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NOTES ON QUAMASIA WITH A DESCRIPTION OF A NEW SPECIES.

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The liliaceous genus *Quamasia* Raf. (*Camassia* Lindl.) consists of a small number of species mostly from the region west of the Rocky Mountains. Economically two or more of the species have been important to the Indians for food, the bulbs being well known under the name "Camas." Several of the species are cultivated as ornamentals, particularly in Europe.

The characters by which the species are defined are often obscure in herbarium material. A recent study of that which has accumulated in the United States National Herbarium, necessitated by some unusually interesting specimens collected by Mr. W. C. Cusick near Roseberg, Oregon, indicates that it may be necessary to recognize several additional species. There is need, however, of careful field study and good suites of specimens before this can be done with assurance.

In the mean time notes on certain differences observable in herbarium material may be useful to field botanists who may have opportunity to determine the taxonomic value of these characters.

Quamasia angusta n. comb.

Scilla angusta Engelm. & Gray, Bost. Jour. Nat. Hist. 2:237. 1845.
Camassia fraseri angusta Torr. & Gray, Pac. R. Rep. 24:176. 1855.

This plant seems to differ constantly from *Q. esculenta* (Ker) Coville in the nervation of the perianth segments, each being 3-nerved while they are 5-nerved in *Q. esculenta*. The constancy of this character and the difference in range point to the plant being specifically distinct. *Quamasia angusta* is confined to Texas.

Quamasia leichtlinii (Baker) Coville, Proc. Biol. Soc. Wash. 11:63. 1897.

Chlorogalum leichtlinii Baker, Gard. Chron. n. ser. 1:689. 1874.
Camassia esculenta leichtlinii Baker, Bot. Mag. t. 6287. 1877.
Camassia leichtlinii Wats. Proc. Am. Acad. 20:376. 1885.

In the original description of this plant Baker writes: "This is a plant which has been widely spread in gardens both in England and on the Continent under the name 'White Camassia,'" and further states, "Our plants were received from the Edinburgh Botanic Garden, and I learn from Mr. M'Nab that it was collected by Mr. John Jeffrey in British Columbia in 1851." "I do not find it from Jeffrey or any other collector in the Kew herbarium." "From Camassia it may be readily distinguished by its firm, persistent leaves, large bracts, and the entirely different habit of the inflorescence. It falls under Chlorogalum very well, but is not in any danger of being confused with the two kinds already known, one of which is the well-known Californian Soap Plant." Three years later Baker referred the plant to *Quamasia* under the name *Camassia esculenta* var. *leichtlinii*, and published therewith a handsome colored illustration. He again repeats the information that "It was discovered by Mr. John Jeffrey in British Columbia in 1853." "The present sketch was taken from a plant which flowered on the rockery in Kew Gardens in May, 1873."

In April, 1914, Mr. W. C. Cusick found growing in the Umpqua Valley around Roseburg, Oregon, a white-flowered *Quamasia* in abundance. Fresh specimens as well as herbarium material from Mr. Cusick show that this plant agrees exactly with the description and colored plate published in the Botanical Magazine in 1877. Mr. Cusick writes further: "An old pioneer told me it was a food plant of the Indians. The gophers gathered the bulbs in caches, and the Indian women would go around with their camas diggers and thrust the elkhorn point into any favorable looking ground, and then get down to the hole and smell; if the camas bulbs were there she got them out. This was all spoiled by the settlers' pigs which soon caught on to the smelling business and so put the Indian women quite out."

Inasmuch as no white-flowered *Quamasia* has ever been recorded from British Columbia, it is a matter of interest to know whence Jeffrey originally secured the plant which, according to Baker, was quite commonly cultivated in Europe in 1874. Jeffrey collected plants at various places on the Pacific Coast from British Columbia to southern California. Practically the whole knowledge of his activities is that contained in the report entitled "Botanical Expedition to Oregon." In this report are given lists of the various seeds and bulbs sent by Jeffrey at different times, and in many cases revised identifications of the plants are given. From these lists it does not appear that any species of *Quamasia* was collected by Jeffrey in British Columbia or in northern Washington. In a list of the specimens and seeds sent by Jeffrey in box No. 10 appears the following note: "No. 1007, Camassia sp. Umpqua Valley, flowers white, six

bulbs." This is apparently the only *Quamasia* he collected, and as it came from identically the locality where Mr. Cusick now finds this white-flowered plant so abundantly, there can be but little doubt that the type locality of *Quamasia leichtlinii* is not British Columbia as published, but the Umpqua Valley of Oregon.

