

Seven new species of *Alchemilla* series *Alchemilla* (*Rosaceae*) from the Caucasus

Семь новых видов ряда *Alchemilla* рода *Alchemilla* (*Rosaceae*) с Кавказа

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Abstract. Descriptions and illustrations of the main morphological traits for seven new species of *Alchemilla* L. series *Alchemilla* (*A. chatiparensis* Czkalov, *A. holobasis* Juz. ex Czkalov, *A. leiophylloides* Juz. ex Czkalov, *A. levichevii* Czkalov, *A. marginalis* Juz. ex Czkalov, *A. propinquoides* Czkalov, *A. pseudolaeticolor* Czkalov) from the Caucasus are presented. The identification key for 58 Caucasian species of the series *Alchemilla* is provided.

Keywords: *Alchemilla*, apomicts, Caucasus, Georgia, Armenia, Azerbaijan, identification key, new species.

Аннотация. Приведены описания и иллюстрации ключевых морфологических признаков семи новых видов ряда *Alchemilla* рода *Alchemilla* L. (*A. chatiparensis* Czkalov, *A. holobasis* Juz. ex Czkalov, *A. leiophylloides* Juz. ex Czkalov, *A. levichevii* Czkalov, *A. marginalis* Juz. ex Czkalov, *A. propinquoides* Czkalov, *A. pseudolaeticolor* Czkalov). Составлен ключ, включающий все 58 кавказских видов этого ряда.

Ключевые слова: *Alchemilla*, апомикты, Кавказ, Грузия, Армения, Азербайджан, ключ, новые виды.

Introduction

The circumscription of *Alchemilla* L. ser. *Alchemilla* and its position in the system of the genus, as presented here, states in good accordance with viewpoint of W. Rothmaler, but with exception for “*Subglabrae*” group. Rothmaler (1938) subdivided the subsection *Heliodrosium* Rothm. (≡ subsect. *Alchemilla*) into unranked groups *Pubescentes*, *Splendentes*, and *Vulgares*. Later, Rothmaler (1962) considered these groups in the rank of series, but also three unranked units were listed within ser. *Vulgares* Rothm. (≡ ser. *Alchemilla*): “*Hirsutae*”, “*Heteropodae*”, and “*Subglabrae*”.

Unlike Rothmaler, I consider “*Subglabrae*” group peculiar enough to be accepted at the series rank, A. ser. *Subglabrae* Pawł. (Pawłowski, 1956). It is clearly characterised by an appressed subtle indumentum.

The delimitation between the *Pubescentes* group and strongly pubescent members of A. ser. *Alchemilla* seems to be sometimes questionable. The former is defined by a low total number of teeth on the leaf blades (50–80(100)), that I consider a very significant diagnostic character in the taxonomy of *Alchemilla* (Chkalov, 2020). A rather small size, meagre inflorescence,

and dense wooly or silky indumentum of all parts of the plant constitute a very clear habit of this group, now recognised as A. ser. *Pubescentes* (Buser) Rothm. (Rothmaler, 1937).

Most of the species of A. ser. *Alchemilla*, which are strongly pubescent, including their flowers, were placed by V. N. Tikhomirov (2001) into A. subser. *Pastorales* V. N. Tikhom., while less pubescent ones were classified into A. subser. *Alchemilla* (= “cycle” *Imberbes* Juz., nom. nudum). I follow this classification, considering members of the series as the plants of medium or large size with patent indumentum, total number of teeth in radical leaf blades 100 or more, and hairy or glabrous flowers.

The members of *Alchemilla* ser. *Pubescentes* in the Caucasus are very numerous (33 species in the Caucasus versus 5 species in the plains of Eastern Europe, or 4 species in the Altai mountain country); this is one of the most xerophilous and ancient *Alchemilla* groups in Eurasia. Within this group, A. aggr. *sericata* Rchb. is endemic to the Caucasus (except for a few derivatives of polytopic hybridogenous speciation in other areas).

Alchemilla subser. *Alchemilla* includes 51 species in the Caucasus, which represent all existing aggregates

(i. e. *A. aggr. acutiloba* Opiz, *A. aggr. subcrenata* Buser, *A. aggr. semilunaris* Alechin (= *A. aggr. nemoralis* Alechin), *A. aggr. retropilosa* Juz.). The presence of the last two aggregates links the Caucasus with the Central Asian mountain areas, the Urals, and the plains of Eastern Europe, as opposed to the Western European countries (Chkalov, 2020).

During our revision of the *Alchemilla* collections in the Herbarium of the Komarov Botanical Institute (LE) for the "Caucasian Flora Conspectus", many examined specimens were recognized as representing several species not yet described. The aim of this study is to describe some of them.

Materials and methods

The study is based on a morphological approach. The material for the study is based on the numerous *Alchemilla* herbarium specimens stored in the LE Herbarium. The terminology and rules of measurements used in the descriptions and the key were described earlier (Chkalov, 2011, 2015).

Results

Alchemilla chatiparensis Chkalov, sp. nova. — *A. glabricauliformis* Juz., in sched., p. p. (*A. subser. Alchemilla*, *A. aggr. subcrenata* Buser). — Fig. 1: 1.

Plant of medium or small size, up to 6–33 cm. Rhizome rather thin, up to 1 cm. Stems 1–3, quite weak, ascendent, often tortuous, shorter than, equal to or 2 times higher than radical leaves, up to 33 cm, pubescent usually only on the lowermost internode with erectopate hairs, rarely on two lower internodes (i. e. on the lower $\frac{1}{3}$ of the stem) or glabrous throughout.

Lower and medium radical leaves widely reniform, clearly undulate, rarely plane, with distinct sinus (angle between veins of basal lobes 110–150°), angle of sector 30–42°; glabrous to sparsely evenly hairy above, glabrous (hairy only on $\frac{1}{3}$ – $\frac{1}{2}$ of the main veins and along margins) beneath; 7(9)-lobed, with lobes 24–32%, central zone 67–80(86)% of leaf length. Lobes shortly parabolic, semicircular to semiovalate, sometimes obtuse with incisions between lobes 5–9% of leaf length, 20–42% of lobe length, with 6–8(10) teeth at both sides of lobe, rather acute, unequally-sided, triangular mammillate, straight, and unequally-sized (teeth at the middle of lobe up to 1.5–2 times larger than the standard tooth); length of standard tooth 7.5–11% of leaf length, 35–50% of lobe length, with apical tooth 53–69% of standard tooth length. Leaves with 90–110(150) teeth in total. Petioles mostly glabrous, some pubescent with erectopate hairs on the base of petiole or throughout.

Upper radical leaves (usually not present), 3–12 cm, leaf blade 1.5–3.5 cm long, orbicular with overlapped basal lobes (in dwarf plants) or orbicular reniform, with distinct sinus, angle between main veins of basal lobes 90–120°, almost plane, angle of sector to 54°, subglabrous above (at least hairy on folds and teeth), glabrous with hairy main veins beneath; 7–9-lobed, lobes to 31%, central zone from 67% of leaf length; with lobes widely triangular, plane, shortly trapezoid or equally-sided triangular, with short incisions between lobes 1.5–3% of leaf length, 5–15% of lobe length, with distance between bases of incisions 100–109% of lobe width, with width 160–218% of lobe length; with 7–9 teeth at each side of lobe, acute, equally-sided, triangular or triangularly ovate, straight, slightly falcate, equally-sized (length of standard tooth 5–9% of leaf length, 17–50% of lobe length); apical tooth 38–69% of standard tooth length, slender and shorter than neighboring ones. Leaves with 100–130 teeth in total. Petioles usually pubescent with erectopate hairs. Stipules of radical leaves green or purplish.

Evenly-spread stem leaves (2)3–4, the one beside the lowermost inflorescence branch widely reniform, truncate or subcordate, petioles 40–80%, central zone (55)62–76% of leaf length, 3–5-lobed (without the two basal ones), lobes 13–40% of leaf length, with 2–3(4) teeth at each side, plane to semiovalate, 28–42 teeth in total. Inflorescence narrow and poor, with 2–3 branches (branching in the upper $\frac{1}{2}$ – $\frac{2}{3}$ of stems). The lowermost inflorescence branch 0.3–1.3 times of its internode, with glabrous branchlets, 1–3(6) nodes, 5–40 flowers. Monochasia lax, the lateral with short stipule (0–1 of pedicel length), with short axis (0–0.5 of pedicel length), 3–5 flowers. Terminal monochasia with stipule 1–4 of pedicel length, short axis (about 0.5 of pedicel length), 3–6 flowers. Flowers of small size, hypanthia obconical, in fruit campanulate, without neck, glabrous, (1)1.18–1.88 mm long, width to length ratio 67–85(100)%; pedicels 2–3 of hypanthia length, glabrous. Sepals ovate to elongate triangular, (0.83)0.95–1.13 mm long, 60–89% of hypanthium length, width to length ratio 68–84(91)%, glabrous. Epicalyx segments lanceolate to widely lanceolate, 0.55–1.30 mm long, 47–69% of hypanthium length, 58–116% of sepal length, width 36–63% of sepal width, width to length ratio 34–50%, glabrous.

