

THE GENUS ANACAMPTODON (AMBLYSTEGIACEAE, BRYOPHYTA)
IN RUSSIA AND TRANSCAUCASIA

РОД ANACAMPTODON (AMBLYSTEGIACEAE, BRYOPHYTA)
В РОССИИ И ЗАКАВКАЗЬЕ

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Abstract

The genus *Anacamptodon* revised for the territory of Russia and Transcaucasia. Two species, *A. latidens* and *A. kamchaticum*, occur in Russia, and one species, *A. splachnoides*, occurs in Caucasus in Georgia. Key to species, their descriptions, illustrations, comparison with other species are given, and distribution is mapped.

Резюме

Проведена ревизия рода *Anacamptodon* в России и Закавказье. В России встречаются два вида, *A. latidens* и *A. kamchaticum*, в Закавказье на территории Грузии – *A. splachnoides*. Приводятся ключ для определения видов, описания, иллюстрации, сравнение с другими видами, карты распространения.

The genus *Anacamptodon* was described by Bridel (1819) within the family Fabroniaceae. According to the recent results of molecular phylogenetic analysis, it is placed in the family Amblystegiaceae (cf. Goffinet & Buck, 2004).

The genus *Anacamptodon* occurs mainly in temperate regions and includes 5 to 10 species (Crosby & al., 1999). Information about some species can be obtained from Buck (1980), Buck & Crum (1978), Crum & Anderson (1980), Grout (1906, 1931), Noguchi (1991), Sharp, Crum & Eckel (1994), and Taoda (1980). In Russia this genus was not specially studied, although it was somewhat commented by Bardunov (1965, 1969) and Melnichuk (1970). Recently the author has described a new species of *Anacamptodon* from Kamtchatka (Czernyadjeva, 2004).

The present work is based on the study of collections made by the author and specimens from the herbaria where main collections from Russia are deposited (LE, MHA, MW, IRK, VLA, H).

According to these materials, two species of this genus are known for the territory of Russia: *A. latidens* и *A. kamchaticus*. *Anacamptodon lati-*

dens grows in the southern part of the Siberia and in the Russian Far East, *A. kamchaticus* is known from Kamchatka, Kuril Islands and Sakhalin Island. *Anacamptodon splachnoides* is known from the Caucasus in Georgia, with two localities in Abkhazia close to Russian border, so it is likely can be found in the Russian part of the Caucasus too. Records of *A. splachnoides* from the Asian Russia are erroneous and have to be referred to *A. latidens*. *Anacamptodon fortunei* Mitt. is widespread in China and Japan; it is probably can be found also in southern part of Primorsky Territory and in Kuril Islands, thus its diagnostic characters are also discussed and illustrated in the present paper.

All species of the genus *Anacamptodon* are epiphytic and grow on the bark of various deciduous trees (*Populus*, *Betula*, *Quercus*, etc.), and occasionally on rotten logs, likely just remaining on places where they grew before trunk fall.

Anacamptodon Brid., Muscol. Recent. Suppl. 4: 136. 1819 [1818].

Plants small, rarely medium-sized, ± shiny, yellowish to dark-green, in dense or lax mats. Stems

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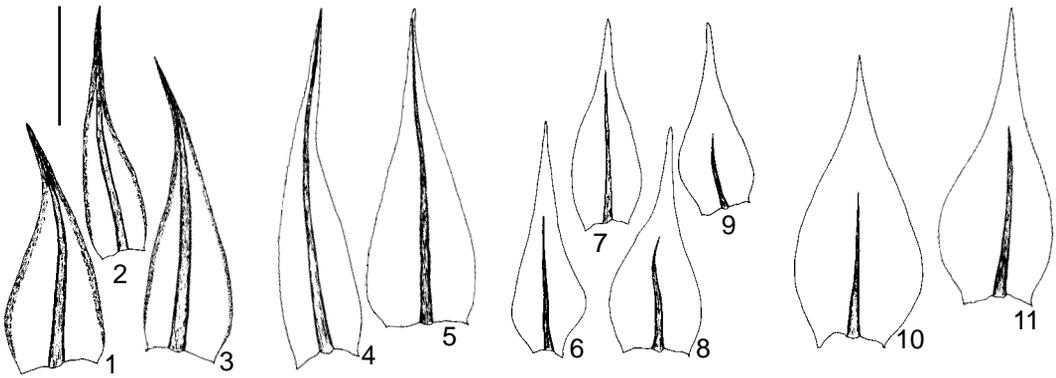


