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THE AMERICAN SPECIES OF FAGONIA.

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The representatives of the genus Fagonia are confined chiefly to two parts of the earth, the more arid regions bordering the Mediterranean in Europe, Asia, and Africa, and the deserts about the Gulf of California in North America. Two species occur on the western coast of South America in Chile and Peru, while another has only recently been described from the interior of Mexico. The genus is composed of remarkably uniform species that are similar in general appearance and differ only in minor characters such as pubescence, shape of leaflets, and form of stipules. In the Kew Index but two names are recognized as valid. All the Old World species, of which a considerable number have been described, along with *Fagonia chilensis* and *F. californica*, are referred to the type species, *F. cretica* L. After an inspection of the Old World material in the National Herbarium, consisting of many more sheets than there are of American collections, the writer is inclined to believe that there are several species in the Eastern Hemisphere although possibly not so many as in America. Our American forms certainly are more diversified than those of Europe and Africa. The latter, for example, exhibit no such distinct types as *Fagonia californica*, *F. palmeri*, and *F. scoparia*.

The genus is ably treated by Dr. P. A. Rydberg in the part of the North American Flora dealing with the Zygophyllaceae, five species being recognized for North America. Before the publication of that monograph only two species had been described from the region, *F. californica* and *F. palmeri*. Miss A. M. Vail in 1895 named a subspecies of *Fagonia californica* from the Southwest.

Recently the writer had occasion to determine several collections of this group. One of them seemed unlike any of the species described by Dr. Rydberg, and upon examination of other material in the herbarium several forms were found which seem to merit description. It was discovered, besides, that Mr. T. S. Brandegee has described a very remarkable species from Coahuila within the present year. It seems worth while to prepare an account of these newest discoveries and to coordinate them with previously described species by a key. Only two species have been described from South America and since they are closely related to ours and we have herbarium material of both, they may be included as well.

The authors of the Kew Index considered that both *Fagonia californica* and *F. chilensis* were synonymous with *F. cretica* of the Old World. The most casual comparison of our plants with *Fagonia cretica* compels a different conclusion. That species has much larger flowers than any of the American ones, its leaflets are larger, the pubescence different, the beak of the fruit is conspicuously thickened at the base, a condition not existing in the plants of the western world, while *F. cretica* is much stouter than our plants that are nearest related to it. *Fagonia chilensis* is almost like *F. californica* but the differences are such that the two can be distinguished, and because of their different ranges it seems as well to hold them apart.

The writer is under obligations to Dr. Wm. Trelease who courteously loaned him all the American material of the genus in the herbarium of the Missouri Botanical Garden.

KEY TO THE SPECIES.

Leaves wanting; stipules triangular-subulate, not more than 1 mm. long; branches erect; sepals persistent . . . . . 1. *F. scoparia.*

Leaves present; stipules subulate, averaging much more than 1 mm. long; branches spreading; sepals caducous.

Leaflets 5 . . . . . 2. *F. palmeri.*

Leaflets 3.

Ovaries glabrous . . . . . 11. *F. laevis.*

Ovaries and mature fruit pubescent.

Pedicels twice as long as the fruit or more, glabrous or slightly scaberulous . . . . . 12. *F. longipes.*

Pedicels not longer than the fruit, mostly shorter, or when longer glandular.

Leaflets glabrous.

Stems densely glandular . . . . . 3. *F. viscosa.*
Stems not glandular, sparingly scaberulous on the angles or glabrous.
Beak of the fruit 1 to 1.5 mm. long; stems usually scaberulous; North American . . . 9. *F. californica.*
Beak 2 to 3 mm. long; stems glabrous; South American . . . . . 10. *F. chilensis.*
Leaflets pubescent, often glandular.
Plants not glandular; South American . . . . . 7. *F. aspera.*
Plants more or less glandular; North American.
Pedicels shorter than the fruit.
Stipules long and stout; leaflets 8 to 13 mm. long; stems densely glandular . . . 4. *F. pachyacantha.*
Stipules short, slender; leaflets 3 to 10 mm. long; stems sparingly or often scarcely at all glandular. 8. *F. barclayana.*
Pedicels longer than the fruit.
Leaflets linear; stipules 4 to 5 mm. long, spreading; stems sparingly soft-villous . . . . . 5. *F. insularis.*
Leaflets lanceolate or linear-oblong; stipules 2 mm. long, reflexed; stems scantily scaberulous . 6. *F. rosei.*

1. **Fagonia scoparia** Brandegee, Univ. Calif. Publ. Bot. **4** : 181. 1911.

