

Epiphytic Lichens of Vladivostok Botanical Garden (Primorskii Krai, Russia)

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Epiphytic lichens are an indispensable component of all forest ecosystems. They are symbiotic systems where fungi give braid algae cells, receive nutrients from them and provide these cells, in turn, with water and mineral substances necessary for surviving and protect from extreme environment. Such union between fungi and alga happens to be a real lucky bond to the nature. Epilithic lichens (which live on the stone surface) play significant role on rocks and stony looses in the mountains of all biotic zones. Fruticose and foliose epigeous lichens are plentiful in many ecosystems of northern taiga, Low and High Arctic regions. Epiphytic lichens occupy the special ecological niche, settling on a bark of trees, in the forests of moderate zone. They play an important role in moderate forests, including participation in biological circulation of substances (especially fixing nitrogen in the moist forests) and as components of food chains (McCune 2000). Much of the sensitivity of epiphytic lichens to air quality apparently results from their lack of a cuticle and their total reliance on atmospheric sources of nutrition. Although trees may respond to moderate, chronic air pollution, all of the other influences on tree growth, such as variation in soils, make the responses of trees to pollutants difficult to measure in the field (McCune 2000). Lichen communities let us not only to measure air pollution, but also show its influence on various aspects of forest health (McCune 2000). Much is written on these properties of epiphytic lichens; so there is no necessity to prove that monitoring lichen populations of particular territory of Botanical Garden FEB RAS (Fig. 1) is an important part of monitoring environmental conditions in a green belt around city of Vladivostok. The Botanical Garden is very actively visited by city residents since it is located near the boundary of residential area, therefore human press on epiphytic lichens here is rather significant.

So far special investigations on epiphytic lichens for Vladivostok Botanical Garden have not been done (Chabanenco 2002, Chabanenco *et al.* 2002), though in general lichens of South Primorskii Krai (Territory) are studied well (Kniazheva 1973, Chabanenco *et al.* 2002). Some lichens have been collected for this area by L. A. Kniazheva in 1970; the samples are located in the Herbaria of the Institute of Biology and Soil Science FEB RAS, Vladivostok (VLA). Those data were used in the course of preparation of lichen flora for the South Primorskii Krai (Kniazheva 1973).

The present work contributes to more general project devoted to monitoring epiphytic lichens in forest communities of the southern Primorskii Krai. Inventory of epiphytic lichens in Vladivostok Botanical Garden was done by the author in 2003. The material was collected on special line routes as well as during field environmental practice with the students of Vladivostok State University for Economics and Services. The routes followed all perimeter of the Botanical Garden Park Zone as well as Small and Great Environmental Paths. The park zone which represents survived old-growth conifer-broadleaf forest typical for South Primorskii Krai has been studied profoundly. The first layer in the forest stand here is composed

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Fig. 1. The old-growth conifer-broadleaf forest in Botanical Garden of the town of Vladivostok.

of *Abies holophylla* and *Pinus koraiensis*; the second - of *Quercus mongolica*, *Tilia amurensis*, *Betula davurica*, *Carpinus cordata*, *Ulmus japonica*, *Juglans mandshurica*, *Kalopanax septemlobum*, *Acer mono*, *A. tegmentosum*, *A. pseudosieboldianum* etc.

In total 300 samples of lichens have been collected and treated. The list of taxa totals 62 species including 33 genera and 13 families. The leading genera are: *Lecanora* (6 species), *Pertusaria* (6), *Phaeophyscia* (5), *Heterodermia* (4); other genera contain from 1 to 3 species. Parmeliaceae and Physciaceae are the most numerous families: 9 and 6 genera, 10 and 18 species accordingly. The herbarium was collected on 9 species of trees. The greatest quantity of lichen species (55) was collected on *Quercus mongolica*; further, on *Tilia amurensis* (15 species), on *Juglans mandshurica* (13 species), on *Acer mono* (12 species), on *Betula platyphylla* and *Ulmus japonica* (10 species). One species was found on *Carpinus cordata*, *Pinus koraiensis*, *Kalopanax septemlobum*. Specific variety is insignificant giving the fact that these tree species are the natural habitats for lichens. These lichens are predominantly foliose and crustose life forms.

In general, we can say that the most lichen species in the Botanical Garden are rather typical, usual species widely widespread in the Primorskii Krai. It is necessary to note that the lichens have rather low projective area and it is diminishing with the highway proximity. Crustose lichens (such as *Graphis*

scripta, *Lecanora pachyheila*, species of *Pertusaria*, *Ochrolechia*, *Caloplaca* genera) have often the greatest projective covering. Specific diversity decreases with a highway proximity; fruticose lichens (*Ramalina*) play the special role here. The latter are also met on extremely poor habitats near the borders of the Botanical Garden. Here we have considerably increasing projective area of such lichens as *Myelochroa*, *Phaeophyscia* and a little bit less frequent - species from *Collema*, *Leptogium*, *Flavoparmelia*, *Parmelia*, *Parmotrema*, *Punctelia*, *Anaptychia*, *Heterodermia*, *Physconia*, *Pyxine*. The most widespread and dominating species of lichens in Botanical Garden of the city of Vladivostok are presented in Fig. 2.

In general, we can conclude that all lichens in Botanical Garden have quite a good state, with well developed thallomes and fruit bodies, but also there are undoubtedly some signs of stress. As a rule, air pollution can be reflected in the absence of some species and visible changes in color of the crust layer on some thallome lichens.

