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***Epipogium aphyllum* in NW-European Russia: distribution and habitats**

Keywords

Orchidaceae; *Epipogium aphyllum*; Flora of NW-Russia; distribution; ecology.

Summary

Efimov, P.G. & I. A. Sorokina (2011): *Epipogium aphyllum* in NW-European Russia: distribution and habitats.- J. Eur. Orch. 43 (1): 99-118.

A short analysis of distribution of *Epipogium aphyllum* in Russia with an emphasis on NW-Russia is given. Existing data on vegetation from all localities of *Epipogium* in NW-Russia are summarized. It is shown that this plant occupies coniferous and mixed forests composed of different tree species, usually showing different stages of the succession from mixed or deciduous to spruce forests. Short description of vegetation in typical habitats is given. In NW-Russia *Epipogium* exhibits more or less typical populational structure, sometimes forming populations which consist up to 100 individual plants, formed by the means of both vegetative and sexual reproduction. Since XIX century this species exhibits decrease, confirmed with probability of 90-95%. Probably, in the eastern NW-Russia, where all recent records of species were made, *Epipogium* exhibited decline to a lesser extent than in western or central NW-Russia. Preliminary data on observations of *Epipogium aphyllum* populations near Ivinsky Razliv Reservoir are summarized.

Zusammenfassung

Efimov, P.G. & I. A. Sorokina. (2011): Verbreitung und Habitate von *Epipogium aphyllum* im nordwesteuropäischen Russland.- J. Eur. Orch. 43 (1): 99-118.

Die Verbreitung von *Epipogium aphyllum* in Russland wird dargestellt, dabei wird insbesondere auf NW-Russland eingegangen. Die Art besiedelt hier unterschiedlich zusammengesetzte Koniferen- und Mischwälder verschiedener Sukzessionsstadien. Von allen aus NW-Russland bekannten Wuchsorten von

E. aphyllum werden die verfügbaren Daten über deren Vegetation zusammengefasst und die Vegetation arttypischer Habitate kurz beschrieben. In NW-Russland zeigt *E. aphyllum* eine mehr oder weniger typische Populationsstruktur. Einzelne Populationen bestehen aus über 100 Individuen, die sich über vegetative und sexuelle Fortpflanzung reproduzieren. Insgesamt ergibt sich aus den Daten ein deutlicher Rückgang der Art seit dem 19. Jahrhundert mit einer Wahrscheinlichkeit von 90-95%. Im östlichen Teil NW-Russlands, wo alle rezenten Nachweise erfolgten, scheint der Rückgang von *E. aphyllum* weniger stark ausgeprägt zu sein als in den westlichen und zentralen Teilgebieten. Die bisher erhobenen Daten der in der Nähe des Stausees von Ivinsky Razliv neu entdeckten Vorkommen von *E. aphyllum* werden näher besprochen.

Резюме

Ефимов П.Г., И.А. Сорокина (2011): Надбородник безлистный (*Epipogium aphyllum*) на северо-западе европейской России: географическое распространение и фитоценотическая приуроченность.- *J. Eur. Orch.* 43 (1): 99-118.

Приводятся краткие данные о распространении *Epipogium aphyllum* в России с акцентом на областях северо-запада европейской части страны. Суммированы данные о растительности во всех местах нахождения *Epipogium* на Северо-Западе. Показано, что этот вид поселяется в хвойных и смешанных лесах, представляющих собой различные стадии сукцессии от смешанных и лиственных к еловым лесам. Приводятся краткие геоботанические описания типичных местообитаний надбородника. На Северо-Западе надбородник проявляет более менее типичную популяционную структуру, иногда образуя популяции, насчитывающие до сотни отдельных растений. Такие популяции образуются как за счет вегетативного, так и семенного размножения. С XIX века надбородник проявляет снижение численности, подтвержденное с вероятностью 90-95% для областей Северо-Запада. По всей вероятности, в восточной части региона, где сделаны все недавние находки вида, снижение его численности менее выражено, чем в западной и центральной частях. Приводятся предварительные данные о наблюдениях за популяциями *Epipogium aphyllum* вблизи Ивинского разлива.

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Introduction

Epipogium aphyllum (L.) Sw., also known as ‘Ghost orchid’, is one of the most interesting and rarest representatives of Orchidaceae family in northern Europe.

In many areas, this species is extremely rare or even considered to be extinct. Probably in every country or region where *Epipogium* is present in the flora, it is strictly protected and deserves considerate attitude to the localities. It is included in the Red Data Book of Russian Federation (BARDUNOV & NOVIKOV 2008) and in numerous regional lists of protected species (PRISYAZHNYUK 2004). In some Regions of Russia it was not recorded for more than 100 years (Pskov: EFIMOV & KONETCHNAYA 2007; Vladimir and Ryazan’: SEREGIN, pers. comm.; Samara: herbarium LE; Saratov: KIREEV & KOSTETSKIY 2006) and may be considered extinct, the same as in Great Britain where it was not recorded more than for 15 years (BATEMAN 2006).

