

BRYOFLORA OF NORTHERN AZOV AREA
(ROSTOV-ON-DON PROVINCE, EUROPEAN RUSSIA)

БРИОФЛОРА СЕВЕРНОГО ПРИАЗОВЬЯ
(РОСТОВСКАЯ ОБЛАСТЬ, ЕВРОПЕЙСКАЯ РОССИЯ)

V.A.SEREDA¹ & M.S.IGNATOV²

В.А. СЕРЕДА¹, М.С. ИГНАТОВ²

Abstract

The bryoflora of the Northern Azov Lowland within Rostov-on-Don Province (southern European Russia) includes 5 liverworts and 87 mosses. Annotated list is provided; 20 species are reported as new for Rostov-on-Don Province.

Резюме

Приводится аннотированный список мхов (87 видов) и печеночников (5 видов) Северо-Приазовской равнины в пределах Ростовской области (юг Европейской части России). 20 видов для Ростовской области приводятся впервые.

KEYWORDS: mosses, biodiversity, Russia, Rostov-on-Don Province

INTRODUCTION

The early information about bryophytes of Rostov-on-Don Province was published in the course of floristic and geobotanic exploration of the area in the first half of XX century (Sukachev, 1903; Zalesskiy, 1918; Novopokrovskiy, 1925, 1940), but these authors mentioned only common species without exact localities.

The special study of bryophytes in the Rostov-on-Don Province was started in 1990s by Babenko (Babenko, 1993ab, 1995ab; Babenko & Bolyukh, 1996), but was not completed because of her early death. Her results were summarized in the publication of Babenko & Fedyaeva (2001), which contains the conspect of bryoflora, including 13 hepatics and 135 mosses, with 45 species recorded in Northern Azov area, the most xeric part of the province.

STUDY AREA, CLIMATE, VEGETATION

Northern Azov area is the south-western part of Rostov Province (Fig.1), delimited from the

north by Donetskii Ridge, from the south – by Taganrog Gulf of the Azov Sea, the eastern border is the valley of Don River, and on the west the study area is limited by the Russian–Ukrainian boundary. The relief of the plain is somewhat hilly and the territory is subdivided into several plateaus by the river valleys.

The climate of the area is continental and very dry (Fig. 2), with the mean annual temperature +8.2°C, that of January –6.5° C, and of July +23.2°C. Winter is short and has unstable snow carpet to 10-15 cm. The annual precipitation is 424 mm, constituting only 0.42 of potential evaporation (Khrustalyev & Smagina, 2002). The main zonal vegetation is steppe that includes also variants of stony steppes (on the bedrock of limestone, chalk, sandstone and shale) and sandy steppes. Rostov-on-Don Province is an agricultural region, and arable lands cover now 60% of its territory. And the rest of area is also strongly affected by agriculture, especially pasturing which occurs almost through-

¹ – Botanical Garden of South Federal University, Botanicheskiy spusk lane, 7, Rostov-on-Don 344041 Russia – Ботанический сад Южного федерального университета, пер. Ботанический спуск, 7, Ростов-на-Дону 344041 Россия; seredam@yandex.ru

² – Main Botanical Garden of Russian Academy of Sciences, Botanicheskaya, 4, Moscow 127276 Russia – Россия 127276 Москва, Ботаническая, 4, Главный ботанический сад им. Н.В.Цицина РАН; misha_ignatov@list.ru

