

## Descriptions of three new species and one subspecies of *Physatocheila* (Heteroptera: Tingidae) from China and the Russian Far East, with an identification key to the species of the Russian fauna

## Описания трёх новых видов и одного подвида *Physatocheila* (Heteroptera: Tingidae) из Китая и с Дальнего Востока России с определительным ключом видов рода фауны России

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**Abstract.** Three new species of the lace bug genus *Physatocheila* Fieber, 1844 (Heteroptera: Tingidae) from China (Sichuan and Yunnan provinces) are described: *Ph. explanata* sp. nov., *Ph. angusta* sp. nov., and *Ph. potanini* sp. nov. A new subspecies *Ph. miyatakei latiuscula* subsp. nov. is described from China (Sichuan Province) and the southern part of the Primorskiy Territory, the Far East of Russia. A key for the identification of *Physatocheila* species of the Russian fauna, including the new taxa, is presented. The distributions of all species are briefly summarised in the key. The species discussed herein are provided with original photographs.

**Резюме.** Из Китая (провинции Сычуань и Юннань) описаны три новых вида клопов-кружевниц, относящихся к роду *Physatocheila* Fieber, 1844 (Heteroptera: Tingidae): *Ph. explanata* sp. nov., *Ph. angusta* sp. nov. и *Ph. potanini* sp. nov. Из Китая (провинция Сычуань) и южной части Приморского края России описан новый подвид *Ph. miyatakei latiuscula* subsp. nov. Представлен ключ для определения видов *Physatocheila* фауны России, включая новые таксоны. В определительном ключе приведены краткие данные по распространению всех видов. Обсуждаемые здесь таксоны проиллюстрированы оригинальными фотографиями.

**Key words:** Russia, Far East, China, key, Heteroptera, Tingidae, *Physatocheila*, new species, new subspecies

**Ключевые слова:** Россия, Дальний Восток, Китай, ключ, Heteroptera, Tingidae, *Physatocheila*, новые виды, новый подвид

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## Introduction

To date, 57 species of the genus *Physatocheila* Fieber, 1844 (Heteroptera: Tingidae) are known in the world fauna, 18 species in the Palaearc-

tic, eight species in the fauna of Russia, and the same number in the fauna of China (Drake & Ruhoff, 1965b; Golub, 1976, 1977; Péricart, 1983; Péricart & Golub, 1996; Vinokurov et al., 2010; Souma & Ishikawa, 2022). Several publications

contain identification keys for the species of this genus in the fauna of the Palaearctic, Russia or of large parts of it (Horváth, 1906; Kiritshenko, 1951; Takeya, 1963; Kerzhner & Jaczewski, 1964; Putshkov, 1974; Golub, 1976, 1988; Vinokurov, 1979; Jing, 1981; Péricart, 1983; Vinokurov & Kanyukova, 1995).

We have studied seven unidentified specimens of the genus *Physatocheila* stored in the collection of the Zoological Institute, Russian Academy of Sciences, St Petersburg, Russia (ZISP) and originating from the eastern and south-eastern territories of the Palaearctic: southern part of the Primorskiy Territory of Russia, and the Sichuan and Yunnan provinces of China. Among them, there are four specimens collected in the 19th century by the Russian explorer of Central Asia G.N. Potanin and three specimens collected in our time. A comparative analysis of the morphological characters of these specimens showed that they belong to three new species and one subspecies of *Physatocheila*.

The paper also presents an improved key for identifying all species of this genus in the Russian fauna, including the new taxa, in order to expand the understanding of *Physatocheila* fauna in the Eastern Palaearctic.

## Material and methods

All the type specimens of the new species described herein are deposited in the collection of ZISP. For the comparative analysis, we used the holotypes of *Ph. putshkovi* Golub, 1976 and *Ph. marginulata* Golub, 1976 from the collection of ZISP, as well as about 600 specimens of various species of the genus *Physatocheila* from the same collection and about 200 specimens from the collection of Voronezh State University, collected by the authors on the plains of the European part of Russia, in the mountains of the North Caucasus, the Urals and Altai. For this purpose, we also used original descriptions and redescriptions of several other eastern palaearctic and oriental species of *Physatocheila*, as well as some species of the genus *Cysteochila* Stål, 1873 (Drake, 1942, 1948; Drake & Maa, 1953; Drake & Ruhoff, 1961, 1965a; Miyamoto, 1964; Jing, 1981; Péricart, 1985, 2000;

Guilbert & Guidoti, 2018; Souma, 2019; Souma & Ishikawa, 2022).

Photographs of the discussed species were taken using a MBS-10 stereoscopic microscope and a Nikon camera. The final images were processed with Adobe Photoshop CS5.

The classification used here follows Drake & Ruhoff (1965b) and Schuh & Weirauch (2020). Morphological terms follow Drake & Davis (1960).

## Results

Order **Heteroptera** Linnaeus, 1758

Infraorder **Cimicomorpha** Leston, Pendergrast et Southwood, 1954

Family **Tingidae** Laporte, 1833

Subfamily **Tinginae** Laporte, 1833

Genus ***Physatocheila*** Fieber, 1844

Type species: *Acanthia quadrimaculata* Wolff, 1804, by subsequent designation (Oshanin, 1912: 45).

***Physatocheila explanata* sp. nov.**

(Fig. 1A, C)

*Holotype*. Male, **China**, “Sichuan [*Prov.*], Tatszinlu. 3.VI[18]93 Potanin [leg.]” [Cyrillic script] (ZISP) (Fig. 1E)\*.

*Paratype*. Female, same geographical data as for holotype, 30.V.1893, G. Potanin leg. (ZISP) (Fig. 1F).

*Description*. Body oval, rather wide, twice as long as wide, dorsally yellowish brown with rusty tint; costal area of hemelytra with transverse wide darkened stripe.

Head black, with three frontal and two occipital yellow spines. Paired frontal spines thin, rather long, with converging apices; unpaired median frontal spine thicker than frontal ones, rather short, elevated above surface of head, with blunt apex. Occipital spines thin and long, arcuately curved along profile of head surface and adjacent to it, with apices reaching anterior margins of eyes.

Pronotum rather wide, 1.6 (in male) or 1.5 (in female) times as long as wide. Pronotal disc convex. Anterior margin of pronotum produced anteriorly, angulate. Elevated tectiform hood (vesicula) rather long, with six small areolae on each

\* *Editor's comment*. For the exact location of the type locality, see the note at the end of the article (p. 42).

side of median vein. Three longitudinal pronotal carinae rib-shaped, lateral carinae parallel, with one row of extremely small areolae. Areolate paranota completely reflexed on pronotal disc, moderately inflated along almost their entire length, except for anterior margin, more inflated in posterior half; paranota with four longitudinal rows of rather large angular areolae at widest part; veins between areolae rather strongly elevated, areolae deeply depressed, with concave surface. Outer margin of reflexed paranotum pressed to disc, nearly straight over most of its length, slightly sinuate in middle of length, touching or almost touching lateral carina in anterior part only. Apex of posterior pronotal process acuminate.

Macropterous form. Hemelytra considerably protruding beyond abdomen, strongly and sharply rounded externally in middle part of their length, slightly sinuate in apical half. Costal area wide, with two rows of large angular areolae and several areolae of third row in basal third of its length, with 3–4 rows of small darkened areolae in middle part of its length, two rows of large angular areolae posterior to middle part and one row at apex. Subcostal area in male with two rows of areolae over most of its length and with several areolae of third row; subcostal area in female with three rows of areolae in widest part; areolae subequal in size to darkened areolae of costal area in middle. Discoidal area with 10–11 rows of small areolae in widest part. Sutural area with eight rows of areolae in widest part in male, with nine rows in female; size of areolae greatly increasing towards apex of hemelytra.

Thorax ventrally with alternating brownish yellow and black transverse stripes. Abdomen blackish brown on sides, yellowish brown in middle part. Ovipositor and subgenital plate black. Labium reaching base of second abdominal sternite. Metasternal laminae separated from each other, slightly wider than mesosternal ones, parallel throughout most of their lengths. Subgenital plate in female slightly elongate, with straight base and rounded lateral margins and apex. Legs brownish yellow, apices of tarsi blackish.

Length (in mm): body in male 2.80, in female 2.95; head in male and female 0.20; pronotum in male 1.45, in female 1.42; antennal segments (I, II, III, IV) in male 0.12, 0.10, 0.85, segment IV missing, in female 0.12, 0.10, 0.81, 0.28.

Width (in mm): body in male 1.35, in female 1.55; head in male and female 0.43; pronotum in male 0.90, in female 0.95.

