

TAXONOMICAL NOTES ON THE GENUS *FILIPENDULA* ADANS. (ROSACEAE)

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The genus *Filipendula* (*Rosaceae*) consisting of about a dozen species is widely distributed in the temperate and subarctic zone of the Northern Hemisphere. Taxonomically speaking, LINNÉ (1753) described two European members of the present genus under the genus *Spiraea*, i. e. *S. Filipendula* L. and *S. Ulmaria* L. Although the name *Filipendula* already appeared in TOURNEFORT'S (1719) and was effectively published as a generic name by ADANSON (1763), it had never prevailed till MAXIMOWICZ (1879) brought out his monograph on *Filipendula*. Consequently, the members of *Filipendula* published between LINNÉ and MAXIMOWICZ had been dealt with as those of *Spiraea*, such as *S. palmata* PALL., *S. kamtschatica* PALL., *S. lobata* GRONOV, and *S. angustiloba* TURCZ. In 1879, MAXIMOWICZ separated the above seven species from *Spiraea*, and at the same time added two species to the flora of Japan proper, *F. multijuga* and *F. purpurea*. The most important diagnostic character on which he delimited *Filipendula* was that the fruit of *Filipendula* was indehiscent (achene) while that of *Spiraea* dehiscent (follicle). It was based upon this character that FOCKE (1894) referred these two genera to the different subfamilies of *Rosaceae*, i. e. *Rosoideae* and *Spiraeoideae*.

Recently, JUZEPČUK (1941) subdivided *Filipendula* into several subgenera and sections, which were partly emended by POPOV (1957). In their systems, however, the species not indigenous to their own country were not listed, so that some species have been still remained to be ranked. They are *F. occidentalis* (S. WATS.) HOWELL, *F. kiraihiensis* HAYATA, *F. coreana* NAKAI, *F. formosa* NAKAI, *F. glaberrima* NAKAI, *F. yezoensis* HARA, *F. Tsuguwoi* OHWI, and so on. To clarify systematic and phylogenetic situation of these species, I present a taxonomic revision and phylogenetic consideration of the genus *Filipendula* in the following pages.

The materials on which the present paper is based owe to the herbaria of Kyoto University, Japan (KYO), Tokyo University, Japan (TI), the National Science Museum, Tokyo, Japan (TNS), the National Taiwan University, Taiwan (TAI), the Taiwan Forestry Research Institute, Taiwan (TAIF), the Harvard University, U. S. A. (GH), and the Royal Botanic Garden, Kew, England (K). I am much grateful herewith to the directors and curators of these herbaria for their

kind provision of much valuable materials. I am also greatly indebted to Dr. B. K. SCHISHKIN and Dr. C. V. SERGIEVSKAYA of the Academy of Science, U. S. S. R., Dr. S. HIRATA of Miyazaki University, Japan, and Mr. T. YAMANAKA of Kochi University, Japan, who all made special kindness to provide me with indispensable materials. Finally I must express my special thanks to Dr. S. KITAMURA and Dr. M. TAGAWA of Kyoto University, Japan, for their constant guidance, and also to Dr. N. KOYAMA of Shinshu University, Japan, for his kind encouragement throughout the course of this study.

Filipendula

(Rosoideae-Ulmariae)

[TOURN.], Inst. 293, t. 150 (1719); MILL., Gard. Dict. ed. 4 (1754), nom. nud.; ADANS., Fam. Pl. 2:295 (1763); MAXIM., Act. Hort. Petr. 6:245 (1879); ASCHERS. & GRAEBN., Syn. Mitteleur. Fl. 6:436 (1902); RYDBERG, N. Am. Fl. 22:266 (1908); KOIDZ., Consp. Ros. Jap. 203 (1913); JUZ., Fl. URSS 10:279 (1941); OHWI, Fl. Jap. 646 (1953); JUZ., Not. Syst. URSS 17:239 (1955); POPOV, Fl. Central Sib. 1:305 (1957). — *Spiraea* (p. p.) L., Sp. Pl. ed. 1, 490 (1753); WILLD., Sp. Pl. 2:1061 (1799); BENTH. & HOOK., Gen. Pl. 1:611 (1865); BAILL., Hist. Pl. 455 & 469 (1869). — *Spiraea* sect. *Ulmaria* CAMB., Ann. Sci. Nat. 1:378 (1824); DC., Prodr. 2:545 (1825); ENDL., Gen. Pl. 1247 (1836–40); LEDEB., Fl. ROSS. 2:16 (1844). — *Ulmaria* HILL, Hort. Kew. 213 (1768); MOENCH, Meth. 663 (1794); FOCKE in ENGL. & PRANTL, Nat. Pfl. Fam. 3 (3): 40 (1894). — *Thecanisia* RAF., New Fl. 2:38 (1837).
Type species : *F. hexapetala* GILIB. (*Spiraea Filipendula* L.)

KEY TO INFRAGENERIC TAXA

- A. Perianth hypogynous, calyx tube obscure, sepal accrescent (Subgen. *Hypogyna*).
..... 1. *F. occidentalis*
- AA. Perianth perigynous, calyx tube more or less distinct obconical or hemisphaerical, sepal not accrescent.
 - B. Root never tuberous, lateral leaflets, if present, ovate or palmate not so numerous, carpels glabrous or ciliate on the margins (Subgen. *Ulmaria*).
 - C. Achenes oblong stipitate or articulate.
 - D. Achenes stipitate, floral segments 4–5 (Sect. *Schalameya*).
 - E. Lateral leaflets, if present, ovate and rather small, sometimes absent.
 - F. Inflorescence pubescent, flower always white. 2. *F. kamtschatica*
 - G. Stems hispid. f. *kamtschatica*
 - GG. Stems glabrous. f. *pilosa*
 - FF. Inflorescence glabrous, flower purple or white.
 - G. Petal clawed, lateral leaflets few or none.
 - H. Achenes attenuate towards the bases, terminal leaflets shallowly cleft, flower white. 3. *F. glaberrima*

- HH. Achenes with distinct stipes, terminal leaflets profoundly cleft, flower usually purple often whitened.
- I. Stipule membranaceous without auricle, leaves with minute cartilaginous hairs at the margin. 4. *F. yezoensis*
- J. Leaves beneath slightly pubescent mostly only on the nerves. var. *yezoensis*
- K. Flower purple. f. *yezoensis*
- KK. Flower whitened. f. *alba*
- JJ. Leaves beneath densely hispid. var. *hispidula*
- II. Stipule herbaceous more or less auricled amplexicaul, leaves smooth at the margin. 5. *F. purpurea*
- J. Stipule obscure, lateral leaflets absent. var. *purpurea*
- K. Flower purple. f. *purpurea*
- KK. Flower whitened. f. *albiflora*
- JJ. Stipule distinct, lateral leaflets 1-2-paired, flower purple. var. *auriculata*
- GG. Petal clawless, lateral leaflets several. 6. *F. multijuga*
- H. Achenes glabrous. var. *multijuga*
- I. Flower purple. f. *multijuga*
- II. Flower whitened. f. *albiflora*
- HH. Achenes ciliate on the margins, flower purple. var. *ciliata*
- EE. Lateral leaflets palmately 3-5-cleft rather large.
- F. Achenes ciliate on the margins, flower white. 7. *F. palmata*
- G. Leaves white tomentose beneath. f. *palmata*
- GG. Leaves greenish beneath. f. *nuda*
- FF. Achenes glabrous on the margins, flower purple. 8. *F. rubra*
- DD. Achenes articulated sessile, floral segments 5-6 (Sect. *Albicoma*). 9. *F. angustiloba*
- E. Leaves glabrous beneath. f. *angustiloba*
- EE. Leaves white tomentose beneath. f. *leiocarpa*
- CC. Achenes with semicordate or semiorbicular bases.
- D. Carpels basally attached, achenes with semiovate or semiorbicular bases (Sect. *Sessilia*).
- E. Carpels erect more than 5, floral segments 5-6.
- F. Flower perfect yellowish, achenes ciliate on the margins usually 10-12. 10. *F. vestita*
- G. Leaves white tomentose beneath. f. *vestita*
- GG. Leaves greenish beneath. f. *depauperata*
- FF. Flower not always perfect white, achenes glabrous usually 7-9. 11. *F. kiraishiensis*
- EE. Carpels twisted less than 5, floral segments 4-5.

- F. Flower dioecious white, achenes 4-5.12. *F. Tsuguwoi*
 FF. Flower perfect purple, achenes 1-2.13. *F. formosa*
 DD. Carpels laterally attached, achenes with semicordate bases (Sect.
Ulmaria). 14. *F. Ulmaria*
 E. Leaves white tomentose beneath. var. *Ulmaria*
 F. Flower 6-8mm in diameter. f. *Ulmaria*
 FF. Flower 10-12mm in diameter. f. *megalocarpa*
 EE. Leaves greenish beneath. var. *denudata*
 BB. Root tuberous, lateral leaflets narrowly lanceolate and pinnately incised
 numerous, carpels pilose all over (Subgen. *Filipendula*).
 15. *F. hexapetala*

ENUMERATION OF INFRAGENERIC TAXA

I. **Subgen. Hypogyna** T. SHIMIZU, subgen. nov. *Perianthia hypogyna*, hinc calycium tubi obsoleti. Sepala accrescentia. Achenia circumcirca pilosa. Styli elongati. Species unica : *F. occidentalis* (S. WATS.) HOWELL

1. ***F. occidentalis*** (S. WATS.) HOWELL, Fl. NW Am. 1:85 (1898); RYDBERG, N. Am. Fl. 22:268 (1908).—*Spiraea occidentalis* S. WATS., Proc. Am. Acad. 18:192 (1883). SPECIM. EXAM. U. S. A. Rocky shady banks of the Trask river 10 miles above, Tillamook Co., Oregon, J. W. TOMPSON s. n. June 18, 1936—**topotype** (GH). Distr. Endemic in western Oregon, U. S. A.

The topotype specimen I examined is one of the most singular representatives among the present genus. The following characters are peculiar to this species : calyx tubes never distinct; sepals accrescent to be lineally lanceolate, 4-5mm long, 1-3-dentate, herbaceous in texture, inside glabrous but outside ascendently pilose on the nerves ; petals elliptical, large in size 5-6mm long and 3-4mm wide, clawless, provided with veins not converging at the bases to be rather in parallel; carpels 8-13 conspicuously ciliate on both the margins, pilose on the whole bodies ; achenes 7-8mm long attenuate towards the distinct stipes ; styles much elongated to occupy 1/3 to 1/2 of the whole length of the achenes. For these characters peculiar, this species should be given an independent subgeneric rank.

According to RYDBERG (1908), this is recorded only from western Oregon. Any other localities of this species have not been reported thereafter, and I have not exact localities of it save the type locality. It seems to be strictly confined to the Coast Range of Oregon. Referring to its primitive character of absence of calyx

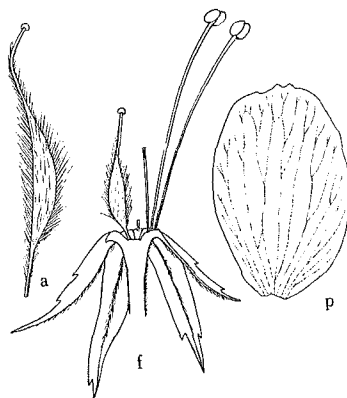


Fig. 1 Floral parts of *F. occidentalis*
 a : achene, p : petal, f : longitudinal section of a flower ($\times 5$)

tubes and its restricted area, it must be one of the old endemics of North America.

II. **Subgen. *Ulmaria*** (HILL) JUZ., Fl. URSS 10:284 (1941), nom. subnud. & Not. Syst. URSS 17:240 (1955); POPOV, Fl. Central Sib. 1:305 (1957). —Subgen. *Aceraria* JUZ., l. c. 280 (1941) & l. c. 239 (1955).

Type species : *F. Ulmaria* (L.) MAXIM. (*Spiraea Ulmaria* L.)

JUZEP CZUK (1941) subdivided *Filipendula* indigenous to his country into three subgenera, *Aceraria* with two sections, *Ulmaria* and *Eu-Filipendula*. POPOV (1957) was of opinion that the first two subgenera would not deserve the respective ranks, and reduced them to two different sections of Subgen. *Ulmaria*. It was based on the same diagnostic characters that they subdivided the genus into three subgenera or two. Apart from Subgen. *Filipendula* (Subgen. *Eu-Filipendula*), which both of them accepted, the group with achenes laterally attached was Subgen. *Ulmaria* of JUZEP CZUK and Sect. *Eu-Ulmaria* of POPOV, while the group with those basally attached was Subgen. *Aceraria* of the former and Sect. *Schalameya* of the latter. From the view point of world-wide species, *F. occidentalis* and *F. hexapetala* are so particular among the genus and the rest are so related one another that POPOV's treatment on the two subgenera is followed here.

(1) **Sect. *Schalameya*** JUZ., Fl. URSS 10:280 (1941), nom. subnud. & Not. Syst. URSS 17:239 (1955); POPOV, Fl. Central Sib. 1:305 (1957).

Type species : *F. kamtschatica* (PALL.) MAXIM.