Epipogium aphyllum is an obligate mycotrophic (mycoparasitic) achlorophyllous herb. Recently it was shown (ROY et al. 2009) that the carbon for this plant is provided by surrounding trees and transmitted via fungi belonging mainly to different *Inocybe* species (Basidiomycota). Underground organ of *Epipogium aphyllum* is coralloid branched rhizome with solitary root hairs, lacking adventitious roots and displaying intensity of mycoinfection as high as 80% (TATARENKO 1996).

Every stem bears 1-7-flowered inflorescence. In NW-Russia rhizome usually produces from 1 to several (up to 15) stems, but usually the stems are solitary on in small groups. Many-flowered inflorescences are rare, 1-3-flowered stems being most common. Coloration of flowers is yellowish or purplish, depending on the intensity of purple pigment which is especially developed at longitudinal keels of the lip. The plants in populations display polymorphism on the coloration of the flowers from almost white to rather intensively colored forms. Plants with intermediate coloration are usually most common (Fig. 4).

Geographical distribution

Figure 1 roughly outlines the distribution area of *Epipogium aphyllum* in Russia. It consists of 2 parts, one in the boreal forest zone and the second in mountainous coniferous and mixed forests of Caucasus. Although this species has wide distribution area within Russia, in every region only occasional localities are known. The most localities of this species were recorded within middle and southern taiga sub-zones.

