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Botanica Pacifica
Botanical Garden-Institute FEB RAS
Makovskii Str. 142
Vladivostok 690024 RUSSIA

http://www.geobotanica.ru/bp

botanica.pacifica@icloud.com
krestov@biosoil.ru
v_bak@list.ru

RESEARCH PAPER

Hepatic Diversity Patterns in the Russian Far East

Vadim A. Bakalin

Vadim A. Bakalin *
v_bak@list.ru

Botanical Garden-Institute FEB RAS
Vladivostok 690024 Russia

Institute of Biology & Soil Science FEB RAS
Vladivostok 690022 Russia

* corresponding author

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ABSTRACT

Based on the analysis of hepatic distribution in the Russian Far East, four 'hot spots' of taxonomic diversity are recognized. They are located in the Dygeren Range in Kamchatka Peninsula, the Nabil'sky Range in Sakhalin Island, Shikotan Island, and the Livadijsky Range in Primorsky Territory. Although the total area of diversity centers is only 1700 km^2 (comprising 0.06 % of the Far East), 312 species (or 77 % of the total hepatic diversity) are recorded there. These regions seem to be potentially appropriate for biota conservation actions. Most taxa, which have not previously been recorded within diversity centers (93 spp.), belong to Arctic and Acrtic-Montane flora elements, and this suggests the necessity to consider at least one more diversity center in the tundra zone of the Russian Far East in the future research.

Keywords

Russian Far East, Hepaticae, distribution patterns, diversity, conservation, phytogeography.

РЕЗЮМЕ

Бакалин В.А.

Закономерности распространения разнообразия печеночников на российском Дальнем Востоке

На основании анализа распространения печеночников на российском Дальнем Востоке, выявлено 4 центра таксономического разнообразия. Эти центры следующие: хребет Дыгерен на п-ове Камчатка, Набильский хребет на о-ве Сахалин, о-в Шикотан и Ливадийский хребет в Приморском крае. Несмотря на незначительную протяженность (1700 км^2 или 0.06 % от общей площади), в пределах выделенных центров известно 312 видов печеночников, что составляет 77 % всего разнообразия на российском Дальнем Востоке. Выявленные центры весьма перспективны для проведения комплекса мероприятий по сохранению разнообразия печеночников на российском Дальнем Востоке. Большая часть таксонов, не известных в пределах центров разнообразия (93 вида), принадлежит к арктическому или аркто-горному элементам флоры, а потому в ходе дальнейших исследований, желательно выделение еще одного центра, расположенного в тундровой зоне на севере Дальнего Востока.

Ключевые слова

российский Дальний Восток, печеночники, закономерности распространения, разнообразие, охрана, фитогеография

INTRODUCTION

Admittedly, the taxonomic diversity of any group of organisms is not equal in different areas. The evaluation of diversity patterns may help in the understanding of basic problems of biogeography such as biota genesis, its future changes and resistance to change. Apart from the listed fundamental problems the analysis of diversity distribution patterns might be very useful for the evaluation of taxonomic diversity centers for conservation purposes. To describe the hepatic taxonomic diversity 'hot spots' in the Russian Far East is the main goal of the present account.

The potential expedience of this approach to conservation was strongly argued, on the global scale, by Myers et al. (2000), who showed that 44 % of all species of vascular plants are confined to 25 hotspots comprising only 1.4 % of the land surface of the Earth. As the authors wrote (l. c.: 853): "This opens the way for a 'silver bullet' strategy on the part of conservation planners, focusing on these hotspots in proportion to their share of the world's species at risk". The task to analyze the hepatic diversity patterns has never been addressed in the Russian Far East and in Russia as the whole, although some progress has been made in the studies of mosses and vascular plants. Ignatov (1993) has analyzed the moss diversity of the former USSR. He (l.c.) has carried out the large scale analysis of the diversity patterns and regional relationships of the composition of taxa in the moss flora. The last analysis had the most impressive result due to the strong discrepancy with the patterns known for vascular plants. The vascular plants taxonomic diversity in the USSR was regarded as generally increasing with the latitude (Malyshev 1975), whereas the diversity of mosses was commonly increased in the areas with wet, mild climate and mountainous relief. This observation was definitively demonstrated by Ignatov (1993), who presented a map showing that moss diversity in the Russian Far East varies from 300 to 500 species per approximate unit of 100000 km^2, highest in the southernmost mountainous edge of the area. The map published by Ignatov (l.c.) is now out of date, since the diversity of many places was not properly known at that time. Nevertheless, the general diversity patterns are not changed in the composition of genera, and this warrants the placement of that map here (Fig. 1).