H o l o t y p e (Fig. 2): [Russia, Karachay-Cherkess Republic] Reg. auton. Karatshai, prope pag. Teberda, m. M. Chatipara, in alpinis, in prato paludoso (Deschampsieto-Nardeto-Cariceto) ad rivum, 18 VIII 1937, S. Juzepczuk, № 700 (LE: LE 01072719, plant marked with asterisk; isotype — LE 01072993).

Note. The holotype and isotype are mounted on the same sheet.

Paratypes. **Russia. Krasnodar Territory:** Circassia, prope opp. Krasnaja Poljana, m. Aibga, in pratis subalpinis juxta cacumen montis, 20 VII 1937, *S. Juzepczuk*, № 233 (LE 01072762). **Karachay-Cherkess Republic:** *Reg. auton. Karatshai, prope pag. Teberda, in valle fl. Eptshik*, in prato alpino (in pascuis), 21 VIII 1937, *idem*, № 752 (LE 01072761); *ibidem*, in prato alpino cespitoso (Festuceto-Brometo-Nardeto), 21 VIII 1937, *idem*, № 764 (LE 01072720); Teberda State Reserve, slope of the Kel-Bashi Ridge, along pathway to valley of the Dzhemalat River, forest meadow, near big stone, 29 VII 1957, *idem*, № 1078 (Кавказ, Тебердинский гос. заповедник, склон хр. Кель-Баши у тропы, ведущей к дол. р. Джемалат, лесной луг у большого камня, 29 VII 1957, С. Юзепчук, № 1078) (LE 01072763).

Affinity. *Alchemilla chatiparensis* differs by its plane or widely triangular leaf lobes from all related species (*A. diversipes* Juz., *A. kurdica* Rothm., *A. alexandri* Juz.). *A. glabricaulis* H. Lindb. and *A. phalacroclada* Rothm. are distinguished from this species by totally glabrous petioles and stem internodes, the latter also by glabrous upper surface of leaves.

Habitat. High mountain meadows, grasslands in forests.

Distribution. Western Caucasus: Georgia, Russia (Karachay-Cherkess Republic, Krasnodar Territory).

Etymology. The species is named after the mountain where it was collected.

Alchemilla holobasis Juz. ex Czkalov, sp. nova. — *A. holobasis* Juz., in sched. (*A. subser. Alchemilla*, *A. aggr. retropilosa* Juz.). — Fig. 1: 2.

Plant of small or medium size, up to 12–30 cm. Rhizome thick, up to 1.5 cm. Stems 1–3(4), erect, 1.5–2 times higher than radical leaves, up to 30 cm, densely pubescent with deflexed or patent hairs throughout or almost glabrous on the upper internodes.

Lower radical leaves reniform or orbicular reniform, with distinct sinus (angle between main veins of basal lobes to 150°), angle of sector to 35°, plane, densely hairy on both surfaces; 6–7-lobed, with lobes from 18%, central zone to 72% of leaf length. Lobes arcuate to semiovate, with incisions between lobes to 15% of leaf length, to 84% of lobe length, with 5–6 teeth at both sides of lobe, almost obtuse, equally-sided, mammillate, straight, almost equally-sized (the lowermost teeth to 1.5 times less than the standard tooth), length of standard tooth to 8.5% of leaf length, to 41% of lobe length, with apical tooth to 89% of standard tooth length. Leaves with 95–100 teeth in total. Petioles densely pubescent with deflexed or sometimes erectopatent hairs.

Medium and upper radical leaves up to 15 cm, leaf blade 2–4.5 cm long, widely reniform or reniform, to orbicular, always with distinct sinus, plane, angle of sector 37–40(50)°, evenly densely hairy to subglabrous (i. e. hairy only along the margins) above, sparsely hairy or often glabrous with hairy main veins beneath; 7–8-lobed, lobes 27–30%, central zone 68–70% of leaf length; with lobes semicircular to equally-sided triangular and triangular ovate, with deep incisions between lobes 9.5–10.5% of leaf length, 31–38% of lobe length, with distance between bases of incisions 100–104% of lobe width, with width 154–213% of lobe length; with 6–8 teeth at each side of lobe, quite obtuse, very unequally-sided, triangularly ovate, oblique, almost equally-sized (the lowermost teeth to 1.5 times less than the standard tooth); length of standard tooth 5–7% of leaf length, 18–25% of lobe length, with apical tooth 44–65% of standard tooth length. Leaves with 100–120 teeth in total. Petioles densely pubescent with deflexed hairs. Stipules of radical leaves green or brownish.

Stem leaves 3–4, the one beside the lowermost inflorescence branch widely reniform, cuneate or subcordate, petioles 30–50%, central zone 50–72(80)% of leaf length, 3(4)-lobed, lobes 22–28% of leaf length, with 3–4 teeth at each side, semicircular to triangular semiovate, 34–50 teeth in total. Inflorescence narrow and poor, with 3–4 branches. The lowermost inflorescence branch 0.3–1(1.5) times longer than its internode, with glabrous or hairy at the base and glabrate throughout branchlets, with 1–3(4) nodes, 5–30 flowers. Monochasia dense, the lateral with short stipule, 0.5–1 of pedicel length, with short axis (0–0.5 of pedicel length), 4–6 flowers. Terminal monochasia with stipule 1–3 of pedicel length, short axis (0.5–1 of pedicel length), 4–6 flowers. Flowers of medium size, hypanthia campanulate, in fruit ovoid or spherical, with neck, glabrous or rarely sparsely hairy on the lower half, 1.25–1.75(2) mm long, width to length ratio 65–71(88)%; pedicels 1–2 of hypanthia length, glabrous. Sepals elongate ovate or widely ovate, (0.75)1.10–1.25 mm long, (54)60–91% of hypanthium length, width to length ratio 70–98%, glabrous, barbate or ciliate. Epicalyx segments lanceolate to widely lanceolate, 0.68–0.98 mm long, 44–56% of hypanthium length, 54–81(90)% of sepal length, width 31–53% of sepal width, width to length ratio 37–44(60)%, glabrous, barbate or ciliate.

Holotype (Fig. 3): [Armenia, Gegharkunik Province] NE coast of Sevan (Gokcha) Lake, 1st gorge Tak-Agach, forest at the upper part of the gorge, 27 VI 1930, O. Polyanskaya, № 1 (Сев.-вост. побережье оз. Севан (Гокча) 1-е ущелье Так-Агач, лес в верхней части ущелья, 27 VI 1930, О. Полянская, № 1) (LE:

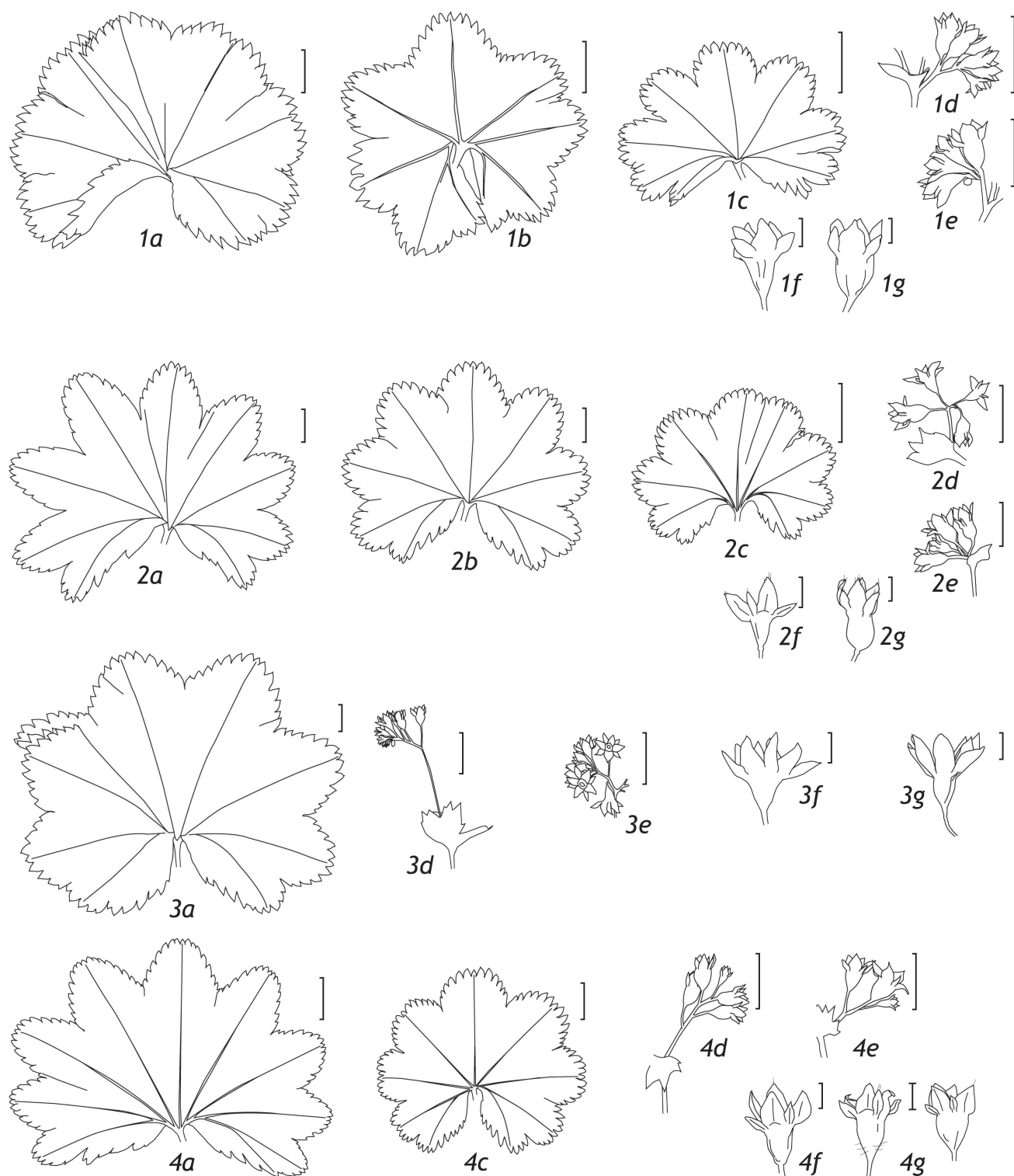


Fig. 1. Morphological traits of *Alchemilla chatiparensis* (1), *A. holobasis* (2), *A. leiophylloides* (3), and *A. levichevii* (4). *a* – leaf blade of upper radical leaf; *b* – leaf blade of medium radical leaf; *c* – leaf blade of lower radical leaf; *d* – terminal monochasium; *e* – lateral monochasium; *f* – blooming flower; *g* – hypanthium with mature fruit. Scale bars: *a*–*c* – 1 cm; *d*, *e* – 5 mm; *f*, *g* – 1 mm.

LE 01073000, plant marked with asterisk; isotypes — LE 01072765, LE 01072767).

Paratypes. **Russia. Republic of Adygeya:** N Caucasus, Krasnodar Territory, Lagonaki Ridge, SW slope (clay) of the Merzekau Ridge, near Mt. Abadzesh (opposite to Mt. Oshten), 2500 m a. s. l., 11 VII 1939, W. Kreczetowicz (Сев. Кавказ, Краснодарский край, хребет Лагонаки, юго-западный склон (глина) хребта Мерзекау у г[оры] Абадзеш (против г[оры] Оштен), на выс. 2100 м над у. м., 11 VII 1939, В. Кречетович) (LE 01072768). **Karachay-Cherkess Republic:** Reg. auton. Karatshai, prope pag. Teberda, in ascensu ad tractat. Kel-bashi e valle fl. Nazaly-kol, in pineto, 8 VIII 1937, S. Juzepczuk, № 478 (LE 01072769). **Armenia. Gegharkunik Province:** Distr. Novo-Bajazet, in jugo Artshatnotz prope pagum Tzamakapert, 6300–8000', 11 VII 1923, A. Grossheim, O. Zedelmeyer (LE 01072801). **Azerbaijan. Quba District:** Transcaucasia, Azerbajdzhan, prov. Baku, distr. Kuba, in pascuis Katal-usti, 8 VIII 1928, A. Achverdov (LE 01072766).

Note. The holotype and isotype LE 01072765 are mounted on the same sheet.

Affinity. From this species, *A. levicevii* Czkalov (see below) differs by obtuse leaf lobes, shorter incisions between them, longer apical tooth (relatively to the standard one), and ribbed hypanthia; *A. integrabasis* Juz. differs in having orbicular to orbicular reniform radical leaves, elongate campanulate hypanthia; *A. sarmatica* Juz. is distinguished by shorter leaf lobes, mostly semicircular, and wide multiflorous inflorescence.

Habitat. Forests, highmountain pastures.

Distribution. Caucasus: Russia (Republic of Adygeya, Karachay-Cherkess Republic, Krasnodar Territory), Armenia, Azerbaijan.

Etymology. The species was named by S. V. Juzepczuk, presumably due to its indistinctly dentate basal lobes.

***Alchemilla leiophylloides* Juz. ex Czkalov, sp. nova. — *A. leiophylloides* Juz., in sched., p. p. (*A. subser. Alchemilla*, *A. aggr. subcrenata* Buser). — Fig. 1: 3.**

Plant of medium or large size, up to 50 cm. Rhizome thick, up to 1.5 cm. Stems 2–3, erect or tortuous, rather robust, up to 2 times higher than radical leaves, up to 50 cm, densely pubescent with erectopatent hairs, at the upper half glabrous.

Lower radical leaves orbicular reniform, with angle of sector from 35°, plane, mostly glabrous, slightly hairy beneath only on teeth, basal lobes, and on the veins throughout; 7-lobed, with lobes to 22%, central zone from 71% of leaf length. Lobes arcuate to semicircular, with incisions between lobes to 12.5% of leaf length, to 58% of lobe length, with 6–7 teeth at both sides of lobe, acutish or almost obtuse, almost equally-sided, mammillate, oblique, straight, almost equally-sized (the lowermost teeth to 1.5 times less than the standard tooth);

standard tooth from 5.5% of leaf length, from 26.5% of lobe length; apical tooth from 43% of standard tooth length, much shorter than neighboring ones. Leaves with 90–110 teeth in total. Petioles densely pubescent with erectopatent hairs.

Medium and upper radical leaves up to 25 cm, leaf blade 5–7 cm long, orbicular reniform to orbicular with narrow sinus, almost plane, angle of sector to 40°, mostly glabrous, slightly hairy beneath only along the margins, on the basal lobes and in the upper $\frac{1}{2}$ – $\frac{2}{3}$ of veins; 7(8)-lobed, lobes from 20%, central zone to 79% of leaf length; with lobes semicircular to widely parabolic, with incisions between lobes from 9% of leaf length, from 46% of lobe length, with distance between bases of incisions 98–103% of lobe width, with 6–7(8) teeth at each side of lobes, quite acute, very unequally-sided, triangularly ovate, straight, curved, almost equally-sized (the lowermost teeth to 2 times less than the standard tooth); standard tooth to 7% of leaf length, to 34% of lobe length, with apical tooth to 47% of standard tooth length, much shorter than neighboring ones. Leaves with 110–130 teeth in total. Petioles densely pubescent with erectopatent hairs. Stipules of radical leaves reddish.

Evenly-spread stem leaves 5–7, the one beside the lowermost inflorescence branch reniform or orbicular reniform, petioles 20–30%, central zone 69–85% of leaf length, 5-lobed, lobes 15–19% of leaf length, with 5–6 teeth at each side, arcuate to widely semiovate, 65–75 teeth in total. Inflorescence wide, with 4–7 branches. The lowermost inflorescence branch 1.5–2 times longer than its internode, with mostly glabrous branchlets, slightly hairy sometimes only on the lowermost internode, with 6–10 nodes, 70–100 flowers. Monochasia dense, the lateral with short stipule, 0.5–1 of pedicel length, with normal axis (0.5–1 of pedicel length), 5–7 flowers. Terminal monochasia with long stipule 5–9 of pedicel length, clear axis (1.5–4 of pedicel length), 7–10 flowers. Flowers of medium size, hypanthia obconical, in fruit campanulate or shortly campanulate, without neck, glabrous, 1.25–1.67(1.80) mm long, width to length ratio 80–125%; pedicels 0.5–2 hypanthia length, glabrous. Sepals elongate triangular ovate, 1.25–1.50 mm long, (76)84–113(130)% of hypanthium length, width to length ratio 50–66(79)%, glabrous. Epicalyx segments lanceolate to narrowly elliptic, 1.25–1.80 mm long, (75)88–130(136)% of hypanthium length, 88–124% of sepal length, width (60)71–96% of sepal width, width to length ratio (29)36–58%, glabrous.

Holotype (Fig. 4): [Georgia, Borjomi Municipality] Georgian SSR, Bakuriani, herbaceous slope beside the pathway at the ascent to Mt. Kokhta, near the



Fig. 2. Holotype (LE 01072719) and isotype (LE 01072993) of *Alchemilla chatiparensis*.



Fig. 3. Holotype (LE 01073000) and isotype (LE 01072765) of *Alchemilla holobasis*.

fons outlet, 20 VI 1953, S. Juzepczuk, Abel Pruidze, № 177 (Грузинская ССР, Бакуриани, травянистый склон рядом с дорогой при подъеме на [ору] Кохту, у выхода ключей, 20 VI 1953, С. Юзепчук, Абель Пруйдзе, № 177) (LE: LE 01072772).

