

PALYNOMORPHS OF JAPANESE ALPINE PLANTS (3)

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(With 6 Plates)

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I. Introduction

This is the 3rd paper of the series of "Palynomorphs of Japanese alpine plants". In the parts 1 and 2, palynomorphs of 59 Japanese alpine and subalpine plants were enumerated with descriptions and photographs. This time, pollen grains of 22 alpine and subalpine plants are newly enumerated; the number, therefore, attains to be 81 in total. This number is about one seventh of all Pteridophyta (ferns) and Spermatophyta (seed plants) that occur in the alpine belt of Japan. For this reason, these palynomorphs will assist for the identification of airborne pollen and spores in Japanese alpine belts.

II. Materials and Methods

The following 22 plants are enumerated here: *Pleuropteropyrum weyrichii* var. *alpinum*, *Minuartia verna* var. *japonica*, *Stellaria nipponica*, *Aconitum nipponicum*, *Ranzania japonica*, *Parnassia palustris* var. *tenuis*, *Saxifraga fortunei* var. *incislobata* f. *alpina*, *S. fusca* var. *kikubuki*, *Sanguisorba canadensis* ssp. *latifolia*, *S. hakusanensis*, *Geranium yesoense* var. *nipponicum*, *Hypericum kamtschaticum* var. *senanense*, *Viola blandiformis*, *Epilobium hornemannii* var. *foucaudianum*, *Schizocodon soldanelloides*, *Gentiana algida*, *G. makinoi*, *G. nipponica*, *Veronica stelleri* ssp. *nipponica*, *Scabiosa japonica* var. *alpina*, *Cirsium babanum* var. *otayae* and *Ixeris dentata* ssp. *kimurana*.

The way of gathering pollen samples, the method for making microscopic slides, the photomicrographic techniques and the systems of pollen classification were almost the same as those described in the 1st and the 2nd parts of this series of papers. Magnification of photomicrographs in plates is about $\times 1,170$.

III. Results of observations

- 1) *Pleuropteropyrum weyrichii* H. Gross var. *alpinum* H. Gross (Polygonaceae)

Pollen samples: Mt. Norikura (Aug. 29, 1988). Pollen type: 6Bb-c. Pollen shape: circular in polar view and circular-oval in equatorial view. Aperture: 3-zonocolporate, occasionally 4-zonocolporate. NPC=345. Surface pattern: fine reticulate. Pollen size: $18.5-21.5(19.6*) \times 17.5-26.3(22.5) \mu\text{m}$. { * average is in parenthesis }

Note: Var. *weyrichii* was enumerated in the 2nd part. Among pollen samples of var. *alpinum*, some unusual ones are found which are oval in equatorial view (pl. I, ff. 2-3).

- 2) *Minuartia verna* Hiern var. *japonica* Hara (Caryophyllaceae)

Pollen samples: Mt. Hachigatake (Aug. 29, 1987). Pollen type: 4Ca. Pollen shape: circular in both polar and equatorial views. Aperture: poly-pantoporate. NPC=764. Surface pattern: baculate. Pollen size: $24.3-26.7(25.9) \times 25-27.5(26.3) \mu\text{m}$.

- 3) *Stellaria nipponica* Ohwi (Caryophyllaceae)

Pollen samples: Mt. Hachigatake (Aug. 29, 1987).

Pollen type: 4Ca. Pollen shape: circular in polar view and circular-oval in equatorial view. Aperture: poly-pantoporate. NPC=764. Surface pattern: granulate. Pollen size: 32.5-34.4 (33.9) $\times$ 34.5-35.9 (35.1) μm .

4) *Aconitum nipponicum* Nakai (Ranunculaceae)

Pollen samples: Nebukapira, Mt. Shirouma (Aug. 28, 1987). Pollen type: 6Bb. Pollen shape: semi-angular in polar view and circular in equatorial view. Aperture: 3-zonocolpate. NPC=343. Surface pattern: scabrate. Pollen size: 32.5-34.6 (33.9) $\times$ 31.6-33.5 (32.7) μm .

5) *Ranzania japonica* T. Ito (Berberidaceae)

Pollen samples: at the foot of Mt. Shirouma (May 22, 1988). Pollen type: 4Da-b. Pollen shape: circular in polar view, circular-oval in equatorial view. Aperture: 3-zonocolpate. NPC=343. Surface pattern: reticulate. Pollen size: 51.5-54.4 (52.6) $\times$ 51.7-54.5 (52.6) μm .

6) *Parnassia palustris* L. var. *tenuis* Wahl. (Saxifragaceae)

Pollen samples: Mt. Norikura (Aug. 29, 1988). Pollen type: 6Bb. Pollen shape: circular in polar view and circular-oval in equatorial view. Aperture: 3-zonocolporate. NPC=345. Surface pattern: fine reticulate. Pollen size: 18-20.4 (19.8) $\times$ 19.6-22.5 (21.1) μm .

