The genus *Placolecis* (Catillariaceae, Lichenized Ascomycota) in Russia

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Summary. A review of the lichen genus *Placolecis* in Russia is presented. Localities in the Primorye Territory of *Placolecis loekoesiana*, a new to Russia species, and *P. opaca*, a new to the Russian Far East species, are reported. For *P. opaca*, this is a second locality in Russia after Trans-Baikal Territory (South Siberia). *Placolecis loekoesiana* was previously known exclusively from the "locus classicus" in South Korea. New localities in South Korea are also reported. The description and localities of the new to Russia lichen species *Placolecis loekoesiana* in the Primorye Territory are reported and results of the phylogenetic analysis (nrITS/5.8S) of *Placolecis* species are presented, confirming the distinctness of *P. loekoesiana* and indicating conspecificity of Far Eastern specimens with specimens from South Korea. The studied specimens of *P. loekoesiana* from Russia and South Korea differ from the protologue by hyaline hymenium smaller in size, exclusively ellipsoid ascospores smaller in size and thallus bigger in size. The verified diagnostic traits of *P. loekoesiana* based on studied specimens from Russia and South Korea are given. Besides, the data on pycnidia and conidia for *P. loekoesiana* are presented for the first time. Thus, the species is characterized by its placodioid, yellow-brown or yellow-olivaceous thallus, lecideine apothecia with glossy permanent proper margin, yellow to orange-yellow medulla, hyaline hymenium, pale brownish to hyaline hypothecium, 8-spored *Catillaria*-type asci with simple, hyaline, ellipsoid ascospores. New data on ecology of the species are reported: so far *P. loekoesiana* was known occurring on calcareous rocks in habitats with periodically flowing water, while wherever in the Russian Far East, it grows on open, dry surfaces of calcareous rocks at the elevation 290 to 480 m.
The type species, *Placolecis opaca* (Dufour) Hafellner, is generally known from Mediterranean region of Europe, and has been infrequently reported from North Africa and Asia (Hertel, 1977; Nimis, Poelt, 1987; Roux, 1991; Kotlov, 2003; Makryi, 2003; Mies, Schultz, 2004; Czarnota et al., 2006; Bilovitz et al., 2008; Aptroot, Moon, 2014; Sinha et al., 2015; Amrani et al., 2018; Ravera et al., 2019). Four other species have been described recently and have a restricted distribution within East and Central Asia: *Placolecis kunmingensis* A. C. Yin et al. from China (Yin et al., 2019) and *P. kashmirensis* R. Kousar et al. from Pakistan (Kousar et al., 2021). In Russia, the only one species *P. opaca* has been previously known from the southeastern Transbaikalia (Trans-Baikal Territory, South Siberia), where this species is considered by Makryi (2003) as a relic of Eurasian xerophilic-thermophilic flora and can be dated, presumably, to the Cretaceous period.

Several specimens belonging to *Placolecis* were collected in the southern part of the Sikhote-Alin Range (Primorye Territory, Russian Far East) from limestone outcrops that locally distributed in this area (Yakovchenko et al., 2020). When identifying the specimens, some questions arose that did not allow them to be unambiguously identified.

The aim of the study was to prepare a review of the genus *Placolecis* in Russia basing on comprehensive analysis of materials, which included morphological and anatomical study of samples, identification of secondary metabolites and molecular phylogenetic analysis.

**Materials and Methods**

**Sampling and phenotypic studies**

The material for study comprises eleven specimens of *Placolecis* collected by authors in 2011, 2017 and 2022 on limestone outcrops in the lowlands of the Central and Southern Sikhote-Alin Range (ALTB, herbarium of Davydov and Yakovchenko), as well as specimens of *P. opaca* from Transbaikalia, collected by T. Makryi (NSK, LE). Moreover, our recent collections of presumably *P. loekoesiana* from South Korea, kept in NIBR, were additionally studied, as well as exsiccate of *P. opaca* from Europe deposited in LE.

