| 部門 | 本研究の目的は、北海道と樺太島の動植物の多様性を調査し、それらの保全に向けた取り組みを図ることである。北海道と樺太島の特殊な野生生物の多様性を示すため、動植物の種類を可能な限り詳しく記録し、その分布を特定することで、将来の調査や保全策の立案に役立つ情報を提供する。
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Additions to Chromosome Numbers for Vascular Plants from Sakhalin and the Kurile Islands (1)

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Abstract As a supplement to chromosome information published in the book entitled “Caryology of the flora of Sakhalin and the Kurile Islands” (Probatova, Barkalov, Rudyka 2007), the chromosome numbers for 57 vascular plant species from Sakhalin and the Kurile Islands (44 genera, 21 families), are presented here. Twenty-two species were added to the Annotated list in the book mentioned above. Chromosome numbers are reported for the first time in the following six species: Cardamine sachalinensis, Elymus franchetii, Minuartia barkalovii, Oxytropis calcarorum, Persicaria extremiorientalis, Popoviocodonia stenocarpa (the first chromosome information for the genus Popoviocodonia). Additionally, new cytotypes are revealed in three species: Lathyrus pilosus, Oxytropis hidakamontana, and Potentilla matsumurae.

Key words: chromosome numbers, vascular plants, Sakhalin, the Kurile Islands, taxonomy, phytogeography

Introduction

This is our first contribution since the publication of the book “Caryology of the flora of Sakhalin and the Kurile Islands. Chromosome numbers, taxonomic and phytogeographical comments” (Probatova et al. 2007). The book is the first of a series devoted to studies on chromosome numbers in the flora of individual subregions of the Russian Far East. The book contains the chromosome numbers data for 536 vascular plant species that were studied on Sakhalin, Moneron and (or) on the Kurile Islands. During the caryological studies of the island flora that have been underway since 1960 we obtained information for: 356 species from Sakhalin (23.4 % of the total number of vascular plant species), 257 species from the Kuriles (18.4 % of the total vascular flora), and 48 species from Moneron Island. The chromosome number data are accompanied with information on ecology and phytogeography, as well as species distribution on the islands. For many species, caryotaxonomic and phytogeographical comments are also given. Chromosome numbers were considered in the context of available global species data. For 184 plant species, the chromosome numbers were obtained from natural protected areas. Among the leading families of the flora studied, the greatest number of species (98 spp.) are from Poaceae; among them, the prevalence of polyploids (72 %, against 28% of diploids) is revealed. On the contrary, in the next largest family, Asteraceae (65 spp. studied), the prevalence of diploids is pronounced (57%, against 43% of polyploids). Chromosome numbers from the majority of species are constant, and only a few species are characterized by intraspecific polymorphism. In some groups, isolation of the insular populations is expressed to a greater or lesser degree. A second book, with chromosome numbers for the flora of the continental part of the Sea of Japan area and the islands of Peter the Great Bay (the Primorsky Territory), is now in the process of compilation.

This paper contains new chromosome counts on the vascular plants from the Kurile Islands and Sakhalin. Three papers have been published in Japan since 2000 (Probatova et al. 2000a), two of them were in the series “Biodiversity and Biogeography of Kuril Islands and Sakhalin”, vols. 1 and 2 (Probatova et al. 2004a; Probatova et al. 2006a). In the present paper, chromosome counts for 57 species are given. For six species there was no previously published information on the chromosome numbers, and for three species new chromosome numbers (new cytotypes) are reported.
Materials and Methods

Counts were primarily made by E.G. Rudyka (R.), with assistance from Z.V. Kozehevnikova (K.), on squashed preparations of root tips fixed with Carnoy’s solution. The root tips were taken from seedlings grown from seeds obtained from herbarium specimens, which were collected by V.Yu. Barkalov. Preparations were stained with iron hematoxylin. First counts are indicated with an asterisk (*). Introduced (alien) species are indicated with a (+). Voucher specimens are preserved in the Herbarium VLA, Vladivostok. The plants were identified by V.Yu. Barkalov. The plant names and geographical distribution of the species studied are, in most cases, given according to "Vascular Plants of the Soviet Far East", Vols. 1–8 (Kharkevich 1985–1996), Cherepanov (1995), and "Flora of the Russian Far East. Addenda et corrigenda ..." (Kozhevnikov and Probatova 2006). For some species, new data on island distributions were provided by Barkalov. The species notes and manuscript, including English translation, were prepared by N.S. Probatova.

Annotated List of Plants with Chromosome Numbers Studied

FAMILY APIACEAE

1. *Kitagawia terebinthacea* (Fisch. ex Spreng.) M. Pimen.
   *Peucedanum terebinthacea* (Fisch. ex Spreng.) Ledeb.; *P. detoilidum* Makino et Yabe; *P. paishanense* Nakai
   Chromosome number. 2n=22 (K.).
   Voucher specimen. VLA 10868, Kuriles, Shikotan Island, Del’fin Bay, on the rocks, 31.VIII. 2007, coll. V. Barkalov.
   Distribution. Sakhalin, South Kuriles; South of the Russian Far East, East Siberia; China, Korea, Japan. Mountains, coastal rocks.
   Note. This species was studied in the Amur R. basin, in the Primorsky Territory, as well as in China, Korea and Japan: everywhere 2n=22, under different species names (see Bolkhovskikh et al. 1969; Goldblatt 1981, 1988; Agapova et al. 1990; Goldblatt and Johnson 1994, 2003).

FAMILY ASTERACEAE

2. *Arctium tomentosum* Mill.
   Chromosome number. 2n=36 (R.).
   Distribution. Sakhalin, South Kuriles; Eurasia (but introduced in the Russian Far East).
   Note. The chromosome number in *A. tomentosum* has not been studied in the Kuriles before. It was previously known from the environs of Vladivostok (2n=36 – Probatova et al. 1991). Many authors give the same chromosome number (2n=36) for *A. tomentosum* (see Bolkhovskikh et al. 1969; Goldblatt 1981, 1984, 1985, 1988; Agapova et al. 1990; Goldblatt and Johnson 1990, 1994, 2003, 2006).