Fig. 1. Leaves: 1-3 – *A. fortunei* (from Japan, Osaka Pref. 23.III.1953, T. Nakajima, LE); 4-5 – *A. kamchaticus* (from Kamchatka, 8.VIII.2002, Czernyadjeva, LE); 6-9 – *A. latidens* (Buryatia, 30.VI.1960, Bardunov, IRK); 10-11 – *A. splachnoides* (from Abkhazia, 21.VIII.1963 I.I. Abramov, LE). Scale bar: 0.5 mm.

creeping, with central strand, cortical cells thick-walled; irregularly branched; branches of greatly varying length, \pm ascending. Rhizoids numerous, reddish-brown, smooth. Stem leaves erect when dry, spreading or \pm subsecund when moist, gradually acuminate, ovate-, ovate-lanceolate to lanceolate, slightly concave; margins plane and entire to minutely serrulate; nerve single, extending to 1/3-3/4 the leaf length or to leaf apex and shortly excurrent; median laminal cells thick to thin-walled, uniform, shortly rhomboidal or oblong-rhomboidal to elongate; basal cells lax, thin-walled, without pores, quadrate to rectangular, alar cells not differentiated. Branch leaves similar to stem leaves, often smaller and secund.

Autoicous. Perigonal bracts ovate, leaves acute, ecostate. Perichaetial leaves oblong-lanceolate, \pm long-acuminate, nerve \pm slender to disappearing, cells lax, elongate. Setae erect, smooth, straight or curved at the base, yellowish, brownish or reddish. Capsules erect and symmetric, oblong-cylindrical to short-obovate or cap-shaped, strongly contracted below the mouth and at the distinct neck when dry. Exothelial cells quadrate to rectangular, with \pm wavy cell walls; peristome double; exostome inserted below the mouth of the urn; the teeth 16, light-brown to yellowish, often fused in pairs at base, broadly lanceolate, gradually tapered, densely papillose on both surfaces throughout, with a zig-zag median line both at the outer or inner sides of the teeth due to the absence of the inner layer of lamellas (see in detail: Buck & Crum, 1978), strongly reflexed when dry; en-

dostome partly reduced and consists of 8-16 linear, smooth filiforme segments about 1/2 the tooth length, spreading when dry. Annulus absent or consists of 1-2 rows of thin-walled cells, persistent; operculum convex-conic, rostrate, short-pointed to blunt; calyptra cucullate. Spores spherical, smooth to finely papillose.

Typical leaves (Fig. 1), areolation (Fig. 2) and capsule shape (Fig. 3) are illustrated for *A. splachnoides*, *A. latidens*, *A. kamchaticus* and *A. fortunei*, and their additional characters are given in Table 1. The shape of stem leaves often varies greatly within one plant, although the length to width ratio (Fig. 4) and the length of nerve are the important diagnostic characters of species of *Anacamptodon*.

KEY TO THE SPECIES OF *ANACAMPTODON*
(known and expected in Russia and Transcaucasia)

1. Nerve to 1/3-3/4 the leaf length 2
- Nerve to leaf apex or shortly excurrent 3
2. Plants larger, stem leaves 1.2-1.5 mm long, capsule oblong-cylindrical *A. splachnoides*
- Plants smaller, stem leaves 0.6-1.0 mm long, capsule short-obovate or cap-shaped
..... *A. latidens*
3. Leaf margins 1- layered (rarely partly 2-layered), capsule short-obovate or cap-shaped
..... *A. kamchaticus*
- Leaf margins 2- layered, bordered by a brownish band above, capsule oblong-cylindrical
A. fortunei [this species occurs in Japan, including Hokkaido and expected in Russian Far East]