Similar results were obtained by Safavi & Shirzadian (2011) based on the analysis of distribution of three genera of mosses (*Tortula*, *Grimmia* and *Bryum*) in Iran. The authors (l.c.) argued three main points: 1) the higher diversity in these genera is strongly associated with mountainous areas, 2) in most cases, the highest diversity occurs in the mountainous areas with high amount of rainfall, 3) the correlation between species diversity and average temperature is negative. The latter principle may contradict to the common belief that warmer areas are richer in the number of species than cooler ones (for example, Tropical versus Boreal zones). However, this point of view may be regarded as true with respect to the narrow latitude gradient or the comparison of plains (or low mountainous area) with highly mountainous area that has a great range of communities. As it was shown on the basis of the worldwide analysis of taxonomic and molecular data (Shaw et al. 2005: 337), the results "do not support the hypothesis that, in general, mosses are more species-rich in the tropics than at higher latitudes". Moreover, basing on molecular evidence, the authors state (l.c.: 337), that "mosses best fit the pattern of 'everything is everywhere' ". The data presented in this paper also did not reveal the notable shift of diversity 'hot spots' to southernmost edge of the area, although currently such centers are not found in the Arctic, where community diversity is certainly lower.

MATERIAL AND METHODS

The first step in the evaluation of diversity centers was to divide the territory into units and compare the total diversity (or *gamma*-diversity) within the Russian Far East. Although the goals of Ignatov's (1993) work are rather different from my own, the main methodological problem is the same. Ignatov (l.c.: 13) defined it as "what is the appropriate area for such comparison?" Based on the information available to him, he defined the appropriate area size as approximately 100000 km^2, with the note that differences in species number are not high whether area 10000 km^2 or 1000000 km^2 is used in the analysis. Indeed, he used data from some areas that are much larger or smaller than 100000 km^2 in the calculations. I suggest this approach is quite applicable to hepatics too. Indeed, data on hepatic diversity in the Russian Far East confirm the existence of only small (if even present) differences in local floras in the interval indicated Ignatov (1993). Some noteworthy examples from hepatics are given in Table 1.

Whereas Ignatov (l.c.) used data on provincial floras for a rather inductive estimation of diversity iso-line positions, I suggest a more formal approach to evaluate data on distribution of hepatics within the Russian Far East. My algorithm includes three steps: 1) to divide study area into regular sectors, 2) to compare sectors diversity, and 3) to

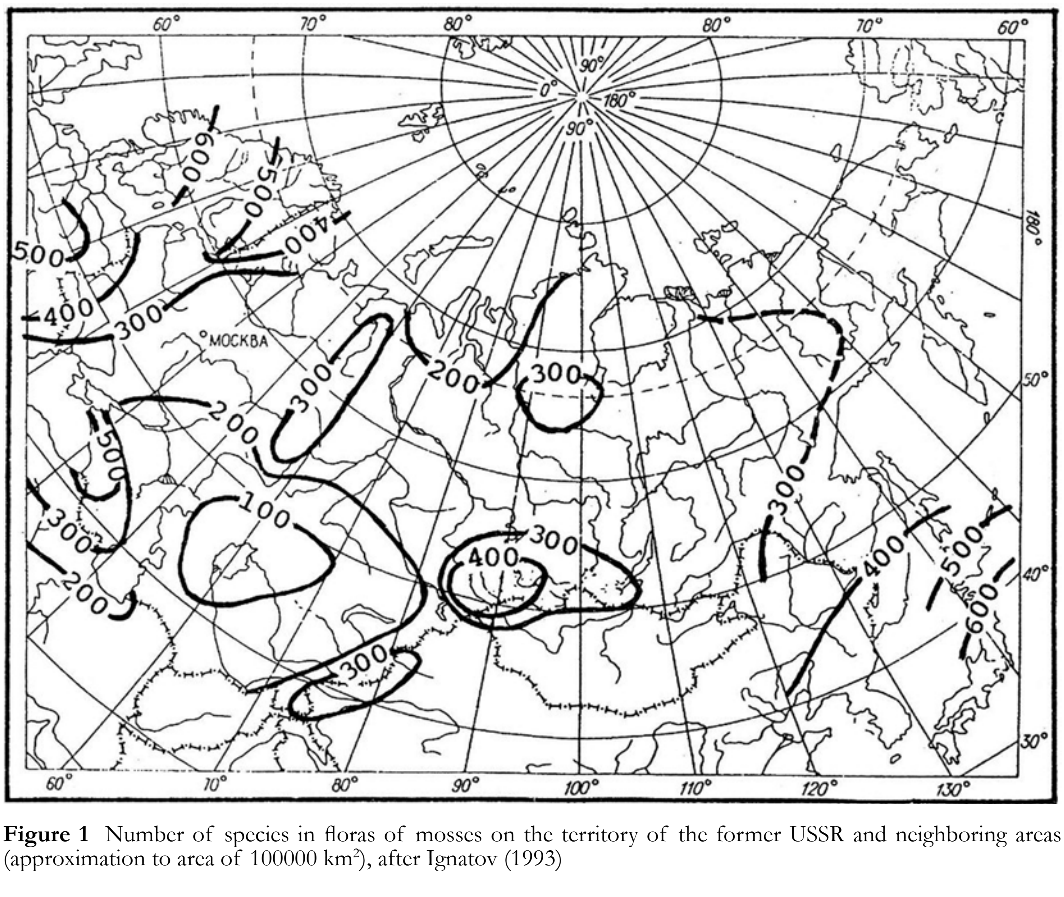

Figure 1 Number of species in floras of mosses on the territory of the former USSR and neighboring areas (approximation to area of 100000 km^2), after Ignatov (1993)