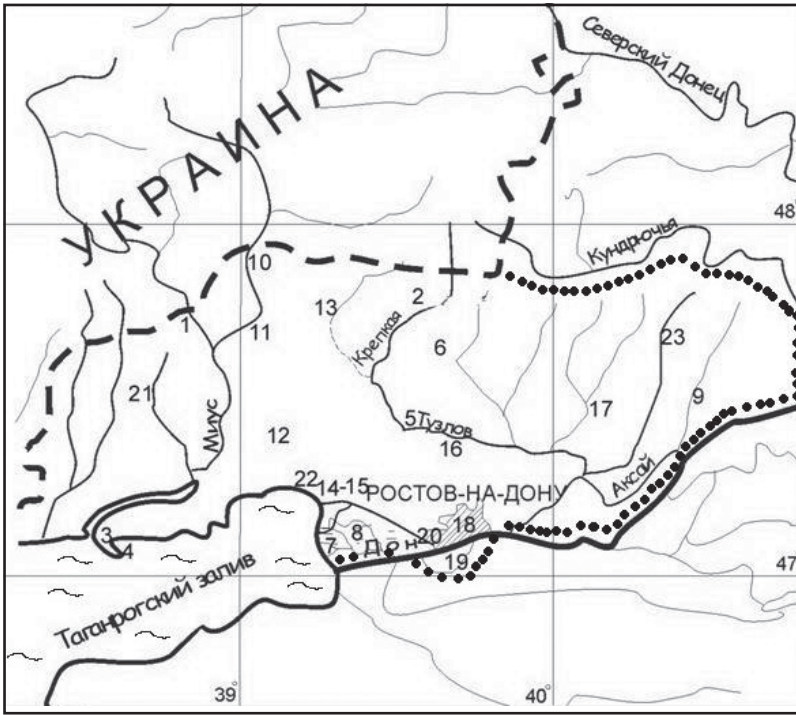


Fig. 1. The collecting localities of bryophytes in Northern Azov area (cf. Table 1)

out the territory outside cities. The forests are very limited and are represented in the Northern Azov area by forests on steep slopes of gullies and in river floodplain. Numerous limestone outcrops occur in many places in the study area.

LIST OF SPECIES

The list includes 92 species (5 hepatics and 87 mosses), 46 species of them are new to the Northern Azov area and 20 are also new to the Rostov-on-Don Province (marked by !). *Didymodon spa-*

diceus and *Fabronia pusilla* were the first recored for the lowland part of European Russia (cf. Ignatov & Ignatova, 2003). The list is based on the collections of the first author, as well as on revision and identification of collections of L.A. Babenko, and partly other collectors. The main collection is in RWBG, duplicates of most of the species in MHA. The annotated list includes data on (1) species habitats; (2) frequency is abbreviated as follow: Un – unique, R – rare, Sp – sporadic, Fr – frequent, Com – common; (3) sporophytes if present are indicated by S+; (4) enumeration of localities (for numbers explanation see Fig. 1 and Table 1).

Hepaticae

- Marchantia polymorpha* L. – wet soil and bricks near water-pump, old fire place and wet soil in boggy depression. R. 18, 20.
- Ricciocarpus natans* (L.) Corda – wet silty soil on lake banks in the delta of Don River (Savicz & Ladyzhenskaya, 1936).
- Riccia fluitans* L. – wet silty banks in the delta of Don River near Rogozhokino (Babenko & Fedyaeva, 2001).
- !*Pellia epiphylla* (L.) Corda – wet sand on bottom of old quarry, among *Equisetum*. Un. 9 (coll. A.N. Shmaraeva). This is a common liverwort in Ukraine (Bachurina & Partyka, 1979).
- Radula complanata* (L.) Dum. – *Ulmus* trunk in gully forest, poplar trunk in city. R. 10, 13, 18, 23.

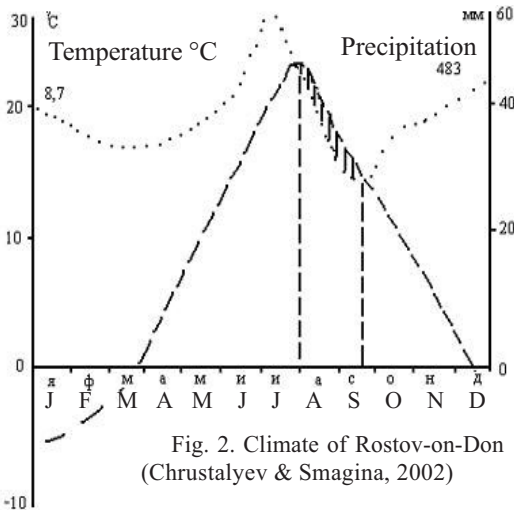


Fig. 2. Climate of Rostov-on-Don (Chrustalyev & Smagina, 2002)

Table. 1. The collecting localities of bryophytes in Northern Azov area (cf. Fig. 1)

