

***Taraxacum erythroboreale* (Asteraceae), a new species of presumably intersectional hybrid nature with broad distribution in North European Russia (*Taraxacum* Notulae Rossiae Boreali Europeae II)**

***Taraxacum erythroboreale* (Asteraceae) — новый вид предположительно межсекционного гибридного происхождения с широким распространением на севере Европейской России (*Taraxacum* Notulae Rossiae Boreali Europeae II)**

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Abstract. *Taraxacum erythroboreale* Efimov, a new apomictic species, is described and illustrated. It occurs in Russia (North of the European part), in the Murmansk and Vologda regions, and in the Komi Republic, being locally very abundant. It occupies mainly dry sandy roadsides and other similar ruderal places, and seems benefiting from the anthropogenic disturbance of the land. The new species may belong either to the section *Erythrosperma* (H. Lindb.) Dahlst., or have originated from the hybridization between this section and some species of an Asiatic section like *Stenoloba* Kirschner et Štěpánek or *Dissecta* (Soest) R. Doll. The new species displays rather wide morphological polymorphism as to the presence/absence of purplish achene pigmentation, shape of outer phyllaries, corniculation of phyllaries, and in some other traits.

Keywords: *Crepidinae*, *Taraxacum*, flora of Russia, Murmansk Region, Komi Republic, Vologda Region, new species, apomixis, biodiversity.

Аннотация. В статье описан и иллюстрирован новый апомиктический вид *Taraxacum erythroboreale* Ефимов. Вид обнаружен на севере европейской части России: в Мурманской и Вологодской областях и Республике Коми, причем местами встречается массово. Он произрастает преимущественно на песчаных обочинах дорог и в других подобных рудеральных местообитаниях, по-видимому, предпочитая сильно нарушенные места. Секционное положение нового вида неоднозначно: он может как относиться к секции *Erythrosperma* (H. Lindb.) Dahlst., так и происходить от гибридизации между видами этой секции и, возможно, азиатской секции *Stenoloba* Kirschner et Štěpánek или *Dissecta* (Soest) R. Doll. Новый вид характеризуется весьма широким морфологическим полиморфизмом по таким признакам, как наличие/отсутствие пурпурной пигментации плодов, форма наружных листочков обертки, наличие рожек на них и др.

Ключевые слова: *Crepidinae*, *Taraxacum*, флора России, Мурманская область, Республика Коми, Вологодская область, новый вид, апомиксис, биологическое разнообразие.

Introduction

Taraxacum F. H. Wigg. section *Erythrosperma* (H. Lindb.) Dahlst., a widely known mostly European group consisting of ca. 150 species, is considered typical of xerothermic and dry habitats (Vašut, 2003; Vašut et al., 2005) with maximum species diversity within the temperate broadleaf forest zone. In taiga zone, its diversity prominently decreases northwards. Thus, in south Finland, in the province of Uusimaa, G. Marklund (1940) listed as much as 13 species, whereas much more modern data by C. E. Sonck (1991) for the northern part of the province of Lapland give only three, of which two were recorded only in one locality. The same general principle seems to be

observed in European Russia, where the diversity of section *Erythrosperma* is known rather fragmentary. During the expeditions of 2022 and 2023 devoted to the collection of our new *Herbarium Taraxacorum*, when travelling northwards from the Leningrad Region to the Republic of Karelia and the Murmansk Region, we found the section *Erythrosperma* species in very few and isolated places, mostly in dry meadows surrounding human settlements populated for a long time, such as old Karelian villages. At the same time, superficially similar but recently formed habitats such as cuttings in pine forests and sandy roadsides, only occasionally harbor species from section *Erythrosperma*, thus ascertaining their status of declining and even relict taxa,

