

Native Species of *Populus* in Japan

Toshio HAMAYA* and Taizo INOKUMA**

Five species of the genus *Populus* have been described or reported in this country, viz. *Populus Sieboldi* MIQUEL, *P. tremula* var. *Davidiana* SCHN. and *P. jesoensis* NAKAI of the sect. *Leuce*, *P. Maximowiczii* A. HENRY and *P. koreana* REHDER of the sect. *Tacamahaca*. Among these, the former two and *P. Maximowiczii* are generally admitted as the comparatively distinct species and are doubtless native in Japan, while the other two are not absolutely manifest about these points. Many complicated and difficult problems remain even in the formers as regards the taxonomical treatment of them.

In this paper, the descriptions of these distinct species are made according to our own opinion which is referred to the current ones, accompanied by the maps of their distribution in Japan and the figures of the representative individuals of them. The detailed discussion on the above-mentioned problems and the full synonymy of all species shall be reserved to another report after more complete investigations.

Sect. *Leuce* DUBY subsect. *Trepidae* SCHNEIDER in SARGENT, Pl. Wilson. 3: 29 (1916).

○ Young branches*** and buds pubescent. Leaves on short branches***

* Institute of Forest Botany, Faculty of Agriculture, University of Tokyo.

** Professor, University of Tokyo.

*** The leaves in the genus *Populus* are usually polymorphous as DODE (1905) and SCHNEIDER (1916) noted. It is very necessary to compare the same kind of leaves in comparing leaves of different species. SCHNEIDER distinguishes three kinds of leaves in the sect. *Tacamahaca*. According to our observations on the young plants of *Populus tremula* and var. *Davidiana*, the growth of shoots is very often interrupted by the utter cessation of it or the formation of summer buds in June. A remarkable point is in most cases recognized a little below the summer bud, at which the form of the leaves is distinctly different between those below and above it. On adult plants, this point and the summer bud become indiscriminate from one another; and their formation also is sometimes irregular owing to various conditions on young plants.

The parts of branches above the summer buds (we name these aestival branches) are vigorous and of shoot-character, and correspond with those of turions, but their formation becomes much restricted to some terminal branches on adult plants. The parts below the summer buds (vernal branches) are of character of short branches, and on adult plants are dominant with a form of short branches.

The leaves on the vernal branches (vernal leaves), especially below the above-mentioned point, are much significant in comparing different species, and so we utilize

predominantly ovate or deltoid-ovate, acute at the apex, rounded or round-truncate and sometimes slightly cordate at the base, with fine, antrorse and regular teeth (i. e. serrate or serrulate) on the margin; with more persistent and denser long hairs on the lower, sometimes upper, too, surface; usually glanduliferous; the petioles shorter than the laminae and pubescent.

..... 1. *Populus Sieboldi*.

- Young branches and buds usually glabrous or nearly so. Leaves on short branches predominantly rounded, obtuse at the apex, rounded or obtuse and usually not cordate at the base, the marginal teeth coarse, spreading and irregular (i. e. crenate or crenulate to dentate or denticulate); with few caducous hairs or glabrous, but often ciliate; nearly eglandulose or entirely so; the petioles nearly as long as the laminae and glabrous.

..... 2. *P. tremula* var. *Davidiana*.

The characters cited in the key are those of the vernal branches and the vernal leaves on adult plants. They are, in brief, ① the hairiness of (i) the vernal branches, (ii) the winter buds and (iii) the vernal leaves, ② the basal glands on the laminae, ③ the leaf-form (i) in the outline, the apex and the base, (ii) in the marginal teeth, and ④ the length of the petioles. Between the typical forms of the two species, there is no troublesome problem. Not only these characters themselves are, however, very variable with populations or specimens, respectively, but also various combinations of these characters each of which shows the condition found in *P. Sieboldi* (S), *P. tremula* var. *Davidiana* (D) or intermediate populations can be observed. We have tenta-

them in the key. On young plants, the vernal leaves on the lower parts of the vernal branches are of very small size and generally of long and narrow shape. Those near to the point are larger and rounder. The latter form is nearly exclusive on adult plants. Generally speaking, as to the vernal leaves, the size is smaller, the marginal teeth are more patent and coarse, the presence of the basal glands on the laminae is less, the petioles are nearly as long as the laminae. The vernal leaves and branches are glabrous or covered with long hairs when young.

On the contrary, the leaves on the aestival branches (aestival leaves), strictly speaking, above that point, have no significant difference between the Japanese species. In contrast with the vernal leaves, they are much larger, short-petiolate, more antrorsely toothed and in nearly all cases glanduliferous. They sometimes become, however, similar to the vernal leaves on the same branches, on adult plants. The aestival leaves and branches as well as the turions are thickly covered with short, or sometimes long, hairs.

We think now this sorting of leaves into two categories may be applied to some species of the sect. *Tacamahaca* in opposition to SCHNEIDER's sorting of three kinds. (The leaves which he finds "at the ends of vigorous branches of young plants" may not be his third kind of leaves but our aestival leaves.) But this remarkable habit is not always found in the other sections or species.

tively discriminated eight representative forms among the intermediate populations or specimens, i. e. S', S-1~4 (pubescent forms) and D-1~3 (glabrous forms) by an entirely artificial or mechanical method. These are mapped with two kinds of signs in Pl. VIII. Though detailed discussion on these forms and on the range of variation in each character is very necessary to understand the relations between the two species and between them and their allied species—for example, there is some reason in ranking *P. Sieboldi* as a variety of *P. tremula* as KUDO (1924) did—, this short paper does not give any space to the discussion.

On the other hand, various characters of the bark of trunks (e. g. the colour and the surface condition), the turions and the aestival branches in our sense, the leaves on them (in *P. Sieboldi* apt to be pentagonal-ovate, while in *P. tremula* var. *Davidiana* ovate to reniform), the floral organs and the capsules show merely individual or epharmonic, or less valuable, differences.

1. **Populus Sieboldi** MIQUEL, in Ann. Mus. Bot. Lugd.-Bat. 3:29 (1867) excl. pl. mascl.; WESMAEL in DC. Prodr. 16 (2):327 (1868); DIPPEL, Handb. Laubholz. 2:192, f. 91 (1892)*; KOEHNE, Deutsche Dendrol. 30 (1893); SCHNEIDER, Ill. Handb. Laubholz. 1:17, f. 3 *h-i*, f. 7 *k-l* (1906)*, et in SARG. Pl. Wilson. 3:38 (1916)*; HENRY in ELWES et HENRY, Trees Gr. Brit. & Irel. 1794 (1913)*; MAKINO et NEMOTO, Fl. Jap. ed. 2, 160 (1931)*; MIYABE et KUDO, Icon. Ess. For. Trees Hokkaido ed. 2, 1:47, t. 12 (excl. f. 1-5), 12 B (1932) p. p.; KIMURA in MIYABE et KUDO, Fl. Hokkaido & Saghal. 4:391 (1934); HARA in Bot. Mag. Tokyo 48:198 (1934); SUGIMOTO, Key Trees & Shrubs Jap. 27 (1936)**; HONDA, Nom. Pl. Jap. 40 (1939); REHDER, Man. Cult. Trees & Shrubs ed. 2, 74 (1940)*, Bibl. Cult. Trees & Shrubs 67 (1949)*; KUDO, Nippon Yuyojumoku Bunruigaku ed. 4, 104, f. 18 (1941)*; HOUTZAGERS, Gen. Populus ed. Italica 37 (1950)*; OHWI, Fl. Jap. 396 (1953); MAKINO, Ill. Fl. Jap. ed. amplif. 675, f. 2025 (1955).