1	Avilo-Uspenka	47°41' N, 38° 40' E	с. Авילו-Успенка (Матвеево-Курганский р-н)
2	Atamano-Vlasovka	47°46' N, 39° 28' E	хут. Атамано-Власовка (Родионово-Несветайский р-н)
3	Beglitsa 1	47° 08' N, 38° 33' E	с. Беглица (Неклиновский р-н)
4	Beglitsa 2	47° 08' N, 38° 30' E	хут. Беглица (Неклиновский р-н)
5	General'skoye	47° 29' N, 39° 37' E	с. Генеральское (Родионово-Несветайский р-н)
6	Dar'evka	47° 56' N, 41° 02' E	с. Дарьевка (Родионово-Несветайский р-н)
7	Dugino	47° 12' N, 39° 25' E	хут. Дугино (Азовский р-н)
8	Yelizavetinskaya	47° 09' N, 39° 28' E	станция Елизаветинская (Азовский р-н)
9	Isayevskiy	47° 23' N, 40° 23' E	хут. Исаевский (Усть-Донецкий р-н)
10	Kuybyshevo	47° 46' N, 39° 53' E	пос. Куйбышево (Куйбышевский р-н)
11	Kul'bakovo	47° 41' N, 38° 54' E	с. Кульбаково (Матвеево-Курганский р-н)
12	Kurlatskiy	47° 21' N, 39° 04' E	хут. Курлацкий (Неклиновский р-н)
13	Lysogorka	47° 40' N, 39° 13' E	с. Лысогорка (Куйбышевский р-н)
14	Nedvigovka, Donskoy Chulek Gully	47° 18' N, 39° 25' E	хут. Недвиговка, балка Донской Чулек (Мясниковский р-н)
15	Nedvigovka, Kamennaya balka Gully	47° 43' N, 39° 13' E	хут. Недвиговка, балка Каменная (Мясниковский р-н)
16	Nesvetay	47° 27' N, 40° 27' E	с. Несветай (Родионово-Несветайский р-н)
17	Persianovskiy	47° 30' N, 40° 12' E	пос. Персиановский (Октябрьский р-н)
18	Rostov-on-Don, suburb	47° 14' N, 39° 42' E	г. Ростов-на-Дону, жилтэбная зона
19	Rostov-on-Don, right bank of Don River	47° 11' N, 39° 37' E	г. Ростов-на-Дону, правый берег р. Дон
20	Rostov-on-Don, left bank of Don River	47° 12' N, 39° 46' E	г. Ростов-на-Дону, левый берег р. Дон
21	Sarmatskiy	47° 31' N, 38° 36' E	хут. Сарматский
22	Sinyavskaya	47° 17' N, 39° 15' E	станция Синявская (Неклиновский р-н)
23	Yagodinka, Osipovskaya Gully	47° 37' N, 40° 19' E	хут. Ягодинка, Осиповская балка (Октябрьский р-н)

Musci

Polytrichastrum formosum (Hedw.) G.L. Smith – edge of periodically flooded depression with reed in the delta of Don River. Un. 7 (coll. L.A. Babenko).

Polytrichum commune Hedw. – delta of Don River, on sand together with typical psammophyte species of vascular plants. Un. S+. 7.

Funaria hygrometrica Hedw. – soil of different types, including silts, rocky substrates, including artificial ones. Sp. S+. 7, 15, 18.

Encalypta vulgaris Hedw. – soil in rocky steppe. Un. S+. 5, 12, 15, 16.

Dicranella varia (Hedw.) Schimp. – limestones under big rock overhang. Un. 15.

Ceratodon purpureus (Hedw.) Brid. – soil of different types, especially sandy ones, in steppes, including rocky variants, lithosol on rocks outcrops, brick, concrete and other artificial substrates. Com. S+. 1, 2, 3, 4, 5, 7, 12, 14, 15, 16, 18, 17, 21, 23.

Pleuroidium subulatum (Hedw.) Rabenh. – clay and chalk soils. R. 17, 18.

!*Acaulon triquetrum* (Spruce) Müll. Hall. – soil in the steppe part of the Botanical Garden of South Federal University. Un. S+. 18. Rare in Russia, known from Saratov (Czerepanova, 1971) and Astrakhan Provinces (Suragina et al., 2002).

Barbula convoluta Hedw. – asphalt, brick, mortar, soil, bases of tree trunks (on the silt layer or not). R. 18.

B. unguiculata Hedw. – soil and stony outcrops of different composition, stony artificial substrates. Com. S+. 5, 6, 13, 12, 16, 17, 21, 23.

Didymodon fallax (Hedw.) R.H.Zander – limestone outcrops near the gully bottom, asphalt and concrete. R. 16, 18.

