. hidalgensis* place it well outside either of those taxa.

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SPHAEROCARDAMUM (CRUCIFERAE)

REED C. ROLLINS

Since it was published more than a century ago (S. Schauer, 1847), to my knowledge no specimens, other than the type, have been referred to *Sphaerocardamum nesliiforme* Schauer. Schulz (1936) recognized and illustrated the genus, but failed to associate any other species with it. Instead, he (1933) proposed the monotypic genus *Cibotarium*, apparently not realizing that *C. stellatum* (S. Watson) Schulz was in reality a second species of *Sphaerocardamum*. Schulz had an excellent opportunity to make the association between *S. nesliiforme* and what Watson (1890) called *Capsella stellata* because he had the type of the former available to him in Berlin, as well as material of *C. stellatum*. Possibly Schulz was misled because Schauer emphasized the resemblance of *Sphaerocardamum* to *Neslia* so strongly in his original publication. Certainly I was not able to make the appropriate association of these species merely from the descriptions of Schauer or of Schulz, or from the illustration given in *Die Pflanzenfamilien*. Even photographs of the type of *S. nesliiforme*, kindly supplied to me by Guy Nesom of Memphis, did not provide enough information for me to make the association. It was apparent that *Capsella stellata* and *Sphaerocardamum nesliiforme* were two species of the same genus only after I was able to see the type of *S. nesliiforme* itself. As a consequence of my studies, it is clear that *Cibotarium* must be abandoned in favor of *Sphaerocardamum*.

My former treatment of the species involved, which are all native of Mexico (Rollins, 1941), was somewhat tentative because of the paucity of available material. Since then, I have been able to observe populations of these plants in the field on several occasions and to obtain some material for cytological study (Rollins and Rüdénberg, 1977). One species, *Sphaerocardamum stellatum*, was successfully grown in the greenhouse. However, there is still too little material for a finished taxonomic treatment of the genus as a whole. Unlike many genera of the Cruciferae, *Lesquerella* for example, plants of *Sphaerocardamum* seem to be few in number where they occur and are often inconspicuous. This may account in part for the unsatisfactory representation of the genus in most herbaria.

Information previously published under the name *Cibotarium* (cf. above and Rollins, 1957) is applicable in detail to *Sphaerocardamum*, and it is not considered necessary to present a wholly new treatment at this time. A key to the species and a synopsis of *Sphaerocardamum* as given below provides a framework for the presentation of new information. A full description of *S. nesliiforme*, which was not treated as such earlier, is given as is a description for the newly described *S. ramosum*, but otherwise descriptions are not provided.

Sphaerocardamum Schauer, *Linnaea* 20: 720. 1847.

Cibotarium, O. E. Schulz, *Bot. Jahrb.* 66: 91. 1933.

Biennial or perennial herbs, often woody at base; stems one to several, branched at least above, densely pubescent throughout with dendritically branched trichomes; basal leaves lacking; cauline leaves linear-oblong to spatulate or oblanceolate, cuneate at base, entire to dentate or remotely denticulate, 1-nerved, densely pubescent; inflorescences racemose, terminating each branch; flowers small to minute, numerous; sepals oblong, pubescent, non-saccate, erect, usually hyaline-margined; petals spatulate, white, sometimes absent; stamens exerted, filaments subequal, anthers globose, usually purplish; fruiting pedicels slender, straight, pubescent, widely spreading to slightly ascending; siliques subglobose to oblong, densely pubescent on exterior, often pubescent on interior; styles glabrous; ovules 2 to 8 in each loculus; seeds wingless, oblong, plump, musilagenous when wetted; cotyledons incumbent to obliquely incumbent.

This genus, as presented here, consists of 8 species that occur only in central Mexico. The geographic area extends from the states of Hidalgo and Aguascalientes, north to Coahuila and eastward to Nuevo Leon. Several taxa apparently are very restricted in their occurrence. The most widespread is *Sphaerocardamum macropetalum* which has been found in Coahuila, Nuevo Leon, and Zacatecas. On the basis of counts in *S. stellatum* and *S. macropetalum*, the basic chromosome number appears to be $x = 8$.

KEY TO THE SPECIES

- A. Siliques spherical or nearly so; valves rounded on back; replum orbicular to broadly obovate or elliptical, 2 mm. or less from base to apex; ovules 2-3 in each locule ... 1. *S. nesliiforme*.
- A. Siliques oblong to obovate, compressed opposite to plane of septum in different degrees; valves either keeled or rounded on back; replum broadly oblong to narrowly linear, more than 3 mm. from base to apex except in *S. stellatum*; ovules 4 or more in each locule.
 - B. Siliques distinctly notched at base of style, obovate; valves of mature fruits definitely keeled on back.
 - C. Petals absent or minute, shorter than sepals if present; styles less than 0.5 mm. long; siliques 2 mm. or less long 2. *S. stellatum*.
 - C. Petals present, exceeding sepals in length; styles nearly 1 mm. long; siliques 3 mm. or more long 3. *S. fruticosum*.
 - B. Siliques truncate or rounded at base of style, oblong or obovate to nearly linear; valves of mature fruits either rounded or keeled on back.
 - D. Petals minute (sometimes absent), shorter than sepals, narrow, without an expanded blade 4. *S. macrum*.
 - D. Petals conspicuous, longer than sepals, obovate to spatulate; blade expanded, often abruptly so.
 - E. Siliques obovate; valves keeled on back 5. *S. ramosum*.
 - E. Siliques oblong to more elongated; valves either rounded or keeled on back.
 - F. Valves of siliques keeled on back; siliques strongly compressed opposite to plane of septum; replum narrowly linear 6. *S. compressum*.
 - F. Valves of siliques rounded on back; siliques moderately compressed opposite to plane of septum; replum oblong.
 - G. Petals spatulate, gradually tapering from blade to claw, less than 2 mm. long; styles 1 mm. or less long 7. *S. divaricatum*.

G. Petals obovate, abruptly narrowed from blade to claw, 2-3 mm. long; styles 1-2 mm. long 8. *S. macropetalum*.

1. *Sphaerocardamum nesliiforme* Schauer, *Linnaea* **20**: 721. 1847.

Cibotarium microcarpum Rollins, *Rhodora* **59**: 70. 1957.

Perennial, sometimes woody at base; stems single to rarely branched from base, virgately branched above, densely pubescent throughout with coarse dendritically branched trichomes, 1.5-2.5(-3) dm. tall; basal leaves not present; cauline leaves linear-oblong, cuneate at base, obtuse at apex, entire or remotely denticulate to shallowly sinuate-dentate, 1-nerved, densely pubescent with coarse dendritic trichomes, 1-2(-8) cm. long, up to 8 mm. wide; inflorescences racemose, terminating each branch; flowers minute, numerous; sepals oblong, pubescent, non-saccate, erect, hyaline-margined, 1 mm. or less long; petals minute, narrowly spatulate, white, shorter than sepals; stamens exerted, filaments subequal, anthers globose; fruiting pedicels slender, straight, pubescent, widely spreading, only slightly ascending, 2.5-3(-4) mm. long; siliques globose or nearly so to oval, disposed at same angle as pedicel, valves nearly hemispherical, rounded on back, densely pubescent on exterior, sparsely pubescent to nearly glabrous on interior, septum entire, replum nearly orbicular to slightly longer than broad, 1.2-1.5 mm. long; styles glabrous, 0.75-1.0 mm. long; ovules 2-3 in each loculus, funiculi usually attached near apex of replum; seeds wingless, oblong, plump, musilagenous when wetted, 1 mm. or less long; cotyledons incumbent to obliquely incumbent.

Mexico: without locality, *Aschenborn* 209 (B!, holotype). **Hidalgo:** dry rocky slopes of Barranca de Tolimán somewhat above the mines, 7.6 mi. from Zimapán on road to Mina Loma del Toro and Balcones, District of Zimapán, Oct. 30, 1949, *H. E. Moore, Jr.* 5443 (GH, holotype; BH, isotype of *Cibotarium microcarpum*). Same general locality, Oct. 18, 1983, *R. C. & K. W. Rollins* 83349 with Mario Sousa P. (GH, and to be distributed).

Following Schulz (1936), the original compounding of the epithet *nesliae-forme* is treated as an orthographic error. It has been corrected to *nesliiforme*. This is in accordance with Article 73 (73.8) of the International Code of Botanical Nomenclature.

The single plant constituting the holotype of *Cibotarium microcarpum* is woody below the leafy portion of the stem. This is the usual situation in older plants of several species of *Sphaerocardamum*. Plants do flower the first year of growth and these have not, at that point, developed a woody foot that is otherwise characteristic. In *S. nesliiforme*, the two specimens constituting the holotype do not have a woody base. However, it is possible that these are plants not yet old enough to have developed wood. Not only is the extent of woodiness variable from plant to plant within species of *Sphaerocardamum*, there are considerable differences between species. *Sphaerocardamum macropetalum* and *S. stellatum* are more woody than either *S. divaricatum* or *S. macrum* for example. There are other slight differences between the holotype of *Cibotarium microcarpum* and material of *S. nesliiforme*. For

example, the siliques on the holotype of *C. microcarpum* are slightly stipitate whereas they tend to be sessile in *S. nesliiforme*. Also, in the one or two fruits of *C. microcarpum* examined, there were three ovules in each locule and the replum was a little more elongated than in *S. nesliiforme* where the ovule number is usually only 2 per locule. But these distinctions may well fall within the total range of variation of *S. nesliiforme* when that is better known. Therefore, *C. microcarpum* has been placed in synonymy.

Because the genus *Sphaerocardamum* is not known south of the state of Hidalgo in Mexico and the mining areas of that state were visited by Aschenborn, the presumption is that the type of *S. nesliiforme* was collected somewhere in that state. Acting on that assumption, we spent four days in October, 1983, searching for *S. nesliiforme* in what we thought might be appropriate sites. Following the leads provided by the data from the collections of Moore (no. 5443) and Moore and Wood (no. 4253a), we found *S. nesliiforme* and *S. divaricatum* in the same areas where they had been collected in 1949 and 1948 respectively.

2. *S. stellatum* (S. Watson) Rollins, comb. nov., based on *Capsella stellata* S. Wats., Proc. Amer. Acad. **25**: 142. 1890.

Cibotarium stellatum (S. Wats.) O. E. Schulz, Bot. Jahrb. **66**: 91. 1933.

SPECIMENS STUDIED. Mexico. Aguascalientes: ladera S del Cerro Palmira, 4 km. al W de Asientos, 1-XI-1967, J. Rzedowski 25059 (ENCB). Coahuila: Caneros Pass, Pringle 2844 (GH, holotype); ca. 2 km. N of Estacion Carneros, E flank of Sierra El Chorreadero, M. C. Johnston et al. 10497A (GH); Carneros Pass, 26 mi. S of Saltillo, Rollins & Tryon 58133 (GH); 29 mi. S of Saltillo, Rollins & Roby 7490 (GH); Saltillo, Palmer 752 (GH). Nuevo Leon: 177 km. N of Matehuala, Rollins & Roby 76067 (GH). San Luis Potosí: 50 mi. NE of San Luis Potosí on road to Matehuala, Rollins & Tryon 58191 (GH). Zacatecas: ca. 15 (air) mi. E of Concepcion del Oro, Sierra del Astillero, Henrickson 13302b (GH).

Like many other herbaceous to suffrutescent species of the milder, arid parts of North America, *Sphaerocardamum stellatum* may produce inflorescences a few months after seed germination. This was shown when seeds planted in the greenhouse in October, 1976, produced plants that flowered in March, 1977. But the species is not an annual in the usual sense of the term. Even though they flower the first year, the plants of this species continue their growth to become woody at the base. Wild plants of *S. stellatum* often appear to be apetalous and it is possible that this is the case in some populations. Certainly the petals, when present, are minute and are very easily shed. Even in greenhouse grown plants, the petals were erratically present and were shed almost immediately after anthesis.

A chromosome number of $n = 8$ was found in Rollins & Roby 7490 from Coahuila and Rollins & Roby 76067 from Nuevo Leon (see citations above).

3. *S. fruticosum* (Rollins) Rollins, comb. nov., based on *Cibotarium fruticosum* Rollins, Contr. Dudley Herb. **3**: 187. 1941.

SPECIMENS STUDIED. Mexico. San Luis Potosí: Minas de San Rafael, Purpus 5374 (GH, holotype; NY, US, MEXU, isotypes); same locality, Purpus 5235, 5235' (UC); ca. 12 km. al SE de Armadillo, 10-VIII-56, J. Rzedowski 7964 (ENCB).

4. *S. macrum* (Standley) Rollins, *comb. nov.*, based on *Lepidium macrum* Standley, *Field Mus. Nat. Hist. (Bot.)* 17: 248. 1937.

Cibotarium macrum (Standley) Rollins, *Contr. Dudley Herb.* 3: 189. 1941.

SPECIMENS STUDIED. Mexico. Coahuila: 16 mi. S of Arteaga, Kenoyer & Crum 2807 (GH). Nuevo Leon: above San Enrique, Hacienda San Jose de Raices, Municipio de Derrumbadero, Mueller 2411 (GH, isotype).

5. *S. ramosum* Rollins, *sp. nov.*

Herba perennis; caulibus divaricato-ramosis, ca. 2 dm. altis, dense foliatis, pubescentibus; foliis oblanceolatis, sparse denticulatis, dense pubescentibus, sessilibus, 1-4 cm. longis, 4-8 mm. latis; sepalis oblongis, nonsaccatis, pubescentibus; petalis albis, spathulatis; pedicellis fructiferis patentibus, pubescentibus, 5-8 mm. longis; siliquis obovatis, pubescentibus, compressis, 3-4 mm. longis; stylis ca. 1 mm. longis; loculis 4-6 ovulatis; seminibus ca. 1 mm. longis; cotyledonibus incumbentibus.