'*P. tremula* var. *villosa* (LÁNG) WESMAEL', FRANCH. et SAV., Enum. Pl. Jap. 1:463 (1875); MIYABE in Mem. Boston Soc. Nat. Hist. 4 (7):260 (1890) (Fl. Kurile Isl.); SHIRASAWA, Icon. Ess. For. Trees Jap. 1, t. 18, f. 1-10 (1900), text. 41 (1905); ? KAWAKAMI, Fig. & Descr. Trees Hokkaido 173, f. 56 (1902) excl. fig.; MATSUMURA, Ind. Pl. Jap. 2 (2):7 (1912).

P. tremula var. *Sieboldi* (MIQUEL) KUDO, Rep. Veg. North. Saghal. 97 (1924) in nota.

'*P. tremula* LINN.', HULTÉN, Fl. Kamtch. 2:4 (1928) p. p.

* ut *Sieboldii*, ** ut *Sieboldiana*.

(Some of these literatures undoubtedly include plants of *P. tremula* var. *Davidiana* and/or intermediate specimens from Hokkaido and the more northern regions.)

NOM. JAP. Yamanarashi, Hako-yanagi etc.

Trees attaining to 25 m in height, 50 cm in diameter. **Bark** on young trunks smooth with scattered slits like abacus-beads, greenish grey; on old trunks with longitudinal shallow fissures on the lower part, greenish or whitish grey, of bitter taste. **Young branches** green or slightly reddish in spring, brownish or dark brown and shining in winter; leaf-scars luniform; lenticels rounded, oblong or slit-like; pith stellate in a cross section; vernal branches sericeous with white hairs when young; aestival ones and turions densely puberulous or often sericeous. **Winter buds** with closely imbricate scales; the terminal usually foliar, ovoid-conical or fusiform, acute or acuminate at the apex, 5-10 (-14) mm long, resinous and most scales floccose with adpressed hairs in winter, greenish brown or light brown; the axillary usually floral, rounded-ovate or ovoid-conical, acute or obtuse at the apex, 5-10 mm long, resinous and thinly pubescent or rarely glabrous, light yellowish green with reddish patches. **Leaves** deciduous, dimorphous. Vernal leaves densely spiral or sub-fasciculate, of very various shapes, rhombic-ovate, deltoid-ovate to rarely depressed-rotund but generally ovate or deltoid-ovate, acute or slightly acuminate at the apex, rounded or dilatate-truncate (sometimes slightly cordate) and rarely broadly cuneate at the base, regularly fine serrate or serrulate or sometimes partially entire on the margin, dark green and shining, thinly pubescent or pilose on the main veins above, pale green and glaucescent, densely pilose when young, nearly glabrous in late summer or later beneath, but hairs more persistent on the basal parts and petioles, usually with 2 glands and rarely small glandular lobes at the base of laminae, 3 or 5 veins branching palmately from the base and a little prominent beneath, (1.5-) 5-8 (-10) cm long, (1-) 3-7 (-8.5) cm wide; petioles slender, compressed laterally, densely pubescent and later glabrous, (0.5-) 3-6 (-7.5) cm long, usually somewhat shorter than the laminae. Aestival leaves and turion leaves spiral, large, generally pentagonal-ovate, acute or obtuse at the apex, truncate or truncate-subcordate at the base, usually fine serrate on the margin, densely pubescent or sericeous on the veins of both surfaces, with 2 glandular dots and rarely small lobes at the base, 5-16 cm long, 4-13 cm wide; petioles terete, pubescent, 1-5 cm long. **Stipules** caducous, lanceolate or linear, 3-13 mm long. **Flowers** dioecious, precocious in early spring. Male aments pendulous, 5-11 cm long, 8-10 mm in diameter; axes and pedicels pubescent.

or rarely glabrous; bracts elliptic to depressed-round, flabellate, deeply 6-9 (or more)-lobed with ciliate linear-lanceolate lobes, attenuate at the base, light chocolate-brown, 3-5 mm long (rarely to 9 mm on the lower part of the ament), 2.5-5 mm wide, pale yellowish green on the stalk; disks obliquely funnel-shaped, glabrous or often pubescent, with short pedicels, pale yellowish green, 3.5 mm long, ca. 2 mm wide; stamens 5-8 (-13), filaments long; anthers oblong-ellipsoid, red. Female aments curved, 5-10 cm long and 15 cm or more at maturity, ca. 7 mm thick; axes and pedicels pubescent, pedicels 0.5-3 mm long; bracts similar to those of the male, subsistent, sometimes elliptic, 7-10 (-13)-lobed, 2-5 mm long, 3 (or more) mm wide; disks funnel-shaped, slightly oblique, glabrous or pubescent, greenish in colour; ovaries broadly ovate, usually pubescent or sometimes glabrous, with 2 longitudinal grooves, ca. 2 mm long, deep green; styles 2, short; stigmata crestate and scarlet. **Capsules** ovate to fusiform, 2-6 mm long, 1.5-3 mm thick, glabrous or often pubescent, with a persistent disk at the base, dehiscing into 2 recurved valves. **Seeds** minute, with many long white hairs at the base. Flowers in IV. Seeds maturing in V-VI.

HABITATS. This species grows on dried open hill-side or waste lands in the temperate zone of Japan. It often forms pure stands on slashes of forest-fire etc., but now such pure stands are very rare. It grows very rapidly but does not persevere against shade. On the open land, the roots put forth many turions. In forests the stems are often very straight and the lowest branches are considerably high.

DISTR. Japan: (there could not be found any local floristic record and actual specimen in Kyushu) Shikoku, Honshu, Hokkaido and South Kuriles (?); Corea (?).

USES. Timber for construction, implements and vehicles, chests or boxes, wood-shaving, match-splints, charcoal for black powder and material of pulp etc., sometimes planted for erosion control.

NOTES. ① When the entity of this species becomes more clear, this may be ranked as a subspecies or a variety of *P. tremula* LINN., on the reference to the other pubescent varieties or forms of the latter (e. g. var. *villosa* WESM. and var. *Davidiana* f. *tomentella* SCHN.).

② *Populus glandulosa* (UYEKI) UYEKI in Jour. Chosen Nat. Hist. Soc. no. 17:54 (1934)—*P. tremula* var. *glandulosa* UYEKI in Bull. Agr. For. Coll. Suigen, Corea no. 1:6 (1925). (NOM. JAP. Suigen-yamanarashi) This seems to be merely a form of *P. Sieboldi* according to the original description and photograph. The differences cited by UYEKI comparing with *P. tremula* var.

Davidiana are usually epharmonic or variable with individual plants. As in the continent there are many pubescent forms or specimens of *P. tremula* var. *Davidiana*, we have been supposing the presence of forms like *P. Sieboldi* there.

