

## YOUNGIA AMERICANA, A NEW SPECIES OF PHYLETIC SIGNIFICANCE

ERNEST B. BABCOCK

A single specimen, collected last year in northwestern Alaska, is of unusual interest for several reasons. Although the plant is reminiscent of *Crepis nana typica* in its tufted habit and dark green, glabrous foliage, yet its most distinctive features are those of either *Soroseris* or *Youngia*, both of which genera hitherto have been restricted to Asia in their natural distribution (*Y. japonica* has been introduced as a weed widely in tropical regions). Since this plant combines certain characters of two Asiatic genera, it presents a problem in classification, especially in view of the absence of mature achenes. Immature achenes, however, are present, and a critical comparison of the material available with species of both genera provides a sound basis for classification. It appears certainly to belong in Section 1, *Desiphylum*, of the genus *Youngia*, near *Y. conjunctiva*.

*Youngia americana* sp. nov. Herba perennis valde humilis viridissima glabra; caulis subterraneus rectus tenuis cataphyllis triangularibus vestitus basi crassus cavus dense foliosus; folia caudicalia 2-7 cm. longa spatulata vel pinnatifida, ea caulina elongata tenuissima; caules aerei numerosi 4 cm. longi dense ramosi; capitula numerosa parva congesta 11-13-flora; involucrem cylindricum squamis exterioribus 3-4 linearibus eis interioribus 7 lanceolatis; corolla 10 mm. longa tubo 4.5 mm. longo glabro; antherae 2.5 mm. longae flavae; rami styli fusci 1.5-2 mm. longi; achenia (immatura) 2-3 mm. longa 11-13-costata costis 5 quam ceteris latoribus; pappus albus 6-7 mm. longus.

Perennial, tufted, ca. 3 cm. high, 12 cm. wide, dark green, glabrous; caudex ca. 3 cm. long, gradually broadened upward to 1 cm. in width including the leaf bases, hollow, terminating a slender vertical subterranean stem bearing cataphylls; longest caudical leaves, forming a rosette, ca. 7 cm. long, 1.4 cm. wide, the stout reddish petiole equal to the blade, lanceolate, pinnatifid, with narrow remote oblong-acute or triangular segments, dark green on upper face, yellowish on lower face, the margin retrorsely revolute; lowest caudical leaves 2 cm. long, spatulate, with oblanceolate blade 6 mm. long, 2 mm. wide; cauline leaves similar to the rosette leaves but reduced, with narrow elongated apical segment, the longest ca. 4 cm. long, the others 1-2 cm. long, filamentous; flower stems numerous, ca. 4 cm. long including the heads, reddish toward the base, paniculately closely branched, bearing ca. 6 heads on short slender peduncles; heads small, numerous, congested, 11-13-flowered; involucre cylindric, ca. 9 cm. long, 3.5 cm. wide at middle; outer bracts 3 or 4, narrow, terete,

arcuate,  $\frac{1}{4}$ – $\frac{1}{2}$  as long as the inner ones; inner bracts 7, slightly coalesced at the base, in two ranks, outer ones 1.3 mm. wide, with a low thickened median protuberance near the apex, inner ones 2–2.5 mm. wide, broadly scarious-margined, shortly white-ciliate at the apex, glabrous on inner face; corolla 10 mm. long, the tube 4.5 mm. long, glabrous; ligule 2 mm. wide, the teeth 0.5–1 mm. long, prominently crested, dark brown *in sic.*; anther tube yellow, 2.5 mm. long, 1 mm. wide when opened out, the appendages 0.5 mm. long, linear, acute or acuminate, the filaments 1 mm. longer; pollen grains echinolophate, ca.  $32 \mu$  in diameter, the spines ca.  $3 \mu$  and similar to *Y. conjunctiva*; style branches dark brown, 1.5–2 mm. long, 0.1 mm. wide, the barbs not as prominent as in *Y. conjunctiva*; achenes (immature) pale tawny, 2–3 mm. long, 0.6–0.8 mm. wide, somewhat obcompressed, fusiform, constricted below the expanded pappus disk, 11–13-ribbed, the ribs unequal with 5 much stronger ones; pappus white, tinged yellowish at the base, 6–7 mm. long, 4-seriate, the setae nearly equal in length, unequal in width, the coarsest ones 50–60  $\mu$  wide at base, stiff but pliable, persistent. Flowering July, flowers yellow, anther tube yellow, stigmas dark brown.

Northwest Alaska, between latitude  $68^{\circ} 30'$  and  $69^{\circ} 30' N.$ , along the Kukpowruk River. June–July, 1949 Robert M. Chapman 132 (U. S. Nat. Herb. no. 1973474). According to Dr. Ira L. Wiggins (*in litt.*) Mr. Chapman made his collections almost entirely along the middle portion of the Kukpowruk River during his field stay in that part of Alaska.