Below we post the resulted list of epiphytic lichens of Vladivostok Botanical Garden. The taxa in the given list are corresponded to the system accepted in 9-th edition of «Dictionary of Mushrooms» (Kirk *et al.* 2001). Genera within families and species within genera follow in alphabetic order. Names of species and their authors follow the report of Chabanenko (2002), in some cases Chabanenko *et al.* (2002).

In the basis of distinguishing geographical elements in the lichens flora of the southern Primorskii Krai we put a principle of altitudinal and zonal attributes proposed by Oxner (1944, 1946, 1948). Besides, we used systems of elements suggested for the lichen flora of Estonia by Trass (1970) and took into consideration the data on modern-day lichen distribution elaborated for the lichen flora of Sangilen Uplands by Sedelnikova (1985). I would like to thank Svetlana Ivanovna Chabanenko for her generous help and numerous consultations in treating materials.

In order to outline distribution of species, we used the following terms.

Geographical elements: (a) **boreal** - main distribution of species is connected with a zone of Holarctic dark-conifer forest; (b) **nemoral** - basic distribution of species is connected with a zone of Holarctic broadleaf forest; (c) **nemoral mountain** - a group of species which tend to inhabit mountain broadleaf forest; (d) **nemoral (oceanic)** - a group of species which tend to inhabit maritime broadleaf forest; (e) **multizonal** - main distribution of species is connected with several different vegetation zones.

Areas of distribution: (1) **Asian** - main area of distribution lies in Asia; (2) **European-Asian-American** - main area of distribution lies in Europe, Asia, and North America; (3) **Asian-American** - main area of distribution lies in Asia and North America; (4) **East-Asian** - main area of distribution lies in East Asia; (5) **East-Asian - South-Asian (? multiregional - Pacific)** - main area of distribution lies in the eastern Asia with tendency to occupy the southern areas, probably these species should be considered as multiregional Pacific ones; (6) **Holarctic** - main area of distribution lies within the limits of northern hemisphere; (7) **multiregional** - main area of distribution lies in several parts of the world in both hemispheres, (7) **multiregional (oceanic)** - main area of distribution lies in oceanic areas of both hemispheres.

Ecological groups: mesophytes; xero-mesophytes.

Ascomycetes

Arthoniomycetidae

Arthoniales

Rocellaceae

1. *Schismatomma pericleum* (Ach.) Branth & Rostr.

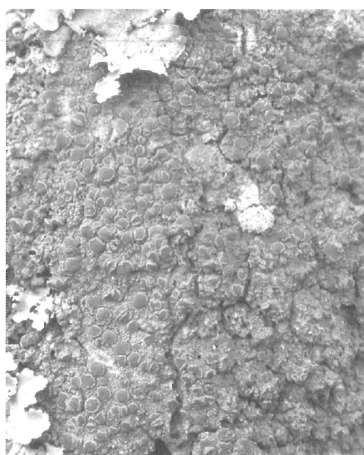
Primorskii Krai, suburban area of the town of Vladivostok, Botanical Garden, old-growth conifer-



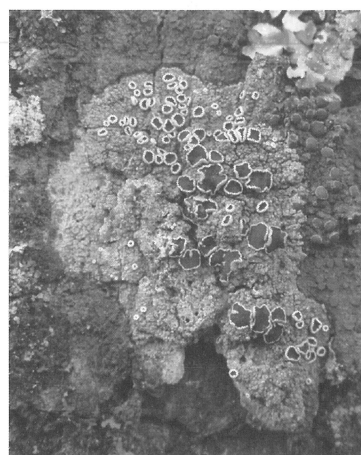
1. *Anaptychia isidiata*.



4. *Flavoparmelia caperata*.



2. *Caloplaca gordejvi*.



5. *Lecanora allophana*.



3. *Candelaria concolor*.



6. *Phaeophyscia hirtuosa*.

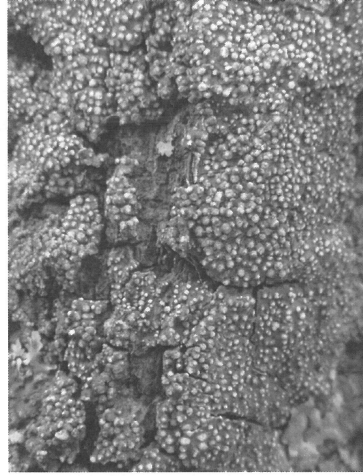
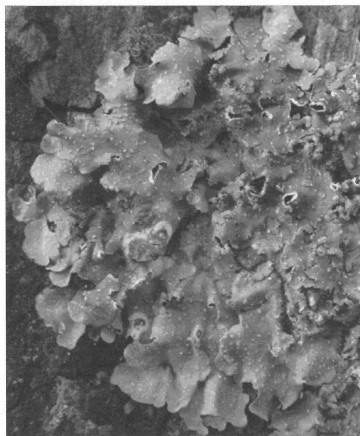
7. *Rinodina sophodes*.10. *Pertusaria submultipuncta*.8. *Pyxine sorediata*.11. *Physconia deterosa*.9. *Punctelia borrieri*.

Fig. 2. The most widespread and dominating species of lichens in Botanical Garden of the town of Vladivostok. 1. *Anaptychia isidiata*, 2. *Caloplaca gordejovi*, 3. *Candelaria concolor*, 4. *Flavoparmelia caperata*, 5. *Lecanora allophana*, 6. *Phaeophyscia hirtuosa*, 7. *Rinodina sophodes*, 8. *Pyxine sorediata*, 9. *Punctelia borrieri*, 10. *Pertusaria submultipuncta*, 11. *Physconia deterosa*.

broadleaf forest, on *Quercus mongolica*, Galanina 1019.