Type locality, "On Cerro del Macho, Coahuila."

Perennial with numerous very slender, broom-like, erect, glabrous, striate, not angled branches; leaves unknown, apparently wanting; stipules 1 mm. long or less, triangular-subulate, spinescent tipped; flowers terminating the branches or on slender pedicels mostly about 15 mm. long; sepals persistent, lanceolate or lance-ovate, acute or somewhat acuminate, 4 mm. long or less; petals rose purple, about 5 mm. long, acute or acuminate; fruit 6 mm. long, hirsutulous, the beak not seen.

Specimens examined: Coahuila: Cerro del Macho, June, 1910, Purpus 4495, type collection.

This is a very remarkable species and comes from a locality far distant from the usual range of the genus in North America. Mr. Brandegee reports that although some of the specimens bear young branches there are no leaves on any of them. The habit of the plant is different from that of our other species, the flowers are smaller, the petals have scarcely any claws, and the sepals are persistent instead of caducous. Doctor Rydberg's diagnosis of the genus in the North American Flora must be changed to include this plant, especially that part dealing with the leaves and the persistence of the sepals. Perhaps when more complete material is secured the plant may prove to be the type of a new genus.

2. **Fagonia palmeri** Vasey & Rose, Contr. Nat. Herb. **1** : 82. 1890.

Type locality, "Santa Rosalia," Lower California.

A stout, rigid, much branched plant, growing in dense clumps 30 to 45 cm. high; stems yellowish, angled and striate, densely glandular, some-

times woody at the base; petioles 4 to 10 mm. long; stipules stout, rigid, spinescent, densely glandular, one-third to one-half as long as the petioles; leaflets five, nearly linear, the principal ones of each leaf 3 to 10 mm. long, spinescent tipped; pedicels 3 to 5 mm. long, equaling or shorter than the fruit; sepals oblong or oblong-lanceolate, acute, 4 or 5 mm. long; petals pinkish, 6 to 8 mm. long; fruit minutely pubescent and glandular, the beak about 3 mm. long.

Specimens examined: Lower California: Santa Rosalia, 1889, Palmer 209, type; San Francisquito Bay, April 9, 1911, Rose 16,729; Tiburon Island, April 11, 1911, Rose 16,779.

The species is one of the most distinct of the entire genus. No other is known to have more than three leaflets. Its range, so far as known, does not extend beyond Tiburon Island in the Gulf of California, and the middle part of the east coast of Lower California.

3. **Fagonia viscosa** Rydb. N. Amer. Fl. **25**[2]: 104. 1910.

Fagonia californica glutinosa Vail, Bull. Torrey Club **22**: 229. 1895. Not *F. glutinosa* Delile, 1813.

Type locality, "Sonora, Mexico." Type collected by C. G. Pringle in 1884.

Stems stout, densely covered with large, yellowish glands, glabrate in age; petioles stout, 4 to 10 mm. long, glabrous; stipules thick, rigid, glabrous or sparingly glandular, much shorter than or even equaling the petioles; leaflets 3, 8 to 15 mm. long, 3 to 8 mm. wide, the terminal one rhombic-obovate to oblanceolate, the lateral ones lanceolate and oblique, spinulose tipped, glabrous, thick and fleshy; pedicels stout, 3 to 5 mm. long, glandular; sepals oblong or oblong-lanceolate, acute; petals purple, 6 to 8 mm. long; peduncles 3 to 5 mm. long, shorter than the fruit; this strigillose and glandular, the beak 1.5 to 2 mm. long.