7) *Saxifraga fortunei* Hook., f. var. *incisulobata* Nakai f. *alpina* T. Shimizu (Saxifragaceae)

Pollen samples: Mt. Hachigatake (Aug. 29, 1987). Pollen type: 6Bb. Pollen shape: circular in polar view and apiculate in equatorial view. Aperture: 3-zonocolpate. NPC=343. Surface pattern: baculate or reticulate. Pollen size: 22-24.6 (23.4) $\times$ 23.8-27.5 (25.74) μm .

8) *Saxifraga fusca* Maxim. var. *kikubuki* Ohwi (Saxifragaceae)

Pollen samples: Mt. Norikura (Aug. 29, 1988). Pollen type: 6Bb. Pollen shape: circular in both polar and equatorial views. Aperture: 3-zonocolpate. NPC=343. Surface pattern: baculate or fine reticulate. Pollen size: 15.5-16.9 (16.4) $\times$ 14.3-16.5 (15.2) μm .

9) *Sanguisorba canadensis* L. subsp. *latifolia* Calder et Taylor (Rosaceae)

Pollen samples: Mt. Hakuba-Norikura-Tenguhara (Aug. 30, 1987). Pollen type: 6Bc. Pollen shape: circular in polar view and circular-oval in equatorial view. Aperture: 3-zonocolporate. NPC=345. Surface pattern: fine reticulate. Pollen size: 30.4-33.7 (32.7) $\times$ 29.4-32.7 (31.5) μm .

10) *Sanguisorba hakusanensis* Makino (Rosaceae)

Pollen samples: Mt. Hachigatake (Aug. 29, 1987). Pollen type: 6Bc. Pollen shape: inter-subangular in polar view and circular-oval in equatorial view. Aperture: 3-zonocolporate. NPC=345. Surface pattern: reticulate. Pollen size: 24.2-26.5 (25.7) $\times$ 27.8-31.5 (29.2) μm .

11) *Geranium yesoense* Fr. et Sav. var. *nipponicum* Nakai (Geraniaceae)

Pollen samples: Mt. Hachigatake (Aug. 29, 1987). Pollen type: 6Bb. Pollen shape: circular in polar view and circular-oval in equatorial view. Aperture: 3-zonocolporate. NPC=345. Surface pattern: clavate. Pollen size: 58.4-61.7 (59.6) $\times$ 68.5-70.9 (70.2) μm .

12) *Hypericum kamtschaticum* Ledeb. var. *senanense* Y. Kimura (Hypericaceae)

Pollen samples: Mt. Norikura (Aug. 29, 1988). Pollen type: 6Bb. Pollen shape: circular in polar view and circular oval in equatorial view. Aperture: 3-zonocolporate. NPC=345. Surface pattern: fine reticulate or scabrate. Pollen size: 18.5-21.7 (20.4) $\times$ 16.4-20.6 (18.7) μm .

13) *Viola blandiformis* Nakai (Violaceae)

Pollen samples: Mt. Hakuba-Norikura-Tenguhara (Aug. 30, 1987). Pollen type: 6Bb. Pollen shape: circular in both polar and equatorial views. Aperture: 3-zonocolporate. NPC=345. Surface pattern: scabrate and slightly granulate. Pollen size: 27.8-32.3 (30.5) $\times$ 26.9-30.5 (28) μm .

14) *Epilobium hornemannii* Reichb. var. *foucaudianum* Hara (Onagraceae)

Pollen samples: Nebukapira, Mt. Hakuba (Aug. 28, 1987). Pollen type: 7Cb $\rightarrow$ 5B. Pollen shape: semi-angular in polar view and apiculate in equatorial view. Aperture: 3-zonoporate. NPC=344. Surface pattern: fine reticulate. Pollen size: 52.6-56.5 (54.9) $\times$ 36.5-40.3 (37.4) μm .

15) *Schizocodon soldanelloides* Sieb. et Zucc.

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(Diapensiaceae)

Pollen samples: at the foot of Mt. Shirouma (May 22, 1988). Pollen type: 6Bb. Pollen shape: circular in polar view and circular-oval in equatorial view. Aperture: 3-zonocolporate (with long colpi). NPC=345. Surface pattern: fine reticulate. Pollen size: $24.5-27.6(26.9) \times 24.3-27.5(26.5) \mu\text{m}$.