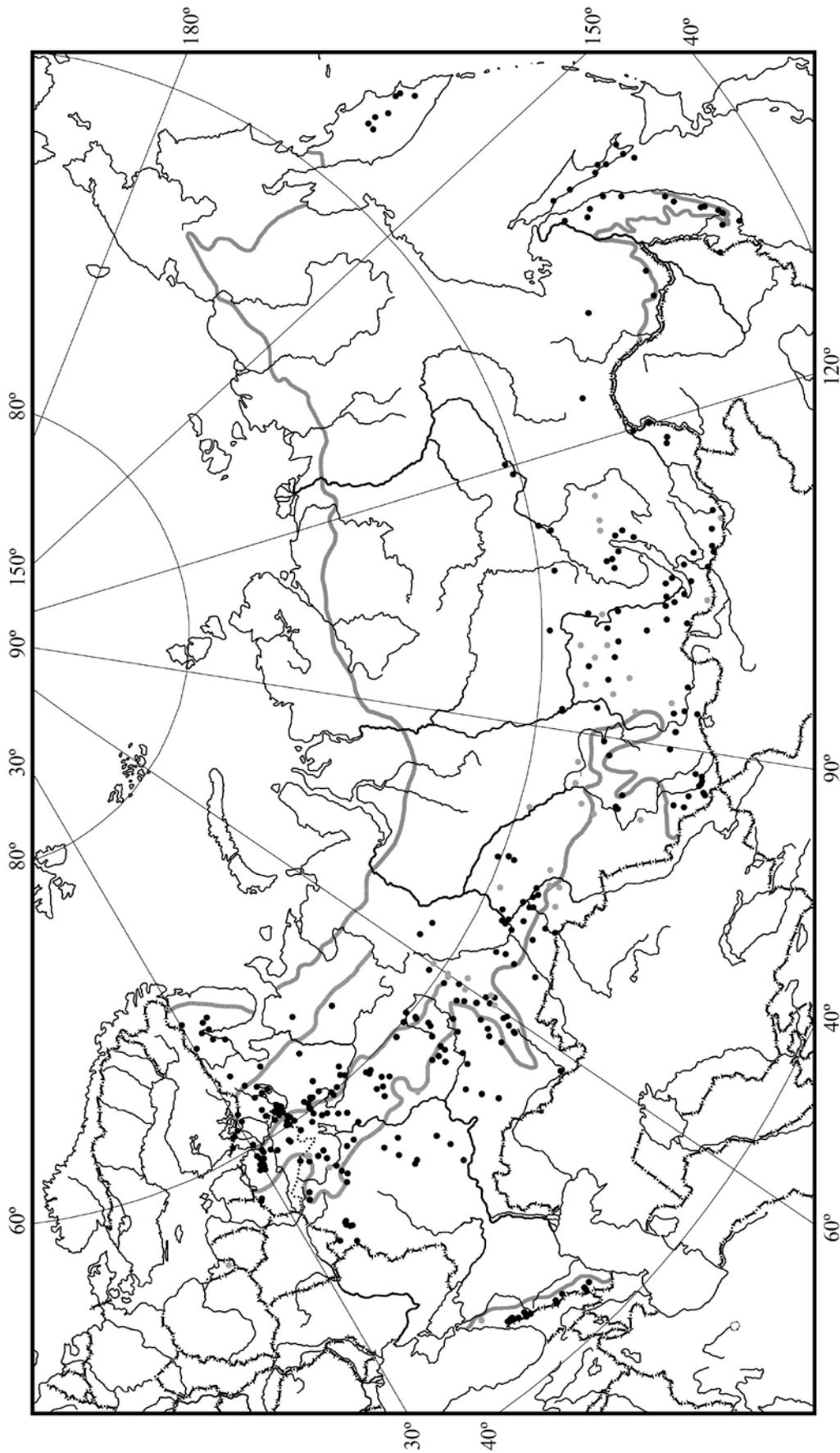


Fig. 1: Distribution of *Epipogium aphyllum* in Russia. Data are taken from the herbarium collections and literature (AVERYANOV 2000; BAIKALOVA 2002; BARANOVA 2006; IVANOVA 1987; KIREEV & KOSTETSKIY 2006; NAUMENKO 2008; NOTOV 2005; SCHMIDT 2005; RYABININA & KNYASEV 2009 and numerous regional Red Lists). Grey dots represent localities which are not precise or represent dubious data. Grey lines indicate the limits of taiga zone, including mountainous coniferous forests; in European part of Russia the borders between southern, middle and north taiga subzones are also shown (ALEKSANDROVA & YURKOVSKAYA 1989). The border of NW-Russia is shown by dotted line.

North-West European Russia includes Leningrad, Pskov and Novgorod Regions and the city of Saint-Petersburg. Figure 2 shows the localities of *Epipogium aphyllum* within NW-Russia. It is clear that this species inhabits mostly the northern half of the territory, which corresponds to southern taiga, where *Epipogium* is more common than in the mixed forest zone that is situated southwards.

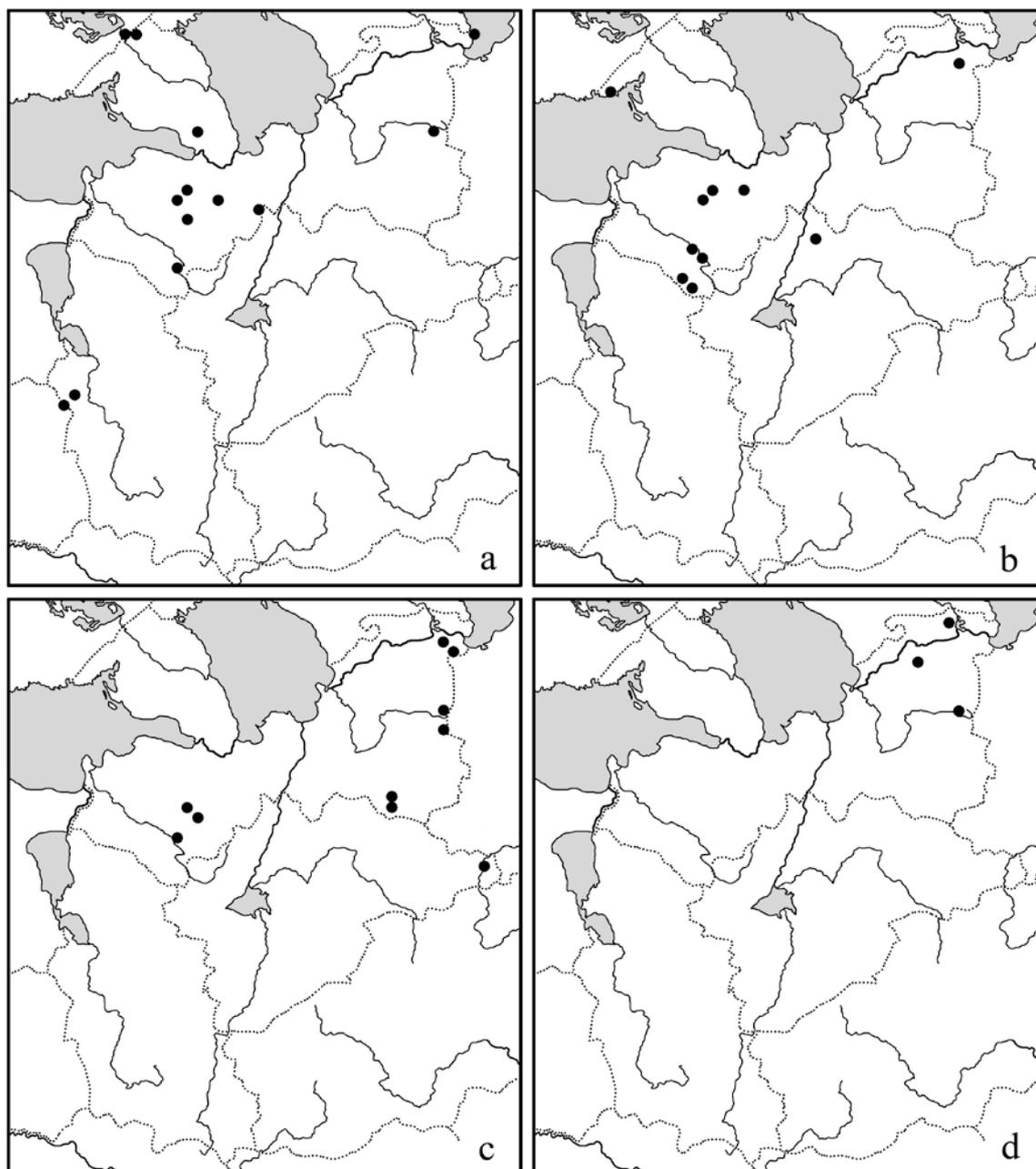


Fig. 2: Localities of *Epipogium aphyllum* in NW-Russia in different periods:
a – before 1900, b – 1900-1969, c – 1970-1999, d – 2000-2010.

