Iva Apostolova & Antoaneta Petrova

New data on *Merendera sobolifera* C. A. Mey

Abstract

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The chorological data on *Merendera sobolifera* in Bulgaria are presented together with the current status of 8 localities, two of which are new for the country. Species ecology, biology and manner of spatial dispersal have been studied, as well as the population structure of 3 investigated populations. Phytocoenological characteristics of 4 communities have been assessed. Some comments are given on the historical migration and distribution of the species. An evaluation of the human influence on the *Merendera sobolifera* populations has been made.

Introduction

Merendera sobolifera is a perennial herb. Its main characteristics are the sobols - short swollen underground stems of 4 to 8 cm length. The sobols form a branched system that develops vegetative and generative aboveground shoots and also serves perennation, vegetative propagation and short-distance spatial distribution. Leaves and flowers develop simultaneously in spring. The flowering shoots are always provided with 3 green leaves, though young vegetative shoots usually have 1 or 2 leaves.

Merendera sobolifera is among those *Colchicaceae* representatives that have the largest distribution (Fig. 1, after Stefanov 1926, Cherniakovska 1935, Savilescu 1966, Valdes 1980, Davis 1984).

Bulgaria falls into the western areal boundary of *Merendera sobolifera*. About 10 localities of the species in the country are known at present, and it is considered a rare species according to Red Data Book of Bulgaria (Velchev 1984). Few data on the species biology and ecology are available. Chorological data for Bulgaria were provided by Stefanov (1926, 1943), Urumov (1905, 1930), Jordanov (1936), Kitanov (1956) and studies on the species morphology (Cheshmedjiev 1970) and chemistry (Ivanova & Cheshmedjiev 1969) were also published.

This paper presents a study on the recent status of *Merendera sobolifera* in Bulgaria and aims to shed light on some aspects of the species ecology and biology.

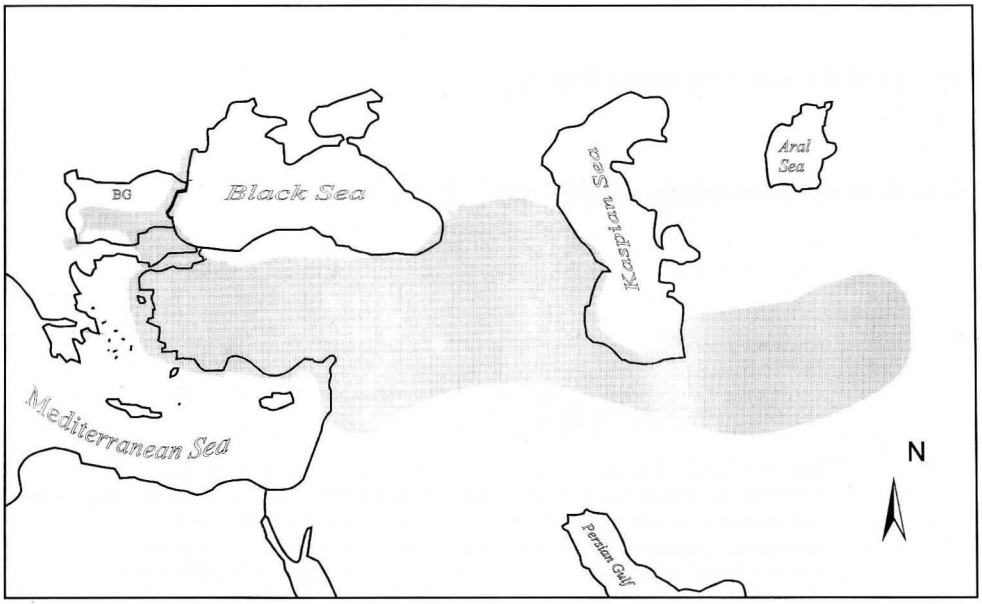

Fig. 1. Distribution of *Merendera sobolifera* C. A. Mey.

Material and Methods

During 1992-1997 we visited eight Bulgarian localities and studied them in more detail.

In 6 spots soil characteristics were studied after the methodology presented by Arinushkina (1970).

The seed weight was measured using 10 samples of 10 seeds each, with analytical balance WA33 with sensitivity 0.001g.

The number of seeds per capsule was counted on 50 or 100 capsules in three populations. One capsule per shoot was collected.

Density, spatial distribution of individuals and vegetative/generative shoots ratio were studied in three populations through sample mapping in scale 1:10 of randomly selected plots. A transect of squares of 50 õ 50 cm was positioned in these plots. Same size squares were used for evaluating the density out of the mapped area. The spatial distribution was tested by Morisita index (Greig-Smith 1964) $I_\delta = q \sum n_i (n_i-1) / N (N-1)$, where q is the number of sampling plots, n_i the number of individuals in i plot that varies from 1 to q, and N the total number of individuals in q plots.