Specimens examined: California: Southwestern part of the Colorado Desert, San Diego County, April, 1887, Orcutt; Signal Mountain, April 2, 1903, Abrams, 3158.

Lower California: Santa Rosalia, 1889, Palmer 180; Los Angeles Bay, 1887, Palmer 546a; Signal Mountain, May 6, 1894, L. Schoenfeldt 2950.

4. **Fagonia pachyacantha** Rydb. N. Amer. Fl. **25**[2]: 105. 1910.

Type locality, "Lower California." Type in the New York Botanical Garden, collected by Leon Diquet.

An undershrub, 3 to 6 dm. high; branches yellowish or straw-colored, viscid, with glandular hairs, striate and somewhat angled; stipules stout, subulate, 6 to 10 mm. long, spreading or somewhat reflexed, longer than the petioles; petioles 5 to 8 mm. long, spreading; leaflets 3, linear, 8 to 15 mm. long, about 1 mm. wide, thick, glandular; peduncles 3 to 5 mm. long; sepals ovate-lanceolate, 3 mm. long, with very short spinulose tips; petals rose-purple, 6 to 8 mm. long; blades obovate-spatulate; fruit 5 mm. long, reticulate, pubescent, the hairs with thickened bases; beak about 2 mm. long.

The writer has seen no material of this species. The description is a transcript of the original one.

5. **Fagonia insularis** Standley, sp. nov.

Stems slender, much branched, 30 cm. long or less, sparingly soft-villous with short, white hairs; petioles 5 to 12 mm. long, short-villous and slightly viscid; stipules slender, spinescent, 4 to 5 mm. long, short-villous and viscid, spreading; leaflets 3, linear, spinescent tipped, 1 to 9 mm. long, pubescent and glandular; pedicels about 8 mm. long, reflexed in age, bearing numerous short, gland-tipped hairs; sepals 2 mm. long, oblong, acuminate; petals 5 mm. long; fruit finely pubescent and sparingly glandular, 3 to 4 mm. high, with a slender beak 2.5 to 3 mm. long.

Type in the U. S. National Herbarium, No. 14,216, collected on Carmen Island, Lower California, in November, 1890, by Dr. Edward Palmer (No. 830). Also collected on the same island by Doctor Palmer 20 years earlier (1870), No. 13.

Of the previously described species this appears to be nearest *Fagonia pachyacantha*, but is a more slender plant with smaller leaflets, slender, shorter stipules, and has a longer beak on the smaller fruit.

6. **Fagonia rosei** Standley, sp. nov.

Perennial with slender, scaberulous and somewhat glandular stems about 30 cm. long; petioles 4 to 7 mm. long, glandular; stipules stout but short, 1.5 to 3 mm. long, mostly 2 mm., spinescent, prominently reflexed, glandular; leaflets 3, lanceolate or linear-oblong, glandular, spinescent tipped, small, 2 to 3 mm. long; pedicels usually slightly longer than the fruit, deflexed, glandular; sepals lanceolate or lance-oblong, rarely more than 2 mm. long, acute; petals pale purplish, 7 mm. long; fruit 4 mm. high, minutely pubescent and glandular, with a slender beak 2 to 2.5 mm. long.

Type in the U. S. National Herbarium, No. 619,744, collected on Tiburon Island in the Gulf of California, April 11, 1911, by J. N. Rose (No. 16,779a).

This stands nearest *Fagonia insularis* but is a greener plant with broader leaflets and different pubescence and stipules.

7. **Fagonia aspera** C. Gay, Hist. Chile Bot. **1**: 470. 1845.

Type locality, Chile.

Low, rather stoutly branched plant with angled, scaberulous or puberulent branches; stipules stout, 2 to 3 mm. long, spinescent, short-villous; petioles stout, about equaling the leaflets, these obovate to oblong-lanceolate, nearly obtuse, abundantly pubescent; pedicels 2.5 to 5 mm. long, pubescent; flowers not seen; fruit 3 to 4 mm. high, conspicuously strigose with rather long hairs, noticeably tapering at the apex, with a slender beak 1.5 to 2 mm. long.