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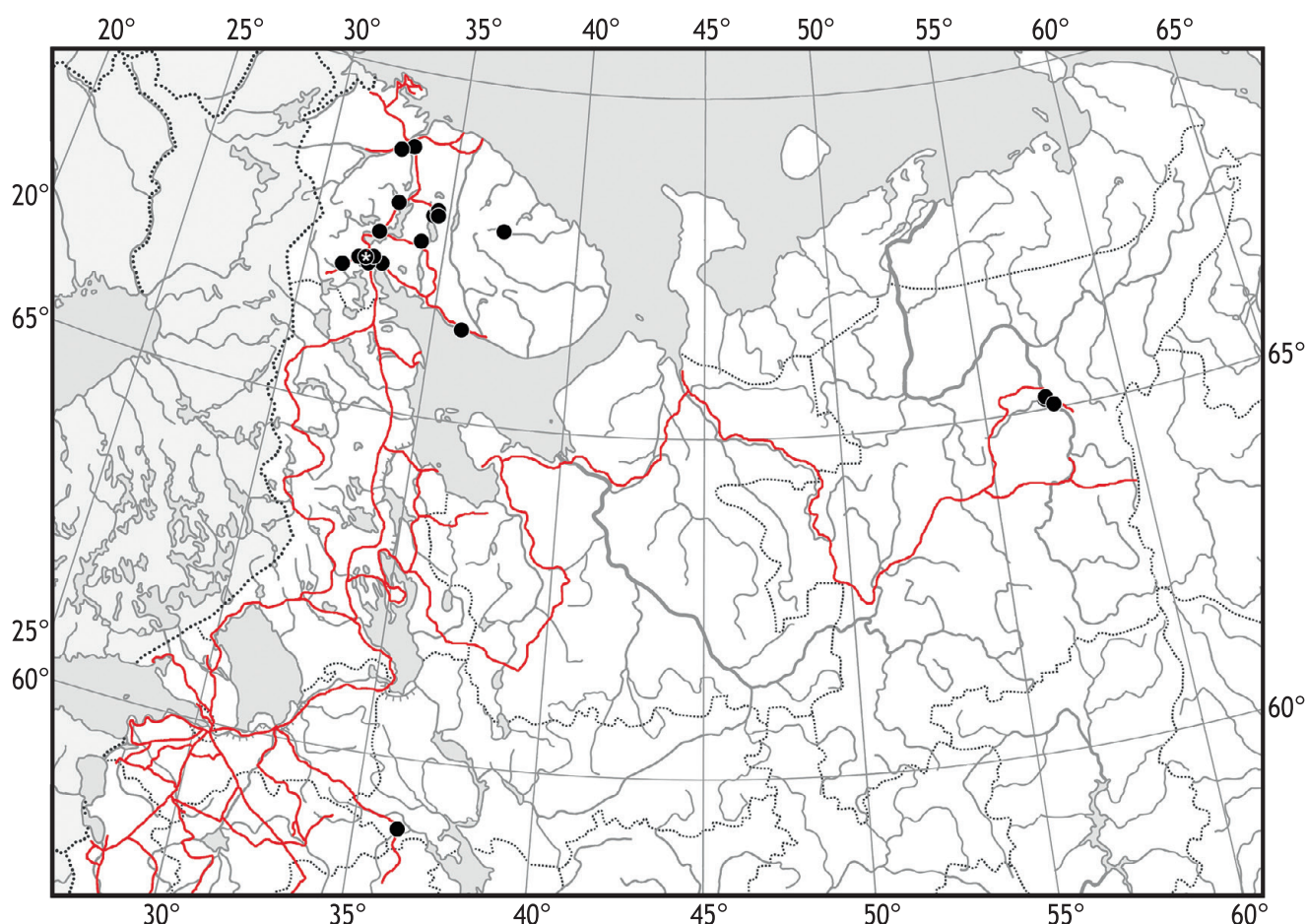


Fig. 1. Known distribution of *Taraxacum erythroboreale* according to field collections.

Dots — localities of safely determined *T. erythroboreale* specimens; asterisk — type locality; red lines — main routes of taraxacological collection in 2019–2023.

associated with traditional farming methods, which are not able to compete with more recent aliens from section *Taraxacum* (Räsänen, 2013: 180).

Therefore it was rather surprising to find plants very similar to species of the section *Erythrosperma* growing rather abundantly in the areas situated enough distantly to the north, at 65° and further, predominantly in secondary habitats, such as highway roadsides and ruderal places in populated areas. The plants discovered proved to be rather peculiar in appearance, and, although quite variable morphologically, were easily distinguishable from all other species of section *Erythrosperma* which we found during the field work. After long and unsuccessful attempts to determine them, we came to an annoying decision to describe them as a new taxon, and this is the main purpose of the current contribution. As far as *Taraxacum* taxonomy is very complicated, description of new taxa should be done with great caution, but naming of broadly distributed and easily-recognizable entities is an important first step, which should be done prior to more detailed revision.

