to ½ as long as leaf; heads 9- to 13-flowered; involucre 10 to 13 mm long; corolla 14 to 15 mm long; ligule 2.4 mm wide; teeth 0.4 to 0.8 mm long, conspicuously glandular at tip, hooded; corolla-tube 4 mm long, shortly pubescent or glabrous; anther-tube 5 to 6.25 × 1.25 to 1.5 mm dis.; filaments extend beyond appendages about 1 mm; appendages 1 to 1.5 mm long, oblong, obtuse or acute, united; style-branches 2.2 to 3 mm long, 0.15 mm wide; achenes deep reddish brown with paler summit, 3 to 4 mm long, 0.6 mm wide, fusiform or ventrally straight and dorsally convex, strongly attenuate to the narrow (0.2 to 0.3 mm wide) summit, with expanded pappus-disk, abruptly attenuate to the narrow (0.3 mm wide) base above the flaring callus enclosing the yellow hollow base, 15- to 17-ribbed, ribs narrow, rounded, with 3 to 4 stronger ones; pappus 6 to 7 mm long, 1- to 2-seriate. (*Crepis yunnanensis* Babcock, in Univ. Calif. Publ. Bot. 14:332, 1928.) (Fig. 17.)

CHINA: Yunnan, between the Yangtze and Chungtien Rivers, alpine meadows, *Schneider 2181* (K), *type; ibid.*, Tong Tchouan (Tungchwan?), 1800 m alt., *R. P. Maire 4002* (UC); *ibid.*, Likiang district, eastern slopes of Likiang Snow Range, *Rock 5354* (B), form 1; *ibid.*, without definite locality, *E. E. Maire 2601, 7325* (UC); Szechwan, Sungpan Hsien, *Fang 4468 part* (B).

12*c*. **Youngia paleacea Smithii** subsp. nov.—Planta 27–46 cm alta; folia caudicalia tantum 14 cm longa, 3 cm lata, petiolus ⅕–⅔ tamdiu folium; capitula circa 12-flora; involucrum 11–13 mm longum; corolla flava, 17–22 mm longa; antheræ virides, 5–8 mm longæ; stylus flavus, rami tantum 3 mm longi; achænia subrufa vel fusca, 3.5–4 mm longa, fusiformia, forte attenuati ad apicem; pappus albus, 7–9 mm longus.

Plant 27 to 46 cm high; caudical leaves up to 14 cm long, 3 cm wide, petiole ⅕ to ⅔ as long as leaf; heads about 12-flowered; involucre 11 to 13 mm long; corolla 17 to 22 mm long; ligule 2 to 2.5 mm wide; teeth 0.4 to 0.9 mm long, conspicuously gland-crested, hooded with small anterior protuberance; corolla-tube 3 to 7 mm long, sparsely pubescent with very short (up to 0.15 mm) stalked papilliform hairs; anther-tube 5 to 8 × 1.25 mm dis.; filaments stout, extending beyond appendages about 1 mm; appendages up to 1.3 mm long, oblong, sagittate, united; style-branches up to 3 mm long, 0.15 mm wide, attenuate at tip, yellow; achenes light reddish or yellowish brown, 3.5 to 4 mm long, 0.6 mm wide, fusiform, ± attenuate to the constricted or coarsely beaked summit (0.25 to 0.3 mm wide), with slightly expanded pappus-disk, abruptly narrowed near the calloused hollow base (0.3 to 0.4 mm wide), about 14-ribbed, ribs narrow, rounded, with 3 to 4 stronger ones; pappus 7,8 to 9 mm long, 2-seriate. (Fig. 18.)

The type, at Upsala, Harry Smith no. 4079*a*, has achenes shaped as in *typica*, but on the same sheet is another plant of which the achenes are more strongly attenuate or with a short coarse beak as in *yunnanensis*. This variability in achene shape occurs in Smith's other two collections cited below, no. 2219 consisting of three plants all with short-beaked fruits, while no. 2876 comprises three plants all with achenes shaped as in *typica*. Yet in the three collections the fruits are pale in color just as in the type of this subspecies, and this peculiarity is asso-

ciated with the larger florets and flower parts. This subspecies is known only from the Sung-pan region in northern Szechwan.

China: northern Szechwan, Sung-pan, mountains about 15 km south, 3000 to 3200 m alt., *Harry Smith 4079* (Upsala), *a* = *type; ibid.*, Sung-pan region, about 3300 m alt., *Harry Smith 2219* (Upsala); *ibid.*, Sung-pan region, *Harry Smith 2876* (Upsala), form 2.