*Comparison.* The new species is morphologically similar to *Ph. putshkovi* Golub, 1976 (Fig. 4A, C) in the more or less inflated reflexed paranota and rather short median frontal spine. Unlike *Ph. putshkovi*, the paranota in *Ph. explanata* sp. nov. are inflated along their entire lengths and more inflated in the posterior part. The marginal outer vein of the paranota in *Ph. explanata* sp. nov. touches the lateral pronotal carina in one point only; this vein in *Ph. putshkovi* touches the lateral pronotal carina at a distance of about one-fifth of its length. The lateral margins of the hemelytra in *Ph. putshkovi* are not strongly and not sharply rounded in the middle part of the lengths as it is in *Ph. explanata* sp. nov. The new species is smaller than *Ph. putshkovi* (body length of the latter is 3.50–3.75 mm).

*Physatocheila explanata* sp. nov. is similar to *Ph. costata* (Fabricius, 1794) (Fig. 3B, D) in having a rather short median frontal spine, and to *Ph. smreczynskii* China, 1952 (Fig. 5A, C) in having a rather wide costal area of the hemelytra. However, the paranota in *Ph. costata* and *Ph. smreczynskii* are not inflated and the hemelytra are externally rounded very weakly. The median frontal spine in *Ph. smreczynskii* is long, it extends to the bases of the lateral spines. In both species, antennal segment III is much longer than in *Ph. explanata* sp. nov.: it is 1.85 mm long in *Ph. costata* and 1.70–1.90 mm long in *Ph. smreczynskii*.

*Etymology.* The specific name of this species is a Latin adjective meaning “sprawled” or “flattened”.

### *Physatocheila angusta* sp. nov.

(Fig. 1B, D)

*Holotype.* Male, **China**, *Yunnan Prov.*, Er Hai Lake, 15 km NE of Xiaguan, 25°45'32.6"N, 100°13'43.0"E, 2261 m a.s.l., 20.V.2002, A. Konstantinov & M. Volkovitsh leg. (ZISP) (Fig. 1G).

*Paratypes.* Two females, same data as for holotype (ZISP).

*Description.* Body elongate, rather narrow, in male 2.63 times and in female 2.54–2.60 times as long as wide, dorsally brown with dark red tint; paranota and hemelytra with large blackish spots.

Head black, with rather long yellowish brown three frontal and two occipital spines thinning towards apices; apices of paired frontal spines converging; median frontal spine slightly or rather strongly protruding beyond bases of lateral frontal spines, elevated above surface of head; occipital spines adjacent to head or slightly erected. Antennae long; first three segments brown, segment IV almost entirely blackish, with slightly raised blackish hairs.

Pronotum 1.70 times (in male) or 1.56–1.58 (in females) times as long as wide. Pronotal disc strongly convex, with large punctures. Anterior margin of pronotum angulate, distinctly but not strongly produced anteriorly, with raised tectiform hood (vesicula). Three longitudinal pronotal carinae distinctly elevated; median carina with one row of minute areolae; lateral carinae scarcely converging anteriorly, slightly lower than median carina, with one row of areolae or only traces of areolae. Areolate paranota completely reflexed on dorsal surface of pronotum, anteriorly pressed to disc, posteriorly, on lateral angles of pronotum distinctly inflated, with five longitudinal rows of rather large areolae at widest part; outer margin of paranotum straight in its considerable length, touching lateral pronotal carina at distance of about one-tenth of its length or only in one point.

Macropterous form. Hemelytra considerably protruding beyond abdomen. Costal area rather narrow, with one row of rather large areolae in most of its length and with few small areolae forming a second row in different parts of area; in widest part of discoidal area, where dark spot located, costal area with approximately six areolae arranged in two rows being most clearly expressed in females; largest areolae located in apical third. Subcostal area narrow, almost vertical, with two rows of areolae along almost its entire length and becoming uniseriate at apex; areolae of subcostal area slightly smaller than areolae of costal area. Discoidal area with seven (in male) or eight (in females) rows of angular areolae in widest part. Sutural area with eight rows of angular areolae in widest part, those being rather large at apex of membrane.

Body ventrally brown; prothorax or mesothorax with black spots near coxae. Legs brown, tarsi black. Subgenital plate in females small, triangular.

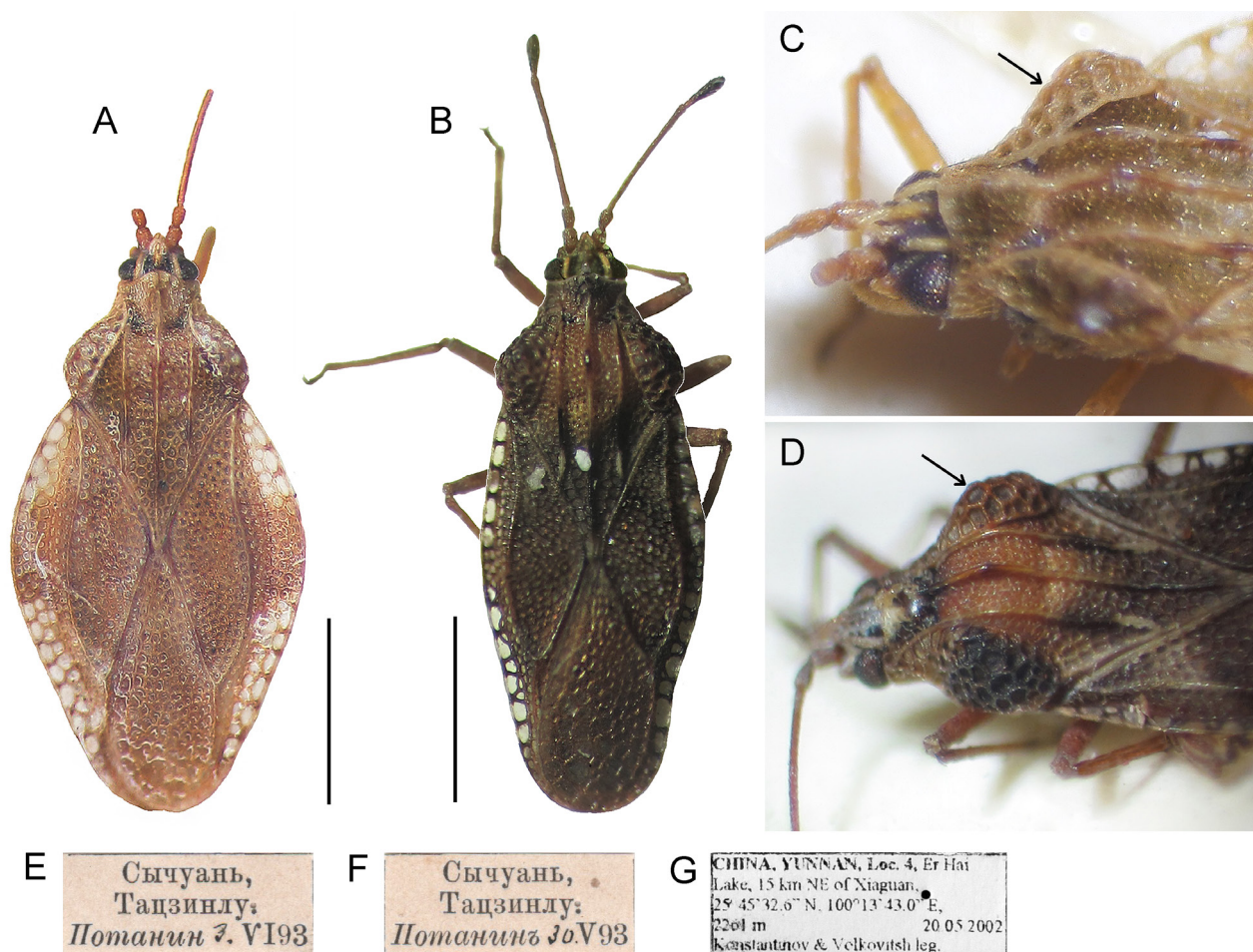
Length (in mm): body in male 3.10, in females 3.10–3.25; head in male 0.25, in females 0.20; pronotum in male 1.70, in females 1.58; antennal segments (I, II, III, IV) in male 0.15, 0.12, 0.88, 0.32, in females 0.12–0.15, 0.11–0.12, 0.72, 0.28.

Width (in mm): body in male 1.18, in females 1.22–1.25; head in male and females 0.70; vertex in male and females 0.22; pronotum in male 1.00, in females 1.00–1.02.

