



## **Annotated checklist of Basidiomycota new to Republic of Kazakhstan**

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### **Abstract**

Information on 87 species of macrofungi new to the Republic of Kazakhstan, identified as a result of field researches from 2009 to 2018, is given. Identification of species was based on macro- and micromorphological characteristics of basidiomes using literature for morphological identification, standard reagents and techniques.

**Key words** – Ile Alatau – Altay – Akkol – Burabay – mushroom – funga

### **Introduction**

The systematic study of Kazakhstan's fungi started at the beginning of the last century. The primary interest for scientists were phytopathogenic fungi important in the agriculture. Therefore, macrofungi were recorded only incidentally as secondary objects. The first study of macrofungal diversity was initiated only in 1970. Later these works resulted in a two-volume monograph by D.I. Samgina (1981, 1985), which comprised a list of macrofungi with full species descriptions. With the collapse of the Soviet Union, research of macrofungal diversity in Kazakhstan slowed down dramatically, and the main focus of the research were still plant pathogenic fungi. Nevertheless, over the past almost three decades, a number of papers and books have been published, which have substantially supplemented the knowledge on fungal diversity of the republic (Kazhieva 1982, 1983, 1986, Samgina 1982, 1983, Nam 1985a, b, 1989, 1990, 1996, 2003, 2007, Abdrakhmanov 1986, Byzova 1988, Samgina & Nam 1989, Nam & Sidorova 1996, Vasjagina 1996, Abiev et al. 2005, Nam et al. 2011, 2016, Rakhimova & Nam 2013, Abdildina et al. 2014, Rakhimova et al. 2014, 2016a, b, c, 2017). At the same time, it is still obvious that the existing list reflects only a part of the real diversity of Kazakhstan's macrofungi.

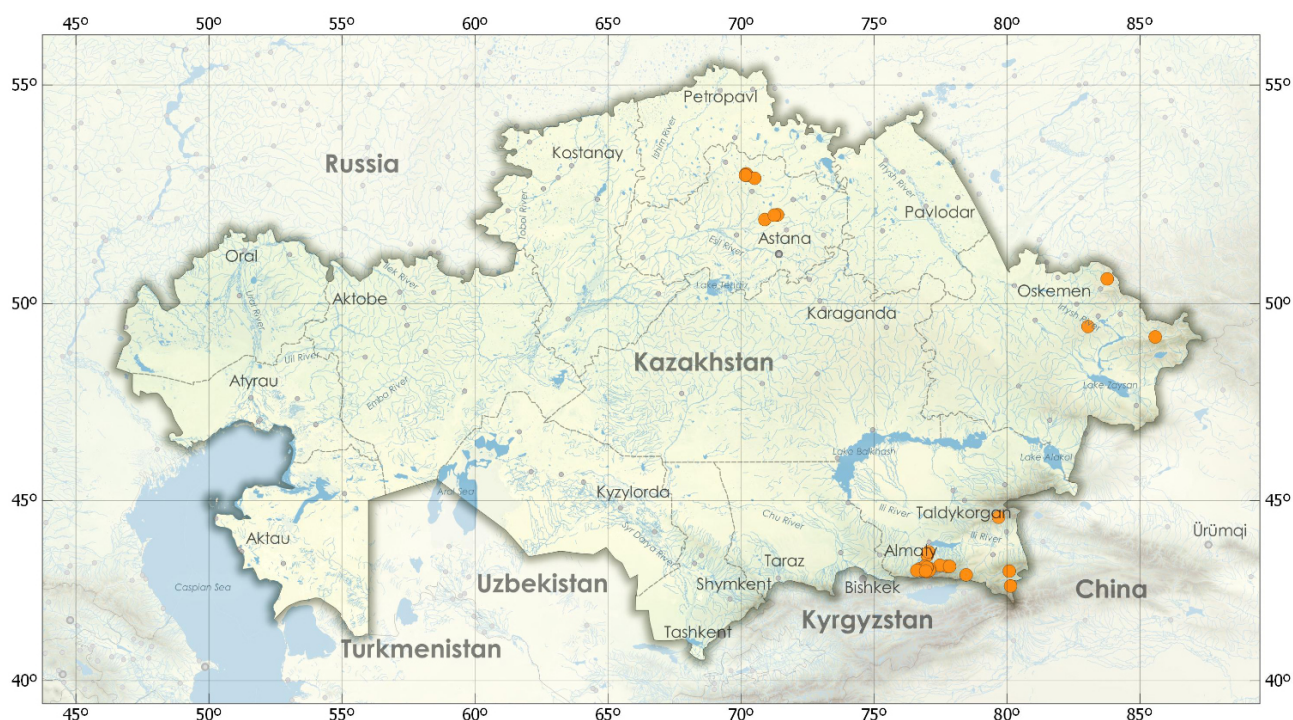
During my own research together with the help of collaborators, an extensive material was obtained. A large collection of fungal specimens and photos has been collected, among which there were identified species that were not previously registered in the republic. This annotated checklist includes 87 species of Basidiomycota new to Kazakhstan.

### **Materials & Methods**

The author's personal collections served as a basis for this paper, as well as findings and photos of fungi made by different people (the names are listed in the text) in the period from 2009 to 2018. The localities are shown on the map in Fig. 1. For all the recorded species, in situ photographs of their basidiomes, and for the greater part, fungarium specimens (63 species) or spore prints (8 species) are existed. Only the most characteristic species were identified based on

photographs. The species were identified by several important literature and web resources (Schaefer 1968, Samgina 1981, 1985, Nezdoiminogo 1996, Shaporova 2007, Knudsen & Vesterholt 2008, Li et al. 2013, Justo et al. 2014, Kuo 2015, Olariaga et al. 2017). Microscopic studies were conducted on fresh samples using a Celestron 44108 microscope with a USB camera and a set of chemical reagents (Sodium hydroxide 5% (w/v), Lugol's iodine, Melzer's reagent, Lactophenol Cotton Blue, Congo red, Methylene Blue and Fuchsin). Spore measurements were taken using the Piximetre program ver. 5.9 (Henriot 2017), 50–100 measurements for each species. Fungal specimens are deposited in the personal collection of the author.

The fungal nomenclature of most fungi based on MycoBank (Robert et al. 2005). Orders and families are arranged in the order of their phylogenetic position according to the Lifemap website based on the NCBI taxonomy (<http://lifemap.univ-lyon1.fr>). Inside the families and genera the species are arranged alphabetically. Data on the location, habitat and substrate of the species, as well as the date of collection, the names of collectors and fungarium numbers were provided.



**Fig. 1** – Dots designate collecting localities of macrofungal species new to Kazakhstan treated in this study.

## Results

An annotated list of species new to the Republic of Kazakhstan complemented with photos of their basidiomes (Figs 2-7), is provided below.

