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## Detective story about one Linnaean species of *Cruciferae*

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**Abstract:** The results of an investigation of the type of *Alyssum hyperboreum* L. are given. The new combination *Schivereckia hyperborea* (L.) BERKUT. is suggested. For pacific plants called *Draba hyperborea* (L.) DESV. before the earliest available name regarded as synonym, *D. grandis* LANGSD., is selected and herbarium samples are cited.

In 1993 an ornithologist from the Institute of Biological Problems of the North (Magadan, Russia), L.A. ZELENSKAJA, gave me the herbarium sample of a plant collected on 25 July 1993 in the southern part of Bering Island (Commander Islands, Bering sea) on the eastern coast. According to oral information of ZELENSKAJA, plants were abundant on the rocks 2-15 m above their base. Surrounding plants were *Cochlearia officinalis*, *Cardaminopsis lyrata*. The peculiarity of such places is the presence of many sea bird colonies. Botanists working in the Pacific sector know very well the restricted number of species growing near the littoral under conditions of superfluous enrichment by nitrogen due to sea bird rookeries. There was no problem in identifying the herbarium specimen: if we take the Manuals or Floras of the Pacific region from at least the last 100 years (from S.WATSON (1878) and A. GRAY (1897) up to modern floristic works, for example, "Arctic flora of the USSR") we can easily find its name: *Draba hyperborea* (L.) DESV.

It is difficult to confuse *D. hyperborea* with other species of *Draba*. Nevertheless, this is a very variable species - a long list of synonyms is proof of this. CALDER and TAYLOR (1968, p. 368) emphasized that fact and I ask you kindly to excuse my temptation to give a long but not boring citation from their monograph: "In 1897 GREENE placed SCHLECHTENDAL'S *Cochlearia siliquosa* and LANGSDORFF'S *Draba grandis*, both based on collections from Alaska, in a new genus *Nesodraba*. GREENE also described at this time a new species, *N. megalocarpa*, typified by a NEWCOMBE collection from Dawson Harbour in the Queen Charlotte Islands. In our opinion there is no justification for the establishment of a new genus. After examining a series of collections we prefer to join recent authors in referring all plants in this complex to *Draba*, recognizing only a single species, *D. hyperborea*."

HITCHCOCK (1941, p. 93) aptly stated the case when he said, "however, since these differences [succulence and huge silicles] are more properly defined as differences of degree rather than of kind (or the 'quantity rather than quality'), I am treating it as a

member of the genus *Draba*". This distinctive Pacific-coast *Draba* ranges from northern Vancouver Island to Alaska and westward through the Aleutian Chain to Kamchatka and the Kurile Islands. *Draba hyperborea* is an extremely variable species in height and size, and shape of the leaves and pods. The variability may be due to habitat. It is found at the seacoast in highly nitrified soils on exposed birdnesting islets. *Draba hyperborea* becomes well established and flourishes in this ecological niche, where there is little competition from other maritime plants. It is occasionally found on rocky headlands and cliffs at the coast".

My experience of work with *Cruciferae* encourages me to join the above mentioned authors in their desire to escape superfluous description of new genera and species. In Japan and Sakhalin we have another species of *Cruciferae*, *D. sachalinensis* Fr. SCHMIDT, with similar ecology and similar range of variability. But back to *D. hyperborea*.

Concerning the occurrence in Russia of this species I can mention with certainty only a few locations: Ratmanov Island, in rock cracks, Bering sea, 28 June 1958. B.A. Tikhomirov and N.F. Michailova (LE! and herbarium of Magadan Museum of Natural History ), the same location, 28 June 1958. Gagarin (LE!); Iturup island (southern Kurile islands), Pacific coast, Iodnji promontorium, on vertical rocks, rare, 14 August 1988. V. Barkalov, I. Vishin, T. Besdeleva (VLA!). As HULTEN (1960, p. 215) truly noticed "old reports from the mouth of Obi R. (Pallas), Okhotsk (Kruhse) and Kamchatka (Mertens, Rieder) are apparently incorrect or in need of confirmation". HULTEN mentions this species for the middle Kurile islands. Neither HULTEN, nor authors of the old and modern books on the Commander Islands (FEDTSCHENKO 1906; VASILJEV 1957; PONAMAREVA, JANITSKAJA 1991) mention *Draba hyperborea* for these islands. Thus, it is a new species for Commander Islands. This floristic discovery permits to fill the gap in the area of distribution between Aleutian and Kurile Islands.