Materials and methods

This study is primarily herbarium-based, both old collections and new herbarium gatherings of 2022–2023 were used.

Main herbaria consulted were those of the Komarov Botanical Institute, St. Petersburg (LE) and the Moscow State University (MW), in addition some collections from the Botanical Museum of Helsinki University (H) and the Polar-Alpine Botanical Garden-Institute (KPABG) were taken into consideration, as well as information from the website iNaturalist (2023).

New herbarium was prepared directly in the field, using a specially designed device based on an autonomous diesel heater, enabling quick (in 2–3 days) preparation of high-quality herbarium samples with minimal color changes and low DNA degradation. Fruits were collected for most of the samples, either along with herbarium, or later, when after-ripened in a glass of water. The main expedition routes are shown in Fig. 1.

Images of achenes were made using a specially constructed device, consisting of a digital camera linked to an objective from microscope (constructed by Dmitry Slastunov, St. Petersburg).

The images of all newly collected specimens cited in this article are accessible in high resolution on the website Herbarium LE (Vascular Plants..., 2023).

Results

Taraxacum erythroboreale Efimov, sp. nova (Figs. 2–4).

Plants 13–30 cm tall during anthesis (including inflorescences), but in dry oligotrophic conditions may be small. **Tunic** present in older plants, lax, consisting of black or brownish basal parts of old leaves; leaf bases are intercalated with numerous, long, whitish hairs. **Leaves** upright, those of the “middle” type (Fig. 2: A–L) 7–25(30) × 1.3–5.5(7) cm. **Petioles** unwinged or very narrowly winged, but in outer (earlier) leaves may be distinctly winged with wings up to 1.5 mm; always distinctly purple, without striate pattern, occupy ca. (0.3)0.5(0.6) of leaf length. **Midrib** purplish in basal one third, whitish-greenish elsewhere. **Leaf blade** pinnatipartite to pinnatisect; with (4)5–6(7) pairs of lateral lobes; more or less oblong to narrowly oblong (occasionally oblanceolate), middle-green throughout to somewhat purplish in full sun; neither with any purple spots or markings nor tar-colored; more or less sparsely pubescent on both sides, but more regularly along nerves, may be subglabrous from beneath. **Leaf lateral lobes** usually distinctly alternate, sometimes subopposite; equidistant from each other or sometimes apical lobes brought slightly closer together; directed upwards, but sometimes perpendicular to midrib, occasionally directed downwards; rather variable in outline, from narrowly triangular to linear, typically broadening toward the apex; tips obtuse or shortly cuspidate; basally may be dilated. **Upper lobe margin** more or less flat, with (0)2–3(4) large teeth basally, or teeth may be displaced to the interlobe. **Lower lobe margin** flat, entire, rarely with one minute tooth near the middle, but in the late-season leaves may have a large lobe or tooth. **Interlobes** with (0)1–2 teeth and often with additional, rather large teeth which are displaced from the basal part of leaf lobes. **Leaf apical lobe** more or less equalling to a pair of lateral lobes, obtuse to subobtuse, sometimes shortly cuspidate apically. **Scapes** overtopping leaves, 13–40 cm tall during anthesis, often strongly arching in flowering stage, sparsely pubescent on most part of their length, but with dense tuft of hairs under inflorescence. **Capitules** medium-sized, (2.5)3–3.5 mm across in full bloom, convex, medium yellow. **Outer phyllaries** (Fig. 3: C–F) (9)11–15(17) in number; 5–10(12) × 2–4 cm; loosely appressed to inner phyllaries

upon flowering, sometimes tips are bent outwards, often arcuate-erect after flowering; shape variable, from broadly ovate or cordate to lanceolate; 5–9 mm long; usually light green, with distinct nerves, rarely medium green, with inconspicuous nerves; imbricate to subimbricate; distinctly but variably bordered, border (0.05)0.1–0.2(0.4) mm wide, but basally sometimes with gradual transition, up to 0.5 mm wide; almost always suffused purplish apically, but typically also purplish along the border; hairy along the margin, but sometimes glabrous; apex shortly corniculate (horns up to 1 mm long) or callose, sometimes may be flat, in herbarium calli usually hardly visible. **Inner phyllaries** 11–16 mm long, apex usually callose. **Outer ligules** flat, striped purplish-gray (alive) or dark grayish (when dried); teeth apically dark yellow, sometimes orange. **Stigmas** yellow to darkish, but never very dark. **Pollen** always present, often abundant; grains of variable size. **Achenes** (Fig. 4) rather uniform in size but polymorphic in spinulosity and color, ca. 3.5–4 × 0.8–1.1 mm (cone included), dark purple or purplish brown, but sometimes evenly dark gray or brownish; purplish tint is variable within populations, from totally absent to rather strongly expressed; spinulose in upper $\frac{1}{3}$ – $\frac{1}{2}$, subglabrous elsewhere; subgradually narrowing into a long cylindrical cone 1–1.3 mm long; beak 7–9 mm long; pappus white.