This new species resembles either *Youngia* or *Sorosseris* more than *Crepis* in its hollow caudex, its elongated, filamentous upper cauline leaves, the revolute margins of the caudical leaves, and in several features of the involucre, corollas, styles and achenes. Furthermore, the pollen grains in particular are like those of *Youngia conjunctiva* and very different from those of *Crepis nana*. The pollen grains of two species of *Sorosseris* and of *Crepis sibirica* (a primitive species) and *C. tectorum* (a more advanced species) are illustrated in the monograph on *Dubyaea* and *Sorosseris* (Stebbins, 1940, pp. 29–30). The pollen of *Y. americana* is similar to that of *C. sibirica*. *Sorosseris* pollen is orange in color, becoming greenish blue when stained with cotton blue in lactophenol; whereas the pollen of *Y. conjunctiva*, *Y. americana* and *Crepis nana* is yellow and stains a bright, clear blue. The data on diameter of the grains and length of the spines for pollen of *S. Hookeriana erysimoides*, *Y. conjunctiva* and *Y. americana* are given in Table 1. In *Crepis nana* it was found that the pollen is much smaller than in the two *Youngia* species, being only  $27 \mu$  in diameter, and that the grains are devoid of spines, the surface being merely rugose.

Table 1 is a synoptical comparison of eleven morphological features and one anatomical character of *Y. americana* with those

TABLE 1. SYNOPTICAL COMPARISON OF *Y. AMERICANA* WITH *SOROSERIS* AND *YOUNGIA*

	SOROSERIS	<i>Y. AMERICANA</i>	YOUNGIA
Stem	Usually short, thick and often hollow above ground, arising from a long rootstock	Short above ground, gradually thickened, hollow, arising from a rootstock	Long, or short in tufted species, but in the latter not notably thickened, borne on a rootstock
Cataphylls	Present on stem below rosette leaves	Present on stem below rosette leaves	Absent
Rosette leaves	Rarely pinnatifid, the margin not revolute	Pinnatifid, the margin revolute	Usually pinnatifid, the margin often revolute
Cauline and uppermost leaves	Gradually reduced, uppermost elongated, linear	Gradually reduced, the uppermost elongated, linear	In tufted species bract-like or resembling reduced rosette leaves
Outer bracts	2 (or 3-4), narrowly linear, shorter than or exceeding inner bracts	3, narrowly linear, $\frac{1}{2}$ - $\frac{1}{3}$ as long as inner ones	Few, very short or up to $\frac{1}{2}$ or $\frac{2}{3}$ the inner, mostly lanceolate or deltoid
Inner bracts	4-15, lanceolate or ovate, not crested, somewhat coalescent at base	7, lanceolate, not crested but the median nerve or keel definitely thickened near the apex, coalesced only at the base	6/12, mostly 8, lanceolate, sometimes crested, carinate and thickened in fruit, not coalescent at base
Corollas	Ligulate, yellow or white, often blackish at base of ligule, 8-21 mm. long, the tube about $\frac{1}{2}$ the total length (in one species $\frac{1}{3}$ )	Ligulate, yellow, 10 mm. long, the tube nearly $\frac{1}{2}$ the total length	Ligulate, yellow, sometimes reddish on ligule, 5-22 mm. long, the tube mostly $\frac{1}{5}$ to $\frac{1}{3}$ the total length
Pollen grains	Subechinolphate or echinate, the spines large. In <i>S. Hookeriana</i> grains average 40 $\mu$ in diam., spines 6-8 $\mu$	Echinolphate, the spines similar to <i>Y. conjunctiva</i> . Grains average 32.5 $\mu$ in diam. spines ca. 3-4 $\mu$	Echinolphate, the spines variable but smaller than in <i>Soroseris</i> . In <i>Y. conjunctiva</i> grains aver. 31 $\mu$ in diam., spines ca. 5 $\mu$
Style	Blackish or greenish, stigmatic branches 1-3.5 mm. long, 0.2-0.3 mm. wide, the barbs on outer surface numerous, close, prominent	Brown (in. sic.), branches 1.5-2 mm. long 0.1 mm. wide, the barbs on outer surface similar to <i>S. umbrella</i> but not quite as prominent as in <i>Y. conjunctiva</i>	Yellow or sometimes brown branches 0.5-2.5 mm. long, 0.05-0.1 mm. wide, the barbs ranging from very fine to rather prominent
Achenes	Oblong or more attenuate toward base, constricted at apex, slightly obcompressed, many-striate	Immature achenes fusiform or oblong, $\pm$ obcompressed, 10-13 ribbed, the ribs unequal with 5 much stronger ones	Fusiform or oblong, obcompressed (sometimes strongly), with 3-5 stronger ribs
Pappus	7-16 mm. long, white, stramineous, yellow, gray, dusky or rufescent; the setae very numerous, coarse, stiff	6-7 mm. long, white; the setae 4-seriate, resembling <i>Y. conjunctiva</i>	2-11 mm. long, white, yellow, gray or fuscous; the setae rather coarse, stiff and brittle to fine or very fine and soft
Ovary anatomy	Primitive, numerous supernumerary strands	Advanced, no supernumeraries	Advanced, no supernumeraries observed in two species