Holotype in the Gray Herbarium, collected in Nuevo Leon on the east slope of Cerro Potosí at ca. 6050 ft. elev., dry open places in a waste area between corn fields, July 9, 1963, R. L. McGregor, L. J. Harms, A. J. Robinson, R. del Rosario & R. Segal 413.

Perennial, erect, leafy, ca. 2 dm. tall, densely pubescent throughout; trichomes dendritic; stems virgately branched and with a densely flowering inflorescence terminating each branch; leaves all cauline, sessile, oblanceolate, sparsely denticulate, 1-4 cm. long, 4-8 mm. wide; sepals oblong, nonsaccate, hyaline-margined, 1 mm. long or slightly more; petals white, spatulate, 1.5 to nearly 2 mm. long; claw very narrow at point of insertion; fruiting pedicels spreading at right angles to rachis, slender, straight, 5-8 mm. long; siliques obovate, compressed in a plane opposite to that of septum, truncate at base of style, 3-4 mm. long; valves moderately keeled on back; styles glabrous, ca. 1 mm. long, 4-6 ovules in each loculus; seeds plump, marginless, ca. 1 mm. long; cotyledons incumbent.

The siliques of *Sphaerocardamum ramosum* are much like those of *S. macrum* but the petals of that species are minute, being 1 mm. or less long with scarcely any expansion in the blade area whereas the petals of *S. ramosum* are comparatively conspicuous, ranging up to 2 mm. in length and with an expanded blade. The leaves of *S. ramosum* are all denticulate while those of *S. macrum* are nearly all entire. Branching begins near the base in *S. ramosum* but in *S. macrum* branching occurs near the top of the stems. Like several other species of *Sphaerocardamum*, there are trichomes present on the interior of the valves in *S. ramosum*. The type collection is the only one known of this species.

6. *S. compressum* Rollins, *comb. nov. et stat. nov.*, based on *Cibotarium divaricatum* var. *compressum* Rollins, *Contr. Dudley Herb.* 3: 180. 1941.

SPECIMENS STUDIED. Mexico. Coahuila: Sierra de Parras, Purpus 4603 (GH, holotype).

The strongly compressed siliques in this species result in a very narrow replum which has an acute angle at the apex and the valves are strongly keeled on the back. This is quite in contrast to the situation in *S. divaricatum* where the replum is oblong with an obtuse angle at the apex and the valves are rounded on the back. The pubescence of *S. divaricatum* is so dense that

the plants are canescent whereas the evenly spaced trichomes on plants of *S. compressum*, particularly on the siliques, provide only a grayish to greenish aspect. The interior of the valves are glabrous in *S. compressum* while these surfaces are covered with trichomes in *S. divaricatum*. These differences support the elevation of the taxon I treated earlier as a variety to the rank of species.

7. *S. divaricatum* (Rollins) Rollins, *comb. nov.*, based on *Cibotarium divaricatum* Rollins, *Contr. Dudley Herb.* 3: 189. 1941.

SPECIMENS STUDIED. Mexico. Coahuila: Sierra de Parras, *Purpus 1027* (GH, holotype; NY, isotype); Saltillo, *Palmer 347* (GH, NY, UC, US); La Casita, *Kenoyer & Crum 3067* (GH). Hidalgo: El Capulin, between Actopan and Ixmiquilpan, *Moore & Wood 4253a* (GH); same locality, Oct. 17, 1983, *Rollins et al. 83347* (GH).

8. *S. macropetalum* (Rollins) Rollins, *comb. nov.*, based on *Cibotarium macropetalum* Rollins, *Contr. Dudley Herb.* 3: 190. 1941.

SPECIMENS STUDIED. Mexico. Coahuila: Carneros Pass, *Pringle 2848* (GH), *Pringle 3195* (GH, NY, UC, US); 12 mi. E of Saltillo, *Rollins & Tryon 58139* (GH); 59 km. S of Saltillo, *Stanford et al. 290* (GH); 29 mi. S of Saltillo, *Rollins & Roby 7489* (GH); 26 mi. S of Saltillo, *Rollins & Tryon 58134* (GH); 4 mi. E of Carneros, *Correll & Johnston 21325* (GH). Nuevo Leon: 34 mi. S of Saltillo, *Rollins & Roby 76065* (GH); between Saltillo and Matehuala, 4 mi. S of turn-off to Hacienda de San Jose Raices, *Rollins & Tryon 58181* (GH); 1.5 km. E of El Barrosite in southern part of Sierra la Tomita, *Wendt et al. 8008* (GH). San Luis Potosí: ca. 6 km. E of Laguna Seca, Mpio. de Charcas, 10-IX-55, *J. Rzedowski 6551* (ENCB). Zacatecas: Puerto de Rocamontes, *M. C. Johnston et al. 10487* (GH, MEXU); 1.5 km. ESE of Salaverna on road to Concepcion del Oro, *Chiang et al. 7936* (GH); Sierra del Astillero, *M. C. Johnston et al. 11564* (GH, MEXU); near Concepcion del Oro, *Palmer 297* (GH, holotype; NY, UC, US, isotypes); same locality, *Pennell 17399* (GH); ca. 16 (air) mi. E of Concepcion del Oro, *Henrickson 13289* (GH); 9.6 mi. W of Concepcion del Oro, *Rollins & Roby 74137* (ENCB, GH).

As is evident from the number of specimen citations, *Sphaerocardamum macropetalum* is the best known species of the genus. It often grows in the same locations as *S. stellatum* and was confused with that species by Watson (1890). However, the two species are amply distinct and can be readily recognized in the field. In the two places where I have observed them, there is no evidence of hybridization. The chromosome number of *S. macropetalum* is $n = 8$ (Rollins & Rüdénberg, 1977).

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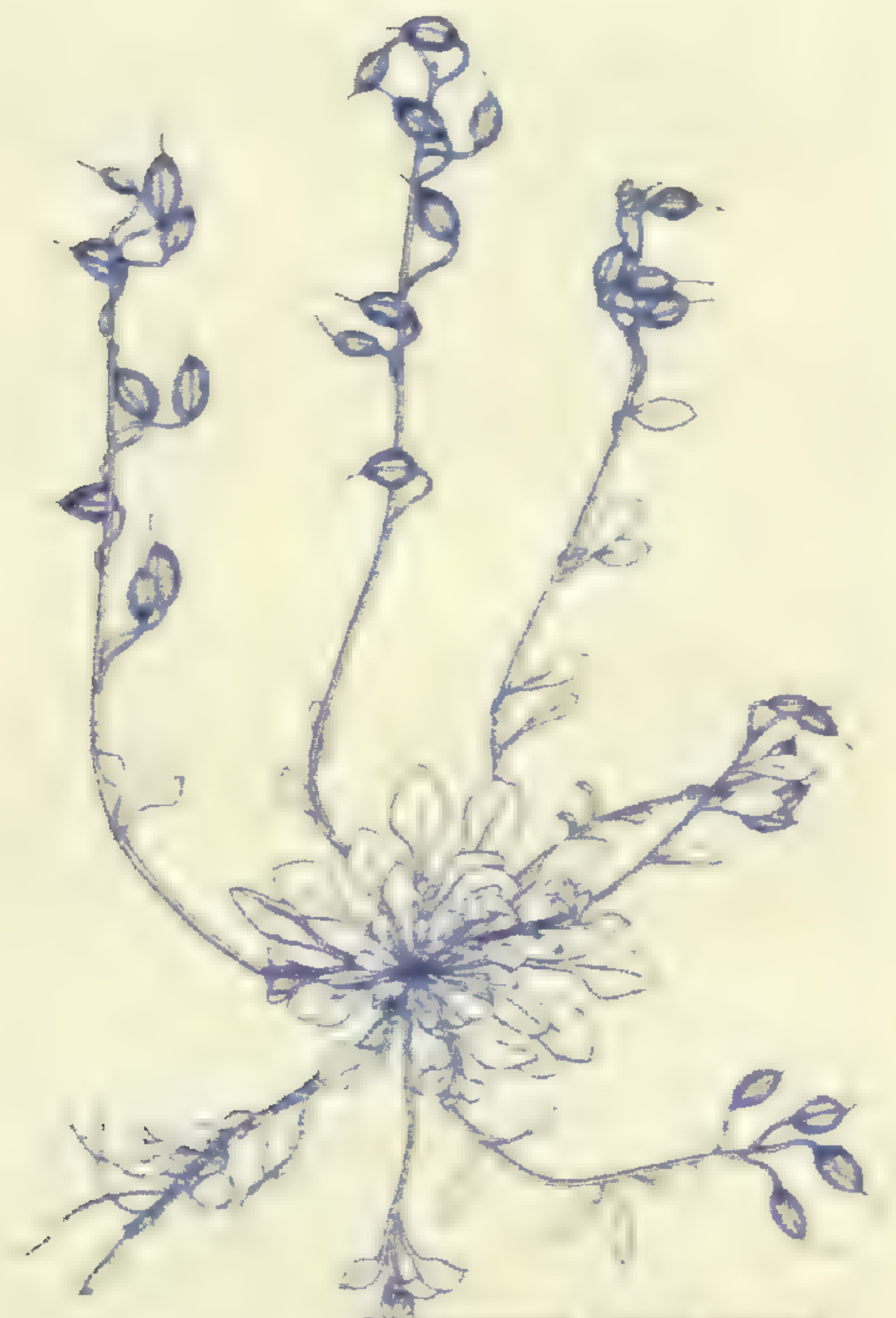
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STUDIES IN THE CRUCIFERAE OF WESTERN NORTH AMERICA II¹

REED C. ROLLINS

Stimulated by leads provided by new collections of Cruciferae from western United States, we organized field trips to various sites in the states of Colorado, Idaho, Montana, Nevada, Utah, and Wyoming. The purpose was to study populations of various species in the field and to collect for laboratory analysis samples of little known or undescribed taxa. The results of these combined studies, including those on materials from other sources, are incorporated in the pages that follow. These include the presentation of new entities in the genera *Arabis*, *Descurainia*, *Draba*, *Lesquerella*, *Physaria*, and *Thlaspi*.

ARABIS

A very dense and fine vesture producing a hoary appearance on leaves, stems, and fruits is characteristic of several species of *Arabis*, particularly some of those of arid areas. Such species as *A. puberula* Nuttall, *A. pulchra* M. E. Jones var. *pulchra*, and *A. subpinnatifida* S. Watson meet these specifications. All three of these species have reflexed or pendent siliques. Undescribed plants from Montana fit in with this group of species as far as trichome type, density, and pubescence distribution are concerned, but they have ascending rather than descending siliques. In searching for a related species to the Montana plants, which I am calling *A. fecunda*, the hoary plants of *A. shockleyi* Munz need to be considered. However, the siliques of that species, while ascending, are glabrous rather than densely pubescent. Also, the siliques are curved outwardly rather than being straight as in *A. fecunda*. A better candidate for a close relationship is *A. fernaldiana* Rollins even though the indument is not so dense and the plants as hoary as in the other species mentioned. It is with the latter that the new species is compared below.

✓ *Arabis fecunda* Rollins, *sp. nov.*

Herba perennis, dense pubescentibus, incana; caudicibus integris vel sparse ramosis; caulibus erectis vel ad basi decumbentibus, simplicibus vel sparse ramosis, 1-3 dm altis; foliis incanis, dimorphis; foliis radicalibus petiolatis, spathulatis vel lineari-oblongatis, integris vel sparse dentatis, 1-3 cm longis, 2-4 mm latis; foliis caulinis sessilibus, oblongis, acutis, parce auriculatis vel nonauriculatis, 7-20 mm longis; sepalis oblongis, nonsaccatis, dense pubescentibus, 6-7 mm longis, ca. 2 mm latis; petalis pupureis, obovatis, 9-13 mm longis, 3-5 mm latis; pedicellis fructiferis erectis vel parce divaricatis, rectis, 6-10 mm longis; siliquis erectis, rectis vel parce curvatis, 3-5 cm longis, ca. 1.5 mm latis; stylis ca. 1 mm longis; seminibus uinseriatis, suborbicularibus, anguste-alatis, ca. 1.2 mm diam.; cotyledonibus accumbentibus.

Holotype in the herbarium of the Botany Department, University of Montana. **Montana.** Ravalli Co.: on rocky terrian near sagebrush, big game range east of Corvallis, June 13, 1976, *Jaculyn Cory 1611*.

¹The first paper bearing this title was published in the *Journal of the Arnold Arboretum* 64: 491-510. 1983.

Perennial with a simple or branched caudex, densely pubescent throughout with fine dendritically branched trichomes; stems erect to somewhat decumbent at base, simple or few branched, 1-3 dm high; leaves hoary, dimorphic; basal leaves petiolate, spatulate to linear oblanceolate, entire or with a few broad teeth in the blade area, 1-3 cm long, 2-4 mm wide; cauline leaves sessile, entire or the lower with a few teeth, oblong, acute, sparingly auriculate to nonauriculate, 7-20 mm long; inflorescences usually congested; sepals oblong, nonsaccate, densely pubescent, 6-7 mm long, ca. 2 mm wide; petals purplish, obovate, not unguiculate, narrowing gradually from blade to point of insertion, 9-13 mm long, 3-5 mm wide; fruiting pedicels erect to slightly divaricately ascending, straight, 6-10 mm long; siliques erect, congested, usually appressed to rachis, straight to slightly curved inward, 3-5 cm long, ca. 1.5 mm wide, valves densely pubescent, compressed between seeds; styles ca. 1 mm long; seeds in a single row, suborbicular to slightly longer than broad, narrowly wing-margined all around, ca. 1.2 mm in diameter, mucilaginous when wetted; cotyledons accumbent.