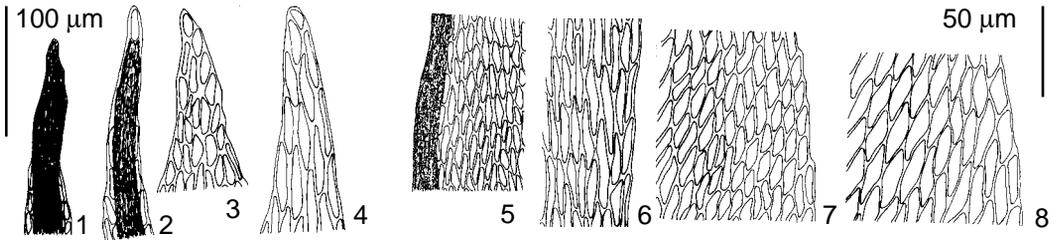


Fig. 2. Leaf apices (1-4) and mid-leaf cells (5-8): 1,5 – *A. fortunei* (from Japan, Osaka Pref. 23.III.1953, T. Nakajima, LE); 2,6 – *A. kamchaticus* (from Kamchatka, 8.VIII.2002, Czernyadjeva, LE); 3,7 – *A. latidens* (Buryatia, 30.VI.1960, Bardunov, IRK); 4,8 – *A. splachnoides* (from Abkhazia, 21.VIII.1963 I.I. Abramov, LE). Scale bars: 100 µm for 1-4; 50 µm for 5-8.

Anacamptodon latidens (Besch.) Broth., Nat. Pfl.-fam. 1: 906. 1907. – *Schwetschkea latidens* Besch., Journ. De Bot. 13: 41. 1899. – *Anacamptodon sublatidens* Card., Bull. Soc. Bot. Geneve, ser. 2, 3: 279. 1911.

Type locality: Mimmaya, Pref. Aomori, Japan.

Plants small, forming dense mats. Stem prostrate, irregularly branched; branches 0.5-1.0 mm long, densely foliated. Stem leaves ovate-lanceolate, lanceolate or ovate, gradually acuminate, spreading; (0.5-)-0.6-1.0(-1.2) mm long, (0.2-)-0.3-0.35(-0.4) mm wide, slightly concave; margins entire, plane; nerve single, 20-30 µm wide at leaf base, extending half to two-thirds the leaf length, rarely to 90% the leaf length; laminal cells smooth, median laminal cells rhomboidal to elongate-rhomboidal, (12-)-25-40(-60) × (5-)-7-8(-12) µm, uniform, practically without pores; leaf length and cell length are correlated; base laminal cells lax, homogeneous, numerous, never colored, not much differentiated at basal margins, rectangular to quadrate, 11-25 µm, thick-walled, rarely with pores; branch leaves similar to stem leaves but smaller, ± secund.

Setae straight, smooth, red or red-brown, 3-8 mm long; capsules erect and symmetric, short-obovate or cap-shaped, wide-mouthed, strongly contracted below the mouth and at a neck when dry, 0.4-0.8 × 0.3-0.5 mm when dry, 0.8-1.0 × 0.5-0.7 mm when wet, with length to width ratio of dry capsule 1-2:1; exothecial cells quadrate to rectangular, ± wavy-walled; peristome double; operculum convex-conic, shortly rostrate; calyptra cucullate. Spores smooth to finely papillose, 10-13 µm in diameter.

Distribution. Russia (Siberia, Far East), Japan, Korea, China, Mongolia.