Specific features of early and later leaves. It is typical of *Taraxacum* that only middle leaves, which dominate in the middle flowering period, should be used in taxonomical studies (Räsänen et al., 2010). In *T. erythroboreale*, outer (early-season) leaves (Fig. 2: M, N) are characterized by broadly winged petiole and less strongly dissected leaf lamina, often without characteristic distally dilated lobes, which are simply triangular and pointing downwards. In juvenile plants, the leaves of this kind may persist the whole season, and sometimes in smaller specimens during their first flowering as well. Inner (late-season) leaves (Fig. 2: O), in contrast, are more strongly dissected and may superficially resemble *T. norvegicum* (Dahlst.) Dahlst., explaining why two sole plants which pre-existed in collections prior to our investigations (MW0551747, MW0551748) were determined so.

Holotype (Fig. 5): Murmansk Region, Kandalaksha District, ca. 7 km WSW from Kandalaksha, at the turn to the village Alakurtti from Murmansk highway, dry sandy roadside, ca. 190 m a. s. l., 67°09.3203' N, 32°09.1428' E, 22 VI 2023, P. G. Efimov, G. Yu. Konechnaya, M. V. Legchenko, M. B. Sheludyakova, № 2023/980, plant 5 (LE 01256353; isotypes: № 2023/980 plant 1 (MSKU), plant 2 (LE 01256356), plant 3 (LE 01256355), plant 4 (LE 01256354),