The species referred to the present section is characterized by oblong stipitate achenes. Their ventral margins of the bodies are almost equal in length to or rather longer than the dorsal ones.

2. ***F. kamtschatica*** (PALL.) MAXIM., Act. Hort. Petr. 6:248 (1879); KOMAR., Fl. Mansh. 2:524 (1903); RYDBERG, N. Am. Fl. 22:268 (1908); KOIDZ., Consp. Ros. Jap. 207 (1913); HULT., Fl. Kamtsch. Adj. Isl. 3:79 (1929); HARA, Bot. Mag. Tokyo 49:123 (1935); JUZ., Fl. URSS 10:281 (1941); OHWI, Fl. Jap. 647 (1953);

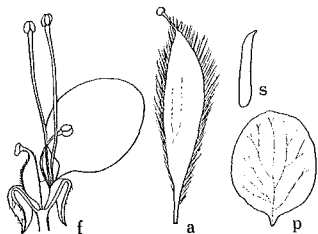


Fig. 2 Floral parts of
F. Kamtschatica s: seed (×5)

KITAM. & MURATA, Col. Ill. Herb. Pl. Jap. (*Choripetalae*) 123 (1961). —*Spiraea kamtschatica* PALL., Fl. Ross. 1:41, t. 28 (1784); WILLD., Sp. Pl. 2:1062 (1799); DC., Prodr. 2:545 (1825); CHAMISS, Linnaea 6:589 (1831); LEDEB, Fl. Ross. 2:19 (1844). —*S. palmata* (non PALL.) THUNB., Fl. Jap. 212 (1784), p. p.

f. ***kamtschatica*** —*F. k.* f. *typica* KOIDZ., Bot. Mag. Tokyo 23:180 (1909) & l. c. (1913).

SPECIM. EXAM. KAMTCHATKA. Petropavlovsk, SHIROV & SAKAVNINA s. n. Sept. 26, 1930 (KYO), Yavino, T. SAWADA 82 (KYO). SAGHALIEN. Korsakov, U. FAURIE 582 (KYO), Sakaehama, G. KOIDUMI s. n. Aug. 13, 1930 (KYO), Hoe, H. TOBITA s. n. Jul. 25, 1935 (KYO), at the coast of Tonai lake, S. SAWADA s. n. Jul. 20, 1930 (TI), Is. Kaiba, S. KOMAT s. n. Aug. 12, 1915 (TI). KURILES. Is. Paramushir, J. OHWI & R.

YOSHII 5938 (KYO), Is. Alide, J. OHWI & R. YOSHII 5862 (KYO), Is. Kunasiri, Y. MUTSUMURA s. n. Jul. 20, 1930 (KYO), Is. Shumushu, K. Yendo (TI). HOKKAIDO. Is. Rishiri, M. HIROE 7515 (KYO), Mt. Daisetsu, Ishikari, G. MURATA & Y. MOMOTANI 89 (KYO), Kanayama, Ishikari, J. OHWI 5274 (KYO), Abashiri, T. HORIKAWA 675 (KYO), Rubeshibe-cho, Kitami, G. MURATA & Y. MOMOTANI 516 (KYO), Sibecha, Kushiro, M. Tamura s. n. Jul. 31, 1954 (KYO), Hakodate, Z. TASHIRO s. n. Jul. 13, 1936 (KYO), Kuchinai, Oshima, K. MIYABE s. n. Jul. 15, 1890 (TI). HONSHU. Mt. Hakkoda, Pref. Aomori, S. MURAI s. n. Jul. 29, 1933 (KYO), Yanagawa-mura, Pref. Iwate, S. YUKINOURA 8 (KYO), Ozegahara, Pref. Gumma, S. KITAMURA s. n. Jul. 31, 1952 (KYO), Is. Sado, G. MURATA 6364 (KYO), Togakushi, Pref. Nagano, S. MATSUDA s. n. (KYO), Mt. Hakusan, Pref. Ishikawa, T. SHIMIZU 4586 (KYO).

f. *pilosa* KOIDZ., l. c. (1909) & l. c. (1913); OHWI, l. c. (1953). — f. *glabra* KOIDZ., l. c.; OHWI, l. c.

SPECIM. EXAM. KAMTCHATKA. Triyaparatunga, K. IGAWA s. n. Sept. 8, 1922 (TI), Middle Anatcha river, E. HULTÉN 4213 (GH). SAGHALIEN. Toyohara, H. MURAMATSU s. n. Jul. 5, 1923 (TI), *ibid.*, G. KOIDZUMI s. n. Aug. 6, 1930 (KYO), Mt. Tosso, N. HIRATSUKA s. n. Jul. 20, 1927 (TI), Kita-itada, s. leg. & s. n. Aug. 3, 1913 (TI), Chipesani, G. NAKAHARA s. n. Aug. 1906—*type* of f. *glabra* (TI), Is. Kaiba, S. KOMAT s. n. Aug. 12, 1915 (TI). KURILES. Is. Urup, K. UCHIYAMA s. n. Jun. 17, 1891 — *syntype* (TI), Is. Shikotan, J. OHWI 1061 (KYO), Is. Paramshir, Y. YASUKAWA s. n. Aug. 1923 (KYO). HOKKAIDO. Jozankei, Ishikari, J. MATSUMURA s. n. Aug. 8, 1898 — *lectotype* (TI), Is. Rishiri, M. FURUSE 21541 (KYO), Mt. Apoi, Z. TASHIRO s. n. Jul. 19, 1936 (TI), Mt. Shiribeshi, G. MURATA 9171 (KYO). HONSHU. Aomori, N. KINASHI 688 (KYO), Mt. Hayachine, Y. OGURA s. n. Jul. 31, 1915 (TI), Akita, U. FAURIE 6055 (KYO), Mt. Gassan, Y. OGURA s. n. Aug. 18, 1915 (TI), Kanzan-pass, Pref. Miyagi, Z. TASHIRO s. n. Jul. 17, 1935 (KYO), Hinoemata-mura, Pref. Fukushima, J. OHWI & M. TAGAWA 471 (KYO), Mt. Mamba, Pref. Niigata, J. YOSHIKAWA 18 (KYO), Tanigawa-onsen, Pref. Gumma, K. OKAMOTO s. n. Jul. 29, 1956 (KYO), Mt. Hakuba, J. OHWI 7745 (KYO), Kirigamine, Pref. Nagano, G. MURATA 11108 (KYO), *ibid.*, M. TAGAWA & K. IWATSUKI 278 (KYO), *ibid.*, T. SHIMIZU 12798-12801 (SHIN*), Mt. Kitadake, M. TAGAWA 1161 (KYO), Mt. Dainichi, Pref. Gifu, Z. TASHIRO s. n. Jun. 30, 1933 (KYO), Babadani-onsen, Pref. Toyama, J. OHWI 7654 (KYO), Mt. Hyonosen, Pref. Hyogo, E. ISHIKAWA s. n. Aug. 29, 1928 (KYO), Mt. Hanami, Pref. Okayama, Z. TASHIRO s. n. Aug. 29, 1928 (KYO).

Distr. Sp. Is. Bering (by HULTÉN), Kamtchatka, Saghalien, Kuriles, Ussuri (by JUZEP CZUK), Hokkaido and north, middle and a part of west Honshu.

Hairiness of inflorescences is much characteristic of this species in Sect. *Schalameya*. Contrary to the original description, even the type specimen named f. *glabra* has minute pubes on all branches of the inflorescence. This is why the name f. *glabra* should be reduced to a synonym of f. *pilosa*, which is delimited from the typical form by its pubescent but not hispid inflorescence. The typical form of this species is provided with minute pubes on inflorescence, and at the same time with rough hairs on stem and inflorescence. Generally speaking, the more

* This abbreviation indicates the herbarium of Shinshu University in Ueda of Japan, which was settled in 1961 chiefly basing upon my own collections.

northward the more hispid on stems and inflorescences the plants are. Almost all of the specimens from middle or west Japan are glabrous on stems, and lack in rough hairs on inflorescences, while those from Kamtchatka or Saghalien are rich in bristle.

Referring to leaf shape, this species usually has no lateral leaflets but a few appendices on petioles. The terminal leaflets are shallowly cleft and possess truncate or much shallowly cordate bases. However, some of the specimens from middle Honshu, for instance, those from Mt. Kirigamine cited above, are much profoundly cordate at the base of the terminal leaflets, and besides distinctly two or three paired as to the lateral ones. Consequently, these specimens are closely related in their leaf shape to *F. multijuga* or *F. purpurea* var. *auriculata*.

Geographically, this species ranges from the coastal region of Amur or Kamtchatka to the northern half of the Japan Islands. HULTEN (1937) pointed out that it never extended to the Aleutian Islands but to Is. Bering at the westernmost of them. It is one of the subarctic members of the Far East flora.

3. *F. glaberrima* NAKAI, Fedde Repert. 13:274 (1914) & Bot. Mag. Tokyo 29 (30) (1915) & Veg. Chirisan 34, 84 (1915); MORI, Enum. Pl. Cor. 196 (1922). —*F. kamtschatica* var. *glaberrima* NAKAI, Bot. Mag. Tokyo 26:129 (1913), nom. nud. & 27:131 (1914), nom. nud. —*F. glabra* NAKAI ex KOMAR. et KLOB.-ALIS., Key Pl. Far East Reg. URSS 2:653 (1932); JUZ., Fl. URSS 10:281 (1941), p. p. —*F. palmata* var. *glabra*, auct. —*F. purpurea* (non MAXIM.) NAKAI, Fl. Sylv. Kor. 7: 8 (1918). —*Ulmaria kamtschatica* (non MATSUM.) NAKAI, Fl. Kor. 2:480 (1911). —*U. palmata* (non FOCKE) NAKAI, Fl. Kor. 1:20 (1909).

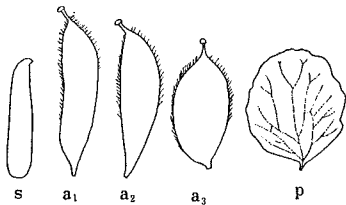


Fig. 3 Floral parts of
F. glaberrima (×5)

SPECIM. EXAM. KOREA. Quensan, Prov. S. Hamgyeng, T. NAKAI s. n. Jul. 9, 1909—**syntype** (TI), *ibid.*, U. FAURIE 350 (KYO), Chosankan, Prov. Hwang-hai, T. NAKAI 12904 (TI), Setsugaku-san, Prov. Kang-wen, T.

NAKAI s. n. Jul. 19, 1936 (TI), Uchikongo, Prov. Kang-wen, M. KOBAYASHI 68 (TI), Mt. Kongo, Prov. Kang-wen, T. NAKAI 5527, 5528 (TI), *ibid.*, G. KOIDZUMI s. n. Aug. 12-14, 1932 (KYO), *ibid.*, FURUSHIMA & NAKAO s. n. Aug. 7, 1932 (KYO), Kariosan, Prov. Kang-wen, S. BOKUZAWA s. n. Jul. 27, 1941 (TNS), Koang-neug, Prov. Kyeng-kwi, T. MORI s. n. —**lectotype** (TI), *ibid.*, G. KOIDZUMI s. n. Aug. 20-21, 1932 (KYO), Sorai Beach, Prov. Kyeng-kwi, R. G. MILLS s. n. Jul. 12, 1921 (TI), Mt. Hokukanzan, Prov. Kyeng-kwi, s. leg. & s. n. May 26, 1912 (TI), Mt. Nankanzan, Prov. Kyeng-kwi, T. UCHIYAMA s. n. Aug. 2, 1902—**syntype** (TI), Mt. Chirubulsusan, Prov. Kyeng-kwi, T. NAKAI 695—**syntype** (TI), *ibid.*, T. NAKAI s. n. Jul. 6, 1913 (TI), Mt. Chirisan, Prov. S. Kyengsang, T. MORI 168—**syntype** (TI), *ibid.*, G. KOIDZUMI s. n. Sept. 1, 1933 (KYO), *ibid.*, S. OKAMOTO s. n. Jul. 22, 1935 (KYO)

Distr. Ussuri (by JUZEP CZUK) and Korea.

Compared with *F. kamtschatica*, this species, to which at first was given a

varietal rank under the former, is easily distinguishable from it by completely glabrous stems to be lustrous and membranaceous smaller stipules. Contrary to the original description, the achenes of the type specimens attenuate towards the bases to end in very short but distinct stipes. In this respect, it is natural that the present species should be ranked in Sect. *Schalameya* as JUZEPCZUK did. Cilia of the achenes are neither so long nor so dense as in *F. kamtschatica*.

Geographically, JUZEPCZUK (1941) recorded *F. glabra* NAKAI from Ussuri and Udshoi as well as Korea. Then, he cited *F. kamtschatica* var. *glaberrima* NAKAI but not *F. glaberrima* in synonymy. Although why he made no reference to *F. glaberrima* itself is unknown to me, *F. glabra* is no doubt synonymous with *F. glaberrima*. All the specimens available to me came from Korea only. However, it might be sure that the present species was distributed also in the Ussuri district.