The specimens were examined using a stereo-microscope (Zeiss Stemi 2000-C) and a compound microscope (Zeiss Axio Lab.A1). Anatomical ex-
amination was undertaken using hand-cut sections mounted in water with following reagents (R): 10 % KOH (K), 10 % HNO₃ (N), lactophenol cotton blue (LCB) and Lugol’s solution (I). Polarized light (pol) was used for locating crystals in the sections. Measurements of ascospores, apothecia, squamules and hymenium are presented as: (smallest value recorded–) (x̄ – SE) – x̄ – (x̄ + SE) (–largest value recorded), where x̄ is the (arithmetic) sample mean, and SE is the sample standard error. Other measurements are presented as: (minimum – maximum) minimum – maximum (extreme maximum). The measurements of anatomical structures were made to the nearest 0.5 μm.

Lichen substances were studied using spot tests with potassium hydroxide solution (K), sodium hypochlorite solution (C) and 1,4-p-phenylenediamine (PD), and by high performance thin-layer chromatography (TLC) with solvent systems A (toluene:1,4-dioxane:acetic acid, 180 : 45 : 5), B’ (hexane:methyl tert-butyl ether:formic acid, 140 : 72 : 18) and C (toluene:acetic acid = 170 : 30) following Orange et al. (2001). We used Merk silicagel 60 UV 254 glass HPTLC plates 10 × 10 cm and made photo by SLR camera in transmitted UV light.

DNA extraction, amplification, and sequencing
Single thallus parts (100–200 mg) or 3–4 apothecia were carefully checked for fungal infections and thoroughly cleaned of extraneous matter. DNA extraction, amplification, and sequencing followed the methods of Davydov and Yakovchenko (2017). Cycling conditions included initial denaturation at 94 °C for 35 cycles of 95 °C for 20 s, 52 °C for 40 s, 72 °C for 60 s, and a final extension step at 72 °C for 7 min. The program Geneious 6.0 (Biomatters Ltd, New Zealand) was used for assembling partial and complementary sequences.

**Sequences and phylogenetic reconstructions**
To test the phylogenetic relationships of *Placolecis loekoesiana* collected in the Russian Far East and its conspecificity with the Korean material (GenBank Acc. No. MN052962), the ITS region of the nrDNA (ITS1, 5.8S, and ITS2), was sequenced (Table). These markers were used because they were used in phylogenetic analyses recently (Yin et al., 2019; Kousar et al., 2021), and sequences of all species are present in GenBank, whereas other loci are available only for *P. opaca*.

<table>
<thead>
<tr>
<th>Species</th>
<th>Source: collection location, and collection number or reference</th>
<th>GenBank accession number</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Placolecis loekoesiana</em></td>
<td>South Korea, 041238 (KoLRI)</td>
<td>MN052962</td>
</tr>
<tr>
<td><em>Placolecis loekoesiana</em></td>
<td>Russia, Primorye Territory, 2014, E. A. Davydov 18307 and L. S. Yakovchenko (ALTB)</td>
<td>OR195131</td>
</tr>
<tr>
<td><em>Placolecis sublaevis</em></td>
<td>China, Yunnan, 19-62675 (KUN)</td>
<td>MK995874</td>
</tr>
<tr>
<td><em>Placolecis kunmingensis</em></td>
<td>China, Yunnan, 18-58078 (KUN)</td>
<td>MK995884</td>
</tr>
<tr>
<td><em>Placolecis kunmingensis</em></td>
<td>China, Yunnan, 56795 (KUN)</td>
<td>MK995879</td>
</tr>
<tr>
<td><em>Placolecis opaca</em></td>
<td>Spain, Inv. Nr. 8764</td>
<td>MK995885</td>
</tr>
<tr>
<td><em>Placolecis kashmirensis</em></td>
<td>Pakistan, Azad Jammu and Kashmir (LAH36831) (MAK – 11 - holotype), (LAH36831),</td>
<td>MW586931</td>
</tr>
<tr>
<td><em>Solenopsora marina</em></td>
<td>–</td>
<td>KF689880</td>
</tr>
<tr>
<td><em>Solenopsora olivacea</em></td>
<td>–</td>
<td>KF689888</td>
</tr>
<tr>
<td><em>Catillaria scotinodes</em></td>
<td>–</td>
<td>ON380913</td>
</tr>
</tbody>
</table>