Ecology and distribution. Often on *Q. mongolica* in Khasan District, often dominates separate trunks in the open wood, as well as in Lazovskii District. Frequent on *Q. mongolica* on the territory of Botanical Garden and infrequent on *Q. dentata* in Lazovskii State Reserve. Multizonal, Holarctic, mesophyte.

Lecanoromycetidae

Gyalectales

Gyalectaceae

2. *Dimerella lutea* (Dicks.) Trenis.

Primorskii Krai, suburban area of the town of Vladivostok, Botanical Garden, old-growth conifer-broadleaf forest, on *Quercus mongolica*, *Tilia amurensis*, Galanina 1023, 1053.

Ecology and distribution. Quite often in the southern Primorskii Krai. Boreal, multiregional, mesophyte.

Lecanorales

Bacidiaceae

3. *Bacidia rubella* (Hoffm.) A. Massal.

Primorskii Krai, suburban area of the town of Vladivostok, Botanical Garden, old-growth conifer-broadleaf forest, on *Tilia amurensis*, *Quercus mongolica*, Galanina 1024, 1054.

Ecology and distribution. Infrequently in the southern Primorskii Krai. Nemoral, European-Asian-American, mesophyte.

4. *Tephromela atra* (Huds.) Hafellner

Primorskii Krai, suburban area of the town of Vladivostok, Botanical Garden, old-growth conifer-broadleaf forest, on *Quercus mongolica*, Galanina 1036.

Ecology and distribution. Frequently in the southern Primorskii Krai, on trunks of trees. In the western Russia it is observed mostly on stony substrata. Frequently on oak in Mongolia and Khasan District, in Lazovskii District, and Lazovskii State Reserve, frequently on the territory of Botanical Garden, but lacks on oak bark. Multizonal, multiregional, mesophyte.

Candelariaceae

5. *Candelaria concolor* (Dicks.) Stein.

Primorskii Krai, suburban area of the town of Vladivostok, Botanical Garden, old-growth conifer-broadleaf forest, on *Quercus mongolica*, *Acer mono*, Galanina 1002, 1065.

Ecology and distribution. The species is characteristic for nitrophylic habitats. In the southern Khasan District it is more frequent on *Quercus dentata*, less frequent on *Q. mongolica*; could be observed in Lazovskii District. Nemoral, multiregional, mesophyte.

Collemataceae

6. *Collema flaccidum* (Ach.) Ach.

Primorskii Krai, suburban area of the town of Vladivostok, Botanical Garden, old-growth conifer-broadleaf forest, on *Quercus mongolica*, *Galanina* 1054.

Ecology and distribution. Infrequent in Primorskii Krai. Nemoral, Holarctic, mesophyte.

7. *C. subflaccidum* Degel.

Suburban area of the town of Vladivostok, Botanical Garden, old-growth conifer-broadleaf forest, on *Ulmus japonica*, *Galanina* 1046.

Ecology and distribution. Infrequent in Botanical Garden, but quite frequent in the oak forest of Lazovskii State Reserve on *Q. mongolica* and *Q. dentata*. Nemoral, multiregional, mesophyte.

8. *Leptogium saturninum* (Dicks.) Nyl.

Primorskii Krai, suburban area of the town of Vladivostok, Botanical Garden, old-growth conifer-broadleaf forest, on *Quercus mongolica*, *Galanina* 1011.

Ecology and distribution. Finding of this species in the southern Russian Far East (Chabanenco 2002) is in doubt. In the southern Primorskii Krai, the author more frequently observed *Leptogium burnetiae* C.W. Dodge. instead of this species. Boreal, multiregional, mesophyte.

9. *Leptogium subtile* (Schrad.) Torss.

Primorskii Krai, suburban area of the town of Vladivostok, Botanical Garden, old-growth conifer-broadleaf forest, on *Quercus mongolica*, *Ulmus japonica*, *Galanina* 1046, 1053, 1065, 1067.

Ecology and distribution. Frequent in Botanical Garden. It is registered infrequently near Kravtsovka Village, Khasan District, on *Q. mongolica*. Nemoral, European-Asian-American, mesophyte.

Lecanoraceae

10. *Lecanora allophana* Nyl.

Primorskii Krai, suburban area of the town of Vladivostok, Botanical Garden, old-growth conifer-broadleaf forest, on *Quercus mongolica*, *Carpinus cordata*, *Acer mono*, *Juglans mandshurica*, *Galanina* 1001, 1010, 1021, 1029, 1048, 1056, 1068.

Ecology and distribution. Very frequent in the southern Primorskii Krai; dominates specifically

oak. Nemoral, European-Asian-American, mesophyte.

11. *L. argentata* (Ach.) Malme

Primorskii Krai, suburban area of the town of Vladivostok, Botanical Garden, old-growth conifer-broadleaf forest, on *Quercus mongolica*, *Tilia amurensis*, *Betula platyphylla*, Galanina 1056.

Ecology and distribution. Infrequent in oak forest of the southern Primorskii Krai. Even lesser in the southern Khasan District. More frequently in Lazovskii District, on *Quercus mongolica*. Nemoral, Holarctic, mesophyte.

12. *L. chlarotera* Nyl.

Primorskii Krai, suburban area of the town of Vladivostok, Botanical Garden, old-growth conifer-broadleaf forest, on *Quercus mongolica*, *Juglans mandshurica*, *Betula platyphylla*, Galanina 1034, 1037, 1056, 1057.

Ecology and distribution. Not abundant, but frequent in the all areas of the southern Primorskii Krai on *Quercus dentata* and *Q. mongolica*. Nemoral, European-Asian-American, mesophyte.