Table 1 The comparison of some regional hepatic flora diversity in the Russian Far East

Area name	**Approximate area, km^2**	**Number of recorded hepatic species (mostly by Bakalin, 2010, with some unpublished additions)**
Kamchatka Peninsula and adjacent islands	270 000	227
South Kurils	10 000	216
South of Primorsky Territory	90 000	180
Sakhalin Island	72 500	198

select sectors with the highest diversity. In my opinion, the sectors should be as small as possible for the current state of knowledge on hepatic distribution. Unfortunately, if we need to divide the Russian Far East into sectors, the smallest size of the latter must be higher than 100000 km^2. The easiest way that I found to accomplish this was to divide the area into sectors 5×5 degrees (latitude × longitude, correspondingly). The sectors were numbered sequentially, from North to South (Fig. 2). Certainly, the area of "northern" sectors is smaller than "southern" ones (note, that latitude only, but not longitude, influences area size). The area (in km^2) of each sector may be calculated by the following formula:

$$\{2\pi r^2[1-cos((90-a)\pi/180)]-2\pi r^2[1-cos((90-b)\pi/180)]\}/(360/5),$$

where r is the Earth radius (average is 6371 km), a – southward situated latitude limit, b – northward situated latitude limit. The areas of different sectors, calculated by such method, are presented in the table 2. The area of the largest sector is less than two times the area of the smallest.

The possible counterarguments against using the subdivision of sectors here suggested here are following: 1) the borders of sectors sometimes divide one distinctive flora into two or more parts, 2) some of sectors will cover in most part not land, but sea, where, certainly no hepatics may grow. These counterarguments are reasonable, and the problem may be reduced, if the smaller size sectors will be designated (for example 50×50 km or smaller). Unfortunately, in the current state of knowledge of hepatic distribution in the Russian Far East, this alternative is not appropriate. By the way, it should be noted that during the analysis of results I did not find any correlations of taxonomic diversity with the proportion of sea/land coverage within a sector (that potentially probably should exist). However I found the strong correlation between known diversity and the level of flora examination.

Basing on the available data (Bakalin 2010; unpublished data), the database of distribution of the species within designated sectors was compiled. It is placed on-line in electronic appendix 1 [*http://www.geobotanica.ru/bp/2013_02_01/2013_01_Bakalin_suppl_material.pdf*].

The division of the area is only the first step to the evaluation of hepatic diversity centers in the Russian Far East. Since it is not possible to name the area of over 100000 km^2 as diversity 'hot spot', the next step is to scrutinize the sectors where the highest hepatic diversity was recorded. For that step I suggest expert appraisal based on the available data on distribution within a sector, which per-

Table 2 The comparison of area of sectors situated at different latitude

Latitude position (from S to N)	**Area, km^2**
45–50°	208 746.7
50–55°	188 097.4
55–60°	166 016.7
60–65°	142 672.5
65–70°	118 242.7

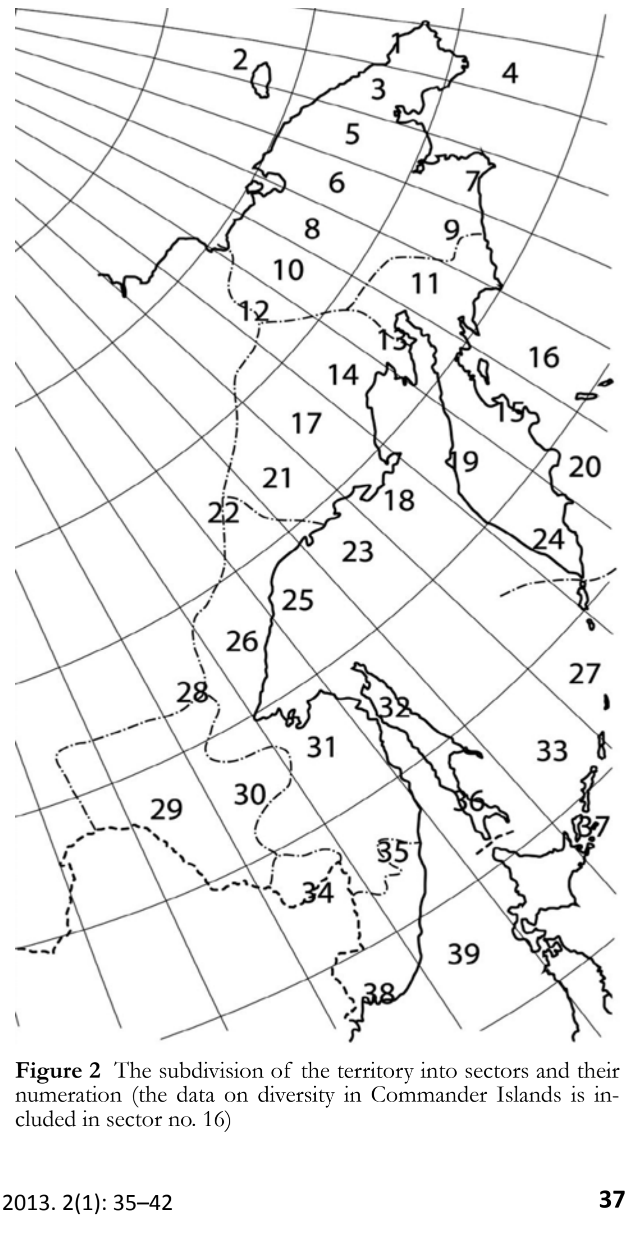

Figure 2 The subdivision of the territory into sectors and their numeration (the data on diversity in Commander Islands is included in sector no. 16)