### *Cantharellales* Gäum.

#### *Cantharellaceae* J. Schröt.

1. *Cantharellus pallens* Pilát – Akmola Region, The Burabay NP, the vicinity of Shchuchinsky village, 53°0'39.1"N, 70°14'8.9"E, coniferous-deciduous forest, under the aspen (*Populus*), 15.08.2016, VA Fedorenko (FVA-016150816) (Fig. 2A).

2. *Craterellus cornucopioides* (L.) Pers. – Akmola Region: The Burabay NP, the vicinity of Shchuchinsky village, 53°1'45.1"N, 70°11'37.2"E, pine-birch forest (*Pinus*, *Betula*), near the swamps, 27.07.2016, TL Baranova (FVA-001270716); *ibid.*, 18.08.2016, VA Fedorenko (FVA-001180816) (Fig. 2B).

**3. *Craterellus lutescens*** (Fr.) Fr. – Akmola Region: The Burabay National Park (hereinafter abbreviated as “Burabay NP”), the vicinity of Shchuchinsky village, 53°0'30.9"N, 70°14'0.8"E, pine-birch forest (*Pinus, Betula*), 02.08.2016, TL Baranova (FVA-001020816); *ibid.*, among the grass, 15.08.2016 & 18.08.2016, VA Fedorenko (FVA-018150816) (Fig. 2C); *ibid.*, 53°0'38.3"N, 70°13'23.9"E, among the grass near the swamps, 27.07.2017, VA Fedorenko.

*Hymenochaetales* Oberw.

*Rickenellaceae* Vizzini

**4. *Rickenella fibula*** (Bull.) Raithelh. – Akmola Region: The Burabay NP, pine forest (*Pinus*), 20.10.2011, AA Fokina (Fig. 2D); *ibid.*, 28.09.2012, AA Fokina.

*Russulales* Kreisel ex P.M. Kirk, P.F. Cannon & J.C. David

*Russulaceae* Lotsy

**5. *Lactarius badiosanguineus*** Kühner & Romagn. – Almaty Region, Ile Alatau: Big Almaty gorge, spruce forest (*Picea*), 07.2003, IYu Styazhkin; Kazachka river, spruce forest (*Picea*), 27.09.2009, AA Fokina; Big Almaty gorge, spruce forest (*Picea*), 15.10.2009, IYu Styazhkin; Kazachka river, spruce forest (*Picea*), 01.07.2010, AA Fokina; *ibid.*, 43°7'39.1"N, 76°57'44"E, 07.08.2011, VA Fedorenko; Big Almaty Lake, 43°3'56.9"N, 76°58'54.7"E, spruce forest (*Picea*), 16.08.2013, VA Fedorenko; Big Almaty gorge, 43°5'4.3"N, 76°58'9"E, spruce forest (*Picea*), 06.07.2016, VA Fedorenko (FVA-018060716) (Fig. 2E); Big Almaty Lake, spruce forest (*Picea*), 17.08.2016, DN Kim.

**6. *Lactarius deterrimus*** Gröger – Almaty Region, Ile Alatau: Kimasar gorge, 43°9'45.7"N, 77°4'44.3"E, young spruce forest (*Picea*), 15.09.2009, VA Fedorenko; *ibid.*, 26.06.2010, IYu Styazhkin; Kazachka river, 04.05.2011, AA Fokina; Big Almaty Lake, 43°3'43.8"N, 76°59'19.1"E, spruce forest (*Picea*), 18.08.2011, VA Fedorenko; Kazachka river, 04.09.2011, AA Fokina; Kok Zhailau plateau, 43°7'27.1"N, 76°58'19.5"E, young spruce forest (*Picea*), 24.09.2011, VA Fedorenko (Fig. 2F); Kimasar gorge, young spruce forest (*Picea*), 22.09.2013, NV Gulieva; Big Almaty gorge, 43°4'59.2"N, 76°58'7.1"E, spruce forest (*Picea*), 26.07.2016, VA Fedorenko (FVA-012260716); Big Almaty Lake, 43°3'49.5"N, 76°58'43.8"E, spruce forest (*Picea*), 15.08.2018, VA Fedorenko (FVA-005150818). Almaty Region, Dzungarian Alatau: Borochudzir plateau, under the spruce, 16.06.2011, AV Kovalenko.

**7. *Lactarius pilatii*** Z. Schaef. – Akmola Region, The Burabay NP, about 2 km to east from the Shchuchinsky village, 53°0'38.3"N, 70°13'23.9"E, birch-pine forest (*Betula, Pinus*), near the swamps, on bumps, 24.07.2017, VA Fedorenko (FVA-005240717) (Fig. 2G).

**8. *Lactarius tabidus*** Fr. – Akmola Region, The Burabay NP, the vicinity of Shchuchinsky village, 53°1'30"N, 70°11'43.7"E, pine-birch forest (*Pinus, Betula*), on the forest floor, 20 & 21.07.2017, VA Fedorenko (FVA-007200717) (Fig. 2H).

**9. *Russula acrifolia*** Romagn. – Akmola Region: The Burabay NP, the vicinity of Shchuchinsky village, 53°1'1.7"N, 70°12'56.3"E, pine-birch forest (*Pinus, Betula*), 23.07.2017, VA Fedorenko (FVA-001230717); the Burabay NP, about 2 km to East from the Shchuchinsky village, 53°0'22"N, 70°13'17.4"E, pine-birch forest (*Pinus, Betula*), 27.07.2017, VA Fedorenko (FVA-012270717) (Fig. 2I); vicinity of Akkol town, 52°8'13"N, 70°56'27.6"E, pine-birch forest (*Pinus, Betula*), 25.07.2018, AM Dolganov.

**10. *Russula atrorubens*** Quéf. – Akmola Region: The Burabay NP, the vicinity of Svetloe lake, 53°1'48.3"N, 70°11'49.9"E, pine-birch forest (*Pinus, Betula*), on moss in the swamps, 18.08.2016, VA Fedorenko (FVA-010180816) (Fig. 2J); *ibid.*, 25.07.2017, VA Fedorenko (FVA-001250717).

**11. *Russula aurantioflammans*** Ruots., Sarnari & Vauras – Almaty Region, Ile Alatau, the vicinity of Issyk Lake, 43°14'52.5"N, 77°28'37"E, birch-spruce grove (*Betula, Picea*), 08. & 15.08.2018, VA Fedorenko (FVA-005080818) (Fig. 2K).

**12. *Russula aurea* Pers.** – Akmola Region: The Burabay NP, the vicinity of Shchuchinsky village, 53°0'36.7"N, 70°12'18.5"E, pine forest (*Pinus*), on the forest floor, 15.08.2016, VA Fedorenko (FVA-003140816); *ibid.*, everywhere in small numbers in pine-birch forest (*Pinus*, *Betula*), 22–29.07.2017, VA Fedorenko (FVA-006260717) (Fig. 2L).