D. rigidulus Hedw. – outcrops of limestone and sandstone, various stony artificial substrates. Fr. 5, 6, 11, 16, 17, 18, 23.

!*D. spadiceus* Limpr. – wet limestone near the bottom of gully. This is the only locality of the species in lowland area of European Russia. Un. 23 (coll. L.A. Babenko). The closest localities are in the Caucasus.

D. tophaceus (Brid.) Lisa – limestone outcrop near the bottom of gully. R. 12, 23 (coll. L.A. Babenko).

Eucladium verticillatum (Brid.) Bruch et al. – wet shady limestone outcrops (under rock overhang). Un. 15.

!*Gymnostomum aeruginosum* Sm. – with the previous species. Un. 15.

Microbryum curvicolle (Hedw.) R.H.Zander – soil of the rocky steppe. Un. S+. 14.

!*Pseudocrossidium hornschuchianum* (Schultz) R.H.Zander – open limestone outcrops. Un. 15. Another noted locality of the European part of Russia is in the Astrakhan Province (Suragina & al., 2002).

- !*P. obtusulum* H.A.Crum & L.E.Anderson – open limestone outcrops, including rocky steppe. Un. 16. The closest localities are in Perm Province (Fedosov & Ignatova, 2006). Det. E.A. Ignatova.
- Pterygoneurum ovatum* (Hedw.) Dix. – soil of rocky steppe and of steppe part of Botanical garden of South Federal University; solid chalk outcrops. R. S+. 13, 14, 18 (coll. L.A. Babenko).
- P. subsessile* (Brid.) Jur. – soil of rocky steppe (above outcrops of solid chalk and limestone). Sp. S+. 6, 13, 17, 22, 23.
- Syntrichia caninervis* Mitt. – soil of rocky steppe and limestone outcrops of the gully slope. Sp. 2, 13, 14, 15, 17, 23.
- S. intermedia* Brid. – soil of rocky steppe and limestone outcrops of the gully slope. Sp. 11, 14, 15, 16, 17.
- S. ruralis* (Hedw.) F.Weber & D. Mohr – soil of rocky steppe, limestone outcrops, sands. Com. S+.
- S. virescens* (De Not.) Ochyra – deciduous trees trunk and limestone outcrops of the gully slope. Un. 15 (coll. L.A. Babenko).
- Tortula acaulon* (With.) R.H.Zander – soil of rocky steppe and synanthropic localities. R. S+. 17, 18, 22.
- T. modica* R.H.Zander – soil in the steppe, including the rocky steppe, clay soils of the scours. R. S+. 14, 17.
- T. muralis* Hedw. – limestone, chalk and sandstone outcrops; various stony artificial substrates. Fr. S+. 11, 12, 13, 14, 15, 16, 21, 23.
- T. protobryoides* R.H.Zander – soil of rocky steppe and synanthropic localities. R. S+. 14, 18.
- T. truncata* (Hedw.) Mitt. – soil of the steppe, including its rocky variant; clay soil of scours, concrete. R. S+. 15, 20.
- Weissia levieri* (Limpr.) Kindb. – soil of rocky steppe and limestone outcrops. Com. S+. 1, 5, 6, 11, 12, 13, 14, 15, 16, 17, 21, 22, 23.
- !*Seligeria pusilla* (Hedw.) Bruch et al. – chalk outcrops near forested gully bottom. Un. S+. 13. Reported from neighboring areas of Voronezh Prov. and Ukraine (Popova, 2002; Bachurina & Melnichuk, 1987).
- !*Schistidium brunescens* Limpr. – open limestone outcrops of the gully slope. Un. S+. Reported from neighboring areas of Ukraine (Bachurina & Melnichuk, 1988). Det. Ignatova.