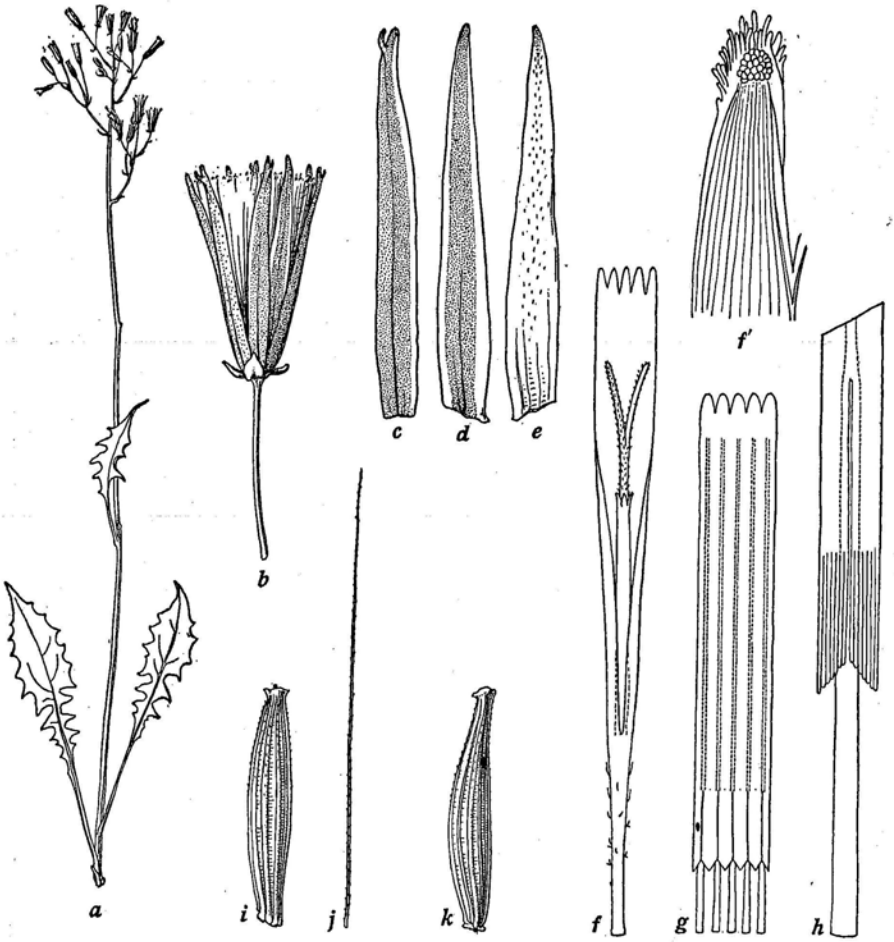

Fig. 18—*Youngia paleacea Smithii*, *a–j*, from type (Upsala); *k*, from cotype, *Harry Smith 4079a*, *b* (Upsala): *a*, plant, × ¼; *b*, fruiting head, × 2; *c*, *d*, *e*, inner involucral bracts, 2 dorsal, 1 ventral, × 4; *f*, floret lacking ovary, × 4; *f'*, detail of ligule-tooth, × 50; *g*, anther-tube, × 8; *h*, detail of appendages, × 32; *i*, *j*, *k*, achenes and pappus-bristle, × 8.

Numbered Forms

1. Youngia paleacea yunnanensis, but caudical leaves long-petioled, sinuate-dentate, approaching those of the type of *Smithii*. *Rock 5354* (B), eastern slopes of Likiang Snow Range, Likiang district, Yunnan.
2. Youngia paleacea Smithii, but caudical leaves very short (up to 5 cm); branches very slender, elongate, pedunculate. *Harry Smith 2876* (Upsala), vicinity of Sung-pan, northern Szechwan.

Variability and Polyploidy

Polymorphism in this species is certainly associated with polyploidy. It probably indicates that subspecies *typica,* which is known to have 32 chromosomes as the somatic number in one collection, is an amphidiploid, derived from hybridization between two 8-paired species. Comparison of stomatal and pollen-grain sizes in herbarium specimens of the three subspecies and the two numbered forms indicates that *yunnanensis* and *Smithii* are hexaploids ($2n = 48$?) but that forms 1 and 2 are octoploids ($2n = 64$?). These data on long axis of guard cells on caudical leaves and diameter of pollen-grains, both measured in microns, are given in the accompanying table. The fact that in form 2 about 25 per cent of the pollen grains are 4-pored, while such grains are scarce in the other specimens, is further evidence that this form is a higher polyploid. Thus it appears that *Youngia paleacea* is an assemblage of polyploid forms, derived from an amphidiploid hybrid, and exhibiting definite tendencies toward specific differentiation. It is probable, therefore, that as future collections increase the herbarium representatives of this species, other anomalous forms and even additional subspecies will come to light.