2. **Populus tremula** LINN. var. **Davidiana** (DODE) SCHNEIDER in SARG. Pl. Wilson. 3:24 (1916); NAKAI, Veg. Diamond Mts. 168 (1918), et in Bot. Mag. Tokyo 33:198 (1919) in nota; REHDER in Jour. Arnold Arb. 4:137 (1923), Man. Cult. Trees & Shrubs ed. 2, 74 (1940), et Bibl. Cult. Trees & Shrubs 67 (1949); KUDO, Rep. Veg. North. Saghal. 97 (1924); OHWI in Acta Phytotax. Geobot. 1:131 (1932); S.-C. LEE, For. Bot. China 174, f. 63 (1935).

'*P. tremula* LINN.', FR. SCHMIDT, Reis. Amur. Sachal. 61 et 174 (1868); BURKILL in Jour. Linn. Soc. 26:537 (1899) (FORB. et HEMSL., Ind. Fl. Sin. 2) p. p., excl. var.; NAKAI, Fl. Korea. 2:211 (1911); HULTÉN, Fl. Kamtch. 2:4 (1928) p. p.

P. Davidiana DODE [in Mém. Soc. Hist. Nat. Autun. 18:31, t. 11, f. 31 (1905)]*; NAKAI in Bull. Soc. Dendrol. France no. 66:6 (1928), Fl. Sylv. Kor. 18:189, t. 47 et 48 (1930), et in Jour. Jap. Bot. 15:528 (1939); KIMURA in MIYABE et KUDO, Fl. Hokkaido & Saghal. 4:392 (1934); SUGIMOTO, Key Trees & Shrubs Jap. 27 (1936); NEMOTO, Fl. Jap. Suppl. 104 (1936); HONDA, Nom. Pl. Jap. 40 (1939); SUGAWARA, Ill. Fl. Saghal. 2:657, t. 308 (1939); OHWI, Fl. Jap. 396 (1953) in nota sub *P. Sieboldi*; LIOU et al., Ill. Fl. Lign. Pl. North-East China 117, t. 16, f. 1-7, 9 et t. 17, f. 37 (1955).

'*P. Sieboldi* MIQUEL', ? KAWAKAMI, Fig. & Descr. Trees Hokkaido 173, f. 56 (1902) quoad fig.; MIYABE et MIYAKE, Fl. Saghal. 432 (1915).

NOM. JAP. Chosen-yamanarashi, Karafuto-yamanarashi etc.

Trees 20 m or more high, 50 cm or rarely to 1 m in diameter. **Bark** similar to the preceding species, on old trunks sometimes light greenish white. **Young branches** like the preceding, vernal branches glabrous or rarely thinly pubescent; aestival ones and turions glabrous or puberulous. **Winter buds** similar to the preceding; the foliar ones resinous, glabrous or nearly so but often with ciliate and thinly sericeous inner scales; the floral always resinous and glabrous. **Leaves** dimorphous. Vernal leaves ovate to depressed-rotundate or rarely wide obovate but generally rounded, slightly acuminate to usually obtuse at the apex, rounded or obtuse and usually not cordate or sometimes wide cuneate at the base, coarsely and irregularly sinuate, dentate or crenate and sometimes (especially in Saghalin etc.) partially or throughout entire on the slightly ciliate margin, usually a little

* The literatures in brackets were not seen by us.

lighter green than the preceding and glabrous above, light green and a little glaucescent, with long caducous hairs when very young beneath, usually eglandulose but rarely ca. a half of leaves on a plant glandular, veins as the preceding, (1.8-) 3-6 (-8) cm long, (1.5-) 2.5-5.5 (-7.6) cm wide; petioles compressed laterally, usually glabrous, (0.6-) 1.5-5 (-7) cm long, nearly as long as the laminae. Aestival leaves and turion leaves generally ovate to reniform, acute or apiculate at the apex, round-cordate or cordate at the base, usually serrate or, on vigorous turions and shoots, irregular double crenate (or serrate-crenate) on the margin, pubescent or entirely glabrous, usually glandular at the base or often less so, 3-12 (-22) cm long, 2-10 (-22) cm wide; petioles terete, pubescent or glabrous, 1-4 (-6) cm long. **Stipules** caducous, lanceolate or linear-lanceolate, 3-12 mm long. **Flowers** similar to the preceding species. Male aments 5-9 cm long, axes and pedicels pubescent or glabrous; bracts blackish-brown, 2-5 (or more) mm long, 2-5 mm wide; disks usually glabrous, 2.5-3 mm long, ca. 2 mm wide; stamens 5-10 (-12); anthers purplish red. Female aments 4-8 cm long or more at maturity; axes and pedicels pubescent or glabrous, pedicels 0.5-3 mm long; bracts 2-5 mm long and wide; disks usually glabrous, ca. 2 mm long; ovaries broadly ovate, ca. 2 mm long, glabrous or sometimes pubescent, green; styles 2; stigmata crestate. **Capsules** ovate to fusiform, 3-7 mm long, 1-2 mm in diameter, glabrous or rarely thinly pubescent, with a persistent disk at the base; valves 2, recurved when dehisced. **Seeds** minute, with long white hairs. Flowers in IV. Seeds maturing in V.

HABITATS. This species occupies habitats similar to the preceding in the more northern zone of Japan.

DISTR. Honshu (?), Hokkaido, Kuriles, Saghalin, Kamtchatka, Amur, Ussuri, North-East China, Mongolia, Northern (and Central?) China and Corea.

USES. For the same purposes as the preceding. Bark often for medical uses or extraction of tannin.

NOTES. ① Some hairy forms (e. g. f. *tomentella* SCHN. and *P. Davidiana* var. *pilosa* NAKAI) and one of laticuneate base of leaves (*P. Davidiana* f. *laticuneata* NAKAI) are described. The formers are included into the intermediate groups in this paper. A form like the latter also is recognized in the preceding species.

② This can be discriminated from *P. tremula* LINN. only by the marginal dentation, but this character is very variable and cannot significantly be a diagnostic character. The vernal leaves in our sense are usually

larger and more coarsely crenate on some plants from Hokkaido and Corea, while on the plants from the Asiatic continent smaller. But these differences are not always sharp, or rather continuous, for example, both forms are found from the same localities (or even on the same plants) in Corea, and a form of similar dentation to *P. tremula* in Saghalin.

Populus jesoensis NAKAI in Bot. Mag. Tokyo 33:197 (1919), et Fl. Sylv. Kor. 18:188, t. 46 (1930); MAKINO et NEMOTO, Fl. Jap. ed. 2, 160 (1931); MIYABE et KUDO, Icon. Ess. For. Trees Hokkaido ed. 2, 1:48 (1932) ut *jesoensis*, in nota sub *P. Sieboldi*; KIMURA in MIYABE et KUDO, Fl. Hokkaido & Saghal. 4:393 (1934); SUGIMOTO, Key Trees & Shrubs Jap. 27 (1936); HONDA, Nom. Pl. Jap. 40 (1939); OHWI, Fl. Jap. 396 (1953) in nota sub *P. Sieboldi*—*P. tremula* LINN. var. *jessoensis* (NAKAI) KUDO, Rep. Veg. North-Saghal. 97 (1924) in adnota; TATEWAKI in Res. Bull. Coll. Exp. Forests Hokk. Imp. Univ. 4:156 (1927). (NOM. JAP. Yezo-yamanarashi). This is merely such a form with larger leaves of coarsely crenate dentation as mentioned above. *Populus Davidiana* DODE f. *grandifolia* SKVORTZOV [in Notes on Tree & Shrubs 339 (1929)], et in LIOU et al., Ill. Fl. Lign. Pl. North-East China 549 (1955) may be likewise included in this case.