- S. brunescens* ssp. *griseum* (Nees & Hornsch.) H.H.Blom – open limestone outcrops of gully slope. Un. S+. Det. Ignatova.
- !*S. crassipilum* H.H.Blom – open limestone outcrops of the gully slope, asphalt. Sp. S+. 12, 14, 15, 16, 20. Det. Ignatova.
- !*S. dupretii* (Thér.) W.A. Weber – open limestone outcrops of the gully slope. R. S+. 5, 16. Det. Ignatova.
- S. elegantulum* H.H.Blom – limestone block in the Botanical garden of South Federal University. Un. 18 (coll. L.A. Babenko).
- !*S. helveticum* (Schkuhr) Deguchi – open limestone outcrops of the gully slope. R. S+. 15, 12. Det. Ignatova.
- !*Grimmia anodon* Bruch et al. – open limestone outcrops. Un. S+. 16. Reported from neighboring areas of Ukraine (Bachurina & Melnichuk, 1988).
- G. laevigata* (Brid.) Brid. – sandstone outcrops. Un. S+. 11.
- G. plagiopodia* Hedw. – limestone outcrops. Un. S+. 23.
- G. pulvinata* (Hedw.) Sm. – limestone and sandstone outcrops, stony artificial substrates. Com. S+. 3, 5, 11, 12, 13, 14, 15, 16, 18, 19, 20, 23.
- Orthotrichum affine* Brid. – tree trunks in the gully and floodplain forests. Com. S+. 1, 10, 13, 14, 18, 19, 20, 23.
- O. anomalum* Hedw. – limestone outcrops. Sp. S+. 5, 14, 16, 23.
- !*O. diaphanum* Brid. – open limestone outcrops and poplar trunks in the suburb zone. R. S+. 8, 14, 23. Species is common in Caucasus and Ukraine, but in southern European Russia is known only in Volgograd Province (Ignatov & Ignatova, 2003).
- O. obtusifolium* Brid. – open limestone outcrops. Un. 14.
- O. pumilum* Sw. – tree trunks, stumps, dead-wood. Sp. S+. 8, 13, 18, 19, 20, 23.
- O. speciosum* Nees – bark of the deciduous trees, dead-wood. Un. S+. 19.
- Leptobryum pyriforme* (Hedw.) Wils. – calcareous soils, urban soils and mortar. R. S+. 13, 15, 18.
- Bryum argenteum* Hedw. – sands, soils of different composition (including disturbed soils), steppes (including rocky variants), dead wood, outcrops of different type, various stony artificial substrates. Com. S+.
- B. bicolor* Dicks. – sands in delta of Don River and Taganrog gulf seaside, soil of rocky steppe. R. 7, 14.
- B. caespiticium* Hedw. – sands in delta of Don River and Taganrog gulf seaside, soils of different composition (including disturbed), steppes (including rocky variants), outcrops of different type, various stony artificial substrates. Com. S+. 3, 4, 5, 6, 7, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 23.
- B. capillare* Hedw. – soil of rocky steppe, shaded limestone outcrops, dead-wood. Sp. S+. 5, 13, 15, 17, 18, 20.
- B. creberrimum* Tayl. – gully slope in rocky steppe. R. 14, 17, 23.
- B. moravicum* Podp. – deciduous tree trunks and dead-wood. R. 10, 13, 18, 20.
- B. lonchocaulon* Müll. Hall. – gully slope in rocky steppe. Un. 14.
- !*B. kunzei* Hoppe & Hornsch. – soil of rocky steppe and sand with addition of shell crumbs (on the Taranrog gulf seaside). R. 3, 4, 13, 17.
- B. rubens* Mitt. – soil of the steppe. R. 16, 17.
- !*B. subapiculatum* Hampe – soil of the steppe. Un. 17. Det. V.I. Zolotov.