OTHER SPECIMENS STUDIED. **Montana.** Ravalli Co.: dry open slope, game range NE of Hamilton, May 17, 1975, *Cory 1416* (MONTU).

Most of the stem length is given over to silique production in *Arabis fecunda*, hence the specific name. In general habit, the plants of this species resemble those of *A. fernaldiana*. However, *A. fernaldiana* has an openly branched caudex which is borne mostly above ground while the caudex branching of *A. fecunda* is very tight and is below ground level. The siliques of *A. fernaldiana* are in loose racemes and they are divaricately ascending, but those of *A. fecunda* are congested, erect or nearly so, and appressed to the rachis. The seeds of these two species are different. Those of *A. fecunda* are consistently winged all around while those of *A. fernaldiana* are either wingless or imperfectly winged, mostly with a narrow wing on the distal margin. Another difference is in the radical leaves. In *A. fernaldiana* the radical leaves are all similar, but in *A. fecunda*, after fruiting occurs, new tufts of leaves are produced that are different from the earlier ones. The oldest leaves are spatulate and short-petioled while the newer tufts of leaves are linear-oblanceolate and long-petioled. A similar sequence of leaf form is characteristic of *A. subpinnatifida* and helps distinguish that species from *A. puberula*.

DESCURAINIA

As pointed out by Detling (1939), branching in plants of the native American species of *Descurainia* is primarily of two kinds. In one, exemplified by *D. richardsonii* (Sweet) Schulz, the central axis is well-developed, resulting in tall plants with relatively short branches. The second still has a central axis but relatively long branches that begin near the base of the plant and continue upward. These, although shorter than the main axis in most

instances, provide a wider and more bushy branching system than the first type. In the latter, exemplified by *D. pinnata* (Walter) Britton, there are substantial internodes on the main axis between the branches. A third branching type, found in *D. torulosa* Rollins where the branches arise at the crown of the caudex and are decumbent, was recently recognized among North American species (Rollins, 1983). A fourth branching habit, where all branches arise at or near the base of the plant, characterizes a new species, *D. ramosissima*, which is described below. Here there are very short internodes between the bases of each of the numerous branches which are all nearly the same length on each plant. The central axis is so short that it is hardly recognizable as such and the resulting growth form is bushy. Some plants of *D. pinnata* subsp. *ochroleuca* (Wooton) Detling approach this growth form.

✓ *Descurainia ramosissima* Rollins, *sp. nov.*

Herba annua, ramosissima, 1.5-3 dm alta, plus minusve virida, dense pubescentibus; trichomatibus dendriticis; foliis bipinnatis, 2-4 cm longis, 1-1.5 cm latis, lobatis obtusis; sepalis oblongis, nonsaccatis, 1.5-1.8 mm longis, sparse pubescentibus; petalis spathulatis, flavis, 1.7-2 mm longis; infructescentiis elongatis, rachis glandulosis; pedicellis divaricatis, rectis, filiformibus, sparse pubescentibus, 6-10 cm longis; siliquis prope teretibus, linearis vel anguste-oblongis, glabris, 7-10 mm longis; loculis 10-16 ovulatis; seminibus oblongis, crassis, exalatis, ca. 1 mm longis, ca. 0.6 mm latis; cotyledonibus incumbentibus.

Holotype in the Gray Herbarium. Colorado. Saguache Co.: on sandy soil of an open plain, near State Route 17, 7 miles S of Villa Grove, June 16, 1983, Reed C. & Kathryn W. Rollins 8349 with Aileen G. Roads. Isotypes to be distributed.

Annual, densely and intricately branched from near base, bushy, greenish, 1.5-3 dm tall; foliage and branches densely pubescent with dendritically branched trichomes but not canescent, nonglandular except on rachis of infructescences and pedicel bases; branches about the same length, leafy; leaves bipinnate, 2-4 cm long, 1-1.5 cm wide, scarcely reduced upward, primary divisions cut to a narrow rachis, ultimate lobes oblong to nearly linear, obtuse; inflorescences dense, elongating in fruit; sepals oblong, purplish to yellowish, nonsaccate, 1.5-1.8 mm long, 1 mm or less wide, pubescent with a few simple or forked trichomes; petals creamy yellow, spreading at anthesis but not unguiculate, spatulate, narrowing gradually to point of insertion, rounded at apex, 1.7-2 mm long, less than 1 mm wide; stamens exerted; filaments not dilated, ca. 1.5 mm long; anthers oval, ca. 0.5 mm long; infructescence axis densely glandular above, with a mixture of glands and other trichomes below; fruiting pedicels divaricately ascending, filiform, straight, 6-10 mm long, sparsely pubescent with simple, forked, and dendritic trichomes, glandular trichomes usually present toward junction with rachis; siliques linear to narrowly oblong, tapered above and below, nearly terete to slightly compressed contrary to plane of septum, glabrous, erect, 7-10 mm long; valves boat-shaped, ca. 2 mm wide when flattened, nerved from base to apex; replum ca. 1.5 mm wide; styles barely evident to 0.2 mm long; ovules 10-16 in each locule; seeds oblong, plump, reddish brown,

wingless, ca. 1 mm long, ca. 0.6 mm wide, in a double row at center of silique and single row at each end; seed coat reticulate-foveate; cotyledons incumbent.

In the arid parts of western North America, *Descurainia* is one of the most commonly encountered genera of the Cruciferae. I have studied and collected various species of the genus many times but have never encountered two native species growing together except where *D. ramosissima* was found. There *D. pinnata* subsp. *halictorum* (Cockerell) Detling was growing in even greater abundance than *D. ramosissima*, and the two taxa were intermixed over a wide area. This does not hold for the introduced *D. sophia* (L.) Webb, which has been seen intermixed with native species several times. Aside from their growth form, which is very different as indicated above, subsp. *halictorum* was easily distinguished because of its gray foliage compared to the greenish foliage of *D. ramosissima*. I looked for, but did not see, any evidence of hybridization between the two taxa.

Silique shape in *Descurainia ramosissima* is somewhat intermediate between the *D. richardsonii* complex and the *D. pinnata* complex. The siliques taper in both directions, a situation that is correlated with the way the seeds are arranged. In the central portion of the silique where there is maximum width, there are two rows of seeds but these taper out to one row toward each end.

DRABA

Endemism in the mountainous area of north central Idaho is well established in the genus *Draba*. Such species as *Draba argyrea* Rydberg, *D. hitchcockii* Rollins, *D. oreibata* Macbride & Payson, and *D. sphaerocarpa* Macbride & Payson are known only from that region, and there are a number of other species that incorporate this area in their geographical ranges: *Draba densifolia* Nuttall, *D. loncocarpa* Rydberg, *D. oligosperma* Hooker, *D. paysonii* Macbride var. *treleasii* (Schulz) C. L. Hitchcock, and *D. praealta* Greene. Now another endemic to this area has been discovered and it turns out to be an undescribed species. It was found in the same place as *Thlaspi aileeniae*, another new species described elsewhere in this publication.

Draba trichocarpa Rollins, sp. nov.

Herba perennis, caespitosa; caudicibus ramosis, densis; caulibus scapiformibus, 1-3 cm longis, dense pubescentibus; trichomatibus dendriticis; foliis rosulatis, oblongis vel spatulatis, non-petiolatis, integris, pubescentibus, 2-3 mm longis, 1-1.5 mm latis; sepalis obovatis, nonsaccatis, pubescentibus, 2.5-3 mm longis, ca. 2 mm latis; petalis 2.5-3.5 mm longis, 2.2-2.8 mm latis, laminiis obovatis vel orbicularibus; pedicellis fructiferis rectis, adscendentibus, 2-3 mm longis; siliquis ovatis, compressis, dense pubescentibus, 2.5-4 mm longis, 2-3 mm latis; stylis ca. 0.5 mm longis; seminibus crassis, exalatis, oblongis vel anguste-ovalis, 1.8-2 mm longis; ca. 1.2 mm latis; loculis 2-4 ovulatis. cotyledonibus accumbentibus.

Holotype in the Gray Herbarium. **Idaho. Custer Co.:** on whitish sand and among small rocks on the steep slope of a knoll, Stanley Creek Road, 6.5 miles NW of Stanley, July 14, 1983, *Reed C. & Kathryn W. Rollins 83281 with Aileen G. Roads*. Isotypes to be distributed.

Perennial, caespitose, clumps up to 10 cm across; caudex profusely branched, dense, covered with old leaves and leaf-bases, leaves densely rosulate, entire, oblong to spatulate, obtuse, 2-3 mm long, 1-1.5 mm wide, pubescent with coarse dendritic or forked trichomes, simple trichomes often present on margins toward leaf-base, trichomes crooked, dendritic ones usually branched near apex; fruiting stems scapose, erect, densely covered with coarse dendritically branched trichomes, 1-3 cm long including infructescences; sepals obovate, nonsaccate, hyaline margined, pubescent, 2.5-3 mm long, ca. 2 mm wide; petals 2.5-3.5 mm long, 2.2-2.8 mm wide, blade nearly orbicular to broadly obovate, narrowed abruptly to a short claw less than 1 mm long; filaments 1-1.5 mm long, dilated at base; anthers oval, less than 1 mm long; fruiting pedicels divaricately ascending, straight, densely pubescent, 2-3 mm long; siliques ovate, flattened toward apex, densely covered with dendritic trichomes, 2.5-4 mm long, 2-3 mm wide; styles ca. 0.5 mm long; seeds plump, oblong to narrowly oval, wingless, 1.8-2 mm long, ca. 1.2 mm wide; ovules 2-4 in each locule; cotyledons accumbent.

The dense clumps of *Draba trichocarpa* show very much the same habit of growth as *D. paysonii* Macbride var. *treleasii* (Schulz) C. L. Hitchcock, a species of somewhat higher altitudes. These taxa differ especially in the types and mixtures of trichomes that occur on different parts of the plants. Large simple or forked trichomes predominate in var. *treleasii* while smaller dendritically branched trichomes are mostly present in *D. trichocarpa*. In the latter, the dendritic trichomes are erect on the fruits, pedicels, and scapes and under magnification give the appearance of a dense forest in miniature. Individual trichomes are branched primarily toward the top of a comparatively long stalk. The situation is somewhat different on the leaves where dendritic trichomes predominate on the leaf-surfaces and larger forked or sometimes simple ones are on the margins. Petal color is not determinable on the material at hand because only dessicated flower parts were available for study. However, because of the similarities in petal fading seen in var. *treleasii*, it is reasonably certain the petals of *D. trichocarpa* are yellow.

Mulligan (1971) pointed to *Draba paysonii*, *D. ruaxes* Payson & St. John, and *D. ventosa* Gray as being a related scapose yellow-flowered group of species. Of these, *D. ruaxes* and *D. ventosa* are most closely related to each other and are quite unlike *D. paysonii* s.l. in growth form and pubescence, as well as basic chromosome number. As suggested above, it is to *D. paysonii* and particularly var. *treleasii* that *D. trichocarpa* is to be compared as far as habit is concerned but the trichomes, especially on the scapes, pedicels, and fruits, are more like those of *D. ventosa* than of *D. paysonii* var. *treleasii*.

***Draba daviesiae* (C. L. Hitchcock) Rollins, stat. nov.**

Based on *D. apiculata* C. L. Hitchc. var. *daviesiae* C. L. Hitchc. in Hitchcock, Cronquist, Ownbey, and Thompson, *Vascular Plants of the Pacific Northwest*, Part 2: Salicaceae to Saxifragaceae, p. 489. Univ. of Wash. Press, Seattle, 1964. *D. densifolia* Nutt. var. *daviesiae* (C. L. Hitchc.) Welsh & Reveal, *Great Basin Nat.* 37: 320, 1977.

SPECIMENS STUDIED. **Montana.** Ravalli Co. Bitterroot Mts.: Base Peak Ridge, 12 Aug. 1967, *Lackschewitz & Fageraas* 288 (MONTU); Bitterroot divide above Duffy Lake, 4 July 1977, *Lesica* 76 (MONTU); Heavenly Twins, 15 Aug. 1971, *Lackschewitz* 3287 (MONTU); Pyramid Butte, 24 Aug. 1968, *Lackschewitz & Fageraas* 941 (MONTU); St. Joseph Peak, 8 Aug. 1966, *Lackschewitz & Fageraas* 120 (MONTU); same locality, 14 Aug. 1965, *Pemle* 310 (MONTU); St. Mary's Peak, Aug., 1968, *Arno* 218 (MONTU); same locality, 13 July 1973, *Cory* 1265 (MONTU); same locality, 7 July 1965, *Pemle* 307 (MONTU); talus above St. Mary's Lake, 10 Aug. 1946, *Hitchcock & Muhlick* 15342 (GH); summit of St. Mary's Peak, 17 July 1983, *Rollins & Rollins* 83304 with *Klaus Lackschewitz, Peter Lesica & Aileen Roads* (GH); Sweeney Peak, 1 Aug. 1966, *Lackschewitz & Fageraas* 103 (MONTU); Trapper Peak, 25 July 1964, *Pemle & Harvey* 40, 47 (MONTU); same locality, 9 July 1966, *Lackschewitz & Fageraas* 10 (MONTU).