The description is drawn from poor specimens collected in Peru by the Wilkes Exploring Expedition. This is the only collection of the species seen and seems to agree well with the original description.

8. **Fagonia barclayana** (Benth.) Rydb. N. Amer. Fl. **25**[2]: 104. 1910.

Fagonia californica barclayana Benth. Bot. Voy. Sulph. 10. 1844.

Type locality, "Bay of Magdalena," Lower California.

A dichotomously branched undershrub; stem with rather slender greenish branches, 3 to 7 dm. long, finely villous-pubernlent; stipules subulate, about 5 mm. long, spinulose, reflexed-spreading; petioles 3 to 5 mm. long; leaflets 3, lanceolate, 8 to 20 mm. long, 2 to 5 mm. broad, finely pubescent, spinulose-tipped; peduncles 2 to 5 mm. long; sepals narrowly lanceolate, 3 mm. long, spinulose tipped; petals rose-purple, about 5 mm. long; blades ovate-spatulate, acutish; fruit 4 to 5 mm. long, finely pubescent, slightly reticulate; beak about 1 mm. long.

Here apparently belong the following specimens from Lower California: San José del Cabo, October 17, 1890, Brandegee 81; Lagoon Head, March, 1889, Palmer 827; Agua Verde, 1911, Rose 16,604. Remarks upon the species may be found under *Fagonia californica*. The description is that of Doctor Rydberg in the North American Flora.

9. **Fagonia californica** Benth. Bot. Voy. Sulph. 10. 1844.

Fagonia californica hindsiana Benth. loc. cit.

Type locality, "Bay of Magdalena," Lower California.

Densely branched, usually about 30 cm. high, with slender, angled stems scaberulous along the angles; petioles 4 to 9 mm. long, glabrous or scaberulous; stipules short, slender, spinescent, half as long as the petioles or shorter; leaflets 3, glabrous, narrowly lanceolate to ovate-lanceolate, acute, spinescent tipped, the lateral ones oblique, sometimes longer than the petioles and sometimes much shorter; pedicels 2 to 5 mm. long, usually much shorter than the fruit, deflexed in age; sepals lanceolate or oblong-lanceolate, acute; petals purplish, 5 to 8 mm. long; fruit puberulent, densely so when young, often nearly glabrous in age except along the angles, the beak short, about 1 mm. long.

Specimens examined:

Utah: St. George, 1879, Palmer.

Arizona: Gila City, Gila Mountains, March 1, 1894, Mearns 2820.

California: Sierra Prieta near Fort Yuma, 1855, Schott; Tia Juana, May 15, 1903, Abrams 3500; canyon west of Borrego Spring, April 19, 1906, M. E. Jones; without locality, Mexican Boundary Survey; San Bernardino, 1880, S. B. Parish; Ogelby, San Diego County, March, 1901, A. F. Eby; Cargo Muchacho, September 20, 1890, Orcutt 2076; Coyote Canyon, altitude 1350 meters, April, 1902, H. M. Hall 2794.

Lower California: Los Angeles Bay, 1887, Palmer 546; Valley of Palms, April 15, 1882, M. E. Jones 3691; Santa Rosalia, 1889, Palmer 196; San Bartolomé Bay, March 14, 1911, Rose 16,235; Lagoon Head, March, 1889, Palmer 818.

The species probably reaches the northwest corner of Sonora but I have seen no specimens from that State, unless the Schott specimen may be Sonoran rather than Californian.

The specimen from Utah differs from the others in having very small stipules and leaflets and remarkably long petioles. Probably it is a different species for it is from a region well removed from the usual range of *Fagonia californica*.