- B. turbinatum* (Hedw.) Turn. – wet coastal soil in delta of Don River. Un. 8.
- Pohlia nutans* (Hedw.) Lindb. – concrete (above the silt layer). Un. 18.
- Plagiomnium cuspidatum* (Hedw.) T.J.Kop. – stumps, dead-wood and limestone lump in the floodplain forest (left bank of Don River). Un. S+. 20.
- !*Hedwigia ciliata* (Hedw.) P.Beauv. – trunk of *Robinia pseudacacia* in the Upper park of the Botanical garden of South Federal University. Un. 18. The closest localities are in the Caucasus.
- Fontinalis antipyretica* Hedw. – stones in the stream of mineralized water (according to Volkov, 1940).
- !*Fabronia pusilla* Raddi – dead-wood in the suburb zone. Un. 18. Besides Rostov-on-Don Province this species is known in Russia only in the Caucasus.
- Hypnum cupressiforme* Hedw. – tree bark, dead-wood and soil. Sp. 8, 10, 13, 14, 15, 20, 23.
- Anomodon viticulosus* (Hedw.) Hook. & Tayl. – soil in Upper park of Botanical garden of South Federal University. Un. 18 (coll. L.A. Babenko).
- !*Brachythecium olympicum* (Jur.) Vanderp. et al. – limestone outcrops of the gully slope, dead-wood of floodplain and gully forests. R. S+. 1, 10, 15, 20.
- B. velutinum* (Hedw.) Bruch et al. – tree trunks and roots, dead-wood, chalk and limestone outcrops, soil. Sp. S+. 10, 11, 13, 17, 20, 23.
- Brachythecium albicans* (Hedw.) Bruch et al. – gully slope in the rocky steppe. Un. 23.
- B. mildeanum* (Schimp.) Schimp. – limestone of gully bottom with watercourse, wet banks of rivers; within Rostov-on-Don city on dead-wood and soil in floodplain forest. R. 8, 14, 19, 22.
- !*B. rotaeanum* De Not. (*B. capillaceum* (F. Weber & D. Mohr) Giacom.) – dead-wood in the gully forest and in the Upper park of the Botanical Garden of South Federal University. R. 13, 18.
- B. rutabulum* (Hedw.) Bruch et al. – tree trunks and roots, dead-wood, chalk, limestone and clay-slate outcrops, soil of gully slopes, in the gully and floodplain forests. Sp. S+. 2, 8, 10, 12, 13, 15, 17, 18, 23.
- B. salebrosum* (F. Weber & D. Mohr) Bruch et al. – limestone outcrops and clay landslides, tree trunks and roots, dead-wood and soil in gully forests, soil in floodplain meadows. Sp. S+. 2, 10, 12, 13, 15, 16, 17, 18, 19, 20, 23.
- Homalothecium lutescens* (Hedw.) H.Rob. – calcareous soil on gully slopes, rocky steppes, wet rocks at stream banks. Fr. 1, 2, 5, 10, 12, 13, 14, 15, 16, 20, 23.
- H. sericeum* (Hedw.) Bruch et al. – calcareous soil in rocky steppe, chalk and limestone outcrops, tree bark, and occasionally soil in city. Sp. S+. 13, 15, 16, 18.
- Oxyrhynchium hians* (Hedw.) Loeske – soil of gully slopes, including rocky steppe, shaded chalk and limestone outcrops, dead-wood and tree roots in the gully and floodplain forests, wet silt soil of the stream and river banks. Sp. 8, 10, 13; 15, 16, 17, 18, 19, 20.
- Sciuro-hypnum populeum* (Hedw.) Ignatov & Huttunen – soil in gully forest (near the bottom); stony artificial substrates in Rostov-on-Don city. R. 18 (coll. Babenko), 23.
- Pyralisia polyantha* (Hedw.) Bruch et al. – trunks of deciduous trees. Sp. S+. 1, 10, 17, 18, 19, 20, 23.
- Stereodon pallescens* (Hedw.) Mitt. (*Hypnum pallescens* (Hedw.) P. Beauv.) – dead-wood in gully forest. Un. 10, 13.
- Leskea polycarpa* Hedw. – limestone, tree bark, dead-wood and soil in the gully and floodplain forests. Sp. S+. 1, 8, 10, 13, 14, 15, 17, 18, 19, 20, 23.
- !*Thuidium delicatulum* (Hedw.) Bruch et al. – wet soil of floodplain meadow on the left bank of Don River. U. 20 (coll. Rebriev). This species is widespread in European Russia, but was not known in its steppe zone (Ignatov & Ignatova, 2004).
- Amblystegium serpens* (Hedw.) Bruch et al. – chalk and limestone outcrops, tree bark, dead-wood and soil in gully and floodplain forests. Com. S+. 8, 10, 12, 13, 14, 15, 16, 18, 19, 20, 23. Some specimens fit var. *juratzkanum* (Schimp.) Rau & Herv.; they occur on chalk and limestone outcrops, dead-wood and soil.
- Hygroamblystegium varium* (Hedw.) Mönk. – limestone outcrops, dead-wood and soil. R. S+. 10, 23 (coll. Babenko), 14, 18, 19, 20.
- Campylidium calcareum* (Crundw. & Nyh.) Ochyra – shaded limestone outcrops near gully bottom. R. S+. 13, 14.
- Drepanocladus aduncus* (Hedw.) Warnst. – meadow in flood plain on the right bank of Don River near Kumzhenskaya Hurts. Un. 19.
- D. polygamus* (Bruch et al.) Hedenäs – delta of Don River, edge of periodically flooded depression with reed. Un. 7.
- Leptodictyum riparium* (Hedw.) Warnst. – wet soil and dead-wood near water on the left bank of Don River; on bricks under the water level within Rostov-on-Don city. R. 18, 19, 20.