13. *L. pachyheila* Hue

Primorskii Krai, suburban area of the town of Vladivostok, Botanical Garden, old-growth conifer-broadleaf forest, on *Quercus mongolica*, *Tilia amurensis*, Galanina 1001, 1017, 1023, 1029, 1058.

Ecology and distribution. Very frequent in the southern Primorskii Krai. Nemoral, East-Asian, mesophyte.

14. *L. pulicaris* (Pers.) Ach.

Primorskii Krai, suburban area of the town of Vladivostok, Botanical Garden, old-growth conifer-broadleaf forest, on *Quercus mongolica*, Galanina 1057.

Ecology and distribution. Periodically observed on *Quercus mongolica* in Khasan District as well as in oak forest of Lazovskii Reserve. Boreal, European-Asian-American, mesophyte.

15. *L. cf. subrugosa* Nyl.

Primorskii Krai, suburban area of the town of Vladivostok, Botanical Garden, old-growth conifer-broadleaf forest, on *Quercus mongolica*, Galanina 1034, 1036.

Ecology and distribution. Occasionally on *Quercus mongolica* in Lazovskii District, infrequently in Botanical Garden. Boreal, multiregional, mesophyte.

16. *Lecidella elaeochroma* (Ach.) M. Choisy.

Primorskii Krai, suburban area of the town of Vladivostok, Botanical Garden, old-growth conifer-broadleaf forest, on *Quercus mongolica*, Galanina 1056.

Ecology and distribution. Very frequent on oak in Khasan and Lazovskii Districts. Multizonal, multiregional, mesophyte.

Parmeliaceae

17. *Anzia stenophylla* Asahina

Primorskii Krai, suburban area of the town of Vladivostok, Botanical Garden, old-growth conifer-broadleaf forest, on *Quercus mongolica*, *Galanina* 1044.

Ecology and distribution. Very infrequent in the southern Khasan District on *Quercus mongolica*, more frequent in the middle portion of the slope near Kravtsovka Village; very infrequent on the territory of Botanical Garden. Nemoral, East-Asian, mesophyte.

18. *Cetrelia pseudolivetorum* (Asahina) W.L. Culb. ex C.F. Culb.

Primorskii Krai, suburban area of the town of Vladivostok, Botanical Garden, old-growth conifer-broadleaf forest, on *Quercus mongolica*, *Pinus koraiensis*, *Galanina* 1018, 1041.

Ecology and distribution. Infrequent on the whole territory of Primorskii Krai, on oak: once registered on *Quercus dentata*, three times on *Q. mongolica* in Khasan District, more frequent in the middle portion of the slope near Kravtsovka Village and on the territory of Botanical Garden. It was observed also on *Q. mongolica* near Kievka Village, Lazovskii District and in oak forest of Lazovskii State Reserve. Nemoral, East-Asian-South-Asian (? multiregional - Pacific), mesophyte.

19. *Flavoparmelia caperata* (L.) Hale

Primorskii Krai, suburban area of the town of Vladivostok, Botanical Garden, old-growth conifer-broadleaf forest, on *Quercus mongolica*, *Galanina* 1013, 1047.

Ecology and distribution. Widespread in all areas of Primorskii Krai. It has the largest frequency of occurrence in oak forest of Lazovskii State Reserve. As to *Quercus dentata*, this species can be observed much less often and not so abundant. Nemoral, multiregional, mesophyte.

20. *Flavopunctelia soledica* (Nyl.) Hale

Primorskii Krai, suburban area of the town of Vladivostok, Botanical Garden, old-growth conifer-broadleaf forest, On branches of broadleaf trees, in the forest litter, *Galanina* 1069.

Ecology and distribution. Infrequently on branches of broadleaf trees on the whole territory of Primorskii Krai; on the litter in Botanical Garden as well as in oak forest of Lazovskii State Reserve and near Kievka Village, Lazovskii District, on *Quercus mongolica*. Nemoral, European-Asian-American, mesophyte.

21. *Menegazzia terebrata* (Hoffm.) A. Massal.

Primorskii Krai, suburban area of the town of Vladivostok, Botanical Garden, old-growth conifer-broadleaf forest, on *Quercus mongolica*, *Galanina* 1029.

Ecology and distribution. Infrequently in the southern Khasan District on *Quercus dentata*, occasionally in Lazovskii State Reserve, quite often in Botanical Garden and more frequent on *Q. mongolica* in oak forest of Lazovskii State Reserve. Boreal, multiregional, mesophyte.

22. *Myelochroa aurulenta* (Tuck.) Hale

Primorskii Krai, suburban area of the town of Vladivostok, Botanical Garden, old-growth conifer-broadleaf forest, on *Quercus mongolica*, *Juglans mandshurica*, Galanina 1012, 1031, 1033, 1037, 1068.

Ecology and distribution. Widespread in the whole Primorskii Krai, often dominates. Separate trunks often have 100% projective covering by this species. Nemoral, multiregional, mesophyte.

23. *M. entotheiochroa* (Hue) Hale

Primorskii Krai, suburban area of the town of Vladivostok, Botanical Garden, old-growth conifer-broadleaf forest, on *Quercus mongolica*, *Juglans mandshurica*, Galanina 1048, 1062, 1068.

Ecology and distribution. In the southern Khasan District one can observe the most pronounced features of this species: very thick carpet-like layer with particularly large and well developed thallus. Nemoral (oceanic), East-Asian, mesophyte.

24. *Parmelia saxatilis* (L.) Ach.

Primorskii Krai, suburban area of the town of Vladivostok, Botanical Garden, old-growth conifer-broadleaf forest, on *Quercus mongolica*, *Juglans mandshurica*, Galanina 1014, 1036, 1049, 1068.