75% of records were made in calcareous regions, which indicates a species' certain tendency to inhabit places with low soil acidity. Such places in NW-Russia are situated in central part of Leningrad Region (to the south from Saint-Petersburg city), in Western Pskov Region (south from Peipus lake) and in some places in eastern part of Leningrad Region.

The majority of recent records were made in eastern part of Leningrad Region. In some, distantmost parts of this area, there are still present some patches of the old-aged forests. The nature park "Vepssky Les" ("Veps' Forest") is an example of the territory, where the fragments of such forests are still present nowadays, being more or less protected (POPOVA et al. 2003). Due to the low human population, problematic accessibility and suitable climatic conditions, this part of NW-Russia offers most favorable conditions for the survival of *Epipogium aphyllum*.

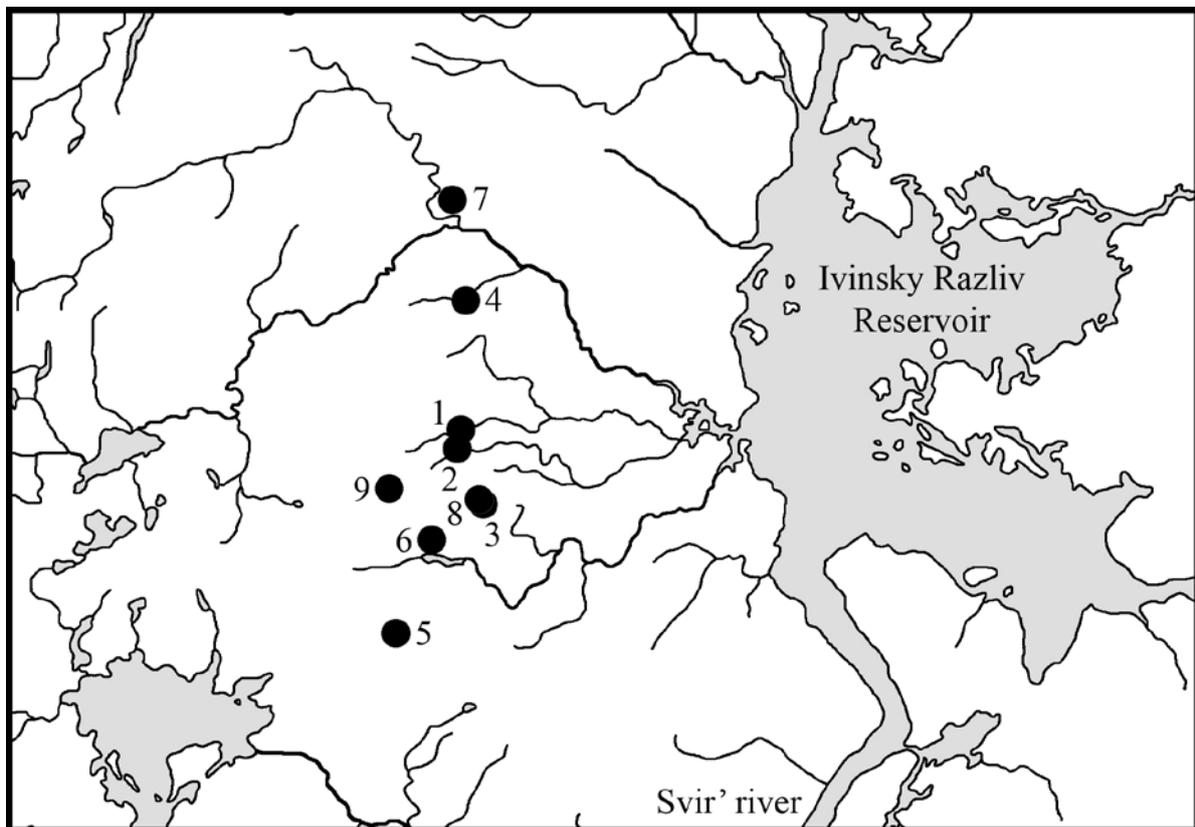


Fig. 3: A detailed map showing populations of *Epipogium aphyllum* that were recently discovered near Ivinsky Razliv Reservoir. Numbers of populations correspond to those given in tab. 3.