16) *Gentiana algida* Pall. (Gentianaceae)

Pollen samples: between Mt. Shirouma and Sangoku-zakae (Aug. 29, 1987). Pollen type: 6Bb. Pollen shape: circular in polar view and circular-oval in equatorial view. Aperture: 3-zonocolporate. NPC=345. Surface pattern: reticulate-striate. Pollen size: $28.6-32.3(30.4) \times 28.4-32.0(30.2) \mu\text{m}$.

17) *Gentiana makinoi* Kusn. (Gentianaceae)

Pollen samples: Mt. Norikura (Aug. 29, 1988). Pollen type: 6Bb. Pollen shape: circular in polar view and circular-oval in equatorial view. Aperture: 3-zonocolporate. NPC=345. Surface pattern: reticulate-striate. Pollen size: $30-34.4(32.7) \times 24.8-28.5(26.9) \mu\text{m}$.

18) *Gentiana nipponica* Maxim. (Gentianaceae)

Pollen samples: Mt. Hachigatake (Aug. 29, 1987). Pollen type: 6Bb. Pollen shape: circular in polar view and circular-oval in equatorial view. Aperture: 3-zonocolporate. NPC=345. Surface pattern: reticulate-striate. Pollen size: $33.5-36.9(35) \times 20.4-24.8(22.5) \mu\text{m}$.

19) *Veronica stelleri* Pall. subsp. *nipponica* Toyokuni (Scrophulariaceae)

Pollen samples: Mt. Norikura (Aug. 30, 1988).

Pollen type: 6Bb. Pollen shape: semi-angular in polar view and circular-oval in equatorial view. Aperture: 3-zonocolporate. NPC=343. Surface pattern: fine reticulate and scabrate. Pollen size: $24.3-28.9(26.9) \times 20.6-24.5(22.2) \mu\text{m}$.

20) *Scabiosa japonica* Miq. var. *alpina* Takeda (Dipsacaceae)

Pollen samples: between Sangoku-zakae and Mt. Hachigatake (Aug. 29, 1987). Pollen type: 6Bb. Pollen shape: semi-angular in polar view and circular-oval in equatorial view. Aperture: 3-zonocolporate. NPC=345. Surface pattern: spinate. Pollen size: $75.8-81.6(78.5) \times 53.7-70.5(67.5) \mu\text{m}$.

21) *Cirsium babanum* Koidz. var. *otayae* Kitamura (Asteraceae)

Pollen samples: between Hakuba-ike and Mt. Hakuba-norikura (Aug. 30, 1987). Pollen type: 6Bb. Pollen shape: circular in polar view and circular-oval in equatorial view. Aperture: 3-zonocolporate. NPC=345. Surface pattern: spinate. Pollen size: $44.2-48.5(46.8) \times 39.1-43.4(40.9) \mu\text{m}$.

22) *Ixeris dentata* Nakai subsp. *kimurana* Kitamura (Asteraceae)

Pollen samples: Mt. Hachigatake (Aug. 29, 1987). Pollen type: 6Bb. Pollen shape: circular in both polar and equatorial views. Aperture: 3-4-zonocolporate. NPC=345. Surface pattern: spinate. Pollen size: $29.5-35.1(33.5) \times 28.4-32.1(30.5) \mu\text{m}$.

IV. References

(Additional references)

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3. Toyokuni, H. 1991. Alpine flowers of Japan (5th print.) (in Japanese).

EXPLANATION OF PLATES I - VI

Photomicrographs used for plates I-VI are in a magnification of x 1,170.