Sect. **Tacamahaça** SPACH, Hist. Vég. 10:392 (1841).

3. **Populus Maximowiczii** A. HENRY [in Gard. Chron. ser. 3, 53:196, f. 89 (1913)], et in ELWES et HENRY, Trees Gr. Brit. & Irel. 7:1838 (1913); SCHNEIDER in SARG., Pl. Wilson. 3:32 (1916); NAKAI, Veg. Daiamond Mts. 168 (1918), in Bull. Soc. Dendrol. France no. 66:6 (1928), et Fl. Sylv. Kor. 18:199, t. 50 (1930); KUDO, Rep. Veg. North. Saghal. 97 (1924), et Nippon Yuyojumoku Bunruigaku ed. 4, 102, f. 17 (1941); TATEWAKI in Res. Bull. Coll. Exp. Forests Hokk. Imp. Univ. 4:156 (1927), 5:13 (1928), 5:78 (1928), et 7:111 (1932); REHDER in Jour. Arnold Arb. 12:68 (1928) in nota, Man. Cult. Trees & Shrubs 78 (1940), et Bibl. Cult. Trees & Shrubs 69 (1949); MAKINO et NEMOTO, Fl. Jap. ed. 2, 160 (1931); MIYABE et KUDO, Icon. Ess. For. Trees Hokkaido ed. 2, 1:43, t. 11 (1932); KIMURA in MIYABE et KUDO, Fl. Hokkaido & Saghal. 4:393 (1934); S.-C. LEE, For. Bot. China 167 (1935); SUGAWARA, Ill. Fl. Saghal. 2:659, t. 309 (1939); HOUTZAGERS, Gen. Populus ed. Italica, 47 (1950); OHWI, Fl. Jap. 397 (1953); LIOU et al., Ill. Fl. Lign. Pl. North-East China 127 (1955); MAKINO, Ill. Fl. Jap. ed. amplif. 676, f. 2026 (1955).

'*P. suaveolens* FISCHER', FR. SCHMIDT, Reis. Amurl. & Sachal. 61 et 174 (1868); MATSUMURA, Nippon Shokubutsumeii 149 (1884); SARGENT in Gard. & For. 6:404 (1893), et Forest Fl. Jap. 21 (1894); KAWAKAMI, Fig. & Descr.

Trees Hokkaido 170, f. 55 (1902); NAKAI, Fl. Korea. 2:211 (1911); MIYABE et MIYAKE, Fl. Saghal. 431 (1915); HULTÉN, Fl. Kamtch. 2:3 (1928) p. p.; KOMAROV, Fl. Penins. Kamtch. 2:2 (1929) p. p.; HARA in Bot. Mag. Tokyo 48:798 (1934); SUGIMOTO, Key Trees & Shrubs Jap. 27 (1936); HONDA, Nom. Pl. Jap. 40 (1939).

'*P. balsamifera* LINN. var. *suaveolens* LOUDON', MATSUMURA, Shokubutsu Mei-i 231 (1895), et Ind. Pl. Jap. 2(2):7 (1912); BURKILL in Jour. Linn. Soc. 26:535 (1899) (FORB. et HEMSL., Ind. Pl. Sin. 2) p. p.; SHIRASAWA, Icon. Ess. For. Trees Jap. 1, t. 18, f. 11-24 (1900), et text. 42 (1905) ut *suaveolens*.

NOM. JAP. Doro-noki, Doro-yanagi, Dero, Watadoro etc.

Trees attaining to 30 m in height, 1-2 m in diameter. **Bark** on young trunks smooth or with scattered slits like abacus-beads, greenish grey; on older trunks with dark longitudinal fissures sometimes toward the tops and sometimes a few meters on the lower part, pale greenish grey or greyish. **Young branches** very often reddish brown especially on young plants; leaf-scars elliptical-oblong or luniform; lenticels round, elliptical or slit-like; pith stellate in a cross section; short branches (vernal branches in our sense) pale brownish green or greyish brown, usually densely puberulous; shoots and turions (aestival branches) of similar colours, densely pubescent or puberulous in naked eyes or sometimes in lens or glabrous, often slightly angulate; older branches pale greyish green, glabrous or puberulous. **Winter buds** with imbricate scales, pale green or red-brownish green, viscid with yellowish or brownish substance, scales glabrous or ciliate and rarely puberulous; the terminal foliar, elongate-ovate-conical, long-pointed, 10-19 (-24) mm long, 4-9 mm in diameter; the axillary linear-fusiform, long-pointed and slightly curved, ca. 10-18 mm long, 2-5 mm in diameter, the floral ones rarely pubescent. **Leaves** deciduous, very variable in form; upper surface dark green and shining, pubescent, puberulous or sometimes glabrous on midribs and primary veins; lower surface pale greenish white or silver-white (by the thick white spongy tissue including many wide cavities in a cross section), densely pilose or puberulous and with glandular tips on the margin; sometimes with glandular dots at the base; midribs and pinnate primary veins conspicuous beneath, midribs and petioles often reddish especially on young plants; petioles terete, sulcate above, pilose, puberulous or glabrous, brownish green or red-brown. Leaves on short branches (our vernal leaves) densely spiral or sub-fasciculate; on young plants (and on short branches on vigorous an-
notinous shoots of adult plants) small and narrow, long or short elliptic, rhombic, or obovate-elliptic, acute or obtuse at the apex, cuneate, obtuse or