**Fig. 2** – A *Cantharellus pallens*. B *Craterellus cornucopioides*. C *C. lutescens*. D *Rickenella fibula*. E *Lactarius badiusanguineus*. F *L. deterrimus*. G *L. pilatii*. H *L. tabidus*. I *Russula acrifolia*. J *R. atrorubens*. K *R. aurantioflammans*. L *R. aurea*. M *R. chloroides*. N *R. medullata*. O *R. nauseosa*. A–C, E–O: Photo credit to Vassiliy Fedorenko. D: Photo credit to Antonina Fokina.

**13. *Russula chloroides* (Krombh.) Bres.** – Akmola Region: vicinity of Akkol town, pine forest (*Pinus*), 11.07.2015, AM Dolganov; *ibid.*, 16.08.2015, AM Dolganov; *ibid.*, 26.09.2015, AM Dolganov; vicinity of Azat village, 53°5'59.2"N, 71°22'3.6"E, pine-birch forest (*Pinus*, *Betula*), 03.09.2013, VA Fedorenko; The Burabay NP, the vicinity of Shchuchinsky village, 53°0'47.9"N,

70°12'35.5"E, pine-birch forest (*Pinus, Betula*), under the pines, 23–29.07.2017, VA Fedorenko (FVA-003230717) (Fig. 2M); vicinity of Akkol town, pine-birch forest (*Pinus, Betula*), 02.08.2018, AM Dolganov; vicinity of Kenes village, 52°40.7"N, 71°15'33.8"E, pine-birch forest (*Pinus, Betula*), 13.08.2018, AM Dolganov.

**14. *Russula medullata*** Romagn. – Akmola Region: The Burabay NP, the vicinity of Shchuchinsky village, 53°0'59"N, 70°11'41.6"E, pine forest (*Pinus*), 04.09.2013, VA Fedorenko; *ibid.*, 53°1'22.9"N, 70°11'59.7"E, pine-birch forest (*Pinus, Betula*), 14–18.08.2016, VA Fedorenko (FVA-009180816); The Burabay NP, the vicinity of Svetloe lake, 53°1'49"N, 70°11'44.4"E, pine-birch forest (*Pinus, Betula*), 22–29.07.2017, VA Fedorenko (FVA-004220717) (Fig. 2N).

**15. *Russula nauseosa*** (Pers.) Fr. – Almaty Region: Ile Alatau, Big Almaty Lake, 43°3'58.1"N, 76°58'53.3"E, spruce forest (*Picea*), 22.07.2011, VA Fedorenko; *ibid.*, 18.08.2011, VA Fedorenko; *ibid.*, 16.07.2016, VA Fedorenko; *ibid.*, 02.08.2016, VA Fedorenko (Fig. 2O); the vicinity of Issyk Lake, 43°14'53.8"N, 77°28'32.6"E, birch-spruce grove (*Betula, Picea*), 08.08.2018, VA Fedorenko (FVA-007080818); Big Almaty Lake, 43°3'48.3"N, 76°58'44.9"E, spruce forest (*Picea*), 15.08.2018, VA Fedorenko (FVA-005150818).

**16. *Russula nitida*** (Pers.) Fr. – Akmola Region, The Burabay NP, the vicinity of Shchuchinsky village, 53°1'8.7"N, 70°11'56.3"E, birch-pine forest (*Betula, Pinus*), among the grass, 20.07.2017, VA Fedorenko (FVA-003200717) (Fig. 3A).

**17. *Russula olivina*** Ruots. & Vauras – Almaty Region: Ile Alatau, Big Almaty gorge, spruce forest (*Picea*), 13.07.2009, IYu Styazhkin; eastern part of Ile Alatau, spruce forest (*Picea*), 26.06.2010, IYu Styazhkin; Ile Alatau, Gorelnik gorge, 43°7'24"N, 77°3'8.7"E, spruce forest (*Picea*), 17.08.2010, VA Fedorenko; Ile Alatau, Big Almaty gorge, 43°4'26"N, 76°58'58.6"E, spruce forest (*Picea*), 16.07.2011, VA Fedorenko; Ile Alatau, Big Almaty Lake, 43°3'46.1"N, 76°59'20.2"E, spruce forest (*Picea*), 22.07.2011 & 13.08.2011, VA Fedorenko; Ile Alatau, Assy Plateau, 43°13'6.4"N, 77°50'29.5"E, spruce forest (*Picea*), 27.08.2011, AA Fokina; Ile Alatau, Big Almaty Lake, 43°3'56.6"N, 76°58'56.1"E, spruce forest (*Picea*), 16.08.2013, VA Fedorenko; *ibid.*, 16.07.2016, VA Fedorenko; *ibid.*, 18.08.2017, VA Fedorenko (FVA-003180817); Big Almaty Lake, 43°3'48.9"N, 76°58'42.3"E, spruce forest (*Picea*), 15.08.2018, VA Fedorenko (FVA-007150818) (Fig. 3B).

**18. *Russula puellaris*** Fr. – Akmola Region, The Burabay NP, the vicinity of Shchuchinsky village, 53°0'40.3"N, 70°12'24.8"E, pine-birch forest (*Pinus, Betula*), on the creek among the grass, 26.07.2017, VA Fedorenko (FVA-005260717) (Fig. 3C).

**19. *Russula sanguinea*** (Bull.) Fr. – Akmola Region: The Burabay NP, the vicinity of Shchuchinsky village, 53°1'6.1"N, 70°12'0.1"E, pine-birch forest (*Pinus, Betula*), among the grass, 20.07.2017, VA Fedorenko (FVA-002200717); about 2 km to East from the Shchuchinsky village, 53°0'12.36"N, 70°13'27.5"E, pine-birch forest (*Pinus, Betula*), on the forest floor, 27.07.2017, VA Fedorenko (FVA-007270717) (Fig. 3D).

**20. *Russula sichuanensis*** G.J. Li & H.A. Wen – Almaty Region: Ile Alatau, Big Almaty gorge, 08.2009, IYu Styazhkin; Ile Alatau, Big Almaty Lake, 43°3'43.5"N, 76°59'6"E, spruce forest (*Picea*), 18.08.2011 & 25.08.2011, VA Fedorenko; *ibid.*, 16.08.2013, VA Fedorenko (Fig. 3E); *ibid.*, 02.08.2016, VA Fedorenko (FVA-015020816); the vicinity of Issyk Lake, 43°14'55.9"N, 77°28'30.7"E, spruce forest (*Picea*), 08.08.2018, VA Fedorenko; Big Almaty Lake, 43°3'57.5"N, 76°58'56.1"E, spruce forest (*Picea*), 15.08.2018, VA Fedorenko.

#### *Auriscalpiaceae* Maas Geest.

**21. *Lentinellus flabelliformis*** (Bolton) S. Ito – Akmola Region, The Burabay NP, the vicinity of Shchuchinsky village, 53°1'4.3"N, 70°12'0.8"E, birch-pine forest (*Betula, Pinus*), on dead birch branches, 20.07.2017, VA Fedorenko (FVA-004200717) (Fig. 3F).

#### *Agaricales* Underw.

#### *Agaricaceae* Chevall.

22. *Lepiota subincarnata* J.E. Lange – Almaty city, Almaty Botanical Garden, 43°13'19.9"N, 76°55'2.2"E, under the spruce (*Picea*), 12.10.2009, VA Fedorenko (Fig. 3G).