Maybe, I ought to stop here? But this is only a beginning, a proper detective story follows. The suspicion that there is something wrong with *D. hyperborea* occurred to me many years ago during preparation of my treatment of *Cruciferae* for the third volume of "Vascular plants of Soviet Far East". I examined microfiches of Linnaean species in Komarov Botanical Institute in St. Petersburg and was very much surprised to see the photo of the type of *Alyssum hyperboreum* L. *Alyssum hyperboreum* is the basionym of *D. hyperborea*. The plant on the photo looked more like *D. cinerea* ADAMS or *D. lanceolata* ROYLE than *D. hyperborea*. But I was obliged to leave everything as it was in my treatment (BERKUTENKO 1988), because the original type was not available: Nobody will send on loan the samples from the herbarium of the Linnaean Society. In my dreams I saw myself opening the door of this Society in London, looking at the sample and starting to surprise the botanical world with a correction of Carl Linnaeus. I don't dwell on details about the chances a botanist from the very remote and small city of Magadan had to visit London, and how the strict discipline at the International

Courses in Herbarium Technique in Kew Gardens prevented a visit to this Society even when I was staying in London. At last on 12 August 1992 I actually opened the door of Linnaean Society. The original of CARL LINNAEUS is in my hands! The description of Linnaeus (1753, p. 651) is short as usual: "*Alyssum hyperboreum*. *Alyssum* foliis incanis dentatis, staminibus quatuor bifurcatis. Lunaria foliis ellipticis incondite dentatis. KRASCHEN. act. petr. 1747 p.381 t.15 f.1. Habitat in America septentrionali, D. KRASCHENINNIKOF. Stamina 2 breviora ungue acuta notata, reliqua 4 ad basin squama emarginata".

What can I say? The type resembles, even I can say, coincides with the drawing of the sample of KRASHENINNIKOV (photos 1 and 2). I am sure this is not *Alyssum*. And the monographer of the genus *Alyssum* left a note: "R. DUDLEY Edinburgh Jan. 3 1962 828.6 *Alyssum hyperboreum* L. Not the genus *Alyssum*". At the end of my first visit to the Linnaean Society I wrote on the sheet of "Notes on specimens in the Linnaean and/or Smithian collections": "828.6 - This is not *Alyssum*. It should be *Draba cinerea* ADAMS, preparation of stamens is required, it is necessary to check pubescence on the fruits. If this is *Draba cinerea* ADAMS (if the fruits (ovaries) are stellate pubescent), we must revise *Draba hyperborea* (L.) DESV. Such pubescence on leaves and stems and big teeth on the leaves are typical for *D. lanceolata* ROYLE (= *D. cana* RYDB.) too. *Draba hyperborea* (L.) DESV. (in modern understanding) has glabrous fruits, another shape of leaves, leaves are green, not grey". The key to the mystery of the Linnean species is hidden inside the flower. I had to look inside not only to see the glabrous or pubescent ovary, I had to clarify the question of scales of the stamens. They are present on the drawing of KRASHENINNIKOV and in his description (KRASHENINNIKOW 1747), they are also the reason for referring this sample to *Alyssum* by LINNAEUS, but SCHULZ (1927 p. 397) was sure it had been a mistake: "In icone autem filamenta majora per errorem in parte inferiore utrinque late alata et supra medium acute dentata delineata sunt".

During my second visit at the Linnaean Society on 26 August 1992 Dr. JARVIS, who is responsible for typification of Linnean specimens, wetted one flower from the inflorescence of the type, and we could look under a microscope at the internal structure of the flower. I saw distinctly the membranous hood-like appendices of long stamens exactly as on the drawing of KRASHENINNIKOV. Thus, it can not be *Draba*, the genus *Draba* does not have stamens with scales. I listed in my head all genera of *Cruciferae* from the Pacific region and was stuck. I could not find the answer: Which genus is the sample in the Linnean Society herbarium? I returned to Moscow and met in the Main Botanical Garden a specialist in *Cruciferae*, Dr. Al-Shehbaz who was going to treat *Cruciferae* for "Flora of North America". I told him about my doubts. His opinion about the scales in such plants was: "This is some teratic abnormality". I was not satisfied with this explanation. I had half a day before departure to Magadan. As usually I spent my last hours in the Herbarium trying to examine more samples. I learnt almost by heart the materials of *Cruciferae* from Far East in the Herbarium of the Main Bo-

tanical Garden and decided to look at materials from Europe and the Urals, not expecting any discoveries. Suddenly I realized: *Schivereckia* ANDRZ. ex DC.! How could I forget this genus?! It looks like *Draba* and has stamens with scales. I ran to Prof. Skvortsov to share my joy. But he hardly believed my fantasies. He knew *Schivereckia* very well and he did not need to look at its area: he had collected *Schivereckia podolica* (BESS.) ANDRZ. in the Urals and in Europe. Steller, whose sample Krasheninnikov had received, did not collect in Europe or the Urals. I did not have the evidence: the photo from the Linnean Society and the drawing of Krasheninnikov. And I could not answer to myself: how could the European genus reappear in the Pacific region?