In the vicinity of Roseburg, Mr. Cusick also collected plants with dark blue flowers and others with pale blue flowers. These appear to differ from typical *Q. leichtlinii* in no other respect than the color of the corolla. White-flowered mutants in blue-flowered plants are very common and have been reported in other species of *Quamasia*. It is noteworthy, however, that in the many specimens of *Quamasia leichtlinii* in the National Herbarium, only one, namely, that collected by Howell at Oakland, also in the Umpqua Valley, has white or whitish flowers.

Mr. Cusick's abundant and complete material of *Quamasia leichtlinii* permits of a critical comparison with the blue-flowered plants that have been described under the names *Quamasia azurea* Heller and *Camassia suksdorfii* Greenman.

Both of these plants agree with *Q. leichtlinii* in having the perianth segments spreading regularly and after anthesis becoming connivent and twisting together, whereas in other species of *Quamasia* the segments remain separate.

Quamasia suksdorfii (Greenman) Piper. (*Camassia suksdorfii* Greenman, Bot. Gaz. 34 : 307. 1902; *Quamasia suksdorfii* Piper, Cont. Nat. Herb. 11 : 191. 1906) is based on specimens collected by Suksdorf in Klickitat County, Washington. Doctor Greenman in proposing the species comments as follows: "From Camassia leichtlinii Watson * * * C. suksdorfii differs in the color of the flowers, the less sharply triangular, thinner, and less conspicuously nerved capsule. The seeds, moreover, in C. suksdorfii are larger and have a more bluish luster than in C. leichtlinii."

Incidentally it may be added Dr. Watson's conception of *Camassia leichtlinii* (Proc. Am. Acad. 20 : 376) was based largely on Suksdorf's material and notes of the plant named *C. suksdorfii* by Dr. Greenman.

Quamasia azurea Heller, Bull. Torr. Bot. Club, 26 : 547. 1899, is based on specimens collected near Montesano, Washington. It is compared with *Q. quamash* from which it is said to differ in its more delicate bright blue flowers, and by growing on grassy slopes. The type has not been examined but other material from near the type locality answer its description accurately.

Q. leichtlinii as represented in Mr. Cusick's specimens has a cream-colored perianth segment 20–30 mm. long, all either 5-nerved or 7-nerved.

Q. suksdorfii has blue perianth segments all 7-nerved, the two outer nerves short. The capsules of the two show no characteristic difference. The value of the seed characters is difficult to judge as so few of the specimens possess mature fruit that can confidently be associated with specimens in bloom. In all the Pacific Coast species they are very much alike. Those in Mr. Cusick's specimens of *Q. leichtlinii* are decidedly

obpyriform, while in the type of *Q. suksdorfii* they are but slightly thicker toward the apex.

Q. leichtlinii, *Q. suksdorfii* and *Q. azurea* are very closely allied and not clearly definable by any of the characters that have been pointed out. Indeed in the plants that have been referred to *Q. leichtlinii*, namely, all of those whose perianth is nearly regular and connivent-twisting after anthesis, there are other forms apparently better deserving of recognition. This species or species group ranges from Vancouver Island to California, mainly west of the Cascade Mountains and the Sierra Nevada, but also occurs on the eastern slope of the Cascade Mountains but not in the interior where *Q. quamash* is very abundant. In the area west of the mountains named *Q. quamash* is a rare plant.

The great majority of the specimens in the National Herbarium have all the perianth segments 5-nerved and 20–25 mm. long agreeing with the type of *Q. azurea*.

Based on nervation alone groups of forms may be differentiated:

1. Perianth segments all 3-nerved;
2. Perianth segments 3 and 5-nerved;
3. Perianth segments all 5-nerved;
4. Perianth segments 5 and 7-nerved;
5. Perianth segments all 7-nerved.

In general the number of nerves to perianth segments seems to be correlated with the vigor of the plant. At least those with the largest perianths, sometimes 3–3.5 cm. long, have more numerous nerves, while some of those with 3-nerved segments have very small flowers. It does not appear in this species at least that the nervation of the perianth is of taxonomic significance, but the matter deserves field study.