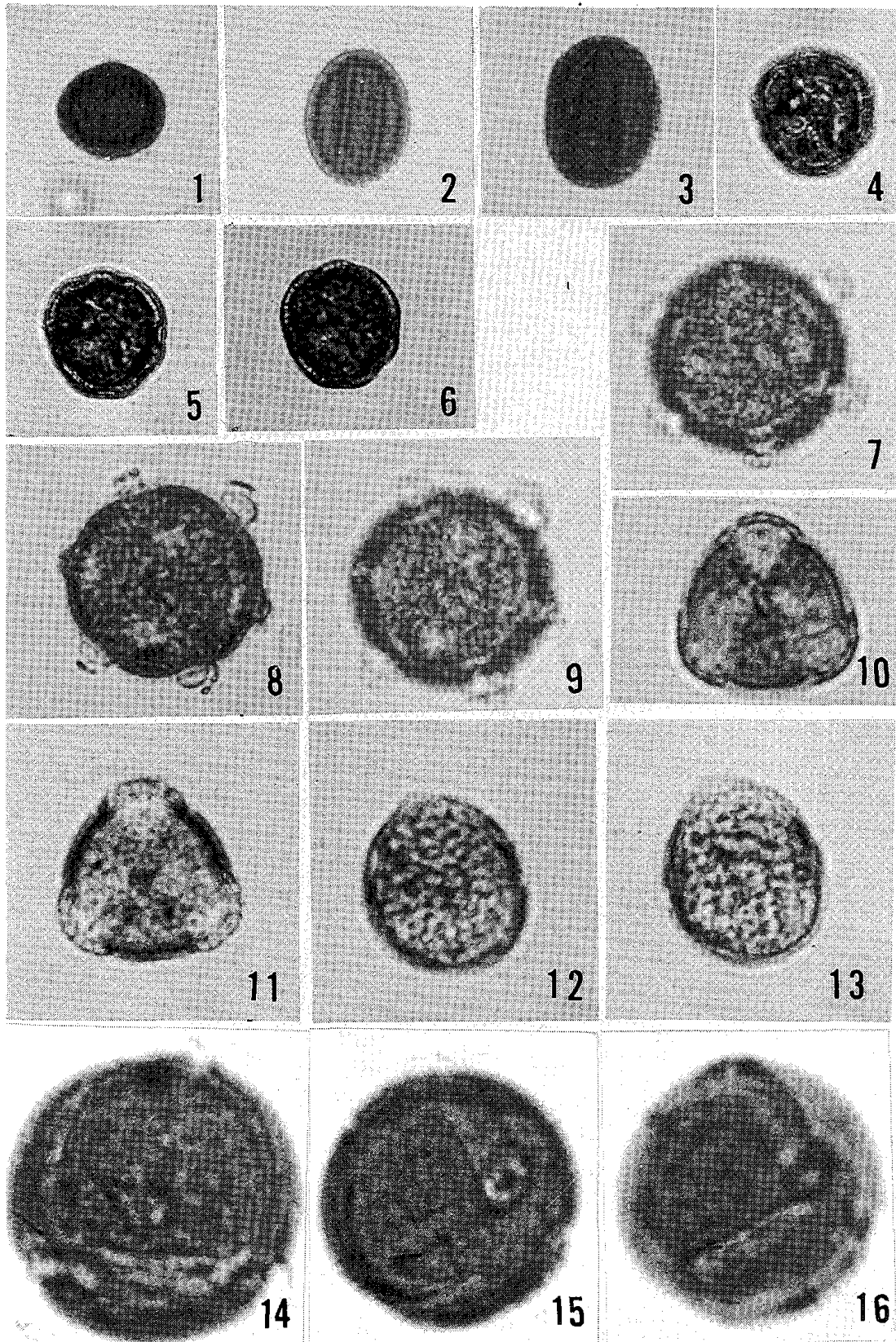


PLATE I 1-3. *Pleuropteropyrum weyrichii* var. *alpinum*

4-6. *Minuartia verna* var. *japonica*

7-9. *Stellaria nipponica*

10-13. *Aconitum nipponicum*

14-16. *Ranzania japonica*

PALYNOMORPHS OF JAPANESE ALPINE PLANTS (3)