More than one year passed before I had a happy chance to visit Komarov Botanical Institute again. I never forgot the mystery of *Schivereckia podolica* - *Draba hyperborea*, the old and recent finding on Bering Island only increased my desire to guess everything in this intriguing story.

My intuition led me again to the European materials. I decided to look at all the material of *Schivereckia*. And very soon I was rewarded: I discovered an isotype of *Alyssum hyperboreum* L.: fragments of the plant (upper part of stem with inflorescence) with KRASHENINNIKOV'S handwriting: "Lunaria foliis ellipticis incondite dentatis" and the notes of RUPRECHT: "*Alyssum hyperboreum* LINNÉ, in herb. LINNEI vidi specimen florens incanum hinc vix *Draba borealis* ROXBG. originale! Ad descript. Krascheninnikovii Conf. Rupr. Fl. Ural".

The Russian botanist F. RUPRECHT (1856, p. 28) saw these fragments and he wrote about them in his commentaries to *Schivereckia podolica*:

"*Alyssum hyperboreum* LINNÉ est planta valde dubia, solum a KRASCHENINNIKOW in Nov. Comment. Acad. Petrop. 1747 illustrata. Icon. et descriptio Krasheninnikowii ex planta culta refert *Schivereckiam podolicam*, quod etiam fragmentis floriferis originalibus in herb. Acad. Petrop. adhuc asservatis testatur. Haec autem enata dicitur e seminibus Stellerianis in America septentrionali (promont. Eliae?) anno 1743 collectis; *Schivereckia podolica* autem vix Sibiriam, nisi maxime occidentalem intrat. Alia huic similis species genuina *Schivereckiae* numquam hucusque ad litora Oceani pacifici borealis lecta est; verum *Drabae* ex affinitate *D. borealis* communissimae, quorum filamenta basin versus sensim valde dilatata, numquam vero apice lata et bifida sunt, ut in *Schivereckia*. At hujus filamenta interdum tantum late appendiculata, nec bidentata, ut *Schivereckia* in *Drabas* fere abeat. Talis *Draba* planta *Stelleriana* fuisse videtur, cujus ceterum descriptio satis a Krascheninnikowiana differt. *Alyssum hyperboreum* Linnaei igitur ex 2 speciebus compositum videtur, dubia certe patria et identitas plantae Krascheninnikowianae et Stellerianae".

How many years ago it was written and nobody paid attention! Thus, it is clear now, KRASHENINNIKOV gave a description of the sphinx-plant. How it happened? He described the plant of STELLER, sowed the seeds, but he did not receive germinated plant from the seeds of STELLER'S plant. Instead, accidentally that year another plant

described later as *Schivereckia podolica* germinated and bloomed. (Everyone who has germinated the seeds of *Cruciferae* can notice regularly: the seeds from dry steppe conditions germinate very well in contrast to montane-tundra plants. *Schivereckia* grows on dry slopes, preferring limestones. If the seeds of *Schivereckia* were in the soil in the Botanical Garden by chance, they could germinate very easily). KRASHENINNIKOV did not suspect this confusion, he collected the plant in flowers, described very thoroughly surmising he had a plant from Pacific seeds but wondering (KRASHENINNIKOW, 1747, p. 381): "Now we shall add a description of the plant born from our soil, partly to add what the discoverer could not observe: partly to show from a comparison of the descriptions, how different a different nature of soil can render one and the same plant".