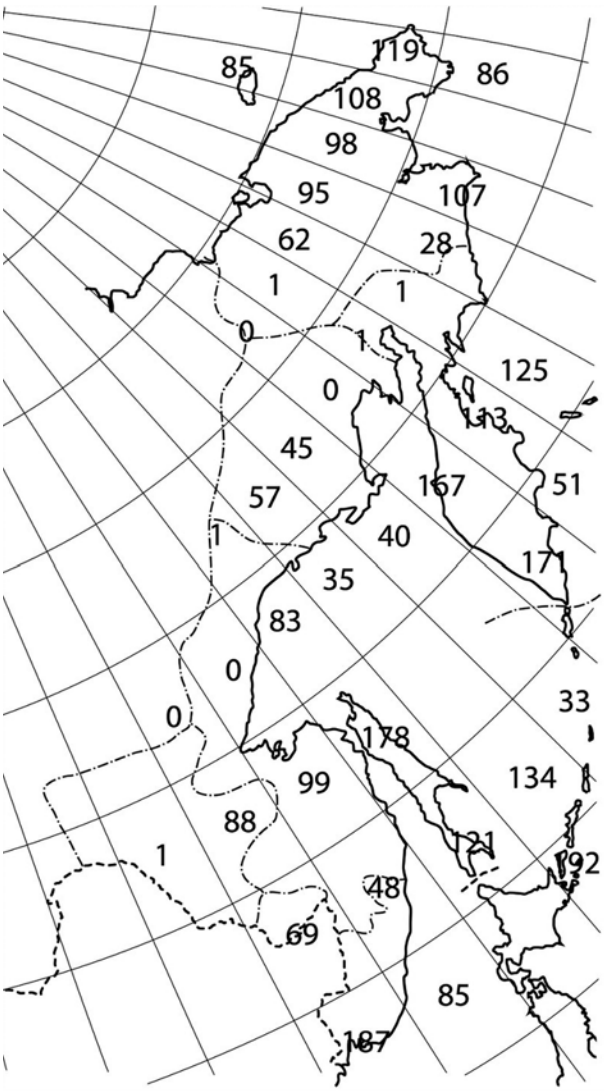

Figure 3 Quantity of recorded taxa per sector (indicated inside of each sector)

mits to selection of even a small locality as a diversity center, and then to describe it.

RESULTS AND DISCUSSION

The analysis of quantity of recorded species has revealed the great variability in the quantity of recorded taxa per square (varying from 0 to 192). The number of recorded species is indicated for each sector in the Fig. 3. With respect to the flora knowledge, all recognized sectors fall into four categories: 1) below 5 species recorded – *not studied*, 2) from 30 to 80 – *poorly studied*, 3) from 80 to 150 – *sufficiently studied northern and insufficiently studied southern* (in the Russian Far East, if areas with similar mountainous relief are compared, the number 100–120 species per sector indicates that flora is well-known in Chukotka Peninsula and adjacent areas, while southward (where forest communities are presented) a number exceeding 150 species is required for the same statement (cf. Konstantinova et al. 2009)), 4) over 150 species – *sufficiently studied*. The sectors ranged from not studied to sufficiently studied, are shown in the Fig. 3. Two observations are obvious: 1) the level of the knowledge of taxonomic diversity is very low in at least 50 % of sectors, 2) the sectors mostly "covered" by the sea, are not noticeably poorer in the diversity. Nevertheless, at least 30 % of sectors seem to be studied sufficiently.

Since the majority of sufficiently studied sectors have similar mountainous contours, one explanation may be related to the difference in community diversity. Indeed, areas near the top of some mountains in southern flank of the area (South Kurils, East Sakhalin, North Sikhote-Alin Mountain Range) provide the habitats for the most of Arctic and Arctic-Alpine taxa (such as *Gymnomitrion*, *Anthelia*, etc.). However, in contrast to the lowlands in Arctic and Hemiarctic, lower elevations in the southern part of the Far East are occupied by broadleaved forests or southern type of taiga, which usually provide the habitats for other taxa of presumably 'southern' distribution. Certainly, the hepatic flora of the southern mountains is not simple sum of the "northern" and "southern" species, since many Arctic taxa (e.g. *Radula prolifera* Arnell, *Mesoptychia sahlbergii* (Lindb.) A.W. Evans, *Scapania kaurinii* Ryan, etc.) occur southward of the northern Hemiarctic in strongly defined refugia of periglacial vegetation (such as in Nabil'skij Range in Sakhalin Island: Bakalin et al., 2012). Another question is: whether areas on the same latitude should be different in taxonomic diversity in oceanic and continental parts? I have hypothesized that the continental hepatic floras should be poorer because many hepatic species are limited in distribution by areas with higher humidity under strong influence of ocean (Bakalin, 2010). Unfortunately, there is no current representative information to resolve this problem, since the continental hepatic floras in the Russian Far East (Amurskaya Province and inner Kolyma Upland in Magadan Province) are poorly known.