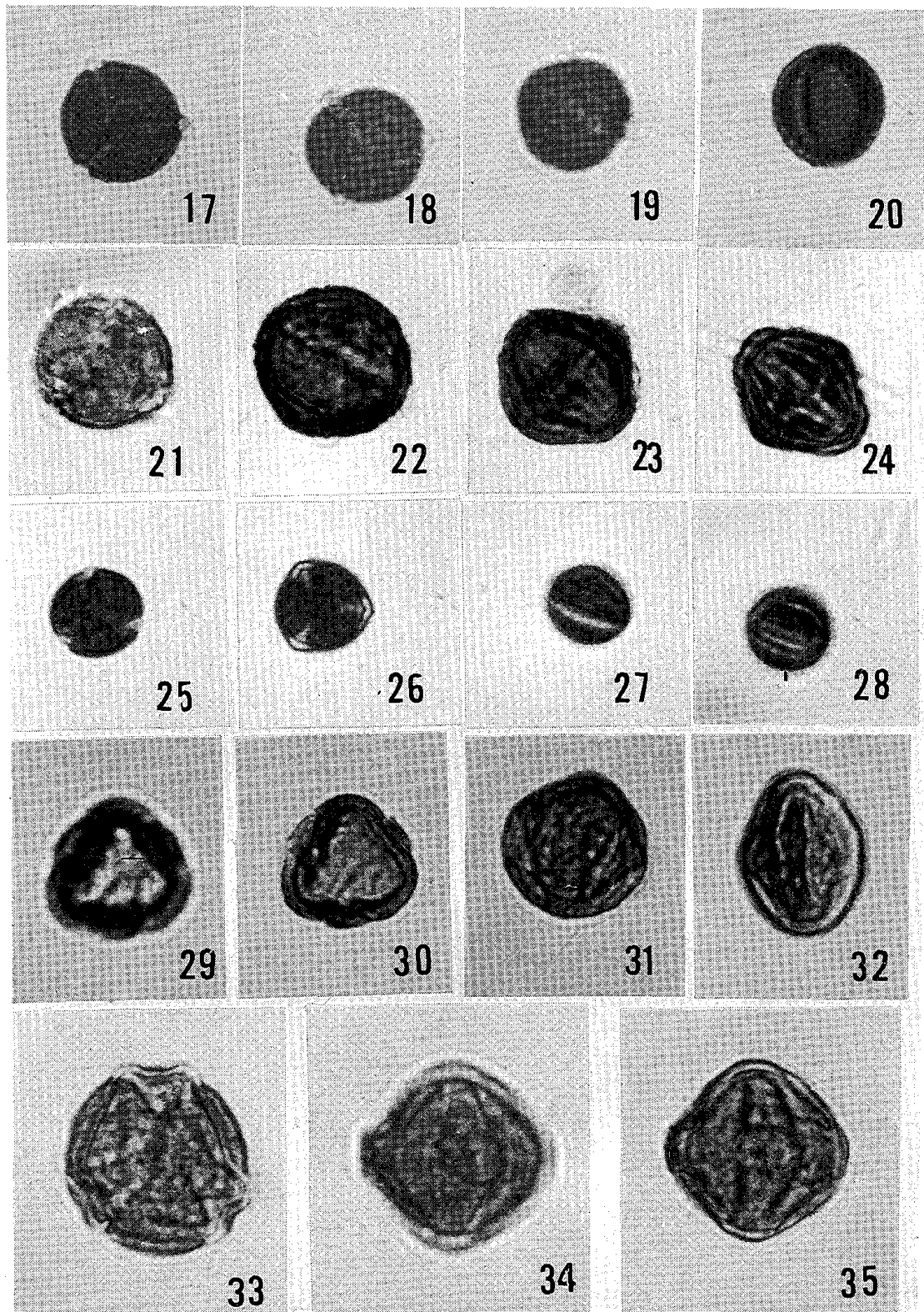


PLATE II 17-20. *Parnassia palustris* var. *tenuis*
 21-24. *Saxifraga fortunei* var. *incislobata* f. *alpina*
 25-28. *S. fusca* var. *kikubuki*