Phytocoenotic characteristics were determined according to the dominance principles (Shennikov 1964); the abundance was estimated by Hult's five degree scale and was written in Arabic numerals; the frequency was written in Roman numerals and corresponds to 20% distance (i.e.1-20% - I; 21-40% - II, etc.). The nomenclature of the species follows Tutin & al.(1964-1980) and Greuter & al. (1984-1989).

The species similarity between communities was estimated by the Soerensen coefficient (Greig-Smith, 1964) K = 2c/(a+b), where c is the number of common species for both communities, a and b - the number of species unique to the communities.

Results

Chorology

Merendera sobolifera was first recorded for the Bulgarian flora by Velenovskyi (1891). In herbaria SO, SOM, SOA and Plovdiv Agricultural High School, there are about 50 sheets. Specimens from several regions are included:

— Sofia region - 9 collections made during 1894-1937;

— Varna region - 5 collections made during 1910-1911 in the surroundings of Varna lake;

— Bourgas region - 2 collections from 1910 and and one specimen from Slanchev Briag collected in 1960;

— Kazanlak region - 2 collections made near the villages Dunavci and Ovoshtnik in 1937 and 1944;

— Plovdiv region - 20 collections made during 1893-1975, all from the meadows close to the town;

— Petrich region - one collection made in 1929.

Six *Merendera sobolifera* localities were verified by our observations:

(1) Sofia district, 7 km east of the capital, between Ravno Pole and Kazichene villages - in meadows;
(2) Kazanlak district, north-west of the Dunavci village - in a moist meadow;
(3) Kazanlak district, by the Ovoshtnik village - on ruderalized pasture;
(4) Sliven district, 2 km south of the Gorno Alexandrovo village - in a pasture;
(5) Plovdiv district, actually in the town of Plovdiv - in a forest park;
(6) Bourgas district, in the Slanchev Briag resort (6a) – in the park zone, and in the damp meadows at Hadjiiska river mouth (6b), 3 km from the resort.

Two new localities were added:

(7) Varna district, in the Novo Oriahovo village, on sandy terrain by the Kamchia river mouth.
(8) Bourgas district, 5 km northwest of the town of Karnobat – in a mesophytic meadow.

The search for the species in localities at foothill of the Vitosha mountain (southwest of Sofia) and at appropriate habitats around the Varna lake was usuccessful. In Bulgarian herbaria there are no specimens either from Sadovo (Stribrnyi) and Haskovo (Adamovic), localities which Stefanov (1926) mentions in his monograph, or from the surroundings of Iskretz village (Urumov 1905).

In SOM herbarium there is a specimen collected in 1919 in the surroundings of Petron lake (SOM 11550) which confirms *Merendera sobolifera* for Greece. The chorology of *Merendera sobolofera* in Bulgaria is presented in Fig. 2.