   Chromosome number. 2n=38 (R.).
   Voucher specimen. VLA 10847, Kuriles, Shikotan Island, Notoro Mt., meadow near the top of the mountain, 25.VIII. 2007, coll. V. Barkalov.
   Note. The chromosome number (2n=38) in *A. unalaschcensis* was also studied from Simushir, Urup and Iturup Islands (Probatova et al. 2000a, 2007). It was studied much earlier on Bering Island, the Commander Islands (Sokolovskaya 1968). Also 2n=38 and 2n=c.40 have been reported from Japan (see Bolkhovskikh et al. 1969; Nishikawa 1986).

   Chromosome number. 2n=20 (R.).
   Voucher specimen. VLA 10846, Kuriles, Shikotan Island, Del’fin Bay, on the rocks, 31.VIII. 2007, coll. V. Barkalov.
   Distribution. Sakhalin (south), South Kuriles; Japan. Forest edges, bush.
   Note. This species has been studied in Japan (2n=20 – Kawano 1961; Watanabe et al. 1990).

5. *Leontopodium kurilense* Takeda
   Chromosome number. 2n=26 (R.).
   Voucher specimen. VLA 10844, Kuriles, Shikotan Island, Shikotan Mt., on the rocks, 23.VIII. 2007, coll. V. Barkalov.
   Distribution. South Kuriles (Iturup and Shikotan Islands). Endemic. Mountains, coastal rocks.
   Note. In the literature, we found only one report for this species: 2n=26 (Sakai 1934). The chromosome number 2n=48 for “*L. kurilense*”, from Chukotka and from the south of Magadansky Region, Nagayevoyo Bay (see Agapova et al. 1990), as well as 2n=52 – from Anujskoye Plateau (Zhukova and Petrovsky 1987), belong to other species, but not to *L. kurilense*, because the latter does not occur there, according to Barkalov (1992). *L. kurilense* was described from Shikotan Island.

   Chromosome number. 2n=18 (R.).
   Distribution. Sakhalin, Moneron, Kuriles; East Asia, North America; expanded throughout the world as alien.
   Note. We obtained the chromosome number (2n=18) for *L. suaveolens* on Moneron Island and from the Lower Amur R. basin (Probatova and Sokolovskaya 1990; Probatova et al. 2007). There is the only one chromosome number for this species in the literature,
sometimes reported under different species names: Matricaria matricarioides (Less.) Porter, M. discoidea DC. etc. (see Bolkhovskikh et al. 1969; Goldblatt 1981, 1984, 1988; Agapova et al. 1990; Goldblatt and Johnson 2003).

7. Picris japonica Thunb.
   Chromosome number. 2n=10 (R.).
   Distribution. Sakhalin, South Kuriles; the Amur River basin (downstream from Khabarovsky), the Primorsky Territory; Korea, Japan. Meadows.
   Note. The species has been thoroughly investigated in the Russian Far East: its chromosome number (2n=10) is known from Sakhalin, Moneron and the Kuriles, Anuchina Island (Probata et al. 2007), as well as from Primorsky Territory and Amur R. basin, in China and Japan (see Bolkhovskikh et al. 1969; Agapova et al. 1990; Goldblatt and Johnson 1991, 1998, 2006).

Family BRASSICACEAE

8. Solidago dahurica Kitag. (? S. decurrens Lour.)
   Chromosome number. 2n=18 (K.).
   Voucher specimen. VLA 10871, Kuriles, Shikotan Island, the middle course of Gorobets R., meadow on the slope, 5. IX. 2007, coll. V. Barkalov.
   Distribution. Sakhalin, South Kuriles; Far East, Siberia. Forests and wetlands.
   Note. This species was studied in Sakhalin and in the Primorsky Territory, also there were many reports of its chromosome number (2n=18) from East Siberia (see Agupova et al. 1990; Probata et al. 2007).

   Chromosome number. 2n=32 (R.).
   Voucher specimen. VLA 10808, Kuriles, Shikotan Island, Zvezdnaya Bay, maritime slope, near the stream, 30.VIII. 2007, coll. V. Barkalov.
   Distribution. Sakhalin, Kuriles; North Pacific. Moist meadows, along the streams.
   Note. Chromosome number (2n=32) in C. regeliana was reported recently from the Kuriles (Simushir, Kharimkotan, Brat Chirpojev Islands) in Probata et al. (2007). This species has also been studied from Kamchatka and Sakhalin (see Agapova et al. 1990). We have not found more chromosome reports for C. regeliana in the literature; perhaps they were under “C. scutata Thunb.” (e.g., 2n=32 – in Lihová and Kučera 2007, from Japan).

10. Cardaminopsis schizalensis Miyake et Miyake
    Chromosome number. 2n=32* (R.).
    Voucher specimen. VLA 8880, Sakhalin, Vostochno-Sakhalinsky Mts., Nabilijsky Range, Chamginsky Pass, the spot elevation “1511 m”, along the rivulet, in moss community, 8. VIII. 2002, coll. V. Barkalov.
    Distribution. Sakhalin; endemic. Montane meadows, near the streams.
    Note. This specimen was misidentified as C. yezoensis Maxim. in Probata et al. (2007), as has now been established by V.Yu. Barkalov. C. sachalinensis was reported in the Russian Far East by Woroshilov (1982). There was no previous chromosome information for C. sachalinensis.

11. Cardamine sp.
(� C. appendiculata Franch. et Savat.)
   Chromosome number. 2n=16* (R.).
   Voucher specimen. VLA 10432, Kuriles, Kunashir Island, the nature reserve “Kurilsky”, Ozernaya R., on the slope, near the waterfall, 9. IX. 2006, coll. V. Barkalov.
   Distribution. South Kuriles (Kunashir Island). Only known hitherto in the locality indicated above.
   Note. The plants, collected in autumn, had half-dry stems without seeds (crumbled). Plants appeared to be ready for dormancy and were almost lying on the surface of the moist soil (mellkozem) with thick (up to 8 mm) green rhizome-like stems (10–15 cm long), and small rosettes of very small leaves in the place of the buds. From these “rhizomes” we cultivated plants in the greenhouse in Vladivostok, and Barkalov wrote the following short description. Stems in lower part, as well as the leaves, pubescent, leaflets in 2–3 pairs, sessile, ovoid, sparse pubescent, edge dentate, the last leaflet not larger than the lateral ones. Flowers white, petals ca. 7 mm long. It might represent a distinct species, as was mentioned by Woroshilov (1982) in his Note to C. yezoensis Maxim., however it is hardly a close relative of C. schizalensis O.E. Schulz, and is (most probably) more closely related to C. appendiculata Franch. et Savat., distributed in Japan (Honshu). Further study of these plants is needed.