**Fig. 3** – A *Russula nitida*. B *R. olivina*. C *R. puellaris*. D *R. sanguinea*. E *R. sichuanensis*. F *Lentinellus flabelliformis*. G *Lepiota subincarnata*. H *Chromosera cyanophylla*. I *Laccaria bicolor*. J *Lepista sordida*. K *Leucopaxillus lepistoides*. L *Pseudoclitopilus rhodoleucus*. M *Ripartites tricholoma*. N *Tricholoma arvernense*. O *T. frondosae*. A-G, J, L, N: Photo credit to Vassiliy Fedorenko. H-I: Photo credit to Antonina Fokina. K, O: Photo credit to Alexander Dolganov. M: Photo credit to Igor Styazhkin.

*Tricholomataceae* Lotsy

23. *Chromosera cyanophylla* (Fr.) Redhead, Ammirati & Norvell – Almaty Region, Ile Alatau, Kazachka river, 43°1'45.1"N, 76°57'26.9"E, on the stump, 01.07.2010, AA Fokina (Fig. 3H).

24. *Laccaria bicolor* (Maire) P.D. Orton – Akmola Region, The Burabay NP, pine forest (*Pinus*), 06.08.2011, AA Fokina (Fig. 3I).



**Fig. 4** – A *Tricholoma fulvum*. B *T. imbricatum*. C *T. sculpturatum*. D *Cortinarius bivelus*. E *C. croceus*. F *C. fulvo-ochrascens*. G *C. glaucopus*. H *C. hemitrichus*. I *C. illuminus*. J *C. venetus*. K *C. percomis*. L *C. saturninus*. M *C. solis-occasus*. N *C. stillatitius*. O *C. transiens*. The author of the photos A-C, E-G, I-O: Photo credit to Vassiliy Fedorenko. H: Photo credit to Antonina Fokina. D: Photo credit to Alexander Dolganov.

25. *Lepista sordida* (Schumach.) Singer – Almaty Region, near «Rassvet» summer cottages, 17 km to north from Almaty city, 43°31'24.9"N, 77°0'7"E, forest belt along the highway, under poplars (*Populus*), 28.10.2010, VA Fedorenko (Fig. 3J).

26. *Leucopaxillus lepistoides* (Maire) Singer – Almaty Region: Terskey Alatau, 50 km from the Narynkol village, 2000 m above sea level, in a meadow, 17.06.2010, IYu Styazhkin; Ile Alatau,

Chinturgen Gorge, in a meadow, 01.07.2010, IYu Styazhkin. Akmola Region: vicinity of Kenes village, 52°2'10.1"N, 71°14'44.8"E, 24.05.2015, AM Dolganov (Fig. 3K).

**27. *Pseudoclitopilus rhodoleucus*** (Sacc.) Vizzini & Contu – Almaty Region, Ile Alatau: Kazachka river, spruce forest (*Picea*), 13.06.2010, AA Fokina; Big Almaty gorge, 43°5'34.1"N, 76°57'20.3"E, spruce forest (*Picea*), on the forest floor, 06.07.2016, VA Fedorenko (FVA-010060716) (Fig. 3L). Almaty Region, Kungey Alatau: Lake Kaindy, 42°59'19.7"N, 78°27'18.8"E, spruce forest (*Picea*), 03.07.2011, VA Fedorenko.

**28. *Ripartites tricholoma*** (Alb. & Schwein.) P. Karst. – Almaty Region, East of the Ile Alatau, 2700 m above sea level, spruce forest (*Picea*), 26.06.2010, IYu Styazhkin (Fig. 3M).

**29. *Tricholoma arvernense*** Bon – Akmola Region, The Burabay NP, pine forest (*Pinus*), 52°59'39.3"N, 70°9'42.3"E, on dry gravelly slope on forest floor, 18.08.2016, VA Fedorenko (FVA-002180816) (Fig. 3N).

**30. *Tricholoma frondosae*** Kalamees & Shchukin – Akmola Region, vicinity of Akkol town, 52°1'15.6"N, 70°55'16.7"E, mixed forest (with *Betula*), 02.08.2016, AM Dolganov (Fig. 3O).

**31. *Tricholoma fulvum*** (DC.) Bigeard & H. Guill. – Akmola Region: vicinity of Azat village, 53°5'59.2"N, 71°22'3.6"E, birch forest (*Betula*), 03.09.2013, VA Fedorenko (Fig. 4A); vicinity of Akkol town, 51°11'18.3"N, 71°44'34.2"E, 01.08.2014, AM Dolganov.

**32. *Tricholoma imbricatum*** (Fr.) P. Kumm. – Akmola Region: The Burabay NP, the vicinity of Shchuchinsky village, pine forest (*Pinus*), 06.08.2011, AA Fokina; *ibid.*, 28.07.2016, TL Baranova; *ibid.*, 52°59'57.2"N, 70°13'11.3"E, pine-birch forest (*Pinus, Betula*), 17.08.2016, VA Fedorenko (FVA-001170816) (Fig. 4B); vicinity of Kenes village, 52°5'32"N, 71°15'9.1"E, pine-birch forest (*Pinus, Betula*), 10.09.2018, AM Dolganov. East Kazakhstan Region: Nizhnie Tainty lake, pine-birch forest (*Pinus, Betula*), 21.08.2013, NV Gulieva.

**33. *Tricholoma scalpturatum*** (Fr.) Quéf. – Almaty Region, Ile Alatau: Aksay Gorge, 43°8'44.6"N, 76°47'56.5"E, in a deciduous grove by the river, 24.09.2009, VA Fedorenko (Fig. 4C); Issyk Lake, 43°14'51.2"N, 77°28'36.9"E, birch forest (*Betula*), 02.06.2012, VA Fedorenko. Akmola Region: vicinity of Astana city, 51°6'43.2"N, 71°16'4.7"E, 05.07.2016, AM Dolganov.

#### *Cortinariaceae* R. Heim ex Pouzar

**34. *Cortinarius bivelus*** (Fr.) Fr. – Akmola Region: The Burabay NP, pine-birch forest (*Pinus, Betula*), 31.07.2016, TL Baranova; *ibid.*, 53°0'9.4"N, 70°9'58.6"E, 16.08.2016, VA Fedorenko (FVA-003160816); *ibid.*, vicinity of Astana city, 51°11'18.3"N, 71°44'34.2"E, 03.08.2016, AM Dolganov (Fig. 4D).

**35. *Cortinarius croceus*** (Schaeff.) Gray – Akmola Region: The Burabay NP, the vicinity of Shchuchinsky village, 53°1'1.6"N, 70°11'35.2"E, pine-birch forest (*Pinus, Betula*), 04.09.2013, VA Fedorenko; *ibid.*, 53°0'46.7"N, 70°12'32.3"E, pine-birch forest (*Pinus, Betula*), on the forest floor under the pines, 21–23.07.2017, VA Fedorenko (FVA-003210717) (Fig. 4E).