**Table**
Sample numbers and their GenBank accession numbers for the phylogenetic analyses in this study.

Newly generated sequence of *P. loekoesiana* supplemented with sequences obtained from GenBank (Table), representing all five known species of *Placolecis*. *Catillaria scotinodes* (Nyl.) Coppins, *Solenopsora marina* (Zahlbr.) Zahlbr., and *Solenopsora olivacea* (Fr.) H. Kiliias were used as the outgroup. This selection is based on the recent studies, in which *Solenopsora* and *Catillaria* appeared more closely related to *Placolecis* (Yin et al., 2019; Kousar et al., 2021). GenBank Accession numbers are provided in Table. ITS5.8S 556 bp matrix was aligned using the MAFFT algorithm (Katoh et al., 2005) as implemented on the GUIDANCE web server (Sela et al., 2015). The most likely tree and 1000 rapid bootstrap replicates were calculated using RAxML 8.0.26 (Stamatakis, 2014) by raxmlGUI software.
version 1.3.1 (Silvestro, Michalak, 2012) applying the GTRGAMMA model of substitution to ITS1, 5.8S, and ITS2 subsets. The tree topologies were taken from RAxML. Bootstrap support values and BMCMC posterior probability were noted onto the best scoring tree. To provide additional support for our phylogenetic reconstruction a heuristic search for the maximum likelihood (ML) bootstrap tree with simultaneous inference of the optimal partitioning scheme and substitution models for each data partition was performed using the online version of IQ-TREE (Nguyen et al., 2015; Trifinopoulos et al., 2016) with default settings.

Results

A few specimens from the Sikhote-Alin Range were identified as *P. opaca* (Fig. 1) basing on morphology and anatomy. The other part of the specimens morphologically resembled *Placolecis loekoesiana* (Fig. 1), which is characterized by its yellow-brown to yellow-olivaceous effigurate thallus with black lecideine apothecia and yellow medulla and is distributed in East Asia (Kondratyuk et al., 2017) but anatomically does not fit into the description well due to hyaline hymenium (vs. dark brown hymenium in the protologue). They also do not fit well to *Placolecis opaca* because of hyaline to pale-brownish hypothecium (in *P. opaca*, hypothecium is brown) and dissimilar habitus.

Morphological and anatomical study of these specimens and specimens from South Korea, showed their identity. In all specimens, hymenium is colorless and does not exceed 55.0 µm height (Fig. 2). It was also found that the size and shape of the ascospores in studied specimens differ from those described in the protologue (Fig. 3). Based on these facts, a verified diagnostic traits of the *P. loekoesiana* are presented. In addition, pycnidia and conidia are described for the first time for this species.

Both species found in the Sikhote-Alin Range are interesting geographical records. *Placolecis loekoesiana* is a new species for Russia, *P. opaca* is new for the Russian Far East. Its locality is the second in Russia. Both species were reported to South Korea (Aptroot, Moon, 2014; Kondratyuk et al., 2017); these localities are the nearest to those of the Russian Far East.

Fig. 1. *Placolecis opaca* (dark brown, left) and *Placolecis loekoesiana* (yellow-olivaceous, right) growing on one rock in the Primorye Territory (field photo). Scale = 1 cm.
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The phylogenetic study

A molecular-phylogenetic analysis of *Placolecis* species was carried out. According to the ITS5.8S phylogram (Fig. 4), the sequences of *P. loekoesiana* from the Primorye Territory and the sequence of this species from South Korea clustered together (RAxML 98 % BS, IQ 97 % BS), which indicates their identity. This confirms the distinctness of *P. loekoesiana* and indicates a conspecificity of the...
specimens from the Primorye Territory and South Korea. We therefore report Placolecis loekoesiana for the first time to Russia based on ITS data.

**The secondary chemistry**

All studied specimens were investigated by TLC. We compared secondary metabolites in *P. loekoesiana* and *P. opaca*. Both species showed the same spots pattern in TLC, however the concentrations of compounds were always higher in *P. loekoesiana* (Fig. 5). As Steiner et al. (1974) reported, fragilin, 2-chlor-siana compounds were always higher in Korea. We therefore report *Placolecis loekoesiana* for specimens from the Primorye Territory and South Korea.