SPECIMENS EXAMINED (selected):

SOUTH SIBERIA. Altai Republic: Teletzkoe Lake 23.VI.1991 *Ignatov* (MHA); Katun River, 18.VII.1993 *Ignatov* (MHA). **Irkutsk Prov.:** Eastern Sayan: Irkuta River, 2.VIII.1960 *Bardunov* (IRK); Alygdzher Settlement 6.VIII.1961 *Bardunov* (IRK); Nilova pustyn' village, 15.VII.1960 *Bardunov* (as *A. splachnoides*, IRK); source of Angara River, 10.VI.1962 *Bardunov* (IRK); Vitimski State Reserve, 9.VIII.1984 *Bardunov* (IRK); **Zabaikalsky Territory:** Stanovoe upland, Udokan Naminga, 9.VIII.1965 *Bardunov* (IRK); Argun' River, Nizhnyaya Vereya Settlement, 29.V.1964 *Bardunov* (IRK). **Buryatia Republic:** Tunkinskij Range, 30.VI.1960 *Bardunov* (as *A. splachnoides*, IRK); South Bajkal Lake: lower Snezhnaya River, 26.VIII.1989 *Kazanovsky* (IRK); 15.IX.1920 *Smirnov* (as *A. splachnoides*, LE); Listvyanka Settlement, 12.II.1977 *Bardunov* (IRK); Shamanka Settlement, 29.VIII.1992 *Bardunov* (IRK); Khamar-Daban Range, 9.VII.1990 *Kazanovsky* (IRK); mouth of Muri-no River, 8.IX.1957 *Bardunov* (as *A. splachnoides*, IRK); Baikalskij State Reserve, 9.VII.1990 *Kazanovsky* (IRK); Vydrino Settlement, 23.VI.1965 *Bardunov* (IRK); Tanhoj Settlement, 28. IX.1979 *Bardunov* (IRK).

FAR EAST. Kamchatskaya Prov.: Kamchatka Peninsula: Middle Range, Icha Volcano, 4.VIII.2007 *Czernyadjeva* (LE); Kljuchevskie volcanoes group, Ostryi Tolbachik Volcano 23, 25 & 27.VIII.2007 *Czernyadjeva* (LE). **Sakhalinskaya Prov.:** Kuril Islands: Kunashir Island, Lagunnoe Lake, 15.VIII.1978 *Cherdantseva* (VLA). Sakhalin: Sokol Settlement 17 & 20.VII.2001 *Cherdantseva* (VLA). **Khabarovsk Territory:** Bureinskij State Reserve, 24.VIII.1997 *Ignatov* (MHA). **Amurskaya Prov.:** Zee-Bureinskij area, Kisilevka village, 7.VI.1910 *Korotkij* (as *A. splachnoides*, LE). **Primorsky Territory:** Ussurijskij Reserve, 3.IX.1969, 31.VIII.1974 & 19.VIII.1975 *Cherdantseva* (VLA), 29.IX.2006 *Ignatov* (MHA); Partizanskij Distr., Lozovoi Settlement, 16.IX.1974 *Bardunov* &

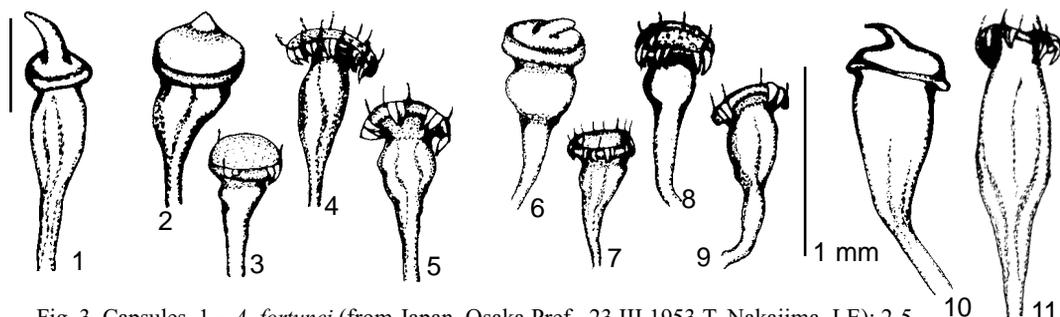


Fig. 3. Capsules. 1 – *A. fortunei* (from Japan, Osaka Pref., 23.III.1953 T. Nakajima, LE); 2-5 – *A. kamchaticus* (from Kamchatka, 8.VIII.2002 Czernyadjeva, LE); 6-9 – *A. latidens* (Buryatia, 30.VI.1960 Bardunov, IRK); 10-11 – *A. splachnoides* (from Abkhazia, 21.VIII.1963 I.I. Abramov, LE). Scale bar 1 mm.