*Comparison.* *Physatocheila angusta* **sp. nov.** is morphologically most similar to *Ph. marginulata* Golub, 1976 (Fig. 4B, D) known from the south of the Primorskiy Territory of Russia in having the narrow costal areas of the hemelytra. The new species differs from it in having five rows of areolae in the widest part of paranota (*vs.* 7–8 rows in *Ph. marginulata*), slightly inflated paranota on the lateral angles of pronotum (the paranota are pressed to the pronotum along their entire length in *Ph. marginulata*). In *Ph. angusta* **sp. nov.**, the costal area of hemelytra has one row of areolae over most of its length and only a few areolae of the second row in the middle part of its length; in *Ph. marginulata*, the costal area has two rows of areolae over most of the length and three rows at the bases. The subcostal area of *Ph. angusta* **sp. nov.** is biseriate over most of its length; in *Ph. marginulata*, this area has four rows of areolae over most of its length. *Physatocheila marginulata* is larger, its body length is 3.65 mm.

This new species bears some resemblance to *Ph. fieberi* (Scott, 1874) distributed in southeastern China, Taiwan, Japan and in the Oriental Region, as well as to three species of *Physatocheila* known from Bhutan, approximately at the latitude of the type locality of *Ph. angusta* **sp. nov.**: *Ph. similis* Péricart, 1985, *Ph. bhutanensis* Péricart, 1985, and *Ph. subgibbosa* Péricart, 1985. The first three species differ from the new species in the reflexed paranota, which are very wide and completely cover the pronotal disc including the lateral carinae. On the contrary, the paranota in *Ph. subgibbosa* are very narrow and almost do not cover the disc dorsally (Péricart, 1985).

*Physatocheila angusta* **sp. nov.** is also somewhat similar in the general appearance to *Cystocheila consueta* Drake, 1948 distributed in the Korean Peninsula, Taiwan, and the Oriental Region. In this species, as well as in *Ph. angusta* **sp. nov.**,



**Fig. 1.** *Physatocheila* spp. **A, C, E, F, *Ph. explanata* sp. nov.**, holotype, male; **B, D, *Ph. angusta* sp. nov.** (B, G, holotype, male; D, paratype, female). General appearance, dorsal view (A, B); head and pronotum, dorsolateral view (C, D); labels of holotype (E, G) and paratype (F). Paranotum shown by arrow. Scale bars: 1 mm.

the reflexed paranota are elevated on the lateral angles of pronotum, the costal area is narrow, with one row of areolae in the anterior half. *Cysteochila consueta* differs from *Ph. angusta* in the wider reflexed paranota, which partially cover the lateral carinae of the pronotum dorsally.

**Etymology.** The specific name of this species is a Latin adjective meaning “narrow”.

***Physatocheila potanini* sp. nov.**

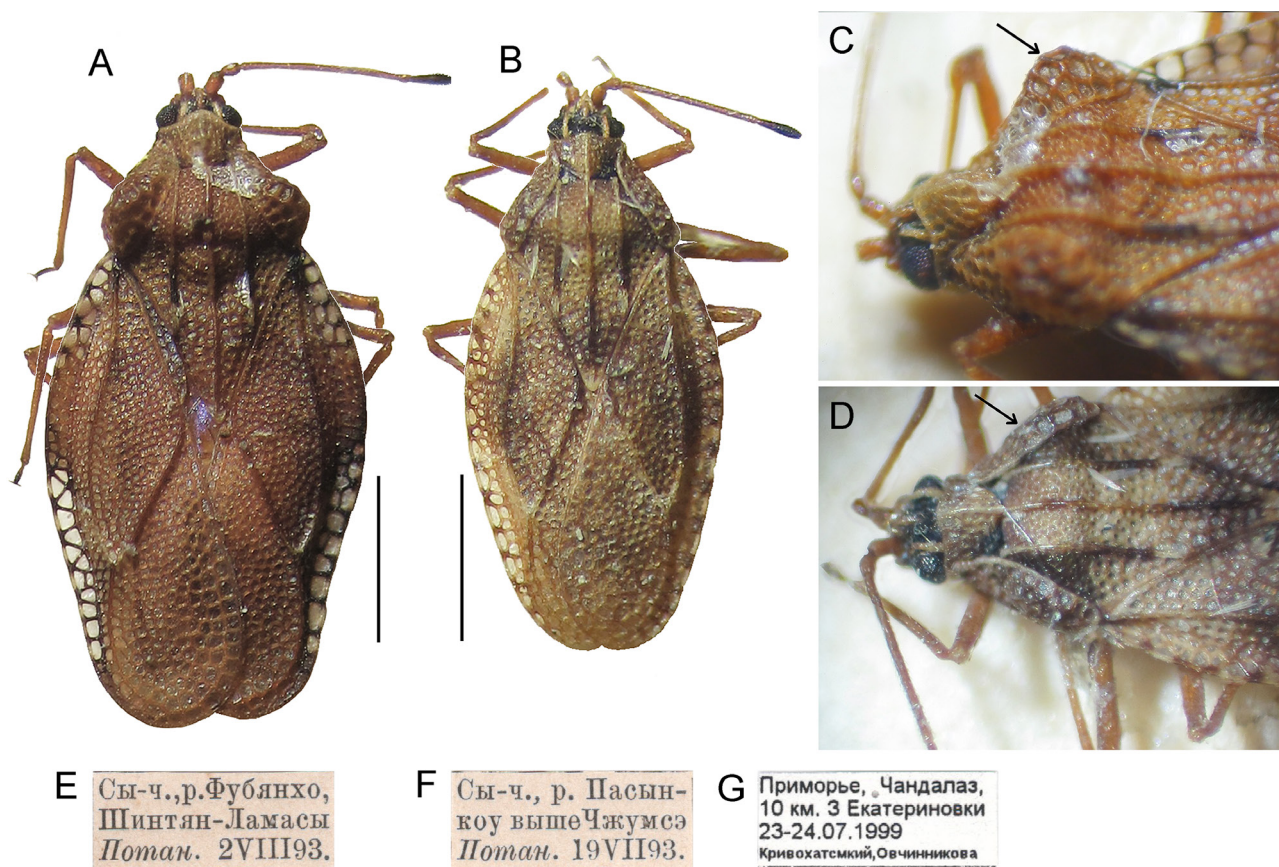
(Fig. 2A, C)

**Holotype.** Female, **China**, “Sy-ch. [*Sichuan Prov.*], r. [river] Fubyankho, Shintyan-Lamasy Potan. [G. Potanin leg.] 2VIII[18]93” [Cyrillic script] (ZISP) (Fig. 2E)\*.

\* **Editor’s comment.** For the exact location of the type locality, see the note at the end of the article (p. 42). The date on the label is in the Gregorian calendar. The modern name of the Fubyankho River is the Fubian River.

**Description.** Body oval, rather wide, twice as long as wide. Hemelytra in holotype slightly separated, dorsally brown with a dark rusty tint; *Hc*, *R+M* and *Cu* veins at extreme base of hemelytra, many veins of costal areas and posterior part of lateral pronotal carinae black.

Head black, with five spines; three frontal spines with black-brown base and yellow apex, two occipital spines yellow; paired lateral frontal spines thin and rather short, with pointed converging and contiguous apices; unpaired median frontal spine thicker than paired spines, short, adpressed to head, with blunt apex located at bases of paired spines. Occipital spines long, thinning towards apices, prominent anteriorly over middle