Ecology and distribution. Infrequent in the southern Khasan District, once met on *Q. dentata*; frequent in Lazovskii District on *Q. mongolica*. Sometimes registered in oak forest of Lazovskii State Reserve on *Q. dentata*. Boreal, multiregional, mesophyte.

25. *Parmotrema chinense* (Osbeck) Hale & Ahti

Primorskii Krai, suburban area of the town of Vladivostok, Botanical Garden, old-growth conifer-broadleaf forest, on *Quercus mongolica*, Galanina 1001, 1004.

Ecology and distribution. Very frequent in Primorskii Krai, often with a great projective cover on both species of oak, sometimes dominate trunks of *Q. mongolica*. Nemoral, multiregional, mesophyte.

26. *Punctelia borreri* (Sm.) Krog

Primorskii Krai, suburban area of the town of Vladivostok, Botanical Garden, old-growth conifer-broadleaf forest, on *Quercus mongolica*, Galanina 1032.

Ecology and distribution. In the southern Khasan District of Primorskii Krai on *Q. dentata* and *Q. mongolica*, frequently with great projective cover on *Q. mongolica*. Less frequent in Lazovskii District on *Q. mongolica*, where it grows mostly on *Q. dentata*. Nemoral, European-Asian-American, mesophyte.

Physciaceae27. *Anaptychia isidiata* Tomin

Primorskii Krai, suburban area of the town of Vladivostok, Botanical Garden, old-growth conifer-broadleaf forest, on *Quercus mongolica*, *Ulmus japonica*, *Galanina* 1008, 1052, 1064.

Ecology and distribution. Frequent in the whole Primorskii Krai, but does not have large projective cover. Nemoral, East-Asian, mesophyte.

28. *Heterodermia diademata* (Taylor) D. Awasthi

Primorskii Krai, suburban area of the town of Vladivostok, Botanical Garden, old-growth conifer-broadleaf forest, on *Quercus mongolica*, *Galanina* 1007, 1016.

Ecology and distribution. Very frequent on the whole territory of Primorskii Krai. In the southern Khasan District, often met on *Q. dentata*, much less often and not so abundant on *Q. mongolica*; occasionally in Lazovskii District on oak. Nemoral, multiregional (oceanic), mesophyte.

29. *H. microphylla* (Kurok.) Skorepa

Primorskii Krai, suburban area of the town of Vladivostok, Botanical Garden, old-growth conifer-broadleaf forest, on *Quercus mongolica*, *Galanina* 1026.

Ecology and distribution. Infrequent in the southern Khasan District and Botanical Garden on *Q. mongolica*, more often registered near Kievka Village, Lazovskii District, occasionally on *Q. dentata* in Lazovskii State Reserve. Boreal, multiregional, mesophyte.

30. *H. hypoleuca* (Ach.) Trevis.

Primorskii Krai, suburban area of the town of Vladivostok, Botanical Garden, old-growth conifer-broadleaf forest, on *Quercus mongolica*, *Galanina* 1016.

Ecology and distribution. Frequent on the whole territory of Primorskii Krai; in the southern Khasan District, often registered with great projective cover on *Q. mongolica*, less often on *Q. dentata* in open forest; frequent in Lazovskii District. Nemoral, multiregional, mesophyte.

31. *H. speciosa* (Wulfen) Trevis.

Primorskii Krai, suburban area of the town of Vladivostok, Botanical Garden, old-growth conifer-broadleaf forest, on *Quercus mongolica*, *Ulmus japonica*, *Galanina* 1009, 1016, 1052, 1055.

Ecology and distribution. Frequent on the whole territory of Primorskii Krai, very often on both species of oak in oak forest. Nemoral, multiregional, mesophyte.

32. *Phaeophyscia melanchra* (Hue) Hale

Primorskii Krai, suburban area of the town of Vladivostok, Botanical Garden, old-growth conifer-broadleaf forest, on *Quercus mongolica*, *Galanina* 1020.

Ecology and distribution. In the southern Primorskii Krai, periodically registered on *Q. mongolica* in Khasan and Lazovskii Districts. Nemoral, Asian-American, mesophyte.

33. *P. hirtuosa* (Krempfh.) Essl.

Primorskii Krai, suburban area of the town of Vladivostok, Botanical Garden, old-growth conifer-broadleaf forest, on *Quercus mongolica*, Galanina 1010, 1012, 1017, 1067.

Ecology and distribution. Frequent in Primorskii Krai, very often with great projective cover on *Q. dentata* in the southern Khasan and Lazovskii District, where dominates in oak forest; occasionally registered on *Q. mongolica*. Nemoral, Asian, mesophyte.

34. *P. hispidula* (Ach.) Essl.

Primorskii Krai, suburban area of the town of Vladivostok, Botanical Garden, old-growth conifer-broadleaf forest, on *Quercus mongolica*, *Acer mono*, *Tilia amurensis*, *Ulmus japonica*, *Betula davurica*, Galanina 1011, 1017, 1025, 1033, 1038, 1040, 1066.

Ecology and distribution. Frequent in the southern Primorskii Krai; in Khasan District, more often on *Q. mongolica*, sometimes absolutely dominates trunks. In the same place periodically on *Q. dentata*, with smaller projective cover. In Lazovskii State Reserve, it is registered more often on *Q. dentata*, than on *Q. mongolica*. Nemoral, multiregional, mesophyte.

35. *P. rubropulchra* (Degelius) Essl.