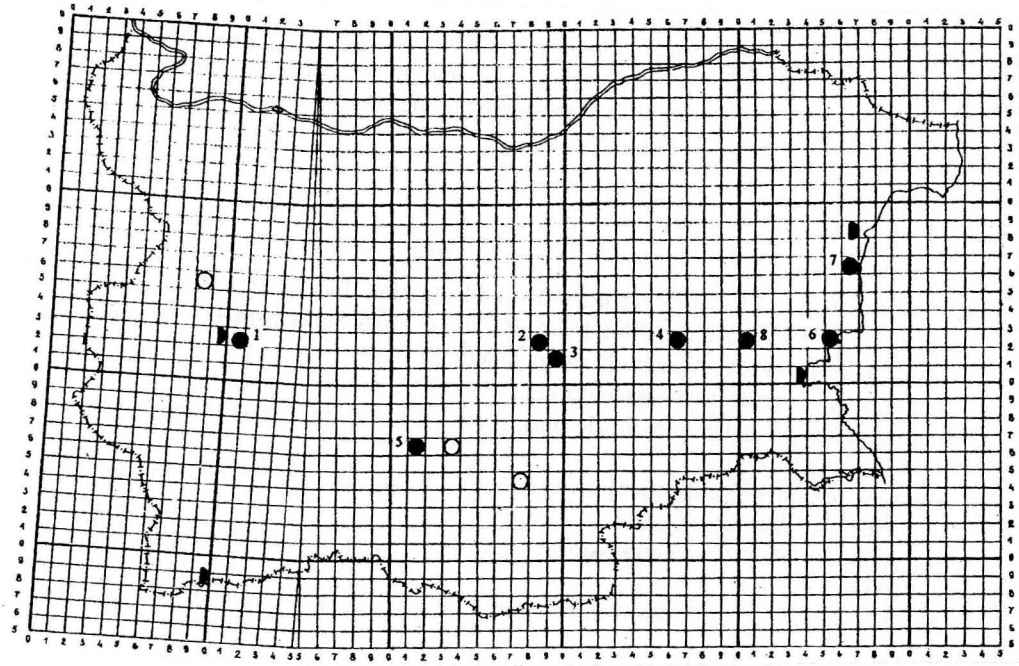

Fig. 2. Distribution of *Merendera sobolifera* C. A. Mey in Bulgaria: (●), visited localities; (◑), localities according to data in the herbaria; (○), localities cited only in the literature.

Habitats and ecology

All known Bulgarian species biotopes are situated on flat terrain between 0 and 650 m above sea level. The species stands successfully temporal spring floodings such as those we observed at localities (1), (2) and (6b).

Merendera sobolifera is a heliophyte but it tolerates some shading as observed in the park zones in Plovdiv (5) and Slanchev Briag (6a). However the population density under the canopy is low.

As proved by soil analyses, *Merendera sobolifera* lives on carbonate alkaline soils. The species has a considerable tolerance of the humus content and of the content of macrobiogenic elements in the soil (Table 1).

Table 1. Soil peculiarities in six *Merendera sobolifera* localities.

Locality	Soil type	pH	% humus	% N	K_2O mg / 100 g	Na_2O mg / 100 g
(1)	carbonate	9.3	2.56	0.17	77	77
(2)	carbonate	8.9	7.71	0.51	18	33
(3)	carbonate	9.2	0.89	0.09	8	13
(6a)	carbonate	8.7	22.70	1.19	17	42
(6δ)	carbonate	8.7	10.96	0.30	88	84.5
(7)	noncarbonate	8.4	21.33	1.22	51	21

Biology

Merendera sobolifera is one of the earliest flowering species in Bulgaria. Depending on air and soil temperature there are some differences in the flowering period. For example around Sofia at 650 m above sea level, all collected specimen are from March–April, while in Varna district, at sea level, it was collected with flowers in January (SOM: 11542; SOM: 11543). A delay in the maximum flowering stage (over 75% of the plants in flower) of 15 to 20 days was observed in locus (6a) compared to the (6b) during 1992, 1993 and 1994. It could be supposed that these differences in phenology depend on different soil and air temperatures, which in the park zone (6a) are considerably higher than along the riverside (6b) where at this time of the year cold wind blows from the sea. The same phenomenon was observed in localities (2) and (3). They are situated at 15 km distance at the same altitude, but meadows near the Dunavci village (2) are inundated by cold waters coming from the mountain and *Merendera sobolifera* there flowers later. On 13 April 1992 the individuals in locality (2) just began flowering while in locality (3) they were completely overblown. Thirty individuals were taken to the Botanical garden from localities (3) and (6). The flowering was simultaneous there in the second year. The first bloom in 1994 was on 2 March and the last on 14 April. In 1995 the first bloom was obtained on 20 February and the last one on 21 April. We think the flowering period in the Botanical garden is a response to the average temperature in February, which in 1994 was 1.3°C while in 1995 it was 5°C. Each shoot could develop from one to four flowers, which bloomed in succession, and each took 8-10 days. The flowering period of *Merendera sobolifera* and its fruit production which in this country occur during May and June define it as a typical ephemeroid.

The capsules are situated at 1-1.5 cm above the ground. When open, most of the seeds fall close to the mother plant. A morphometric study was made of 71 capsules from (6a) locality. The length of a capsule is 19.1 mm (σ =3.4; C.V. = 17.8%), its width is 9.2 mm (σ = 1.3; C.V. = 14.1%). The average diameter of the seeds is 1.47 mm (σ = 0.2; n = 30). The weight of a seed is 2.35 õ 10^{-3} g (σ = 0.32; C.V. = 23.7%).

Over micropyle a pale fleshy caruncle was observed. The caruncle is built up of reserve starch parenhyma full of polyhedral starch grains. Early blooming and fruit production, existence of caruncle and seed dispersal on the soil surface are symptoms of dispersal by myrmecochory (Levina 1957, Fahn & Werker 1972, van der Pijl 1982) in *Merendera sobolifera*. We consider this as natural as many *Colchicum* species are also myrmecochoric (Skripcinski 1979, Tahtadjian 1982). Seed production data from 3 populations are summarized in Table 2. The plants in park zones (6a) and (5) usually develop 2 to 3 capsules on a shoot, while in locality (1) there is one capsule on each shoot. The high seed production in (6a) is supposed to be the result of park management, low competition among species and free access of pollinators to the flowers.