Cherdantseva (VLA); Sihote-Alinskij State Reserve, 21.VI.1983 *Cherdantseva* (VLA); Ol'ginskij Distr., Scherbakovka village, 28.VIII.1977 *Bardunov & Cherdantseva* (VLA); Kedrovaya Pad' State Reserve, 15.VII.1926 *Severnin* (as *A. splachnoides*, LE) & 22.VIII.1977 *Cherdantseva* (VLA); Chuguevskij Distr., Pravaya Sokolovka River, 29.VIII.1974 *Cherdantseva* (VLA); Lazovskij State Distr., 22.IX.1987 *Cherdantseva* (VLA); Murav'ev-Amurckij Peninsula, 3.VIII.1973 *Bardunov* (VLA); lower course of Aba River, 27.IX.1961 *Bardunov* (IRK).

Anacamptodon latidens is a very variable species. The shape of the capsule is usually short-ovate or cap-shaped, but some specimens have shortly oblong-cylindrical capsule. The leaf shape varies from ovate to lanceolate; leaf length is on average 0.7-1.0 mm, but may reach up to 1.2-1.3 mm; nerve usually reaches 50-70% of the leaf length, sometimes up to 90%. Specimens of *A. latidens* with long lanceolate leaves and long nerve are difficult to distinguish from *A. kamchaticus*. However, in *A. kamchaticus* leaves are generally longer, the nerve is stronger, always percurrent or excurrent, while *A. latidens* has a weaker nerve, often vanishing near the leaf tip, never excurrent. Stem leaves of *A. latidens* are ovate-lanceolate to ovate, rarely oblong-lanceolate. *A. kamchaticus* has more elongated leaves, lanceolate to oblong-lanceolate. Operculum of *A. latidens* is shortly rostrate vs. short-pointed to blunt in *A. kamchaticus* (Table 1). Comparing to the specimens from Japan, some Siberian and Far East specimens of *A. latidens* have bigger leaf size (0.7-1.0 vs. 0.4-0.6 mm, cf. Taoda, 1980). By the leaf size these specimens are closer to Asian species *A. amblystegioides* Card. (Taoda, 1980). However, typical for *A. latidens* shape of the capsule (short-ovate or cap-shaped) does not allow to refer samples from Asian Russia to *A. am-*

blystegioides, which has oblong-cylindrical capsule. The differences between *A. latidens* and *A. splachnoides* are discussed under the latter species.

Anacamptodon kamchaticus Czernyadjeva, *Arctoa*. 13: 5. 2004.

Type locality. Bannaya River, Kamchatka Peninsula, Far East, Russia.

Stem leaves lanceolate to oblong-lanceolate, (0.7-)1.1-1.7(-2.1) mm long, (0.2-)0.3-0.5(-0.6) mm wide, slightly concave; margins plane, unistratose, very rarely partly bistratose; nerve single, strong, 25-42 μ m wide in leaf base, excurrent to percurrent; median laminal cells elongate to elongate-rhomboidal, (17-)30-70(-83) x (5-)7-9(-10) μ m.

Autoicous. Setae straight, 7-14 mm long; capsules erect and symmetric, short-ovate or cap-shaped, wide-mouthed, strongly contracted below the mouth and at a neck when dry, 0.6-1.0 x 0.4-0.7 mm when dry, 0.8-1.3 x 0.6-0.9 mm when wet, with length to width ratio of dry capsules 1.3-2:1; operculum convex-conic, short-pointed to blunt. Specimen from Kuril Islands have capsules ovate to shortly oblong-cylindrical. Detailed description and comparison with other species is given by Czernyadjeva (2005).

Distribution. Russian Far East (Kamchatka Peninsula, Kuril Islands, Sakhalin Island).