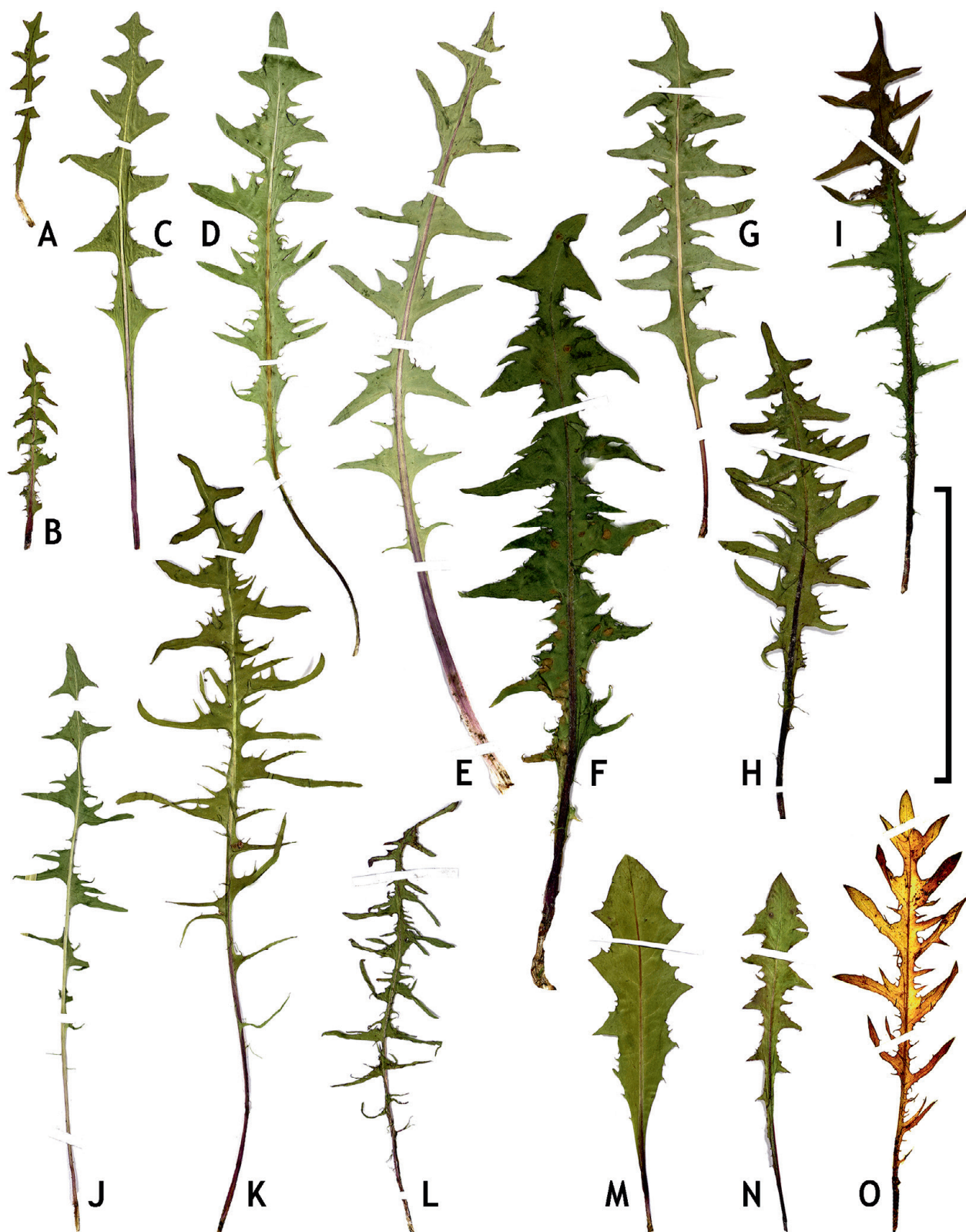


Fig. 2. Variability of leaf shape in *Taraxacum erythroboreale* (from herbarium specimens). A–L — “middle” type; M, N — juvenile leaves; O — late-season leaf from the herbarium specimen misidentified as *T. norvegicum*. Scale bar: 10 cm.



Fig. 3. Morphology of *Taraxacum erythroboreale* from the type locality. A — overview of habitat with numerous well-developed individuals; B — weakly developed individual; C — outer phyllaries of distinctly corniculate plant; D–F — variability of the shape of outer phyllaries.



Fig. 4. Variability of fruits in *Taraxacum erythroboreale* from the type locality. Scale bar: 1 mm.

plant 6 (LE 01256352), plant 7 (LE 01256351), plant 8 (LE 01256350), plant 9 (LE 01256349)).

Paratypes. Appendix 1.

Note about further location of type specimens. Numerous isotypes were collected having in mind their distribution in the future among public Herbaria of the world with prominent taraxacological collections, so some of them in the future are to be sought outside Herbarium LE.

Distribution. *Taraxacum erythroboreale* is yet safely recorded from ca. 22 localities within three regions of Russia: Republic of Komi, Murmansk Region, Vologda Region (Fig. 1). Most numerous localities (ca. 18) were discovered in the Murmansk Region, evidencing continuous distribution in this area. Findings in the Republic of Komi and in the Vologda Region are solitary, but unlike the Murmansk Region, these regions were only marginally touched by our studies (see routes on Fig. 1) and it is unknown whether these localities are indeed isolated or represent part of continuous species distribution. Anyway, taking into account numerous findings of *T. erythroboreale* in the short period such as two years (2022–2023), it is reasonable to suppose that it has indeed large distribution in North European Russia, mostly between 65° and 69° N, and additional findings are expected in the future.

In the Murmansk Region, the new species was collected in 8 districts, and was especially abundant in Kandalaksha District, both concerning the number of localities and the number of plants in local populations. It was also found regularly further north, up to the Kola District; in the latter, we found two localities only, with solitary plants observed. The northernmost one was in the town of Kola, which is near the southern part of the city of Murmansk. In Murmansk urban area, we did not find this plant despite search in 3 or 4 places; perhaps, it will

be found there in the future, but obviously, *T. erythroboreale* reaches its climatic limit near Murmansk.

Additionally, data from the website iNaturalist (2023) show that the plants superficially very similar to *T. erythroboreale* exist also in Yamal-Nenets and Khanty-Mansi Autonomous Areas (North-West Siberia) and maybe further southwards as well. It seems that similarly with the Murmansk Region, the plants occur there in strongly ruderalized habitats, e. g. in the cities and highway roadsides. However, safe determination of plants according to photographs is impossible.