   Chromosome number. 2n=16 (R.).
   Voucher specimen. VLA 10807, Kuriles, Shikotan Island, Zvezdnaya Bay, maritime slope, at the stream, 30.VIII. 2007, coll. V. Barkalov.
   Note. The chromosome number (2n=16) was known earlier for C. lyrata from North Sakhalin (Schmidt Peninsula) and from the Kuriles, Urup Island (Probata et al. 2006a, 2007). The species has also been studied in Chukotka, Kamchatka and near Magadan, Koni Peninsula, under different names: Arabidopsis lyrata subsp. kantschatica (Fisch. ex DC.) O’Kane et Al-Shehab; Arabis lyrata L.; A. kantschatica (Fisch.) Ledeb. However, the authors report two chromosome numbers (two ploidy levels) – 2n=2x =16 and 2n=4x =32, from North America – 2n=16 (see Bolkhovskikh et al. 1969; Ornduff 1968; Goldblatt 1984, 1985; Agapova et al. 1990; Goldblatt and Johnson 2003). The geographical distribution of
these two cytotypes in *C. lyrata* seems to be of great interest.

13. **Draba kurilensis** (Turcz.) Fr. Schmidt (Draba borealis auct., p.p.)

Chromosome number. 2n=32 (R).

Voucher specimen. VLA 10863, Kuriles, Shikotan Island, Del’fin Bay, on the rocks, 31.VIII. 2007, V. Barkalov.

Distribution. Sakhalin, Kuriles; Japan. Sea coasts, on the rocks.

Note. *D. kurilensis* with 2n=16 (2x) was known from Sakhalin, and with 2n=32 (4x) – from Moneron and the Kuriles: Matua and Shiashkotan Islands (see Agapova et al. 1990; Probatova et al. 2004a, 2006a, 2007). This species belongs to the North Pacific complex *D. borealis* aggr., and some authors do not recognize *D. kurilensis* as a species. However, very high chromosome numbers have been reported for *D. borealis* s str.: 2n=64 (8x) from East Chukotka, 2n=80 (10x) – from North America (see Bolkhovskikh et al. 1969; Agapova et al. 1990). We believe the chromosome numbers provide additional reasons to consider *D. kurilensis* as a separate species, one that occupies a more ancient part of the *D. borealis* aggr. area of distribution (Probatova et al. 2007). It is noteworthy that the ploidy levels in *D. borealis* aggr. rise to the north. Typically, *D. kurilensis* occurs in the South Kuriles. The geographical distribution of cytotypes within *D. borealis* aggr. needs to be clarified.

14. **Draba ussuriensis** Pohle

Chromosome number. 2n=16 (R).

Voucher specimen. VLA 10586, Sakhalin, Poronaysky District, Vostochno-Sakhalinskore Mts., Vaidja Mt., the upper course of Vitnitsa R., near the limestone rocks, 20.VIII. 2006, V. Barkalov.


Note. *D. ussuriensis* is poorly investigated cytologically. There were only two chromosome reports, both from the environs of Magadan city, the coast of the Sea of Okhotsk: 2n=16 (under “*D. villosula* Tolm.”) and 2n=32 (see Agapova et al. 1990). The diploid cytotype found in Sakhalin is probably a relict.

**FAMILY CAMPANULACEAE**

15. **Popoviocodonia stenocarpa** (Trautv. et C. A. Mey.) Fed. (P. nyetome Kudo; *Campanula stenocarpa* Trautv. et C. A. Mey., C. nyetome (Kudo) Miyabe et Tatew.)

Chromosome number. 2n=34* (R).

Voucher specimen. VLA 10600, Sakhalin, Vostochno-Sakhalinskore Mts., Nabiljsky Range, the environs of Chapmignsky Pass, the spot elevation “1511 m”, stony slope, near the ridge of watershed, ca. 1400 m above sea level, tundra vegetation, 15. VIII. 2006, V. Barkalov, V. Yakubov.

Distribution. Sakhalin; Sea of Okhotsk area (south), Sikhote-Alinj Mts. Mountain tundras, rocks.

Note. There was no chromosome information for this species in the literature. The genus *Popoviocodonia* is monotypic, and it is endemic to the Russian Far East. The diploid chromosome number 2n=34 (2x) is also common for many species of the related genus *Campanula* L.

**FAMILY CARYOPHYLLACEAE**

16. **Dianthus superbus** L.

Chromosome number. 2n=30 (K.)

Voucher specimen. VLA 10853, Kuriles, Shikotan Island, meadow on the stony slope, 23.VIII. 2007, V. Barkalov.

Distribution. Sakhalin, South Kuriles; Eurasia. Stony slopes and meadows.

Note. The very polymorphic species *D. superbis* was studied from Moneron Island, 2n=30 (Probatova et al. 2007) and from the Khabarovskiy Territory, Botchinsky nature reserve, 2n=30 (Probatova et al. 2006c). Most authors report 2n=30 for *D. superbis*, e.g., from Siberia, as well as from Japan, Hokkaido (Nishikawa 1985) and from Korea (Lee 1967), but sometimes 2n=60 and 90 are also reported (see Bolkhovskikh et al. 1969; Agapova et al. 1990; Goldblatt 1981, 1985, 1988; Goldblatt and Johnson 1990, 1991, 1996, 2000, 2003).

17. **Minuartia barkalovii** N.S. Pavlova (M. arctica auct.)

Chromosome number. 2n=26* (K.)

Voucher specimen. VLA 10835, Kuriles, Iturup Island, Stokap volcano, on volcanic scoria slide-rocks near the top, 11.VIII. 2007, coll. V. Barkalov.

Distribution. Sakhalin, South Kuriles; Japan (?). Stony slopes and rocks in the mountains.

Note. *M. barkalovii* was described by Pavlova (1996) from the Stokap volcano on Iturup Island. We studied its chromosome number in the “locus classicus” of the species. *M. barkalovii* is related to *M. arctica* (Ste. ex Ser.) Graebn.: for *M. arctica* 2n=22, 26, 38, 52 are known, from Siberia (see Agapova et al. 1990).

18. **Minuartia verna** (L.) Hiern

Chromosome number. 2n=24 (R.)