29-32. *Sanguisorba hakusanensis*
 33-35. *S. canadensis* subsp. *latifolia*

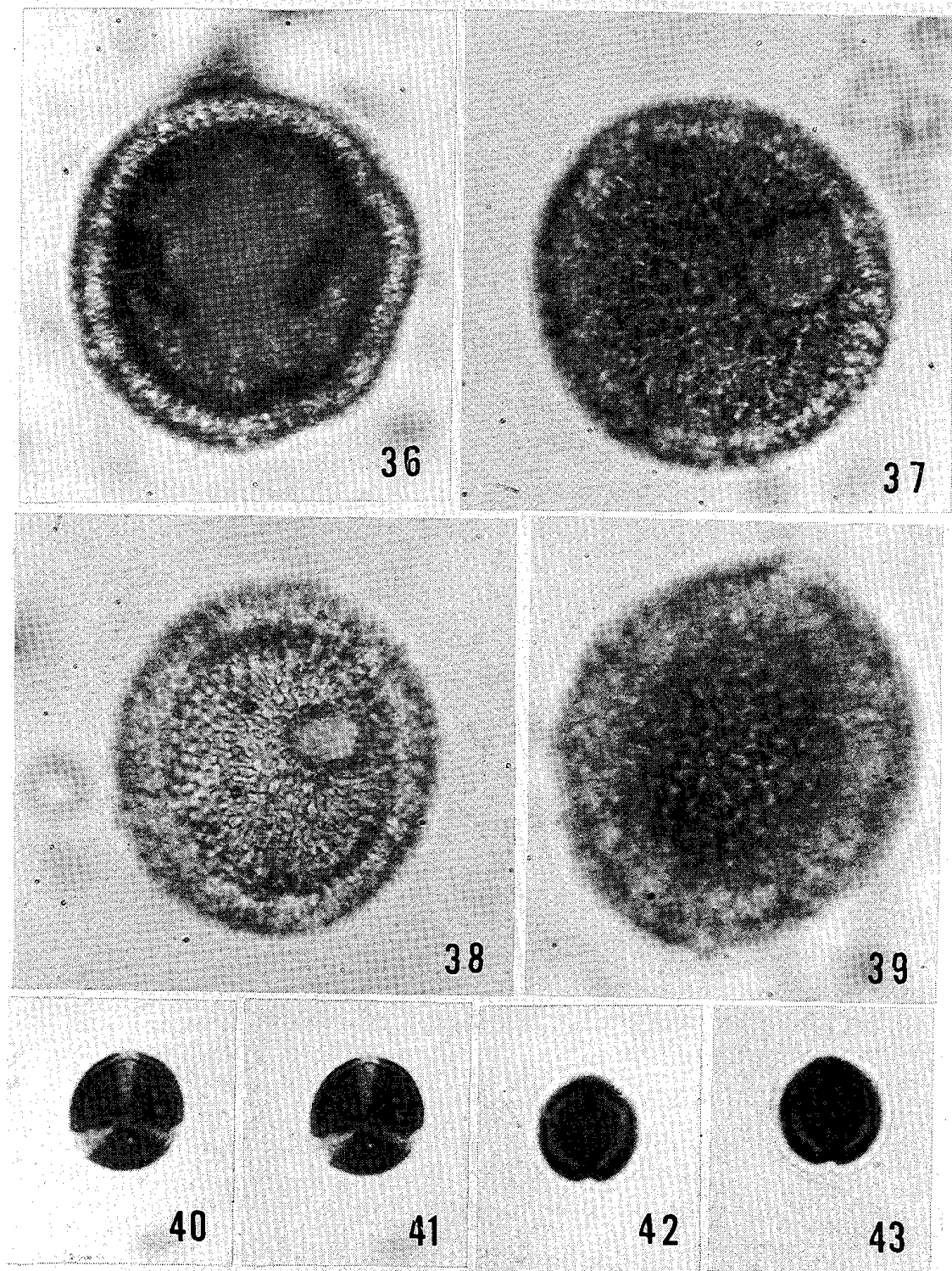


PLATE III 36-39. *Geranium yesoense* var. *nipponicum*
40-43. *Hypericum kamtschaticum* var. *senanense*

PALYNOMORPHS OF JAPANESE ALPINE PLANTS (3)