4. *F. yezoensis* HARA, Journ. Jap. Bot. 10:235 (1934) & Bot. Mag. Tokyo 49:123 (1935).—*F. multijuga* var. *yezoensis* HARA, l. c. (1934), pro syn.; OHWI, Fl. Jap. 647 (1953).—*F. m.* var. *koreana* NAKAI, Bot. Mag. Tokyo 27:132 (1913), nom. nud. & Fedde Repert. 13:274 (1914) & Bot. Mag. Tokyo 29:(30) (1915).—*F. koreana* NAKAI ex MORI, Enum. Pl. Cor. 197 (1922), nom. nud.; NAKAI, Veg. Waigalbon 39 (1916), nom. nud. & Fl. Sylv. Kor. 7:8 (1918), nom. nud.; KITAG., Lineam. Fl. Mansh. 260 (1939).—*F. purpurea* (non MAXIM.) KOMAR., Act. Hort. Petr. 22:523 (1903) & Fl. Mansh. 2:523 (1903), p. p. & Fl. Sib. Orient. 2:650 (1932).—*F. purpurea* (non MAXIM.) JUZ., Fl. URSS 10:282 (1941), p. p.—*F. ciliata* KUDO, Veg. Yezo 263 (1925), p. p.—*F. ciliata* MIYABE et KUDO in TATEW., List Pl. Teshio Univ. Exp. For. 1:23 & Veg. Mt. Apoi 91 (1928), nom. nud.; NAKAI, Veg. Mt. Apoi 54 (1930), nom. nud.—*F. multijuga* var. *ciliata* KOIDZ., Bot. Mag. Tokyo 23:178 (1909), p. p. & Consp. Ros. Jap. 205 (1913), quoad pl. ex Hokkaido.

var. *yezoensis*.

f. *yezoensis*.

SPECIM. EXAM. HOKKAIDO. Nupuro-mapporo, Teshio, H. HARA s. n. Jul. 21, 1956 (TI), *ibid.*, S. KITAMURA s. n. Aug. 3, 1953 (KYO), Mt. Teshio, Teshio, R. IMAZEKI s. n. Jul. 25, 1941 (TNS), Saru, Teshio, U. FAURIE 10394 (KYO), Teshio First Forest, Teshio, Y. KUDO 4511 (TAI), Kamuikotan, Ishikari, K. MIYABE s. n. Aug. 12, 1891 (TI), Mt. Yubari, Ishikari, G. KOIDZUMI s. n. Aug. 17, 1916 (TI), *ibid.*, G. KOIDZUMI s. n. (TI), *ibid.*, M. HONDA s. n. Aug. 1938 (TI), *ibid.*, H. YANAGISAWA s. n. Aug. 8, 1914 (TAI), Kanayama, Ishikari, U. FAURIE s. n. Jul. 1905 (KYO), Mt. Hanmen, Ishikari, S. IGARASHI s. n. Jul. 4, 1914 (TAI), Mt. Apoi, Hidaka, T. NAKAI s. n. Aug. 1928—**type** fr. (TI), *ibid.*, H. HARA s. n. Jul. 8, 1933—**type** fl. (TI), *ibid.*, S. OKUYAMA s. n. Jul. 26, 1941 (TNS), *ibid.*, Z. TASHIRO s. n. Jul. 18, 1936 (KYO). KOREA. Tonai, Mozan-gun, Prov. N. Ham-gyeng, J. OHWI s. n. Jul. 31, 1930

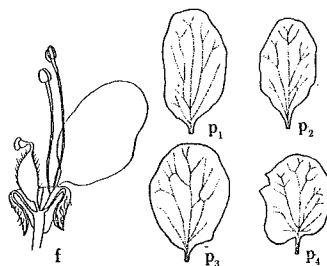


Fig. 4 Floral parts of *F. yezoensis* (×5)

(KYO), Gojo, Prov. N. Ham-gyeng, T. SAITO 1142 (KYO), Mt. Nankasekizan, Prov. N. Ham-gyeng, T. ISHIDOYA s. n. Jul. 1931 (KYO), Flum. Jalu, V. KOMAROV s. n. Jul. 6, 1897—**type** of *F. coreana* (TI), Sanbo, Abe-gun, Prov. S. Ham-gyeng, N. NOMURA s. n. Aug. 14, 1933 (KYO), Tojomen, Shinkyo-gun, Prov. S. Ham-gyeng, G. KOIDZUMI s. n. Jul. 25, 1933 (KYO), *ibid.*, T. NAKAI 15526 (TI), Tokamen, Choshin-gun, Prov. S. Ham-gyeng, N. NOMURA s. n. Jul. 25, 1935 (KYO), Ryugan, Prov. S. Ham-gyeng, H. UCHIDA s. n. Jul. 1943 (TNS), Mt. Rorinsan, Prov. N. Phyengan, s. leg. & s. n. Jul. 22, 1916 (TI), Yotoku, Prov. S. Phyeng-an, T. NAKAI 12369 (TI), Ookogai, Prov. S. Phyeng-an, s. leg. & s. n. Jul. 22, 1916 (TI). MANCHURIA. Ninguta, Kirin, V. KOMAROV s. n. Jun. 13, 1896 (GH).

f. **alba** (NAKAI) T. SHIMIZU, *comb. nov.* — *F. multijuga* var. *alba* NAKAI, l. c. (1914) & l. c. (1915). — *F. coreana* var. *alba* NAKAI ex MORI, l. c. (1922), *nom. nud.*; KITAG., l. c. (1939). — *E. koreana* f. *alba* (NAKAI) KITAG., *Journ. Jap. Bot.* 36 : 23 (1961).

SPECIM. EXAM. KOREA. Ung-keui-ryong, Prov. N. Ham-gyeng, K. Jo 445—**type** (TI), Setsurei, Prov. N. Ham-gyeng, T. NAKAI 7154 (TI).

var. **hispidata** T. SHIMIZU, *var. nov.* A typo differt : folia subtus hispida.

SPECIM. EXAM. HOKKAIDO. Sibeche, Kushiro, M. TAMURA s. n. Jul. 30, 1954—**type** (KYO), Kushiro-shi, T. HORIKAWA 602 (KYO), at the coast of Shunsai lake, Kushiro, Y. KUDO 3012 (TAI), Ohoro to Atsukeshi, Kushiro, Y. KUDO 3013 (TAI) ; Ohoro, Kushiro, Y. KUDO 3014 (TAI), Bekkai to Shibetsu, Y. KUDO 3283 (TAI).

Distr. sp. Manchuria, Ussuri (by KOMAROV), north Korea and Hokkaido.

Based upon a specimen from "Korea septentrionalis : Flum. Jalu, V. KOMAROV s. n. Jul 6, 1897 (TI)", NAKAI (1914) effectively published *F. multijuga* var. *coreana* NAKAI for the north Korean plants with purple flowers. Soon after, he turned to the opinion that it deserved a specific rank, and the specific name, *F. coreana* NAKAI appeared in several publications as cited above. But, it had remained illegitimate till KITAGAWA's work (1939) was brought out. Independent on this Korean plant, the name *F. yezoensis* was made public in 1934 basing upon the specimens from Mt. Apoi of Hidaka in Hokkaido. When I examined the types and other specimens of these two species, *F. coreana* and *F. yezoensis*, I arrived at the conclusion that there was no distinct character between them to give the different specific names. Both of them are provided with several pairs of distinct lateral leaflets, small membranaceous stipules, more or less hairy leaves with margins cartilaginously ciliated, almost entire and clawed petals, more or less pilose sepals inside, and ciliate and distinctly stalked achenes. Unifying these species in this point of view, *F. yezoensis* should be adopted as the correct name.

Referring to the type specimen of *F. coreana* NAKAI, it is worth noted that KOMAROV determined it as *F. purpurea*, and wrote down the name on its sheet. Another specimen he identified so is "Ninguta, Kirin, Manchuria, V. KOMAROV s. n. Jun. 13, 1896 (GH)". This results that he recorded *F. purpurea* in his "Flora Manshuriae" or "Flora Siberiae Orientalis". JUZEP CZUK (1941) followed him to report *F. purpurea* from Ussuri, but without citing any specimens. It is now understand-

dable that KOMAROV or JUZEPCZUK regarded the Far Eastern *Filipendula* with purple flowers as *F. purpurea*. Indeed, *F. purpurea* is surely so related to *F. yezoensis*, that the similar treatment can be found in KITAMURA and MURATA's work (1961). In my opinion, however, it would be better not to unify them into the same species, for the former is an old cultivated plant of Japan, having almost completely smooth leaves, smaller and herbaceous stipules, usually auricled petals, and no lateral leaflets.

Var. *hispidula* is characterized by its conspicuously hispid leaves beneath. Its area is the southeastern part of Hokkaido. In Hokkaido, var. *yezoensis* seems to find favor with serpentine areas, while var. *hispidula* has not such peculiarity.

As the result of the above discussion, the geographical range of the present species should be extended from Hokkaido to Ussuri, Manchuria and north Korea.

5. ***F. purpurea*** MAXIM., Act. Hort. Petr. 6:248 (1879); KOMAR., Fl. Mansh. 2:523 (1903), p. p.; KOIDZ., Consp. Ros. Jap. 206 (1913); JUZ., Fl. URSS 10:282 (1941), quoad pl. Jap.; OHWI, Fl. Jap. 647 (1953). —*S. palmata* (non PALL., nec L.) THUNB., Fl. Jap. 212 (1784), p. p.; WILLD., Sp. Pl. 2:1062 (1799); DC., Prodr. 2:545 (1825); MIQ., Prol. Fl. Jap. 221 (1867); FR. et SAV., Enum. Pl. Jap. 1:121 (1875). —*S. kamtschatica* f. *glabrata* A. GRAY, Bot. Jap. 386.

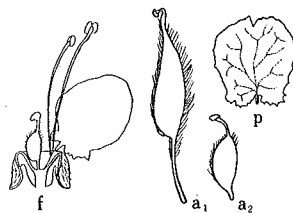


Fig. 5 Floral parts of *F. purpurea* ($\times 5$)

var. ***purpurea***—*F. purpurea* sensu KITAMURA et MURATA, Col. Ill. Herb. Pl. Jap. (*Choripetalae*) 122 (1961), excl. syn.

f. ***purpurea***

SPECIM. EXAM. HOKKAIDO. Betto-mura, Oshima, S. MOCHIZUKI s. n. Jul. 30, 1931 (KYO). HONSHU. Nikko Bot. Gard., H. KUBOTA s. n. May 1952 (KYO), Koishikawa Bot. Gard., s. leg. (TI), Koganai, Kitatama-gun, Pref. Tokyo, H. KANAI s. n. Jun. 30, 1949 (TI), Tsushima Med. Herb. Gard.; Pref. Tokyo, J. OHWI s. n. Jun. 27, 1951 (TNS), Rokuroshi, Ono-gun, Pref. Fukui, s. leg. & s. n. Jun. 13 (KYO), Kitashitara-gun, Pref. Aichi, G. KOIDZUMI s. n. Jun. 29, 1934 (KYO), Takeda Farm, Pref. Kyoto, S. KITAMURA s. n. Jun. 17, 1953 (KYO).

f. ***albiflora*** (MAKIMO) OHWI, Bull. Nat. Sci. Mus. Tokyo n. 33, 76 (1953) & Fl. Jap. 647 (1953). —*F. purpurea* var. *albiflora* MAKINO in IINUMA, Somoku Zusetsu ed. MAKINO 2:711 (1910).

Distr. var. Cultivated, often escaped.

var. ***auriculata*** OHWI, ll. cc. —*F. auriculata* (OHWI) KITAM. in KITAM. & MURATA, l. c. 123, nom. subnud., exclud. syn.

SPECIM. EXAM. HONSHU. Nakatsugawa-mura, Nishiokitama-gun, Pref. Yamagata, G. KOIDZUMI s. n. Aug. 27, 1942 (KYO), Hirano-mura, Nishiokitama-gun, Pref. Yamagata, G. KATO s. n. Jun. 21, 1935 (KYO), *ibid.*, Y. YUKI 5308 (TNS) & 4030 (KYO), Kokunimoto-mura, s.

leg. & s. n. Jun. 30, 1908 (TNS), Mt. Haguro, S. Ishizuka s. n. Jun. 22 (TI), Tsuchiyu, Pref. Fukushima, G. NAKAHARA s. n. Jul. 30, 1904 (TNS), foot of Mt. Myoko, I. ISHIBA s. n. Jul. 28, 1921 (TNS), *ibid.*, S. MATSUDA s. n. Jul. 26, 1894 (KYO), Matsunoyama-mura, Pref. Niigata, T. AIZAWA s. n. Jun. 1950—**type** (TNS), Mt. Kasuga, Pref. Niigata, N. Ogata s. n. Aug. 16, 1954 (TNS), Morimachi-mura, Gamohara-gun, Pref. Niigata, Y. SATAKE s. n. Jun. 10, 1951 (TNS), Mt. Yahiko, I. ITO 2908 (TNS), Ooyu, Pref. Niigata, J. OHWI s. n. Oct. 6, 1950 (TNS), Mt. Kirin, Higashigamohara-gun, Pref. Niigata, T. NAKAI & MARUYAMA s. n. May 26 & Oct. 8, 1950 (TNS), Mt. Morimondake, Pref. Niigata, Y. SATAKE s. n. Aug. 10, 1947 (TNS), Kanatani-mura, near Takada, Pref. Niigata, S. OHDAIRA s. n. Jul. 8 & 17, 1949 (TNS), Asahi-cho, Shimoniikawa-gun, Pref. Toyama, H. KANAI s. n. Jul. 29 & 30, 1958 (TI), between Tozawa-mura and Oota-mura, Shimominochi-gun, Pref. Toyama, M. MIZUSHIMA 11728 (TI) & 13862 (KYO).