Voucher specimen. VLA 10591, Sakhalin, Vostochno-Sakhalinskore Mts., Nabiljsky Range, near Chapmignsky Pass, the spot elevation “1511 m”, mountain tundra belt, on the rocks, 15. VIII. 2006, coll. V. Barkalov, V. Yakubov.


Note. This is the second chromosome count for *M. verna* in the Russian Far East (and in Sakhalin). The first one was made from the Schmidt Peninsula (2n=24 – Probatova et al. 2004a). There is a series of chromosome numbers within this species reported in the international literature: 2n=24, 26, 48, 78, 120 (see Bolkhovskikh et al. 1969; Goldblatt 1981, 1984,
19. Atriplex subcordata Kitag.

Chromosome number. 2n=26 (R.).

Voucher specimen. VLA 10824, Kuriles, Shikotan Island, Tserkovnaya Bay, sandy seashore, 2.IX.2007, coll. V. Barkalov.

Distribution. Sakhalin (north), Kuriles; North Pacific area. Coastal rocks.

Note. This is the second chromosome count for S. ruscifolia from the Kuriles. The first one was made from Ekmarn Island (2n=26 – Probatova et al. 2000a). The same chromosome number 2n=26 is known in S. ruscifolia from the environs of Magadan, in the Sea of Okhotsk (Zhukova and Petrovsky 1987). However, 2n=c.50 has been reported for S. ruscifolia from North America (see Bolkhovskikh et al. 1969), this probably is 2n=52.

FAMILY CHENOPODIACEAE

20. Atriplex subcordata Kitag.

(A. gmelinii auct., p.p.)

Chromosome number. 2n=36 (R.).

Voucher specimen. VLA 10824, Kuriles, Shikotan Island, Tserkovnaya Bay, sandy seashore, 2.IX.2007, coll. V. Barkalov.

Distribution. Sakhalin, Kuriles; North Pacific area. Coastal rocks.

Note. This is the first chromosome count for A. subcordata from the Kuriles. Earlier we reported 2n=36 for A. subcordata from Sakhalin (Probatova et al. 2006a). Two chromosome numbers (two ploidy levels) were published for A. subcordata from Japan, 2n=36 (see Bolkhovskikh et al. 1969) and 2n=54, from Hokkaido (Nishikawa 1981). Later, Nishikawa (1986) reported 2n=36 for “Atriplex gmelinii” from Hokkaido. In the Primorsky Territory, 2n=36 was also known in A. subcordata (Probatova and Sokolovskaya 1990). A. subcordata has more of a distribution in the southern area than A. gmelinii C. A. Mey. According to Ignatov (1988), in the South Kuriles and Primorsky Territory only A. subcordata occurs. The existence of hexaploid cytotype 2n=54 in A. subcordata needs more evidence.

21. Chenopodium glaucum L.

Chromosome number. 2n=18 (R.).


Distribution. Sakhalin (south), South Kuriles; nearly cosmopolitan.

Note. Ch. glaucum is well studied caryologically, as shown in the international literature, and is reported almost everywhere as 2n=18 (see Bolkhovskikh et al. 1969; Goldblatt 1981, 1985, 1988; Agapova et al. 1990; Goldblatt and Johnson 1991, 1994, 1998, 2000, 2003, 2006); only once was 2n=36 reported (see Goldblatt 1984).

FAMILY FABACEAE

22. Lathyrus japonicus Wild.

(L. maritimus auct.)

Chromosome number. 2n=14 (R.).

Voucher specimen. VLA 10861, Kuriles, Shikotan Island, Zvezdnaya Bay, maritime slope, meadow, 30.VIII.2007, coll. V. Barkalov.

Distribution. Sakhalin, Kuriles; North Pacific area. Coastal rocks.

Note. The chromosome number in L. japonicus (2n=14) was studied from Sakhalin, Kamchatka, Kuriles; North Koryakia, the Primorsky Territory, Japan and elsewhere (see Bolkhovskikh et al. 1969; Goldblatt 1988; Agapova et al. 1990; Goldblatt and Johnson 1991, 1994, 2003, 2006; Probatova et al. 2007).

23. Lathyrus pilosus Cham.

(L. palustris var. pilosus (Cham.) Ledeb.)

Chromosome number. 2n=56* (R.).

Voucher specimen. VLA 10814, Kuriles, Shikotan Island, Anamka R., along the edge of a moist meadow, 5.IX.2007, coll. V. Barkalov.

Distribution. Sakhalin, Kuriles; Russian Far East; Siberia; Arctic and East Europe, China, Japan, North America. In damp forests and wetlands.

Note. L. pilosus belongs to a small group, L. palustris agg., peculiar because of its rather frequent polyploidy, which is not common at all for the genus Lathyrus L. The most frequent variables in the polymorphic species L. pilosus are hairiness and width of the leaflets (Pavlova 1989). Plants from Sakhalin and the South Kuriles, with broad leaflets (up to 15 (23) mm wide), have been described as L. miyabei Matsum. (L. pilosus var. miyabei (Matsum.) Hara). For L. pilosus and L. palustris (the latter is absent in the Russian Far East), beside 2n=14 (many reports), several authors give 2n=42, mostly under the name “L. palustris var. pilosus”, and from various parts of its area of distribution including: Finland, Slovakia, China, Japan, North America (see Bolkhovskikh et al. 1969 – for “L. palustris”; Goldblatt 1981, 1988; Goldblatt and Johnson 1991, 1998, 2006). There is a paper on hexaploid L. palustris (Khwaja et al. 1995), where it is considered as a natural autohexaploid. We revealed for the first time a new, octoploid (8x) cytotype in L. pilosus (L. palustris agg.). The taxonomic status of L. miyabei requires revision.

24. Oxypotis calcareaorum N. S. Pavlova

Chromosome number. 2n=32* (R.).

Voucher specimen. VLA 10583, Sakhalin, Poronaysky District, Vostochno-Sakhalinsky Ms., Vaida Mt., the upper course of Vitnitsa R., near the limestone rocks, 20.VIII.2006, coll. V. Barkalov.


Note. Previously, no chromosome information existed for this species. According to Pavlova (1989),

*(O. retusa auct., p. p.)*

**Chromosome number.** 2n=64* (R.).

**Voucher specimens.** VLA 10800, Kuriles, Shikotan Island, Shikotan Mt., rocks in the top of the mountain, 8. IX. 2007, coll. V. Barkalov; VLA 10802, Kuriles, Shikotan Island, Notoro Mt., near the top of the mountain, on the rocks, 24. VIII. 2007, coll. V. Barkalov.