Basing on the available information (cf. Fig. 3, 4), there are five main recognizable diversity sectors in the Russian Far East. They are located in Kamchatka Peninsula (two sectors), the northern half of Sakhalin, the South Kurils and the southern part of Primorsky Territory. The explanations placed below clarify where taxonomic diversity is concentrated.

1. Sakhalin Island

Recent advances in floristic hepaticology in Sakhalin were summarized in the book "Bryophytes of Sakhalin" (Bakalin et al., 2012), where the territory of the Island is subdivided (following to Krestov et al., 2004) into 6 floristic districts (excluding Moneron Island). The richest diversity is observed in the East Sakhalin (Fig. 5), where 134 species (68 % of total island diversity) are recorded. The western part of the district is covered by lowland plain in the basins of two largest Sakhalin Rivers, Tym' and Poronaj. In contrast to the western part, the eastern part is mostly occupied by the complex of ranges called the East-Sakhalin Mountains. The highest altitude in the latter complex is in Nabil'skij Range, providing habitats in communities varying from southern taiga to alpine tundra. The highest diversity is registered near the highest peaks of Sakhalin (well

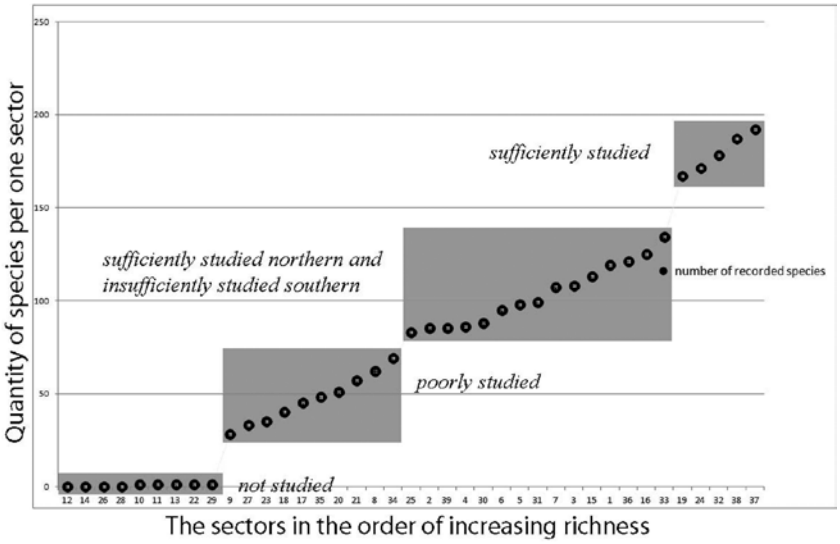

Figure 4 The diagram showing the sectors range in the order of increasing of species number

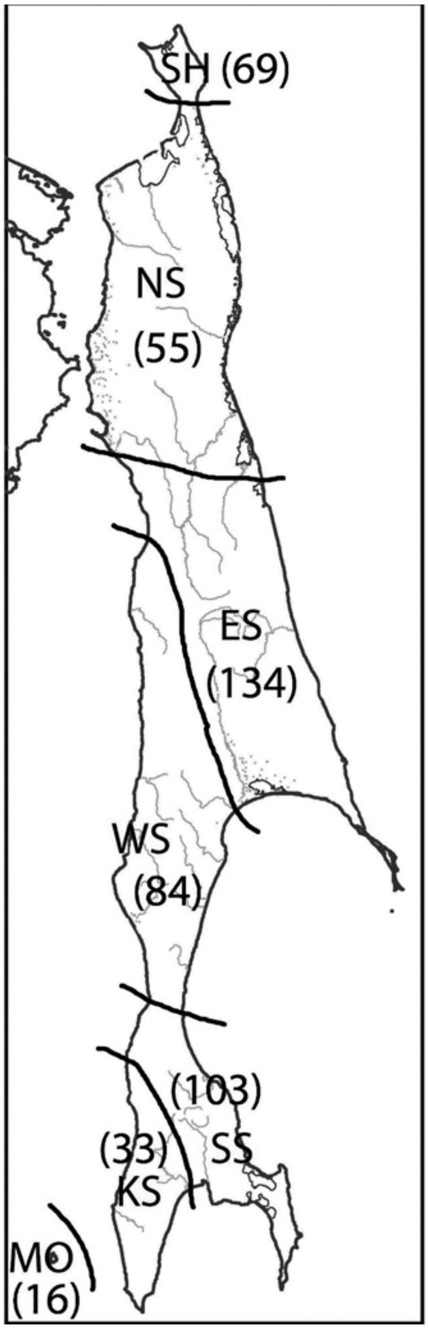

Figure 5 The floristic regionalization and species richness in Sakhalin Island, species recorded numbers in the brackets (the regionalization followed to Krestov et al., 2004).

studied in Chamga Mt.), where 129 species (or 96 % of district diversity) is found. Therefore the latter should be considered as the diversity center in Sakhalin.