Distr. var. Japan Sea side of middle Honshu.

The most important difference between var. *purpurea* and var. *auriculata* is the size and shape of stipules. The former's are too small to be distinctly auricled at the bases, while the latter's are so conspicuous as to be auricled and amplexicaul like in *F. kamtschatica*. The difference of such a character, however, is problem of degree. Not few specimens can not be easily assigned to either of them. As example of the intermediate form I am able to mention the following specimens: Hirano-mura, Nishiokitama-gun, Y. YUKI 5308 (TNS) & 4030 (KYO) and Kokunimoto-mura, s. leg. & s. n. Jun. 30, 1908 (TNS). In this respect, it is not unnatural that OHWI (1953) regarded var. *auriculata* as the parental plant of var. *purpurea*. Furthermore, if we lay stress upon the large amplexicaul stipules and presence of 1~2-paired lateral leaflets, var. *auriculata* might well be ranked up to another species as done by KITAMURA (1961).

In wild state, the present species is geographically restricted to the Japan Sea side of middle Honshu, and to comparatively lower elevation of 300m alt. or so.

6. ***F. multijuga*** MAXIM., Act. Hort. Petr. 6:247 (1879); KOIDZ., Consp. Ros. Jap. 205 (1913); OHWI, Fl. Jap. 647 (1953); KITAM. & MURATA, Col. Ill. Pl. Jap. (*Chori-petalae*) 123 (1961).

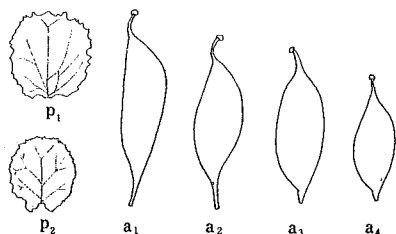


Fig. 6 Floral parts of *F. multijuga*
(×5)

var. ***multijuga***.

f. ***multijuga***. — *F. m. f. dilutorosea* (MAKINO) HONDA, Nom. Pl. Jap. ed. emend. 378 (1957). — *F. m. var. dilutorosea* MAKINO, Journ. Jap. Bot. 3:29 (1926) & 7:(407) (1931).

SPECIM. EXAM. HONSHU. Mt. Tanigawa, Pref. Gumma, N. NISHIDA s. n. Jul. 2, 1950 (KYO), Mt. Naeba, Pref. Niigata, M. TAKEUCHI 26 (TI), Hakone, S. KITAMURA s. n. Jul. 21, 1930 (KYO), Mt. Tsubakuroatama, Pref. Yamanashi, G. MURATA 12094 (KYO), Mt. Togakushi, Pref. Nagano, G. MURATA 6430 (KYO), Mt. Hakusan, Pref. Ishikawa, T. SHIMIZU 4596 (KYO), Mt. Arashima, Pref. Fukui, G. MURATA & T. SHIMIZU 499 (KYO),

Mt. Ibuki, Pref. Shiga, M. HIROE 6230 (KYO), Mt. Gozaisho, Pref. Mie, S. KITAMURA s. n. Aug. 6, 1936 (KYO), Mt. Oodaigahara, Pref. Nara, G. MURATA 10124 (KYO), Mt. Daisen, Pref. Tottori, G. MURATA 11544 (KYO). SHIKOKU. Mt. Akaishi, Pref. Ehime, G. KOIDZUMI s. n. Jul. 8, 1928 (KYO), Mt. Yahazu, Pref. Kochi, s. leg. & s. n. Aug. 8, 1888 (TI), Tenguzuka, Miyoshi-gun, Pref. Tokushima, Y. MOMIYAMA 155 (TI). KYUSHU. Mt. Kuju, Pref. Ooita, S. KITAMURA s. n. Aug. 4, 1944 (KYO), Mt. Yugai, Pref. Ooita, Z. TASHIRO s. n. Aug. 17, 1916 (TAI), Kuma-gun, Pref. Ooita, Z. TASHIRO s. n. Aug. 17, 1916 (TAI), Mt. Tsumatori, Pref. Miyazaki, Z. TASHIRO s. n. Jul. 29, 1917 (TNS), Kirishimayama, Pref. Miyazaki, Z. TASHIRO s. n. Jul. 29, 1917 (TAI).

f. *albiflora* (MAKINO) OKUYAMA, Journ. Jap. Bot. 30:42 (1955). —*F. m.* var. *albiflora* MAKINO, 11. cc.

Distr. var. Middle and western Honshu, Shikoku, and Kyushu.

var. *ciliata* KOIDZ., Bot. Mag. Tokyo 23:179 (1909) & 1. c. (1913), exclud. pl. Hokkaido; OHWI, 1. c. (1953); KITAM. & MURATA, 1. c. (1961).

SPECIM. EXAM. HONSHU. Mt. Iide, Pref. Niigata, T. YAMAZAKI s. n. Jul. 20, 1941 (TI), Mt. Arafune, Kozu-bokujo, Pref. Gumma, J. KATO s. n. Oct. 1954 (TI), Mt. Koshinzan, Pref. Tochigi, M. TAGAWA & K. IWATSUKI 1899 (KYO), Nikko, J. MATSUMURA s. n. Jul. 30, 1885 —lectotype (TI), *ibid.*, Y. SATAKE s. n. Jul. 16, 1928 (TI), Akita, U. FAURIE 6056 (KYO), Otaki-mura, Chichibu-gun, Pref. Saitama, H. KANAI s. n. Sept. 8, 1955 (TI), Mt. Kirigamine, Pref. Nagano, M. TAGAWA & K. IWATSUKI 270 (KYO), *ibid.*, 1750m. alt., T. SHIMIZU 12795-12797 (SHIN), Komoro-cho, Kitasaku-gun, Pref. Nagano, S. MOCHIZUKI s. n. Jul. 25, 1931 (KYO), Mt. Kitadake, Pref. Yamanashi, M. TAGAWA 1147 (KYO), Nembagahara, Pref. Yamanashi, G. MURATA 11913 (KYO), Mt. Kushigata, Pref. Yamanashi, H. MATSUDA s. n. Sept. 25, 1955 (TI), Sandankyo, Pref. Hiroshima, H. KANAI s. n. Sept. 8, 1955 (TI).

Distr. var. Honshu.

This species is characterized by presence of comparatively numerous lateral leaflets and mostly clawless and denticulated petals. The bodies of achenes usually attenuate towards the stipes which are to some degree variable in length. Some achenes have distinct stipes, and another too short ones to say distinct.

Although achenes are usually glabrous, some of them are more or less ciliate sometimes only on dorsal margins and sometimes on both ones. Such plants with ciliated achenes were named by KOIDZUMI (1909) var. *ciliata*, which was originally reported from "Japonia media et septentrionalis" without quoting any exact localities. Several years after, the same author indicated the specimens of this variety from northern Honshu and Hokkaido. As mentioned above, however, those from Hokkaido were renamed by HARA (1934) *F. yezoensis*. As to the specimens from Honshu, they are to be cited as this: Nikko, H. S. C. Jul. 1885; *ibid.*, J. MATSUMURA Jul. 1885; Chuzenji, H. S. C. Jul. 1880; and Yudonosan, H. S. C. Jul. 1887. Unfortunately, they seem to have been lost not to be found at any herbaria of Japan except the second one, which should be designated as the lectotype of this variety.

F. m. var. *ciliata* and *F. yezoensis* are so closely related as to be considered as the same by KOIDZUMI (1913). It is hairiness of sepals insides that HARA

(1934) strongly insisted as a distinct character at his separation of *F. yezoensis* from KOIDZUMI's var. *ciliata*-group. In other words, the plants from Hokkaido (*F. yezoensis*) are pilose on sepals inside, but those from Honshu (*F. m.* var. *ciliata*) are not. Contrary to such definition of him, the precise examination has revealed the fact that some specimens from Honshu are hairy on sepals insides as in *F. yezoensis*. They would be exemplified by the following specimens: Nikko, Y. SATAKE (TI); Mt. Iide, T. YAMAZAKI (TI); Mt. Kushigata, H. MATSUDA (TI); Mt. Kirigamine, T. SHIMIZU (SHIN), etc. In such cases, of course, they must be discriminated by the combination of several characters; size of stipules, number of lateral leaflets, degree of hairiness on leaves and shape of petals, and so on.

Geographically, the present species, *F. multijuga*, is in majority on the upper elevation of high mountains over than 1000m alt. in middle Honshu. It is rather rare in the western or northern part of our country. According to the data available to me, it ranges from Akita of Honshu to Mt. Kirishima of Kyushu. It would be worth notice that the northernmost part of its area is occupied by its variety, var. *ciliata*, which is not found in Shikoku and Kyushu.

7. *F. palmata* (PALL.) MAXIM., Act. Hort. Petr. 6:250 (1879); KOMAR., Fl. Mansh. 2:521 (1903); KOIDZ., Consp. Ros. Jap. 208 (1913); HULT., Fl. Kamtch. Adj. Isl. 3:82 (1929); KITAG., Lineam. Fl. Mansh. 261 (1935); JUZ., Fl. URSS 10:282 (1941); POPOV, Fl. Central Sib. 1:305 (1957). —*Spiraea palmata* PALL., It. 3, App. 735, t. Q, fig. 1 (1776) & Fl. Ross. I, 1:40, t. 27 (1784); FRANCH., Pl. David. 108 (1884); FORB. & HEMSL., Ind. Fl. Sin. 1:226 (1887). —*S. digitata* WILLD., Sp. Pl. 2:1061 (1779); CAMB., Ann. Sci. Nat. 1:382 (1824); DC., Prodr. 2:546 (1825); CHAMISS., Linnæa 6:589 (1831); LEDEB., Fl. Ross. 2:17 (1844); MAXIM., Prim. Fl. Amur 92 (1859), p. p.; FRANCH., l. c. (1884). —*Ulmaria palmata* FOCKE in ENGL. & PRANTL, Nat. Pfl. Fam. 3 (3) : 41 (1894); PALIB., Consp. Fl. Kor. 1:82.

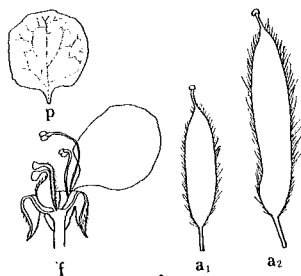


Fig. 7 Floral parts of
F. palmata (×5)

var. *palmata*. —*F. p.* var. *tomentosa* LEDEB. ex KOMAR., l. c. 522 (1903), nom. subn.; KOMAR., Fl. Sib. Orient. 2:650 (1932), nom. subn. —*S. digitata* var. *tomentosa* LEDEB., l. c. (1844). —*S. d.* var. MAXIM., l. c. 225 (1859). —*S. d.* var. *latiloba* GLEHN, Act. Hort. Petr. 4:37 (1876).

SPECIM. EXAM. KAMTCHATKA. Bolsheredsk, E. HULTEN s. n. Aug. 23, 1921 (GH), Savoiko, W. EYERDAM s. n. Jul. 16, 1928 (GH). SAGHALIEN. Hoe-mura, Shikika-gun, s. leg. & s. n. Jul. 30, 1929 (KYO), *ibid.*, H. TOBITA s. n. Jul. 25, 1935 (KYO), *ibid.*, S. SUGAWA s. n. Aug. 6, 1932 (KYO). USSURI. Vladivostok, Hankaisk, E. GRINEBUYA s. n. Jul. 25, 1928 (KYO). MANCHURIA. Kirin, F. H. CHEN 105 (GH), Ogihei, Kyohakuko, Botanko-sho, Y. SATAKE

174 (TNS), Koan, Koanhoku-sho, M. KITAGAWA s. n. Jul. 29, 1931 (TI), Hakuto, Koan-sho, K. KAWAI s. n. Aug. 1934 (TI). KOREA. Ranan, Prov. N. Ham-gyeng, T. SAITO 1462 (KYO), Mt. Hakuto, Prov. N. Ham-gyeng, T. ISHIDOVA s. n. Jul. 1931 (KYO), Retsukissui, Kisshu-gun, Prov. N. Ham-gyeng, J. OHWI s. n. Aug. 5, 1930 (KYO), Seishin, Prov. N. Ham-gyeng, T. NAKAI s. n. Jun. 17, 1909 (TI), Kyonson, Prov. N. Ham-gyeng, J. OHWI 2124 (KYO), Kantairi, Tojomen. Shinkyo-gun, Prov. S. Ham-gyeng, G. KOIDZUMI s. n. Jul. 23, 1933 (KYO), *ibid.*, N. NOMURA 159 (KYO), Unsuirei, Fusenkogen, Prov. S. Ham-gyeng, S. OKUYAMA s. n. Aug. 14, 1940 (TNS), Neihen, Prov. N. Phyeng-an, H. IMAI s. n. 1936 (TI), Koryo, Prov. Kyeng-kwi, T. MORI 161 (TI). CHINA. Mt. Murei, Jehol, T. NAKAI, M. HONDA & M. KITAGAWA 2005, 2007 (TI).

f. **nuda** (GRUB.) T. SHIMIZU, *stat. nov.* — *F. nuda* GRUB., *Not. Syst. URSS* 12:112 (1950). — *F. rufinervis* NAKAI, *Bot. Mag. Tokyo* 26:35 (1912) & 1. c. 32: (78) (1918).