**Distribution.** South Kuriles; Japan. Stony slopes, coastal rocks.

*Note.* Only one chromosome report for this species existed, 2n=16, in Pavlova *et al.* (1989). It is also from Shikotan Island (Gorobets Bay, near Krabozavodsk). It was previously published as "*Oxytropis retusa*", in Gurzenkov and Pavlova (1984). We have now received two specimens (from two different mountains) that are not diploid, but octoploid (8x), with chromosome number 2n=64. According to Pavlova (1989), the plants from the South Kuriles do not agree well with *O. hidakamontana*, and they might belong to a separate species. The situation with these plants in Shikotan Island needs to be clarified, and further chromosome studies on this group are also needed.


**Chromosome number.** 2n=16 (R.).


**Distribution.** Sakhalin (north and east). Endemic. Mountain tundras, meadows and rocks.

*Note.* The chromosome number in *O. sachalinensis* was counted previously on Sheltinga Cape, Sakhalin (east), 2n=16 (Probatova *et al.* 2006a). This species is a relative of *O. ajanensis* (Regel et Til.) Bunge (Pavlova 1989), which also has 2n=16 (Yurtsev and Zhukova 1972).

**FAMILY GERANIACEAE**

28. *Geranium erianthum* DC.

**Chromosome number.** 2n=28 (R.).


**Distribution.** Sakhalin, Kuriles; North Pacific area. Meadows.

*Note.* This species was studied from Shumshu Island: 2n=28 (Probatova *et al.* 2000a), as well as from Chukotka and from North America. 2n=30 was reported in Japan (see Bolkhovskikh *et al.* 1969; Goldblatt 1984; Agapova *et al.* 1990).

**FAMILY HEMEROCALLIDACEAE**

29. *Hemerocallis yezoensis* Hara

**Chromosome number.** 2n=22 (R.).

**Voucher specimen.** VLA 10448, Kuriles, Kunashir Island, Sea of Okhotsk coast, near the mouth of Ozernaya R., marine terrace, grass meadow, 6.IX. 2006, coll. V. Barkalov.

**Distribution.** South Kuriles (Kunashir Island); Japan. Meadows on sea coasts.

*Note.* The chromosome number for *H. yezoensis* (2n=22) was determined from Japan (see Bolkhovskikh *et al.* 1969; Goldblatt and Johnson 1991).

**FAMILY HYPERICACEAE**

30. *Hypericum kamtschaticum* Ledeb. *(H. paramushiriense Kudo)*

**Chromosome number.** 2n=16 (R.).

**Voucher specimen.** VLA 10653, Kuriles, Kunashir Island, north-east part, the caldera of Tyatyu Volcano, meadow, 14.IX.2006, coll. V. Barkalov.

**Distribution.** Kuriles; West Pacific area. Mostly sea coasts (rocks and meadows).

*Note.* This species is poorly studied. Its chromosome number was hitherto known only from Japan: 2n=16 (Kogi 1984; Nishikawa 1985). The same chromosome number 2n=16 has also been revealed in two relative species: *H. yezoensis* Maxim., from Moneron Island, and *H. attenuatum* Choisy, from the south of the Primorsky Territory (see Agapova *et al.* 1990; Probatova *et al.* 2004a; Probatova *et al.* 2006b).


**Chromosome number.** 2n=16 (K.).

**Voucher specimen.** VLA 10860, Kuriles, Shikotan Island, Zvezdnaya Bay, maritime stony slope, meadow, 30.IX.2007, coll. V. Barkalov.

**Distribution.** Sakhalin (south), South Kuriles; Japan. Rocks and meadows.

*Note.* The chromosome number in *H. yezoense* was studied for the first time not long ago, on Moneron Island: 2n=16 (Probatova *et al.* 2004a).

**FAMILY JUNCACEAE**

32. *Juncus bufonius* L.

**Chromosome number.** 2n=34 (R.).

**Voucher specimen.** VLA 10870, Kuriles, Shikotan Island, Del’fin Bay, sand banks by the lakeside, 31.VIII. 2007, coll. V. Barkalov.

**Distribution.** Sakhalin, Kuriles; Holarctic (as alien – in South America and Australia). Sandbanks, uliginose banks.

*Note.* The species was previously studied in the South Kuriles, Kunashir Island: 2n=50, 54, 56 (Probatova *et al.* 2000a). From Chukotka, 2n=34 and 52 were reported (Zhukova and Petrovsky 1987; Agapova *et al.* 1990). This is a very polymorphic species, with 2n=30, 34, 52, c.60, c.70, 80, c.100, 106,

FAMILY LAMIACEAE

33. +Galeopsis tetrahit L.
   Chromosome number. 2n=32 (R.).
   Voucher specimen. VLA 10787, Kuriles, Shikotan Island, Zvezdnaya Bay, sea shore, near the rivulet, 29.VIII. 2007, coll. V. Barkalov.
   Distribution. South Kuriles (Shikotan Island); Europe; as alien – in the Primorsky Territory (near Vladivostok, very rare) and in North America.

Note. This species is reported for the first time from the Kuriles. There are many reports of 2n=32 for G. tetrahit in the literature (see Bolkhovskikh et al. 1969; Goldblatt et al. 1981, 1984, 1985, 1988; Goldblatt and Johnson 1991, 1998, 2000, 2003), but 2n=30 was found once from Baikal Siberia (see Agapova et al. 1990) which, most probably, is incorrect.

FAMILY ONAGRACEAE

34. Epilobium fastigiato-ramosum Nakai
   Chromosome number. 2n=36 (R.).
   Voucher specimen. VLA 10854, Kuriles, Shikotan Island, Zvezdnaya Bay, marine terrace, small bog with herbs and mosses, 30.VIII. 2007, coll. V. Barkalov.
   Distribution. South Kuriles (Shikotan Island, first report for the Kuriles!); south of the Russian Far East; South Siberia; Mongolia, China, Korea, Japan. Forest edges, wetlands.

Note. We only found one chromosome report in the literature for E. fastigiato-ramosum, from China (2n=36, Chen C.-J. et al. 1992).

35. +Oenothera biennis L.
   Chromosome number. 2n=14 (R.).
   Distribution. Sakhalin (south), South Kuriles; introduced (naturalized in the Russian Far East); Japan; native in North America; as alien – almost cosmopolitan.