slightly pandurate at the base, 2-9 cm long, 1-4.5 cm wide, petioles 0.3-2.8 cm long; on adult plants often somewhat rugose above, long elliptic, ovate-elliptic, orbicular to oblanceolate-elliptic but generally orbicular-ovate or -elliptic, acute, cuspidate or obtuse and usually twisted at the apex, slightly cordate, rounded or slightly pandurate at the base, (2-) 6-13.5 cm long, (1-) 4-10 cm wide, petioles 2-6 cm long. Leaves on shoots and turions (our aestival leaves) spiral, flattened above, elliptic-lanceolate, wide oblong, ovate to orbicular-ovate, usually narrower than the leaves on short branches of adult plants, acute, cuspidate or obtuse and often twisted at the apex, slightly cordate or rounded at the base, 5-16 (-30.5) cm long, 3-15 (-18) cm wide, petioles 0.5-4 cm long. **Stipules** caducous, hairy like as leaves, lanceolate-linear, ca. 4-10 mm long, 0.5-2 mm wide on short branches; triangular-ovate, 5-6 mm long, 3-5 mm wide on shoots. **Flowers** dioecious, precocious in early spring, pendulous. Male aments at first cylindrical, nearly sessile, (3-) 5-10 cm long, 8-11 mm in diameter; axes glabrous or sometimes pubescent; bracts nearly reniform-orbicular, chocolate-brown, irregularly many-lobed, lobes linear-subulate and fringed with long hairs, pale yellowish green and cuneate at the base, 3-5 (or more) mm long, 4-5 (or more) mm wide; disks obliquely funnel-shaped, ca. 2 mm in diameter, with short stalks; stamens 20-40; filaments white, filiform; anthers oblong, red. Female aments at first cylindrical, short stalked, 3-8 cm long, ca. 8 mm in diameter, ca. 10-18 (-30) cm long at maturity; axes glabrous or sometimes pubescent, often 1.8 mm in diameter at the lower part, pedicels ca. 1 mm long or nearly sessile; bracts and disks similar to those of the male; ovaries glabrous, green, broadly ovate and ca. 2 mm long, sessile; styles 3, short, green; stigmata irregularly divided crestate, scarlet. **Capsules** broadly ovate, acute at the apex, (3-) 5-9 mm long, 4-8 mm in diameter, glabrous, green, with a persistent disk at the base, dehiscing into 3-4 recurved valves. **Seeds** minute, with many long white hairs at the base. Flowers in IV-V. Seeds maturing in VI-VII.

HABITATS. This species grows on the wet places such as the alluvial land along the river banks, where we often meet with many seedlings or young plants, or the lower slope on the hill-side, associated with other broad-leaved trees or solitarily, in the temperate or sub-boreal zones of Japan. The stems are very often straight and of big diameter, and moreover, the lowest branches are considerably high. Such magnificent trees are seen in Hokkaido still now, though they have become very few.

DISTR. Honshu (northward from the Kinki district), Hokkaido, South Kuriles, Saghalin, Kamtchatka (?), Amur, Ussuri, Siberia, North-East China

and Corea.

USES. Wood whitish, light and soft. Utilized for the same purposes as *P. Sieboldi*, i. e. timber for construction, ship and implements, boxes, wood-shaving, match-splints, material of pulp, charcoal for black powder and so on. Hairs of seeds locally used in place of cotton. A sort of balsam taken from buds.

NOTES. ① The pubescence of the leaves of this species is very variable in its degree and in the sort of hairs. Though forms with pubescent branches and leaves are common, it is not rare that we meet with entirely glabrous forms. As to the axes of aments, moreover, the glabrous forms seem to occur more frequently than the pubescent ones and there are many intermediate forms. We consequently can not decide how this differs from *P. suaveolens* FISCH., because of the condition that we want specimens of the latter. It seems for us, however, that the leaves of *P. suaveolens* are generally of a more lanceolate outline and acuminate apices. According to the photographs and the figures of LIOU et al. (t. 27, f. 47 et t. 28, etc.), *P. suaveolens* FISCH. in their sense are very similar to the specimens of *P. Maximowiczii* HENRY from Japan and the continent in the Japanese herbaria.

Populus ussuriensis KOMAROV [in Jour. Bot. URSS. 19:510 (1934)]; LIOU et al., Ill. Fl. Lign. Pl. North-East China 125, t. 29 et t. 33, f. 48 (1955). This is like to be a densely pubescent form of *P. Maximowiczii*. And a similar form had been already described in Corea by NAKAI in 1930: *P. Maximowiczii* var. *barbinervis* NAKAI, Fl. Sylv. Kor. 18:201.

② *Populus koreana* REHDER in Jour. Arnold Arb. 3:226 (1922), in Mitt. Deutsche Dendrol. Gesells. 38:37 (1927), Man. Cult. Trees & Shrubs ed. 2, 78 (1940), et Bibl. Cult. Trees & Shrubs 69 (1949); NAKAI in Bull. Soc. Dendrol. France no. 66:6 (1928), et Fl. Sylv. Kor. 18:196, t. 49 (1930); KIMURA in MIYABE et KUDO, Fl. Hokk. & Saghal. 4:394 (1934); NEMOTO, Fl. Jap. Suppl. 104 (1936); SUGIMOTO, Key Trees & Shrubs Jap. 27 (1936); HONDA, Nom. Pl. Jap. 40 (1939); HOUTZAGERS, Gen. Populus ed. Italica, 48 (1950); OHWI, Fl. Jap. 397 (1953) in nota sub *P. Maximowiczii*; LIOU et al., Ill. Fl. Lign. Pl. North-East China 123, t. 25 et t. 27, f. 45 (1955). (NOM. JAP. Chirimen-doro, Nioi-doro). Though the occurrence of this species has often been reported in Japan, it is not sure for us yet. According to our observations on the young plants of this from Corea (?), the only significant difference from *P. Maximowiczii* is the viscid-glandular character of young shoots. In this case, very short hairs usually are covered by the viscid substance. The other characters cited by REHDER (1922) are not much

significant but epharmonic or variable with individual plants. The viscosity becomes obscure or entirely not recognizable when the specimens dry. The rugoseness of the upper surface of the leaves, especially of the vernal ones on adult plants, in this case, is a secondary clew, and we laid down in the map (Pl. IX) the localities of the specimens which we temporarily treated as *P. koreana* by this character. In some of these localities there have been reports of its occurrence. But this character also is often continuous between the two species like the reddish colour of the branches, the petioles and the midribs which is more epharmonic and dependent to the habitats and the age of plants.

Other important characteristics, which we observed only on the above-mentioned young plants, are (i) that the opening of buds in this species is in late Feb. to early March in Tokyo and about two weeks earlier than *P. Maximowizii* (cfr. HOUTZAGERS), and (ii) that all the lateral branches on the annotinous shoots are of shoot-character and not of character of short branches as in *P. Maximowiczii*. We expect the examination of the type specimen and specimens from Corea as well as the reported localities in Japan, and at the same time the detailed investigations of these latter two characters.

Explanation of Plates

Pl. I and II : *Populus Sieboldi* MIQUEL.

Pl. I. Fig. 1. Vernal branch of adult tree ($\times 1$). 2, 3. Bracts of a male ament on the middle (2) and the lower part (3) ($\times 4$). 4. Male flower, dorsal view ($\times 10$). 5. Ditto, lateral view, bract taken away ($\times 9$).

Pl. II. Fig. 1. Terminal shoot on which the aestival and vernal leaves become very similar to one another ($\times 1$). 2. Short branch with vernal leaf (upper surface) on old tree ($\times 1$). 3. Aestival leaf on young plant showing upper surface ($\times 1$). 4. Branch bearing very young leaves and aments of dehisced capsules ($\times 1$). 5. Branch bearing younger capsules and large foliar bud ($\times 1$). 6. Male ament ($\times 1$).

Pl. III and IV : *Populus tremula* var. *Davidiana* SCHN.

Pl. III. Fig. 1. Vernal branch of adult tree ($\times 1$). 2. Bract of female flower ($\times 6$). 3. Bract of male flower ($\times 6$). 4. Two lateral views of capsule ($\times 6$). 5. Male flower, lateral view ($\times 6$). 6. Disk of male flower ($\times 6$).