SPECIM. EXAM. MANCHURIA. Mt. Ryutanzan, Kitsurin-sho, J. SATO 9 (TI), Koanrei, K. YAMATSUTA 1308 (TNS), Irukuto, K. YAMATSUTA 1309 (TNS). KOREA. Kantairi, Tojomen, Shinkyo-gun, Prov. S. Ham-gyeng, N. NOMURA 66, 67 (KYO), *ibid.*, G. KOIDZUMI s. n. Jul. 23, 1933 (KYO), Daikantairi, Tojomen, Shinkyo-gun, Prov. S. Ham-gyeng, G. KOIDZUMI s. n. Jul. 24, 1933 (KYO), Kantairi, Prov. S. Ham-gyeng, T. NAKAI 15527 (TI), Daikyori, Prov. S. Ham-gyeng, N. NAKAI 3461 (TI), Ryugan, Prov. S. Ham-gyeng, H. UCHIDA s. n. Jul. 1943 (TNS), Eikaigai, Prov. S. Phyeng-an, s. leg & s. n. Jul. 20, 1916 (TI), Choenri in Mts. Kongo, Prov. Kang-wen, T. NAKAI 5529, 6050 (TI).

Distr. Kamtschatka. Kuriles (by HULTÉN), Saghalien, Ussuri, Manchuria, Dahuria (by GRUBOV) central Siberia (by POPOV), Mongolia (by JUZEPCZUK), north china and north Korea.

Lateral leaflets palmately cleft ; leaves usually white tomentose beneath ; inflorescence and floral segments glabrous. These are diagnoses of the present species. JUZEPCZUK (1941) suggested that the plants to be so called *F. palmata* var. *glabra* LEDEB. would not be a counterpart of var. *palmata*, but another species *F. glabra* NAKAI (*F. glaberrima*), and that the real glabrous race of *F. palmata* on leaves beneath would be found. About ten years after, GRUBOV (1950) published *F. nuda* GRUB. for the just mentioned race. At this juncture, he emphasized the parallel relation between tomentose race and glabrous one among the genus concerned, such as *F. Ulmaria* against *F. denudata*, *F. intermedia* against *F. angustiloba*, and *F. palmata* against *F. nuda*.

Geographically, the distribution area of the present species is over that of *F. kamschatica* to extend to central Siberia and Mongolia, but not yet to Japan proper.

8. **F. rubra** (HILL) B. L. ROBINSON, *Rhodora* 8:204 (1906) ; RYDBERG, *North Am. Fl.* 22:267 (1908) ; BRITT. & BROWN, III. *Fl. N. St. Canad.* 2:249 (1913). — *Ulmaria rubra* HILL, *Hort. Kew.* 214 (1761). — *U. lobata* KOSTEL, *Ind. Prag.* 138. — *F. lobata* (GRONOV.) MAXIM., *Act. Hort. Petr.* 6:251 (1879). — *Spiraea lobata* GRONOV. in JACQ., *Hort. Vind.* 1:38, t. 88 (1770) ; MURR., *Syst. ed.* 14, 472 ; DC., *Prodr.*

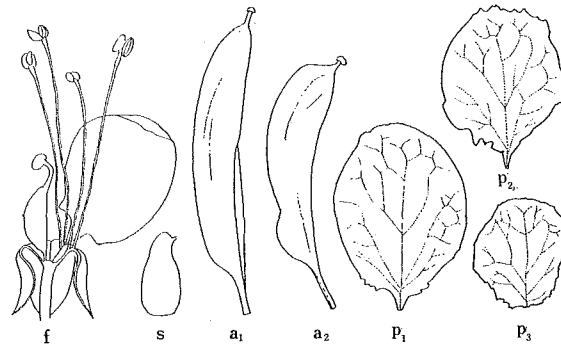


Fig. 8 Floral parts of *F. rubra* (×5)

2:545 (1825).—*S. rubra* BRITT., Bull. Torr. Bot. Club. 18:270 (1891).—*S. palmata* L., Syst. ed. 13, 393 (1774).—*Thecanisia lobata* (GRONOV.) RAF., New Fl. 2:38 (1837).

SPECIM. EXAM. CANADA. Novascotia. Damp roadside thicket, Star Road, Yarmouth Co., M. L. FERNALD, E. B. BARTRAM & B. LONG 23965 (GH). Amer. Borealis, s. loco speciali, ENGELMAN, s. n. (K). U. S. A. New Hampshire. Hanover, E. F. WILLIAMS s. n. Jul. 17, 1910 (GH). Vermont. Hancock, E. F. WILLIAMS s. n. Jul. 18, 1908 (GH). New York. Roadside 1½ mile north of West Dryden, Tompkins Co., K. M. WIEGAND & A. H. WRIGHT 13663 (GH), Olmstedville, Essex Co., H. D. HOUSE 18582 (GH). Connecticut. Town of Franklin, R. W. WOODWARD s. n. Jul. 14, 1919 (GH), Stepney, E. H. EAMS s. n. Jul. 4, 1898 (GH). Pennsylvania. Rich Hill, W. M. BENNER s. n. Jul. 2, 1815 (GH). Illinois. Peoria, F. E. McDONALD s. n. Jul. 13, 1907 (GH), moist grassy bank along Lake Vermilion, Vermilion Co., G. N. JONES 13893 (GH). Virginia. Western slope of Bull Run Mountains, Fauquier Co., H. A. ALLARD 8995 (GH).

Distr. Eastern half of U. S. A. and a part of Canada.

Compared with the previous species, this is discriminated by its purple and larger flowers. The leaves beneath are never white tomentose. Speaking about size of floral parts they are larger than any other Asiatic members of the same section; flowers 5–8mm in diameter, petals 3–4.5mm long, and achenes 6–8mm long.

Although I could examine neither the original description nor the type specimen, I have met with the fact contrary to MAXIMOWICZ's (1879) or RYBERG's (1908) explanation of this species. It is that, as far as the materials available to me were concerned, I could detect short but distinct stalks of achenes. Therefore, the present species is also due to be ranked in Sect. *Schalameya*.

Geographically, this is a North American vicariant of the Asiatic *F. palmata*.

(2) Sect. *Albicoma* JUZ., Fl. URSS 10:283 (1941), nom. subn. & Not. Syst. URSS 17:239 (1955).

Species unica: *F. angustiloba* (TURCZ.) MAXIM.

9. *F. angustiloba* (TURCZ.) MAXIM., Act. Hort. Petr. 6:250 (1879); KOMAR., Fl.

Mansh. 2:522 (1903); JUZ., Fl., URSS 10:238 (1941); POPOV, Fl. Central Sib. 1:306 (1957).—*Spiraea angustiloba* TURCZ. in FISCH. & MEY., Ind. Sem. 8 Hort. Bot. Petr. 71 (1841); TURCZ., Add. Fl. Baic. Dah. 19 (1856); LEDEB., Fl. ROSS. 2:17 (1844); FRANCH., Fl. David. 1:108 (1884); FORB. & HEMSL., Ind. Fl. Sin. 1:223 (1887).—*S. lobata* var. *angustiloba* TURCZ., Fl. Baic. Dah. 1:364 (1843).—*S. digitata* var. *angustiloba* (TURCZ.) GLEHN, Act. Hort. Petr. 4:38 (1876).

f. *angustiloba*. — *F. a.* var. *glabra* (LEDEB.) MAXIM., l. c. 251 (1879); KOMAR., l. c. 523 (1903). — *S. a.* var. *glabra* LEDEB., l. c. 18 (1844). — *S. digitata* var. *glabra* LEDEB., l. c. (1844). — *S. d.* var. *intermedia* GLEHN, l. c. (1876), quoad *b.* — *S. argunensis* LEDEB. ex FISCH. & MEY., l. c. (1841).

SPECIM. EXAM. AMUR. Circa stationem Innocentievskaya, V. KOMAROV s. n. Aug. 22, 1895 (TI). MANCHURIA. Harbin, B. V. SKVORTZOV s. n. Jun. 29, 1937 (GH), Fulerdai, P. H. DORSETT & J. H. DORSETT 3420 (GH), Chiburi-mura, Sanko-sho, Y. SATAKE 54 (TNS).

f. *leiocarpa* (JUZ.) T. SHIMIZU, nom. nov. — *F. a.* var. *tomentosa* MAXIM., l. c. (1879); KOMAR., l. c. 523 (1903). — *F. intermedia* JUZ., l. c. 284 (1941). — *F. a.* var. *intermedia* GLEHN, l. c. (1876), quoad *a.* — *F. intermedia* f. *leiocarpa* JUZ., l. c. (1941), nom. nud.

SPECIM. EXAM. MANCHURIA. Fulerdai, P. H. DORSETT & J. H. DORSETT 3420, one of two individuals on the sheet (GH), Harbin, B. V. SKVORTZOV s. n. Jun. 26, 1937 (GH).

Distr. Dauria (by JUZEPCZUK), Manchuria, Amur and Ussuri (by JUZEPCZUK).

This species is characterized by leaflets palmately cleft into linear lobes, and especially achenes oblong-lanceolate but not stalked. It was based upon this character of stipeless achenes that JUZEPCZUK (1941) proposed for *F. angustiloba* and *F. intermedia* a new section *Albicoma*, though it was neglected by POPOV (1957).

Referring to *F. intermedia*, this is the name for the plant with carpels ciliated and leaves white tomentose beneath. The combination of hairiness on carpels and leaves results the following four races. First is the race with glabrous carpels and glabrous leaves, originally named *Spiraea angustiloba* TURCZ.; second with ciliated carpels and glabrous leaves, originally named *S. digitata a glabra* LEDEB.; third with glabrous carpels and tomentose leaves, originally named *F. intermedia* f. *leiocarpa* JUZ.; and last with ciliated carpels and tomentose leaves, originally named *S. digitata β. intermedia a.*

MAXIMOWICZ (1879) pointed out that cilia of carpels would extinguish to become completely glabrous as they mature in this group. Also, I have not detected ciliated achenes in any specimens available to me. Here, I follow to his treatment taxonomically accepting only two races among *F. angustiloba*-group: glabrous race and

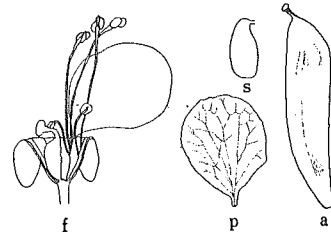


Fig. 9 Floral parts of *F. angustiloba* (×5)

tomentose one with regard to leaves beneath.

The area of this species is restricted to Manchuria and its vicinities.

(3) **Sect. Sessilia** T. SHIMIZU, sect. nov. Achenia semiorbicularata vel semiovata basi affixa.

Type species : *F. vestita* (WALL.) MAXIM.

The species assigned to this new section is provided with semiorbicular or semiovate and sessile achenes. Their ventral margins are almost straight to be evidently shorter than the dorsal ones which are arcuated to the outside.

10. ***F. vestita*** (WALL.) MAXIM., Act. Hort. Petr. 6:248 (1879); HAND.-MAZT., Symb. Sinic. 3:523 (1933). —*Spiraea vestita* WALL. ex HOOK. f., Fl. Brit. Ind. 3:323 (1879); AITCHISON, Journ. Linn. Soc. 18:52 (1880). —*S. kamtschatica* WALL., Cat. n. 704. —*S. k.* var. *himalensis* LINDL., Bot. Reg. 17:4 (1841).
f. ***vestita***.

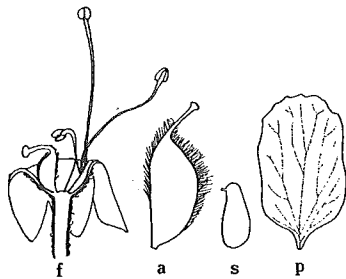


Fig. 10 Floral parts of *F. vestita* (×5)

SPECIM. EXAM. INDIA. 4 miles south of Karagbal, Kashmir, W. KOELZ 9256 (GH), s. loco speciali, Kashmir, T. THOMPSON s. n. (GH), Kali Pass to Tsamba, Tsamba, Punjab, SCHLAGINTWEIT s. n. Jun. 28–Jul. 8, 1856 (GH), Tsamba to Padri

Pass, Punjab, SCHLAGINTWEIT s. n. Jul. 9–16, 1856 (GH), Ralam, Garhwal, United Prov., R. ATRACHEY & J. E. WINTERBOTTOM 5 (GH), Simla, Bushahr, Pangi, United Prov., N. Parmanand 510 (GH). AFGHANISTAN. Trokikharl to Chatrass, Nuristan, S. KITAMURA s. n. Aug. 1, 1955 (KYO), Kushmaicot to Pushuki, Nuristan, S. KITAMURA s. n. Aug. 3, 1955 (KYO), Kurrum Valley, J. E. T. AITCHISON 674 (K), Surgeon Major, J. E. T. AITCHISON 213 (GH). CHINA. Yunnan, C. SCHNEIDER 2373 (GH), *ibid.*, T. T. YU 12555 (GH).

f. ***depauperata*** (AITCHISON) T. SHIMIZU, comb. nov. —*Spiraea vestita* f. *depauperata* AITCHISON, l. c. (1880).