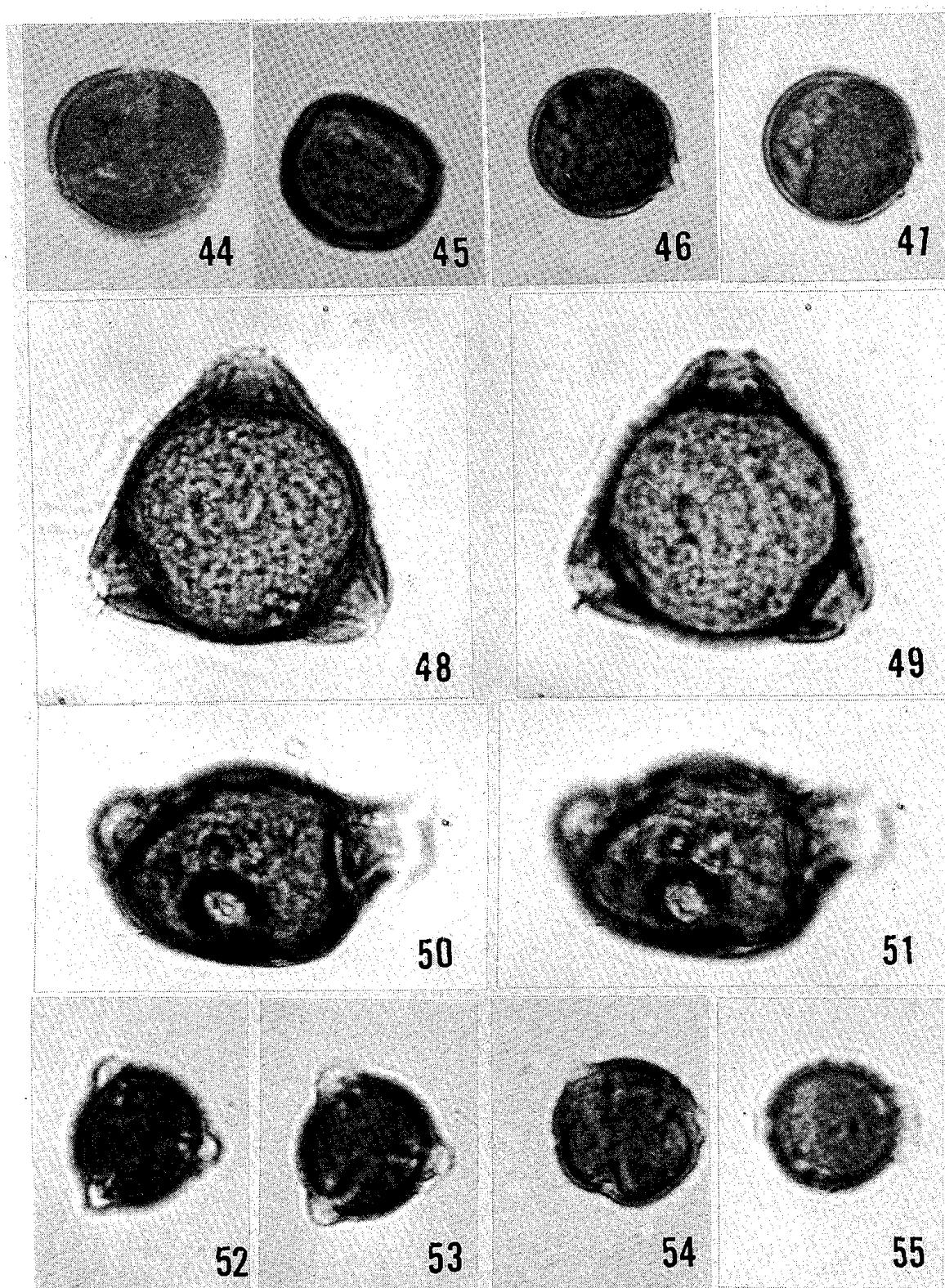


PLATE IV 44-47. *Viola blandiformis*
 48-51. *Epilobium hornemannii* var. *foucaudianum*
 52-55. *Schizocodon soldanelloides*

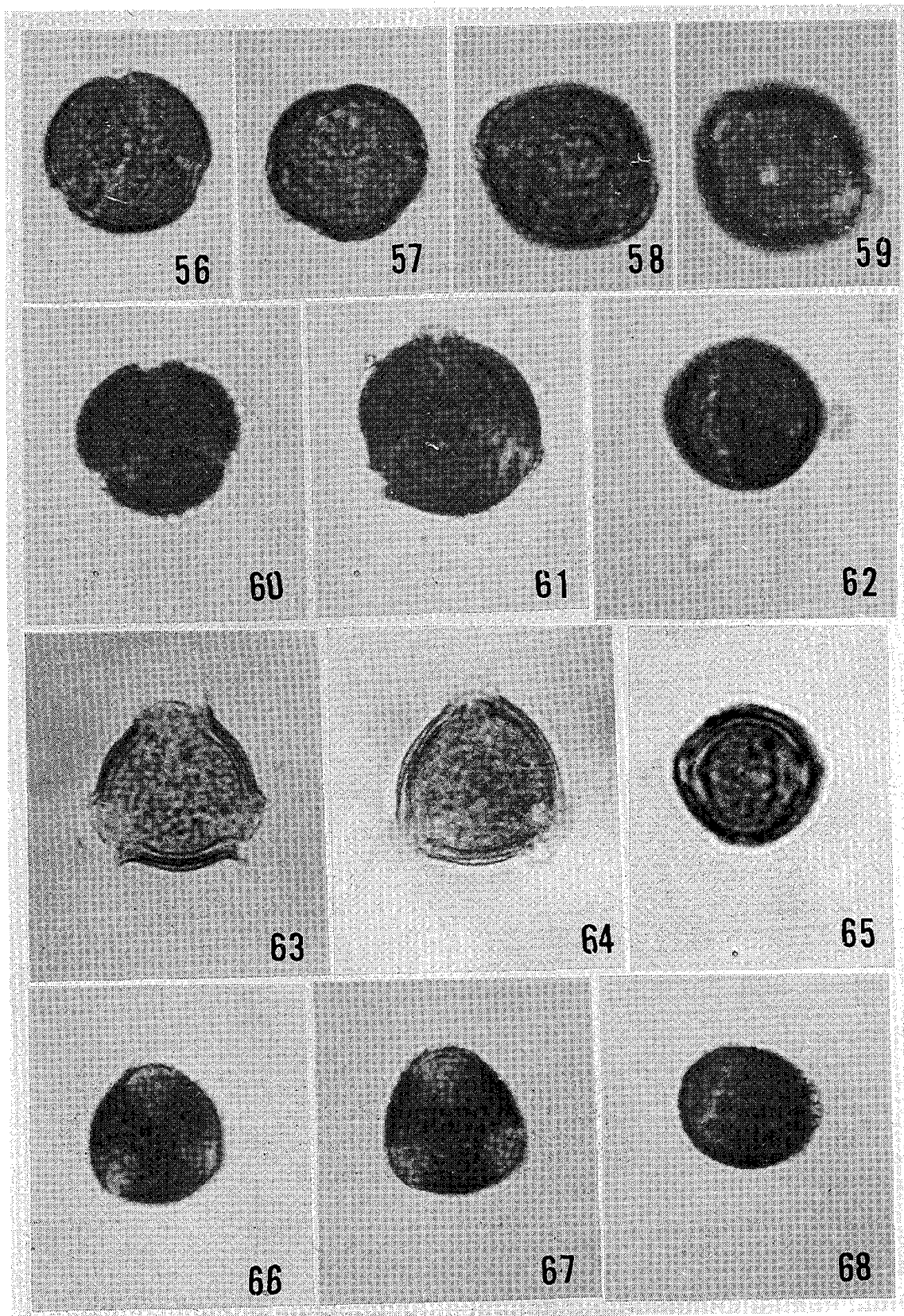


PLATE V 56-59. *Gentiana algida* 66-68. *Veronica stelleri* subsp. *nipponica*
 60-62. *G. makinoi*
 63-65. *G. nipponica*