Primorskii Krai, suburban area of the town of Vladivostok, Botanical Garden, old-growth conifer-broadleaf forest, on *Quercus mongolica*, *Acer mono*, *Tilia amurensis*, *Betula platyphylla*, Galanina 1012, 1027, 1031, 1040, 1048, 1066.

Ecology and distribution. In the southern Primorskii Krai, very frequent on both oak species and is often found in postfire successions on trunks together with *Phaeophyscia hirtuosa*. Nemoral, Asian-American, mesophyte.

36. *P. squarrosa* Kashiw.

Primorskii Krai, suburban area of the town of Vladivostok, Botanical Garden, old-growth conifer-broadleaf forest, on *Quercus mongolica*, *Acer mono*, *Tilia amurensis*, *Ulmus japonica*, *Kalopanax septemlobum*, Galanina 1006, 1017, 1038, 1042, 1043, 1052, 1054.

Ecology and distribution. Quite frequent in the southern Primorskii Krai on *Q. mongolica* near Kravtsovka Village as well as in Khasan District; frequent and abundant in the Botanical Garden, in the area remote from federal highway. Quite often met in Lazovskii State Reserve where especially frequent on *Q. dentata*. Nemoral, Asian-American, mesophyte.

37. *Physconia detersa* (Nyl.) Poelt

Primorskii Krai, suburban area of the town of Vladivostok, Botanical Garden, old-growth conifer-broadleaf forest, on *Quercus mongolica*, *Acer mono*, *Ulmus japonica*, Galanina 1040, 1043, 1045,

1052, 1067.

Ecology and distribution. In the southern Primorskii Krai, very often met on both oak species; on the whole territory of the Krai dominates trunks of *Q. dentata*. Nemoral, European-Asian-American, xero-mesophyte.

38. *P. kurokawae* Kashiw.

Primorskii Krai, suburban area of the town of Vladivostok, Botanical Garden, old-growth conifer-broadleaf forest, on *Quercus mongolica*, *Ulmus japonica*, *Galanina* 1006, 1025, 1060.

Ecology and distribution. Frequent in the southern Khasan District on *Q. dentata*, less frequent on *Q. mongolica* in the same place; abundant in Botanical Garden and near Kievka Village, Lazovskii District. Occasionally in Lazovskii State Reserve on both oak species. Infrequent in Sikhote-Alinskii Biosphere Reserve (Skirina 1995). Nemoral, Asian-American (? East-Asian-American), xero-mesophyte.

39. *P. subpulverulenta* (Szatala) Poelt

Primorskii Krai, suburban area of the town of Vladivostok, Botanical Garden, old-growth conifer-broadleaf forest, *Betula platyphylla*, *Galanina* 1066.

Ecology and distribution. Quite frequent in the southern Primorskii Krai; very frequent and abundant in the southern Khasan District on *Q. dentata*, being one of dominating species among lichens, less often on *Q. mongolica* in the same place; periodically in Lazovskii District on both oak species. Very rare in Sikhote-Alin Biosphere Reserve (Skirina 1995). Nemoral, East-Asian, xero-mesophyte.

40. *Pyxine sibirica* Tomin

Primorskii Krai, suburban area of the town of Vladivostok, Botanical Garden, old-growth conifer-broadleaf forest, on *Quercus mongolica*, *Galanina* 1003.

Ecology and distribution. Not frequent in the southern Primorskii Krai, predominately in oak forest on *Q. mongolica*. Boreal, Asian, mesophyte.

41. *P. soledata* (Fr.) Mont.

Primorskii Krai, suburban area of the town of Vladivostok, Botanical Garden, old-growth conifer-broadleaf forest, on *Quercus mongolica*, *Galanina* 1015.

Ecology and distribution. Quite frequent in the southern Primorskii Krai, in oak forest on both oak species, more frequently than *Pyxine sibirica*. Very frequent in Sikhote-Alin State Reserve (Skirina 1995). Boreal, European-Asian-American, mesophyte.

42. *Rinodina pyrina* (Ach.) Arnold.

Primorskii Krai, suburban area of the town of Vladivostok, Botanical Garden, old-growth conifer-broadleaf forest, on *Acer mono*, *Juglans mandshurica*, *Tilia amurensis*, *Galanina* 1027, 1068.

Ecology and distribution. Infrequent in the southern Khasan District, occasionally on *Q. dentata*; infrequent near Kievka Village, Lazovskii District, on *Q. mongolica*; rare in Sikhote-Alin State Reserve (Skirina 1995). Nemoral, Holarctic, mesophyte.

43. *R. sophodes* (Ach.) A. Massal.

Primorskii Krai, suburban area of the town of Vladivostok, Botanical Garden, old-growth conifer-broadleaf forest, on *Quercus mongolica*, Galanina 1028, 1053.

Ecology and distribution. Infrequent near Kravtsovka Village, Khasan District, on *Q. mongolica*; in Botanical Garden; near Kievka Village, Lazovskii District; more frequent in Lazovskii State Reserve on *Q. dentata*; rare in Sikhote-Alin State Reserve (Skirina 1995). Nemoral, multiregional, mesophyte.

44. *R. xanthophaea* Nyl.

Primorskii Krai, suburban area of the town of Vladivostok, Botanical Garden, old-growth conifer-broadleaf forest, on *Quercus mongolica*, *Acer mono*, *Juglans mandshurica*, Galanina 1005, 1031, 1056, 1068.

Ecology and distribution. Frequent in the southern Khasan District, often on both oak species; frequent on the territory of Botanical Garden on *Q. mongolica*; frequent near Kievka Village, Lazovskii District, and on *Q. dentata* in Lazovskii State Reserve; very frequent in Sikhote-Alin State Reserve (Skirina 1995). It is worth to note that everywhere this species is more frequent and abundant on *Q. mongolica*. Nemoral, East-Asian, mesophyte.