**Description (in Russian)**

Таллом накипный, плакодиоидный, округлый (розетки до 3,0 см в диам.) или бесформенный (Fig. 1). Подслоевище отсутствует. Ареолы выпуклые, 0,3–0,5–0,7 мм толщиной, в центре скушенные, округлые и овальные до изогнуто-бесформенных, (0,3–)0,7–1,0–1,4(–2,0) мм шир. (*n* = 65), по краям удлиненные в виде лопастинок, (1,8–) 2,6–3,1–3,6(–4,0) мм дл. и (0,6–)0,7–1,0–1,3(–1,5) мм шир. (*n* = 55), веерообразно расширяющиеся, от перисто-надрезанных до рассечённых на вторичные доли, с округлыми краями. Верхняя поверхность темно-желтая, желто-коричневая, желто-оливковая, матовая до слегка блестящей, гладкая до складчатой, без наleta. Вегетативные пропагулы отсутствуют. Сердцевина желтая до оранжево-желтой. Пигмент распределён неравномерно, ближе к верхней коре. Кора таллома 25,0–45,0–75,0 мм толщ., бесцветная, параллектическая, сложена гифами с изодиаметрическими клетками, 4,5–6,0–7,5 мм в диам., расположенных в 3–4(5) ряда, сверху покрыта коричневыми коровыми кристаллами и бесцветным эпинекральным слоем, 5,0–10,0–12,5 мм высотой. Водорослевый слой сплошной, до 112,5 мм толщ., водоросли хлорококковые, максимальный диаметр 14 мм; сердцевина состоит из рыхло расположенных гиф до 5,0 мм в диам. с бесформенными золотисто-коричневыми кристаллами и бесцветным эпинекральным слоем, от K+ краснеет.

**The species**


нул в базальной части сливается с гипотецием, в латеральной части расширяющийся, из радиально расходящихся гиф, (100.0–)111,3–133,5–133,8–150,0 мкм толщ. (n = 15), параллептических, из изодиаметрических клеток 5,0–12,5 мкм в диам., бесцветный до чуть коричневато- булавовидные до шаровидные, с коричневыми шапочками. Сумки Catillaria-типа, бесцветные, 8-споровые (35,0–)38,3–40,7–43,0(–45,0) × (11,8–)12,4–13,2–14,0(–15,0) мкм (n = 20).

Парафизы (Fig. 3) простые, бесцветные, эллипсоидные до узко эллипсоидных, (7,5–)9,6–10,8–11,9(–12,5) × (4,0–)4,8–5,0–5,2(–5,5) мкм (n = 65). Пикниды обильные, черные, погруженные до слегка выступающих; конидии бесцветные, палочковидные, прямые, 4–6 × 1 мкм.

Таллом K-, C-, KC-, P-; сердцевина K+ краснеет, C+ краснеет, KC+ краснеет, P-.

*Substrate and ecology.* In the Primorye Territory P. lokeosiana grows on open, dry, well-insolated surfaces of carbonate limestone rocks in the mountains at the elevation up to 480 м above the sea level (Fig. 6). It commonly grows together with representatives of the Verrucariaceae, Teloschistaceae, and Lichinaceae. Associated species include *Porpidinia brevispora* Yakovchenko et Davydov, *Endocarpodium pusillum* Hedw., *Placynthium nigrum* (Huds.) Gray, *Protoblastenia rupestris* (Scop.) J. Steiner, *Verrucaria nigrescens* Pers., and others.

*Distribution.* The species is known only in East Asia – in South Korea and in the southern part of the Russian Far East (Primorye Territory).