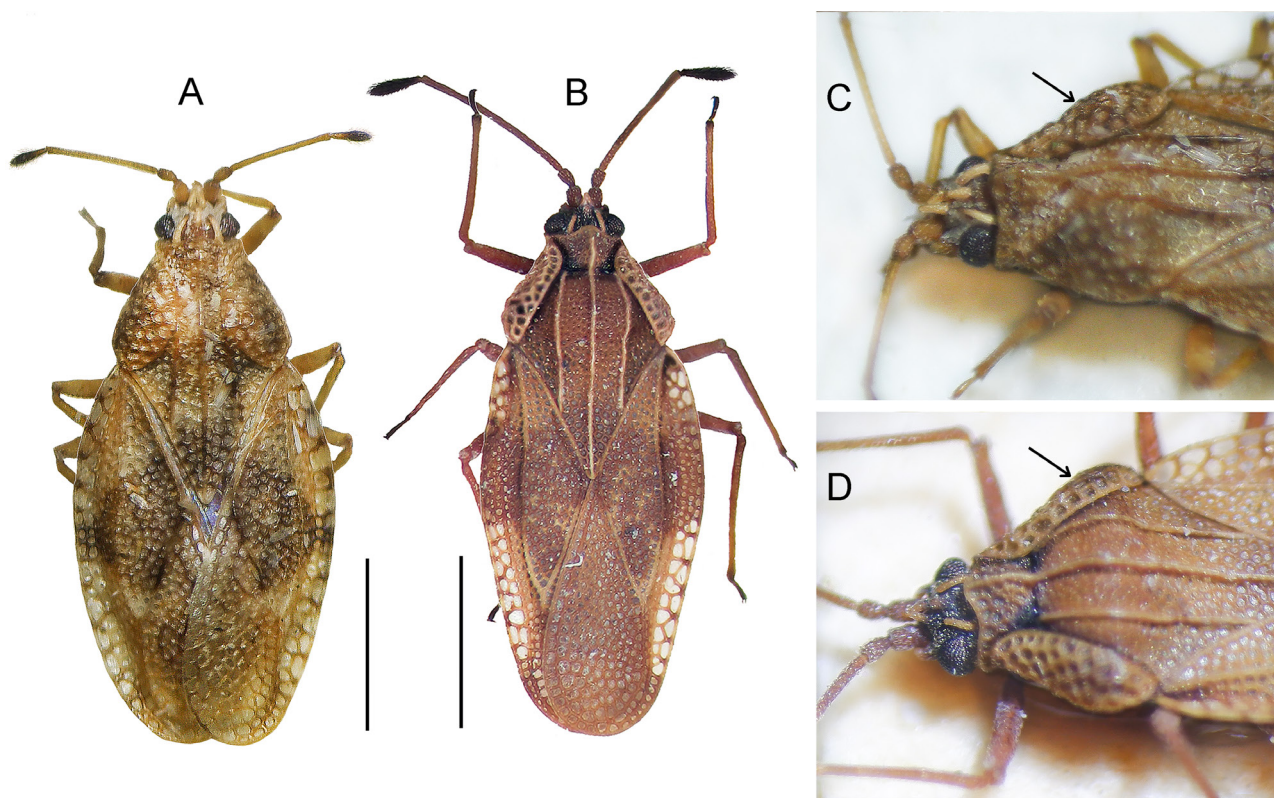
**Fig. 2.** *Physatocheila* spp. **A, C, E**, *Ph. potanini* sp. nov., holotype, female; **B, D, F, G**, *Ph. miyatakei latiuscula* subsp. nov., holotype, male. General appearance, dorsal view (**A, B**); head and pronotum, dorsolateral view (**C, D**); labels of holotype (**E, F**) and paratype (**G**). Paranotum shown by arrow. Scale bars: 1 mm.

of eyes. First three antennal segments brownish yellow, segment IV yellowish brown at base, blackish brown in other parts.

Pronotum rather wide, 1.53 times as long as wide. Pronotal disc strongly convex; all three longitudinal pronotal carinae distinctly elevated but without areolae; lateral carinae weakly converging anteriorly. Anterior margin of pronotum strongly angulate, distinctly produced anteriorly, with raised tectiform hood (vesicula). Areolate paranota completely reflexed on dorsal surface of pronotum, slightly inflated in anterior half and rather strongly inflated posteriorly, especially on lateral angles of disc, with seven irregular longitudinal rows of large angular areolae in widest part; veins between areolae of paranota strongly raised. External marginal veins of reflexed paranota touching lateral carinae at a distance of one-eighth to one-tenth of its length only near anterior

end. Posterior process of pronotum rather long, with almost acuminate apex.

Macropterous form. Hemelytra considerably protruding beyond abdomen, broadly rounded externally in anterior half, slightly sinuate posterior to middle. Costal area rather wide, with base bearing one row of large areolae on right hemelytron and single small areola forming a second row on left hemelytron, with two rows of large areolae posteriorly, three rows of smaller shaded areolae towards middle, and one row of large areolae and single areola of second row in posterior half. Most areolae of costal area larger than areolae of other areas, except for areolae at apices of hemelytra. Subcostal area with three rows of small areolae in most of its length. Discoidal area with eleven rows of small angular rounded areolae in widest part. Membrane with ten rows of areolae in widest part; areolae noticeably increasing in size towards apices of hemelytra.



**Fig. 3.** *Physatocheila* spp. **A, C**, *Ph. distinguenda* (Jakovlev, 1880), female, southern Primorskiy Territory, Russia; **B, D**, *Ph. costata* (Fabricius, 1794), male, environs of St Petersburg, Russia. General appearance, dorsal view (A, B); head and pronotum, dorsolateral view (C, D). Paranotum shown by arrow. Scale bars: 1 mm.

Body ventrally brown with reddish rusty tint. Legs rather thin, yellowish brown; apices of tarsi black.

Length (in mm): body 3.95, head from hind margin of eyes to apex of clypeus 0.25; pronotum 1.95; antennal segments (I, II, III, IV) 0.18, 0.12, 1.05, 0.32.

Width (in mm): body 2.0; head 0.54; vertex 0.25; pronotum 1.28.

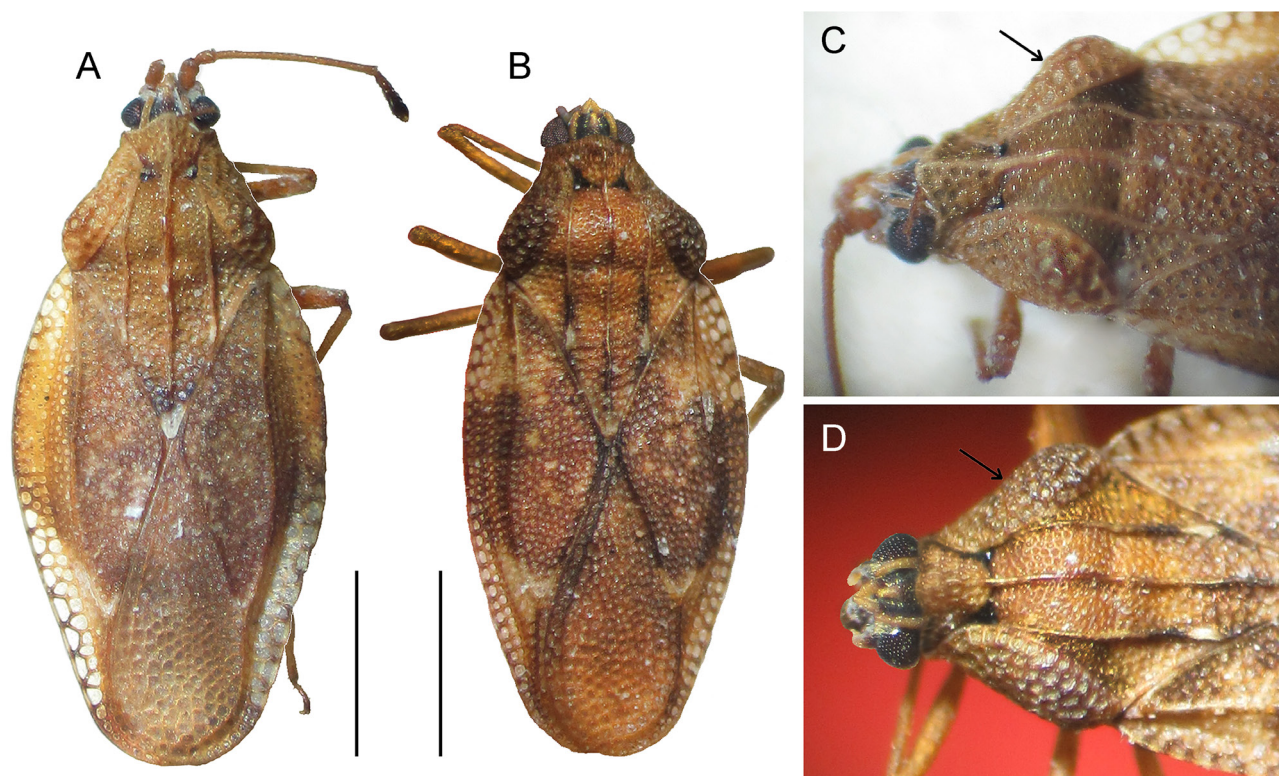
*Note.* The presence of the subgenital plate in the holotype was not examined to avoid its damage.

*Comparison.* *Physatocheila potanini* **sp. nov.** is morphologically closely related to *Ph. putshkovi*; these species share the inflated paranota on the lateral angles of pronotum and rather wide body (Fig. 4A, C). *Physatocheila potanini* **sp. nov.** differs from *Ph. putshkovi* in the much stronger inflated paranota on the lateral angles of pronotum. In addition, female of *Ph. putshkovi* has shorter antennae than *Ph. potanini* **sp. nov.** (length of segment III is 0.85 mm). In addition, a blackish mark near the middle of each costal area, four rows of very

small areolae and two complete rows of areolae in almost the entire apical half of this area separates *Ph. putshkovi* from *Ph. potanini* **sp. nov.**

In the inflated reflexed paranota on the lateral angles of pronotum, *Ph. potanini* **sp. nov.** is also similar with *Ph. angusta* **sp. nov.** (Fig. 1B, D). However, the latter species differs from *Ph. potanini* **sp. nov.** in the much narrower body (body width in female of *Ph. angusta* **sp. nov.** is 1.22–1.25 mm and the ratio of body length to its width is 2.54–2.60). Moreover, *Ph. angusta* **sp. nov.** has a smaller body size (its length is 3.10–3.25 mm), the narrower costal areas of hemelytra, and larger areolae of the discoidal areas, arranged in eight rows in the widest part in females.