Having collected the rare *Draba apiculata* on three separate occasions in northwestern Wyoming (*Rollins & Muñoz* 2839 in 1939; *Rollins & Porter* 51272 in 1951; and *R. C. & K. W. Rollins* 83320 in 1983), I was struck with the very different habit of growth of what Hitchcock (1964) called *D. apiculata* var. *daviesiae* when I saw it at the type locality on the summit of St. Mary's Peak in the Bitterroot Mountains of southwestern Montana. The matted, loosely branching caudex with elongated leafy branches was quite in contrast to the dense rosulate caudex structure of *D. apiculata* and the leaves, instead of being acute and apiculate with simple trichomes (as in *D. apiculata*), were rounded at the apex with a fringe of marginal simple trichomes, but no apiculation. As indicated by Hitchcock (1964), the scapes are longer, with 5-10 flowers instead of 2-5 flowers, the pedicels are longer, and the leaves are larger in var. *daviesiae* than in var. *apiculata*. The differences are so outstanding that these taxa cannot be reasonably considered varieties of the same species and I have, therefore, elevated var. *daviesiae* to the rank of species.

I cannot agree with Welsh and Reveal (1977) that *Draba apiculata* C. L. Hitchcock, "is a poorly differentiated phase . . ." of *D. densifolia*. It appears to me that Hitchcock (1941) included too much in *D. apiculata* and thereby picked up material I would refer questionably to *D. densifolia*. But if *D. apiculata* is restricted to plants agreeing with the type, the species is comprehensible and readily distinguished from *D. densifolia*. The *densifolia*-like plants need further study. They occur on St. Mary's Peak at the type locality of *D. daviesiae*, but they are easily distinguished from that species.

✓ ***Draba ramulosa* Rollins, sp. nov.**

Herba perennis, tegetes formantes, dense pubescentibus; caudicibus ramulosis, stramineis; foliis fasciculatis, oblongis vel anguste-obovatis, cuneatis, integris, 5-8 mm longis, 2-3 mm latis; foliis caulinis 4-8; caulibus simplicibus, 4-7 cm longis; sepalis oblongis, nonsaccatis, 2.5-3 mm longis, ca. 1.5 mm latis; petalis obovatis, 4-5 mm longis, ca. 2 mm latis; pedicellis fructiferis rectis, adscendentibus, 4-6(-8) mm longis; siliquis late ellipticis, compressis, dense pubescentibus, 4.5-5.5 mm longis, 3.5-4 mm latis; stylis plus minusve 1 mm longis; loculis 4-5 ovulatis; seminibus oblongis, crassis, exalatis, ca. 2 mm longis, ca. 1.2 mm latis; cotyledonibus accumbentibus.

Holotype in the herbarium of the Missouri Botanical Garden. **Utah.** Beaver Co.: on loose calcareous talus, E slopes, peak and saddle, Tushar (Belknap) Peak, Tushar Mts., 11,500-12,000 ft., July 22, 1940, *Bassett Maguire* 19778. Isotype and photocopy of holotype GH.

Perennial, loosely matted, densely pubescent throughout with fine dendritically branched trichomes, both sterile and fertile active shoots present; creeping rootstocks highly ramified, stramineous; leaves monomorphic; tufted leaves in small elongated clusters, oblong to narrowly obovate, nonpetiolate, entire, cuneate at base, obtuse to acute at apex, 5-8 mm long, 2-3 mm wide; cauline leaves both below and above tufts, those on fertile stems 4-8, mostly toward base, uppermost usually subtending pedicels; fertile stems simple, 4-7 cm long including infructescence; sepals oblong, nonsaccate, 2.5-3 mm long, ca. 1.5 mm wide; filaments markedly dilated at base; petals obovate, gradually narrowed from blade to point of insertion, 4-5 mm long, ca. 2 mm wide; fruiting pedicels divaricately ascending, 4-6(-8) mm long; siliques broadly elliptical, compressed parallel to septum, densely pubescent, 4.5-5.5 mm long, 3.5-4 mm wide; styles slightly less than 1 mm long; ovules 4-5 in each locule; seeds oblong, plump, wingless, light brown, ca. 2 mm long, ca. 1.2 mm wide; cotyledons accumbent.

Draba ramulosa is mostly closely related to *D. ventosa* Gray, which it resembles in growth form, particularly the production under appropriate conditions of numerous straw-colored creeping rootstocks, which result in a tangled mass. The elongated clusters of gray leaves are also similar although their shapes differ somewhat. Also, the two species are similar in having filaments with a dilated base, and the density of the vesture is about the same. They differ in silique shape, size of the stigmatic area, size and branching of the trichomes, and in the fact that *D. ventosa* is scapose while *D. ramulosa* has leaves present on the fertile stems. The siliques of *D. ramulosa* are elliptical while those of *D. ventosa* are oval or broadly ovate to nearly orbicular. In *D. ramulosa* the stigmatic area, as seen on mature siliques, is the same diameter as the styles, but in *D. ventosa* the apex of the style flares to at least twice the diameter of the rest of the style. The trichomes of *D. ramulosa* are fine and more highly branched than those of *D. ventosa* where the pubescence must be characterized as being coarse.

LESQUERELLA

An uncommonly condensed habit of growth is found in certain taxa of *Lesquerella* and the related genus *Physaria*. This is indicated by the specific names *L. condensata* A. Nelson and *P. condensata* Rollins. This growth form is not only found in the Cruciferae but in a number of other plant families as well, and in the Rocky Mountain region it appears to be common where the plants grow on certain decomposed shales. These are abundant in the drainage area of the upper Colorado River and its tributaries. A new species of *Lesquerella* has been found in just such shale barrens of the Green River Formation in northwestern Colorado. If possible, the condensed habit is even more exaggerated in this species than in the other two mentioned.

✓ *Lesquerella congesta* Rollins, *sp. nov.*

Herba perennis, congesta, 1-3 cm diam, dense pubescentibus; trichomatibus stellatis radiatis; caudicibus crassis, simplicibus vel sparse ramosis; caulibus 0.5-1.5 cm longis; foliis basalibus integris, erectis, lineari-oblancoolatis, nonpetiolatis, acutis vel anguste obtusis, (6-)8-12(-15) mm longis, 2-3 mm latis; pedicellis fructiferis erectis, 3-6 mm longis; siliquis ovatis, erectis, 3.5-4.5 mm longis, 2.5-3.5 mm latis; stylis 1-1.5 mm longis; loculis 2-ovulatis; seminibus ovoideis vel prope orbicularibus, noncompressis, ca. 2.5 mm longis; cotyledonibus accumbentibus; floribus ignotis.

Holotype in the Gray Herbarium. **Colorado. Rio Blanco Co.:** near top of ridge, decomposed shale of the Green River Formation, North Dudley Gulch, ca. $\frac{3}{4}$ mile NE of junction of Dudley Gulch and Piceance Creek, T2S, R97W, Sec. 4, June 20, 1983, *Reed C. & Kathryn W. Rollins 8394 with Scott Peterson, Aileen G. Roads, Karen Wiley-Eberle & Dieter Wilken*. Isotypes to be distributed.

Perennial with a thick caudex and long thick taproot; caudex simple or rarely few branched below ground, covered with old leaf-bases and leaf-scars; infructescences nearly sessile or fruiting stems up to 1.5 cm long; plants 1-3 cm in diameter, densely pubescent with appressed stellate trichomes; trichomes stiff, radiately branched, primary branches 4-5, fused at center, ultimate tips 18-25; leaves silvery, monomorphic, basal erect, linear-oblancoolate, entire, acute to narrowly obtuse, without a distinct petiole, (6-)8-13 (-15) mm long, 2-3 mm wide; cauline leaves 1-3 per stem, similar to basal; fruiting pedicels erect or nearly so, straight to slightly curved, 3-6 mm long; siliques erect, ovate, flattened at apex and along margins, densely pubescent with appressed trichomes, 3.5-4.5 mm long, 2.5-3.5 mm wide; styles 1-1.5 mm long; replum ovate, acute; septum entire or with a small perforation; valves glabrous on interior; ovules 2 in each locule; seeds plump, wingless, ovoid to nearly orbicular, ca. 2.5 mm long; mucilaginous when wetted; cotyledons accumbent, radical equalling cotyledons. Flowers not known.

OTHER SPECIMENS STUDIED. **Colorado. Rio Blanco Co.:** 1.5 miles E of junction of Little Duck Creek and Trail Canyon, T1S, R97W, S7, 2 June 1982, *Walker, Waters & Riefler 82-108 (CS)*; 1.3 miles W of Piceance Creek and 1.9 miles WSW of Square S Ranch, T1S, R97W, S17, 25 May 1982, *O'Kane & Sigstedt 82-125 (CS)*; 3.5 miles W of junction of Duck Creek Road and Yellow Creek Road, T1S, R98W, S7, 19 May 1982, *Walker & Sigstedt 82031 (CS)*; North Dudley Gulch, ca. $\frac{3}{4}$ mile NE of junction of North Dudley Gulch and Piceance Creek, T2S, R97W, S4, 11 June 1982, *Baker & Naumann 82-191 (CS)*.

We were alerted to the novelty of *Lesquerella congesta*, not only by the growth habit, but more importantly by the nature of the trichomes. These are less than one-half the size of those of the related *L. alpina* s.l., the rays are shorter, more massive, and are more fused toward their bases than those of *L. alpina*, where the rays are mostly free with relatively long arms. Although *L. condensata* and *L. congesta* are fairly close in their habit of growth, their trichomes are even more different from each other than those of *L. alpina* and *L. congesta*.

Compared to most variants of *Lesquerella alpina*, *L. congesta* has much shorter styles, 1-1.5 mm vs. 1.5-6 mm. It is true that in some specimens of *L. alpina*, the style length of *L. congesta* is approached, but there is very

little overlap from the species as a whole. Also, the margins of the siliques of *L. congesta*, as well as the apex, are flattened whereas the flattening is confined to the apex in *L. alpina*.

***Lesquerella humilis* Rollins, sp. nov.**

Herba perennis, dense pubescentibus, argentea; caudicibus crassis, plerumque simplicibus; trichomatibus stellatis, ramosis; caulibus prostratis, simplicibus, 2-5 cm longis; foliis radicalibus petiolatis, integris, (1-)1.5-2.5(-3) cm longis, laminis ellipticis vel late obovatis, 3-6(-7) mm latis, 4-7 mm longis; foliis caulinis 3-6, spatulatis, 3-7 mm longis; sepalis oblongis, dense pubescentibus, 4-5 mm longis, 1.5-2 mm latis; petalis spatulatis, retusis, 7-8.5 mm longis, 3-3.5 mm latis; pedicellis fructiferis rectis vel plus minusve curvatis, 3-4 mm longis; silliquis compressis, 3-4 mm altis, 4-5 mm latis; stylis 2-3 mm longis; loculis 2-ovulatis; seminibus crassis, semiorbicularibus, exalatis, ca. 2 mm longis; cotyledonibus accumbentibus.

Holotype in the Gray Herbarium. **Montana. Ravalli Co.:** on steep hillside of metamorphosed rocks and detritus, approach to and near summit of St. Mary's Peak, Bitterroot Range, July 17, 1983, *Reed C. & Kathryn W. Rollins 83300, with Klaus H. Lackschewitz, Peter Lesica & Aileen G. Roads*. Isotypes to be distributed.

Perennial, densely pubescent and silvery from an encrustment of stellate trichomes; primary trichome branches 5-6, free to base to slightly fused at center, forked or 3-branched, trichomes with 16-25 free ends, appressed on upper leaf surface, less appressed to somewhat flaring on lower leaf-surface; caudex usually simple, thick, covered with old leaf-bases; stems prostrate, simple, one or two to several, arising below and among a terminal rosette of leaves, 2-5 cm long; rosette leaves petiolate, entire, (1-)1.5-2.5(-3) cm long, blade elliptical to broadly ovate or obovate, usually narrowed abruptly, 3-6 (-7) mm wide, 4-7 mm long, obtuse; cauline leaves 3-6, spatulate, cuneate at base, 3-7 mm long; inflorescences 3-5 flowered, scarcely elongating in fruit; sepals yellowish, oblong, densely pubescent, 4-5 mm long, 1.5-2 mm wide, outer pair slightly saccate, inner pair non-saccate; petals yellow, spatulate, retuse or rarely with a deeper sinus at apex, narrowed gradually from blade to claw, 7-8.5 mm long, 3-3.5 mm wide; stamens strongly tetradynamous; filaments of paired stamens ca. 4 mm long, anthers ca. 1 mm long; pedicels straight to slightly curved, nearly paralleling rachis, 3-4 mm long; siliques wider than high, compressed contrary to plane of septum, shallowly notched to nearly truncate at base of style, 3-4 mm high, 4-5 mm wide, valves densely pubescent on exterior with trichomes that have ascending to erect rays, sparsely pubescent on interior; replum oval to broadly oblong, acute at apex, 2.5-3.5 mm long; septum usually folded; styles 2-3 mm long; ovules 2 in each locule; seeds plump, wingless, slightly compressed, orbicular to semiorbicular, ca. 2 mm in diameter; cotyledons accumbent, orbicular or nearly so.

OTHER SPECIMENS STUDIED. **Montana. Ravalli Co.:** dry exposures, summit, St. Mary's Peak, elev. 9,100 ft., July 26, 1973, *Lackschewitz 4560* (GH, MONTU); same locality, *Woodland & Arno 1077* (MONTU); above and below krumholz, same locality, June 19, 1974, *Lackschewitz & Schaack 4944* (GH); rocky fellfield, E St. Joseph Peak, Bitterroot Mountains, July 4, 1970, *Lackschewitz 2126* (MONTU); dry ledge, St. Joseph Peak, Aug. 8, 1966, *Lackschewitz 117* (MONTU); dry S slope, same locality, July 24, 1971, *Lackschewitz & Gouaux s.n.* (MONTU).