*Specimens examined.* **Russia. Primorye Territory:** "vicinity of Nakhodka City, Sestra Mt. (Sister Mt.) – conical calcareous rocks, south slope, 42°49′39.7″N, 132°59′40.0″E, elev. 301 m a. s. l., limestone cliffs, on rock. 21 IX 2011. Yakovchenko 1254" (VLA); ibid., "on S exposed calcareous rock, 16 VIII 2022, E. A. Davydov 19347 and P. Yu. Ryzhkova"; "Dal’negorsky District, Sikhote-Alin’ at 3.5 km NW from Dalnegorsk, upstream the Barachnyi Stream, 44°35′21″N, 135°33′17″E, elev. 470 m a. s. l., polydominant mixed forest with a calcareous rock massif, on calcareous rocks. 2 IX 2017. E. A. Davydov 18308 and L. S. Yakovchenko" (ALTB); ibid., "at 3.5 km NW from Dalnegorsk, upstream the Barachnyi Stream, 44°35′21″N, 135°33′17″E, elev. 470 m a. s. l., polydominant broadleaf deciduous forest, calcareous rocks massif, on S exposed calcareous rock. 3 IX 2017. E. A. Davydov 18308 and L. S. Yakovchenko" (herbarium Davydov and Yakovchenko); Kavalershov District: "at S from the Kavalerovo, eastern macroslope of central Sikhote-Alin Range, at the right bank of the Zerkalnaya River, 44°14′50″N, 135°03′38.5″E, elev. 290 m a. s. l., near the summit of the calcareous rock cliff surrounded by polydominant broadleaf deciduous forest, on calcareous rocks. 1 IX 2017. E. A. Davydov 18307 and L. S. Yakovchenko" (herbarium Davydov and Yakovchenko); "at S from the Kavalerovo, right bank of the Zerkal’naya River, near the top of the calcareous rock cliff surrounded by polydominant broadleaf deciduous forest, 44°14′50″N, 135°03′38.5″E, elev. 290 m a. s. l., on S exposed calcareous rock. 1 IX 2017. E. A. Davydov 18307 and L. S. Yakovchenko" (ALTB).

*Additional specimens examined. South Korea.* "Gangwon-do, Sokcho city, Seorak-dong, Mt. Seorak, Seoraksan National Park, on route from Gwengum Castle to Hwachae-bong, 38°09′36″N, 128°29′01″E, elev. 700–1200 m a. s. l., local summit on stone. 14 V 2015. E. A. Davydov 12163" (NIBR); "Samcheok city, Singi-myeoun, Shingi-ri, along the Osipstream, around Shindong elementry School, 37°21′06″N, 129°04′55″E, elev. 100 m a. s. l., S exposed calcareous rocks, on soil over the rocks. 11 V 2015. E. A. Davydov 12098" (NIBR).


Type: France, "in ripus alpinus Galliae", leg. Dufour. [in Herbarium Elias L. Fries in UPS, as in G, not a single authentic material was found (Hertel, 1977)].

**Thallus** crustose placodioid, forming up to 2.0 cm wide, regular rosettes to irregular in outline (Fig. 1). **Prothallus** absent. **Areoles** flat to slightly convex, rounded to elongated, up to 1.0 mm wide in the central part, marginally with distinctly elongated, fan-shaped expanding lobes, up to 4.0 mm long and 0.4–1.5–(2.0) mm wide and up to 0.35 mm high. **Upper surface** olive to brown, matt, smooth, without pruina. **Vegetative propagules** absent. **Medulla** orange to yellow, darker in the upper part and paler in the lower part. **Cortex** paraplectenchymatous brown in upper part, colourless to pale brown in lower part, 20.0–25.0 μm high, of 3–4 rows of hyphae with isodiametric cells, up to 7.5 μm in diam., without hyaline epynecral layer. **Algae layer** even, up to 100 μm tall, chlorococcal algae, the maximum diameter is 15.5 μm. **Medulla** consists of loosely arranged hyphae up to 5.0 μm thick with irregular golden brown crystals that turn red from K.

**Apothecia** lecideine, usually present, in the centre of the thallus, single to rare crowded, rounded to irregular, 0.25–0.75 mm in diam., sessile, rounded to somewhat constricted at the base. **Disc** black, flat, matt, smooth, without pruina. **Proper margin** black, persistent, glossy, even, at the same level as disc, up to 0.07 mm thick. **Hymenium** colourless up to 60.0 μm tall. **Ephymenium** brown, 7.0–10.0 μm high. **Hypothecium** brown, non inspersed by oil droplets. **Proper margin** brown in outer part, colourless within, up to 120.0 μm thick in uppermost part, paraplectenchymatous, consist of isodiametric cells 5.0–10.0 μm in diam. **Paraphyses** simple to branched near the tips, septate, 2.0–2.5 μm thick in mid hymenium, apically clavate to capitulate, the apical cells with an internal pigment cap, up to 6.5 μm wide. **Asci** 8-spored, clavate, **Catillaria**-type, 32.0–45.0 × 12.0–15.0 μm. **Ascospores** simple to 1-septate, hyaline, ellipsoid, (8.0–)10.0–12.0 × (4.0–)5.0–6.5 μm. **Pycnidia** frequent, immersed or slightly projecting. **Conidia** hyaline, bacilliform, straight, 4.0–7.5 × ca. 1 μm. **Spot tests** thallus K–, C–, KC–, P–; medulla K+ red, C+ red, KC+ red, P–.