Table 2. Number of seeds in one capsule.

			Number of seeds in one capsule				
Locality	Year	Capsules	min	max	average	σ	C.V.
(6a)	1992	100	8	120	56.9	25.7	42.2
(1)	1994	50	3	82	23.5	15.8	67.2
(5)	1995	50	14	45	24.6	11.7	47.6

Population structure

The largest *Merendera sobolifera* population studied is that of Slanchev Briag (6), which has an area of 4 x 0.2-0.8 km. At Novo Oriahovo village (7) *Merendera sobolifera* was found in few patches of 1-2 to 10-15 m^2.

The populations near Dunavci (2), Gorno Alexandrovo (4), and Ravno Pole (1) villages were represented by several (3-10) patches of 1 to 500 m^2, sometimes separated by several dozens of meters. The population near Ovoshtnik village (3) consists of only one 1000 m^2 patch. The population at Karnobat (8) occupies 50000 m^2 forming patches of 500 – 1000 m^2 each.

Spatial population structure is uneven. Morisita index calculated for the three populations is: $I\delta$ (1) = 11*6864 / 26406 = 2.86; $I\delta$ (6a) = 20*38004 / 375156 = 2.03; $I\delta$ (7) = 50*5316 / 54990 = 4.83. Where the values are above 1, they indicate a patchy spatial structure. Samples of spatial distribution are shown on Fig. 3. The correlation between generative and vegetative shoots has higher values for vegetative shoots in all mapped populations (Table 3).

Table 3. Density and presence of generative and vegetative shoots in mapped populations.

Locality	Mapped area (m^2)	Total number of shoots	Average number of shoots per 1 m^2	Vegetative shoots (%)	Generative shoots (%)
(1)	1.2	83	69.2	79.5	20.5
(6a)	10	614	61.4	86.3	13.7
(7)	12.5	235	18.8	69.8	30.2

Another illustration of the patchy structure is the flower density data for different regions in Slanchev Briag (6a) presented in Table 4. The high variation coefficient (C.V.) shows extreme variation of population density according to the scale proposed by Zaicev (1984).

Narrow belts (1-2 m) along the paths show approximately 5 times higher density as compared to the rest of the park zone in (6a). These belts become trampled during the summer and use to be dug up every other year. The frequent digging tears up the *Merendera sobolifera*'s sobols and thus stimulates vegetative propagation. At the same time it suppresses the competition with other species.

The vegetative reproduction of the sobols is very fast. Most of the specimens taken to the botanical garden formed new buds of 2-3 mm in about 3 days .

Table 4. Density of the flowering shoots of *Merendera sobolifera* in the Slanchev Briag park zone.

Sampling region	Number of samples	Number of flowering shoots at 0.25 m^2				
		min	max	average	σ	C.V.
In the lawn	43	0	15	3.2	3.5	109.4
Along paths	43	0	47	18.2	10.2	56.0

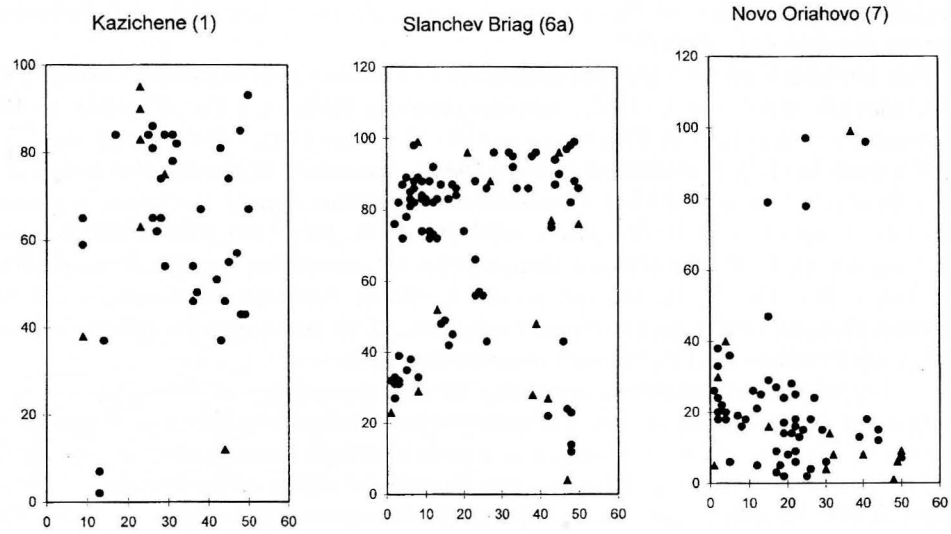

Fig. 3. Examples (100 cm × 50 cm) of spatial distribution of *Merendera sobolifera* C. A. Mey shoots in the mapped populations: (▲), generative shoots; (●), vegetative shoots.