Etymology. The species epithet is a combination of two words, “Erythrosperma” and “borealis”, intended to describe that it bears a distinct stamp of section *Erythrosperma* morphology, and is widely distributed in the North.

Monstrous and untypical specimens. Appendix 2.

Ecology. *Taraxacum erythroboreale* occupies mostly dry sandy roadsides along the roads passing through dry pine forests, occurs on disturbed sites on the edges of such forests, and in other ruderal places in similar soil type and moisture conditions, such as dry sandy roadsides in populated areas.

The fruits are extensively used by siskins, *Spinus spinus* (Linnaeus), for foraging. This was often observed in 2023 in the Murmansk Region. Sometimes fruits were so accurately harvested, both ripe and unripe ones, that it was difficult to find any.

Discussion

Diagnostically valuable characters of *Taraxacum erythroboreale* are the following: distinctly purple, un-winged or very narrowly winged petioles; symmetrical (subsymmetrical) leaf shape (oblong, not oblanceolate); obtuse leaf lateral lobes with a prominent tendency to



Fig. 5. Holotype of *Taraxacum erythroboreale* (LE 01256353).
Inset: achenes (scale bar: 1 mm).

the dilatation in distal half at least in half of the leaves, basally with (0)2–3(4) more or less large teeth which can be displaced to the interlobe; leaf blade neither with purple markings or spots, nor tar-colored; capitules medium-sized, (2.5)3–3.5 cm across; outer phyllaries usually light green and purplish apically, distinctly (but sometimes narrowly) bordered; appressed (rarely erect); pollen always present on stigmatic surface; cone uniformly long, cylindrical, 1–1.3 mm long.

Morphological polymorphism. *Taraxacum erythroboreale* exhibits high morphological polymorphism in some important traits. According to our observations, this polymorphism is comparably similar between and within populations (very few marginal populations with untypical morphology excluded). Possible explanation of high polymorphism is presumable hybrid nature of the plant. The following traits are especially polymorphic in *T. erythroboreale*:

1) Shape of outer phyllaries varies strongly from broadly ovate (Fig. 3: D) to lanceolate (Fig. 3: C), and this variability is rather wide within populations. If outer phyllaries are broad, they usually tend to be cordate in outline rather than broadly ovate.

2) The width of hyaline border of outer phyllaries is rather variable, from very narrow but distinct, 0.05 mm wide, to rather broad, up to 0.5 mm, and indistinctly separated from the green part.

3) Corniculation of outer phyllaries is also rather variable, but horns never exceed 1 mm (Fig. 3: C), sometimes phyllaries are minutely callose or flat.

4) Color of stigma varies from yellow to darkish, styles may be covered with dark hairs, but never distinctly dark.

5) Color of achenes (Fig. 4). The presence/absence of purplish color is variable in populations (but never within the same plant). In the populations of *T. erythroboreale*, ca. 75% plants display distinct purplish achene pigmentation. This kind of polymorphism looks rather surprising for apomictic species of section *Erythrosperma*, but G. Wendt and H. Øllgaard (2015) observed variability of this character in as much as 5 taxa of this section (*T. dahlii* Dahlst., *T. falcatum* Brenner, *T. frondatum* H. Øllg., *T. fulvum* Raunk., and *T. isthmicola* H. Lindb.). At the same time, other details of fruit morphology seem to be rather monomorphic.

6) Leaf shape (Fig. 2). The leaf lobes may vary from narrowly triangular to linear in outline. We noticed that the shape of leaf lobes (unlike the degree of their dissection) not necessarily corresponds to the dimensions of the plant, although smaller plants more usually develop broader leaf lobes. Leaf polymorphism of such kind is generally a normal phenomenon in *Taraxacum*.

Affinities and possible intersectional hybrid nature of *Taraxacum erythroboreale*. The new species is treated here as a possible member of section *Erythrosperma* because of its strongly dissected leaves, bordered outer phyllaries, and rather small fruits with long cone, often displaying distinct red pigmentation. *T. erythroboreale* superficially resembles robust taxa of this section, like *T. commixtum* G. E. Haglund or *T. falcatum*, but may be readily distinguished from both by appressed outer phyllaries, which are usually lighter-colored and broader, by shape of lateral leaf lobes; additionally *T. falcatum* differs by the absence of pollen and *T. commixtum* by distinctly dark red achenes. However, this sectional affiliation is not undoubtful, because *T. erythroboreale* has some similarity to the Asiatic sections *Stenoloba* Kirschner et Štěpánek and *Dissecta* (Soest) R. Doll (Table), e. g. in the characters of outer phyllaries (light-colored and broad, appressed, usually indistinctly corniculate, often with indistinct hyaline border with purplish pigmentation). The shape of *T. erythroboreale* leaves also looks unusual for section *Erythrosperma* because their lateral lobes typically have only large teeth and somewhat broaden towards the end. Its wide distribution in northern areas was also bothering.