**Chemistry** fragilin and other antraquinones detected by TLC (Fig. 5).

The morphological features of the Far Eastern specimen of *P. opaca* (Fig. 1) agree with the descriptions provided by Schneider (1979), Makryi (2002) and Kotlov (2003) as well as with herbarium specimens of the species from Europe (J. Schuler 55, LE-L1332!, T. Makryi 6856, NSK!).

**Substrate and ecology.** In Primorye and Trans-Baikal Territories *P. opaca* grows on open, dry, well-insolated surfaces of limestone rocks in the mountains at the elevation up to 500 m a. s. l. (Fig. 6). It commonly grows together with representatives of the Verrucariaceae, Teloschistaceae, and Lichinaceae. In one locality in Primorye it was observed growing together with *P. loekoesiana* (Fig. 1).

**Distribution.** Mediterranean region of Europe, North Africa (Algeria) and Asia (India, Yemen, South Korea and Russia) (Hertel, 1977; Nimis, Poelt, 1987; Roux, 1991; Makryi, 2003; Mies, Schultz, 2004; Czarnota et al., 2006; Bilovitz et al., 2008; Aptroot, Moon, 2014; Sinha et al., 2015; Amrani et al., 2018; Ravera et al., 2019).

**Specimens examined.** **Russia. Primorye Territory.** "Nakahodka City, at the vicinity of Nahodka, the left bank of the Partizanskaya River near its mouth, the conical summit of the Sestra Mt. (318 m), calcareous rocks, 42°49’40”N, 132°59’39”E, elev. 310 m a. s. l., on S exposed calcareous rock. 16 VIII 2022. E. A. Davydov 19348 and P. Yu. Ryzhkova" (ALTB); "Partizansk District, at 1.5 km NE from Ekaterinovka Village, the right bank of the Partizanskaya River, 13.5 km upstream from its mouth, Prizhevikskogo Range, 42°56’09”N, 133°03’54”E, elev. 80 m a. s. l., oak forest (*Quercus mongolica*) with calcareous rocks, on S exposed calcareous rock. 17 VIII 2022. E. A. Davydov 19351 and P. Yu. Ryzhkova" (hb. Davydov and Yakovchenko); ibid., "E. A. Davydov 19342 and P. Yu. Ryzhkova" (ALTB). **Trans-Baikal Territory:** "Nerchinsk-Zavodskiy District, vicinity of Nerchinskii Zavod Village, 51°18’18”N, 119°37’23”E, elev. ca. 500 m a. s. l., upper part of the slope, meadow steppe with *Paeonia lactiflora* Pall. near the Betula dahurica Pallas forest. On big stone of crystalline calcite, calcareous rock. 1 VII 1985. T. V. Makryi" (NSK 4001000); ibid., "steppe slope, on stones of dolomitic limestone. 31 VII 2001. T. V. Makryi D-501" (LE-L1332; NSK 4001001; duplicate in ALTB).
Fig. 6. The sun exposed calcareous rock outcrop is a typical habit for *Placolecis loekoesiana* and *P. opaca* in the Primorye Territory (Sestra Mt.).
Additional specimens examined. Italy. Kryptogamæ exsiccatæ editæ a Museo Palatino Vindobonensi No. 55, "litorale austriacum: ad saxa calcarea in agro tergestino. Leg. J. Schuler" (LE); Italy. "Liguria occidentalis: Alassio. IV 1955. C. Sbarbaro" (LE).

Discussion

The genus _Placolecis_ in Russia is represented by two species: _P. opaca_ which is distributed in South Siberia and southern part of Far East and _P. loekoesiana_ which is first discovered in Russia in southern part of the Russian Far East. The species are well identifiable, the worldwide key is given in Kousar et al. (2021).