2. Kamchatka Peninsula

The peninsular hepatics were more or less satisfactorily studied within the first decade of the 21st century. Reliable information was summarized in the "Flora and phytogeography of hepatics in Kamchatka and adjacent islands" by Bakalin (2009). In total 227 species of hepatics were recorded in that book, while 220 species are recorded from Kamchatka Peninsula, excluding islands. The diversity data, being placed on the Kamchatka floristic regional map showed the highest richness in Central Kamchatka district, where 150 species (or 68 % of the peninsular diversity) are recorded (Fig. 6). That may be easily explained, if the general nature characteristic of Kamchatka will be taken into account. Two factors determine the development of Kamchatka' flora in historical retrospective (Bakalin 2009): 1) almost insular position (during most part of Cenozoic Kamchatka was an island, and even when in contact with the mainland, as it is as now, contacts were impeded by narrow and flat nature of the isthmus in northern part), 2) strong volcanic activity impeding vegetation development in large areas, which could probably provide the wide range of habitats in other conditions. Fortunately for modern flora diversity, the Sredinnyj ('midline') Mt. Range in the Kamchatka was almost free of eruptions during the Pleistocene. Thus, the richest hepatic diversity may be expected there, as confirmed by Bakalin (2009). This high diversity is not distributed continuously and some places are richer than other, with the essential diversity concentrated in the Dygeren Mt. Range that is within the Sredinnyj Mt. Range. The former is the small range of ca. 30 km length and 10 km width, but provides the large (for that latitude) spectrum of vegetation communities, varying from larch forests to alpine heathlands. One hundred and forty species of hepatics are recorded for the Dygeren Range, which comprises ca. 93 % of taxonomic diversity of the floristic district.

3. South Kuril Islands

South Kuril Islands mean here the islands situated southward of 46th degree of northern latitude, and belonging to East Asian floristic Province (cf. Bakalin 2010). The robust progress in the diversity studies of hepatics in Kuril Islands has been made within last decade (Bakalin & Cherdantseva 2006, Bakalin et al. 2009). Basing on the last cited paper, 216 species of hepatics are known from South Kurils (Iturup Island – 148 spp., Kunashir Island – 151 spp., Shikotan Island

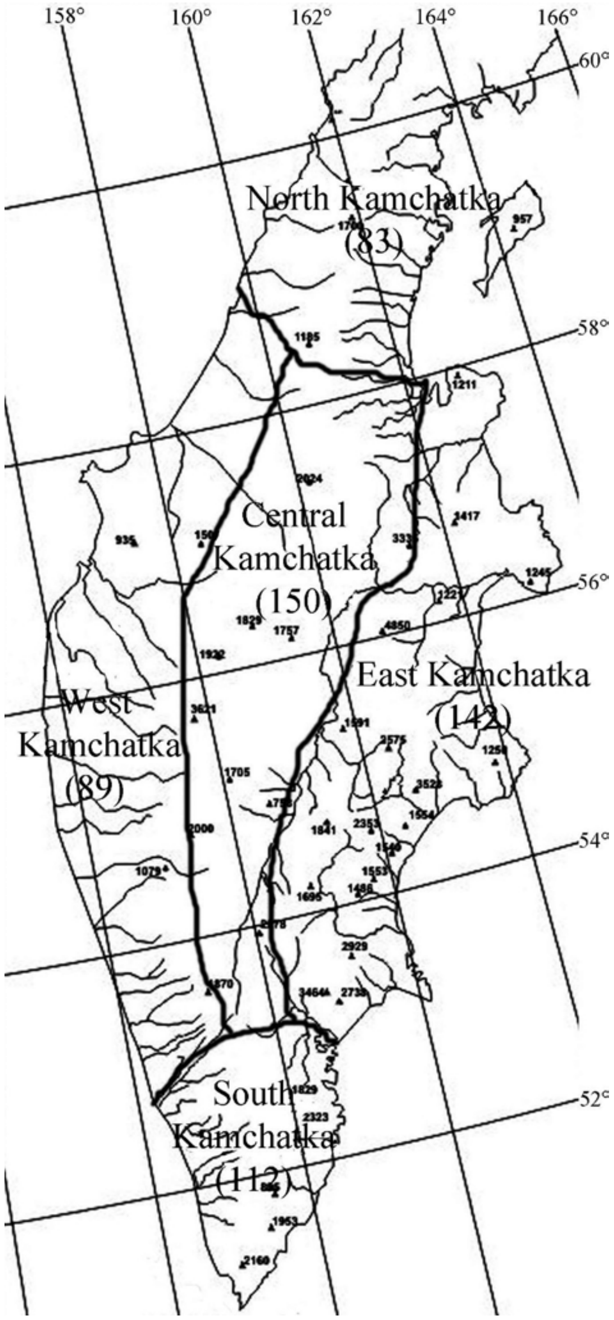

Figure 6 The floristic regionalization and the taxonomic diversity of Kamchatka Peninsula, species recorded numbers in the brackets (the regionalization followed to Bakalin 2009)

– 137 spp.). The most diverse is the Shikotan Island, where 137 species are recorded in the area of 225 km^2. A lot of bryophyte species are occurring in Russia in the island only, e.g. *Dozya japonica* Sande Lac., *Dicranum setifolium* Cardot of mosses and *Plectocolea hattoriana* Amakawa and *Lejeunea otiana* S. Hatt. of hepatics.