There is certain evidence of recent spread of plants from section *Stenoloba* westwards. Whereas J. Kirschner and J. Štěpánek (2011) reported this group from Altai and further east, there are numerous new reports of *T. scariosum* or *scariosum*-like morphotypes from West Siberia up to the Ural Mountains, both in the southern and northern areas, including Yamal-Nenets and Khanty-Mansi Autonomous Areas (GBIF, 2023). In addition, we have recently found large populations of alien plants from section *Stenoloba* (their species-level determination is yet uncertain) in the south of the Arkhangelsk Region (Efimov, unpubl.), very far from the main range of this section as outlined by Kirschner and Štěpánek (2011). Supposedly, this westward migration might be accompanied by hybridizations with local taxa from section *Erythrosperma*, which could give rise to *T. erythroboreale*.

There are several confirmed examples in *Taraxacum* when recent immigrants produce hybrids with local taxa (e. g., Uhlemann et al., 2009). This process is possible only if at least one of the parents can produce sexual offspring. At the current level of knowledge, among the sections discussed in the context of *T. erythroboreale*, there are a few sexual taxa only in the sections *Erythrosperma* and *Dissecta* (Kirschner et al., 2020; Kirschner, Štěpánek, 2011, 2023). However, there may exist some yet undescribed sexual taxa, especially in the mountainous areas, which are often known to harbor sexual diversity of the genus (Kirschner et al., 2014), e. g. in the Urals.

Table. Comparison between *Taraxacum erythroboreale* and sections *Erythrosperma*, *Stenoloba* and *Dissecta* (after: Kirschner, Štěpánek, 2011, 2023 or from personal data)

Character	<i>T. erythroboreale</i>	Section		
		<i>Erythrosperma</i>	<i>Stenoloba</i>	<i>Dissecta</i>
Tunic	Present, but not persisting for long time	+ Usually present	– Absent	+ Present
Outer phyllaries shape	Broadly to narrowly ovate, sometimes up to lanceolate	– Narrowly to broadly lanceolate, up to narrowly ovate	– Ovate-lanceolate to linear-lanceolate	+ Broadly ovate to ovate-lanceolate, up to lanceolate
Outer phyllaries posture	Appressed to erect-appressed	± Erect-patent to arcuate-recurved, rarely subappressed	± Appressed to arcuate-patent	+ Appressed, rarely erect to arcuate-patent
Outer phyllaries apex	Usually only callose, but may be flat or with small horns	+ Usually present, rather small; sometimes absent	– Callose to corniculate	– Apically flat, rarely callose or corniculate
Outer phyllaries border	Bordered, but border variable, very often not distinctly delimited; may be pinkish	– Usually with a thin but distinct border; sometimes borderless	– Usually with a narrow but distinct border	– Usually with a distinct border, or borderless
Achene length, mm	3.5–4	+ 3–4.5	– 3.7–5	+ 2.8–4.2(4.4)
Achene color	Gray-brownish, often with distinct reddish hue	+ Usually distinctly red or with red hue, sometimes brown or fulvous	– Pale grayish to stramineous brown	+ Stramineous-brown, light gray or red-brown
Cone length, mm	1–1.3	± (0.5)0.7–1.3	– 0.9–1.2	– 0.5–0.9
Achene body/cone transition	Subgradual	± Subgradual to abrupt	+ More or less gradual	– Abrupt or subabrupt, rarely subgradual
Geography	(?) Presumably originated from East Siberia	– Mainly European group with few species outside	+ Rather broad distribution in south Siberia and further south	+ Broad distribution in continental Asia

Note. Symbols “+”, “±” and “–” denote the degree of similarity of a character state between the section and *T. erythroboreale*.

The newly described species, despite its rather large morphological variability, is most likely an apomict because its pollen grains in several examined specimens were unequal in size, which is a good indicator of apomictic reproduction mode in *Taraxacum* (Nijs et al., 1990).