SPECIM. EXAM. AFGHANISTAN. Kurrum Valley, AITCHISON 647—**isotype?** (GH), en route from Voma to Chatrass, Nuristan, S. KITAMURA s. n. Aug. 1, 1955 (KYO). INDIA. Ascent to Rotang Pass, Punjab, R. STEWART 389 (GH), Simla, Punjab, T. THOMPSON, s. n. (GH).

Distr. Afghanistan, Kashmir, Punjab, United Provinces, KUMAON (by MAXIMOWICZ) and N. W. Yunnan.

The diagnostic character of this species is represented by ciliate and erect sessile achenes as many as 9–13. Also in this case, there are accepted two races : white tomentose race and almost glabrous greenish one regarding undersurface of the leaves.

HOOKE (1879) at first made an information about the distribution area of this species as "From Kashmir to Kumaon, alt. 7000–12000ft." After that, AITCHISON (1880) and HANDEL-MAZZETT (1933) expanded it to Afghnaistan and Yunnan respectively. This is all that I have about the area of the present species. From the vacant

space including Nepal, Sikkim, Buhtan and Burma between Kumaon and Yunan, it would be expected with high probability hereafter. Anyway, it is a member of the Sino-Japanese region in the sense of phytogeography.

11. **F. kiraishiensis** HAYATA, Ic. Pl. Formos. 9:39 (1920).

SPECIM. EXAM. TAIWAN. Mt. Nankotaizan, Bunakke, G. MASAMUNE, N. FUKUYAMA & T. NAKAMURA 3127 (TAI), *ibid.*, T. SUZUKI, N. FUKUYAMA & H. SHIMADA 17364, 18047 (TAI), Mt. Nankotaizan, K. MORI s. n. Jun. 1931 (TAI), *ibid.*, G. MASAMUNE & K. MORI s. n. Jul. 15, 1931 (TAI), *ibid.*, 12000 ft., S. SASAKI 11730* (TAIF), *ibid.*, 3700m alt., J. OHWI 4063 (KYO), Mt. Kiraishu, Nampo, 10000ft., OHASHI 11733* —type (TAIF), en route from Kiraikei to Asahi, E. MATSUDA 11734* (TAIF), Mt. Noko, E. MATSUDA 11731*, 11732* (TAIF), *ibid.*, 9000ft., E. MATSUDA 291 (TAI), Mt. Daihasenzan, 8000ft. over, N. FUKUYAMA s. n. Jul. 26, 1932 (TAI), Mt. Chuosenzan, 3500m alt. in scopulis, N. FUKUYAMA & T. SUZUKI 15135B (TAI), Mt. Kwanzan, 3600m alt., S. OKAMOTO s. n. Jul. 24, 1938 (KYO), s. loco speciali & s. leg. (TAI).

Distr. Alpine region of Taiwan.

Small sized plants, 30cm or so tall. Lateral leaflets ovate, several paired, densely arranged. Stems puberulous through the whole length. Inflorescence puberulous. Petals white orbicular 3-3.5mm long, larger than those of any other Far Eastern members of this genus. Achenes not ciliated, 6-10, erect. These are the outline of this species.

Among 16 sheets of the specimens I examined, three remain at the budding stage, or else sterile. In particular, it is much unfortunate that the type specimen was destroyed, representing only one leaf. The rest are comparatively good specimens with flowers or fruits or both. Of these 13 sheets, four were at fruiting stage having only matured achenes in the floral parts. It is noteworthy that some individuals, among the rest nine sheets, had perfect flowers, while the others not always perfect ones. So far as are concerned the next five sheets, such as "Mt. Nankotaizan, S. SASAKI 11730 (TAIF)", "Ibid., J. OHWI 4063 (KYO)", "Mt. Daihasenzan, N. FUKUYAMA s. n. (TAI)", "Mt. Chuosenzan, N. FUKUYAMA & T. SUZUKI 15135 B (TAI)", and a specimen without special data (TAI), they bring fourth too minute or vestigial carpels completely buried in calyx tubes to detect by naked eyes or even magnifying glasses. Meanwhile, the rest four sheets are provided with the complete flowers carpels of which are easily detected by even naked eyes. Regarding stamens, on the other hand, every specimen is supplied by perfect ones. This would be, in my opinion, the good evidence that

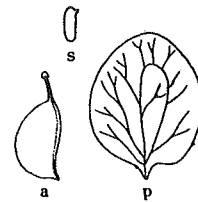


Fig. 11 Floral parts of *F. kiraishiensis* ($\times 5$)

* The figure indicates the specimen number of the herbarium (TAIF), not the collector's field number.

F. kiraishiensis is polygamous. In this respect, the present species is most related to *F. Tsuguwoi* which will be discussed in the following pages.

Geographically, this is restricted to the alpine region of Taiwan.

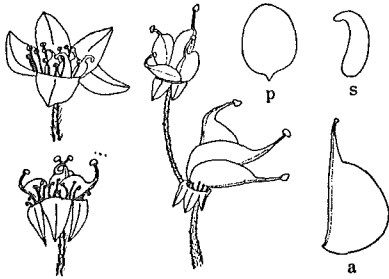


Fig. 12 Floral parts of *F. Tsuguwoi* ($\times 5$)

25, 1947 ♀ (TNS). KYUSHU. Mt. Shiraiwa, Pref. Miyazaki, T. SHIMIZU 3418 ♀ (KYO), *ibid.*, S. HIRATA 81 ♂ (TI), *ibid.*, S. HIRATA s. n. Jul. 16, 1953 ♀ (Herb. Miyazaki Univ., Japan).

Distr. Shikoku and Kyushu.

Describing this species, OHWI (1954) emphasized that it was characterized by its stipeless and twisted carpels. This is the much peculiar character at least in the Japanese members of *Filipendula*. In addition to such a diagnosis, he made another important information that this new species might be a dioecious plant. The conclusion of my precise examination of the specimens cited above is that *F. Tsuguwoi* is doubtless dioecious. Indeed, some specimens have the stamens reduced to be too small to call perfect, while the others have elongated stamens and no carpels in the flowers. Therefore, this is a curious exceptional member of *Filipendula*, and in this respect it is most related to polygamous *F. kiraishiensis*.

Ecologically speaking, this species is found on the gravelly places of limestone or conglomerate in the high mountain over 1000m above the sea level. Of few records of it, those from Mt. Ishidate of Shikoku and from Mt. Shiraiwa of Kyushu owe to limestone areas characteristically.

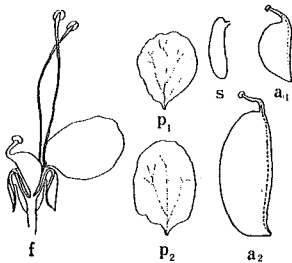


Fig. 13 Floral parts of *F. formosa* ($\times 5$)

13. *F. formosa* NAKAI, Fedde Repert. 13:274 (1914) & Bot. Mag. Tokyo 20: (30) (1915) & Veg. Chirisan 34, 78, 84 (1915); MORI, Enum. Pl. Cor. 196 (1922).

SPECIM. EXAM. KOREA. Sing-yang-chihi in Mts. Chirisan, Prov. S. Kyeng-sang, T. NAKAI s. n. Jul. 13, 1913—type (TI), at the foot of Mt. Chirisan, Prov. S. Kyeng-sang, S. OKAMOTO s. n. Jul. 27, 1935 (KYO), Mt. Chirisan, Prov. S. Kyeng-sang, S. BOKUZAWA s. n. Aug. 17, 1937 (TNS).

Distr. South Korea.

Small numbers (1-2) of twisted and stipeless achenes, and minutely serrate leaves are the most important diagnoses of this species. Although the original description of NAKAI made no references to the key point if the achenes were sessile

or not, the type specimen I carefully examined informed me that *F. formosa* should not be ranked in Sect. *Schalameya* but in Sect. *Sessilia*. The achenes are neither equally attenuated towards the bases nor provided with any stalks distinctly detected. Contrary to NAKAI's opinion that *F. formosa* is intermediate species between *F. purpurea* and *F. multijuga*, my opinion is that *F. formosa* is more closely related to *F. Tsuguwoi* in this respect, though the former is completely hermaphrodite and the latter dioecious.

Geographically, the present species is endemic to South Korea.

(4) **Sect. *Ulmaria*** (HILL).—Sect. *Eu-Ulmaria* M. POP., Fl. Central Sib. 1:306 (1957), nom. subn.

This section is characterized by semicordate achenes laterally attaching in the subgenus concerned.

14. ***F. Ulmaria*** (L.) MAXIM., Act. Hort. Petr. 6:251 (1879); ASCHERS. & GRAEBN., Syn. Mitteleur. Fl. 6:437 (1902); RYDBERG, North Am. Fl. 22:266 (1908); KOIDZ., Consp. Ros. Jap. 204 (1913); BRITT. & BR., Ill. Fl. N. St. Canad. 2:249 (1913); JUZ., Fl. URSS 10:284 (1941); POPOV, Fl. Central Sib. 1 : 306 (1957).—*Spiraea Ulmaria* L., Sp. Pl. ed. 1, 490 (1753); PALL., Fl. ROSS. 1:40 (1784); WILLD., Sp. Pl. 2:1061 (1799); DC., Prodr. 2:545 (1825); LEDEB., Fl. ROSS. 2:18 (1844), p. max. p. quoad var. β .—*Ulmaria Spiraea-Ulmaria* HILL, Hort. Kew. 214 (1768).—*U. pentapetala* GILIB., Thome Fl. Deutsch. Oester. Schw. 3:57 & Fl. Lithuan 5:236 (1782).—*U. palustris* MOENCH., Meth. 663 (1794); FOCKE in ENGL. & PRANTL, Nat. Pfl. Fam. 3 (3) : 41 (1894).—*S. palustris* (MOENCH) SALISB., Prodr. 364 (1796).—*S. odorata* S. F. GRAY, Nat. Brit. Pl. 2:589 (1821).—*Thecanisia discolor* RAF., New Fl. 2:39 (1837).—*T. Ulmaria* RAF., Sylva Tell. 152 (1838).—*U. Ulmaria* BARNH., Bull. Torr. Bot. Club. 21:491 (1894).

var. ***Ulmaria***.—*S. glauca* SCHULZ, Fl. Starg. Suppl. 26 (1819).—*S. Ulmaria* var. *tomentosa* HAYNE, Arzneigew. 8, t. 31 (1821); CAMB., Ann. Sci. Nat. 1:381 (1824).—*S. U.* var. *nivea* WALLR., Sched. Crit. 235 (1822).—*S. U.* var. *discolor* KOCH, Syn. ed. 1, 208 (1837) & ed. 2, 231 (1844); NEIRL., Fl. N. Oest. 917 (1859); GLAAB, DBM 9:40 (1891).—*S. U.* a. *glauca* SCHUR, Enum. Pl. Transs. 182 (1866).—*S. U.* f. *subdenudata* GLAAB, l. c. (1891).—*F. Ulmaria* var. *tomentosa* MAXIM., l. c. 252 (1879); GLAAB, DBM 14:60 (1896).—*F. U.* var. *glauca* ASCHERS. & GRAEBN., l. c. 438 (1902).—*F. U.* f. *pubescens* BECK, Ann. Hofmus. Wien 2:118 (1892); GLAAB, l. c. (1896).—*F. U.* var. *subdenudata* FRITSCH, Abh. Zool.-Bot. Ges. Wien 39:591 (1889); GLAAB, l. c. (1896); ASCHERS. & GRAEBN., l. c. (1902).—*F. U.* subsp. *nivea* HAYEK., Fl. Str. Exz. 8, n. 356 (1906).

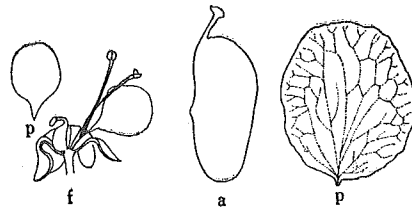


Fig. 14 Floral parts of *F. Ulmaria*
A large achene and a large petal
are those of f. *megarocarpa* ($\times 5$)

f. **Ulmaria**. —*Filipendula stepposa* JUZ., l. c. 286, nom. subn. & 617 (1941) & List Pl. Herb. URSS 8:67 (1955).