As originally published the species consisted of two forms, α *hindsiana*, and β *barclayana*. The first, of course, is to be taken as the type. The other is *F. barclayana* (Benth.) Rydb. The form *hindsiana* was described as being "glabra, stipulis brevissimis." The second form was described as "pubernla, stipulis setaceo-spinescentibus petiolo paullo brevioribus." Personally the writer is inclined to believe that these two are the same species. This opinion, however, may be altogether wrong. A few of the plants here listed under the species are nearly perfectly glabrous while others are conspicuously scaberulous. Judging from Bentham's meager descriptions alone it seems likely that these are the two forms he had before him.

10. **Fagonia chilensis** Hook. & Arn. in Hook. Bot. Misc. **3**: 165. 1833.

Type locality, "Coquimbo," Chile. Type collected by Cuming, No. 907.

Rather slender, 25 cm. high or less, with glabrous, angled branches; petioles equaling or shorter than the leaflets, glabrous; stipules stout, spreading or slightly reflexed, 3 to 4 mm. long, spinescent; leaflets obovate to linear-lanceolate, glabrous, acute or acuminate, spinescent tipped, 2 to 8 mm. long, the lateral ones oblique; pedicels 3 to 4 mm. long, reflexed in age, shorter than the fruit; sepals lanceolate or oblong-lanceolate, 3 to 4 mm. long, acute; petals rose purple, 7 or 8 mm. long; fruit about 5 mm. high, scaberulous, often nearly glabrous in age, with a beak 2 to 3 mm. long.

Specimens examined: Chile: Atacama, 1890, Morong 1180; prov. Coquimbo, R. A. Philippi.

11. **Fagonia laevis** Standley, sp. nov.

Low, densely branched perennial 20 to 40 cm. high; stems rather slender, green, glabrous, angled and striate; petioles 4 to 10 mm. long, glabrous; stipules slender, 1.5 to 2.5 mm. long, spinescent, spreading; leaflets 3, linear-lanceolate, 2 to 8 mm. long, glabrous, petiolulate, spinescent tipped, the lateral ones somewhat oblique; pedicels glabrous, shorter than the fruit, deflexed in age; sepals oblong-lanceolate, 2 to 2.5 mm. long, acute, spinescent tipped; petals rose purple, about 5 or 6 mm. long, narrow, long-clawed; ovaries and fruit glabrous, the latter 3.5 mm. high, the slender beak 1.5 to 2 mm. long.

Type in the U. S. National Herbarium, No. 855,582, collected near Yuma, Arizona, April 25, 1906, by Marcus E. Jones.

Additional specimens examined:

California: 10 miles west of Coachella, Riverside County, altitude 150 meters, April, 1905, H. M. Hall 5806.

Lower California: Tia Juana, June 30, 1884, Orcutt.

From all our other species this is distinguished by the glabrous ovaries and the completely glabrous stems. Aside from these differences it is not far removed from *Fagonia californica*.

12. **Fagonia longipes** Standley, sp. nov.

Stems very slender, glabrous, angled, about 30 cm. long, abundantly branched; petioles 4 to 10 mm. long, stout, glabrous; stipules stout, 1.5 to 2 mm. long, slightly reflexed; leaflets 3, glabrous, linear-oblong or linear-lanceolate, the lateral ones oblique, 3 to 10 mm. long, minutely spinulose tipped; pedicels 10 to 12 mm. long, slender, glabrous or obscurely scaberulous, deflexed in age; sepals lanceolate or oblong-lanceolate, acute or acuminate; petals 7 to 9 mm. long, rose purple; fruit 4 mm. high, sparingly and finely pubescent and slightly glandular, with a beak 1.5 mm. long.

Type in the U. S. National Herbarium, No. 14,222, collected in Arizona in 1876 by Dr. Edward Palmer. No other data are given on the sheet in the National Herbarium but on one in the J. H. Redfield Herbarium in the collection of the Missouri Botanical Garden, the label gives the locality as Bill Williams Fork, the date of collection as March 11, and the collector's number as 58.

The plant is related to *Fagonia californica* but may be distinguished at a glance by the very long pedicels. The stems, too, are nearly glabrous, the stipules shorter, and the whole plant more slender.