**36. *Cortinarius fulvo-ochrascens*** Rob. Henry – Almaty Region: Ile Alatau, Big Almaty Lake, 43°3'56.7"N, 76°58'58.7"E, spruce forest (*Picea*), 25.08.2011, VA Fedorenko; *ibid.*, 05.08.2015, VA Fedorenko (Fig. 4F); *ibid.*, 26.07.2016, VA Fedorenko (FVA-004260716); *ibid.*, 02.08.2016, VA Fedorenko; *ibid.*, 15.08.2018, VA Fedorenko (FVA-009150818).

**37. *Cortinarius glaucopus*** (Schaeff.) Gray – Almaty Region, Ile Alatau: Kazachka river, 43°7'45.4"N, 76°57'25.8"E, 07.08.2011, VA Fedorenko; *ibid.*, 14.09.2015, VA Fedorenko; Big Almaty Lake, 43°2'48.1"N, 76°58'48.9"E, spruce forest (*Picea*), 25.09.2015, VA Fedorenko; Big Almaty Lake, 43°3'49.6"N, 76°58'42.9"E, spruce forest (*Picea*), 26.07.2016, VA Fedorenko (FVA-005260716); *ibid.*, 15.08.2018, VA Fedorenko (Fig. 4G).

**38. *Cortinarius hemitrichus*** (Pers.) Fr. – Akmola Region, The Burabay NP, pine-birch forest (*Pinus, Betula*), 06.08.2011, AA Fokina (Fig. 4H).

**39. *Cortinarius illuminus*** Fr. – Almaty Region: Ile Alatau, Big Almaty Lake, 43°3'48"N, 76°58'48.4"E, spruce forest (*Picea*), 16.08.2013, VA Fedorenko (Fig. 4I); *ibid.*, 05.08.2016, VA Fedorenko (FVA-002050816).



40. *Cortinarius venetus* (Fr.) Fr. – Almaty Region, Ile Alatau, Big Almaty Lake, 43°3'49.3"N, 76°58'48.8"E, spruce forest (*Picea*), 05.08.2016, VA Fedorenko (FVA-001050816) (Fig. 4J).



**Fig. 5** – A *Cortinarius vibratilis*. B *Pluteus leoninus*. C *P. petasatus*. D *P. rangifer*. E *P. romellii*. F *P. umbrosus*. G *P. variabilicolor*. H *Gymnopilus junonius*. I *G. luteofolius*. J *Pholiota squarrosoides*. K *Amanita battarrae*. L *A. crocea*. M *Limacella delicata*. N *L. illinita*. O *Hygrocybe acutoconica*. A, C–H, J–K, N–O: Photo credit to Vassiliy Fedorenko. B, I, M: Photo credit to Alexander Dolganov. L: Photo credit to Natalia Gulieva.

41. *Cortinarius percomis* Fr. – Almaty Region, Ile Alatau: Gorelnik gorge, 43°7'24"N, 77°3'8.7"E, spruce forest (*Picea*), 17.08.2010, VA Fedorenko; Big Almaty Lake, 43°3'49"N, 76°58'47.2"E, spruce forest (*Picea*), 05.08.2015, VA Fedorenko (Fig. 4K); *ibid.*, 26.07.2016, VA Fedorenko (FVA-007260716); *ibid.*, 02 & 28.08.2016, VA Fedorenko (FVA-003020816).

**42. *Cortinarius saturninus*** (Fr.) Fr. – Almaty Region, Ile Alatau, Aksay Gorge, 43°7'8.4"N, 76°47'49.3"E, deciduous belt, by the river under poplars (*Populus*), 16.10.2016, VA Fedorenko (FVA-001161016) (Fig. 4L).

**43. *Cortinarius solis-occasus*** Melot – Almaty Region, Ile Alatau: Big Almaty Lake, 43°3'48.9"N, 76°58'48.8"E, spruce forest (*Picea*), 12.08.2015, VA Fedorenko; *ibid.*, 30.06.2016, VA Fedorenko; *ibid.*, 16.07.2016, VA Fedorenko (FVA-008160716); *ibid.*, 26.07.2016, VA Fedorenko (FVA-008260716) (Fig. 4M).

**44. *Cortinarius stillatitius*** Fr. – Akmola Region, The Burabay NP, the vicinity of Svetloe lake, 53°1'31.5"N, 70°11'58.3"E, pine-birch forest (*Pinus*, *Betula*), on the ground in the moss, 25.07.2017, VA Fedorenko (FVA-005250717) (Fig. 4N).

**45. *Cortinarius transiens*** (Melot) Soop – Almaty Region, Ile Alatau: Assy Plateau, spruce forest (*Picea*), in the moss, 17.07.2011, AA Fokina; Big Almaty Lake, 43°3'57.4"N, 76°58'56.5"E, 16.08.2013, VA Fedorenko; *ibid.*, 17.07.2015, VA Fedorenko; *ibid.*, 16.07.2016, VA Fedorenko (FVA-009160716) (Fig. 4O); *ibid.*, 02.08.2016, VA Fedorenko.

**46. *Cortinarius vibratilis*** (Fr.) Fr. – Almaty Region, Ile Alatau: Assy Plateau, 43°13'18.1"N, 77°49'29.4"E, spruce forest (*Picea*), in the moss, 27.08.2011, VA Fedorenko; Big Almaty Lake, 43°3'49.7"N, 76°58'41.4"E, spruce forest (*Picea*), 02.08.2016, VA Fedorenko (FVA-007020816) (Fig. 5A).

#### ***Pluteaceae*** Kotl. & Pouzar

**47. *Pluteus leoninus*** (Schaeff.) P. Kumm. – Akmola Region: vicinity of Akkol town, on the remains of dead wood, 26.07.2014, AM Dolganov; vicinity of Astana city, 51°11'18.3"N, 71°44'34.2"E, 04.08.2016, AM Dolganov (Fig. 5B).

**48. *Pluteus petasatus*** (Fr.) Gillet – Akmola Region: vicinity of Akkol town, 52°8'7"N, 70°56'38.7"E, on a birch log (*Betula*), 09.08.2013, AM Dolganov; The Burabay NP, the vicinity of Svetloe lake, 53°1'28.9"N, 70°11'56.3"E, birch-pine forest (*Betula*, *Pinus*), on a birch log (*Betula*), 21.07.2017, VA Fedorenko; *ibid.*, on wood remains in the soil, 22.07.2017, VA Fedorenko (FVA-001220717) (Fig. 5C).

**49. *Pluteus rangifer*** Justo, E.F. Malysheva & Bulyonk. – Akmola Region, The Burabay NP, the vicinity of Svetloe lake, 53°1'39"N, 70°11'52.9"E, birch-pine forest (*Betula*, *Pinus*), on a birch log (*Betula*), 25.07.2017, VA Fedorenko (FVA-002250717) (Fig. 5D).