Pl. IV. Fig. 1. Short branch bearing vernal leaf (upper surface) and some foliar and floral buds on old tree ($\times 1$). 2. Vernal leaf showing upper surface and marginal crenate teeth ($\times 1$). 3. Aestival leaf showing upper surface ($\times 1$). 4. Ditto, showing basal glands and hairs. 5. Branch bearing male aments ($\times 1$). 6. Branch bearing aments of young capsules ($\times 1$).

Pl. V and VI : *Populus Maximowiczii* A. HENRY.

Pl. V. Fig. 1. Short branch bearing ripened aments ($\times 1$). 2. Upper surface of midrib of leaf. 3. Lower surface of midrib and petiole. 4, 5. Valves of dehisced capsule, under and upper view ($\times 3$). 6. Ovary, lateral view, bract removed ($\times 9$). 7. Ditto, with bract, under view ($\times 9$). 8. Bract of female flower ($\times 9$). 9, 10. Bract and male flower (lateral view) without bract, of *P. koreana* from Corea ($\times 9$).

Pl. VI. Fig. 1. Seedling ($\times 1$). 2. Branch bearing winter buds ($\times 1$). 3. Vernal leaf on old tree, showing upper surface ($\times 1$). 4. Leaf on shoot, lower surface ($\times 1$). 5. Short branches on young tree ($\times 1$). 6. Aments of dehisced capsules ($\times 1$).

Pl. VII-IX. Distribution maps.

The specimens whose localities are laid down in these maps are mainly deposited in the herbaria of the Botanical Institute, Faculty of Science, Kyoto University, the Botanical Institute, Faculty of Science, Tokyo University, the Biological Institute, Faculty of Science, Tohoku University, the Botanical Institutes, Faculty of Agriculture and of Science, Hokkaido University and of Science Museum of Tokyo, and in our herbarium. Besides these, we have examined many wild plants and some valuable materials sent from other persons. To the curators of the said herbaria and them, we wish to express our deepest gratitude.

Pl. VII. ● : *Populus Sieboldi* MIQUEL ; ▲ : *P. tremula* var. *Davidiana* SCHN. including the specimens identified as *P. jesoensis* NAKAI by the determiner (but NAKAI's type

specimens are missing).

Pl. VIII. The intermediate specimens between *P. Sieboldi* and *P. tremula* var. *Davidiana*.

●: S' and S-1~4 in the text (p. 3); ▲: D-1~3; ■: the specimens of turions or shoots only. These turion or shoot specimens, especially those in Hokkaido, have no conclusive characteristic for identification, as mentioned in the text, while those in Honshu we treated as *P. Sieboldi* because of the condition that they usually have pentagonal-ovate leaves and that the typical forms of *P. tremula* var. *Davidiana* is very few or entirely absent southward from the Oshima Peninsula of Hokkaido.

Pl. IX. ●: *P. Maximowiczii* A. HENRY; ▲: the specimens with the leaves which are more or less rugose above.

日本産ハコヤナギ属樹木 (摘要)

大学院学生 浜谷稔夫*

教授 猪熊泰三*

本邦で5種の本属樹木が今までに報告されているが、そのいづれにも未だ分類学上の定説が出されていないし、また大陸産種の十分な資料と比較された場合にはそれらの分類学的な取扱いに重要な変更が生じることも考えられる。したがってニオイドロ *Populus koreana* REHDER の本邦自生の報告はまずこの観点からの検討を要する。私共のこの報告ではその中でも比較的良好に知られているヤマナラシ *P. Sieboldi* MIQUEL, チョウセンヤマナラシ *P. tremula* var. *Davidiana* SCHN. 及びドロノキ *P. Maximowiczii* A. HENRY の3種を主に扱い、やや詳しい記載と共に写図及び分布図をのせた。

I. ハコヤナギ節ハコヤナギ亜節 Sect. *Leuce* DUBY subsect. *Trepidae* SCHN.

一般に本属樹木の葉は多形で、種の同定・比較にあたって同類の葉を用いるべきであることは DODE 及び SCHNEIDER の指摘したところである。特に後者はドロノキ節 Sect. *Tacamahaca* で3種を区別した。しかし私共の *P. tremula* L. 及びチョウセンヤマナラシの若木に関する観察によると次のような著しい習性が見られる。すなわち徒長枝は6月頃一旦全く生長が止り(時に頂端に夏芽の形成が起る)、その後再び旺盛な伸長を始めるが、この休止点(または芽)の少し下にその上下の葉の形が全く異なる1点が認められる。成木では多くの場合この点と夏芽とは区別できなくなるし、またそれらの形成も外部諸条件により影響されることが多い。夏芽以上は徒長枝性が強く(これを夏枝 *aestival branches* と呼ぶことにする)、以下は短枝性が強い(春枝 *vernal branches*)。夏枝は吸枝 (*turions*) と対応するものと考えられ、成木では一部の頂枝のみにその形成が限定される。春枝は短枝として成木上では大多数がこれである。

上記の葉形の変る点以下の葉(春葉 *vernal leaves*)は分類学上重要である。若木と成木とでは多少形が異なるが、概して小形で、鋸齒は疎で開出し、葉の基部の腺が少く、葉柄は葉身とほぼ等長の傾向がある。また春枝と春葉とは無毛か或は長毛に被われる。

一方、それより上の葉(夏葉 *aestival leaves*)は本邦産種では重要な差別を示さな

* 東京大学農学部森林植物学教室

い。概して大形で、鋸歯は密で上向し、ほとんど常に腺があり、葉柄は短い。また夏枝・夏葉は共に密に短毛（時に長毛）で被われることが多い。しかし成木上では春葉と夏葉とがよく似てくるともしばしばである。

この葉を2型に分ける仕方はドロノキにもある程度通用するように思える。ただ若木の短枝上の葉が成木上のものと異り、徒長枝上の葉と成木の短枝上の葉とが多少似てくるので SCHNEIDER は3型を設けたものであろう（彼と私共とは多少意見を異にするが）。またこの習性は必ずしもハコヤナギ属の全節乃至全種には通用しない。

さて、本節の本邦産3種の中下記2種をわける主な区別点は成木の春枝と春葉に見出される次の諸性質である。① 次の各部の有毛性 (i) 春枝, (ii) 冬芽及び (iii) 春葉, ② 葉の基部の腺の有無, ③ 葉形 (i) 全形, 頭部及び基部及び (ii) 鋸歯, ④ 葉柄長。すなわち:

○若い春枝と冬芽は有毛。春葉は傾向として卵形乃至三角状卵形, 鋭頭, 円底乃至円状截底時に僅かに浅心底, 鋸歯は細かく上向し規則的, 下面（及び時に上面にも）に長毛が密に生じやや宿存性, 通常腺がある。葉柄は葉身より短い。……………1. ヤマナラシ

○若い春枝と冬芽はほとんどまたは全く無毛。春葉は概して円形, 鈍頭, 円底乃至鈍底, 鋸歯は粗で開出し不規則, 下面は全く無毛か長毛を散生し時に縁毛がある, 通常腺がない。葉柄は葉身とほぼ等長。……………2. チョウセンヤマナラシ

この両種の代表的な型は互によく識別できるが, 各特徴にそれぞれ移行があるほか, これらの特徴のいろいろな組合せを示す多くの中間型が見られる。私共は全く機械的にこれを有毛型 (S', S-1~4) と無毛型 (D-1~3) に分けて地図 (Pl. VIII) にその産地を記入したが, これは単に両種間の関係を理解するための方便にすぎず, その詳細な論議は他の機会にゆずる。

1. ヤマナラシ (ハコヤナギ) *Populus Seiboldi* MIQUEL.