Ramalinaceae

45. *Ramalina calicaris* (L.) Fr. var. *japonica* Hue

Primorskii Krai, suburban area of the town of Vladivostok, Botanical Garden, old-growth conifer-broadleaf forest, on *Quercus mongolica*, Galanina 1018, 1048.

Ecology and distribution. Very frequent in Sikhote-Alin State Reserve on *Q. mongolica* (Skirina 1995) and in Lazovskii State Reserve in oak forest. The data on findings require additional verification; it is probably wrongly indicated for East Asia (Chabanenco 2002). Nemoral, multiregional, mesophyte.

46. *R. roesleri* (Hochst. ex Schaer.) Hue

Primorskii Krai, suburban area of the town of Vladivostok, Botanical Garden, old-growth conifer-broadleaf forest, on *Quercus mongolica*, Galanina 1018.

Ecology and distribution. Less frequent than other species of the genus; near Kravtsovka Village, Khasan District, on territory of Botanical Garden. More frequent near Kievka Village, Lazovskii District, but seldom on *Q. dentata*; very frequent in Sikhote-Alin State Reserve (Skirina 1995). Nemoral, European-Asian-American, mesophyte.

47. *R. sinensis* Jatta

Primorskii Krai, suburban area of the town of Vladivostok, Botanical Garden, old-growth conifer-broadleaf forest, on *Quercus mongolica*, *Galanina* 1048.

Ecology and distribution. Occasionally, but not abundant in Khasan District, on *Q. mongolica*; more frequent near Kievka Village, Lazovskii District, as well as in Lazovskii State Reserve in oak forest; rare on the territory of Botanical Garden. As to growing on *Q. dentata*, it happens infrequently in Khasan District and Lazovskii State Reserve. Very frequent in Sikhote-Alin State Reserve (Skirina 1995). Nemoral, European-Asian-American, mesophyte.

Pertusariales**Pertusariaceae**48. *Ochrolechia pallescens* (L.) A. Massal.

Primorskii Krai, suburban area of the town of Vladivostok, Botanical Garden, old-growth conifer-broadleaf forest, on *Juglans mandshurica*, *Acer mono*, *Galanina* 1037.

Ecology and distribution. Infrequent in the southern Khasan District and Sikhote-Alin State Reserve (Skirina 1995) on *Q. mongolica*; quite common in Lazovskii State Reserve on both oak species. Nemoral, multiregional, mesophyte.

49. *O. parella* (L.) A. Massal.

Primorskii Krai, suburban area of the town of Vladivostok, Botanical Garden, old-growth conifer-broadleaf forest, on *Quercus mongolica*, *Juglans mandshurica*, *Galanina* 1019, 1053, 1058, 1063, 1068.

Ecology and distribution. Frequent in the southern Primorskii Krai on *Q. mongolica* and *Q. dentata*, sometimes on the territory of Botanical Garden and in Lazovskii State Reserve; very frequent in Sikhote-Alin State Reserve (Skirina 1995). Nemoral, Holarctic, mesophyte.

50. *O. yasudae* Vain.

Primorskii Krai, suburban area of the town of Vladivostok, Botanical Garden, old-growth conifer-broadleaf forest, on *Quercus mongolica*, *Galanina* 1035.

Ecology and distribution. Infrequent on the territory of Botanical Garden and near Kievka Village, Lazovskii District, on *Q. mongolica*; very frequent in Sikhote-Alin State Reserve (Skirina 1995); in Lazovskii State Reserve on both oak species. Multizone, multiregional, mesophyte.

51. *Pertusaria albescens* (Huds.) M. Choisy & Werner

Primorskii Krai, suburban area of the town of Vladivostok, Botanical Garden, old-growth conifer-broadleaf forest, on *Quercus mongolica*, *Galanina* 1055.

Ecology and distribution. Infrequent on the territory of Botanical Garden as well as in Sikhote-Alin

State Reserve (Skirina 1995), on *Q. mongolica*. Nemoral, multiregional, mesophyte.

52. *P. leucostoma* A. Massal.

Primorskii Krai, suburban area of the town of Vladivostok, Botanical Garden, old-growth conifer-broadleaf forest, on *Juglans mandshurica*, *Galanina* 1051.

Ecology and distribution. Infrequent on the territory of Botanical Garden, near Kievka Village, Lazovskii District, in the Sikhote-Alin State Reserve (Skirina 1995), on *Q. mongolica*. Nemoral, European-Asian, mesophyte.

53. *P. pertusa* (Weigel) Tuck.

Primorskii Krai, suburban area of the town of Vladivostok, Botanical Garden, old-growth conifer-broadleaf forest, on *Quercus mongolica*, *Galanina* 1056, 1063.

Ecology and distribution. Sometimes in Khasan District, more frequent near Kievka Village, Lazovskii District, on the territory of Botanical Garden, in Lazovskii State Reserve, very frequent in Sikhote-Alin State Reserve (Skirina 1995), on *Q. mongolica*. Nemoral, multiregional, mesophyte.

54. *P. pseudophlyctis* Erichsen

Primorskii Krai, suburban area of the town of Vladivostok, Botanical Garden, old-growth conifer-broadleaf forest, on *Tilia amurensis*, *Quercus mongolica*, *Galanina* 1039, 1058, 1056.

Ecology and distribution. Frequent and abundant on *Q. mongolica* on the territory of Botanical Garden, infrequent in Sikhote-Alin State Reserve (Skirina 1995). Nemoral mountain, European-Asian-American, mesophyte.