Paratypes. **Russia. Krasnodar Territory:** Circassia, prope opp. Krasnaja Poljana, m. Atshishcho, in prato juxta lacus vetustos (paludificatos), ad tramitem, 25 VII 1937, S. Juzepczuk, № 318 (LE 01072804). **Georgia. Borjomi Municipality:** Tiflis Province, Bakuriani, Shougliat-oubani Ridge, 18 VI 1924, W. Kozłowsky (Тифлис[ская] губерния), Бакуриани, хр. Шуглиат-убани, 18 VI 1924, W. Kozłowsky) (LE 01072805–LE 01072807, LE 01072809); Near the town of Borjomi, near Tseros-tba Lake, 22 VII 1923, *idem* (Окр. Боржома, у оз. Церос-тба, 22 VII 1923, W. Kozłowsky) (LE 01072808).

Affinity. From this species, *A. leiophylla* Juz. differs by patent and deflexed indumentum of stems and petioles, smaller epicalyx segments 74–83% of hypanthium length, 32–59% of sepal width, and wider sepals with width to length ratio (53)74–90(109)%; *A. pseudolaeticolor* Czakalov (see below) differs in having longer and narrower (see width to length ratio) hypanthia, shorter sepals and epicalyx segments relatively to hypanthia length, shorter incisions between leaf lobes, and less angle of leaf sector; *A. laeticolor* Juz. is distinguished by hairy main veins of radical leaves throughout and $\pm$ hairy stems at the upper half. The species demonstrates intermediate features between representatives of *A. ser. Alchemilla* and *A. subsect. Calycanthum* (Rothm.) Rothm. *ser. Elatae* Rothm., probably due to hybridization between them. From the latter, it probably inherited the flower structure and relatively dense indumentum of petioles; but I was convinced to attribute the species to *A. ser. Alchemilla* because of its rather soft indumentum, a slender constitution, and leaf blades with quite small total teeth number.

Habitat. Along the banks of mountain watercourses, on forest edges and moist meadows.

Distribution. Caucasus: Russia (Krasnodar Territory), Georgia, Armenia.

Etymology. The species was named by S. V. Juzepczuk due to its similarity with *A. leiophylla* Juz.

***Alchemilla levichevii* Czakalov, sp. nova** (*A. subser. Alchemilla*, *A. aggr. retropilosa* Juz.). — Fig. 1: 4.

Plant of medium or almost large size, 25–40 cm. Rhizome quite thick, up to 1.2 cm. Stems 1–2(3), erect, 1.5–2 times higher than radical leaves, up to 40 cm, pubescent throughout with deflexed or patent hairs, subglabrous or glabrous at the upper 1–2 internodes.

Lower radical leaves reniform, with distinct sinus (angle between basal lobe veins to 150°), angle of sector

to 39°, slightly undulate, evenly hairy above, sparsely hairy, subglabrous or glabrous beneath; 7-lobed, with lobes from 13%, central zone to 84% of leaf length. Lobes arcuate to semiovate, with incisions between them to 9% of leaf length, to 70% of lobe length, with 5–6 teeth at both sides of lobe, acutish, equally-sided, triangular mammillate, straight, unequally-sized (the lowermost teeth to 3 times less than the standard tooth), length of standard tooth to 10% of leaf length, to 78% of lobe length, with apical tooth from 54% of standard tooth length. Leaves with 70–100 teeth in total. Petioles densely pubescent with deflexed hairs.

Medium and upper radical leaves up to 15 cm, leaf blade 2–4.5 cm long, reniform to orbicular reniform, ever with distinct sinus, almost plane or slightly undulate, angle of sector 30–39°, evenly sparsely hairy to subglabrous above, sparsely hairy or often glabrous beneath, with hairy main veins, which are sometimes subglabrous at the bases; 7–9-lobed, lobes 20–25%, central zone 70–77% of leaf length; with lobes trapezoid and elongate trapezoid, with distinct incisions between them, 5–9% of leaf length, 27–35% of lobe length, with distance between bases of incisions 106–113% of lobe width, with width 160–245% of lobe length; with (6)7–9 teeth at each side of lobe, quite obtuse, very unequally-sided, triangularly ovate, straight, unequally-sized (with the largest teeth at the middle of lobe up to 4 times larger than the lowermost one); standard tooth 4.5–6% of leaf length, 20–30% of lobe length; apical tooth 65–75% of the standard tooth length. Leaves with 115–145 teeth in total. Petioles densely pubescent with deflexed hairs. Stipules of radical leaves green or brownish.

Stem leaves 3–4, assembled in the upper half of stem, the one beside the lowermost inflorescence branch reniform, cuneate or subcordate, petioles 50–100%, central zone 68–83% of leaf length, 3–5-lobed, lobes 16–20% of leaf length, arcuate to semicircular, with 4–5 teeth at each side, 50–65 teeth in total. Inflorescence slightly widespread, with 2–4 branches assembled in the upper half. The lowermost inflorescence branch 0.5–1 times longer than its internode, with glabrous branchlets or hairy only on the lowermost internode and gradually glabrate to the top, with 3–4(6) nodes, 10–50 flowers. Monochasia quite lax, the lateral with short stipule, 0.5–1 of pedicel length, with almost no axis (0–0.5 of pedicel length), 3–4 flowers. Terminal monochasia with distinct stipule 1–2 of pedicel length, long axis (2–3 of pedicel length), 5–7 flowers. Flowers of large size, hypanthia campanulate, truncate at the base, ribbed; in fruit campanulate, with neck, glabrous or rarely sparsely hairy at the lower half, 1.25–1.75(2.50) mm long, width to length ratio (50)75–94%; pedicels 1–1.5 of hypanthia length, glabrous. Sepals ovate, 1.05–1.20(1.75) mm long,



Fig. 4. Holotype of *Alchemilla leiophylla* (LE 01072772).

67–78(96)% of hypanthia length, width to length ratio (60)67–78%, glabrous or ciliate. Epicalyx segments narrowly lanceolate to ovate, 0.75–0.90(1.35) mm long, 49–60% of hypanthia length, (56)70–86% of sepal length, width 31–61% of sepal width, width to length ratio 33–47%, glabrous or ciliate.

H o l o t y p e (Fig. 5): [Azerbaijan, Quba District] Transcaucasia, Azerbajdzhan, prov. Baku, distr. Kuba, in pascuis alpinis supra pagum Krys [Qriz], 21 VII 1927, A. Achverdov, № 1 (LE: LE 01072773; isotypes — LE 01072793, LE 01072803).

P a r a t y p e s. **Russia. Krasnodar Territory:** Lagonaki Ridge, Mt. Mezmay, 30 VII 1940, I. Simonenko (Краснодарский край, хр. Лагонаки, г[ора] Мезмай, 30 VII 1940, И. Симоненко) (LE 01072792). **Azerbaijan. Quba District:** Transcaucasia, Azerbajdzhan, prov. Baku, distr. Kuba, in pascuis alpinis supra pagum Krys [Qriz], 30 VII 1927, A. Achverdov (LE 01072802).

A f f i n i t y. *Alchemilla breviloba* H. Lindb., being similar to this species in appearance and especially through the shape of ribbed hypanthia, differs by larger angle of radical leaves sector (40–45°) with evenly hairy main veins, shorter incisions between lobes (1–2 of standard tooth length), shorter pedicels (0.5–1 of hypanthium length). *A. cyrtopleura* Juz. differs in having evenly hairy leaves, rounded at the base campanulate hypanthia, shorter incisions between lobes (1–2 of standard tooth length), and normal (i. e. longer) axis of lateral monochasia about one pedicel length. *A. heterophylla* Rothm., in comparison with this species, has smaller flowers with hypanthia acuminate at the base and usually ± hairy, leaf lobes mostly rounded at the top.

H a b i t a t. Mountain pastures.

D i s t r i b u t i o n. Caucasus: Russia (Karachay-Cherkess Republic, Krasnodar Territory), Armenia, Azerbaijan.

E t y m o l o g y. The species was named in honour of taxonomist and morphologist Igor Germanovich Levichev (Komarov Botanical Institute of the Russian Academy of Sciences, St. Petersburg, Russia).

***Alchemilla marginalis* Juz. ex Czakalov, sp. nova.** — *A. marginalis* Juz., in sched. (*A. subser. Alchemilla*, *A. aggr. retropilosa* Juz.). — Fig. 6: 1.

Plant of small or medium size, 12–30 cm. Rhizome rather thin, up to 0.9 cm. Stems 1–3(6), quite weak, ascendent, often tortuous, equal to or 1.5 times higher than radical leaves, up to 30 cm, pubescent with erectopatent hairs throughout or gradually glabrate to the top, at the upper 1–2 internodes glabrous.

Lower radical leaves widely reniform, with distinct sinus (angle between the basal lobe veins to 110°), angle of sector to 55°, plane, evenly sparsely hairy above, glabrous or subglabrous beneath, hairy only on main veins

throughout, basal lobes, and leaf lobes; 5–7-lobed, with lobes from 18%, central zone from 70% of leaf length. Lobes arcuate or shortly triangular, with incisions between lobes to 15% of leaf length, to 83% of lobe length, with 4–6 teeth at both sides of lobe, acutish, equally-sided, triangular mammillate, straight, almost equally-sized (the lowermost teeth to 1.5 times less than the standard tooth); standard tooth to 10% of leaf length, to 43% of lobe length; apical tooth to 92% of standard tooth length. Leaves with 70–105 teeth in total. Petioles densely pubescent with erectopatent hairs.