ACKNOWLEDGEMENTS

The authors are very grateful to E.A. Ignatova and V.I. Zolotov for checking and identification of some species and to I.L. Goldberg for checking the specimen of *Seligeria pusilla*.

LITERATURE CITED

- [BABENKO, L.A.] БАБЕНКО Л.А. 1993. Динамика развития бриофлоры в разновозрастных древесных насаждениях ботанического сада Ростовского университета. – [The dynamics of bryoflora development in the forest stands of different age in the Botanical garden of the Rostov State University] В кн.: Материалы международной научной конференции «Экологические

- проблемы интродукции растений на современном этапе: вопросы теории и практики». Краснодар [In: *Materialy mezhdunarodnoj nauchnoj konferencii "Ecologicheskie problemy introdukcii rastenij na sovremennom etape: voprosy teorii i praktiki, Krasnodar"*]: 620–623.
- [BABENKO, L.A.] БАБЕНКО Л.А. 1994а. Флора мохообразных Ростовской области – [The moss flora of the Rostov Province] В кн.: *Материалы международной конференции молодых ученых. Санкт-Петербурге* [In: *Materialy mezhdunarodnoj konferencii molodyh uchenyh, St.-Petersburg*]: 123–124.
- [BABENKO, L.A.] БАБЕНКО Л.А. 1994б. Редкие виды бриофлоры Ростовской области. – [Rare species of the bryoflora of Rostov Province] В кн.: *Охорона генофонду рослин в Україні. Донецк* [In: *Ohorona genofondu roslin v Ukraini, Donetsk*]: 6.
- [BABENKO, L.A.] БАБЕНКО Л.А. 1995а. Влияние городской среды на формирование бриофлоры в г. Ростова-на-Дону. – [The influence of the urban environment on the forming of Rostov-on-Don bryoflora] В кн.: *Материалы III международной конференции "Экология города"*, Ростов н/Д. [In: *Materialy III mezhdunarodnoj konferencii "Ecologia goroda"*, Rostov-on-Don]: 48–51.
- [BABENKO, L.A.] БАБЕНКО Л.А. 1995б. Применение популяционного подхода к охране редких видов мохообразных степной зоны. – [Population approach to protection of rare bryophyte species in steppe zone] В кн.: *Матеріали науково-практичної конференції 12–15 червня 1995 р. "Проблеми становлення і функціонування новосотворених заповідників" "Тримайліа"* [In: *Materialy naukovo-praktichnoj konferencii "Problemy stanovlenn'a i funkcionuvann'a novosotvorenyh zapovidnyukiv"*]: 99.
- [BABENKO, L.O. & V.O. BOLYUKH] БАБЕНКО, Л.О., В.О. БОЛЮХ 1996. Рідкісні мохоподібні еколого-ценотичних комплексів Нижнього Дону та центральної частини Поділля. – [Rare mosses of Lower Don and Central Podolia] *Укр. бот. журн.* [Ukr. bot. zhurn.] **53**(1–2): 141–143.
- [BABENKO, L. A. & V. V. FEDYAEVA] БАБЕНКО, Л. А., В. В. ФЕДЯЕВА 2001. Биоразнообразие нижнего Дона: бриофлора. – [Biodiversity of Lower Don River: bryoflora] *Ростов-на-Дону, Ростовск. гос. ун-т* [Rostov-on-Don, Rostovsk. Gos. Univ.], 103 pp.
- [BACHURINA, G.F. & V.M. MELNICHUK] БАЧУРИНА, Г.Ф., В.М. МЕЛЬНИЧУК 1987. Флора мохів Української РСР. – [The moss flora of Ukrainian SR]. – Київ: Наук. думка [Kyiev, Nauk. dumka] **1**: 180 pp.
- [BACHURINA, G.F. & V.M. MELNICHUK] БАЧУРИНА, Г.Ф., В.М. МЕЛЬНИЧУК 1988. Флора мохів Української РСР. – [The moss flora of Ukrainian SR]. – Київ: Наук. думка [Kyiev, Nauk. dumka] **2**: 178 pp.