The distinctiveness of *Lesquerella humilis* rests on characters such as the few ovules and position of the funiculi in the ovary, the spreading trichome branches on the valves of the siliques, the few-flowered and non-elongating inflorescences, and the trichome pattern on the rosulate leaves. Compared to its nearest relative, *L. hemiphysaria*, which has 4 to 8 ovules in each locule with the funiculi extending down each side of the replum, *L. humilis* has 2 or sometimes but one ovule per locule and they are attached near the apex of the replum. Usually but one ovule develops resulting in a single seed in each valve. The dense covering of trichomes with their branches spreading away from the valve surfaces in *L. humilis* is quite in contrast to the scattered and appressed trichomes on the valve surfaces of *L. hemiphysaria*. In fact, the silique valves in *L. hemiphysaria* are sometimes glabrous or nearly so. There are usually fewer than 6 flowers on each stem of *L. humilis* and these mature near or at the shoot apex whereas in *L. hemiphysaria* there are many flowers ultimately resulting in somewhat elongated infructescences. Although the trichomes are fairly similar in the two species, they are considerably larger and with less fused branches in *L. humilis* than in *L. hemiphysaria*. On the whole, the plants of *L. hemiphysaria* are larger with more numerous flowering stems and leaves than in *L. humilis*. As far as our present knowledge goes, the two species are completely allopatric, *L. hemiphysaria* being confined to central Utah and *L. humilis* to western Montana.

✓ *Lesquerella klausii* Rollins, *sp. nov.*

Herba perennis, dense pubescentibus; caudibus simplicibus; foliis radicalibus petiolatis, integris, 1.5-2.5 cm longis, laminis obovatis vel deltatis; foliis caulinis oblanceolatis vel spatulatis, 6-9 mm longis; caulibus erectis vel ad base decumbentibus, tenuis, 6-10 cm altis; pedicellis fructiferis tenuis, sigmoideis, 5-7 mm longis; siliquis late obovatis, dense pubescentibus, ca. 4 mm altis, ca. 5 mm latis; replis anguste-obovatis, superne obtusis, 2.5-3 mm longis; stylis pubescentibus vel glabris, 3-3.5 mm longis; loculis 2 ovulatis; seminibus suborbicularibus vel late oblongis, crassis, exalatis, ca. 2 mm longis, ca. 1.8 mm latis; cotyledonibus accumbentibus.

Holotype in the herbarium of the Botany Department, University of Montana. **Montana. Lewis and Clark Co.:** on open gravel slide, W side above Hwy. 200 at Rogers Pass, elev. 5,800 ft., July 25, 1982, *Klaus H. Lackschewitz & David Ramsden 10112.*

Perennial from a taproot, densely stellate pubescent; trichomes loosely spreading, primary rays 3-5, forked, ultimate rays exceptionally long for members of the genus; caudex simple, only slightly enlarged; radical leaves petiolate, entire, 1.5-2.5 cm long, blade obovate to deltate, petiole slender; cauline leaves oblanceolate to spatulate, 6-9 mm long; stems erect to decumbent at base, slender, 6-10 cm high; infructescences loose, 1-3 cm long; pedicels slender, sigmoid, 5-7 mm long; siliques broadly obovate, slightly bilobed to nearly truncate above, densely pubescent with spreading trichomes, ca. 4 mm high, ca. 5 mm wide, valves pubescent on interior; replum narrowly obovate, obtuse above, 2.5-3 mm long; styles pubescent or glabrous, 3-3.5 mm long; ovules 2 in each locule; funiculi attached near apex of

replum; seeds slightly longer than broad, wingless, thick, ca. 2 mm long, ca. 1.8 mm wide; cotyledons accumbent.

The silique shape of *Lesquerella klausii* is similar to that of *L. cordiformis* (Rollins) Rollins & Shaw, a species of Nevada, but the trichomes are not at all alike in these species and it is not believed they are particularly related. A better candidate for a related species would be *L. hemiphysaria* Maguire, were it not for the presence of 4-6 ovules per locule of the siliques in that species, whereas in *L. klausii* only 2 ovules occur in each locule. In fact, *L. klausii* is not easily associated as a probable relative with any other species of *Lesquerella*. Because of the obcordate siliques with a sinus at their style base in some plants, the species falls in a borderline between *Lesquerella* and *Physaria*, a situation earlier discussed several times (see references in Rollins & Shaw, 1973). But according to our classification, this taxon definitely falls into *Lesquerella* rather than *Physaria*. The trichomes of *L. klausii* are not exactly matched by those of any other species of the genus (Rollins & Banerjee, 1975). Their nature and disposition provide an easy way of identifying *L. klausii*. The trichomes themselves have unusually long branches and these are more or less erect, forming a tangled mass, rather than being flattened to the plant surface as in many species of *Lesquerella*. The species is named for the principal collector, Klaus H. Lackschewitz, who specializes on the high elevation flora of Montana.

PHYSARIA

The genus *Physaria* has been of special interest to me for more than forty years (Rollins, 1939). For much of this long period newly collected specimens were easily accommodated in categories that were well established. But beginning with the publication of two new species by Mulligan (1966a), a number of discoveries of new taxa have been made (Rollins, 1981, 1983; Lichvar, 1983). My own intensive fieldwork in western United States, especially in 1979, 1981, and 1983, has continued to uncover previously unrecognized species of *Physaria*, and new material from others has added to the total. The emerging picture of this genus is one that consists of a rather large number of species that are relatively restricted, either to specialized local habitats or to particular geological formations that are in turn localized in their occurrence. In addition, there are some species, for example *P. acutifolia* Rydberg, *P. chambersii* Rollins, and *P. didymocarpa* (Hooker) Gray, that are fairly widespread. The new taxa described below appear to fall into the former category.

Physaria repanda Rollins, *sp. nov.*

Herba perennis, dense stellato-pubescentibus, argentea; caudicibus simplicibus, crassis; caulibus decumbentibus, numerosissimis, simplicibus, 1-2 dm longis; foliis radicalibus petiolatis, repandis vel late dentatis, 4-7 cm longis, 1-2.5 cm latis, laminis late obovatis vel prope orbi-

cularibus; foliis caulinis oblanceolatis, integris, acutis vel obtusis, 1.5-3 cm longis; sepalis oblongis vel lineari-oblongis, nonsaccatis, 7-9 mm longis, 2-3 mm latis; petalis flavis, lingulatis vel prope spathulatis, 10-12 mm longis, 3-4 mm latis; pedicellis fructiferis adscendentibus vel divaricatis, 1-1.5 cm longis; siliquis didymis, inflatis; loculis semioricularibus, 2-4 ovulatis; replis anguste-oblongis, 4-5 mm longis; stylis glabris vel pubescentibus, 5-6 mm longis; seminibus immaturis crassis, exalatis.

Holotype in the Gray Herbarium. **Utah. Duchesne Co.:** on clay-like soil of a steep road-cut, off U.S. Hwy. 191, 22.5 miles SW of Duchesne, June 23, 1983, *Reed C. & Kathryn W. Rollins 83117 with Aileen G. Roads*. Isotypes to be distributed.

Perennial with a deep taproot, densely pubescent with stellate trichomes; caudex thick, usually simple; stems numerous, simple, decumbent, 1-2 dm long; radical leaves rosulate and horizontal to ascending, petiolate, repand to coarsely dentate, 4-7 cm long, 1-2.5 cm wide, blade broadly ovate to nearly orbicular; cauline leaves oblanceolate, entire, acute to obtuse, 1.5-3 cm long; sepals oblong to linear-oblong, nonsaccate, 7-9 mm long, 2-3 mm wide; petals yellow, lingulate to nearly spatulate, tapering gradually from widest place to point of insertion, slightly widened at base, not unguiculate, 10-12 mm long, 3-4 mm wide; infructescences elongated; pedicels divaricately ascending, straight to slightly curved upward, 1-1.5 cm long; siliques didymous, inflated, valves rounded, up to 1.5 cm high in immature siliques, densely pubescent with spreading trichomes; orifices oblong, just below middle of valve faces; replum narrowly oblong, obtuse above, 4-5 mm long; styles pubescent or glabrous, 5-6 mm long; ovules 2-4 per locule; immature seeds wingless, plump, slightly longer than broad.

OTHER SPECIMENS STUDIED Utah. Duchesne Co.: steep clay bank of road-cut, Utah Route 33, Indian Canyon, 25.2 miles W of Duchesne, May 30, 1979, *Reed C. & Kathryn W. Rollins 79112 (GH)*.

The first collection of *Physaria repanda* was tentatively identified as *P. grahamii* Morton, a rare species of the Uinta Basin of northeastern Utah. But those specimens were in flower only and the possibility of a positive identification was low. The type series, which consists of 17 specimens, does not have fully matured fruits; however, the distinctive features are sufficiently represented to make certain the populations sampled are not *P. grahamii*. In the latter species, the radical leaves are pinnatifid to deeply lobed and the trichomes present have spreading rays that produce a lanate appearing surface. In contrast, the radical leaves of *P. repanda* are merely repand to dentate and the trichomes are closely appressed to the leaf surface.

Physaria repanda is related to *P. grahamii* but it is probably closer to *P. acutifolia* Rydberg. It shares the same silique shape with *P. acutifolia*, especially those populations on the southwestern edge of the geographic range in Utah of that species. The siliques of *P. repanda* are densely covered with spreading trichomes and these appear as a whitish down on the young siliques. But the trichomes on the siliques of *P. acutifolia* are closely appressed, fewer in number, and do not show as a whitish down on the young siliques. There is a marked difference in the radical leaves of these

two species. Those of *P. repanda* are dentate to repand with a terminal lobe that is mostly wider than long whereas the radical leaves of *P. acutifolia* are entire and terminated by a blade which is longer than broad.

✓ ***Physaria saximontana* Rollins, sp. nov.**

Herba perennis; caudicibus crassis, integris; caulibus prostratis, vel decumbentibus, 3-10 cm longis; foliis radicalibus rosulatis, argenteis, petiolatis, obtusis, 1.5-3 cm longis, 8-14 mm latis, laminis orbicularibus vel late obovatis; foliis caulinis late spathulatis vel lineari-oblongatis, integris, 1-1.5 cm longis; pedicellis fructiferis adscendentibus, rectis vel plus minusve curvatis, 6-10 mm longis; siliquis bilobatis, inflatis; loculis 2-ovulatis; stylis 3-5(-7) mm longis; seminibus ovalis vel late oblongis, ca. 3 mm longis, ca. 2 mm latis; cotyledonibus accumbentibus.

Holotype in the Gray Herbarium. **Wyoming. Fremont Co.:** on red soil near State Route 28, 18.4 miles SW of Lander, June 20, 1981, *Reed C. & Kathryn W. Rollins 81374*. Isotypes to be distributed.

Perennial with a taproot and usually simple caudex, silvery pubescent throughout; trichomes stellate with forked rays; stems several to numerous, prostrate to decumbent, 3-10 cm long; radical leaves rosulate, densely pubescent with appressed trichomes, petiolate, 1.5-3 cm long, 8-14 mm wide, petiole winged, blade orbicular to broadly obovate, obtuse, entire or with broad obscure tooth-like angles on each side at apex; cauline leaves broadly spatulate to linear-oblongate, entire, 1-1.5 cm long; sepals narrowly oblong, non-saccate, 5-6 mm long; petals yellow, spatulate, not unguiculate, 8-10 mm long, 2-3 mm wide, tapering gradually from apex to point of insertion; infructescences condensed, subumbellate to slightly more elongated; fruiting pedicels divaricately ascending, straight to slightly curved, 6-10 mm long; siliques deeply bilobed, inflated at maturity, sinus absent below, deep above, valves irregular, rounded, densely pubescent with spreading trichomes, shed with seed enclosed; orifice narrowly ovate to elliptical, margined with spreading trichomes, situated toward base of valve inner face; replum narrowly ovate to broadly oblong, acute to obtuse above, not narrowed at middle, 3-4 mm long, 1.5-2 mm wide; styles 3-5(-7) mm long; ovules 2 in each locule (2-4 in var. *dentata*); funiculi near apex of replum; seeds oval to broadly oblong, wingless, slightly compressed, smooth, ca. 3 mm long, ca. 2 mm wide; cotyledons accumbent.

KEY TO VARIETIES

Radical leaves entire; styles 1-2 times or less length of replum var. *saximontana*.
 Radical leaves with broad teeth at margins and angled at apex; styles 3 or more times length of replum var. *dentata*.

✓ ***Physaria saximontana* Rollins var. *saximontana***

OTHER SPECIMENS STUDIED. **Wyoming. Fremont Co.:** 15 mi. NW of Fort Washakie, July 22, 1983, *R.C. & K.W. Rollins 83330 with Aileen Roads* (GH); ca. 25 mi. NW of Morton, Wind River Indian Reservation, June 22, 1981, *R.C. & K.W. Rollins 81386* (GH); near State Route 28, 18.4 miles SW of Lander, July 22, 1983, *R.C. & K.W. Rollins 83331 with Aileen Roads* (GH). **Converse Co.:** 6 miles S of Douglas, July 10, 1951, *Porter 5727* (GH). **Northwestern Wyoming, 1873, C. C. Parry 25** (GH).

✓ *P. saximontana* var. *dentata* Rollins, *var. nov.*

Foliis radicalibus late dentatis; stylis 5-7 mm longis.

Holotype in the Gray Herbarium. **Montana. Lewis and Clark Co.:** on upper E slope of mountain S of Solk Lake, elev. 8,100 ft., Bob Marshall Wilderness, SE $\frac{1}{4}$ Sec. 31, T24N, R11W, July 26, 1979, *Klaus H. Lackschewitz* 9106. Isotype: MONTU.