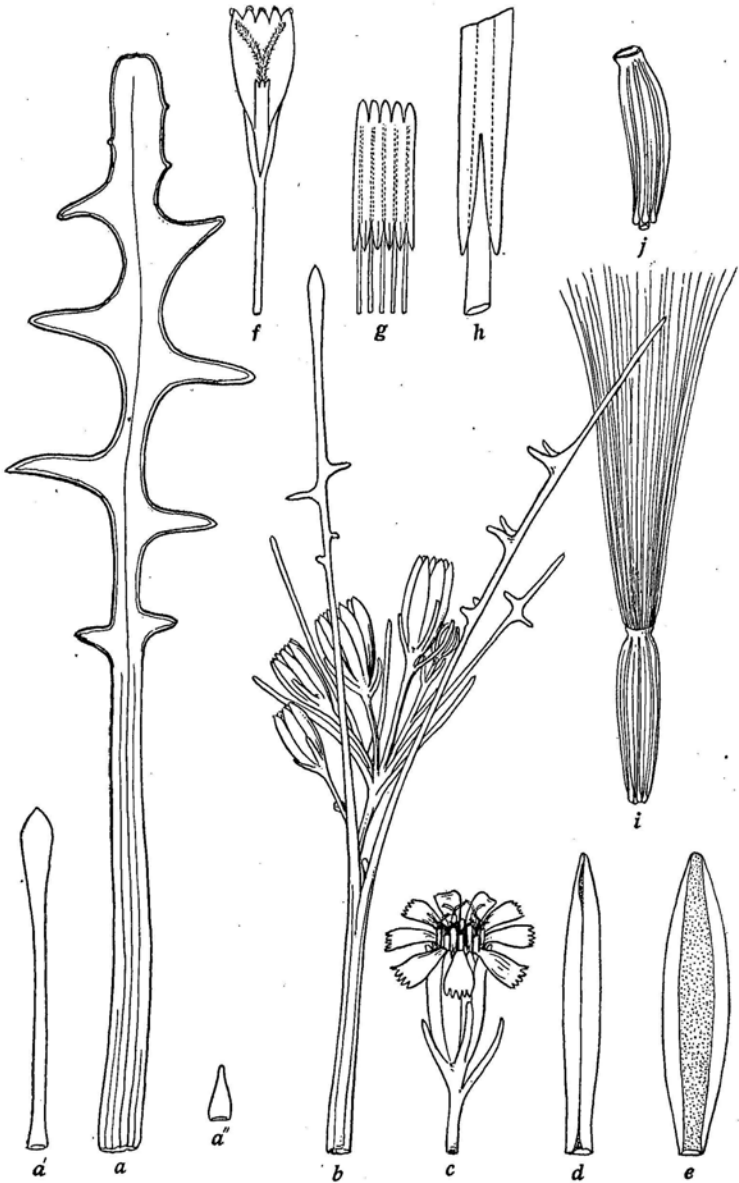


FIG. 1. *Youngia americana* Babcock. From the type: *a*, rosette leaf, lower face, *a'*, lowest caudical leaf, *a''*, cataphyll,  $\times 2\frac{1}{4}$ ; *b*, flower stem,  $\times 2$ ; *c*, head in anthesis,  $\times 2$ ; *d*, *e*, inner involucrel bracts from outer and inner series, outer face,  $\times 4$ ; *f*, floret lacking ovary,  $\times 4$ ; *g*, anther tube opened out,  $\times 8$ ; *h*, detail of appendage,  $\times 32$ ; *i*, marginal achene (immature, pappus removed),  $\times 8$ ; *j*, inner achene with pappus,  $\times 8$ . (Drawings by the author, inking by Miss Anna Hamilton.)