- [BACHURINA, A.F. & L.YA. PARTYKA] БАЧУРИНА, А.Ф., Л.Я. ПАРТЫКА 1979. Печеночники и мхи Украины и смежных территорий. Краткий определитель. – [Hepaticae and Musci of Ukraine and adjacent territories. Brief handbook] *Киев, Наук. думка* [Kyiev, Nauk. dumka]: 204 pp.
- [CZEREPAKOVA, L.A.] ЧЕРЕПАКОВА Л.А. 1971. Листостебельные мхи Саратовской области. – [Mosses of the Saratov Province] *Бот. журн.* [Bot. Zhurn.] **56**(12): 1827–1836.
- FEDOSOV, V.E. & E.A. IGNATOVA 2006. The genus *Pseudocrossidium* R.S. Williams (Pottiaceae, Musci) in Russia. – *Arctoa* **15**: 203–210.
- [IGNATOV, M.S. & E.A.IGNATOVA] ИГНАТОВ, М.С., Е.А. ИГНАТОВА 2003-2004. Флора мхов средней части Европейской России. Т. 1–2. – [Moss flora of the Middle European Russia. Vols. 1–2] *М., КМК* [Moscow, KMK]: 960 pp.
- [KHRUSTALEV, JU.P. & YU.P.SMAGINA] ХРУСТАЛЕВ, Ю.П., Ю.П. СМАГИНА 2002. Климат и агроклиматические условия. – [Climat and agroclimatical conditions] В кн.: *Природные условия и естественные ресурсы Ростовской области. Ростов-н/Д.: Изд-во Рост. ун-та* [In: *Prirodnye usloviya i estestvennye resursy Rostovskoy Oblasti. Rostov-on-Don*]: 90–119.
- [NOVOPROKROVSKIY, I.V.] НОВОПОКРОВСКИЙ И.В. 1925. Растительность Северо-Кавказского края. – [The vegetation of the North-Caucasian Territory] *Ростов-н/Д* [Rostov-on-Don]: 27.
- [NOVOPROKROVSKIY, I.V.] НОВОПОКРОВСКИЙ И.В. 1940. Растительность. – [Vegetation] В кн.: *Природа Ростовской области. Ростов-н/Д* [In: *Priroda Rostovskoi oblasti. Rostov-on-Don*]: 111–140.
- [POPOVA, N.N.] ПОПОВА Н.Н. 2002. Бриофлора Среднерусской возвышенности. I. – [Bryoflora of the Central Russian Upland. I] *Arctoa* **11**: 101–168.
- [SAVICZ, L.I. & K.I. LADYZHENSKAYA] САВИЧ Л.И., К.И. ЛАДЫЖЕНСКАЯ 1936. Определитель печеночных мхов Севера Европейской части СССР. – [Manual of Hepaticae from the North of European part of USSR] *М., Л.* [Moscow, Leningrad]: 309 pp.
- [SUKACHEV, V.N.] СУКАЧЕВ В.Н. 1903. Ботанико-географическое исследование в Донской области летом 1902 г. Предварительный отчет. – [Botanico-geographical investigations of the Don Province in the summer 1902. The preliminary report] *Труды С-Пб. Общества естествоиспытателей. С.–Пб.* [Trudy S-Pb Obschestva estestvoispytateley] **34**(1): 70–83.
- [SURAGINA, S.A., E.A. IGNATOVA, M.S. IGNATOV & V.I. ZOLOTOV] СУРАГИНА С.А., Е.А. ИГНАТОВА, М.С. ИГНАТОВ, В.И. ЗОЛОТОВ 2002. Материалы к флоре мхов Астраханской области (юг Европейской России). – [Materials to the bryoflora of the Astrakhan Province (south of the European Russia)] *Arctoa* **11**: 169–174.
- [VOLKOV, L.I.] ВОЛКОВ Л.И. 1940. Материалы к флоре Азовского моря. – [Contribution to flora of Azov] *Тр. Ростовск. обл. биол. общ-ва* [Trudy Rostovsk. Obl. Biol. Obshchestva] **4**: 114–137.
- [ZALESSKIY, K.M.] ЗАЛЕССКИЙ К.М. 1918. Залежная и пастбищная растительность Донской области. – [Fallow and pasture vegetation of Don Province] *Ростов н/Д* [Rostov-on-Don]: 84 pp.