Note. This species was studied in Sakhalin (2n=14, Probatoeva and Rudyka 1981). For O. biennis many authors give 2n=14 (see Agapova et al. 1993; Goldblatt 1981, 1988; Goldblatt and Johnson 1990, 1991, 1994, 2000, 2003), in the old literature 2n=28 was found (see Bolkhovskikh et al. 1969).

FAMILY ORCHIDACEAE

36. Oreorchis patens (Lindl.) Lindl.
   Chromosome number. 2n= c.48 (R.).
   Voucher specimen. VLA 9096, Sakhalin, Dolinsky District, the environs of Sokol settlement, on the slope of a hill, mixed forest, 16. VII. 2003, coll. V. Barkalov.
   Distribution. Sakhalin (south), South Kuriles; West Pacific area. In forests.

Note. The chromosome number (2n=48) was already revealed from Sakhalin, Moneron and the Kuriles. Urup Island (Probatoeva and Sokolovskaya 1995; Probatoeva et al. 2007). In Japan there were reports 2n=48 and, sometimes, 2n=50 (see Bolkhovskikh et al. 1969; Goldblatt and Johnson 1991).

FAMILY PAPAVERACEAE

37. Chelidonium asiaticum (Hara) Krachulkova
   Chromosome number. 2n=10 (R.).
   Voucher specimen. VLA 10822, Kuriles, Shikotan Island, Malokuriljskoye settlement, near the buildings, 6.IX. 2007, coll. V. Barkalov.
   Distribution. Sakhalin, South Kuriles; south of the Russian Far East; China, Korea, Japan. Forest edges, sandbanks. Described from Japan.

Note. This is the first chromosome count for this species in the Kuriles. Ch. asiaticum is the only native species to East Asia, its chromosome number, 2n=10, has been revealed many times in the Primorsky Territory, in the Amur River basin and in Sakhalin (Probatova and Sokolovskaya 1986; Probatova et al. 1996, 1998, 2000c, 2006a; Shatalova 2000). All reports of 2n=10 for “Ch. majus L.” (instead of 2n=12) from the Russian Far East, China, Korea and Japan (see Bolkhovskikh et al. 1969; Goldblatt 1984, 1985; Goldblatt and Johnson 1991, 1998, 2003; Agapova et al. 1993), as well as “Ch. majus var. asiaticum”, must be referred to Ch. asiaticum.

FAMILY PINACEAE

38. Picea glehnii (Fr. Schmidt) Mast.
   Chromosome number. 2n=24 (R.).
   Voucher specimen. VLA 10433, Kuriles, Kunashir Island, in vicinity of Goryachyi Plyazh settlement, along the road, 11. IX. 2006, coll. V. Barkalov.
   Distribution. Sakhalin (south), South Kuriles; Japan, Forests.

Note. The chromosome number in P. glehnii was studied from Sakhalin, 2n=24, and from Japan, 2n=24+0-5B (see Goldblatt and Johnson 1991, 2006).

FAMILY POACEAE

   Chromosome number. 2n=14 (K.).
   Voucher specimen. VLA 10833, Kuriles, Shikotan Island, Tomari Mt., meadow near the mountain top, 26.VIII.2007, coll. V. Barkalov.
   Distribution. Sakhalin, Kuriles; Japan; West Pacific area (mostly insular). Meadows.

Note. A. flaccida has been studied in Sakhalin and the Kuriles (Paramushir, Iturup and Kunashir Islands) and found to be 2n=14 (see Agapova et al. 1993;
40. Agrostis matsumurae Hack. ex Honda (A. clavata subsp. matsumurae (Hack. ex Honda) Tateoka; ?A. macrothyrsa Hack. )

Chromosome number. 2n=42 (R.).
Voucher specimen. VLA 10862, Kuriles, Shikotan Island, the slope of Ploskaya Mt., forest stream bank, 27.VIII. 2007, coll. V. Barkalov.

Distribution. Sakhalin, Kuriles; Japan. In forests, near the rivulets.

Note. Sometimes A. matsumurae is considered as conspecific with A. macrothyrsa Hack. or with A. clavata Trin. There are some chromosome counts from Sakhalin and the Kuriles (Paramushir, Iturup Islands) of 2n=42 (Probatova et al. 2007 – as A. clavata). For A. matsumurae from Japan, 2n=28 and 42 were reported (see Bolkhovskikh et al. 1969).

41. Deschampsia macrothyrsa (Tatew. et Ohwi) Kawano

Chromosome number. 2n=26 (R.).
Voucher specimen. VLA 8612, Sakhalin, northwards from Pomrj Bay, in vicinity of the former Muzjma settlement, 10.VIII. 2001, coll. V. Barkalov.

Distribution. Sakhalin, South Kuriles; the Sea of Japan area. Sea coasts. Salt marches and meadows.

Note. The species has received little study. The only chromosome report was given by A.P. Sokolovskaya in Probatova (1984), from the “locus classicus” of D. macrothyrsa (Solovyovka, or “Soriofka”), in the south of Sakhalin (see Probatova et al. 2007).

42. Elymus franchetii Kitag.

Chromosome number. 2n=42* (K.).
Voucher specimen. VLA 10841, Kuriles, Shikotan Island, the middle coarse of Gorobets R., on the edge of Alnus hirsuta forest, by the road, 24.VIII.2007, coll. V. Barkalov.

Distribution. Sakhalin, South Kuriles; south of the Russian Far East; China, Korea, Japan (?).

Note. This species was described from China and belongs to E. dahuricus agg. According to Acad. N.N. Tzvelyov’s opinion (his personal communication to Probatova), E. franchetii occupies the “intermediate” position between E. dahuricus Turcz. ex Griseb. s. str. and E. excelsus Turcz. ex Griseb., but the morphological features distinguishing it from the coastal species E. woroschilovi Probat. are not clear. No published chromosome information was found for E. franchetii.

43. Festuca ovina L.

Chromosome number. 2n=14 (R.).
Voucher specimen. VLA 10864, Kuriles, Shikotan Island, the upper course of Ostrovnya R., rubbly-melkzem slide-rocks on the slope of the mountain, 25.VIII. 2007, coll. V. Barkalov.

Distribution. Sakhalin, South Kuriles; Holarctic. Steppes and meadows.