SPECIMENS EXAMINED: **Kamchatskaya Prov.**, Middle Bannaya River, 8.VIII.2002 *Czernyadjeva* (LE); Bystraya River, 4.VIII.2005 *Czernyadjeva* (LE). **Sakhalinskaya Prov.**, Kuril Islands, Kunashir Island, Golovnin Volcano, 5.IX.2006 *Ignatov* (MHA); Sakhalin, Uglegorsk District, Lamonskij Mountains, 13.VIII.1986 *Ardeeva* (VLA); Nabil'skij Mountains, 8.VIII.2001 *Cherdantseva* (as *A. latidens*, VLA).

Table 1. Comparison of *A. splachnoides*, *A. latidens*, *A. kamchaticum*, *A. fortunei*.

	<i>A. splachnoides</i>	<i>A. latidens</i>	<i>A. kamchaticum</i>	<i>A. fortunei</i>
Leaf length, mm	1.2-1.5	0.6-1.0	1.1-1.7	1.0-1.5
Nerve	1/2-2/3 of leaf length	1/2-3/4 of leaf length	percurrent to excurrent	excurrent to percurrent
Mid-leaf cells, μm	40-60 x 10-13	25-40 x 7-8	30-70 x 7-9	20-40 x 5-7
Leaf margin	unistratose	unistratose	unistratose	bistratose
Capsule	oblong-cylindric	short-obovate or cap-shaped	short-obovate or cap-shaped	oblong-cylindric
Capsule length:width	2-3:1	1-2:1	1.3-2:1	2.5-4:1
Operculum	rostrate	shortly rostrate	short-pointed to blunt	rostrate

Anacamptodon splachnoides (Froel. ex Brid.) Brid., *Musc. Recent. Suppl.*, vol.4:136. 1819. – *Orthotrichum splachnoides* Froel. ex Brid., *ibid.*, *Suppl.* 2:4. 1812. – *Campyodontium hypnoides* Schwägr., *Suppl. Sp. Musc.*, Vol. 3(1): 211. 1827.

Plant small, forming dense mats. Stem prostrate, irregularly branched; branches 1-1.5 mm long, densely foliated. Stem leaves lanceolate to ovate, gradually acuminate, spreading; (1.0-)1.2-1.5(-1.7) mm long, (0.3-)0.4-0.6(-0.7) mm wide, slightly concave; margins entire, plane; nerve single, 40-50 μm wide at leaf base, extending to 1/2-2/3 of the leaf length, rarely to 70% the leaf length; laminal cells smooth, median laminal cells rhomboidal to elongate-rhomboidal, (20-)40-60(-70) x (8-)10-13(-14) μm , uniform, practically without pores, there is correlation between leaf length and cell length; basal laminal cells lax, homogeneous, numerous, never colored, not much differentiated at the basal margins, rectangular to quadrate, thick-walled, rarely with pores, 17-30 μm ; branch leaves similar to stem leaves, but smaller, \pm secund.

Autoicous. Setae straight, smooth, red or red-brown, 7-15 mm long; capsules erect and symmetric, oblong-cylindric, rarely obovate, contracted below the mouth and at a neck when dry, 0.9-1.4 x 0.3-0.6 mm when dry, 1.1-1.5 x 0.5-0.8 mm when wet, with length to width ratio of dry capsules 2-3:1; exothecial cells quadrate to rectangular, \pm wavy-walled; peristome double; operculum convex-conic, rostrate; calyptra cucullate. Spores smooth to finely papillose, 10-13 μm in diameter.

Type locality. Ellwangen in Wurttemberg, Germany.

Distribution. North America, Europe, Caucasus.

SPECIMENS EXAMINED: **Caucasus, Georgia.** Rioni River, 7.VII.1877 *V.F. Brotherus* (LE); Abkhazia, Kelasuri Range, 21.VIII.1963 *I.I. Abramov* (LE); Abkhazia, vicinity of Sukhumi, 21.VIII.1963 *I.I. Abramov* (LE).