Taraxacum erythroboreale may be compared with *T. jacuticum* Tzvelev and *T. pospelovii* Tzvelev et E. B. Pospelova, peculiar Siberian taxa with similar narrow leaf lobes, which oscillate between different sections and do not have unanimously accepted position within the genus (Kirschner, pers. comm.). Those taxa also may represent similar result of intersectional hybridization, which is confirmed by the fact that both of them, being rather peculiar morphologically, were only recently collected and described (protologues dated 1984 and 2015, respectively). In the case of *T. jacuticum* and *T. pospelovii*, section *Borealia* Hand.-Mazz. might be involved instead of *Erythrosperma*.

Anyway, intersectional origin of *T. erythroboreale* is here only hypothesized, traits of section *Erythrosperma* generally dominate, and its hybrid origin needs verification in the future. It is often said that *Taraxacum* has

low level of structural differentiation (e. g. Kirschner, Štěpánek, 1996), so that the same character states are displayed in various, unrelated sections of the genus. In this view, similarities of *T. erythroboreale* with sections other than *Erythrosperma* may be a result of morphological convergence and not necessarily indicate true relationships.

Two late-season collections of *T. erythroboreale* kept in Herbarium MW were originally determined as *T. norvegicum*. In fact, the similarity between these taxa is minimal. *T. norvegicum* belongs to a completely different, unrelated arcto-alpine section *Borealia*, and it can be easily distinguished by a very large apical leaf lobe, which is substantially bigger than lateral ones, and by fewer number (0–1(2)) of additional teeth on the lateral lobes or between them. Phyllaries of *T. norvegicum* (both outer and inner ones) differ by dark green color and bear very distinct horns ca. 1 mm long.

Note about possible distributional changes. The species composition of *Taraxacum* within particular areas and the frequency of particular species may change rather quickly, which was shown on the example of

floristic province Karelia borealis in southern Finland (Räsänen, 2013). In that study, substantial changes in the numbers of localities within the last 70 years were observed not only for separate species, but for the whole sections as well, such as the gradual substitution of species of section *Borea* Sahlin ex A. J. Richards by those of section *Taraxacum*.

Taraxacum erythroboreale was collected for the first time only in 1998 (two herbarium specimens) despite numerous earlier floristic studies in the Murmansk Region and the Republic of Karelia (Kravchenko, 2007; Kozhin et al., 2020), and in other areas of North European Russia as well. This may indicate that *T. erythroboreale* was much more rare in the past, or even absent within the studied territory. Similarly to the species from section *Taraxacum*, it may benefit from the current environmental conditions, as well as human activity. *T. erythroboreale* occurs in strongly ruderal environment, and it may develop secondary range in relatively short time. Although *Taraxacum* species are mainly considered to be wind-dispersed, anthropochory may be responsible for its dispersal along highways, and probably for its long-distance dispersal to more distant localities, such as one in the Vologda Region.

Finally, I would like to add some speculative point on the possible spread of *erythroboreale*-like plants. In fact we have no information how successful further invasion of *T. erythroboreale* into new areas can be. But if it is progressing, *T. erythroboreale* may mark a new step in *Taraxacum* colonization by a new type of plants that have a potential to displace earlier migrated taxa of widespread section *Taraxacum*. Such trend was already observed in several places of the Murmansk Region, where no or solitary plants of section *Taraxacum* persisted, despite they occurred in larger quantities in the areas free from *T. erythroboreale*. According to photographs from Yamal-Nenets Autonomous Area on iNaturalist (2023), *T. erythroboreale* is also very successful in Novyi Urengoi and in some other relatively young settlements of that area. However, such evolutionary success of *T. erythroboreale* may be confined to special kind of habitats only, such as places with sandy soil in cold climate.

Whatever the origin and further spread of *T. erythroboreale* may be, the finding of such a distinctive taxon in numerous localities illustrates low extent of knowledge of modern *Taraxacum* diversity of North European Russia.

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Supplementary materials

Appendix 1. Paratypes of *Taraxacum erythroboreale*. https://www.binran.ru/files/journals/Novitates/2023_54/NSPV_54_12_Efimov_Appendix_1.pdf

Appendix 2. Monstrous and untypical specimens of *Taraxacum erythroboreale*. https://www.binran.ru/files/journals/Novitates/2023_54/NSPV_54_12_Efimov_Appendix_2.pdf

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