A very noteworty specimen collected at Colby, Butte County, California, Mrs. R. M. Austin, No. 738, July, 1897, has 5 and 7-nerved perianth segments 20–25 mm. long, with pedicels as long as the flowers in anthesis, but in fruit 3–4 cm. long, more than twice that of the bracts. In its long pedicels it suggests *Q. howellii*, but the large connivent-twisted perianth at once separates it from that species.

On the whole it is difficult to avoid the conclusion that *Q. azurea* and *Q. suksdorfii* should be considered synonymous of *Q. leichtlinii*.

Quamasia leichtlinii commonly occurs in grassy prairies or well-drained meadows, contrasting in this respect with the wet meadow preference of *Q. quamash*.

Quamasia quamash (Pursh) Coville, Proc. Biol. Soc. Wash. 11 : 64. 1897.

Phalangium quamash Pursh, Fl. Am. Sept. 1 : 226. 1814.
Quamasia esculenta Raf. Am. Month. Mag. 2 : 265. 1818.
Camassia esculenta Lindl. Bot. Reg. 18 : t. 1486. 1832.
Scilla Kamas Nutt. Proc. Acad. Sci. Phila. 7 : 55. 1834.
Camassia quamash Greene, Man. Bay Reg. Bot. 313. 1894.

Quamasia quamash is an abundant species in the eastern portions of

Washington and Oregon, western Montana, but also occurs sparingly west of the Cascade Mountains from Vancouver Island to northern California, and in Utah. It prefers low flat land of heavy clay texture and often occurs in bottoms that are overflowed in spring.

The material in the National Herbarium seems very consistent except in the matter of the venation of the perianth segments. Most of the material from Idaho has all the perianth segments 3-nerved, as has the original specimen collected by Lewis at "Quamash Prairie" or Weippe, Idaho. The same is true of most of the specimens from Montana, Washington and Utah.

On the other hand, many of the specimens from Washington and Montana and two from northern California have the perianth segments either all 5-nerved or with an occasional one 3-nerved. In some of the specimens the segments seem to be alternately 3-nerved and 5-nerved in every flower.

No other characters have been detected connected with that of the nervation of the perianth segments, but these should be sought for both in flowering and fruiting specimens by those who have opportunity to study the matter in the field.

Quamasia walpolei n. sp.

Bulbs ovoid, 2.5–3 cm. long, 1–2 cm. thick; leaves linear, flat, 20–25 cm. long, 5–10 mm. broad, many nerved, green above, paler or somewhat glaucous beneath; scapes strictly erect, 30–50 mm. high, smooth, pale green; bracts subulate, somewhat scarious, shorter than the buds but longer than the pedicels, the lowermost one or two below the inflorescence; raceme dense, even in fruit, 15–30 flowered, narrow, spike-like, 10–15 cm. long; pedicels all of nearly equal length, erect or becoming so, 5–8 mm. long; perianth segments linear-lanceolate, pale blue, 10–13 mm. long, the outer 3-nerved, the inner 5-nerved, persistent, each twisting separately after anthesis, apparently irregularly disposed, one spreading downward, the others upward; capsules 6–8 mm. long and nearly as broad, obtusely angled, strongly few nerved; seeds slightly obpyriform, black, shiny, 3 mm. long.

Closely allied to *Q. quamash* (Pursh) Coville, but readily distinguished by its dense raceme, more numerous smaller flowers, short subequal pedicels and smaller capsules. It is a pleasure to dedicate the interesting species to the late Mr. F. A. Walpole.

All of the specimens examined are from southwestern Oregon:

Hood River, Klamath Indian Reservation, F. A. Walpole, No. 2218, June 22, 1902, in flower (type); Fort Klamath, F. A. Walpole, No. 2251, July 25, 1902, in fruit; Klamath Valley, Dr. H. M. Cronkhite, Nos. 16 and 48, in 1864; Kean Creek, Jackson County, Elmer I. Applegate, No. 2302, May 25, 1898; Roseburg, W. C. Cusick, No. 4026.

According to Mr. F. V. Coville camas bulbs are gathered in abundance on the Klamath Indian Reservation. So far as the National Herbarium specimens disclose only *Quamasia walpolei* grows in that area, so this species must apparently be edible.