Medium and upper radical leaves up to 30 cm, leaf blade 2–3.5 cm long, orbicular or orbicular reniform, with narrow sinus or overlapped basal lobes, plane or only the uppermost slightly undulate, angle of sector 35–48°, subglabrous (± glabrous among the veins) or sparsely hairy above, glabrous with hairy main veins beneath; 7–8-lobed, lobes 20–30%, central zone 70–73% of leaf length. Lobes widely semiovate or trapezoid, with deep incisions between lobes 6.5–11% of leaf length, 29–37% of lobe length, with distance between bases of incisions 97–114% of lobe width, with width 200–246% of lobe length; with 5–7 teeth at each side of lobe, quite obtuse or acutish, very unequally-sided, triangularly ovate, straight, unequally-sized (the teeth at the middle part of lobe up to 2 times larger than the other); standard tooth 5–10% of leaf length, 22–34% of lobe length; apical tooth 52–67% of standard tooth length. Leaves with 100–130 teeth in total. Petioles densely pubescent with erectopatent hairs. Stipules of radical leaves purple or brownish.

Evenly spread stem leaves 3–4, the one beside the lowermost inflorescence branch reniform, cuneate or truncate, petioles 0–50%, central zone 54–68% of leaf length, 1–3-lobed (without the basal ones), lobes arcuate to semiovate, 19–34% of leaf length, with 2–3(4) teeth at each side, 25–40 teeth in total. Inflorescence narrow and poor, with 2–3 branches. The lowermost inflorescence branch 0.3–1 of its internode length, sparsely hairy almost to the top of branchlets, with 1–3(4) nodes, 10–20 flowers. Monochasia lax, the lateral with short stipule 0.5–1 of pedicel length, short axis (0–0.5 of pedicel length), 3–5 flowers. Terminal monochasia with stipule 1–3 of pedicel length, short axis (0.5–1 of pedicel length), 4–5 flowers. Flowers of small size, hypanthia campanulate, in fruit ovoid or spherical, with neck, glabrous or rarely sparsely hairy at the base, (1.08)1.30–1.43(1.58) mm long, width to length ratio 65–77%; pedicels 1–3 of hypanthia length, glabrous. Sepals ovate or widely ovate, 0.93–1.3 mm long, 60–87% of hypanthium length, width to length ratio 62–79%, mostly ciliate. Epicalyx segments lanceolate to narrowly ovate, 0.60–0.88 mm long, 40–58(65)% of hy-

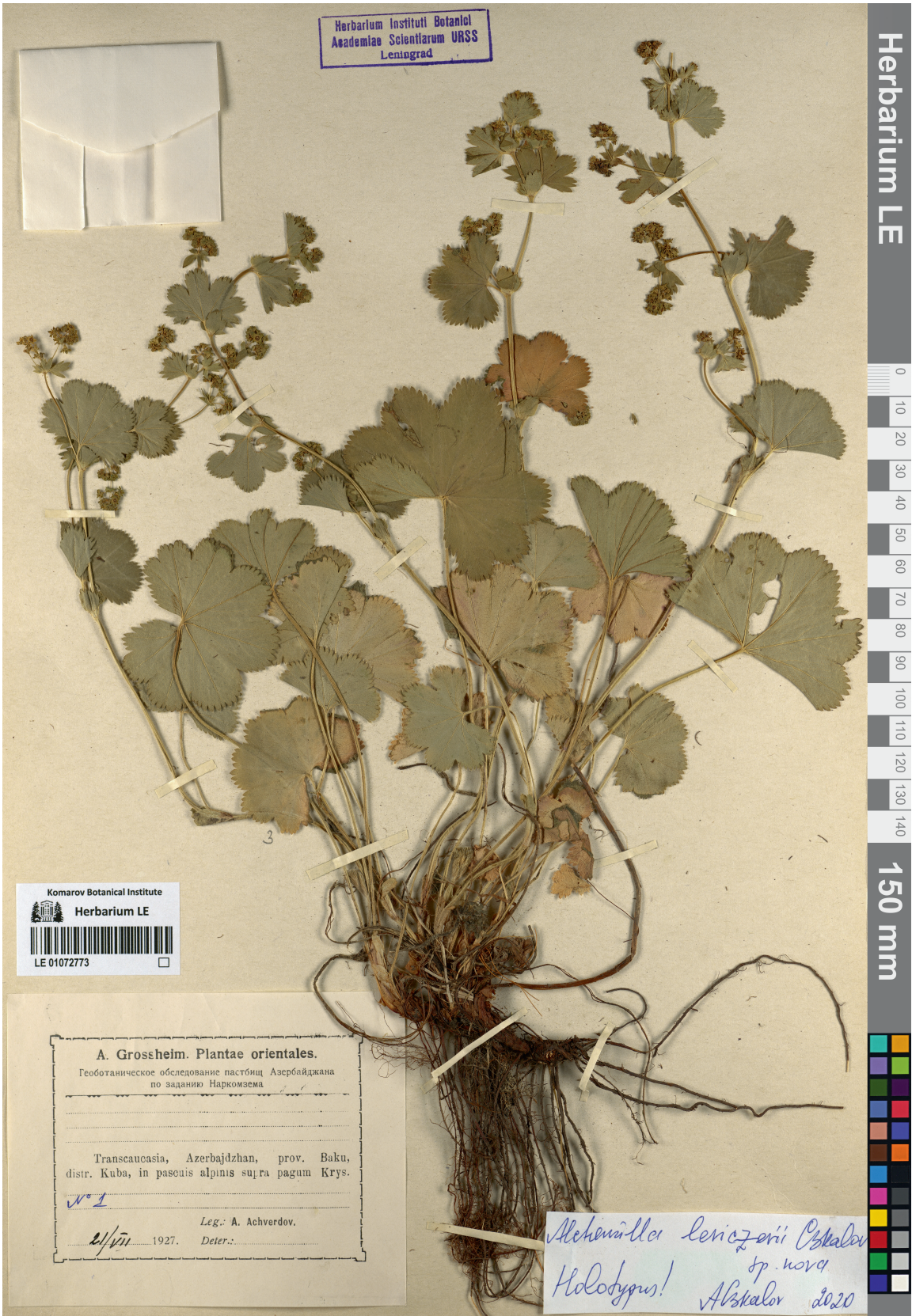


Fig. 5. Holotype of *Alchemilla levicevii* (LE 01072773).