For full clarification we cite the second part of the description of KRASHENINNIKOV referring to *Schivereckia*: "The plant grows in dense tufts and is rough from short, white hairs as a whole. It arises from a woody root that is of the thickness of a pigeon's feather above, tapering downwards, from one to one and a half inch long, obliquely descending into the soil, surrounded by hair-like fibres in its whole length, outside covered by a brown skin, inside green, without any recognizable smell or sap. Stems one and a half inch, two inches or a little longer (?), erect or prostrate, terete, glaucous-green; bearing 3 or 4 leaves and one or two flowering branches, which arise from leaf-axils. Leaves elliptical, acute: basal leaves several arranged in a circle, 18-20 mm long, 4,5-7 mm wide; lower stem-leaves a little shorter, the uppermost scarcely 6,5 mm long: all with long, acute teeth, in some more numerous, in others less, especially round the middle. Flowers in the uppermost part of the stem and branches in a certain way umbellate, on very slender pedicels of 2 1/4-3 1/2 mm length, some also sessile. Calyx tetraphyllous, yellowish green, leaflets ovate, erect to spreading, deciduous; two opposite ones of them concave and swollen at base. Corolla with 4 petals, white. Petals nearly orbicular, very slightly emarginate, large, flat, spreading, tapering into yellowish claws of the length of the calyx. Filaments 6, subulate, yellowish; the two smaller ones hide in the concave leaflets of the calyx and are surrounded at their base by a green, nectariferous gland; the 4 longer ones are erect, bear single of certain singular (special?) squamules in the uppermost part of their back, maybe nectaries, which are concave and surround and envelop the ovary. The anthers are cordate, sulcate, erect, yellow. Ovary oblong, terete, hidden between the squamules of the longer stamens. Style as long as ovary, persistent. Stigma capitate. Silicula elliptic, flat, acuminate on both sides, scarcely 6,5 mm long and 3-3,5 mm wide, often incurvate, not rarely also straight, septum parallel to the valves, membranous, pellucid, white. The seeds behave exactly in the way described for *Lunaria* by the famous LINNÉ, gen. pl.: they are, as should be from his words, reniform, compressed, marginate, situated in the middle of the siliculae, with filiform, but short receptacles inserted in the lateral sutures, pendent, three on each side. It flowered at the end of April. The seeds got mature in June. I join it with *Lunaria*, as it has in common with this genus most of the

essential characters; though I am in favour also of the opinion of those, who thought that it should perhaps be separated from *Lunaria* and called by some new name: as the squamules, that surround the ovary and support the bigger stamens seem to be estimated of no less importance for the essence of the genus as the teeth in the minor stamens of *Alyssum*, which constitute the essence of this genus, as the famous LINNÉ, taught. The illustration shows the plant in its natural size. a) Stamens and pistil as seen with the naked eye, b) the same seen with a lens, c) bigger stamen bearing squamule (scale)". (The unripe seeds of *Draba* and *Schivereckia* can look as if marginate, in fact they are without margins and are not round).

Thus, we have all evidences for creation of the new combination:

***Schivereckia hyperborea* (L.) BERKUTENKO comb. nova.**

*Alyssum hyperboreum* L. 1753, Sp. pl.: 651. *Alyssum podolicum* BESSER 1816 Catal. plant. Hort. Bot. Volhyn.: 8; *Schivereckia podolica* (BESS.) ANDRZ.ex DC. 1821 Syst. nat. II: 300.

This is the first part of the description by KRASHENINNIKOV referring to STELLER's sample: "STELLER collected this in North America when it carried already mature fruits and described it under the name "*Leucoium saxatile* foliis ad radicem *Turritidis* in orbem sparsis, asperis, siliquis planis, latis, utrinque acuminatis, seminibus planis, marginatis, nigris" in the following manner: "The plant grows on eastwards directed rocks to a height of 9 inches. The leaves which arise from the crown of the root are explanated in a circle, glaucous-green, rough from pointlets in the manner of *Turritis*, one and a half inch long, 11,2 mm wide. From the middle of the leaves arises the 9 inches high stem, which is much branched above. The 6,7,8 lineas (13,5-18 mm) long, 3-4 lineas (7-9 mm) wide siliqua is attached to single branchlets, acuminate on both sides, at maturity in the middle curved or contorted and along the length bent upwards in the way of a sickle, bivalved, dirty yellowish, divided by a membranous, white, very thin, diaphaneous septum in the middle to which black, orbicular, flat and marginate seeds adhere on both sides, which are best collected mature. In my opinion it deserves a separate genus because of the short, wide, twisted and curved siliculas, or can be distinguished from the rest of *Leucoium* for the following reason. *Leucoium* with the leaves of *Turritis*, short, wide, twisted or falcate siliquas, black seed. Maybe it should be counted among *Lunaria*".

We do not have STELLER's sample and can only surmise what it is. Maybe, this is the plant called by Pacific botanists *D. hyperborea* (you can see on the drawing of the plant from Queen Charlotte Islands, some curled fruits, photo 3). STELLER spent 3 years on Bering Island and could find it there and in America as well; maybe, this is *D. borealis* DC., but it does not matter for nomenclatural consequences.