Note. F. ovina was studied in Sakhalin and the Kuriles (Iturup and Shikotan Islands), as well as in various regions of the Far East and all of Russia: 2n=14 (Alexeev et al. 1990). Chromosome counts other than 2n=14 in the extensive literature (especially in old sources) are likely not to belong to F. ovina s. str.

44. Milium effusum L.

Chromosome number. 2n=28 (R.).
Voucher specimen. VLA 10842, Kuriles, Shikotan Island, Tserkovnya Bay, on the edge of Alnus hirsuta forest with tall herbs, 3.IX.2007, coll. V. Barkalov.

Distribution. Sakhalin, Kuriles; Holarctic (?). Forests, tall herbs communities.

Note. The chromosome number in M. effusum was studied in Sakhalin and the Kuriles (Urup, Iturup, Kunashir Islands), 2n=28 (Probatova et al. 2000a, 2007). In the Amur R. basin (Russian part), in the Primorsky Territory, as well as in the other regions of Russia, this species have been studied many times (2n=28 – Probatova and Sokolovskaya 1981; Probatova et al. 2000b, 2001, 2004b and unpublished data). In the literature for M. effusum many authors report 2n=28, rarely 2n=28+0-1B or 2n=26 (see Bolkhovskikh et al. 1969; Goldblatt 1981, 1984, 1985, 1988; Goldblatt and Johnson 1994, 1996, 2003; Agapova et al. 1993). There is only one report of 2n=14 from European Arctic of Russia (Khbinskuye Mts.) which is obviously an error; moreover, the voucher specimen was not found in LEU Herbarium.

45. Poa palustris L.

Chromosome number. 2n=28 (R.).

Distribution. Sakhalin, Kuriles; Holarctic. Wet meadows.

Note. Polymorphic species. Its chromosome number was studied in Sakhalin and the Kuriles (Simushir, Iturup, Kunashir Islands), 2n=28 (see Agapova et al. 1993; Probatova et al. 2000a). Also 2n=28 was revealed for P. palustris in Kamchatka, the Amur R. basin and the Primorsky Territory. Most authors report 2n=28 for P. palustris (see Bolkhovskikh et al. 1969; Goldblatt 1981, 1984; Goldblatt and Johnson 1990, 1991, 1994; Agapova et al. 1993; Shatalova 2000), but 2n=42 (and especially 2n=14) seem not to belong to this species.
46. *Poa trivialis* L.
Chromosome number. 2n=14 (R.).

Distribution. Sakhalin, South Kuriles (introduced, also in Kamchatka and the Primorsky Territory); Europe, Siberia, Central Asia; naturalized in many regions. Moist places along roads, disturbed meadows, near the rivulets.

Note. *P. trivialis* was studied on Sakhalin and the Kuriles, Shikotan Island, near Krabozavodsk and has a count of 2n=14 (see Agapova et al. 1993). For *P. trivialis* most authors report 2n=14 (sometimes with 1-4B-chromosomes), but rarely 2n=28, but the latter chromosome number, most probably, does not belong to this species (see Bolkhovskikh et al. 1969; Goldblatt 1981, 1984, 1985, 1988; Goldblatt and Johnson 1990, 1991, 1994, 1996, 1998, 2003; Agapova et al. 1993).

FAMILY POLYGONACEAE

47. *Acetosella angiocarpa* (Murb.) A. Löve (Rumex angiocarpus Murb.)
Chromosome number. 2n=42 (R.).
Voucher specimen. VLA 10836, Kuriles, Shikotan Island, Tserkovnaya Bay, along the abandoned road near seashore, 3.IX. 2007, coll. V. Barkalov.

Distribution. Sakhalin, Kuriles (introduced ?); not reported for the rest of the Russian Far East; almost cosmopolitan. Roadsides, disturbed habitats.

Note. This species was studied in Sakhalin and the Kuriles, Shikotan Island, near Krabozavodsk and has a count of 2n=14 (see Agapova et al. 1993). For *P. trivialis* most authors report 2n=14 (sometimes with 1-4B-chromosomes), but rarely 2n=28, but the latter chromosome number, most probably, does not belong to this species (see Bolkhovskikh et al. 1969; Goldblatt 1981, 1984, 1985, 1988; Goldblatt and Johnson 1990, 1991, 1994, 1996, 1998, 2003; Agapova et al. 1993).

Chromosome number. 2n=22* (R.).
Voucher specimen. VLA 10823, Kuriles, Shikotan Island, Del’fin Bay, sea shore, 1.IX. 2007, coll. V. Barkalov.

Distribution. Sakhalin (south), South Kuriles; Sea of Japan area; introduced (?) to some countries of South and South-East Asia. Riverbanks, roadsides. Described from Moneron Island.

Note. No chromosome data were known up to this point for *P. extremiorientalis*. According to Tzvel’yov (1989), the species might be of hybrid origin.

49. *Persicaria scabra* (Moench) Mold. (Polygonum scabrum Moench)
Chromosome number. 2n=22 (R.).
Voucher specimen. VLA 10856, Kuriles, Shikotan Island, the middle course of Gorobets R., moist place on the edge of a bog, along the roadside, 5.IX. 2007, coll. V. Barkalov.


Note. *P. scabra* was studied on Sakhalin and the Kuriles, Kunashir Island, 2n=22 (Probatova and Sokolovskaya 1989). In the literature we found 2n=22 and 44 for this species (see Bolkhovskikh et al. 1969; Goldblatt 1988; Agapova et al. 1993; Goldblatt and Johnson 1994, 2003).

50. *Rumex crispus* L.
Chromosome number. 2n=60 (R.).
Voucher specimen. VLA 10805, Kuriles, Shikotan Island, the valley of Gorobets R., roadside, 5.IX. 2007, coll. V. Barkalov.

Distribution. Sakhalin (south), South Kuriles; Holarctic; introduced to other regions.


FAMILY ROSACEAE

51. *Fragaria nipponica* Makino (F. nipponica var. yezoensis (Hara) Kitam.; F. yezoensis Hara)
Chromosome number. 2n=14* (R.).
Voucher specimen. VLA 10788, Kuriles, Shikotan Island, the bottom of Shikotan Mt., in vicinity of Malokuril’skoye settlement, alder forest (*Alnus hirsuta*), near the stream, 23. VIII. 2007, coll. V. Barkalov.

Distribution. Sakhalin (south), South Kuriles; Japan. Forest edges, meadows.