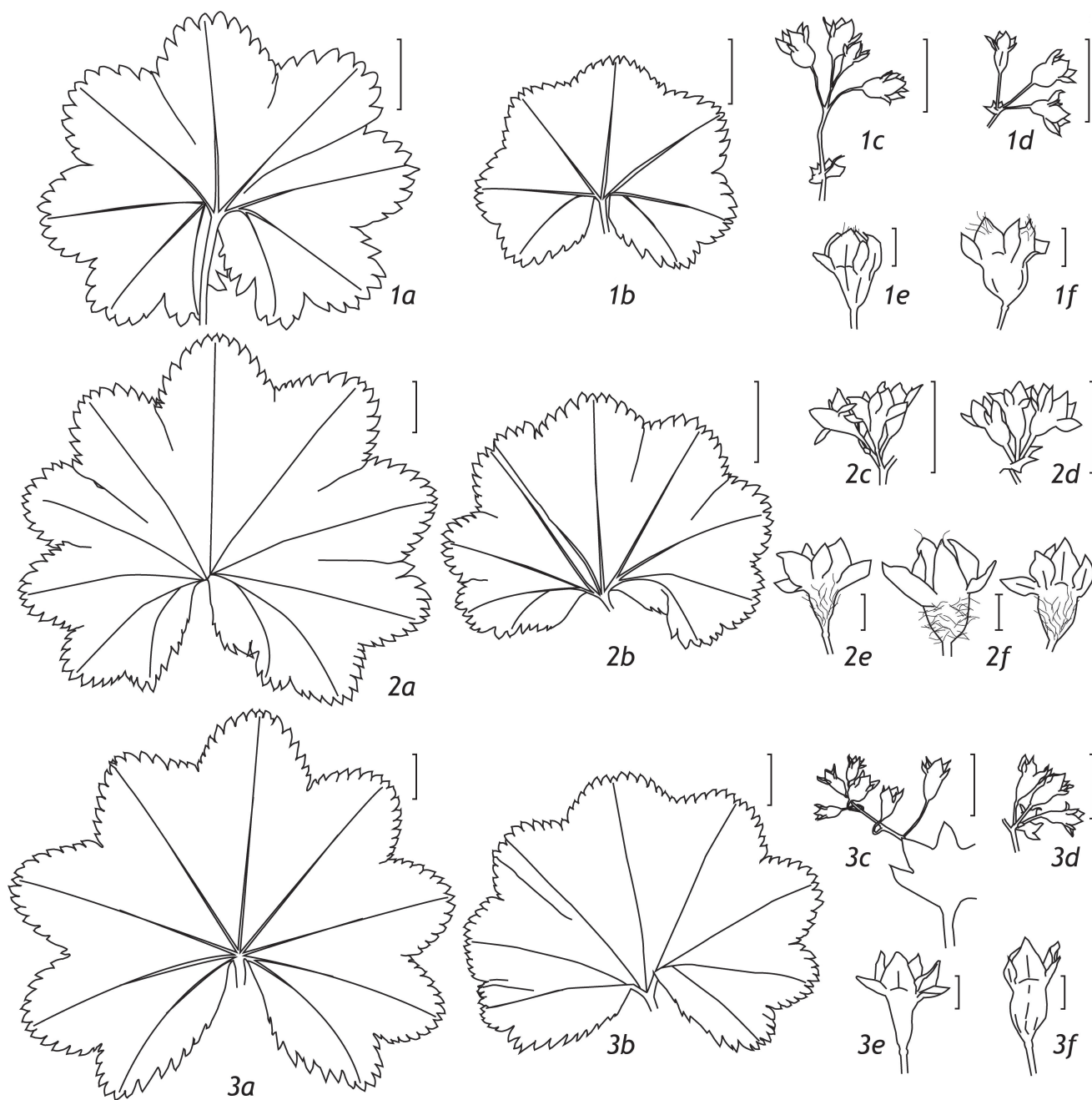


Fig. 6. Morphological traits of *Alchemilla marginalis* (1), *A. propinquoides* (2), and *A. pseudolaeticolor* (3). *a* – leaf blade of upper radical leaf; *b* – leaf blade of lower radical leaf; *c* – terminal monochasium; *d* – lateral monochasium; *e* – blooming flower; *f* – hypanthium with mature fruit. Scale bars: *a*, *b* – 1 cm; *c*, *d* – 5 mm; *e*, *f* – 1 mm.

panthia length, 63–76% of sepal length, width 32–50% of sepal width, width to length ratio 40–50%, mostly ciliate.

H o l o t y p e (Fig. 7): [Russia, Karachay-Cherkess Republic] Teberda State Reserve, valley of the Dzhemalat River, forest meadow plot above hayfields, 25 VII 1957, S. Juzepczuk, № 1055 (Тебердинский гос. заповедник, долина р. Джемалат, лесная лужайка выше сенокосных угодий, 25 VII 1957, S. Juzepczuk, № 1055) (LE: LE 01072994, plant marked with asterisk; isotypes — LE 01072776, LE 01072995, LE 01072996).

N o t e. The holotype and isotypes are mounted on the same sheet.

P a r a t y p e s. **Georgia. Borjomi Municipality:** Georgian SSR, Borjomi, Sadgher plateau, between park (former “Vorontsovsky”) and Sadgheri village, forest road, 17 VI 1953, S. Juzepczuk, Abel Pruidze, № 54 (Грузинская ССР, Садгерское плато, между парком (бывшим) Воронцовским) и д. Садгери, лесная дорога, 17 VI 1953, С. Юзепчук, Абель Приудзе, № 54) (LE 01072778); **Azerbaijan. Ganja:** Transcaucasia, Azerbajdjan, prov. et distr. Gandzha, in faucibus fl. Koshkar-tshaj, 19 VI 1928, A. Doluchanov (LE 01072777).

A f f i n i t y. Leaf and flower structure of this species is very typical of *A. aggr. retropilosa*, despite the erectopatent indumentum of petioles and stems, which distinguishes *A. marginalis* from all other species of this group. Caucasian species with erectopatent indumentum (*A. sedelmeyeriana* Juz., *A. subcrenatisformis* Juz., *A. laeticolor* Juz.) differ in having more numerous teeth of leaf lobes (7–10 at each side), and larger flowers.

H a b i t a t. On meadow plots in forests, along pathways, and in highmountain pastures.

D i s t r i b u t i o n. Caucasus: Russia (Karachay-Cherkess Republic), Georgia, Azerbaijan.

E t y m o l o g y. The name was proposed by S. V. Juzepczuk, meaning “marginal”, presumably, because of a position of the species at the border between *Pubescentes* and *Alchemilla* (“*Imberbes*”) groups.

Alchemilla propinquoides Czakalov, sp. nova (*A. subser. Pastorales* V. N. Tikhom., *A. aggr. argutiser-rata* Juz.). — Fig. 6: 2.

Plant of small or medium size, 12–20 cm. Rhizome quite thick, up to 1.2 cm. Stem solitary, erect or tortuous, 1–2 times higher than radical leaves, up to 20 cm, densely pubescent with erectopatent hairs throughout.

Lower radical leaves reniform to orbicular, with distinct sinus or without sinus, undulate, angle of sector to 45°, densely hairy on both surfaces; 7-lobed, with lobes from 18%, central zone to 78% of leaf length. Lobes arcuate or shortly trapezoid, with incisions between lobes to 12% of leaf length, to 60% of lobe

length, with 5–6 teeth at both sides of lobe, acutish, equally-sided, triangular mammillate, almost straight, almost equally-sized (the lowermost teeth to 1.5 times less than the standard tooth); standard tooth from 6% of leaf length, from 62% of lobe length, apical tooth from 27% of standard tooth length. Leaves with 90–110 teeth in total. Petioles densely pubescent with erectopatent hairs.

Medium and upper radical leaves up to 12 cm, leaf blade 3–4.5 cm long, widely orbicular reniform or orbicular, with narrow sinus or overlapped basal lobes, undulate, angle of sector 35–47°, densely hairy on both surfaces; 7–9-lobed, lobes 20–25%, central zone 75–80% of leaf length; with lobes widely semiovate to triangular semiovate, with deep incisions between lobes 8–10% of leaf length, 43–55% of lobe length, with distance between bases of incisions 95–105% of lobe width, with width 200–255% of lobe length; with (6)7–9 teeth at each side of lobe, acutish, almost equally-sided, triangularly ovate, externally oblique, curved, unequally-sized (the lowermost teeth to 2 times less than the standard tooth); standard tooth 7–12% of leaf length, 28–40% of lobe length, apical tooth 30–50% of standard tooth length. Leaves with 90–150 teeth in total. Petioles densely pubescent with erectopatent hairs. Stipules of radical leaves green or brownish.

Evenly-spread stem leaves 4–5, the one beside the lowermost inflorescence branch widely reniform, cuneate or subcordate, petioles 30–50%, central zone 62–81% of leaf length, 3(4)-lobed, lobes arcuate to equally-sided triangular, 26–32% of leaf length, with 4–6 teeth at each side, 50–62 teeth in total. Inflorescence narrow and poor, with 2–3 branches. The lowermost inflorescence branch 0.5–1 times longer than its internode, with hairy branchlets throughout, with 3–7 nodes, 10–35 flowers. Monochasia dense, the lateral with no stipule, no axis, 4–5 flowers. Terminal monochasia with stipule about one pedicel length, axis about one pedicel length, 4–5 flowers. Flowers of small or medium size, hypanthia obconical, in fruit campanulate to spherical, without neck, various in pubescence — glabrous, sparsely or densely hairy, 1–1.8 mm long, width to length ratio 70–90%; pedicels short, 0.5–1 of hypanthia length, glabrous or hairy at the base. Sepals triangular ovate, 1.25–1.75 mm long, 75–95(130)% of hypanthia length, width to length ratio 49–59%, glabrous, rarely barbate. Epicalyx segments widely lanceolate to ovate, 1.25–1.70 mm long, 91–100(130)% of hypanthia length, 98–124% of sepal length, width (60)74–86% of sepal width, width to length ratio 30–44%, ciliate.

H o l o t y p e (Fig. 8): [Russia, Krasnodar Territory] Circassia, prope opp. Krasnaja Poljana,



Fig. 7. Holotype (LE 01072994) and isotypes (LE 01072776, LE 01072995, and LE 01072996) of *Alchemilla marginalis*.



Fig. 8. Holotype (LE 01072997) and isotype (LE 01072784) of *Alchemilla propinquaoides*.

m. Aibga, haud procul a tabernis pastoralibus II, ad fontes, 14 VII 1937, S. Juzepczuk, № 88 (LE: LE 01072997, plant marked with asterisk; isotypes — LE 01072784, LE 01072785).

Note. The isotype LE 01072784 is mounted on the same sheet as the holotype.