PALYNOMORPHS OF JAPANESE ALPINE PLANTS (3)

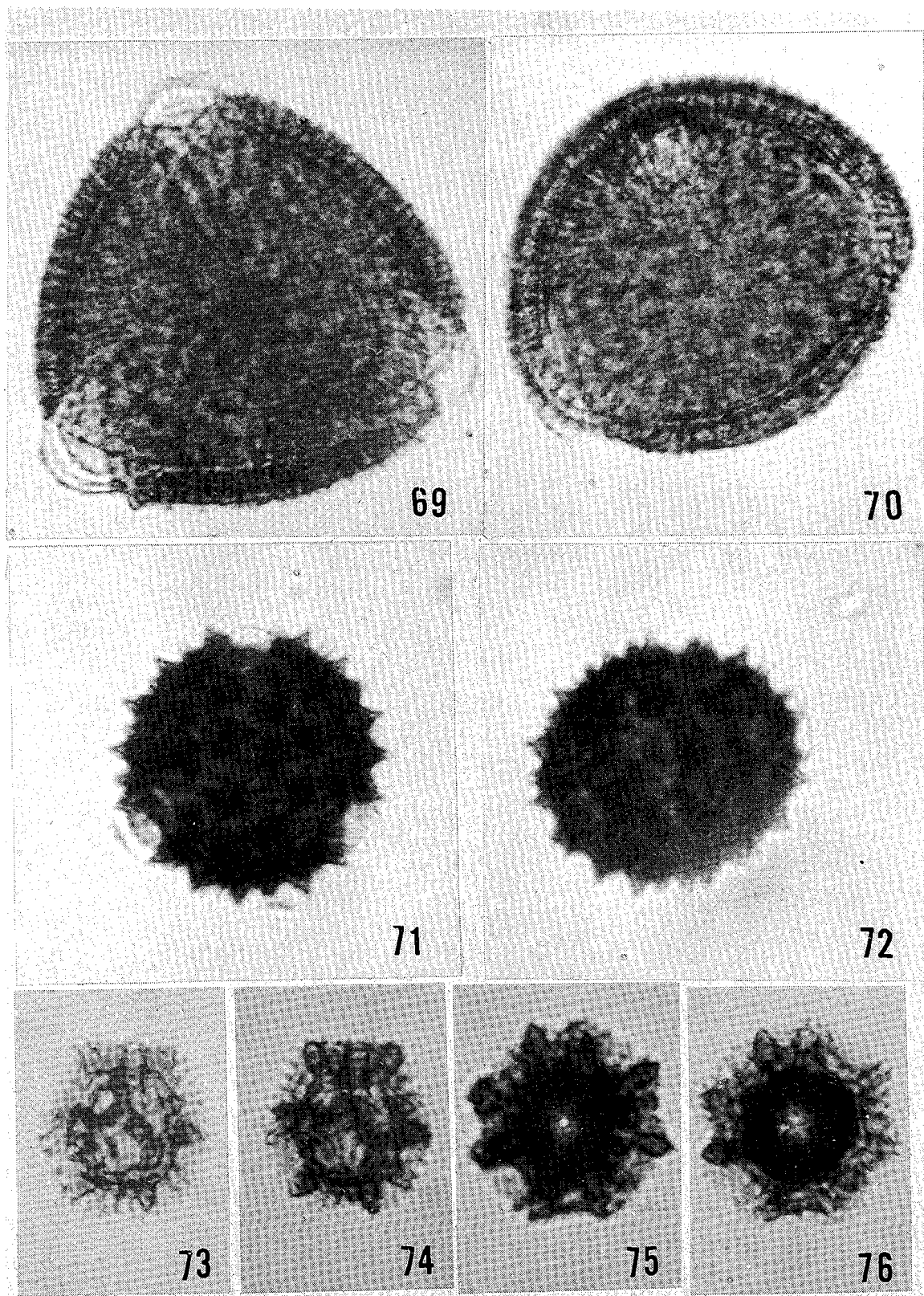


PLATE VI 69-70. *Scabiosa japonica* var. *alpina*
 71-72. *Cirsium babanum* var. *otayae*
 73-76. *Ixeris dentata* subsp. *kimurana*