Especially numerous recent records of this plant were made in the northern part of Podporozh'ye District (Fig.3), where intensive botanical exploration of the territory was done since 2007 by Metsaliitto Forest Company with participation of the specialists from Saint-Petersburg State University, focused at the search of key habitats. Also several excursions of Saint-Petersburg Orchid Society (SPOS) in that region were conducted in 2008 and 2010. Thus, numerous findings of *Epipogium* in that area might indicate not only the unevenness of species' distribution, but also, in part, the consequence of intensive search. Favorable conditions here might be also due to the presence of old-aged forests and high diversity of edaphic conditions and relief (SOROKINA 2010).

Pskov and Novgorod Regions are situated nearer to the southern distributional limit of *Epipogium*, which, along with low floristic exploration comparing to Leningrad Region, results in only occasional localities of *Epipogium* there known to the date.

The complete list of localities in NW-Russia is the following:

LENINGRAD, PODPOROZH'YE: 28 km NW from Oshta (11.VIII.1971, TEPLYAKOVA et al. 633 – LECB); 6 km E from Barany (24.VIII.1976, TEPLYAKOVA et al. 692 – LECB); Vepssky Les Nature Park, kv.90 (4.VIII.1971, BORODINA, SOLOV'YOV 24 – LECB); Yuksovskoye lake (data from literature: PERTTULA 1944); upper reaches of Chaldoga riv. (data from literature: SOROKINA et al. 2009); Shcheleyki ([before 1890], GÜNTHER s.n. – H); 9 localities W from Ivinsky Razliv (2007-2010, numerous observations by SOROKINA, BUBYREVA, CHIRKOV, SHOROKHOV, SMAL', EFIMOV and others, partly summarized by SOROKINA et al. (2009)).

LENINGRAD, TIKHVIN: Nyurgovichi (19.VII.1894, KOLMOVSKY s.n. – LECB); Vepssky Les Nature Park, Karbonovye Ottorzheny area (data from literature: DORONINA 2010).

LENINGRAD, BOKSITOGORSK: Korvala (11.VIII.1971, MINYAEV et al. 224 – LECB); near Nungosha lake (12.VII.1995, SABEL'NIKOVA s.n. – LE); 6 km NE from Semenovskoye (12.VII.1998, IVANOV s.n. – LE); near Goriletskoye bog (data from literature: EREMEYEVA et al. 2002).

LENINGRAD, GATCHINA: Divenskaya (30.VIII.1978, ZAKHAROV s.n. – LECB); near Gatchina (27.VII.1857, [?KARPINSKY] s.n. – LE; VIII.1860, [MEINSHAUSEN] s.n. Herbarium Florae Ingricae exciccates No. 640 – LE, LECB, KFTA, H, HERZ, etc.; 21.VII.1907, [anonymous] 537 – LE); 7-8 km NW from Wyra (24.VII.1957, DOROFEYEV, TZVELEV s.n. – LE); Hinkolovo

(28.VII.1854, KARPINSKY s.n. – LE; VII.1855, [KARPINSKY] s.n. – LE; 17.VII.1856, KARPINSKY s.n. – LE; 15.VIII.1859, KARPINSKY s.n. – LE); Orolino (20.VII.1854, FALDERMANN s.n. – LE); Vayalovo (23.VII.1891, REGEL' s.n. – LE); Nikol'skoye [former Sivoritzzy] (VII.1857, [?RUPRECHT] s.n. – LE; VII.1872, [?MEINSHAUSEN] s.n. – LE; 24.VII.1893, [?MEINSHAUSEN] s.n. – LE); N from Mshinskoye bog (data from literature: AVERYANOV et al. 1996).

LENINGRAD, TOSNO: near Novolisino (29.VII.1954, TZVELEV s.n. – LE); Dragotino (8.VIII.1891, KOMAROV s.n. – LE); Lisino (1844, GRAFF s.n. – LE; 15.VII.1846, HERRATH s.n. – LE; 1851, GRÄULICH s.n. – LE; [before 1860], BORSZOW s.n. – LE; date unknown, LINDBLOM s.n. – LE).

LENINGRAD, LUGA: Natalyino (15.VII.1911, LITVINOV s.n. – LE, LECB); Shalovo (30.VII.1868, EVAL'D s.n. – LECB); Serebryanka (5.IX.1923, TZINSERLING 943 – LE); Krupeli (24.VII.1911, TZINSERLING s.n. – LE); upper reaches of Krupka riv. (14.VIII.1923, TZINSERLING 699 – LE); near the mouth of Krupel'ka river (observed by IVANENKO & VOLKOV betw. 1980 and 2000).

LENINGRAD, VYBORG: Chistopol'ye [former Ala-Urpala] (30.VII.1935, TOIVARI s.n. – H); Topol'ki [former Tietävälä] (8.VIII.1888, LINDEN s.n. – H; 9.VIII.1888, LINDEN s.n. – H); Topol'ki [former Laitila] (14.VIII.1888, LINDEN s.n. – S); village N from Svetogorsk [former Pel'kola] (14.VIII.1888, LINDEN s.n. – H; 17.VIII.1888, LINDEN s.n. – H; 24.VIII.1888, LINDEN s.n. – S).