55. *P. submultipuncta* Nyl.

Primorskii Krai, suburban area of the town of Vladivostok, Botanical Garden, old-growth conifer-broadleaf forest, on *Quercus mongolica*, *Betula platyphylla*, *Galanina* 1034, 1059, 1064.

Ecology and distribution. Frequent in the southern Khasan District, on both oak species; less frequent near Kravtsovka Village, Khasan District, on the territory of Botanical Garden and near Kievka Village, Lazovskii District, on *Q. mongolica*; very frequent in Sikhote-Alin State Reserve (Skirina 1995). The species inhabits *Q. mongolica* more frequently than *Q. dentata*. Nemoral, East-Asian, mesophyte.

56. *P. velata* (Turner) Nyl.

Primorskii Krai, suburban area of the town of Vladivostok, Botanical Garden, old-growth conifer-broadleaf forest, on *Quercus mongolica*, *Juglans mandshurica*, *Tilia amurensis*, *Galanina* 1030, 1031, 1039, 1050, 1059.

Ecology and distribution. Quite common near Kravtsovka Village, Khasan District, on the territory of Botanical Garden, in Lazovskii State Reserve, on *Q. mongolica*; very frequent in Sikhote-Alin

State Reserve (Skirina 1995). Nemoral, multiregional, mesophyte.

Teloschistales

Teloschistaceae

57. *Caloplaca gordejevi* (Tomin) Oxner

Primorskii Krai, suburban area of the town of Vladivostok, Botanical Garden, old-growth conifer-broadleaf forest, on *Quercus mongolica*, *Tilia amurensis*, *Juglans mandshurica*, *Betula platyphylla*, *Galanina* 1017, 1018, 1024, 1034, 1048, 1051, 1055, 1057, 1061, 1068.

Ecology and distribution. Frequent, sometimes very abundant on both oak species, in the southern Primorskii Krai as well as in Sikhote-Alin State Reserve (Skirina 1995). Nemoral, East-Asian, mesophyte.

58. *C. oxneri* S. Kondratyuk & Sochting

Primorskii Krai, suburban area of the town of Vladivostok, Botanical Garden, old-growth conifer-broadleaf forest, on *Quercus mongolica*, *Acer mono*, *Ulmus japonica*, *Galanina* 1017, 1025, 1054.

Ecology and distribution. Found once in Lazovskii State Reserve, on *Q. dentata*. Nemoral, East-Asian, xero-mesophyte.

Orders uncertainae

Ostropales [= Graphidales]

Graphidaceae

59. *Graphis scripta* (L.) Ach.

Primorskii Krai, suburban area of the town of Vladivostok, Botanical Garden, old-growth conifer-broadleaf forest, on *Quercus mongolica*, *Betula platyphylla*, *Galanina* 1019, 1034.

Ecology and distribution. Infrequent in Khasan District, on *Q. mongolica*; frequent and abundant on the territory of Botanical Garden; very frequent in Sikhote-Alin Biosphere Reserve (Skirina 1995). Nemoral, multiregional, mesophyte.

Pyrenulales

Pyrenulaceae

60. *Pyrenula nitida* (Weigel) Ach.

Primorskii Krai, suburban area of the town of Vladivostok, Botanical Garden, old-growth conifer-broadleaf forest, on *Tilia amurensis*, *Galanina* 1024, 1039.

Ecology and distribution. Rather frequent in Botanical Garden and Lazovskii State Reserve, on *Q. mongolica*. Nemoral, multiregional, mesophyte.

Ascomycota: Genera uncertae sedis61. *Lepraria incana* (L.) Ach.

Primorskii Krai, suburban area of the town of Vladivostok, Botanical Garden, old-growth conifer-broadleaf forest, on *Quercus mongolica*, *Acer mono*, *Juglans mandshurica*, *Tilia amurensis*, *Ulmus japonica*, *Betula davurica*, *Galanina* 1010, 1017, 1018, 1024, 1025, 1027, 1033, 1036, 1043, 1051, 1052, 1054, 1056, 1057, 1067, 1068.

Ecology and distribution. Quite common in the southern Khasan District and Lazovskii State Reserve, on both oak species; more frequent near Kravtsovka Village; Khasan District, near Kievka Village, Lazovskii District, on the territory of Botanical Garden, on *Q. mongolica*; very frequent in Sikhote-Alin State Reserve (Skirina 1995). Multizonal, multiregional, mesophyte.

62. *Normandina pulchella* (Borrer) Nyl.

Primorskii Krai, suburban area of the town of Vladivostok, Botanical Garden, old-growth conifer-broadleaf forest, on *Quercus mongolica*, *Galanina* 1035, 1067.

Ecology and distribution. Rare in Khasan and Lazovskii Districts, on *Q. dentata*; rare on the territory of Botanical Garden, on *Q. mongolica*; more frequent near Kravtsovka Village, Khasan District; very frequent in Sikhote-Alin State Reserve (Skirina 1995). Its thallus is often possible to find only in a mixture with other larger species. Nemoral, multiregional (oceanic), mesophyte.

The results on specific diversity of epiphytic lichens of the Botanical Garden can not be considered complete: we need to research lichens located in the higher branches of trees and also conduct the thorough study of herbarium collected in the previous years to detect rare and very sensitive species which could disappear already from the Botanical Garden area. More detailed studies of crustose species can also give some new contributions to the list, because they are hard to identify. Further we plan to set a system of constant lichenometry plots on trunks of trees in order to make a long-term monitoring of lichens and identify some changes in the specific pattern.

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