KRASHENINNIKOV described STELLER'S sample as a polynomial. For the Pacific species of *Draba*, called wrongly since 1878 until now *D. hyperborea* we have to select the earliest synonym:

*Draba grandis* LANGSD. in DC., Syst. nat., 1821, 2, p. 355 (photo typi vidi: "Ins. S. Pauli (inter Kamtschatkam et Americam Mr: Fischer 1819.

Langsdorf; photo of type from Gray Herbarium of Harvard University in ALA; notes on the sheet: Annotation label:

*Draba hyperborea* (L.) DESV. C.L. HITCHCOCK, 11/17/39; Type of *Draba grandis* LANGSD. Photo gift from J.F. Macbride. Detailed description in letter of J.F.M., Sept. 11, 1933. *Cochlearia spathulata* SCHLECHT. ex STEV. in DC. Syst. II (1821): 369; CHAMISSE et SCHLECHTENDAL in LINNAEA I (1826): 27; *C. siliquosa* SCHLECHT. ex STEV. in DC. Syst. II (1821): 369. *Nesodraba grandis* GREENE in PITTONIA III (1897): 252.

Information about distribution of *Draba grandis* is very sparse and insufficient in available literature. A selected list of herbarium samples from the Alaskan herbarium follows:

ALA: Sub *D. hyperborea* (L.) DESV. Queen Charlotte Islands, outer island of Skedans Islands, of Louise Island and Moresby Island, common in highly nitrified areas on rock bluffs and cliffs on promontory at east end of island, N 22384. July 10, 1957 J.A. CALDER, R.L. TAYLOR, D.B.O. SAVILE, voucher specimen cited in Flora of the Queen Charlotte Islands *Nesodraba megalocarpa* GREENE Skedans, Queen Charlotte islands, Dr. G.F. NEWCOMBE June 1901 Annot. label: *Draba hyperborea* (L.) DESV. C. Leo HITCHCOCK. 11/17/39; Small rocky intel on south side of entrance to Gowgaja Bay, Moresby island. Common in rock crevices and in nitrified areas of bird rookery N 36570 J.A. CALDER, R.C. TAYLOR Aug. 3, 1964 Voucher specimen for chromosome number cited in Flora of the Queen Charlotte islands by Roy TAYLOR and Gerald A. MULLIGAN 2n=19 II; Plants of Alaska, N 3097 *Draba (Nesodraba) hyperborea* (L.) DESV. Collected on Raspberry Island, Port Vita, Kodiak Islands, Alaska, alt. 3 meters, habitat in soil pockets on slate rocks near seashore not common July 19/39 coll. by Walter G. EYERDAM, det. by W.G.E.; Harriman Alaska Expedition *Draba grandis* LANGSD. St. Paul island N 1828 July 9 1899 Frederick V. COVILLE, Thomas H. KEARNEY Annot. label: *Draba hyperborea* (L.) DESV. 11/17/39 C. Leo HITCHCOCK; U.S. Coast Survey Prof. B. PIERCE *Draba grandis* DC. var. *siliquosa* Flowers yellow, Rocks Popoff and Shuma - Plantae alaskanac, U.S. Coast Survey, W.H. Dall's Exploration *Draba grandis* DC. var. *siliquosa* Coll. M.W. HARRINGTON 1871-72 Annot. label: *Draba hyperborea* (L.) DESV. 11/17/39 C. Leo HITCHCOCK (duplicates from Gray Herb. Harvard Univ.); St. Matthew Quad: St. Matthew island 60deg. 24' N, 172 deg. 42' W, sandy beach dunes, 8 July 1982 M. WARD and R. WARD, Det. HATCH M.A. 1983; Stepovak Bay Quad., Shumiyan Islands, Big Koniuji Islands, 55 deg. 06' N, 159 deg. 33' W Yukon Head Beach cliff 8 June 1976 R. ALLEN; Sutwik island Quad.: c Howiet Island, 56 deg. 02' N, 156 deg. 42' W Growing in wet, muddy soil overhanging rock, 25 June 1977 Martha HATCH; Kodiak Quad.: Pillar Beach, Monaska Bay, Kodiak Island, 57 deg. N, 152 deg. 25 W, Rock outcrops above beach 31 Jul. 1991 C.L. PARKER; Alaska Saemel island, cove in southern most point Gotween, Cape Felix, growing on rock 23 July 1979. Linda VOROBK, G. HOPPER.

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