SAINT-PETERSBURG, KURORTNYI: Levaschevo (VIII.1886, TRANSHEL' s.n. – LE; 13.VIII.1886, [?TRANSHEL'] s.n.; 11.VIII.1887 [?TRANSHEL'] s.n.; 10.VIII.1888, [?TRANSHEL'] s.n. – LECB; 20.VIII.1888, REGEL' s.n. – LE; 10.VIII.1889, TRANSHEL' s.n. – LE; 10.VIII.1890, TRANSHEL' s.n. – LE; 2.VIII.1898, PURING, TRANSHEL' s.n. – LE).

PSKOV, PALKINO: Poddubno (23.VII.1895, Puring s.n. – LE, KFTA); Gnil'skaya datcha (data from literature: Puring 1896).

NOVGOROD, PESTOVO: N from Pestovo (26.VII.1980, KRUPKINA et al. s.n. – LECB; 2.VIII.1980, KRUPKINA, ONIPKO s.n. – LE).

NOVGOROD, MALAYA VISHERA: Prokhonovo [former settlement] (VII.1916, FROMGOL'D-TREJ s.n. – LE).

Numerous herbarium collections made in different years from the same places indicate that *Epipogium* exhibits more or less typical populational structure in NW-Russia. The separate populations probably constitute of many individual plants and persist for more or less long time. The examples are the populations which were known at Lisino (there are data from 1844 up to 1851), Hinkolovo (1854-1859), Gatchina (1857-1907), Nikolskoye (1857-1893), Levaschevo (1886-1898) and the recently discovered locality near Ivinsky Razliv Reservoir

(2007-2010). Many of the localities listed probably served as classical places for regular excursions for the founders of botanical science in Saint-Petersburg. The decrease of such big populations, along with the obvious intensification of floristic research, indicates the decrease of the plant in the last 100 years.

Habitats

The major part of NW-Russia lies within southern taiga sub-zone (ALEKSANDROVA & YURKOVSKAYA 1989). The dominant forest communities here are represented by coniferous and mixed forests composed of *Picea abies*, *Pinus sylvestris*, *Betula pubescens* and *Populus tremula* in different alignments. Broad-leaved tree species (*Quercus robur*, *Tilia cordata* and *Ulmus laevis*) play an insignificant role in the forest plant communities, being represented in river valleys and slopes of the hills. The southernmost part of NW-Russia is attributed to mixed forest zone. Here the broad-leaved tree species appear also at the plain, although their role in the formation of forest vegetation remains very small. The northernmost part of NW-Russia (Karelsky Isthmus and north part of Podporozh'ye District) belong to the middle taiga, dominated by coniferous and mixed forests marked with complete absence of *Quercus robur* in the flora, and by other broad-leaved tree species usually do not overgrowing the shrub layer.

Epipogium in Russia grows mainly in southern taiga sub-zone, and, to a lesser extent, in the middle taiga. Here it occupies coniferous and mixed forests composed of different tree species. There are data that in NW-Russia *Epipogium* is a habitat specialist of biologically valuable forests which were not cut down for a long time (ANDERSSON et al. 2009). However the detailed analysis of the existing data on *Epipogium* localities and the observations in nature shows that it is more usually seen in mixed forests of younger age. The summary of ecological data taken from the herbarium labels, literature and personal observations is presented in table 1.

Data from table 1 confirm that the most typical habitat for *Epipogium aphyllum* in NW-Russia is a spruce forest. But since the data were taken mainly from herbarium labels bearing very short information on the subject, 'spruce' forest in some cases might indicate different kinds of forests with *Picea excelsa* as a dominant.

Tab. 1: The ecology of *Epipogium aphyllum* in NW-Russia based on herbarium data and literature (for references see the list of localities).

Habitat	Number of records
'Spruce' forest (<i>Picea abies</i>)	18
Mixed forest (<i>Picea abies</i> + <i>Populus tremula</i>)	14
Mixed forest (<i>Picea abies</i> + <i>Betula pubescens</i>)	5
Birch forest (<i>Betula pubescens</i>)	4
Aspen forest (<i>Populus tremula</i>) with <i>Picea excelsa</i> in understory	2
Spruce forest (<i>Picea abies</i>) with <i>Tilia cordata</i>	2
<i>Acer platanoides</i> grove	1
<i>Alnus glutinosa</i> forest	1
Forest clearing with young aspen and birch (<i>Populus tremula</i> + <i>Betula pubescens</i>)	1
'In pratis humidis' (data from an old herbarium label)	1

Consequently, percent of *Epipogium* findings in monodominant *Picea* forests might be overestimated. So *Epipogium* colonizes wide range of forest types at different stages of the succession from mixed or deciduous (with the dominance of aspen and birch) to spruce forests. However we hadn't enough material to decide whether *Epipogium* prefers the forests of younger age, or it was only more usually found there due to the rarity of old-aged forests.