Specimen	Size of stomata	Size of pollen-grains	Somatic chromosome number
	μ	μ	
Typica:			
Rock 23472 (living progeny)	34 (31 cauline)	30	32
Handel-Mazzetti 8055	31 (cauline)	29	32?
Rock 18505	34	29	32?
Fang 4468 (US 1509716)	.....	34	48?
Yunnanensis:			
Fang 4468 (B)	.....	33	48?
Maire 4002	37	34	48?
Maire 7325	36	33	48?
Maire 2601	37	32	48?
Rock 5354 (form 1)	40.5	35	64?
Smithii:			
Smith 4079	36	33	48?
Smith 2219	36	32	48?
Smith 2876 (form 2)	41.5	34.5	64?

Relationship

Two species which may have been involved in the original hybrid from which the amphidiploid progenitor of *paleacea* was derived are *Y. lanata* and *Y. Mairei.* This is indicated by the general morphology of the two species; and their differences in shape of achenes and size of florets would explain the variations in these characters which occur within *paleacea.* Data on stomatal size in *Y. lanata* support this hypothesis, since the average length of the stomata on caudical leaves is only 26 μ in *lanata* as compared with 34 μ in *paleacea typica.* The pollen-grains in *lanata* average about 29 μ, which is the same as *paleacea typica.* Data on stomata and pollen-grains in *Mairei* are lacking; but since its heads,

florets, and achenes are smaller than in *lanata*, it is fair to assume that *Mairei* is also a diploid with eight pairs. Geographic distribution is consistent with this hypothesis. It is possible, however, that there are other diploid species in the Yunnan region which may have been involved in the origin of *paleacea*.

13. **Youngia lanata** sp. nov. (Fig. 19)

Herba perennis, 9–28 cm alta; radix tenuis; caudex 4–7 mm latus, fuscus; folia caudicalia pauca, parva, scandentia, obovalia vel oblanceolata, petiolata, infra fusca et tomentosa, supra pubescentia; folia caulina

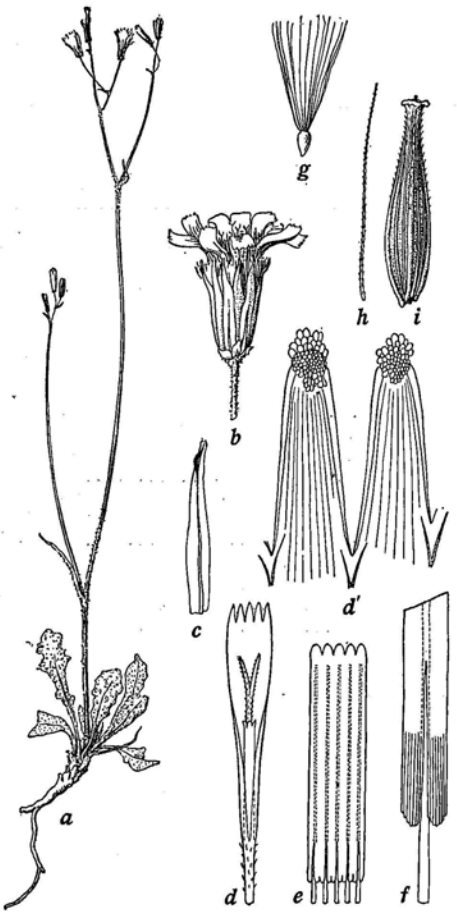

FIG. 19—*Youngia lanata*, *a–g*, from type (DL); *h*, *i*, from *Maire 2872* (UC 388604): *a*, whole plant, × ½; *b*, head with all florets in anthesis, × 2; *c*, inner involucral bract, outer face, × 4; *d*, floret lacking ovary, × 4; *d'*, detail of ligule-teeth, × 50; *e*, anther-tube, × 8; *f*, detail of appendages, × 32; *g*, ovary with pappus, × 4; *h*, *i*, achene (nearly mature) and pappus-bristle, × 8.

pauca, bracteaformia; caulis erectus, fuscus ad nodos, dichotomus cum 2–4 ramis, rami stricti, inflorescentia paniculata vel corymbiformia; pedunculi filiformes, tomentulosi; capitula pauca, parva, 9–10-flora;