SPECIM. EXAM. ICELAND. Solvholt, Arnessysla, ASKELL & DORIS LOVE 267 (GH). FAROE ISLANDS. S. loco speciali, E. TAYLOR s. n. Jul. 20, 1905 (GH). IRELAND. Westmeath, Kinnegad, J. BALL s. n. Jul. 16, 1868 (GH). ENGLAND. Cambridge, E. J. D. s. n. Jul. 10, 1910 (K), Headington, Bayswater Rd., near Bayswater Brook, Oxford, T. BALLARD 908 (K). SWEDEN. Hedemora, Dalarna, G. A. RINGSSELLE s. n. Jul. 1905 (GH), Stocksbro, Provincia Stora Skedvi, Dalarna, V. SAMUELSON s. n. Jul. 19, 1918 (GH), Uppsala, C. G. ALM s. n. Jul. 9, 1936 (KYO). FINLAND. Sarfvik, Par. Kyrkslätt, Nyland, H. LINDBERG s. n. Jul. 28 & Aug. 24, 1909 (TI). NETHERLANDS. Gouda, O. SHINODA s. n. Jul. 9, 1927 (KYO). HUNGARY. Ohrensdorf, M. Weisskirchen, F. PETRAK s. n. Jul. 1912 (GH). FRANCE. Le mans, Sarthe, MANCEAU s. n. (TNS). GERMANY. Ausburg, Bavaria, V. J. KRAUGLE s. n. Jun. 24, 1905 (GH). AUSTRIA. The Dolomite Alps, Tyrol, J. R. CHURCHILL s. n. Jul. 9, 1913 (GH). ITALY. Prov. Cuneo, Piedmont, E. F. PAOLETTI s. n. Jul. 23, 1899 (GH). EUROP.—RUSSIA. Chelyabinsk, E. SERGIYEVSKAYA 1 (KYO). CANADA. Yarmouth, Nova Scotia, M. L. FERNALD & B. LONG 21512 (GH), Boundary between Quebec and New Brunswick, J. ROUSSEAU 32382 (GH). U. S. A. New York. Ithaca, Tompkins C., K. M. WIEGAND 6707 (GH), 3 miles north of Stephentown, Rensselaer Co., H. D. HOUSE 29364 (GH).

f. **megarocarpa** (JUZ.) T. SHIMIZU, stat. nov. —*F. megarocarpa* Juz., Not. Syst. URSS 17:240 (1955).

SPECIM. EXAM. CAUCASIA. Bakuriany, C. V. SERGIYEVSKAYA 5 (KYO).

var. **denudata** (HAYNE) MAXIM., l. c. (1879); BECK, l. c. (1892) & Fl. N. Oesterr. 2:764 (1892); GLAAB, l. c. (1896); ASCHERS. & GRAEBN., l. c. (1902). —*Spiraea denudata* PRESL, Fl. Cech. 101 (1819). —*S. Ulmaria* var. *denudata* HAYNE, l. c. (1921); KOCH, l. c. (1837). —*S. U.* var. *concolor* NEIRL., l. c. (1859); LANGE, Handb. Danske Fl. ed 2, 334 (1859); GLAAB, l. c. (1891). —*F. denudata* (PRESL) FRITSCH, l. c. (1889); RYDBERG, North Am. Fl. 22:267 (1908); JUZ., l. c. 281 (1941).

SPECIM. EXAM. ENGLAND. Appleton, Norfolk, C. E. HUBBARD s. n. Oct. 6, 1932 (K). FINLAND. Pag. Osterby, Par. Kyrkslätt, Nyland, H. LINDBERG s. n. Jul. 23, 1908 (TI). SWEDEN. Abisko, Par. Jukkasjarvi, Torne Lappmark, C. G. ALM 5594 (GH), Par. Jukkasjarvi, Lake Tornetrask District, C. G. ALM 2181 (TNS). NETHERLANDS. Epen, O. SHINODA s. n. Jun. 5, 1927 (KYO). HUNGARY. Marmaros, VAGNER s. n. (TI & GH). FRANCE. Vallée d'Ossau, Basas Pyrénées, J. BALL s. n. Jul. 28, 1861 (GH). GERMANY. Oberpfalz, Bavaria, v. SCHELLING s. n. Jul. 10, 1912 (GH), Westerwaldes, Nassau, H. ANDRES s. n. Jul. 11, 1929 (GH). AUSTRIA. Moravia, J. SUZA s. n. Jul. 7, 1925 (GH).

Distr. sp. Europe, Caucasia, Asia Minor (by JUZEPCZUK), Central Asia (by JUZEPCZUK), Siberia (rare in the eastern districts, by JUZEPCZUK) and Mongolia (by CLAPHAN et al.). Naturalized in the eastern part of North America.

Owing to the vast distribution area covering Europe, Asia Minor, Caucasia, Siberia and even Mongolia, this species has brought forth various forms here and there, to which many a scientific name has been proposed. Taxonomically, also

in this case they could be reduced to either of two races relating to hairiness of leaves beneath, tomentose or denudate races. Besides them, JUZEPCZUK recently published two new species closely related to *F. Ulmaria* itself; one *F. stepposa* (1941) and the other *F. megarocarpa* (1955). Fortunately, I could examine one sheet of the former identified by himself and three sheets of the latter determined by Miss SERGIEVSKAYA studying the present genus. My opinion is that they are not so distinct from and so concordant in main characters with *F. Ulmaria* that their specific ranks should be rejected. The diagnosis of *F. stepposa* is only that leaves are not so smooth but rugose. That of *F. megarocarpa* is only that size of floral parts as well as vegetative ones are superior to *F. Ulmaria* in the narrow sense.

Habitats of the present species is "swamps, marshes, fens, wet woods and meadows, wet rock ledges and by river" but not "acid peat" in the words of CLAPHAM et al. (1958).

III. **Subgen. Filipendula.** —Subgen. *Eu-Filipendula* JUZ., Fl. URSS 10:286 (1941), nom. subn. & Not. Syst. URSS 17:240 (1955); POPOV, Fl. Central Sib. Mosqua 1:307 (1957).

Species unica : *F. hexapetala* GILIB.

15. ***F. hexapetala*** GILIB., Fl. Lithuan 2:237 (1781); MAXIM., Act. Hort. Petr. 6:247 (1879); JUZ., Fl. URSS 10:286 (1941); POPOV, Fl. Central Sib. 1:307 (1957). —*Spiraea Filipendula* L., Sp. Pl. ed. 1, 490 (1753); PALL., Fl. Ross. 1:39 (1784); WILLD., Sp. Pl. 2:1061 (1799); CAMB., Ann. Sci. Nat. 1:378 (1824); DC., Prodr. 2:546 (1825); LEDEB., Fl. Ross. 2:16 (1844). —*Ulmaria Filipendula* (L.) HILL, Hort. Kew. 214 (1768); KOSTEL, Ind. Prag. 138 (1844); A. BR. in ASCHERS., Fl. Brand. 1:178 (1864). —*Filipendula vulgaris* HILL, Brit. Herb. 24 (1756); MOENCH, Meth. 663 (1794). —*S. tuberosa* SALISB., Prodr. 364 (1796). —*S. vulgaris* S. F. Gray, Nat. Arr. Brit. Pl. 2:588 (1821). —*F. Filipendula* (L.) VOSS. in VILMORIN, Blümgärt. ed. 3, 1:240 (1896); ASCHERS. & GRAEBN., Syn. Mitteleur. Fl. 6:439 (1902); RYDBERG, North Am. Fl. 22:267 (1908).

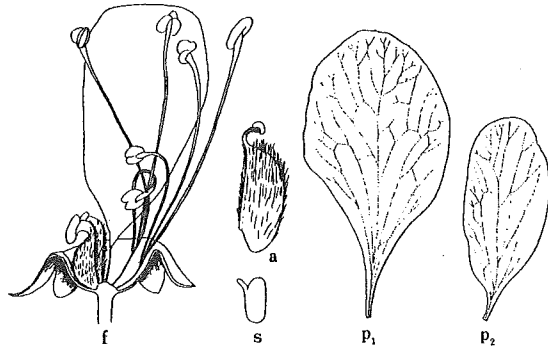


Fig. 15 Floral parts of *F. hexapetala* (×5)

SPECIM. EXAM. ENGLAND. Grassington, West Yorks, L. ROTHERAY s. n. Aug. 5, 1903 & Jul. 28, 1907 (GH), Bayswater Brook, Oxford, F. BALLARD & N. NELMES 896 (K), Coast near Torguay, Devon, J. BALL s. n. Jun. 2, 1861 (GH), Wale Hill, C. BUCKNALL'S s. n. Jul. 7, 1905 (K). SWEDEN. Lund, cult. in Kyoto, Japan, G. MURATA s. n. Jun. 6, 1956 (KYO), Södermanland, V. SAMUELSSON s. n. Jun. 26, 1919 (GH), Upsala, s. leg. & s. n. (TI). FINLAND.

Strängsberget, Tvärminne, Par. Ekeåes, Nyland, J. A. PALMEN s. n. Jul. 3, 1906 (TI). GERMANY. Lower Bavaria, Bavaria, V. SCHELLING s. n. Jun. 25, 1912 (GH). FRANCE. Var., F. RAINE s. n. Jun. 9, 1908 (GH). HUNGARY. Weisskirchen, F. PETRAK s. n. Jun. 1912 (GH). AUSTRIA. Kozmice Wielkie ad Wieliczka, Cracow, A. JASIEWICZ s. n. Jun. 17, 1956 (GH), Hermannskogel, Wien, A. S. PEASE 13239 (GH). ITALY. Prov. di Treviso, Venetia, R. PAMPANINI s. n. Jun. 20, 1904 (GH). BULGARIA. Mt. Vitosha, TAMAMDIEFF s. n. Jul. 30, 1929 (GH). SWITZERLAND. Montana Vermala, Valais, RHENO-TRAI 110 (KYO). CAUCASIA. Prov. Terek, E. A. & N. A. BUSCH s. n. May 29, 1911 (GH). IRAN. Karabach, Azerbajan, A. ACHVERDOV & A. DOLUCHANOV s. n. Jun. 9, 1929 (GH). SIBERIA. Semiparatinsk, N. SCHIPCZINSKY s. n. Jun. 13, 1914 (GH).

Distr. Europe (exclud. the larger part of the Balkan peninsula), Caucasia, Azerbajan, Armenia (by MAXIMOWICZ), Asia Minor (by JUZEP CZUR), North Africa (by CLAPHAM et al.), Siberia (to Angara-Sayan, by JUZEP CZUR) and Altai (by MAXIMOWICZ).

Roots tuberous. Stems solid. Lateral leaflets numerous, narrow, pinnatisect and densely arranged. Carpels 7-13 erect, pilose all over, semicordate and laterally attached. These are the important characters of this species. Its floral parts are larger than those of any other members of the genus. The flowers are yellowish contrary to white or purple colors in the other species.

The variation in every character seems to be comparatively poor out of proportion to its vast distribution area. Even a few names proposed to the varied forms such as var. *minor* CAMB. and var. *pubescens* CAMB. have been completely neglected by the current taxonomists. In my case, there are not available the materials to accept these varietal names, too.

Ecologically, the present species is favorite on calcareous glassland at least in England and usually on pastures. Its area deviates from that of *F. Ulmaria* a little more southwards to arrive at the northern part of Africa or Iran, while it is absent from Iceland and the arctic Russia.

PHYLOGENETIC AFFINITY AND DISTRIBUTION OF THE SPECIES

To analyse affinity of each species, it is necessary that the characters used in the above classification are evaluated from the viewpoint of phylogeny and evolution. Also consideration of distribution area of each taxon will generally give some suggestive accounts for evolutionary trends in any plant group. In this part, I wish to discuss affinity of the species basing upon phylogenetic consideration of each character and phytogeographical data.

1. Important morphological characters in the genus

The plants grouped to *Filipendula* are middle- or large-sized perennial herbs. Leaves are herbaceous and more or less pinnatisect. Inflorescence is a corymb consisting of numerous small flowers with caducous stamens. This short statement of the present genus makes it enough to be discriminated from the other genera of *Rosaceae*. Within the genus itself, several characters concerning with roots, stems, stipules, leaves, flowers and achenes will provide key characters for settling subgenera,

sections, species, etc.

Among these key characters, relative position of perianths and carpels should be mentioned for the first place. The species of *Filipendula* bear as a rule perigynous perianths and more or less distinct calyx tubes. But *F. occidentalis* offers only one exceptional case. In this species, perianths are hypogynous, calyx tubes being indistinct consequently. According to the general conception that hypogynous ovary is of more advanced type than epigynous one, *F. occidentalis* could be regarded as the most primitive of *Filipendula* so far as position of carpels were concerned. Corresponding with this character, much elongated styles and long stipes of carpels are also peculiar to *F. occidentalis*.