**50. *Pluteus romellii*** (Britzelm.) Sacc. – Almaty Region, Ile Alatau, Kazachka river, 43°7'42.7"N, 76°57'46.6"E, on the stump, 07.08.2011, VA Fedorenko. Akmola Region, The Burabay NP, the vicinity of Svetloe lake, 53°1'31.3"N, 70°11'58.5"E, birch-pine forest (*Betula*, *Pinus*), on a birch log (*Betula*), 22.07.2017, VA Fedorenko (FVA-002220717) (Fig. 5E).

**51. *Pluteus umbrosus*** (Pers.) P. Kumm. – Akmola Region, The Burabay NP, the vicinity of Shchuchinsky village, 53°0'42.9"N, 70°12'28"E, birch-pine forest (*Betula*, *Pinus*), on a birch log (*Betula*), 29.07.2017, VA Fedorenko (FVA-005290717) (Fig. 5F).

**52. *Pluteus variabilicolor*** Babos – Akmola Region, The Burabay NP, the vicinity of Svetloe lake, 53°1'30.3"N, 70°12'0.4"E, birch-pine forest (*Betula*, *Pinus*), on a birch log (*Betula*), 25.07.2017, VA Fedorenko (FVA-003250717) (Fig. 5G).

#### ***Strophariaceae*** Singer & A.H. Sm.

**53. *Gymnopilus junonius*** (Fr.) P.D. Orton – Akmola Region: The Burabay NP, the vicinity of Shchuchinsky village, 53°1'10"N, 70°12'1.9"E, birch-pine forest (*Betula*, *Pinus*), on a birch log (*Betula*), 21.07.2017, VA Fedorenko (Fig. 5H); *ibid.*, 53°1'48.4"N, 70°12'36.3"E, birch-pine forest (*Betula*, *Pinus*), at the base of a living birch (*Betula*), 29.07.2017, VA Fedorenko (FVA-006290717).

**54. *Gymnopilus luteofolius*** (Peck) Singer – Akmola Region, vicinity of Akkol town, 52°7'30.7"N, 70°56'11.7"E, on a dead birch log (*Betula*), 23.07.2017, AM Dolganov (Fig. 5I).

**55. *Pholiota squarrosoides*** (Peck) Sacc. – Akmola Region, The Burabay NP, the vicinity of Svetloe lake, 53°2'19.3"N, 70°11'42.6"E, birch-pine forest (*Betula*, *Pinus*), on a birch log (*Betula*), 28.07.2017, VA Fedorenko (FVA-010280717) (Fig. 5J).



**Fig. 6** – A *Hygrophorus discoideus*. B *Entoloma vernalis*. C *Gymnopus ocior*. D *Rhodocollybia maculata*. E *Pleurotus dryinus*. F *P. pulmonarius*. G *Inocybe lanuginosa*. H *I. leucoblema*. I *Strobilurus stephanocystis*. J *Calocybe chrysenteron*. K *Hypsizygos ulmarius*. L *Lyophyllum macrosporum*. M *Mycena galopus*. N *M. haematopus*. O *M. pterigena*. A–C, F–H, J–M, O: Photo credit to Vassiliy Fedorenko. D: Photo credit to Tatiana Baranova. E: Photo credit to Vladimir Kazenas. I, N: Photo credit to Alexander Dolganov.

**Amanitaceae** E.-J. Gilbert

**56. *Amanita battarrae*** (Boud.) Bon – Akmola Region: The Burabay NP: the vicinity of Shchuchinsky village, 53°1'8.5"N, 70°11'47.1"E, pine-birch forest (*Pinus*, *Betula*), 06.08.2011, AA

Fokina; *ibid.*, 04.09.2013, VA Fedorenko (Fig. 5K); *ibid.*, 53°1'47.6"N, 70°12'31.3"E, pine-birch forest (*Pinus, Betula*), on the forest floor, 29.07.2017, VA Fedorenko (FVA-004290717).

**57. *Amanita crocea*** (Quél.) Singer – East Kazakhstan Region: Nizhnie Tainty lake, pine-birch forest (*Pinus, Betula*), 21.08.2013, NV Gulieva; *ibid.*, Lake Markakol, 18.08.2013, NV Gulieva (Fig. 5L).

**58. *Limacella delicata*** (Fr.) H.V. Sm. – Akmola Region, vicinity of Akkol town, 52°8'15.3"N, 70°56'27.8"E, birch forest (*Betula*), 28.07.2016, AM Dolganov (Fig. 5M).

**59. *Limacella illinita*** (Fr.) Maire – Akmola Region: vicinity of Akkol town, 52°6'33.8"N, 70°53'59.4"E, pine-birch forest (*Pinus, Betula*), 04.08.2016, AM Dolganov; The Burabay NP, 53°0'38.3"N, 70°13'15.7"E, pine-birch forest (*Pinus, Betula*), on the forest floor, 22–25.07.2017, VA Fedorenko (FVA-002210717) (Fig. 5N). East Kazakhstan Region: Nizhnie Tainty lake, pine-birch forest (*Pinus, Betula*), 11.07.2012, NV Gulieva; *ibid.*, 10.08.2014, NV Gulieva.

### *Hygrophoraceae* Lotsy

**60. *Hygrocybe acutoconica*** (Clem.) Singer – Almaty Region, Ile Alatau: Kazachka river, mixed forest, 05.06.2010, AA Fokina; the vicinity of Issyk Lake, 43°14'50.1"N, 77°28'36.1"E, birch-spruce grove (*Betula, Picea*), 08.08.2018, VA Fedorenko (FVA-003080818) (Fig. 5O).

**61. *Hygrophorus discoideus*** (Pers.) Fr. – Almaty Region, Ile Alatau, Big Almaty lake, 43°3'47.5"N, 76°58'46.6"E, spruce forest (*Picea*), on the ground, 15.08.2018, VA Fedorenko (FVA-002150818) (Fig. 6A).

### *Entolomataceae* Kotl. & Pouzar

**62. *Entoloma vernum*** S. Lundell – Almaty Region, Ile Alatau: Kazachka river, among the grass, 10.05.2010, AA Fokina; *ibid.*, 43°7'45.2"N, 76°57'28.1"E, spruce forest (*Picea*), 09.05.2011, VA Fedorenko (Fig. 6B); Big Almaty lake, 43°3'56.8"N, 76°58'47.1"E, spruce forest (*Picea*), on the ground, 13 & 23.06.2017, VA Fedorenko (FVA-002130617).

### *Omphalotaceae* Bresinsky

**63. *Gymnopus ocior*** (Pers.) Antonín & Noordel. – Akmola Region, The Burabay NP, the vicinity of Svetloe lake, 43°1'32.2"N, 70°11'53.7"E, birch-pine forest (*Betula, Pinus*), on the forest floor, 22.07.2017, VA Fedorenko (FVA-003220717) (Fig. 6C).

**64. *Rhodocollybia maculata*** (Alb. & Schwein.) Singer – Akmola Region, The Burabay NP, pine forest (*Pinus*), 30.07.2016, TL Baranova (Fig. 6D).