4. Primorsky Territory

Primorsky Territory has the longest history of bryological exploration in the Russian Far East. Among other things, more than 20 years of the scientific career of the professional hepaticologst S.K. Gambaryan were mostly devoted to this area. Her data were summarized in "Anthocerotae and Hepaticae of South Primor'ye" (Gambaryan, 1992). In total, 132 species were recorded for the southern half of the Primorsky Territory. Despite this fact, the flora was not studied enough, and each year some new taxa with mostly Manchurian distribution are found. Bakalin (2008) has reviewed the current state of the knowledge of the Territory and listed 177 species. To this number ca. 10 species were added and 2 were excluded as misidentified within last five years. Most of diversity is known (although not limited, certainly) from small, less than 25 km length, Livadijskij Range (southern spurs of Sikhote-Alin), where 111 species (60 % of the total hepatic diversity of the territory) are recorded.

The general data on geographic position and species diversity within diversity centers are summarized in Table 3. There are 312 species recorded in four diversity centers that comprise ca. 77 % of the total diversity in the Russian Far East. It is noticeable that the previously mentioned high proportion is presented in the total area of 1700 km^2 that comprises 0.06 % of the total area and, therefore could be easily protected. Moreover, 312 species comprise ca. 68 % of the total Russian hepatic diversity (448 species, cf. Konstantinova et al. 2009), enhancing the value of the designated centers as areas for hepatic diversity conservation.

The 312 species are recorded from four diversity 'hot spots' in total. Of these, 44 are common in all of four localities. Dygeren, Nabilskij Ranges and Shikotan Island floras share 29 species. Nabilkij, Livadijskij Ranges and Shikotan Island floras count 20 common species. Dygeren, Livadijskij Ranges and Shikotan Island floras share 6 species. At last Dygeren, Nabilskij and Livadijskij Ranges

Table 3 The general data on area and diversity of the recognized diversity centers

The locality	Elevation range, m a.s.l.	Approximate coordinates (N latitude – E longitude)	Community diversity, from / to	Approximate area (covered by researches), km^2	Taxonomic diversity, species number
Dygeren Range	800–2000	55°54' – 158°43'	Larch forest / mountain tundra and alpine heathlands	500	140
Nabil'sky Range	300–1600	50°45' – 143°16'	Fir-Spruce taiga / mountain tundra	500	129
Shikotan Island	0–400	43°46' – 146°44'	Fir-Spruce taiga / grassland and tundroids	225	137
Livadijakij Range	400–1300	43°06' – 132°44'	Broadleaved forest / crooked forests and stony field	400	111

counts 16 common species. The sharing of species within pairs of localities are shown in the Table 4.

The specificity of the Dygeren Range is highest among described diversity centers (23 species) and becomes apparent in the group of Arctic and Arctic-Alpine species (*Isopaches decolorans* (Limpr.) Buch, *Scapania obcordata* (Berggr.) S. W. Arnell, etc). In addition to two aforementioned species, the following taxa are recorded from this diversity center only (in comparison with other three localities): *Anastrophyllum sphenoloboides* R. M. Schust., *Anthelia julacea* (L.) Dumort., *Asterella saccata* (Wahlenb.) A. Evans, *Athalamia hyalina* (Sommerf.) S. Hatt., *Barbilophozia rubescens* (R. M. Schust. & Damsh.) Karttunen & Soederstroem, *Cephalozia ambigua* C. Mass., *Cephaloziella elegans* (Heeg.) Schiffn., *Lophozia heteromorpha* R. M. Schust. et Damsh., *L. polaris* (R. M. Schust.) R. M. Schust. et Damsh., *L. schusteriana* Schljakov, *Mannia sibirica* (Mull.Frib.) Frey et Clark, *Marsupella sparsifolia* (Lindb.) Dumort., *Orthocaulis floerkei* (F. Weber et D. Mohr) H. Buch, *Prasanthus suecicus* (Gott.) Lindb., *Riccia lamellosa* Raddi, *Scapania brevicaulis* Tayl., *S. glaucocephala* (Tayl.) Aust., *S. obscura* (Arnell et C. E. O. Jensen) Schiffn., *S. parvifolia* Warnst. var. *grandiretis* Schljakov, *Solenostoma sphaerocarpum* (Hook.) Steph. var. *nana* (Nees) R. M. Schust., *Sphenolobus cavifolius* (Buch et S. W. Arnell) Mull. Frib.