Observations in nature in July 2010 in Podporozh'ye District had shown the similar results. All *Epipogium* localities discovered in 2007-2010 displayed different stages of succession from mixed to spruce forests, where birch and(or) aspen plays an important role in first tree layer but was completely absent both from the second tree layer and the understory (Fig. 5). The eldest forest where *Epipogium* occurred here was represented by mixed forest with spruce and aspen, where the age of the aspen trees was approximately 100-120 years. Here are the short descriptions of the vegetation showing typical plant communities occupied by *Epipogium* near Ivinsky Razliv Reservoir:

Tab. 2: Short characteristic of vegetation in 4 localities of *Epipogium aphyllum* (approx. 5 x 5 m plot in each case was described).

	Population 3	Population 8	Population 5	Population 6
<i>First tree layer, %:</i>				
<i>Betula pubescens</i>	60%	90%	-	-
<i>Picea excelsa</i>	40%	-	30%	-
<i>Populus tremula</i>	-	10%	70%	90%
<i>Pinus sylvestris</i>	-	-	-	10%
<i>Second tree layer and understory, %:</i>				
<i>Picea excelsa</i>	100%	100%	100%	100%
<i>Shrub layer:</i>				
<i>Sorbus aucuparia</i>	solitary shrubs	-	-	solitary shrubs
<i>Herb layer, projective cover:</i>				
<i>Convallaria majalis</i>	2%	3%	12%	20%
<i>Vaccinium myrtillus</i>	-	-	12%	20%
<i>Oxalis acetosella</i>	6%	< 1%	-	5%
<i>Calamagrostis arundinacea</i>	< 1%	< 1%	< 1%	5%
<i>Majanthemum bifolium</i>	< 1%	< 1%	3%	< 1%
<i>Rubus saxatilis</i>	< 1%	< 1%	-	< 1%
<i>Solidago virgaurea</i>	< 1%	-	< 1%	< 1%
<i>Dryopteris carthusiana</i>	< 1%	< 1%	-	-
<i>Pulmonaria obscura</i>	< 1%	< 1%	-	-
<i>Vaccinium vitis-idaea</i>	-	-	< 1%	< 1%
<i>Carex digitata</i>	< 1%	< 1%	-	-
<i>Viola riviniana</i>	< 1%	< 1%	-	-
<i>Orthilia secunda</i>	< 1%	-	-	-
<i>Trientalis europaea</i>	< 1%	-	-	-
<i>Goodyera repens</i>	-	-	< 1%	-
<i>Pyrola rotundifolia</i>	-	-	-	< 1%
<i>Lathyrus vernus</i>	-	< 1%	-	-
<i>Aconitum septentrionale</i>	-	< 1%	-	-
<i>Trollius europaeus</i>	-	< 1%	-	-
<i>Angelica sylvestris</i>	< 1%	-	-	-
<i>Moss layer, projective cover:</i>				
All species (mainly <i>Hylocomium splendens</i>)	< 1%	< 1%	5%	< 1%

Ecologically *Epipogium* tends to grow at the places with low projective cover. In the area just around *Epipogium* stems other species of vascular plants are usually completely absent. Population 6, with rather high projective cover (>30%) was represented by the only one stem.

Table 2 indicates that *Epipogium* sometimes was found in the habitats which are untypical for this plant species. The most prominent examples are clearing with aspen and birch, and a meadow. It is possible that the clearing was rather young, and still retained microniches with ecological conditions similar to that of the forest. Presence of *Epipogium* in the open meadow ('pratis humidis') is doubtful, and the plant was probably found somewhere at the edge of the forest or at the forest glade. Tab. 2 also shows some species characteristic for meadows in the habitats of *Epipogium* (as *Trollius europaeus*, which is a species characteristic for places where the trees might have been completely cut in the past).

Several times *Epipogium* stems were found on decayed wood. There are both herbarium records of such habitat ('on decayed stump') and our recent observations. Also the observations has shown that *Epipogium* stems tend to grow closer to tree trunks, which might be explained by the preferences of symbiotic fungi.

The population structure and dynamics

The ontogeny of *Epipogium aphyllum* remains insufficiently studied in many aspects. Mainly this is due to its long underground development, when the details of ontogenesis remain kept out of sight of researchers. The information on the ontogeny of this species was recently summarized (ROY et al. 2009). However it still remains dubious whether coralloid rhizome of this plant does wither after producing flower stem or not. We have dug out one whole plant in population 8, and the rhizome seemed to be dying, lacking sprouting root tips. Also an effort was done in order to locate the rhizome of the plant which flowered at the preceding year in population 5. The rhizome was not located, giving evidence of its complete or almost complete destruction. Long-term dynamics must be conducted in order to reveal the details of the ontogeny of this plant. Unfortunately regular monitoring in NW-Russia is problematic due to hard accessibility of all *Epipogium* localities known here to the date.