Note. The species was studied previously on the Kuriles (Simushir, Matua, Kunashir Islands), 2n=14 (under “F. yezoensis”, in Probatova et al. 1989, 2000a). This chromosome number also is known from Japan (see Bolkhovskikh et al. 1969; Goldblatt and Johnson 1991, 1994). The tetraploid chromosome number 2n=28, reported in some cases, probably does not belong to this species.

52. *Potentilla dickinsii* Franch. et Savat.
Chromosome number. 2n=14 (R.).
Voucher specimen. VLA 10840, Kuriles, Shikotan Island, Tserkovnaya Bay, on the rocks along the mountain ridge, 3.IX. 2007, coll. V. Barkalov.

Distribution. South Kuriles (Shikotan Island; also reported from Kunashir, in Woroschilov 1982); Korea, Japan. Described from Japan. Coastal slopes and rocks.

Note. This species is poorly investigated. There were two chromosome reports for *P. dickinsii*, one from Korea and one from Japan, and both stated 2n=14 (Kawano 1963; Lee 1967).

53. *Potentilla matsumurae* Th. Wolf
Chromosome number. 2n=14* (R.).
Voucher specimen. VLA 10820, Kuriles, Shikotan Island, Shikotan Mt., on the rocks, 23.VIII. 2007, coll. V.
Barkalov.

**Distribution.** Sakhalin (south), Kuriles; Japan; Sea of Japan area (?). Mountain tundras, alpine meadows, stony slopes and rocks.

**Note.** We found the only one chromosome report, from Japan, for *P. matsumurae* of 2n=28 (Shimotomai 1929). We revealed a new, diploid (2x) cytotype in this species. Further studies are needed.


**Chromosome number.** 2n=70 (R.).

**Voucher specimen.** VLA 10644, Kuriles, Kunashir Island, the Sea of Okhotsk coast, westwards of Golovnina Volcano, stony slope of marine terrace, 6.IX. 2006, coll. V. Yakubov.

**Distribution.** Sakhalin, Kuriles; West Pacific. Coastal rocks.

**Note.** *P. megalantha* was previously studied several times on the Kuriles, from Shumshu, Ushishir, and the Urup Islands (2n=70, Probatova et al. 2000a, 2006a). From Japan there were counts made by Shimotomai (1930a, b) of 2n=70. In its closely related species, the North Pacific *P. fragiformis* Willd. ex Schlecht., two cytotypes were known, 2n=42 and 56, according to many reports in the literature (see Agapova et al. 1993). Moreover, we recently revealed 2n=28 in *P. fragiformis* from the Shantar Skye Islands, in the Sea of Okhotsk (unpublished). Taking all these data into consideration, we have complementary evidence to consider *P. megalantha* as a separate species with a constant, decaploid (10 x) chromosome number of 2n=70.

FAMILY RUBIACEAE

55. *Galium trifidum* L.

**Chromosome number.** 2n=24 (R.).

**Voucher specimen.** VLA 10885, Kuriles, Shikotan Island, Tserkovnaya Bay, seashore, along the edge of Picea wood, 3.IX. 2007, coll. V. Barkalov.

**Distribution.** Sakhalin, Kuriles; Hokkaido. Damp forests, bogs and wetlands.

**Note.** This is the only chromosome number reported for *G. trifidum* in the literature. This species was studied from Chukotka, as well as in Japan and in North America (2n=24, see Bolkhovskikh et al. 1969; Goldblatt 1981, 1985; Agapova et al. 1993). We also obtained this chromosome number for *G. trifidum* from the Amur R. basin, the Khabarovsk Territory (unpublished).

FAMILY SCROPHULARIACEAE


**Chromosome number.** 2n=20 (R.).

**Voucher specimen.** VLA 10825, Kuriles, Shikotan Island, Tserkovnaya Bay, seashore, 2.IX. 2007, coll. V. Barkalov.

**Distribution.** Sakhalin (south), South Kuriles; Sea of Japan area. Coastal rocks and meadows.

**Note.** Not long ago we revealed the diploid chromosome number 2n=20 in *S. grayana* from the Kuriles (Iturup Island), and from Moneron (Probatova et al. 2006a), but 2n=40 in the south continental coast of the Primorsky Territory (Probatova et al. 2006b). We assume the insular part of *S. grayana*'s area of distribution to be more ancient than the continental one.

57. *Veronica schmidtiana* Regel

**Chromosome number.** 2n=34 (R.).

**Voucher specimen.** VLA 10859, Kuriles, Shikotan Island, Shikotan Mt., maritime slope, on the screes with melkzem, 6.IX. 2007, coll. V. Barkalov.

**Distribution.** Sakhalin, Moneron, South Kuriles; Japan. Coastal rocks and screes.

**Note.** *V. schmidtiana* was studied from Moneron Island (Probatova et al. 2006a), and earlier from Japan (see Bolkhovskikh et al. 1969). In all cases 2n=34.

**General remarks**

Twenty-two species now make up the addition to the list of the species from Sakhalin and the Kuriles with studied chromosome numbers. They are: *Arctium tomentosum*, *Cardamine sachalinensis*, *Cardamine sp.*, *Chenopodium glaucum*, *Draba assuriensis*, *Elymus frachetzii*, *Epilobium fastigiatosum*, *Eupatorium glehnii*, *Galeopsis tetrahit*, *Galium trifidum*, *Hemero callis yezoensis*, *Hypericum kantschaticum*, *Kitagawia terebinthacea*, *Lathyrus pilosus*, *Leontopodium kurilense*, *Minuartia barkalovi*, *Oxytropis calcarovum*, *Persicaria extremiorientalis*, *Popoviocodon stenocarpa*, *Potentilla dickinsii*, *P. matsumurae*, *Rumex crispus*. Thus, the total number of species, with chromosome numbers obtained on local material, is equal to 536 + 22 = 558 spp. studied (in Sakhalin 356 + 4 = 360 spp., in the Kuriles 257 + 29 = 286 spp.).

This study represents the first caryological investigation of the representatives of the genera *Arctium*, *Atriplex*, *Chelidonium*, *Chenopodium*, *Dianthus*, *Eupatorium*, *Galeopsis*, *Galium*, *Kitagawia*, *Lathyrus*, *Leontopodium*, *Lepidotocha*, *Minuartia*, *Oenothera*, *Solidago*, *Vicia* – in the Kuriles, and the first caryological report on the genus *Popoviocodon*, from Sakhalin.

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