The distinctiveness of the flora of the Nabilskij Range is not as great and is centered in the occurrence of calciphilous and, more widely, basiphilous Arctic-Alpine and Arctic-Boreal taxa (*Arnellia fennica* (Gott.) Lindb., *Leiocolea badensis* (Gott.) Schiffn., *Plagiochila arctica* Bryhn et Kaal., etc.). The total list includes 8 specific species (apart from aforementioned, they are *Cephaloziella divaricata* (Sm.) Schiffn. var. *asperifolia* (Tayl.) Macv., *C. grimsulana* (Jack ex Gott. & Rabenh.) Lacout, *Eocalypogeia schusteriana* (S. Hatt. et Mizut.) R. M. Schust., *Frullania nisqualensis* Sull., *Leiocolea collaris* (Nees) Schljakov). The latter specificity may be explained by the absence of calcium-rich substrata in Kamchatka (with the exception of poisonous fresh travertines due to high arsenic compound).

The uniqueness of the Livadijsky Range (in comparison with other diversity centers) is apparent in taxa of Temperate and Subtropical-Temperate East Asian distribution, such as *Cephaloziella spinicaulis* Douin, *Jubula japonica* Steph., *Trichocoleopsis sacculata* (Mitt.) Okam., etc. The total list of specific taxa includes 16 species (*Asterella leptophylla* (Mont.) Grolle, *Athalamia nana* (Shim. et S. Hatt.) S. Hatt., *Cephaloziella spinicaulis*, *Cololejeunea ornata* A. W. Evans, *Frullania taradakensis* Steph., *Herbertus dicranus* (Taylor ex Gottsche et al.) Trevis, *Jubula japonica*, *Macvicaria ulophylla* (Steph.) S. Hatt., *Plagiochasma japonicum* (Steph.) Hass., *Plagiochila hakkodensis* Steph., *Plicanthus birmensis* (Steph.) R. M. Schust., *Porella caespitans* (Steph.) S. Hatt., *P. oblongifolia* S. Hatt., *Radula auriculata* Steph., *Scapania parvitexta* Steph., *Trichocoleopsis sacculata*).

A similar tendency of East-Asian taxa to dominate occurs in the Shikotan Island hepatics. There, 16 taxa are recorded only within designated 'hot spots' (*Aneura maxima* (Schiffn.) Steph., *Cololejeunea macounii* (Spruce in Underw.) A. Evans, *Cololejeunea subkodamae* Mizut., *Diplophyllum andrewsii* A. W. Evans, *Lejeunea otiana* S. Hatt., *Lejeunea ulicina* (Tayl.) Gottsche et al., *Marsupella alata* S. Hatt., *Nardia geoscyphus* (De Not.) Lindb. var. *dioica* Bakalin, *Plectocolea biloba* Amakawa, *P. hattoriana* Amakawa, *P. infusca* Mitt. var. *infusca, P. infusca* Mitt. var. *ovicalyx* (Steph.) Bakalin, *P. rigidula* S. Hatt., *Radula brunnea* Steph., *Scapania hirosakiensis* Steph. in Mull. Frib., *Trichocolea tomentella* (Ehrh.) Dumort.).

Table 4 The share of taxa occurring in the pair of diversity centers (in accordance to the note to this table) only, number of species. In the cells of diagonal, total number of species in the center and number of species occurring only in this center (in parentheses). The diversity centers are marked with numbers: I – Dygeren Range, II – Nabilskij Range, III – Shikotan Island, IV – Livadijsky Range

Diversity centers	I	II	III	IV
I	150 (23)			
II	37	129 (8)		
III	24	4	137 (16)	
IV	12	19	18	111 (16)

Ninety three species are not present in the designated diversity centers, but occur in the Russian Far East. They mostly belong to Arctic and Arctic-Alpine flora elements (*Scapania ligulifolia* (R. M. Schust.) R. M. Schust., *S. simmonsii* Bryhn et Kaal., *Marsupella arctica* (Berggr.) Bryhn et Kaal., etc.), with only a few representatives of the Temperate East-Asian group (*Alobiellopsis parvifolia* (Steph.) R. M. Schust., *Plectocolea virgata* Mitt.). Taking into account this information, if the floristic works in the Russian Far East are continued, one or more other diversity centers will be designated. One of them seems to be advisable to propose in Arctic to cover the most of diversity not included into localities described in this paper.

CONCLUSIONS

Basing on the analysis of hepatic diversity patterns in the Russian Far East, five sectors of 5×5 degrees (latitude × longitude correspondingly) where the known diversity is highest within the Russian Far East are evaluated. Within each recognized sectors (one for two in Kamchatka), the diversity 'hot spot' including most of known sector's diversity is suggested. Those maximal diversity centers are situated within Livadijskij, Nabil'skij, Dygeren Ranges and Shikotan Island and cover together 312 species that comprise 77 % of the total hepatic diversity of the Russian Far East. Noticeably, this high proportion of the total diversity is found in the 0.06 % of the area analyzed (1700 km^2 versus 3000000 km^2). Therefore, the designated territories are potentially appropriate for protection of hepatic diversity in the Russian Far East and in the Russia as the whole. The next floristic investigations will probably evaluate one or more additional diversity centers in the Russian Far East, probably situated within Arctic or northern Hemiarctic.

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