_Placolecis loekoesiana_ is a conspicuous epilithic calcicolous lichen characterized by its yellow-brown to yellow-oliveaceous, effigurate to irregular thallus, crustose centrally. The closest species, _P. opaca_, is mainly differ by its smaller and darker, brown thallus, with smaller areoles in the central part, up to 1.0 mm wide (vs. up to 1.0(–2.0) mm wide), also by brown to red-brown hypotecium (vs. hyaline to yellowish, grayish or brownish).

The specimens of _P. loekoesiana_ from the Russian Far East, in general, fit into the description of the species, but mainly differ in the following: the hymenium is colorless (dark brown in the protologue) and lower, up to 55.0 μm tall (in the protologue up to 75.0 μm tall) (Fig. 2), the spores are ellipsoid to narrowly ellipsoid (the shape of the spores in the protologue was “round to ellipsoid”, but according to the sizes “10.0–12.0(–14.0) × 5.0–6.0 μm” they cannot be round), the minimum and maximum spore length is less than given in the protologue (Fig. 3). In addition, we have studied the material of the species from South Korea. In all investigated specimens the hymenium was hyaline and up to 50.0 μm tall. Moreover, the maximum size of the thallus of studied specimens is twice as large as indicated in the protologue. Possibly, it depends on different method of measuring. Among the studied specimens, we observed variability in the morphology of the thallus: some specimens are characterized by a radial effigurate thallus with clearly elongated marginal lobes, in other specimens the thallus possesses forms of a compact crust but the marginal lobes are less distinct, specimens of the third group have irregular thallus and elongated lobes occur arranged randomly, and not only along the edge of the thallus. We measured only distinct placodioid rosettes, ignoring specimens from the last group or confluent thalli. The hyaline epinuclear layer was found in all specimens of _P. loekoesiana_ and lack in specimens of _P. opaca_.

According to the protologue, “medulla yellow in the upper portion and white in the lower portion, K+ violet” and it is one of the characters to split the species with _P. opaca_. According to our observations, the medulla is yellow to orange-yellow. It is remarkable that the color of the medulla is connected with the color of the upper surface of the thallus: under the darker upper surface, the medulla is darker, orange-yellow. The specimens with paler upper surface have a lighter, yellow medulla. The pigment is distributed unevenly: its concentration is high under the upper cortex, gradually decreasing to the lower cortex. When the medulla is yellow in the upper part its coloration is getting white close to the lower cortex. However, the yellow coloration is observed throughout the section in specimens with a brighter colored medulla. We could not observe K+ violet reaction in _P. loekoesiana_. The reaction after K was similar for _P. opaca_ and _P. loekoesiana_, and it was K+ red. Moreover, we showed the same chemosindrome in both species (Fig. 5).

Both species of _Placolecis_ are found in the same localities at altitudes of 290 to 480 m, sometimes grow together. Sun exposed surfaces of calcareous rocks are the typical habitats for _P. opaca_. However, _P. loekoesiana_ grows in South Korea on calcareous rocks in habitats with periodically flowing water, while wherever in the Russian Far East, it grows on open, dry surfaces of calcareous rocks. Thus, our observations from the Russian Far East expand data on its ecology. The species was found in five localities in the Primorye Territory at a latitude between 44° and at a maximum distance of about 300 km from each other. The localities of _P. loekoesiana_ in the Primorye Territory are the northernmost known ones. The South Siberian locality of _P. opaca_ is situated 1400 km west from the Far Eastern locality. The nearest localities in Juwang Mts, South Korea (Apt-root, Moon, 2014) are about 700 and 1000 km from newly reported localities in the Primorye Territory. The doubts expressed by Kondratyuk et al. (2017) about the reality of the presence of _P. opaca_ in South Korea are most likely erroneous, since our research has confirmed the presence of both species in East Asia.

Thus, _P. loekoesiana_, previously known exclusively from “locus classicus”, is recorded as a new species for Russia. A new location of it in South Korea
is also reported. *Placolecis opaca* is reported for the first time for the Russian Far East, and this locality is the second in Russia after Transbaikal locality.

A verified diagnostic traits of *P. loekoesiana* are presented on the basis of the studied samples from Russia and South Korea.

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