OTHER SPECIMENS STUDIED. **Montana. Glacier Co.:** Divide Mountain, Glacier National Park, 9 Aug. 1964, *Hervey & Premble* 7213 (MONTU). **Park Co.:** mountain N of Sunlight Lake, Crazy Mountains, July 30, 1980, *Lackschewitz* 9374 (MONTU).

For several years I have been encountering populations of *Physaria* with many of the features of *P. didymocarpa*, but with a number of distinctive characters that make them difficult to accept as part of that species. These populations occur southeast of the Wind River Mountains of west central Wyoming, and extend northward through the main chains of the central Rocky Mountains of Montana. The area overlaps, but is mostly to the south of, the primary geographical range of *P. didymocarpa*, which is largely in Canada and western Montana (Mulligan, 1967). The most significant differences between *P. didymocarpa* and *P. saximontana* are in the silique shape and in the position of the orifice on the inner face of each valve. The siliques of *P. didymocarpa* are cordate at the base because the valves produce a narrow sinus at the base of the replum. This is well shown in the illustrations provided with the original publication of the species (Hooker, 1830). On the other hand, the siliques of *P. saximontana* have no sinus at their base. Here, the replum is attached at the very base of the valves and the orifice to each valve is also at the base. But in *P. didymocarpa* the valve orifice is near the middle of each valve face.

The stellate trichomes on *Physaria saximontana* are not uniform over the entire plant as they are in many species of the genus. Those of the radical leaves have 6 to 8 primary rays, each of which is forked, providing 12-16 free ends. There is some fusion of the rays at the center. These trichomes are in multiple layers and the rays parallel the leaf surface. The most different from these trichomes are those on the valves of the siliques. Here, the primary rays are only 3 to 5, and by forking they produce 6 to 10 free ends which spread away from the valve surfaces. The young ovaries are covered by a tangle of spreading trichomes, appearing downy in much the same way as in *P. didymocarpa*. The primary rays of the silique trichomes are free to the center.

✓ *Physaria stylosa* Rollins, *sp. nov.*

Herba perennis; caudicibus ramosis; caulibus tenuibus, prostratis vel adscendentibus, 3-8 cm longis; foliis radicalibus petiolatis, integris vel vix sinuolatis, dense pubescentibus, argenteis, 2-4 cm longis, 5-10 mm latis; foliis caulinis lineari-oblongatis, integris; sepalis nonsaccatis, lineari-oblongis, 6-7 mm longis, ca. 1.5 mm latis; petalis spathulatis, flavis, 9-11 mm longis; pedicellis fructiferis divaricatis vel adscendentibus, 7-10 mm longis; siliquis, didymis, pubescentibus; repleo oblongo, 1.5-2 mm longo; stylo 6-9 mm longo; loculis 2-ovulatis; seminibus crassis, semiorbicularibus, ca. 2.5 mm diam; cotyledonibus accumbentibus.

Holotype in the Gray Herbarium. Utah. Wasatch Co.: in sandy rocky ground of steep raw slopes with a south exposure, Duchesne Ridge above Corral Hollow, West Fork of Duchesne River, 23 miles from Tabiona, 9,800 ft. elev., Aug. 5, 1980, S. Goodrich 14905.

Perennial; caudex usually branched; stems slender, prostrate to ascending, 3-8 cm long; radical leaves entire to shallowly sinuate, densely pubescent, silvery, 2-4 cm long, 5-10 mm wide, blade obovate to elliptical, petiole slender, 1-2 cm long; cauline leaves few, linear-oblongate, entire; leaf trichomes stellate, appressed in several layers, primary rays 8-10, forked, secondary rays 16-20; sepals non-saccate, linear-oblong, 6-7 mm long, ca. 1.5 mm wide; petals yellow, spatulate, tapering gradually from blade to claw, 9-11 mm long, 2-3 mm wide; fruiting pedicels divaricately ascending, 7-10 mm long; siliques pubescent, with a deep sinus above and none below; valves asymmetrical, concave on outer surface, tapered on upper part toward orifice, 5-7 mm high; orifice at base of valve, oblong, 1.5-2 mm long; replum oblong, rounded at apex; styles slender, 6-9 mm long; ovules 2 in each locule; funiculi at apex of replum; seeds plump, nearly orbicular in outline, wingless, ca. 2.5 mm in diameter; cotyledons accumbent.

Among those species of *Physaria* with no sinuses at the base of their siliques, *P. stylosa* is distinctive in having small valves that are tapered toward the orifice, very long slender styles well exerted above the valves and a branched caudex that appears to be a regular feature of the species. The tapered valves fit to a very short replum so that the length ratio of replum to style is roughly 1 to 4 where in most species of *Physaria* the ratio is less than 1 to 2. The silique shape is somewhat like that of *P. alpina* in that the valves are strongly tapered but in the latter the tapering occurs both above and below the orifice whereas in *P. stylosa* the tapering is all above the orifice.

In silique size and shape, replum length, and style length, *Physaria stylosa* is closer to *P. vitulifera* Rydberg than to any other species. However, they differ in significant ways. The plants of *P. vitulifera* are much larger and possess a simple enlarged caudex compared to *P. stylosa* where the plants are small and the caudex is branched with only minor enlargement toward the radical leaf cluster. The radical leaves of *P. vitulifera* are lobed or sinuate-dentate to dentate and the largest are up to 3 cm wide, while those of *P. stylosa* are mostly entire with the largest scarcely reaching 1 cm in width. In *P. stylosa* the fruiting pedicels are straight or nearly so, but those of *P. vitulifera* are definitely sigmoid. In the latter, the valves of the siliques are rigid and uneven whereas those of *P. stylosa* are smooth and papery. Trichomes on the valve surfaces are erect in *P. vitulifera* but smaller and appressed in *P. stylosa*. The infructescences of *P. stylosa* are dense and short while those of *P. vitulifera* tend to form elongated racemes. *Physaria vitulifera* occurs east of the front range of the Rocky Mountains in Colorado (Mulligan, 1966b).

THLASPI

Since the work of P. Holmgren (1971), the features of *Thlaspi* previously used for taxonomic purposes have been known to be unusually inconstant. In her detailed study of North American representatives of the genus, she found that many of the previously recognized taxa (Payson, 1926) graded into each other almost imperceptibly in such a way as to weaken or cancel differences thought to characterize recognizable taxa. She ended up with four species for all of North America, but included five infraspecific taxa under *T. montanum* L. Two of the species, *T. arcticum* Porsild and *T. mexicanum* Standley, are restricted in their distribution at the limits of the occurrence of *Thlaspi* in North America, the arctic and subarctic on the one hand and Mexico on the other. The other species with a restricted range is *T. parviflorum* A. Nelson, which occurs from north central Wyoming westward to central Idaho. Otherwise, *T. montanum*, including its several varieties, is found from west Texas and northern Mexico to Washington and Montana. This species is very abundant in many parts of its range and is a frequently seen member of the Cruciferae. Of concern in the present study is *T. montanum* var. *idahoense* (Payson) P. Holmgren, which is confined to central Idaho. The reason is that an underscribed species of *Thlaspi* has been discovered which is related to var. *idahoense*, to which the new species must be compared. The new taxon is described below, followed by a comparison of these two taxa.

✓ *Thlaspi aileeniae* Rollins, *sp. nov.*

Herba perennis caespitosa glabra; caudicibus congestis; caulibus simplicibus, rigidis, tenuis (1.5-)2-4(-5) cm altis; foliis basalibus densis, erectis, carnosis, linearis vel lineari-oblongatis, integris, (5-)6-9(-10) mm longis; foliis caulinis oblongis, sessilibus, (3-)4-6(-7) mm longis, 1-2 mm latis; infructescentiis densis, 1-2 cm longis; pedicellis rectis, (2-)3-4(-5) mm longis; siliquis obovatis vel ellipticis, 4-6(-6.5) mm longis, 2.5-4 mm latis; stylis ca. 1 mm longis; loculis 2-5 ovulatis; seminibus crassis, exalatis, bruneis, anguste-ovalis, 1.5-2 mm longis, 1-1.2 mm latis; cotyledonibus accumbentibus; floribus ignotis.

Holotype in the Gray Herbarium. **Idaho. Custer Co.:** on a stony flat off road to Cape Horn, between Knopp Creek and Valley Creek, ca. 16 miles NW of Stanley, Custer County, Idaho, July 15, 1983, *Reed C. & Kathryn W. Rollins 83287 with Aileen G. Roads*. Isotypes NY and to be distributed.

Caespitose glabrous perennial with few to many upright stems; caudex branches congested below ground level; stems simple, rigid, slender, (1.5-)2-4(-5) cm tall including mature infructescences; basal leaves tufted, erect, fleshy, linear to linear-oblongate, sometimes nearly terete, entire, obtuse, 1-1.5 mm wide near apex and narrowing to point of insertion, (5-)6-9(-10) mm long; cauline leaves (0-)1-3(-4) per stem, oblong, sessile, non-auriculate or with small auricles on uppermost leaves, (3-)4-6(-7) mm long, 1-2 mm wide; infructescences dense, 1-2 cm long; pedicels straight, nearly at right angles to rachis to divaricately ascending, (2-)3-4(-5) mm long; siliques divaricately ascending to erect, obovate to nearly elliptical, truncate to obtuse or

acute at base of style, 4-6(-7.5) mm long, 2.5-4 mm wide; styles 1 mm or less long; ovules 2-5 in each locule; seeds plump, brown, wingless, narrowly oval in outline but tapered toward each end, 1.5-2 mm long, 1-1.2 mm wide; cotyledons accumbent. Flowers not known.

SECOND COLLECTION. Idaho. Custer Co.: coarse sand and small rocks, steep slope of a knoll, off Stanley Creek road, 6.5 miles NW of Stanley, July 14, 1983, Reed C. & Kathryn W. Rollins 83283 with Aileen G. Roads (GH, NY).

The most easily seen, and in many ways the most distinctive, features of *Thlaspi aileeniae* are the basal leaves and growth habit. The narrow, erect basal leaves are like those of no other North American species of *Thlaspi*. But because there is gradual flaring from the petiolar area to the broadened blade in *T. montanum* L. var. *idahoense* (Payson) P. Holmgren, this taxon comes closer in leaf-form to *T. aileeniae* than any other. Similarities between these two taxa occur also in silique form, and the shortness of the sterile portion of the fertile stems. They differ in style length, density of the infructescence and auriculation of the cauline leaves. Substantial auricles are found on all cauline leaves of var. *idahoense* but none are present or there are but the barest suggestions of auricles on the uppermost leaves of *T. aileeniae*. The lower cauline leaves are definitely non-auriculate. In the latter species, the infructescences are so dense and so short that it approaches a subumbellate condition. In contrast, the infructescences of var. *idahoense* are definitely elongated. An exceptional collection (Rollins 79384) from 14.6 miles south of Stanley, Idaho, has somewhat shortened infructescences but the cauline leaves are distinctly auriculate, the basal leaves have blades, and the styles are 1.5-2 mm long, all features characteristic of var. *idahoense*. The styles of *T. aileeniae* are 1 mm long or less and in this respect are more like those of *T. parviflorum* and *T. mexicanum* than any other North American taxon.

I am pleased to name *Thlaspi aileeniae* for my sister, Aileen Gates Roads, who has not only supported my research, but she participated in the field work resulting in the discovery of this previously undescribed species.

ACKNOWLEDGMENTS

We are indebted to Scott Peterson, Karen Wiley-Eberle, and Dieter Wilken for guiding us to populations of *Lesquerella* and *Physaria* in Rio Blanco County, Colorado, and to Klaus Lackschewitz and Peter Lesica for their guidance to populations of *Draba* and *Lesquerella* near the summit of St. Mary's Peak in the Bitterroot Range of southwestern Montana. Dr. Patricia Holmgren has kindly examined our collections of *Thlaspi aileeniae* and corroborated our conclusion that they represented an undescribed species. Financial support was provided by the Roads Grant of the Gray Herbarium.

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STUDIES ON MEXICAN CRUCIFERAE II¹

REED C. ROLLINS

Some of my research on different genera of the Cruciferae dates back to the 1940's, and recently I have been involved in bringing these studies up to date. In the course of this work, a number of undescribed taxa have come to my attention. Several of these involving the genera *Asta*, *Dryopetalon*, *Lesquerella*, *Romanschulzia*, and *Thelypodopsis* are described in the pages that follow.

ASTA

An undescribed species of *Asta* from Hidalgo has refocused our attention on this small genus which is endemic to Mexico. Previously (Rollins, 1941), I accepted *Asta* with but a single species composed of two varieties. Originally described from the state of San Luis Potosí, *A. schaffneri* (S. Watson) Schultz var. *schaffneri* appears to be largely, if not completely, confined to that state. The more frequently collected variety, *A. schaffneri* var. *pringleii* (Schulz) Rollins, occurs from Aguascalientes eastward to Tamaulipas and northward to Coahuila. *Asta* is distinctive because of its 4-angled grooved stems, flaring style-bases, and the presence of small white horn-like structures flanking the leaf-bases. Frequently these structures are also on the lower pedicels of the infructescences. In addition, scale or vesicle-like emanations are concentrated along the angles of the stems, a feature that is unusual in members of the Cruciferae of the western hemisphere.

KEY TO THE SPECIES

- Siliques oblong, sessile or with a short gynophore less than 0.5 mm long; valves obtuse to acute at apex, rounded on the margins; pedicels divaricately ascending to widely spreading, 3-6 mm long *A. schaffneri*.
Siliques ovate to nearly orbicular, with a gynophore 1 mm or more long; valves prolonged into an acute protruding apex, flattened on the margins; pedicels strictly erect and appressed to rachis, 7-10 mm long *A. stricta*.