*Physatocheila potanini* **sp. nov.** may be related to *Ph. costata* (Fig. 3B, D), *Ph. smreczynskii* (Fig. 5A, C) and *Ph. orientis* Drake, 1942 (Fig. 5B, D), based on the mutual arrangement of the lateral pronotal carinae and the reflexed paranota. The last three species differ from *Ph. potanini* **sp. nov.** in the adpressed (not inflated) paranota on the lateral



**Fig. 4.** *Physatocheila* spp. **A, C**, *Ph. putshkovi* Golub, 1976, paratype, female, foothills of Saur Ridge, Kazakhstan; **B, D**, *Ph. marginulata* Golub, 1976, female, holotype, southern Primorskiy Territory, Russia. General appearance, dorsal view (A, B); head and pronotum, dorsolateral view (C, D). Paranotum shown by arrow. Scale bars: 1 mm.

pronotal angles, the slenderer body, and two rows of areolae in the posterior half of the costal area of hemelytra. In addition, the median frontal spine in *Ph. smreczynskii* is long and thin, its apex is located between the bases of the frontal spines.

**Etymology.** The new species is named after the eminent Russian explorer of Central Asia G.N. Potanin.

***Physatocheila miyatakei* Miyamoto, 1964**

*Physatocheila miyatakei* Miyamoto, 1964: 525.

**Holotype** (not examined): macropterous male, **Japan**, Ishigaki I., Omoto-san, 16.III.1964, Y. Miyatake leg. (Entomological Laboratory, Kyushu University) (Miyamoto, 1964: 526).

***Physatocheila miyatakei latiuscula* subsp. nov.** (Fig. 2B, D)

**Holotype.** Male, **China**, “Sy-ch. [Sichuan Prov.], r. [river] Pasynkou vyshe [upstream of] Chzhumse

Potan. [G. Potanin leg.] 19VII[18]93” [Cyrillic script] (ZISP) (Fig. 2F)\*.

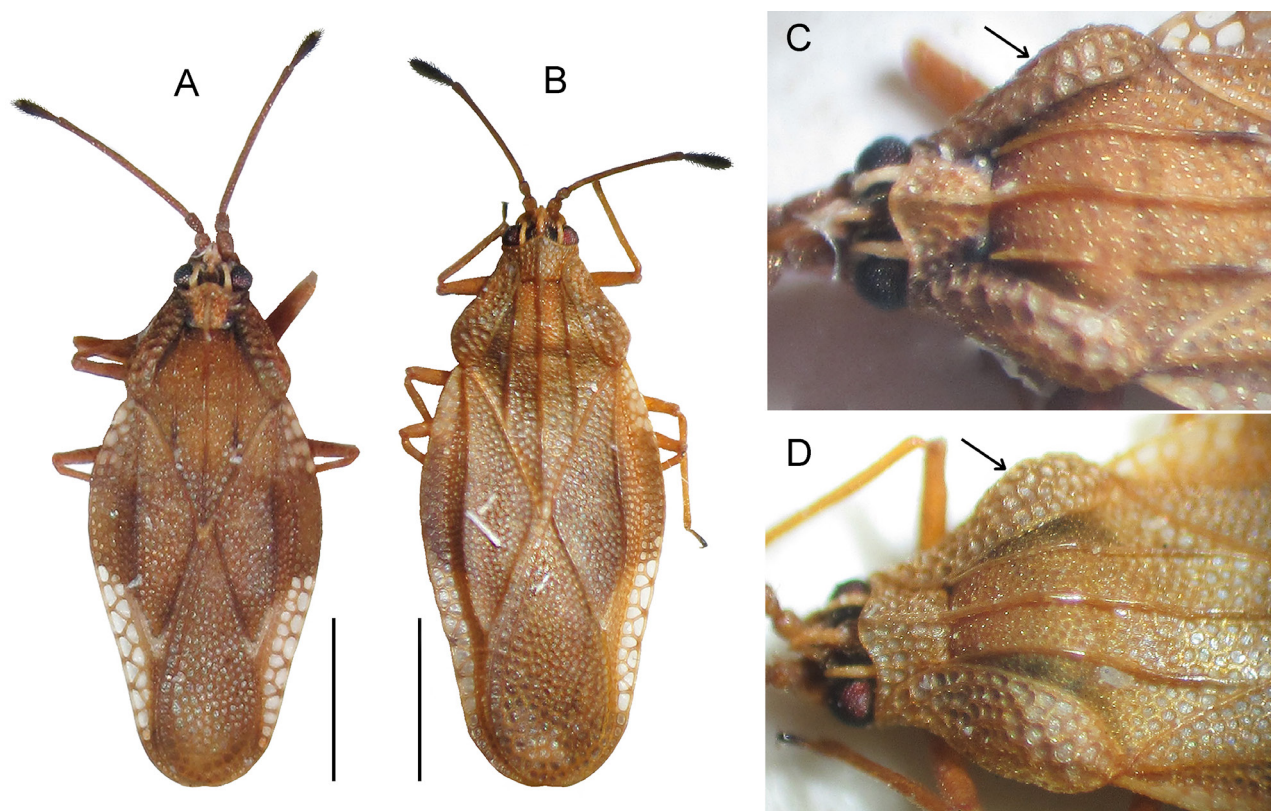
**Paratype.** One female, **Russia**, *Primorskiy Terr.*, Chindalaz Mt., 10 km W of Ekaterinovka Vill., 23–24. VII.2007, V. Krivokhatsky & O. Ovtshinnikova leg. (ZISP) (Fig. 2G).

**Description.** Body oval, 2.27 times as long as wide in male (holotype) and 2.18 times in female (paratype), dorsally yellowish brown (holotype) or brown with rusty tint (paratype), with blackish spots (those being more distinct in holotype) at base of hood (vesicula), on sides of disc, at apical part of posterior pronotal process and at border between subcostal and discoidal areas of hemelytra. In holotype, pronotum and hemelytra with extremely sparse and short adpressed light hairs; paratype with very short but clearly visible light adpressed or slightly erected hairs.

Head black, with five long, rather thin yellow spines with pointed apices, three frontal and

\* **Editor’s comment.** For the exact location of the type locality, see the note at the end of the article (p. 42). The date on the label is in the Gregorian calendar.





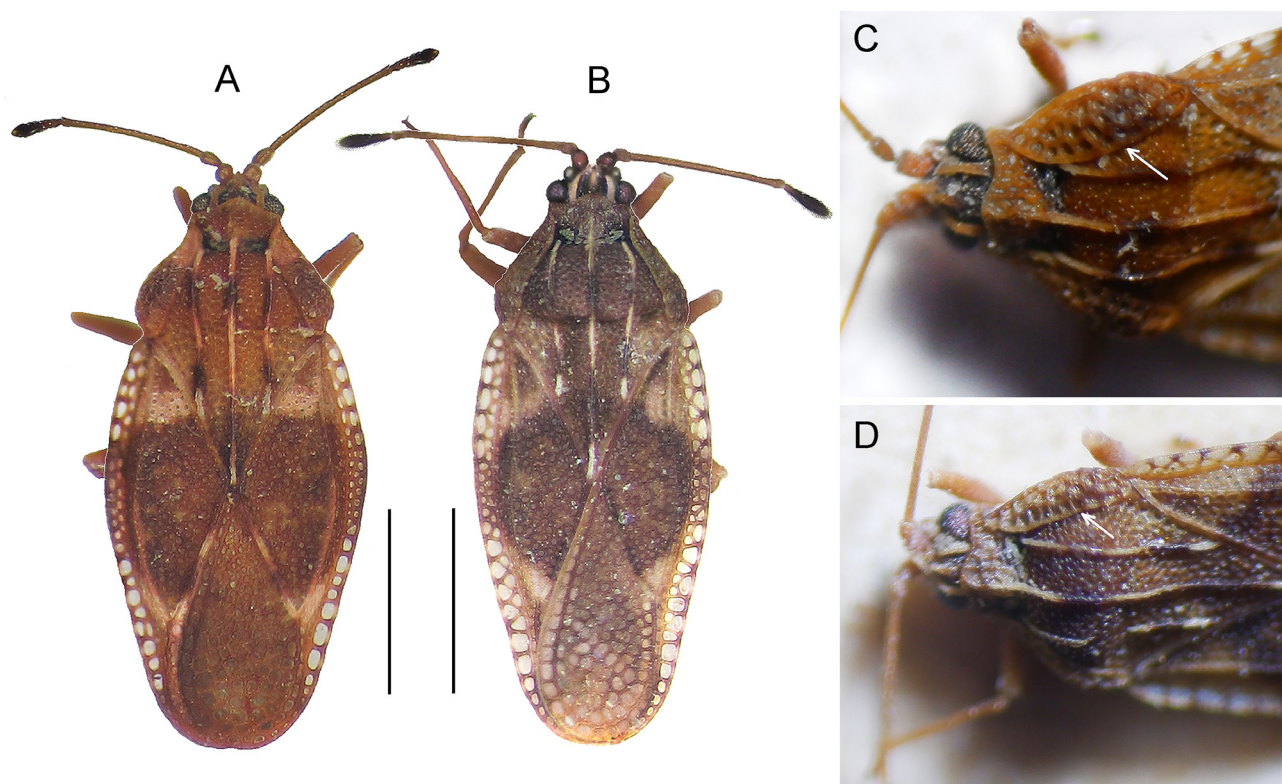
**Fig. 5.** *Physatocheila* spp. **A, C,** *Ph. smreczynskii* China, 1952, male, southern Primorskiy Territory, Russia; **B, D,** *Ph. orientis* Drake, 1942, female, Yuzhno-Sakhalinsk, Sakhalin Island, Russia. General appearance, dorsal view (A, B); head and pronotum, dorsolateral view (C, D). Paranotum shown by arrow. Scale bars: 1 mm.