Affinity. Many species of *A. aggr. argutiserrata* (*A. monticola* Opiz, *A. heterophylla* Rothm.) are distinguished from *A. propinquoides* through patent or deflexed indumentum of petioles and stems. *A. stevenii* Buser differs by longer rounded leaf lobes (parabolic or widely parabolic), deeper incisions between them (1–2 of standard tooth length); *A. propinqua* H. Lindb. ex Alexandrov et Nekr. differs in having deeper (1–2.5 of standard tooth length) and wide open (V-shaped) incisions between leaf lobes, densely hairy campanulate and barrel-shaped (in fruit) hypanthia, plane leaf blades; *A. conglobata* H. Lindb., *A. sibirica* Zämelis differ by deeper (from 2.5 of standard tooth length) incisions between leaf lobes, flowers with similarly densely hairy hypanthia. This species is very similar in appearance to *A. crinita* Buser, but the latter has patent or deflexed indumentum, numerous stems (to 5), poor but widespread inflorescence with 4–5 branches, lateral monochasia with distinct axis (1–2 of pedicel length), long pedicels (1.5–4 of hypanthia length).

Habitat. Along streams, in highmountain pastures and pine forests.

Distribution. Caucasus: Russia (Karachay-Cherkess Republic, Krasnodar Territory), Armenia, Azerbaijan.

Etymology. The species is named due to its similarity with *A. propinqua*.

Alchemilla pseudolaeticolor Czekalov, sp. nova. — *A. leiophylloides* Juz., in sched., p. p., excl. typo *A. leiophylloides* Juz. ex Czekalov (*A. sect. Alchemilla* subser. *Alchemilla*, *A. aggr. subcrenata* Buser). — Fig. 6: 3.

Plant of medium size, up to 25 cm. Rhizome quite thick, to 1.2 cm. Stems (2)3–4, erect or ascendant, rather robust or tortuose, 2 times higher than radical leaves, up to 25 cm, densely pubescent with erectopatent hairs, at the upper half glabrous.

Lower and medium radical leaves orbicular reniform or reniform, with angle of sector from 30°, plane, mostly glabrous, hairy only along the margins and on the veins at the upper $\frac{1}{4}$ – $\frac{1}{3}$; 7-lobed, with lobes 18–35%, central zone 76–79% of leaf length. Lobes arcuate to semiovate, with incisions between lobes to 4–7% of leaf length, to 17–40% of lobe length, with (6)7–9 teeth at both sides of lobe, acutish or almost obtuse, very unequally-sided, mammillate or triangular mammillate, straight, very unequally-sized (the lowermost teeth to 5 times less than

the standard tooth); standard tooth about 5% of leaf length, 23–29% of lobe length, apical tooth 71–76% of standard tooth length. Leaves with 100–130 teeth in total. Petioles densely pubescent with erectopatent hairs.

Upper radical leaves up to 10 cm, leaf blade 3–5 cm long, reniform or widely reniform with wide sinus (angle between veins of the basal lobes about 90°), almost plane, angle of sector to 35°, mostly glabrous, hairy only along the margins and on the veins at the upper $\frac{1}{4}$ – $\frac{1}{3}$; 8–9-lobed, lobes arcuate or shortly trapezoid, from 14%, central zone to 84% of leaf length; incisions between lobes from 2% of leaf length, from 15% of lobe length, with distance between bases of incisions 93–105% of lobe width, with width 190–330% of lobe length; with 7–9 teeth at each side of lobe, quite acute, unequally-sided, triangular or triangularly ovate, straight, almost equally-sized; standard tooth about 5% of leaf length, to 37% of lobe length, apical tooth from 57% of standard tooth length. Leaves with 110–130 teeth in total. Petioles densely pubescent with erectopatent hairs. Stipules of radical leaves green or brownish.

Stem leaves beside the lowermost inflorescence branch widely reniform, cuneate or truncate, petioles to 30%, central zone 62–69% of leaf length, 3-lobed, lobes arcuate to semicircular, 24–26% of leaf length, with 3–4 teeth at each side, 38–45 teeth in total. Inflorescence narrowish, with 3–4 branches. The lowermost inflorescence branch 0.5–1.5 times longer than its internode, with glabrous branchlets, 5–7 nodes, 30–60 flowers. Monochasia quite lax, the lateral with short stipule 0.5–1 of pedicel length, with short axis (0.5–1 of pedicel length), 3–5 flowers. Terminal monochasia with long stipule (2–4 pedicel length), normal axis (1–2 of pedicel length), 5–7 flowers. Flowers of medium or large size, hypanthia obconical or elongate obconical, in fruit elongate campanulate or pitcher-shaped, with neck, glabrous, (1.3)1.4–1.95(2.2) mm long, width to length ratio 55–79%; pedicels 1–1.5 of hypanthia length, glabrous. Sepals ovate or elongate triangular ovate, (0.9)1.1–1.58 mm long, 57–79% of hypanthia length, width to length ratio 59–96%, glabrous. Epicalyx segments widely lanceolate or narrowly ovate, 0.9–1.4 mm long, 53–70% of hypanthia length, 93–100% of sepal length, width 35–60% of sepal width, width to length ratio 32–46%, glabrous.

Holotype (Fig. 9): [Russia, Karachay-Cherkess Republic] Reg. auton. Karatshai, in via ad trajectum Kluchor, in ripa fl. Kluchor septentr. inter “Refugium septentrionale” et I cataractam, 24 VIII 1937, S. Juzepczuk, № 808 (LE: LE 01072791).

Affinity. From this species, *A. leiophylla* Juz. differs by patent and deflexed indumentum of stems and petioles, longer sepals and epicalyx segments — (71)87–

Fig. 9. Holotype of *Alchemilla pseudolaeticolor* (LE 01072791).

108% and 74–83% of hypanthium length, respectively; differences from *A. leiophylloides* Juz. ex Czkalov see above (p. 88); *A. laeticolor* Juz. is distinguished by main veins of radical leaves hairy throughout and $\pm$ hairy stems at the upper half.

Habitat. In highmountain moist meadows, beech forests.

Distribution. Caucasus: Russia (Karachay-Cherkess Republic), Georgia.

Etymology. The species is named because of the similarity in appearance with *A. laeticolor*.

Key to the species of *Alchemilla* series *Alchemilla* in the Caucasus

1. All petioles glabrous 2.
- + At least petioles of upper leaves $\pm$ hairy 4.
2. Lobes more than $\frac{1}{4}$ of leaf length, parabolic or almost triangular *A. oligotricha* Juz.
- + Lobes less than $\frac{1}{4}$ of leaf length 3.
3. Most leaves reniform to orbicular reniform, subglabrous above, with arcuate to semicircular lobes *A. phalacroclada* Rothm.
- + Most leaves orbicular or orbicular reniform, evenly hairy above, with semicircular to shortly parabolic lobes *A. glabricaulis* H. Lindb.
4. Petioles of lower leaves glabrous 5.
- + Petioles of lower leaves hairy 11.
5. Lobes less than $\frac{1}{4}$ of leaf length 6.
- + Lobes more than $\frac{1}{4}$ of leaf length 9.
6. Leaves very undulate 7.
- + Leaves plane or nearly so 8.
7. Teeth at each lobe side 5–7, with normal width, length to width ratio 1–1.5, angle of leaf sector 35–40(50)° *A. diversipes* Juz.
- + Teeth at each lobe side 3–5, narrow with length to width ratio up to 2, angle of leaf sector 45–60° *A. kurdica* Rothm.
8. Lobes of medium and upper leaves equally-sided triangular to widely triangular or almost plane, with 6–10 teeth at each side *A. chatiparensis* Czkalov.
- + Lobes of medium and upper leaves semicircular to trapezoid, with 3–6 teeth at each side *A. fluminea* S. E. Fröhner.
9. Lobes of medium and upper leaves ovate to elongate triangular, $\frac{2}{7}$ – $\frac{3}{7}$ of leaf length, with (8)9–12 teeth at each side, incisions between lobes less than 1 standard tooth length *A. insignis* Juz.
- + Lobes of medium and upper leaves arcuate to equally-sided triangular and shortly parabolic 10.
10. Leaves almost plane, orbicular reniform with distinct sinus, with lobes to shortly parabolic *A. alexandri* Juz.
- + Leaves very undulate, orbicular with overlapped basal lobes, with lobes to semicircular *A. rechingeri* Rothm.
11. At least some pedicels hairy 12.
- + Pedicels glabrous or hairy only at the base 16.
12. Indumentum of petioles erectopatent, leaf lobes widely parabolic and parabolic *A. stevenii* Buser.
- + Indumentum of petioles patent and deflexed 13.
13. Lobes less than $\frac{1}{4}$ of leaf length 14.
- + Lobes more than $\frac{1}{4}$ of leaf length 15.
14. Hypanthia equally densely hairy, incisions between lobes 2–4 of standard tooth length *A. hebesceus* Juz.
- + Some hypanthia subglabrous, incisions between lobes 1–1.5 of standard tooth length *A. languescens* Juz.
15. Central zone about $\frac{2}{3}$ of leaf length, sepals with length to width ratio 1.1–1.4, clearly shorter than hypanthia *A. valdehirsuta* Buser.
- + Central zone about $\frac{3}{5}$ of leaf length, sepals with length to width ratio 1.5–1.7, equal to hypanthia *A. pycnantha* Juz.
16. Main veins of medium or upper leaves glabrous at the base 17.
- + Main veins of medium and upper leaves hairy throughout 23.
17. Lobes more than $\frac{2}{5}$ of leaf length, semiovate to triangular parabolic *A. kozlovskii* Juz.
- + Lobes less than $\frac{2}{5}$ of leaf length 18.
18. Upper and medium leaves glabrous or subglabrous above 19.
- + Upper and medium leaves evenly hairy above 21.
19. Epicalyx segments similar with sepals, longer than hypanthia *A. leiophylloides* Juz. ex Czkalov.
- + Calyx and epicalyx shorter or equal to hypanthium 20.
20. Indumentum of petioles deflexed and patent *A. leiophylla* Juz.
- + Indumentum of petioles erectopatent and patent *A. pseudolaeticolor* Czkalov.
21. Angle of leaf sector 30–35°, apical tooth 0.3–0.5 of standard tooth length, lower leaves evenly hairy *A. hyrcana* (Buser) Juz.
- + Angle of leaf sector 35–50° 22.
22. Apical tooth 0.5–0.8 of standard tooth length, lower leaves glabrous or subglabrous, leaves almost plane *A. exuens* Juz.
- + Apical tooth 0.4–0.6 of standard tooth length, lower leaves usually hairy, all leaves undulate *A. filicaulis* Buser.
23. Most of hypanthia glabrous or with a few hairs 24.
- + Most of hypanthia $\pm$ hairy 48.
24. Lobes more or equal to $\frac{1}{3}$ of leaf length 25.
- + Lobes less than $\frac{1}{3}$ of leaf length 34.
25. Leaves reniform or orbicular reniform with distinct sinus 26.
- + Leaves orbicular with overlapped basal lobes or orbicular reniform 28.
26. Axis of monochasia less than one pedicel length *A. holobasis* Juz. ex Czkalov.
- + Axis of monochasia 2–4 of pedicel length 27.
27. Leaves undulate with triangular lobes, indumentum of petioles deflexed and patent *A. lessingiana* Juz.
- + Leaves almost plane with trapezoid, less often elongate trapezoid lobes, indumentum of petioles erectopatent and patent *A. micans* Buser.
28. Indumentum of petioles deflexed and patent 29.
- + Indumentum of petioles erectopatent and patent 33.
29. Incisions between lobes less than 1.5 of standard tooth length 30.