### *Pleurotaceae* Kühner

**65. *Pleurotus dryinus*** (Pers.) P. Kumm. – Almaty Region, Ile Alatau: Kyrgauyldy gorge, on the trunk of live spruce (*Picea schrenkiana*), 29.08.2004, VG Epiktetov; Kazachka river, on the trunk of a spruce (*Picea*), 22.09.2010, AA Fokina; Small Almaty Gorge, near the Butakovka bus stop, on a spruce log (*Picea*), 04.05.2015, VL Kazenas (Fig. 6E).

**66. *Pleurotus pulmonarius*** (Fr.) Quél. – Akmola Region: The Burabay NP, the vicinity of Svetloe lake, 53°1'28.6"N, 70°11'51.9"E, birch-pine forest (*Betula, Pinus*), on the trunk of a birch, 16.08.2016, VA Fedorenko (FVA-001160816); *ibid.*, 53°2'13.1"N, 70°11'38.4"E, mixed forest, on the dead trunk of aspen (*Populus*), 28.07.2017, VA Fedorenko (FVA-009280717) (Fig. 6F).

### *Inocybaceae* Jülich

**67. *Inocybe lanuginosa*** (Bull.) P. Kumm. – Akmola Region, The Burabay NP, the vicinity of Shchuchinsky village, 53°0'39.4"N, 70°12'24.9"E, birch-pine forest (*Betula, Pinus*), on stumps and wood remains in soil, 26.07.2017, VA Fedorenko (FVA-007260717) (Fig. 6G).

**68. *Inocybe leucoblema*** Kühner – Almaty Region, Ile Alatau: Big Almaty Lake, 43°3'48"N, 76°58'58.2"E, spruce forest (*Picea*), on the forest floor, 30.06.2016, VA Fedorenko (Fig. 6H); *ibid.*, 02.07.2017, VA Fedorenko (FVA-001020717).

**Physalacriaceae** Corner

**69. *Strobilurus stephanocystis*** (Kühner & Romagn. ex Hora) Singer – Almaty Region: Ile Alatau, Kamenskoe Plateau, pine plantations (*Pinus*), 09.05.2013, DN Kim; Ile Alatau, Kazachka river, 43°7'42.4"N, 76°57'31.3"E, pine plantations (*Pinus*), on the forest floor, 13.05.2017, VA Fedorenko (FVA-003130517). Akmola Region: vicinity of Akkol town, 52°0'54.6"N, 70°53'53.9"E, pine forest (*Pinus*), on the forest floor, 28.04.2014, AM Dolganov (FVA-004280417); the vicinity of Kenes village, pine forest (*Pinus*), on the forest floor, 22.04.2017 & 28.04.2017, AM Dolganov (Fig. 6I).



**Fig. 7** – A *Mycena viridimarginata*. B *Phloeomana alba*. C *Boletus reticulatus*. D *Chamonixia caespitosa*. E *Leccinum albstipitatum*. F *L. holopus*. G *L. vulpinum*. H *Neoboletus luridiformis*. I *Suillellus luridus*. J *Xerocomellus ripariellus*. K *Xerocomus ferrugineus*. L *Gomphidius roseus*. A–D, F, G, K, L: Photo credit to Vassiliy Fedorenko. E, J: Photo credit to Alexander Dolganov. H: Photo credit to Igor Styazhkin. I: Photo credit to Natalia Gulieva.

**Lyophyllaceae** Jülich

**70. *Calocybe chrysenteron*** (Bull.) Singer – Almaty Region, Ile Alatau: Kazachka river, 43°7'45"N, 76°57'27.1"E, spruce forest (*Picea*), on the forest floor, 06.07.2016, VA Fedorenko (FVA-015060716) (Fig. 6J).

**71. *Hypsizygus ulmarius*** (Bull.) Redhead – Akmola Region, the vicinity of Zhukey lake, 52°56'7.4"N, 70°30'44.9"E, birch forest (*Betula*), at the base of a living birch, 05.09.2013, VA Fedorenko (Fig. 6K).

**72. *Lyophyllum macrosporum*** Singer – Almaty Region, Ile Alatau: Kazachka river, spruce forest (*Picea*), on the ground, 12.06.2010, AA Fokina; Big Almaty gorge, 1300 m above sea level, spruce forest (*Picea*), on the forest floor, 28.06.2010, IYU Styazhkin; Kazachka river, spruce forest (*Picea*), on the forest floor, 24.07.2010, AA Fokina; *ibid.*, 19.08.2010, AA Fokina; *ibid.*, spruce forest (*Picea*), on the forest floor, 15.09.2010, AA Fokina; Big Almaty gorge, 43°5'2.7"N, 76°58'5.4"E, spruce forest (*Picea*), on the ground, 04.07.2012, VA Fedorenko; Kazachka river, spruce forest (*Picea*), 43°7'44.8"N, 76°57'29.5"E, on the forest floor, 14.09.2015, VA Fedorenko; Big Almaty Lake, 43°3'56.7"N, 76°58'53.8"E, spruce forest (*Picea*), on the forest floor, 25.09.2015, VA Fedorenko; *ibid.*, spruce forest (*Picea*), on the ground, 02.07.2017, VA Fedorenko (FVA-012020717) (Fig. 6L).

#### *Mycenaceae* Overeem

**73. *Mycena galopus*** (Pers.) P. Kumm. – Almaty Region, Ile Alatau: Kazachka river, 43°7'43.2"N, 76°57'48"E, spruce forest (*Picea*), 30.07.2010, AA Fokina; *ibid.*, 23.05.2015, VA Fedorenko (Fig. 6M).

**74. *Mycena haematopus*** (Pers.) P. Kumm. – Almaty Region, Ile Alatau: Big Almaty gorge, on spruce stumps (*Picea*), 31.05.2010, IYU Styazhkin; Small Almaty Gorge, on a piece of wood in the ground, 01.06.2010, IYU Styazhkin; Kazachka river, mixed forest, on a birch stump (*Betula*), 12.06.2010, AA Fokina; *ibid.*, on the stump, 14.05.2011, AA Fokina; Kamenskoe Plateau, on a dry apple tree trunk (*Malus*), 15.05.2016, DN Kim. Akmola Region: vicinity of Akkol town, 52°0'56.5"N, 70°54'9.8"E, 27.07.2016, AM Dolganov (Fig. 6N); *ibid.*, 23.07.2017, AM Dolganov.

**75. *Mycena pterigena*** (Fr.) P. Kumm. - Almaty Region, Ile Alatau: Kazachka river, on a rotten branch, 25.09.2010, AA Fokina; *ibid.*, on a dry stalk of a plant, 09.10.2010, AA Fokina; *ibid.*, 43°7'45.7"N, 76°57'28"E, on a rotten branch, 24.09.2011, VA Fedorenko (Fig. 6O).