two occipital spines. Apices of paired frontal spines converging and crossing (in holotype) or touching; median frontal spine curved to bases of paired spines, protruding beyond bases of frontal spines. Occipital spines curved in vertical plane along profile of head, slightly elevated above head surface, with pointed apices slightly produced anteriorly beyond anterior margins of eyes. Antennal segments I–III in male (holotype) yellowish brown, segment IV almost entirely black; segments II and III with extremely short slightly raised light hairs, segment IV with longer erected dark hairs. Antennae of paratype broken.

Pronotum rather wide, 1.57 (in male) or 1.40 (in female) times as long as wide. Pronotal disc not very convex, with three low longitudinal carinae lacking areolae in male (holotype) and with traces of extremely small areolae in female (paratype); lateral carinae in their anterior halves slightly converging anteriorly. Anterior margin of pronotum with raised tectiform, rather long hood (vesicula) being slightly (in holotype)

or noticeably (in paratype) angularly protruding anteriorly. Areolate paranota completely reflexed over dorsal surface of pronotum, not inflated along their entire lengths, not forming cysts, pressed to disc (in holotype) or only slightly elevated upwards (in paratype), with four longitudinal rows of rather large rectangular and pentagonal areolae in widest part; total number of paranotal areolae 28–31. Outer margins of reflexed paranota virtually straight over most of their lengths, broadly arcuately curved at level of hood, not reaching lateral carinae almost along their entire lengths and only touching or almost touching their anterior ends.

Macropterous form. Outer margins of hemelytra distinctly broadly rounded along entire lengths, not sinuate in posterior halves. Costal area with two rows of triangular, rectangular and pentagonal areolae and several areolae of third row at base and middle; only 7–8 areolae in middle; dark spot noticeably smaller than most of areolae in apical half. Most of areolae of costal



**Fig. 6.** *Physatocheila* spp. **A, C**, *Ph. dumetorum* (Herrich-Schaeffer, 1838), female, 60 km SSW of Voronezh, Russia; **B, D**, *Ph. confinis* Horváth, 1905, male, environs of Teberda, 1700 m a.s.l., North Caucasus, Russia. General appearance, dorsal view (A, B); head and pronotum, dorsolateral view (C, D). Paranotum shown by arrow. Scale bars: 1 mm.

area larger than areolae of other hemelytral areas. Costal area as wide as subcostal area in its widest part. Subcostal area with three rows of areolae in basal half, with two rows in apical half. Discoidal area and membrane in widest part with 7–9 and eleven rows of areolae, respectively.

Body ventrally and legs brown with rusty tint; apical half of tibia paler, yellowish; apical half of tarsi blackish. Subgenital plate small, rhombic, slightly lighter than abdominal sternites.

Length (in mm). Body: male 3.4, female 3.5; pronotum: male 1.65, female 1.75; antennal segments (I, II, III, IV): male 0.15, 0.10, 0.90, 0.26, antennae broken in female.

Width (in mm): body in male 1.50, in female 1.68; head in male 0.50, in female 0.58; vertex in male and female 0.22; pronotum in male 1.05, in female 1.25.

**Comparison.** According to the original description of *Ph. miyatakei* Miyamoto, 1964 and the diagnosis and photograph of this species by Souma & Ishikawa (2022), several morphological features of

the specimens described above from China and the Primorskiy Territory indicate that they belong to *Ph. miyatakei*: the median frontal spine protrudes anteriorly beyond the bases of frontal spines; the paranota are not bulged upwards throughout their entire lengths; the lateral carinae of pronotum are almost parallel to each other throughout their entire lengths, touch the anterior ends of the outer margins of paranota; the costal areas of hemelytra are rather narrow, equal in width to the subcostal areas in their widest parts, with no less than two rows of areolae throughout the entire lengths; the subcostal areas with three rows of areolae in the anterior half, including its widest part; and the sutural area with eleven areolae in the widest part.

At the same time, the above-described specimens from China and the Primorskiy Territory differ slightly from specimens of *Ph. miyatakei* from Japan. Judging by the photo of the holotype (male) in the original description of *Ph. miyatakei* and the photo of female in Souma & Ishikawa (2022), the costal areas of the hemelytra of the

specimens described here are slightly wider than those of the specimens from Japan. This area in the specimens studied by us has several areolae of the third row at the base and in the middle of the length or in the entire anterior half of this area *vs.* the costal areas of the holotype of *Ph. miyatakei* with “2 rows of fairly large areolae except for 3-seriate middle part” (Miyamoto, 1964), and in the specimens from Japan, according to Souma & Ishikawa (2022), they have two rows of areolae throughout their entire lengths. The subcostal areas in the specimens from China and the Primorskiy Territory have three rows of areolae throughout the entire basal half *vs.* this area in the holotype of *Ph. miyatakei* is “mostly 3-seriate, biseriate on both ends“. In addition, the subcostal areas in specimens of *Ph. miyatakei* from Japan, according to Souma & Ishikawa (2022), have three rows of areolae only at the widest points.

Based on the above-mentioned differences between the specimens from China and the Primorskiy Territory of Russia, on the one hand, and the holotype of *Ph. miyatakei* and other specimens from Japan, on the other hand, we consider *Ph. miyatakei* from the continental part of the Eastern Palaearctic as the subspecies *Ph. miyatakei latiuscula* **subsp. nov.** along with the insular nominative subspecies *Ph. miyatakei miyatakei* Miyamoto, 1964.

The new subspecies is similar to *Ph. marginulata* Golub, 1976 (Fig. 4B, D), in particular, in the rather narrow costal areas of the hemelytra in the middle, and two rows of areolae in the apical half. Both taxa have long and thin occipital spines and the paranota adpressed to the pronotal disc. *Physatocheila marginulata* differs from *Ph. miyatakei latiuscula* **subsp. nov.** in the short unpaired frontal spine, the paranota having approximately 60 small areolae arranged in 7–8 longitudinal rows, and the subcostal areas of hemelytra with four rows of areolae.

*Physatocheila miyatakei latiuscula* **subsp. nov.** is somewhat similar to *Ph. smreczynskii* (Fig. 5A, C), *Ph. costata* (Fig. 3B, D) and *Ph. putshkovi* (Fig. 4F, C) in having the long frontal spines. However, *Ph. smreczynskii* differs from *Ph. miyatakei latiuscula* **subsp. nov.** in the longer antennae (length of segment III is 1.08–1.10 mm) and the wider costal areas of hemelytra, which

have 3–4 rows of small areolae at dark transverse stripe immediately before the middle. Also, *Ph. smreczynskii* has weakly but distinctly sinuate outer margins of hemelytra in the posterior half, the reflexed paranota with five rows of areolae in the widest part, and the slenderer body. *Physatocheila costata* differs from *Ph. miyatakei latiuscula* **subsp. nov.** in the short unpaired frontal spine, the slenderer body, which is 2.9–3.0 times as long as wide, and very weakly rounded outer margins of the hemelytra. *Physatocheila putshkovi* differs from the new subspecies in the inflated paranota on the lateral pronotal angles, significantly wider costal area of the hemelytra, which is wider than the subcostal area having four rows of small areolae in the middle of its length, and the presence of five longitudinal rows of areolae in the widest part of the reflexed paranota.