この種はあるいは欧亜大陸産 *P. tremula* L. の亜種または変種となるべきものかもしれない。また朝鮮産スイゲンヤマナラシ *P. glandulosa* UYEKI はこの種の1型であろう。

2. チョウセンヤマナラシ (カラフトヤマナラシ) *P. tremula* L. var. *Davidiana* SCHN.

母種とは僅かに鋸歯の形で区別されるにすぎない。北海道及び朝鮮に葉が大形で鋸歯のやや内曲して粗なものが見られる。また大陸産のものは概して小形の葉をもつ。エゾ

ヤマナラシ *P. jesoensis* NAKAI は前者の型である。しかし両者の差は必ずしも明確でなく、時に同一株上で観察される。この変種の多くの有毛品を私共は上記の中間型 (S系) に含めた。

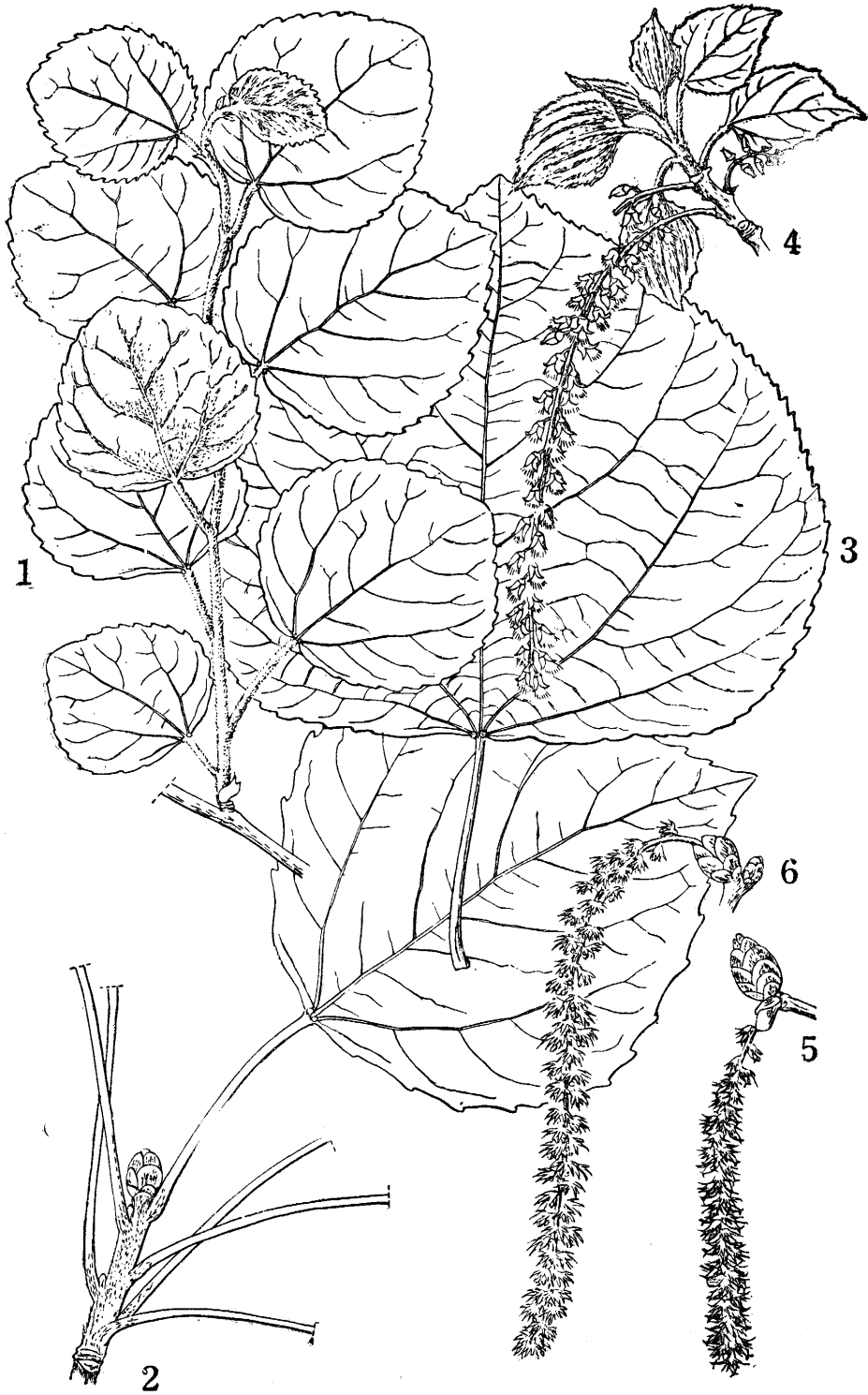
II. ドロノキ節 Sect. *Tacamahaca* SPACH.