- + Incisions between lobes more than 1.5 of standard tooth length 32.
- 30. Leaf lobes acute triangular *A. acutiloba* Opiz.
- + Leaf lobes $\pm$ rounded or obtuse 31.
- 31. Leaves orbicular with overlapped basal lobes, very undulate, angle of leaf sector 35–45° *A. dzhavakhetica* Juz.
- + Leaves orbicular or orbicular reniform with distinct sinus, almost plane, angle of leaf sector 45–60° *A. commixta* Juz. (see also Step 56).
- 32. Incisions between lobes 1.5–2.5 of standard tooth length, leaf indumentum bristle *A. compactilis* Juz.
- + Incisions between lobes 2–4 of standard tooth length, leaf indumentum soft *A. integribasis* Juz.
- 33. Leaves glabrous above *A. laeticolor* Juz.
- + Leaves evenly hairy above *A. subcrenatisformis* Juz.
- 34. Leaves reniform or orbicular reniform with distinct sinus 35.
- + Leaves orbicular with overlapped basal lobes and orbicular reniform 44.
- 35. Lobes less than $\frac{1}{4}$ of leaf length 36.
- + Lobes more than $\frac{1}{4}$ of leaf length, incisions between lobes 2–4 of standard tooth length *A. sarmatica* Juz. (see also Step 59).
- 36. Incisions between lobes less than standard tooth length 37.
- + Incisions between lobes more than standard tooth length 40.
- 37. Angle of leaf sector 20–35° 38.
- + Angle of leaf sector 35–50° *A. imberbis* Juz.
- 38. Leaves glabrous above *A. brevidens* Juz.
- + Leaves evenly hairy above 39.
- 39. Leaf lobes plane, arcuate or widely triangular, pubescent with short hairs *A. arcuatiloba* Juz.
- + Leaf lobes widely semiovalate to triangular parabolic, pubescent with long bristle hairs *A. tythantha* Juz.
- 40. Angle of leaf sector 20–35° 42.
- + Angle of leaf sector (30)35–50° 41.
- 41. Leaf lobes rounded at the top, hypanthia elongate obconical or tubulose *A. tubulosa* Juz.
- + Leaf lobes trapezoid or elongate trapezoid, hypanthia campanulate, truncate at the base, ribbed *A. levicevii* Czkalov.
- 42. Leaf lobes 7–8 (without the basal ones), leaves undulate, hypanthia rounded at the base *A. semilunaris* Alechin.
- + Leaf lobes 8–10 (without the basal ones), leaves almost plane, hypanthia acute at the base 43.
- 43. Leaf lobes $\pm$ triangular, indumentum of petioles patent or deflexed, stem leaves dissected to $\frac{1}{5}$ – $\frac{1}{4}$ *A. rigescens* Juz.
- + Leaf lobes rounded, indumentum of petioles patent or erectopatent, stem leaves dissected to $\frac{1}{3}$ – $\frac{1}{2}$ *A. sedelmeyeriana* Juz.
- 44. Indumentum of petioles erectopatent, teeth at each side of leaf lobe 4–6 *A. marginalis* Juz. ex Czkalov.
- + Indumentum of petioles patent or deflexed, teeth more numerous 45.
- 45. Incisions between lobes less than 1.5 of standard tooth length 46.
- + Incisions between lobes more than 1.5 of standard tooth length 47.
- 46. Leaves plane or slightly undulate, apical tooth shorter than neighboring ones, less than 0.5 of standard tooth length *A. pachyphylla* Juz.
- + Leaves very undulate, apical tooth equal to neighboring ones, more than 0.5 of standard tooth length *A. melancholica* S. E. Fröhner.
- 47. Incisions between lobes 1.5–2.5 of standard tooth length, stem leaves with short petioles, 0.5–1.5 of leaf length *A. cymatophylla* Juz.
- + Incisions between lobes 2.5–4 of standard tooth length, stem leaves with long petioles, 1–4 of leaf length *A. microdonta* Juz. (see also Step 59).
- 48. Indumentum of petioles erectopatent 49.
- + Indumentum of petioles patent or deflexed 52.
- 49. Hypanthia equally densely hairy 50.
- + Some hypanthia subglabrous or glabrous 51.
- 50. Leaves almost plane, lobes of upper leaves elongate triangular ovate, with deep incisions between them more or equal to 2.5 of standard tooth length *A. conglobata* H. Lindb.
- + Leaves very undulate, lobes of upper leaves shorter, semicircular to semiovalate, with shorter incisions between them less than 2 standard tooth length *A. sibirica* Zämelis.
- 51. Leaf lobes parabolic, elongate trapezoid, elongate triangular *A. aenostipula* Juz.
- + Leaf lobes shorter, to semiovalate *A. propinquoides* Czkalov.
- 52. Hypanthia equally densely hairy 53.
- + Some hypanthia subglabrous or glabrous 55.
- 53. Leaf lobes to semicircular or equally-sided triangular *A. hirsutissima* Juz.
- + Leaf lobes longer, to semiovalate or elongate triangular .. 54.
- 54. Leaves orbicular or orbicular reniform, leaf lobes $\frac{2}{7}$ – $\frac{2}{5}$ of leaf length, ovate or triangular *A. argutiserrata* H. Lindb. ex Juz.
- + Leaves reniform or orbicular reniform, leaf lobes $\frac{1}{5}$ – $\frac{2}{7}$ of leaf length, semiovalate or widely semiovalate *A. barbulata* Juz.
- 55. Incisions between lobes less than 1.5 of standard tooth length 56.
- + Incisions between lobes more than 2 standard tooth length 58.
- 56. Most of hypanthia glabrous, leaf lobes trapezoid or elongate trapezoid *A. commixta* Juz. (see also Step 31).
- + Most of hypanthia hairy, leaf lobes shorter, rounded or triangular at the top 57.
- 57. Axis of monochasia less or equal to pedicel length, angle of leaf sector 40–55° *A. pycnotricha* Juz.
- + Axis of monochasia 1–3 of pedicel length, angle of leaf sector 30–45° *A. crinita* Buser.
- 58. Most of hypanthia glabrous 59.
- + Most of hypanthia $\pm$ hairy 60.
- 59. Leaves 9-lobed, usually orbicular with narrow sinus, apical tooth 0.5–0.8 of standard tooth length *A. microdonta* Juz. (see also Step 47).
- + Leaves 7-lobed, mostly orbicular reniform with distinct sinus, apical tooth 0.3–0.6 of standard tooth length *A. sarmatica* Juz. (see also Step 35).
- 60. Leaves glabrous or subglabrous above *A. heterophylla* Rothm.
- + Leaves densely hairy above *A. vinacea* Juz.

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