*Physatocheila miyatakei latiuscula* **subsp. nov.** is slightly similar in the general appearance to *Tracypeplus fulgoris* (Drake, 1937) described from southern Jiangxi (south-eastern China) in the genus *Physatocheila* and currently known from a number of localities in southern China, as well as from India and Bhutan (Péricart & Golub, 1996). Both taxa have a rather wide pronotum. *Tracypeplus fulgoris*, judging by the drawings and photograph by Jing (1981), differs from *Ph. miyatakei latiuscula* **subsp. nov.** in the shape of the outer margins of reflexed paranota, which do not reach the lateral pronotal carinae, in the presence of two rows of areolae in the costal areas of hemelytra throughout their entire lengths, and in the wider body.

*Etymology.* The subspecific name is a Latin adjective meaning “widish”.

### Key to the imagines of *Physatocheila* species of the fauna of Russia, with brief data on their distribution

The genus *Physatocheila* includes eight species and one subspecies known in the fauna of Russia: *Ph. confinis* Horváth, 1905, *Ph. costata* (Fabricius, 1794), *Ph. distinguenda* (Jakovlev, 1880), *Ph. dumetorum* (Herrich-Schaeffer, 1838), *Ph. marginulata* Golub, 1976, *Ph. miyatakei latiuscula* **subsp. nov.**, *Ph. orientis* Drake, 1942, *Ph. putshkovi* Golub, 1976, and *Ph. smreczynskii* China, 1952.

The key presented below is supplemented with the new species described here, as this expands the understanding of the composition of the Chinese fauna and the complex of characters that can be used in the further development of the taxonomy of the entire genus and in the compilation of more complete keys by subsequent authors. In addition to the new taxa, three more species are known from China, *Ph. enodis* Drake, 1948, *Ph. fieberi* (Scott, 1874) and *Ph. ruris* Drake, 1942, which are not included in this key, since the authors did not have the opportunity to study the collection material of these species.

- 1(2). Lateral carinae of pronotum strongly converging anteriorly from posterior margin of pronotum to middle of disc, distance between them at highest point of disc less than or equal to width of vertex; they touching or almost touching outer margins of reflexed paranota at long distance; line of contact or very close convergence between outer margin of paranotum and lateral carina posteriorly almost reaching the highest point of disc. Body length 3.10–3.80 mm ..... *Ph. distinguenda* (Fig. 3A, C) **Distribution:** southern part of European Russia, Russian Far East, mountains of south-eastern Kazakhstan and Kyrgyzstan, Mongolia, north-eastern China, Korean Peninsula, and Japan.
- 2(1). Lateral carinae of pronotum parallel or weakly converging anteriorly, distance between them at highest point of disc greater than width of vertex, often not touching distal margins of reflexed paranota or touching them only at short distance, and line of contact between outer margin of paranotum and lateral carina posteriorly far not reaching the highest point of disc (Figs 2–6).
- 3(8). Reflexed paranota distinctly inflated throughout entire lengths (Fig. 1A, C) or over most of lengths, or only on lateral angles of pronotum; in latter case, paranota cyst-like posteriorly (Fig. 2B, D). Costal area of hemelytra within transverse dark spot with no more than 20 small areolae arranged in two or three rows.
- 4(5). Reflexed paranota moderately inflated along almost their entire lengths, except for the anterior small parts; inflated rather strongly at lateral angles of pronotum; veins between areolae of paranota rather strongly prominent, areolae deeply depressed, with concave surfaces. Outer margins of hemelytra strongly and sharply rounded at middle part of their length. Body length 2.80–2.95 mm ..... *Ph. explanata* sp. nov. (Fig. 1A, C) **Distribution:** southern China (Sichuan Province).
- 5(4). Reflexed paranota distinctly inflated only on lateral angles of pronotum; veins between areolae of paranota not strongly prominent, surfaces of areolae flat. Outer margins of hemelytra smoothly rounded along almost their entire lengths, except for apex.
- 6(7). Costal areas of hemelytra each with one row of rather large areolae over most of its length and with several small areolae of a second row, located in different parts of this area, including middle of length of this area. Body narrow, 2.54–2.63 times as long as wide. Smaller: body length 3.10–3.25 mm ..... *Ph. angusta* sp. nov. (Fig. 1B, D) **Distribution:** southern China (Yunnan Province).
- 7(6). Costal areas of hemelytra in anterior quarter each with two rows of rather large areolae, with about 20 small areolae arranged in three rows within dark spot in anterior third. Body wider, only twice as long as wide. Larger: body length 3.95 mm ..... *Ph. potanini* sp. nov. (Fig. 2A, C) **Distribution:** southern China (Sichuan Province).
- 8(3). Reflexed paranota usually completely adpressed to surface of disc or slightly raised above disc over almost their entire lengths (Fig. 3B, D), except for outer vein; if paranota weakly inflated on lateral angles of pronotum (*Ph. putshkovi*; Fig. 4A, C), then dark transverse spot of costal area of hemelytra with about 30 small areolae arranged in four rows.
- 9(20). Costal areas of hemelytra with three rows of areolae at base, three to four in middle, and two rows beyond; if third row incomplete near base, then body no shorter than 3–4 mm.
- 10(13). Median frontal spine rising noticeably above surface of head and above lateral frontal spines, sometimes curved downwards, if so, then that being short and thick, with blunt apex being hardly protruding anteriorly beyond bases of lateral frontal spines, located above them and visible laterally (Fig. 3B). Each paranotum with no more than 45 areolae.
- 11(12). Paranota pressed to disc or slightly raised above it, except for distal vein (viewed from above and slightly from side; Fig. 3D). Lateral

- carinae of pronotum parallel along most of their lengths, except for their short anterior parts. Hemelytra at rest 1.30–1.40 times as wide as pronotum, 2.80–3.00 times as wide as head. Body length 3.40–3.90 mm . . . . .  
 . . . . . *Ph. costata* (Fig. 3B)  
**Distribution:** transpalaeartic species, predominantly in forest zone.
- 12(11). Paranota more strongly inflated on lateral angles of pronotum than in other part of their surface (Fig. 4C). Lateral carinae of pronotum slightly converging anteriorly throughout. Hemelytra 1.45–1.50 times as wide as pronotum, 3.00–3.40 times as wide as head. Body length 3.70–3.95 mm . . . . .  
 . . . . . *Ph. putshkovi* (Fig. 4A)  
**Distribution:** mountains of Altai and south-eastern Kazakhstan; Eastern Siberia, southern Primorskiy Territory of Russia, and northern Mongolia.
- 13(10). Median frontal spine usually strongly curved to head, thin or with pointed apex, significantly protruding beyond bases of lateral frontal spines or passing between their bases or reaching bases of lateral frontal spines (in *Ph. marginulata*); sometimes (in some specimens of *Ph. orientis*), median spine slightly or noticeably erected, short and blunt at apex, but then each paranotum with 50–60 areolae.
- 14(15). Costal area of hemelytra with two rows of areolae in middle. Median frontal spine short, not protruding anteriorly beyond bases of lateral frontal spines; apices of occipital spines not reaching bases of lateral spines. Reflexed paranota each with about 60 small areolae. Body length 3.65 mm . . . . .  
 . . . . . *Ph. marginulata* (Fig. 4B, D)  
**Distribution:** southern Primorskiy Territory of Russia.
- 15(14). Costal area of hemelytra in middle with two rows of areolae and several areolae of a third row, or with three complete rows of areolae, or with three complete rows and several areolae of a fourth row. Median frontal spine long, extending anteriorly beyond the bases of lateral frontal spines; occipital spines reach imaginary line connecting their bases. Reflexed paranota with rather large areolae in different numbers (30–45 in *Ph. miyatakei latiuscula* subsp. nov. and *Ph. smreczynskii*, 50–60 in *Ph. orientis*).
- 16(17). Costal area of hemelytra in middle with two rows of areolae and several areolae of a third row and here with 7–8 areolae being smaller than most areolae in posterior half of this area. Reflexed paranota each with approximately 30 areolae. Body length 3.40–3.50 mm . . . . .  
 . . . . . *Ph. miyatakei latiuscula* subsp. nov. (Fig. 2B, D)  
**Distribution:** China (Sichuan Province), Russia (Primorskiy Territory).
- 17(16). Costal area of hemelytra with three complete rows of areolae in middle or also with a fourth row comprising approximately 15 (in *Ph. costata*) or 25–30 (in *Ph. orientis*) areolae being 0.33–0.50 times as large as areolae in apical half of this area. Reflexed paranota each with 35–60 areolae.
- 18(19). Paranota each with 35–45 areolae being considerably, often twice as large as those in costal areas of hemelytra in middle, located in 4–5 (rarely six) rows in widest part; outer margins of paranota usually straight or slightly convex in middle, not touching or hardly touching lateral carinae of pronotum anteriorly. Third antennal segment 1.80–2.00 (rarely 2.10) times as long as head width in males, 1.60–1.85 (rarely 1.90) times, in females. Smaller on average: 3.2–3.6 mm . . . . .  
 . . . . . *Ph. smreczynskii* (Fig. 5A, C)  
**Distribution:** transpalaeartic species, mainly in boreal and subboreal zones.
- 19(18). Paranota each with 50–60 areolae being usually not larger or slightly larger than areolae of costal area in middle, arranged in 7–8 (rarely six) rows; outer margins of paranota distinctly convex along their entire lengths, always touching lateral carinae anteriorly and at some distance, often covering anterior portion of lateral carinae from above. Third antennal segment 2.20–2.40 (rarely 2.10) times as long as head width in males, 1.75–1.90 (very rarely 1.70) times, in females. Larger on average: 3.50–4.50 mm . . . . . *Ph. orientis* (Fig. 5B, D)  
**Distribution:** Russia (Transbaikalia, southwestern Yakutia, Amur Province, southern Khabarovsk Territory, Sakhalin, Primorskiy Territory, Kuril Islands), Korean Peninsula, north-eastern China, and Japan.
- 20(9). Costal areas of hemelytra each with two rows of areolae or with only several areolae of third row in basal half, and with one row or with only several areolae of second row in apical half. Usually smaller: body length 2.70–3.45 mm.
- 21(22). Head black. Reflexed paranota 2.15–2.35 times as long as wide (measured when pronotum viewed obliquely dorsally and laterally), their outer margins weakly or noticeably