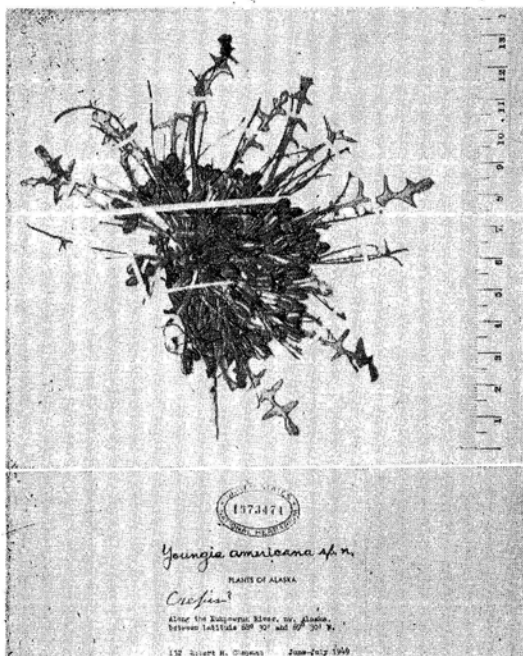


FIG. 2. *Youngia americana* Babcock. Type specimen in United States National Herbarium, folio no. 1973474. (Photograph by V. Duran.)

distinctive features of *Sorosseris* (Stebbins, 1940). Since it is in these parts of the plant, as well as in the achenes, that this new species shows definite resemblance to *Youngia*, its classification in the latter genus is clearly indicated.

At the same time, the hollow caudex, the cataphylls on the rootstock below the rosette leaves, the elongated linear upper cauline leaves, the few, long, linear outer involucral bracts, and the long corolla tube, are not found in most species of *Youngia*, whereas they are characteristic of most *Sorosseris* species. This occurrence of several marked resemblances to *Sorosseris* appeals to the author as indicating affinity with that relict genus of the Sino-Himalayan region (Stebbins, 1940), thus endowing this plant with considerable phylogenetic significance. As in the case of *Crepis pygmaea* which, in certain features, exhibits resemblance to *Youngia depressa*, while the latter species in turn shows relationship with the more primitive genera, *Sorosseris* and *Dubyaea*, so in *Y. americana* we find additional evidence that *Youngia* and *Sorosseris* had a common derivation. The ancestral group from which *Youngia*, *Crepis*, and the other genera of the Crepidinae were probably derived is the genus *Dubyaea* (Stebbins, 1940; Babcock, 1947).

of both *Sorosseris* and *Youngia*. It will be noted that the distinctive resemblances to the two genera are about equal in number, five for *Sorosseris* and seven for *Youngia*; but that the *Sorosseris* resemblances are found mostly in vegetative features, whereas most of the resemblances to *Youngia* occur in the pollen grains, the style and stigma, the immature achenes, the pappus, and especially the ovary anatomy. The peculiarities of the styles and pollen grains and the presence of numerous supernumerary strands in the ovary are considered the most dis-

These clearly indicated phylogenetic relations have a direct bearing on the location of the center of origin of the Crepidinae. Extensive evidence has already been presented (cf. Babcock, 1947, Pt. I, Ch. 6, especially pp. 96-97) that both *Sorooseris* and *Dubyaea* originated in central Asia and migrated southeast and south to their present areas of distribution. The discovery of this primitive species of *Youngia* in Alaska suggests a similar origin and migrational history to that of *Crepis*, section *Iæridopsis*. In addition to this section, all of the other native American species of *Crepis* were unquestionably derived from species or hybrids that must have migrated across Beringea in Tertiary times. This evidence, together with the well justified assumption (Babcock, 1947, pp. 108, 137-139) that some of the *Crepis* species of northern Europe and of Iceland (*C. paludosa*) or their ancestors migrated westward south of the Ural Mountains in early Miocene, points to a northern central Asiatic origin of *Crepis*. Now, in *Youngia americana*, we find additional support for the concept of a northern Asiatic origin of the Crepidinae.

Division of Genetics  
University of California, Berkeley

#### LITERATURE CITED

- BABCOCK, E. B. 1947. The genus *Crepis*. Univ. Calif. Publ. Bot. 21.  
STEBBINS, G. L., JR. 1940. Studies in the Cichorieae: *Dubyaea* and *Sorooseris*,  
endemics of the Sino-Himalayan Region. Bull. Torrey Club 19: 5-76.

## CYTOTAXONOMIC STUDIES IN THE GENUS SORGHUM.

### II. TWO NEW SPECIES FROM AUSTRALIA

E. D. GARBER AND L. A. SNYDER

In a recent taxonomic revision of the genus *Sorghum*, Garber (1950) recognized six subgenera: *Eu-Sorghum*, *Chaetosorghum*, *Heterosorghum*, *Sorghastrum*, *Para-Sorghum*, and *Stiposorghum*. Among the subgenera, *Para-Sorghum*, and *Stiposorghum* form one circle of affinity and the other subgenera constitute a second circle of affinity.

The basic chromosome number of *Sorghum* is 5 and is known only in *Para-Sorghum* and *Stiposorghum*. The application of cytological methods to the taxonomic problems of this genus and especially of the subgenera *Para-Sorghum* and *Stiposorghum* has been eminently successful. A cytological study of a collection of Australian sorghums, using criteria previously validated in defining species of these subgenera, has revealed the presence of two undescribed species.

#### MATERIALS AND METHODS

Herbarium specimens of Australian sorghums furnished by