Asta stricta Rollins, *sp. nov.*

Planta herbacea glabra; caulibus superne ramosis, 4-angularis, usque adhuc 3 dm altis; foliis monomorphis, oblanceolatis vel lineari-oblanceolatis, obtusis, sessilibus, ad basi cuneatis, 1-3.5 cm longis, 2-8 mm latis; sepalis oblongis, eburneis, 2.5-3 mm longis, 1-1.2 mm latis; petalis albis, obovatis, 3-4.5 mm longis, 1.5-2 mm latis; infructescentiis angustis, 8-15 cm longis; pedicellis erectis, adpressis, 7-10 mm longis; siliquis ovatis, compressis, stipitatis, 2-3 mm longis, ca. 2 mm latis; stylis ca. 1 mm longis; loculis 2-4 ovulatis; seminibus crassis, ca. 1.2 mm longis.

Holotype in the herbarium of the Escuela Nacional de Ciencias Biológicas (ENCB). Mexico. Hidalgo: cerca de la cumbre del cerro Cangandó, promixo a Encarnación, alt. 2700-2800 m, 15 Sept. 1961, L. Paray 3198. Isotype: MICH.

¹The first paper bearing this title was published in Contrib. Gray Herb. 206: 3-18, 1976.

Plants herbaceous, glabrous, basal part not known; stems apparently single, branched above, 4-angled and grooved, at least 3 dm tall, angles and other areas of stem with few to many minute vesicle- or scale-like emanations; leaves monomorphic, oblanceolate to linear-oblanceolate, obtuse at apex, cuneate at base, 1-3.5 cm long, 2-8 mm wide; usually flanked at base by two minute white pointed horn-like structures; inflorescences terminating each branch; sepals oblong, whitish, 2.5-3 mm long, 1-1.2 mm wide, outer pair saccate, inner non-saccate; petals white, obovate, narrowed abruptly to a short claw, 3-4.5 mm long, 1.5-2 mm wide; stamens nearly equal; filaments ca. 2 mm long; anthers oval, less than 1 mm long; infructescences narrow, greatly elongated, 8-15 cm long; fruiting pedicels erect, straight, appressed to rachis, 7-10 mm long; siliques ovate to nearly orbicular, gynophorate, compressed parallel to septum and flattened all around on margins, 2-3 mm long, ca. 2 mm wide; valves acute at apex, strongly veined; replum thick; septum dense, opaque, often folded; gynophore ca. 1 mm long; styles flaring at base, ca. 1 mm long; ovules 2-4 per locule; seeds plump, brown, mucilaginous when wetted, slightly longer than broad, ca. 1.2 mm long, wingless.

Many of the differences between *Asta schaffneri*, including var. *pringlei*, and *A. stricta*, are emphasized in the key to the species. However, there is a sheet of specimens, *Purpus* 4907 (GH), presently referred to *A. schaffneri* var. *schaffneri* that is somewhat anomalous in that taxon. The plants of this collection are obviously single-stemmed and branched above which is uncharacteristic of the branching habit in all of *A. schaffneri*, where branching starts at the base. Furthermore, the pedicels are erect and appressed to the rachis. In these respects, the plants are somewhat like those of *A. stricta* but in the characters of the fruit they are similar to var. *schaffneri*. One of four plants that make up the holotype collection is similar to those of the *Purpus* collection. This has led me to specify that the holotype of *A. schaffneri* consists of three plants so marked on the sheet of the type collection in the Gray Herbarium. The fact that there are substantial differences between different collections presently referred to *A. schaffneri* from the state of San Luis Potosí suggests that further field work in the area may show the presence of species other than *A. schaffneri*.

DRYOPETALON

Dryopetalon occurs from the tip of northwestern Texas to southern Arizona and southward in Mexico to the end of the Baja California peninsula. This is an area that still has not been fully botanized. But since my former treatment of *Dryopetalon* (Rollins, 1941), a number of new collections have become available for study. Most of these fall comfortably into my previous classification, which includes four species. Several of these recent collections augment the known range of variation of taxa as previously given and provide

a source for needed new information. However, one collection from Sinaloa, Mexico (*Anderson & Anderson 6172*) is of a species not seen before.

***Dryopetalon membranifolium* Rollins, sp. nov.**

Herba annua vel biennis, glabra vel sparse pubescentibus; trichomatibus simplicibus; caulibus tenuibus, ramosis, 2.5-3.5 dm altis; foliis basalibus petiolatis, laminis hastatis vel late ovatis, integris vel 2-lobatis, 3-6 cm longis, 2-4 cm latis; foliis caulinis linearibus, acuminate, integris vel sinuato-dentatis, 3-8 mm latis; sepalis non-saccatis, 3-3.5 mm longis, ca. 1.5 mm latis; petalis albis, bilobatis, 6.5-7.5 mm longis, 3-3.5 mm latis; pedicellis fructiferis tenuibus, rectis, divaricatis, 1.5-2 cm longis; siliquis teretibus, rectis, 1.5-2.3 cm longis; stylis plus minusve 1 mm longis; seminibus uniseriatis, oblongis, non compressis, ca. 1.2 mm longis; cotyledonibus incumbentibus.

Holotype in the Gray Herbarium. **Mexico. Sinaloa:** on a steep slope with shrubby woods, just below oak zone, 51 km by road from Villa Union on road to Durango, elev. 800 m, 11-12 March 1970, *W. R. & Christiane Anderson 6172*. Isotypes: ENCB, MICH.

Annual or biennial, glabrous or with a few scattered simple trichomes especially on young leaves and petioles; stems slender, branched, usually several arising at or near base, 2.5-3.5 dm tall; leaves dimorphic, very thin; lowest leaves strongly petiolate, nearly hastate to broadly ovate, entire or with 1 or 2 obtuse lobes, petiole slender 2-3.5(-5) cm long, blades cuneate to nearly cordate at base, 3-6 cm long, 2-4 cm wide, obtuse at apex, strongly veined; lower cauline leaves similar to lowest but entire or with a shallowly sinuate margin; upper cauline leaves linear, gradually narrowed to a short petiole or cuneate at base, acuminate above, entire to sinuate dentate, 3-8 mm wide; inflorescences few-flowered, lax; sepals greenish with a hyaline margin, oblong, non-saccate, 3-3.5 mm long, ca. 1.5 mm wide; petals white, spatulate in outline, deeply cleft forming two lobes above, widest at apex, tapering gradually to point of insertion, 6.5-7.5 mm long, 3-3.5 mm wide; paired filaments ca. 3 mm long, anthers ca. 1 mm long; fruiting pedicels divaricately ascending, straight, slender, 1.5-2 cm long; siliques terete or nearly so, spread at same angle as pedicels, 1.5-2.3 cm long, ca. 1 mm in diameter; styles 1 mm or less long; seeds in a single row, oblong, wingless, plump, ca. 1.2 mm long, less than 1 mm wide; cotyledons incumbent.

Dryopetalon membranifolium is nearest related to *D. runcinatum* Gray var. *laxiflorum* Rollins which also occurs in Sinaloa. These taxa share the same habit, particularly the lax inflorescence and loose branching. Variety *laxiflorum* is usually taller and has a more definite set of basal leaves than *D. membranifolium* but the more fundamental differences are in the lobing of the petals, lengths of the pedicels and siliques, shape and margin of the leaves and distribution of the trichomes. In var. *laxiflorum*, the petals are severally lobed, the fruiting pedicels are 1 cm or less, the siliques are 3-5 cm long, the lowest leaves are pinnatifid and irregularly serrate-dentate and the leaves and lower stems are covered with large simple ascicular trichomes. In contrast, the petals of *D. membranifolium* are bilobed, the fruiting pedicels are 1.5-2 cm long, the siliques are less than 2.5 cm long, the lowest leaves are entire or with 1 or 2 lobes and the margin is entire to slightly wavy or

shallowly crenate and the leaves and lower stems are either entirely glabrous or there are a few scattered simple trichomes present that are much smaller than those of var. *laxiflorum*.

The sinus between the two petal lobes in *Dryopetalon membranifolium* is a very deep one that clearly points to the affinity of this species with others of *Dryopetalon* where petal lobing is more extensive. However, it is also true that a reduced number of lobes suggests either a trend toward entire petals or that the bilobed condition is at the beginning of a trend from entire to multilobed petals. There is such a close resemblance between plants of *D. membranifolium* and those of *Thelypodopsis byei* and *T. breedloveii*, both of which have entire petals, that it is among these species where *Thelypodopsis* and *Dryopetalon*, as genera, come very close together.

LESQUERELLA

The opportunity to observe populations and to collect mature fruiting material of *Lesquerella* in the state of Hidalgo, Mexico, has provided the basis for a reevaluation of the taxa formerly treated as *L. argentea* (Schauer) S. Wats. subsp. *argentea* and *L. argentea* subsp. *lepidota* (Rose) Rollins & Shaw. The most important discovery is that true *L. argentea* has only slightly compressed siliques and what compression there is is in the plane of the septum, whereas the material formerly referred to subsp. *lepidota* (Rollins & Shaw, 1973) has the siliques strongly compressed contrary to the plane of the septum. This evidence provides a clear mandate to treat these taxa as distinct species. Mature siliques of *L. argentea* previously were not available. Additional specimens from the states of Puebla and Veracruz have permitted the clarification of *Lesquerella* in those areas. Material formerly treated as *L. argentea* subsp. *lepidota* is now referred to a newly described species, *L. sinuosa*, and to *L. roseii*, a new name for subsp. *lepidota*. The latter is required because there is already an independent name, *L. lepidota* Cory, in *Lesquerella*.

KEY TO THE SPECIES

- Siliques moderately compressed parallel to septum to nearly tetragonal; trichomes with rays fused nearly to their tips; petals white *L. argentea*.
 Siliques flattened contrary to septum; trichomes with rays fused ca. ½ their lengths or less; petals light yellow to purplish or white.
 Ovules 10-18 per locule; stems usually branched and ascending; basal leaves entire to wavy-margined; weakly perennial *L. roseii*.
 Ovules 3-5 per locule; stems simple and prostrate; basal leaves lyrate-pinnatifid to remotely dentate; strongly perennial with an enlarged caudex *L. sinuosa*.

Lesquerella argentea (Schauer) S. Wats., Proc., Amer. Acad. 23: 252, 1888, based on *Vesicaria argentea* Schauer, Linnaea 20: 720, 1847.

Mexico. Hidalgo: El Capulin, between Actopan and Ixmiquilpan. Moore & Wood 4253 (GH); 16 km N of Actopan, R.C. & K.W. Rollins 83346 with Mario Sousa-Peña (GH and to be distributed); 19 km al Este de Ixmiquilpan, Mopo. de Cardonal, R. Hernandez-M. & R. Her-

nandez-V. 4606 (CAS, ENCB). **Queretero:** 3 km al NE de Bernal, *Rzedowski 25563* (ENCB); same locality, *Rzedowski 26069* (ENCB).

Lesquerella roseii* Rollins, *nom. nov., based on *Synthlipsis lepidota* Rose, *Contr. U.S. Nat. Herb.* 8: 294, 1905, not *Lesquerella lepidota* Cory, *Rhodora* 32: 110, 1928. *L. argentea* (Schauer) S. Wats., subsp. *lepidota* (Rose) Rollins & Shaw, *The Genus Lesquerella* (Cruciferae) in North America, p. 159, Harvard Univ. Press, 1973.

The known material of *Lesquerella roseii* falls into two minor taxa as shown by the following key.

KEY TO THE VARIETIES

Styles slender, 2-3 mm long; pedicels 7-12 mm long var. *roseii*.
 Styles stouter, 1-1.5 mm long; pedicels 3-6 mm long var. *perotensis*.

L. roseii* Rollins var. *roseii

Mexico. Distrito Federal: 2 km E de Ixtapalpa, *Rzedowski 20083* (DS, DUKE, ENCB, GH). **Hidalgo:** near Tula, *Pringle 6899* (holotype, US; isotypes B, GH, MO, NY, US); same locality, *Rose et al. 8360* (GH, MEXU, US); Zimipan (?), *Coulter 691* (K, GH); 14 km al E de Ixmiquilpan, *Gonzalez Quintero 2913* (ENCB); Zempoala, A. *Ventura A. 1499* (CAS, NY). **Puebla:** Atezcaca, Lago Volcanico con cenizas, *Boege 183* (CAS); Zacatepec, Mn. de Oriental, *F. Ventura A. 4068* (DS).

L. roseii* var. *perotensis* Rollins, *var. nov.

Herba humifusa; pedicellis fructiferis sigmoideis, 3-6 mm longis; siliquis ellipticis vel late ovatis, compressis; stylis 1-1.5 mm longis.

Holotype in the Gray Herbarium. **Mexico. Veracruz:** Bosque de Pinos, secundaria, suelo arenoso; Alrededores de Perote, alt. 2700 m, 21-IV-1976, *Sergio Avendaño R. et al. 201*.

OTHER SPECIMENS STUDIED. **Mexico. Hidalgo:** Hacienda Palmar, near Pachuca, *Rose et al. 8815* (GH). **Veracruz:** al SW del Pueblo de Alchichica, *Clara H. Ramos 155* (GH); Justo Sierra, Mn. de Perote, *F. Ventura A. 4010* (CAS).

Lesquerella sinuosa* Rollins, *sp. nov.