Anacamptodon splachnoides differs from *A. latidens* in longer leaves and in shape of capsule (oblong-cylindrical vs. short-obovate or cap-shaped). There are some difficulties in distinguishing these two species when *A. latidens* has relatively long leaves and also some capsules have oblong-cylindrical shape. However, *A. latidens* always has at least

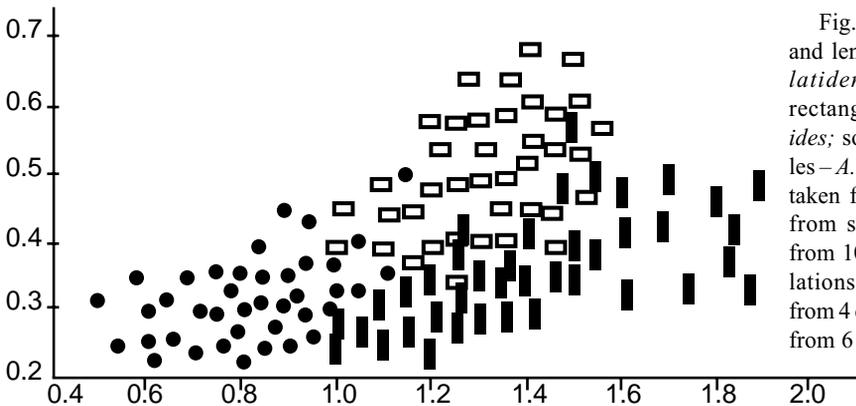


Fig. 4. The leaf width (Y) and length (X). Circles – *A. latidens*; open horizontal rectangles – *A. splachnoides*; solid vertical rectangles – *A. kamchaticum*. Leaves taken from interval 2-6 mm from stem apex; 40 leaves from 10 plants from 2 populations of *A. splachnoides*, from 4 of *A. kamchaticum*, and from 6 of *A. latidens*.

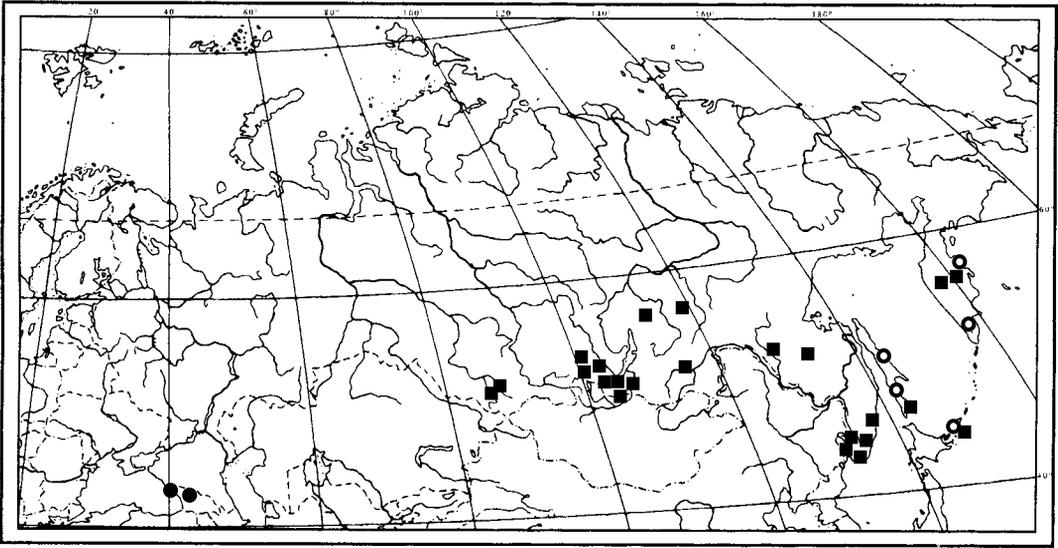


Fig. 5. The distribution of *Anacamptodon latidens* (squares), *A. kamchaticus* (open circles) in Russia and *A. splachnoides* (solid circles) in Georgia, based on studied specimens.

some capsules short-obovate or cap-shaped, what is never so in *A. splachnoides*. The width of the leaf cells can serve as an additional diagnostic character, being always bigger in *A. splachnoides* (Table 1). *Anacamptodon splachnoides* differs from *A. kamchaticus* and *A. fortunei* in shorter nerve.

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