**76. *Mycena viridimarginata*** P. Karst. - Akmola Region, The Burabay NP, the vicinity of Shchuchinsky village, 53°0'60"N, 70°12'1.8"E, pine forest (*Pinus*), on stumps and wood remains in soil, 20.07.2017 & 21.07.2017, VA Fedorenko (FVA-001200717) (Fig. 7A).

#### *Porothelaceae* Murrill

**77. *Phloeomana alba*** (Bres.) Redhead – Almaty Region: Zhana-Arna village, poplar grove (*Populus*), 43°37'0.3"N, 77°2'49.3"E, on the bark of poplar stumps, 30.10.2010, AA Fokina; *ibid.*, 29.11.2015, VA Fedorenko (Fig. 7B); *ibid.*, on the ground on the bark of poplar, 23.10.2016, VA Fedorenko (FVA-002231016).

#### *Boletales* E.-J. Gilbert

#### *Boletaceae* Chevall.

**78. *Boletus reticulatus*** Schaeff. (Hoffm.) Pers. – East Kazakhstan Region, Chernaya Uba River, Western Altai, 50°36'27.3"N, 83°48'54.1"E, birch-fir forest (*Betula*, *Abies*), 17.08.2014, VA Fedorenko (Fig. 7C). Akmola Region: vicinity of Akkol town, 52°4'56.5"N, 70°52'27.7"E, pine-birch forest (*Pinus*, *Betula*), 20.07.2016, AM Dolganov; *ibid.*, 23.07.2017, AM Dolganov.

**79. *Chamonixia caespitosa*** Rolland – Almaty Region, Ile Alatau, Kok Zhailau plateau, 43°7'28.1"N, 76°58'17.9"E, young spruce plantations (*Picea*), 12.07.2016, YuA Zima (FVA-002120716) (Fig. 7D).

**80. *Leccinum albostipitatum*** den Bakker & Noordel. – Akmola Region: vicinity of Akkol town, 52°3'28.7"N, 70°55'40.3"E, birch forest (*Betula*), 05.08.2013, AM Dolganov; *ibid.*, 52°2'51.7"N, 71°10'41"E, 06.09.2013, VA Fedorenko; *ibid.*, 01.08.2014, AM Dolganov; *ibid.*, 20.06.2015, AM Dolganov; *ibid.*, 05.07.2016, AM Dolganov; *ibid.*, 21.07.2018, 01.08.2018, 13.08.2018 & 10.09.2018, AM Dolganov (FVA-009210718) (Fig. 7E).

**81. *Leccinum holopus*** (Rostk.) Watling – Almaty Region, Ile Alatau: Kaskelen Gorge, 06.06.2010, IYu Styazhkin; Aksay Gorge, 1600 m above sea level, 07.06.2010, IYu Styazhkin; Kazachka river, birch forest (*Betula*), 12.06.2010, AA Fokina; Kazachka river, 43°7'42.6"N, 76°57'30.4"E, birch forest (*Betula*), 12.07.2016, VA Fedorenko (FVA-010120716) (Fig. 7F). Akmola Region: vicinity of Akkol town, pine-birch forest (*Pinus, Betula*), 25.07.2013, AM Dolganov; *ibid.*, pine-birch forest (*Pinus, Betula*), 24.05.2015, AM Dolganov; The Burabay NP, 53°1'32.3"N, 70°12'2.4"E, pine-birch forest (*Pinus, Betula*), 16.08.2016, VA Fedorenko; *ibid.*, the vicinity of Svetloe lake, 53°1'44.9"N, 70°11'53.9"E, birch-pine forest (*Betula, Pinus*), on the ground, 22.07.2017, VA Fedorenko (FVA-005220717); vicinity of Akkol town, pine-birch forest (*Pinus, Betula*), 20.06.2018, 26.07.2018 AM Dolganov.

**82. *Leccinum vulpinum*** Watling – Akmola Region: The Burabay NP, pine forest (*Pinus*), 06.08.2011, AA Fokina; *ibid.*, 30.07.2016, TL Baranova; *ibid.*, 53°1'22.4"N, 70°11'59.3"E, 15. & 18.08.2016, VA Fedorenko (FVA-005180816) (Fig. 7G); *ibid.*, pine forest (*Pinus*), 25.07.2017, VA Fedorenko (FVA-004250717). East Kazakhstan Region, Nizhnie Tainty lake, pine-birch forest (*Pinus, Betula*), 20.08.2013, NV Gulieva.

**83. *Neoboletus luridiformis*** (Rostk.) Gelardi, Simonini & Vizzini – Almaty Region, Ile Alatau: Big Almaty gorge, beside the spruces and aspens (*Picea, Populus*), 09. & 14.06.2010, IYu Styazhkin (Fig. 7H); Ayu-sai gorge, spruce forest (*Picea*), 16.07.2011, O Bondareva.

**84. *Suillellus luridus*** (Schaeff.) Murrill – East Kazakhstan Region, Katon-Karagay NP, birch forest (*Betula*), 05.07.2012, NV Gulieva (Fig. 7I).

**85. *Xerocomellus ripariellus*** (Redeuilh) Šutara – Akmola Region, vicinity of Astana city, 51°6'39.3"N, 71°16'17.7"E, willow and birch planting (*Salix, Betula*), 21.07.2018, AM Dolganov (FVA-008210718) (Fig. 7J).

**86. *Xerocomus ferrugineus*** (Schaeff.) – Akmola Region: vicinity of Akkol town, 52°5'29.1"N, 71°22'42.7"E, pine-birch forest (*Pinus, Betula*), 03.09.2013, VA Fedorenko; The Burabay NP, 53°0'37.2"N, 70°10'28.4"E, the vicinity of Shchuchinsky village, birch-pine forest (*Betula, Pinus*), on a pine stump, 14.08.2016, VA Fedorenko; The Burabay NP, the vicinity of Shchuchinsky village, 53°1'6.8"N, 70°12'0.6"E, birch-pine forest (*Betula, Pinus*), on the edge of the ravine, 20.07.2017, YuA Zima (FVA-008200717) (Fig. 7K); the vicinity of Kenes village, 52°3'31.9"N, 70°55'44.3"E, pine-birch forest (*Pinus, Betula*), on the forest floor, 25.08.2018, AM Dolganov (FVA-001250818).

### ***Gomphidiaceae* Maire ex Jülich**

**87. *Gomphidius roseus*** (Fr.) Fr. – Akmola Region, The Burabay NP: the vicinity of Svetloe lake, 53°1'40.6"N, 70°11'49.5"E, pine-birch forest (*Pinus, Betula*), 17.08.2016, YuA Zima (FVA-002160816); the vicinity of Shchuchinsky village, 53°0'40.1"N, 70°12'24.2"E, pine-birch forest (*Pinus, Betula*), in the moss, 23.07.2017, VA Fedorenko (Fig. 7L); the vicinity of Svetloe lake, 53°2'17.9"N, 70°11'40.8"E, pine-birch forest (*Pinus, Betula*), on the forest floor, 28.07.2017, VA Fedorenko (FVA-008280717).

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