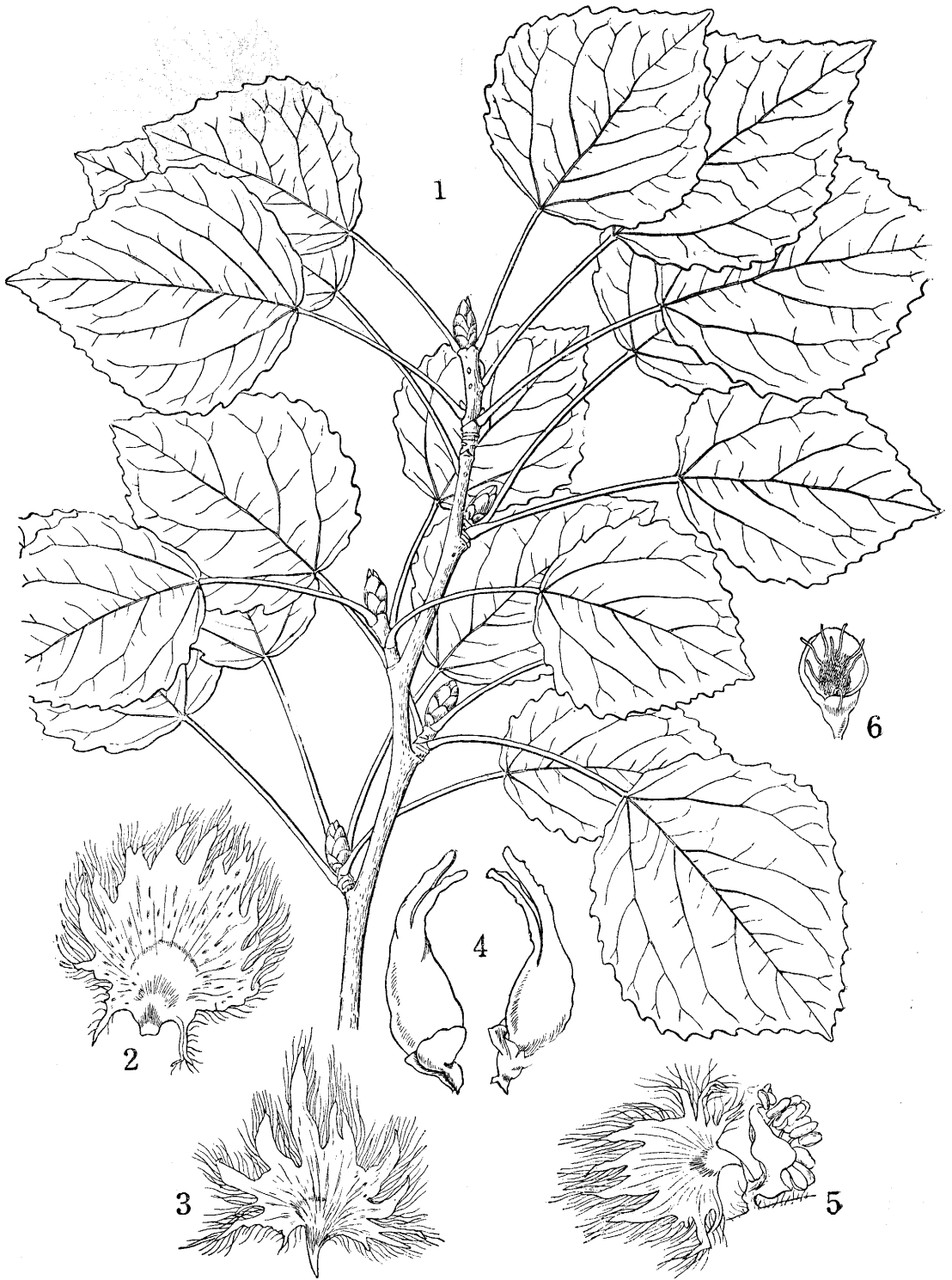
3. ドロノキ *P. Maximowiczii* A. HENRY.

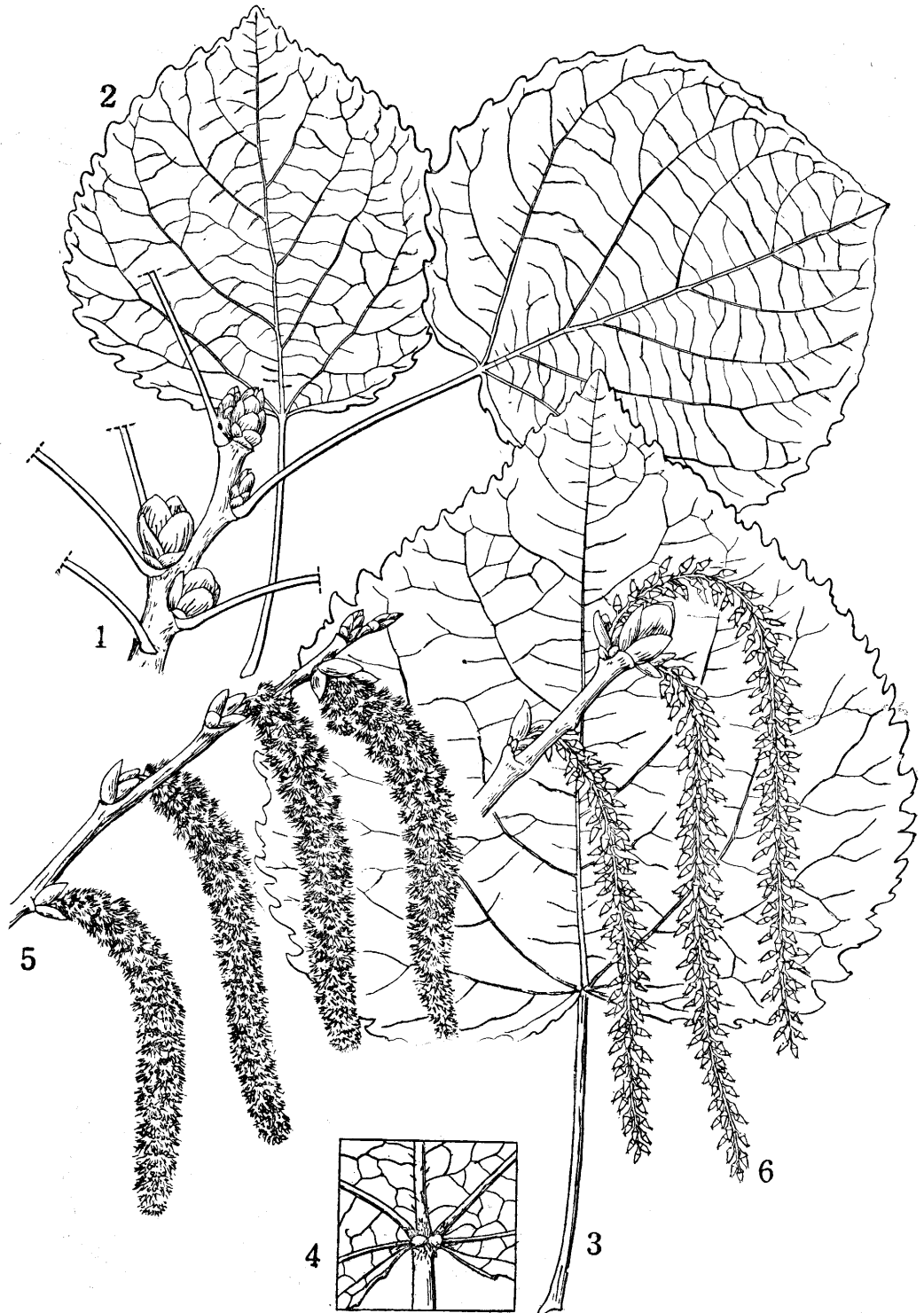
この種の葉の中肋、葉柄及び花序軸の有毛性には変異が大きく、欧亜大陸産の *P. suaveolens* FISCHER との区別は明確でない。多少葉形が異なるように思われるにすぎない。中国東北産 *P. ussuriensis* KOMAROV はこれのやや多毛な型であろう。ニオイドロ (チリメンドロ) *P. koreana* REHDER は北海道及び本州南アルプスでしばしばその自生が報告されたが私共は未だ現地で確認していない。ドロノキとの唯一の区別点は若い枝の粘性であるが腊葉にするとわからなくなる。その際第二の手掛りは葉表面のシワであるがこれはドロノキと中間型が多い。私共はシワのやや著しい腊葉の産地を地図 (Pl. IX) に記入した。REHDER の指摘したその他の性質は全く個体差か単に環境的影響によるものである。更にその開舒が東京でドロノキより約2週間早いこと、及び若木では前年の徒長枝上の本年の枝が皆やはり徒長しドロノキのように短枝状にならないことの2点は重要な区別と考えられるがなお詳細な調査を要する。

(昭和32年3月15日 東京大学農学部森林植物学教室において)









Pl. V