Shape of achenes is another good indicator for evolutionary trends of the genus. In my opinion, the assumption that length of the ventral margins in achenes including styles and also stipes, if present, have been reduced shorter and shorter as plants evolved will be not absurd. Shorter ventral margins in achenes result in the shorter vascular bundles for supply of nutrients to the ovules as well as shorter distance for spermatid movement at fertilization. It would be reasonable that the short ventral margins were more rational for plant life or of more advanced type than the long ones. Achenes bearing the longest ventral margins in *Filipendula* are represented by *F. occidentalis* achenes of which are narrowly lanceolate 7–8mm long. Thus, *F. occidentalis* might be regarded as most primitive in the genus, also basing upon shape of achenes. Supposing *F. occidentalis* as the first stage in evolutionary trends, the second one is performed by the members of Sect. *Schalameya*, which are characterized by oblong and more or less stipitate achenes. However, their stipes are much variable in length in the section or even in the same species. Those of *F. yezoensis*, *F. purpurea*, *F. palmata* and *F. rubra* are usually distinct, while in the rest achenes attenuate to much short stipes at the bases. The styles in this section are not elongated, being only 1 mm or so long. The third stage is Sect. *Albicoma* for which the key character is sessile but oblong achenes. Their ventral margins still remain equal to or rather longer than the dorsal ones. On the fourth stage, we would find members of the new section, *Sessilia*, achenes of which are outlined by almost straight ventral lines and arcuate dorsal ones. The finale is Sect. *Ulmaria* or Subgen. *Filipendula*. In their achenes, much shortened ventral margins finally resulted in lateral attachment of achenes. Styles are more shortened about 0.5mm long in their two species. The above five stages of development in shape of achenes are schematically shown in Fig. 16.

Size or length of achenes seems to be corresponding to this evolutionary trend. Achenes of *F. occidentalis*, as above mentioned, are 7–8mm long, while those of Sect. *Sessilia*, Sect. *Ulmaria* and *F. hexapetala* are 3–4mm long. In Sect. *Schalameya* and Sect. *Albicoma* they are almost intermediate in size, 4–6mm long, though those of *F. multijuga* and *F. rubra* a little deviate out of this range, being 3–5mm and 6–8

mm long respectively.

In *F. hexapetala*, calyx tubes are hemispherical and larger than any other species of the genus, being over 2mm in diameter. This will serve for protection and acceptance of many (to 12) erect carpels laterally attached. In the case of *F. Ulmaria*, though carpels are of most advanced type and comparatively many (to 10), calyx tubes still remain to be obconical rather so small. This will be a reason why carpels cannot but twist.

It is interesting that members of Sect. *Sessilia* seem to bear various handicaps in structure of the floral parts for their surviving and prospering. *F. formosa* fails to increase number of carpels in a flower, retaining only one or two, the smallest number of the genus.

In the case of *F. Tsuguwoi*, development of semiorbicular carpels (4-5) cannot afford perfect stamens, so that the result is that this is only one dioecious plant of *Filipendula*. Similarly in *F. kiraishiensis*, though bearing comparatively large calyx tubes including 8-10 carpels, flowers are not always perfect to be polygamous. Meanwhile, *F. vestita* gains an advantage over them, having perfect flowers and many (9-13) carpels. It would be accepted that *F. vestita* was most advanced in Sect. *Sessilia* and most related to *F. Ulmaria*. Such handicaps or advantages in structure of the flower reflect extension of distribution areas. *F. formosa*, *F. Tsuguwoi* and *F. kiraishiensis* have much restricted areas in the region of mild climate, while *F. vestita* occupies the vast area inside of the continent, extending from Afghanistan through the Himalayan Range to Yunnan.

As above referred, number of carpels in a flower tends to increase as the plants are advanced. In the groups with stalked or oblong carpels, however, such tendency is not clear. Many carpels, if stalked or oblong, are possible to stand on small receptacles in calyx tubes or even if no calyx tubes. Therefore, it is not impossible that *F. occidentalis*, *F. kamtschatica*, *F. palmata*, *F. rubra* and *F. angustiloba* are bearing comparatively many a carpel in a flower; 8-13, 3-7, 7-13, 5-8 and 7-10, respectively. Number of carpels would be of phylogenetic meaning, only when they are semiorbicular or semicordate carpels almost completely protected within calyx tubes.

Petals of *F. vestita*, *F. Ulmaria* and *F. hexapetala* are, though slightly, yellowish in colouration. *F. occidentalis*, *F. kamtschatica*, *F. glaberrima*, *F. palmata*, *F. angustiloba*, *F. Tsuguwoi* and *F. kiraishiensis* are always in possession of white flowers,

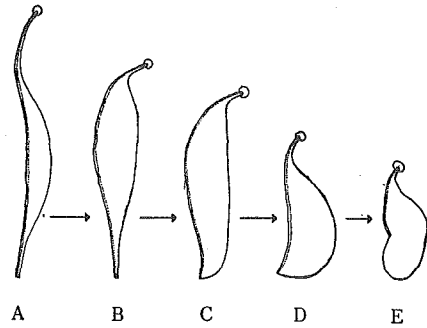


Fig. 16 A scheme showing the evolutionary trend of the achenes in *Filipendula*

- A. Subgen. *Hypogyna*,
- B. Sect. *Schalameya*,
- C. Sect. *Albicoma*,
- D. Sect. *Sessilia* and
- E. Sect. *Ulmaria* or Subgen. *Filipendula*.

while *F. rubra* and *F. formosa* purple ones. In *F. yezoensis*, *F. purpurea* and *F. multijuga*, flowers are usually purple but often whitened.

Internal structure of stems in *Filipendula* is same in principle throughout all the species. Epidermis, cortex, sclerenchym, vascular part and pith are centripetally arranged. However, it is noteworthy that stems of only *F. hexapetala* are solid, those of the other species being fistulous. Other features peculiar to *F. hexapetala* are stipules adnating to the petioles and tuberous roots. In the other species, stipules are liberated from the petioles, roots bearing no tubers.

Chromosome counting of the genus is so far from perfection that it is impossible to discuss affinity of the species basing upon cytological data. According to DARLINGTON and WYLIE's list¹⁾, somatic chromosome numbers of two European species, *F. Ulmaria* and *F. hexapetala*, are 14 or 16 and 14 or 15, respectively. On the other hand, my own counting shows that two endemic species of Japan, *F. multijuga* and *F. Tsuguwoi*, are $2n=14$ in chromosome number (Fig. 17). Regarding further cytological study of *Filipendula*, I wish to publish another paper.

2. Distribution of sections and species

In the previous part, the area of each species was already informed. Relation between the floristic regions and each taxon of the genus is summarized in Table. 1. Although each region in it is mainly followed to GOOD²⁾, Taiwan, Kashmir, Punjab and eastern Afghanistan are included in the Sino-Japanese region. Such treatment of the Sino-Japanese region is advocated by KITAMURA³⁾. Also in the case of *Filipendula*, his treatment seems to be more reasonable than GOOD's. In addition, I divide the Euro-Siberian region into two areas in the table for convinience, the border of which is the Ural Mountains.

As evident in the table, majority of the species concentrates into the Sino-Japanese region, and this region is rich in endemic species. These facts indicate that the present region is mass center of maximum variation of *Filipendula*.

However, the Sino-Japanese region seems to have had nothing to do with center of origin of the genus. The most primitive species of the genus, *F. occidentalis*, exists outside of this region. As well known⁴⁾, on the other hand, some related plants,

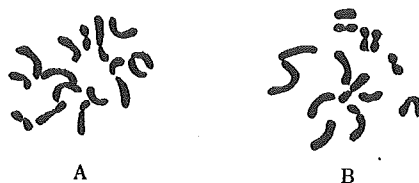


Fig. 17 Somatic chromosomes of
A. *F. multijuga* from Mt. Mitsutoge, Pref. Yamanashi and
B. *F. Tsuguwoi* from Mt. Shiraiwa, Pref. Miyazaki ($\times 1500$)

- 1) DARLINGTON, C. D. & A. P. WYLIE, Chromosome atlas of flowering plants 142 (1955).
- 2) GOOD, R., The geography of the flowering plants (1947).
- 3) KITAMURA, S., Distribution of plants in "Coloured illustrations of herbaceous plants of Japan (*Sympetalae*)" (1957).
- 4) GRAY, A., Observation upon relationship of the Japanese plant to that of North America (1859).

Table 1 Relation between floristic regions and each taxon

Subgenera	Sections	Species	Floristic regions										
			Arctic and Subarctic	Mediterranean	Euro-Siberian (1)	West and Central Asiatic	Euro-Siberian (2)	Sino-Japanese	Indian	Pacific North American	Atlantic North American		
<i>Hypogyna</i>		<i>F. occidentalis</i>										○	
<i>Ulmaria</i>	<i>Schalameya</i>	<i>F. kamtschatica</i>					○	○					
		<i>F. glaberrima</i>						○					
		<i>F. yezoensis</i>						○					
		<i>F. purpurea</i>						○					
		<i>F. multijuga</i>						○					
		<i>F. palmata</i>				○	○	○					
		<i>F. rubra</i>											○
	<i>Albicoma</i>	<i>F. angustiloba</i>					○						
	<i>Sessilia</i>	<i>F. formosa</i>							○				
		<i>F. Tsuguwoi</i>							○				
		<i>F. kiraishiensis</i>							○				
<i>Ulmaria</i>	<i>F. vestita</i>							○	○				
	<i>Ulmaria</i>	<i>F. Ulmaria</i>	○	○	○	○	○						
<i>Filipendula</i>		<i>F. hexapetala</i>		○	○	○	○						
		Total	1	2	2	3	5	11	1	1	1		
		Endemic	0	0	0	0	0	7	0	1	1		

whether they are same species or not, distribute in the Sino-Japanese region and the Atlantic North American region. In such cases, it is of high probability that their predecessor originated in the Arctic region. Also, *Filipendula* has the related species of Sect. *Schalameya* in both the regions. The genus *Filipendula* must be of arctic origin.

It is worth notice that Sect. *Schalameya* and Sect. *Albicoma* occupy the northern part in the area of the genus, such as Kamtschatka, Kuriles, Saghalien, Ussuri, Amur, Manchuria, Dahuria, Mongolia, Korea and rather north Japan, while Sect. *Sessilia* does the southern part of the Sino-Japanese region, viz. South Korea (*F. formosa*), Shikoku and Kyushu (*F. Tsuguwoi*), Taiwan (*F. kiraishiensis*), Yunnan to Afghanistan (*F. vestita*). In addition, the members of Sect. *Sessilia* are completely

independent and confined within the areas as written above, so that the area of this section are extremely discontinuous contrary to that of Sect. *Schalameya*. The reason for this phenomenon might be that the first three species in Sect. *Sessilia* owing to their inharmonious structure of the flowers, have failed to be conquerors and survived as relicts of rocky unfavorable habitats. It is still doubtful if Sect. *Sessilia* is not of Himalayan origin, but of arctic origin like Sect. *Schalameya* and others.

Anyway the more advanced species, *F. vestita*, *F. Ulmaria* and *F. hexapetala* have succeeded to obtain vast areas adapting to severe conditions inside of the continent. Other species are generally growing in the districts surrounding sea, where they could receive benefits of more or less mild climates.

SUMMARY

Modifying the taxonomic system of the genus *Filipendula* published by JUZEPCZUK or POPOV, I intend to admit three subgenera in the genus, viz. *Hypogyna*, *Ulmaria* and *Filipendula*. One of them, Subgen. *Ulmaria* is subdivisible into four sections, i. e. *Schalameya*, *Albicoma*, *Sessilia* and *Ulmaria*. The characters used in this classification are mainly concerning with shape of achenes and presence or absence of calyx tubes.

If regard Subgen. *Hypogyna* demarcated by its hypogynous perianths as most primitive, it is elucidable by means of shortening of the ventral margins of achene that the evolutionary trend in *Filipendula* was directed from Subgen. *Hypogyna* through Sect. *Schalameya* and Sect. *Sessilia* towards Sect. *Ulmaria* or Subgen. *Filipendula* (Fig. 16).

Among the fifteen species accepted in this text, seven belong to Sect. *Schalameya*. Moreover they are almost concentrated into rather coastal districts of the Sino-Japanese region, except *F. rubra* of North America. The reason why they could not extend their areas into the inside of the Continent seems to be attributable to the comparatively primitive structure of their floral organs. The more advanced species such as *F. Ulmaria* and *F. hexapetala* have obtained the vast areas of distribution, being highly tolerable to the severe continental conditions as well as the subarctic coastal ones. Although the Sino-Japanese region played a great rôle for speciation not only of Sect. *Schalameya* but also of Sect. *Albicoma* or of Sect. *Sessilia*, their members have been not always prospering. It is worth notice that many of them remain endemic to the small areas or discontinuous as exemplified by *F. glaberrima*, *F. purpurea*, *F. multijuga*, *F. angustiloba*, *F. formosa*, *F. Tsuguwoi* and *F. kiraishiensis*.

Explanation of Plates

- Pl. 1** *F. occidentalis* from Oregon, J. W. THOMPSON s. n. (GH)
Pl. 2 *F. kamtschatica* from Kamtchatka, E. HULTÉN 4213 (GH)
Pl. 3 *F. palmata* from Kamtchatka, W. EYERDAM s. n. (GH)
Pl. 4 *F. rubra* from New Hampshire, E. F. WILLIAMS s. n. (GH)
Pl. 5 *F. angustiloba* from Manchuria, B. V. SKVORTZOV s. n. (GH)
Pl. 6 *F. vestita* from Afghanistan, J. E. T. AITCHISON 674 (K)
Pl. 7 *F. Ulmaria* from Nova Scotia, M. L. FERNALD & B. LONG 21512 (GH)
Pl. 8 *F. hexapetala* from Venetia, R. PAMPANINI s. n. (GH)