It is known for sure that vegetative reproduction plays an important role in the renewal of populations of this species. The vegetative reproduction is provided by thin stolons with small undifferentiated axillary buds (ROY et al. 2009) and

also by small apical fragments of stolons which might survive after flowering (TATARENKO 1996). Dense populations of *Epipogium aphyllum*, registered several times within NW-Russia as well as in other places (for example, see KOPYLOV-GUS'KOV et al. 2005) are probably formed both by the means of vegetative reproduction and sexual process.

The majority of populations discovered near Ivinsky Razliv Reservoir were small (tab. 3). The biggest population included 27 flowering plants with 68 stems (groups of stems were formally supposed to be formed by one rhizome if clustered together within 20 sq. cm). High polymorphism of the coloration of flowers in this population affirms the sufficient role of sexual reproduction in its preservation.

Tab. 3: A short characteristic of the populations discovered in 2007-2010 near Ivinsky Razliv Reservoir (stems growing within 20 sq. cm. were formally considered as one plant).

Population number	Discovered in...	Number of plants / number of stems	
		When discovered	Revisiting in 2010
1	2007	3/7	1/1
2	2007	1/2	0 (probably plants disappeared after inundation caused by beavers)
6	2007	1/1	1/1
9	2007	1/1	no data (the locality not found)
3	2008	3/9	2/15
4	2008	3/15	27/68
5	2009	14 /ca.50	0
7	2010	1/3	
8	2010	7/21	

Sometimes *Epipogium aphyllum* produces dense populations which constitute of big numbers of stems. The best known example is a population at Kem'-Ludy Archipelago, where 80 – 150 generative shoots were observed in 2002-2004 (KOPYLOV-GUS'KOV et al. 2005). In part, this might be a consequence of

vegetative spread by stolons in favorable conditions. In NW-Russia, the similar huge populations, consisting of more than 100 stems were discovered in 1980 near Pestovo (KRUPKINA & SMEKALOVA, pers. comm.) and in Podporozh'ye District by TEPLYAKOVA (pers. comm.). Some populations discovered in XIX century probably consisted of hundreds of flowering stems too, although we have no undoubtful data from that time. Probably, many specimens were found in Gatchina by MEINSHAUSEN, which enabled him to collect enough material for publication of the herbarium exsiccates "Herbarium Florae Ingricae" (*Epipogium* was issued under no. 640).

The seed productivity is low. Productivity as much as 37%, recorded once at Kem'-Ludy Archipelago (TATARENKO 1996) should be viewed as high value for this species.

Within NW-Russia *Epipogium* appears above ground only in July. The flowering period lasts from the end of July up to the first half of the august, although solitary specimens might produce flowers as late as in September, as recorded in population 5 in 2009 (observation by I. SOROKINA).

The Saint-Petersburg Orchid Society undertakes the revisitations of the places, where *Epipogium* was seen more or less recently. The localities at the mouth of Krupel'ka River and near Pestovo were revisited in 2007 and 2009, respectively, but the specimens were not found despite purposive search for many days. The search will be continued. Nowadays, the vicinities of the Ivinsky Razliv Reservoir remain the only place in NW-Russia where *Epipogium* could be found for sure.

The investigation of the dynamics of *Epipogium aphyllum* within NW-Russia doesn't show high decreasing trend, as many other orchid species on the considered territory (EFIMOV 2010). Its general decrease was confirmed with probability 90-95%. This might indicate either the consequence of insufficient data (the significance is low for species which were registered in small numbers of localities, as *Epipogium*), or the true situation. However in Pskov Region, where it was recorded only twice, this species is thought to be extinct (EFIMOV & KONETCHNAYA 2007), as it was not found there since 1895.

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Fig. 6: *Epipogium aphyllum*, habit of the plant, Leningrad Region, Podporozh'ye District, near Ivinsky Razliv, population 3, 30.07.2010 (phot. P. Efimov).

Fig. 7: *Epipogium aphyllum*, habit of the plant, Leningrad Region, Podporozh'ye District, near Ivinsky Razliv, population 8, 30.07.2010 (phot. P. Efimov).

Fig. 8: *Epipogium aphyllum*, habit of the plant, Leningrad Region, Podporozh'ye District, near Ivinsky Razliv, population 4, 28.07.2010 (phot. P. Efimov).

Fig. 9: *Epipogium aphyllum*, habit of the plant, Leningrad Region, Podporozh'ye District, near Ivinsky Razliv, population 4, 28.07.2010 (phot. P. Efimov).



Fig. 4: The variability of perianth coloration in *Epipogium aphyllum* from the populations near Ivinsky Razliv Reservoir, 28. and 30.07.2010 (phot. PE).



Fig. 5: Forest with *Picea excelsa* and *Betula pubescens*, a typical habitat of *Epipogium aphyllum* (population 8), 30.07.2010, (phot. P. Efimov).