Herba perennis, dense pubescentibus, argentea; trichomatibus stellatis, adpressis; caudicibus simplicibus; caulibus prostratis, simplicibus, 1-1.5 dm longis; foliis radicalibus oblanceolatis, obtusis, petiolatis, sinuolatis vel parve lobatis, 1.5-3(-4) cm longis, 4-8 mm latis; foliis caulinis anguste-oblongis, obtusis, integris, ad basi cuneatis, 8-13 mm longis, 2-3.5 mm latis; pedicellis fructiferis patentissimis, sigmoideis vel parce recurvatis, 5-8(-10) mm longis; siliquis ellipticis, compressis, 7-10 mm longis, 3-5 mm latis; stylis 2-3 mm longis; loculis 3-7 ovulatis; seminibus orbicularibus, crassis, exalatis, ca. 2 mm diam; cotylendonibus accumbentibus.

Holotype in the Gray Herbarium. **Mexico. Puebla:** "stems prostrate, radiating; petals clear white (!) pod compressed contrary to septum," N of Tehuacan, 5650 ft, Nov. 19, 1966, *H. D. Ripley & R. C. Barneby 14734*. Isotype: NY.

Perennial with a taproot, densely pubescent, silvery, trichomes radiate, closely appressed, rays simple, ca. 20, fused toward base for ca. 1/4 of their lengths; caudex simple; stems prostrate, simple, 1-1.5 dm long; radical leaves petiolate, oblanceolate, obtuse, shallowly sinuate to few-lobed, 1.5-3(-4) cm long, 4-8 mm wide; cauline leaves entire, narrowly oblong, obtuse, cuneate at base, 8-13 mm long, 2-3.5 mm wide; infructescences usually elongated, often occupying half the stem length; fruiting pedicels at right angles to rachis to somewhat recurved, usually sigmoid, 5-8(-10) mm long; siliques

widely spreading to ascending, elliptical, compressed contrary to septum, 7-10 mm long, 3-5 mm wide; valves rounded on back; styles 2-3 mm long; replum narrowly oblong, acute above, 2-3 mm wide; septum usually with a large perforation; ovules 3-7 in each locule; seeds nearly orbicular, wingless, thick but compressed, ca. 2 mm diameter, mucilaginous when wetted; cotyledons accumbent.

Information given by the collectors is quoted above from the herbarium label because this tells us the flowers have white petals. There are no flowers on the two sheets of specimens at hand, so that flower color could not be determined independently. *Lesquerella sinuosa* is unquestionably related to *L. roseii*. A fundamental difference is in the ovule number as indicated in the above key, and the habit of the two species is quite different.

The stems of *Lesquerella sinuosa* are prostrate, simple, and radiate from an enlarged crown while those of *L. roseii* are upright to decumbent at base, usually branched and arise from a small crown. Because the siliques of *L. sinuosa* are not as strongly compressed as those of *L. roseii*, the replum is wider and less linear than in the latter species where the siliques are strongly flattened contrary to the septum. There is considerable variation in leaf margin on the basal leaves of *L. sinuosa*. In one plant on the holotype sheet, the leaves are deeply cut, producing large terminal lobes and a few minor lobes along the lateral margins. Basal leaves on other plants of the type collection are only shallowly sinuate, and a range from one extreme to the other can be seen.

ROMANSCHULZIA

There are several specimens of *Romanschulzia* in different herbaria that appear to represent underscribed species. Some of these are in flower only or are otherwise too fragmentary to be used as the basis for describing a new taxon. However, among those examined recently, two collections, each representing a new species, are in fruit and are adequate for the purpose. My previous papers (Rollins, 1942, 1956) treat 12 species. With two added here, the genus to the present is comprised of 14 species, all from Mexico and Central America.

Romanschulzia correllii Rollins, *sp. nov.*

Herba robusta, annua vel biennis, erecta; trichomatibus simplicibus; caulibus parce ramosis, hirsutis, ca. 1 m altis; foliis inferne ignotis; foliis caulinis auriculatis, amplexicaulibus, ovatis, lobatis vel integris, sparse hirsutis, usque ad 1.5 dm longis, 5 cm latis; pedicellis fructiferis remotis, divaricato-adsendentibus, rectis, glabris, 3-6 mm longis; siliquis sessilibus, rectis, glabris, teretibus vel parce compressis, 3.5-4.5 cm longis, 1.5-2 mm latis; stylo minus 1 mm longo; seminibus crassis, exalatis, uniseriatis, ca. 1 mm longis; cotyledonibus incumbentibus.

Holotype in the Lundell Herbarium, University of Texas. Mexico. Chihuahua: at the edge of woods along stream, near La Rocha on tributary of Rio de Soldado, northeast slope of Sierra Mohinora, 7,500 ft., Oct. 14-15, 1959, D. S. Correll & H. S. Gentry 23139.

Robust single-stemmed annual or biennial, erect; trichomes simple, stems leafy, single, branched above, hirsute except above, ca. 1 m tall; lower leaves not known; middle and upper leaves with a strong mid-vein, auriculate, amplexicaul, ovate, lobed to entire, sparsely hirsute but more densely so on the veins, up to 1.5 dm long and 5 cm wide, middle remotely denticulate, upper entire and apiculate; fruiting pedicels remote, divaricately ascending, straight, glabrous, 3-6 mm long; siliques sessile, divaricately ascending, straight, glabrous, terete to slightly compressed contrary to septum, 3.5-4.5 cm long, 1.5-2 mm wide; valves 1-nerved the full length; styles less than 1 mm long; ovules numerous; funiculi expanded toward base; septum with prominent elongated areolae; seeds slightly embedded in septum, in a single row, plump, irregular in shape, usually slightly longer than broad, just over 1 mm long, not mucilaginous when wetted; seed coat grayish, foviate; cotyledons obliquely incumbent.

Romanschulzia correllii (named for the senior collector, the late Donovan S. Correll) is most closely related to *R. elata* Rollins, a species so far known only from the state of San Luis Potosí. Both of these species are tall, single-stemmed herbs with relatively large amplexicaul leaves. Large leaf-like bracts subtend the branches and both have thick septa in the siliques which tend to partially envelope the seeds, which are also similar in the two species. Plants of the species differ in length and position of the siliques, length and position of the pedicels, presence or absence of a gynophore and presence or absence of trichomes on the stems and leaves. In *R. correllii*, the divaricately ascending siliques are 3.5-4.5 cm long; the pedicels are divaricately ascending and only 3-6 mm long; there is no gynophore; and the stems and leaves are hirsute, the latter sparsely so. On the other hand, *R. elata* has siliques widely spreading to slightly ascending that are 2-3 cm long; the pedicels are widely spreading and 8-13 mm long; each silique has a gynophore up to 1 mm long and the plants are entirely glabrous, insofar as they are presently known. The latter qualification has to be made because the lower parts of the plants are not present on the two available collections of *R. elata*. *Romanschulzia correllii* is the most northerly species of the genus.

Romanschulzia rzedowskii* Rollins, *sp. nov.

Herba annua vel biennis, erecta, ca. 4 dm alta; caulibus inferne pubescentibus, superne glabris, ramosis; trichomatibus simplicibus; foliis basalibus ignotis; foliis caulinis auriculatis, late obovatis vel oblongis, integris, obtusis vel acutis, 4-7 cm longis, 1.5-3 cm latis, inferne sparse pubescentibus, superne plerumque glabris; inflorescentiis laxis; sepalis glabris, nonsaccatis, late oblongis vel prope ellipticis, ca. 2.5 mm longis; petalis nullis; pedicellis fructiferis recurvatis, glabris, 4-6 mm longis; siliquis teretibus, sessilibus, nervatis, glabris, 2.5-3 cm longis; stylis ca. 1 mm longis; seminibus ovoideis, exalatis, uniseriatis, ca. 1.2 mm longis, ca. 1 mm latis; cotyledonibus incumbentibus.

Holotype in the Gray Herbarium. **Mexico. Jalisco:** Veriente N del Cerro Viejo, Arroyo de Aguas, Municipio de Tlajomulco, 14-VIII-1970, alt. 2100 m, *J. Rzedowski* 27493.

Annual or biennial, erect, ca. 4 dm tall; stems one or two, branched above, pubescent with minute simple trichomes below, becoming glabrate upwards, branches arising in axils of leaves, basal leaves not present; cauline leaves monomorphic, auriculate, broadly obovate to broadly oblong, entire but with remote minute teeth, midvein prominent, obtuse to acute, 4-7 cm long, 1.5-3 cm wide, those of upper branches smaller, lower sparsely pubescent with minute simple trichomes, upper glabrate; inflorescences lax, flowers remote; sepals glabrous, nonsaccate, broadly oblong to nearly elliptical, quickly deciduous, ca. 2.5 mm long, ca. 1.5 mm wide; petals none; stamens nearly equal; filaments abruptly dilated at base, purplish, ca. 1.5 mm long; anthers less than 1 mm long, fruiting pedicels arched downward, glabrous, 4-6 mm long; siliques terete, sessile, straight, glabrous, pendent, 2.5-3 cm long; valves with a strong nerve from base to apex, net-veined; styles ca. 1 mm long; stigmas capitate, shallowly lobed; lobes over replum; seeds plump, slightly longer than broad, wingless, tan, uniseriate, ca. 1.2 mm long, ca. 1 mm wide, embedded in tissue of septum; seed-coat with a reticulate pattern; funicle flattened; cotyledons incumbent, smaller than radicle.

It is hard to pinpoint the nearest relative of *Romanschulzia rzedowskii* because of its recurved pedicels and pendent siliques. In these respects, it is like but one other species, *R. apetala* Rollins. There are substantial differences in pedicel and silique position in the other species of *Romanschulzia*, where the range goes from widely spreading to erect, but not markedly reflexed. *Romanschulzia apetala* Rollins can be easily eliminated as a possible close relative of *R. rzedowskii* because of its broad flattened siliques and greatly elongated infructescences. Most species of *Romanschulzia* have narrow inflorescences several decimeters long which are composed of numerous densely arranged small flowers. A more lax type of inflorescence characteristic of *R. rzedowskii* is found in *R. schistacea* Rollins, a species so far known only from Hidalgo. The fact that *R. rzedowskii* is apetalous is an interesting feature that is matched by *R. subclavata* and *R. apetala*.

It is a pleasure to name this species in honor of the collector, Dr. Jerzy Rzedowski, Professor and veteran botanist of Escuela Nacional de Ciencias Biológicas, Instituto Politécnico Nacional, México.

THELYPODIOPSIS

In my recent treatment of *Thelypodiopsis* (Rollins, 1982), I overlooked a misidentified specimen that represents an undescribed species. Because of its superficial resemblance to *Dryopetalon runcinatum* var. *laxiflorum*, the specimen had been placed there. But the petals are entire and other features of the plant ally it to *Thelypodiopsis byerii*.

Thelypodiopsis breedloveii Rollins, sp. nov.

Herba annua vel biennis; trichomatibus simplicibus; caulibus erectis, ramosis, inferne pilosis, superne glabris, usque 5 dm altis; foliis petiolatis, inferne ellipticis vel obovatis, integris vel

lobatis, sparse pubescentibus, usque 1 dm longis, superne lobatis, glabris; inflorescentiis laxis; sepalis oblongis nonsaccatis, glabris, 3-3.2 mm longis, 1.2-1.5 mm latis; petalis albis, obovatis vel late oblongis, 5-6.5 mm longis, ca. 2.5 mm latis; pedicellis fructiferis tenuis, rectis, glabris, late divaricatis, (7-)9-11(-13) mm longis; siliquis late divaricatis, teretibus, glabris, stipitatis, 2-3 cm longis, plus minusve 1 mm latis; stipo ca. 0.5 mm longo; stylis 1.5-2 mm longis; stigmatibus bilobatis; seminibus oblongis, ca. 1 mm longis; cotyledonibus incumbentibus.

Holotype in the Gray Herbarium. **Mexico. Sinaloa:** on a steep north-facing slope, growing with *Bursera*, *Ipomoea arborescens* and *Ficus*; Cañon de Tarahumares between Arroyo Verde and Rancho Tarahumares, Sierra Surutato, elev. 3,200 ft., Mncpo. Sinaloa, 27 Feb. 1968, *D. E. Breedlove 15913*. Isotype: CAS.

Annual or biennial; pubescence of simple acerose trichomes; stems erect, one or few, branched, hirsute below, glabrous above, up to 5 dm tall; leaves monomorphic, petiolate, thin, prominently veined, lower elliptical to broadly obovate, obtuse, sparsely pubescent, entire to few-lobed, up to 1.5 dm long including petiole, 3-5 cm wide, margins sinuate to nearly entire, middle leaves deeply lobed, glabrous or nearly so, upper leaves linear-lanceolate, glabrous, short-petioled, sparsely dentate to somewhat lobed; inflorescences lax; flowering pedicels very slender, spreading nearly at right angles to rachis to slightly ascending, remote; sepals oblong, greenish with a distinctive white margin, thin, transparent, nonsaccate, glabrous, 3-3.2 mm long, 1.2-1.5 mm wide; petals white, obovate to broadly oblong, 5-6.5 mm long, ca. 2.5 mm wide; filaments slender, nearly equal, ca. 3 mm long; anthers oblong, ca. 1 mm long; fruiting pedicels slender, straight, glabrous, at right angles to rachis to slightly ascending, (7-)9-11(-13) mm long; siliques widely spreading to somewhat ascending, terete, glabrous, stipitate, 2-3 cm long, less than 1 mm in diameter; stipe 1.5-2 mm long; stigma bilobed with lobes over replum; seeds oblong, wingless, ca. 1 mm long, less than 1 mm wide; cotyledons incumbent.

OTHER SPECIMENS STUDIED. **Mexico. Sinaloa:** Sierra Suratato, Cañon de Tarahumares, below the settlement of Tarahumares, Mncpo. Sinaloa y Vela, 3,000 ft., 4 March 1971, *D. E. Breedlove 19108* (CAS).

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