convex along their entire lengths (Fig. 6C). Body length 2.7–3.1 mm . . . . .

. . . . . *Ph. dumetorum* (Fig. 6A)

**Distribution:** central and southern Europe, Ukraine, Moldova, and forest-steppe and steppe zones of European part of Russia, north-western and north-eastern China.

22(21). Head red or brown. Paranota 2.60–2.80 times as long as wide, their outer margins very weakly convex, straight or slightly concave in middle (viewed dorsally and slightly laterally; Fig. 6D). Body length 2.70–3.45 mm . . . . .

. . . . . *Ph. confinis* (Fig. 6B)

**Distribution:** southern Europe, Ukraine, southern part of European Russia, North Caucasus, Transcaucasia, South-Western Asia, and mountains of Kyrgyzstan.

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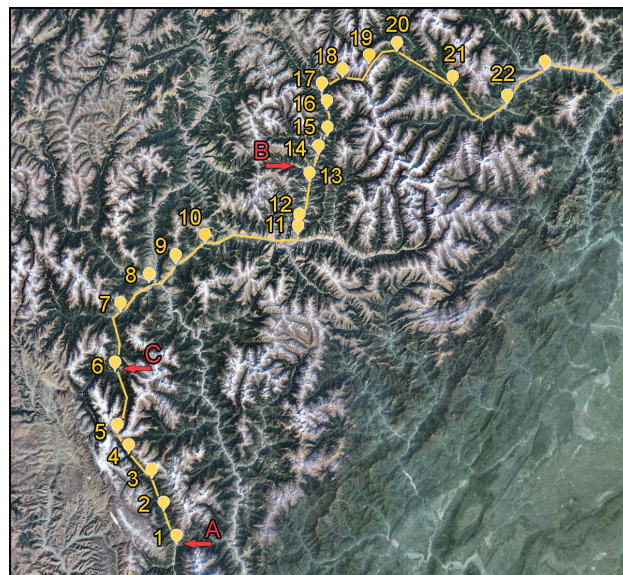
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### Editor's note to the article of V.B. Golub & V.A. Soboleva, pp. 27–42

Finding out the locations of G. Potanin's collections is often difficult. For his material from Sichuan, he mainly used the Tibetan names of localities that are not on the maps. His routes were published by V. Komarov [Komarov V.L. 1928. Les itinéraires botaniques des principales expéditions russes en Asie Centrale. Livre second. Itinéraires de G.N. Potanine (1876–1899). *Acta Horti Petropolitani*, 34(2): 199–404 + map. (In Russian, with preface in French)] based on Potanin's diaries and articles. This publication helps to compare the data on the labels with modern geographical names, but for this, it is often necessary to trace part of a specific route, and when a significant part of its points coincides with modern names, we can be sure that the locality we are interested in has been found correctly. The type localities of the two species and one subspecies described in this article were determined from the reconstruction of the part of Potanin's route in Sichuan in 1892–1893 from “Ta-chien-lu” to “Tzza-gu-tin”. The dates of the route (in the Julian and Gregorian calendars), the names of the points (in Latin and in Russian) are given according to Komarov (1928); modern names and numbers of points on the map are given in square brackets.

The type localities of the new taxa are marked on the map with arrows: **A**, *Physatocheila explanata*; **B**, *Ph. potanini*; **C**, *Ph. miyatakei latiuscula*.

- 4 Apr. – 1 July. Oppidum Ta-chien-lu, s. Da-tzzjan-lu, tibetice Tarsando [1 Kangding, 29°59'50.5"N 101°57'24.6"E], 16 Apr. – 13 July.
- 2 July. Flumen Tun-bo-che [Yala River], pagum Tshzhinkjaj [2 Jingai, 30°09'41.7"N 101°55'11.6"E], 14 July.
- 3 July. Pagus Tshzhungu [3 Zhonggucun, 30°15'50.8"N 101°52'36.1"E], 15 July.
- 4 July. Pagus Mongu [4 Xindianzi, 30°20'28.5"N 101°47'25.7"E], 16 July.
- 6 July. Trajectus Da-pao-shanj, s. Ta-p'ao shan [5 30°24'20.4"N 101°45'04.7"E], 18 July.
- 7 July. North down the valley to Rumi-zhang town; Kunyuy village, Chzhumse village or Mao-nyu-kou, side valley of Pasykyou River, where is the way to Gata monastery. Pagus Tshzhumse s. Maonjju-kou, s. Mao-niu [6 Maoniu, 30°36'04.3"N 101°44'10.9"E], 19 July.
- 8 July. Pagi Mi-ljanj-kou et Dungu s. Tung-ku [7 Dongguxiang, 30°47'20.2"N 101°45'03.1"E], 20 July.
- 10 July. Oppidum Rumi-tshzhan-gu s. Romi-chango [8 Zhanggu, 30°52'46.2"N 101°53'03.0"E], 22 July.
- 13 July. Pagus E-za [9 30°56'27.1"N 101°57'14.7"E ?], 25 July.
- 14 July. Pagus Panj-scha-myr [10 Banshanmenxiang, 30°59'52.2"N 102°03'14.2"E], 26 July.
- 15 July. Pagus Sinj-tshen-tzzy, 27 July.



- 16 July. Oppidum Sinj-gaj-tzzy, 28 July.
- 19 July. Pagus Tshan-tzzja-vanj [11 Kuangjiawan, 31°02'05.1"N 102°24'09.0"E], 31 July.
- 20 July. Pagus Schinj-djanj-tzzy [12 c. 31°04'11.1"N 102°24'38.2"E], 1 Aug.
- 21 July. Templum Lamasy [13 Laolama Temple, 31°11'59.8"N 102°26'50.9"E], 2 Aug.
- 22 July. Oppidum Fu-bjanj [14 Fubianxiang, 31°17'09.9"N 102°28'48.5"E], 3 Aug.
- 24 July. Pagus Schin-djanj-tzzy [15 Xindianzi, 31°20'46.9"N 102°30'49.6"E], 5 Aug.
- 25 July. Pagus Mar-dan [16 Ma'erdang, 31°25'37.6"N 102°30'36.8"E], 6 Aug.
- 26 July. Pagus Lanj-che-kou [17 Lianghecun, 31°29'08.4"N 102°29'27.4"E], 7 Aug.
- 27 July. Pons Schabagou-tzjao and Yu-hai-tsy village [18 Yuhaizi, 31°31'37.6"N 102°34'05.3"E], 8 Aug.
- 28 July. Trajectus Ohung-kiao s. Chuntzjao [19 31°34'04.7"N 102°40'07.9"E ?], 9 Aug.
- 29 July. Descent from the pass to the east into the valley belonging to the Min River system, 10 Aug.
- 30 July. Pagus Mungu [20 Menggu, 31°36'37.9"N 102°46'09.5"E], 11 Aug.
- 31 July. Pons Chuti s. Tshuti, 12 Aug.
- 1 Aug. Pons Er-dao-tzjao, 13 Aug.
- 2 Aug. Pagus Ku-er-kou [21 Gu'ergouzhen, 31°29'52.7"N 102°58'48.6"E], 14 Aug.
- 3 Aug. Oppidum Tsa-ku-lao s. Tzzagolo [22 Lixian, 31°26'19.0"N 103°09'54.0"E], 15 Aug.
- 5 Aug. Oppidum Tzza-gu-tin s. Li-fanj-fu s. Li-fan-ting, 17 Aug.

D.A. Gapon