Phytosociology

Phytosociology of *Merendera sobolifera* was studied in 4 natural localities:

1) Between Ravno Pole (1) and Kazichene villages - Sofia district, the population of *Merendera sobolifera* has developed in a meadow which was recently used as a pasture. The population occupies about 300 m^2. The flat terrain is developed on Pleocene sediments. *Merendera sobolifera* is a component of the *Poa pratensis* + *Festuca nigrescens* association. The projection cover of all herbs is 95%. The following species diversity and abundance was observed on 5 June1994:

Poa pratensis L. (3 IV), *Festuca nigrescens* Lam. (2 V), *Dactylis glomerata* L. (2 II), *Briza media* L. (1 I), *Festuca pseudodalmatica* Krajina ex Domin (1 II), *Carex distans* L. (1 II), *Lathyrus pratensis* L. (1 I), *Ononis arvensis* L. (+), *Trifolium diffusum* Ehrh. (1 I), *Vicia grandiflora* Scop. (1 I), *Achillea millefolium* L. (1 I), *Lactuca serriola* L. (1 I), *Taraxacum officinale* Web. (1 I), *Capsella bursa-pastoris* (L.) Medic. (1 I), *Thlaspi arvensis* L. (1 I), *Lychnis flos-cuculi* L. (+), *Stellaria palustris* Retz. (1 I), *Knaucia arvensis* (L.) Coult. (1 I), *Euphorbia cyparissias* L. (1 I), *Prunella vulgaris* L. (1 I), *Merendera sobolifera* C. A. Mey (1 II), *Ornithogallum narbonense* L. (+), *Orchis laxiflora* Lam. (+), *Plantago lanceolata* L. (1 II), *Odontites serotina* (Lam.) Dum. (+), *Rhinanthus rumelicus* Vel. (1 II).

2) In the haymaking meadows situated west of the village of Dunavci (2), *Merendera sobolifera* is an element of the *Poa sylvicola* association. The association occupies an area of 3-4 ha on 10° steep slope. The soils are deluvial with high underground water table. The meadows are well moistured during the year and inundated in spring. The projection vegetation cover is 100%. In late spring and in autumn the communities are used as a

pasture. The description of the association was made on 1 June1993. The following species diversity were observed:

Poa sylvicola Guss. (3 V), *P. pratensis* L. (1 I), *P. annua* L. (1 I), *Bromus mollis* L. (2 IV), *Dactylis glomerata* L. (1 I), *Festuca pratensis* Huds. (1 II), *F. rubra* (1 II), *Cynosurus cristatus* L. (1 I), *Carex panicea* (1 I), *C. distans* (1 I), *Trifolium pratense* L. (1 I), *T. repens* L. (1 I), *T. montanum* L. (1 I), *Ononis arvensis* (1 I), *Ranunculus acris* L. (2 IV), *Rhinanthus minor* L. (2 III), *Cerastium brachypetalum* Pers (1 I), *Galium rubioides* L. (1 I), *G. verum* L. (1 I), *Merendera sobolifera* C. A. Mey (1 I), *Filipendula ulmaria* (L.) Maxim. (1 I), *Orchis palustris* Jacq. (1 II), *O. coriophora* L. (1 I), *Dactylorhiza incarnata* (L.) Soo (1 I), *Daucus carota* L. (1 I), *Plantago lanceolata* L. (1 I), *Ornitogallum sp.* (2 III), *Leucanthemum vulgare* Lam. (1 I), *Taraxacum officinale* Web. (1 II), *Iris graminea* L. (1 I), *Clematis integrifolia* L. (1 I).

3) The *Merendera sobolifera* population in the surroundings of Ovoshtnik (3) is a component of the *Vulpia myuros* + *Euphorbia cyparissias* association. The ground is formed by Pliocene sands. At present it is a pasture of high ruderalisation degree. Every day herds of different kinds of breeds cross through the region of the community which cause severe trampling and grazing. The projection cover of the herbs is 50%. The association description was made on 2 June1993:

Bromus mollis L. (3 IV), *B. tectorum* L. (2 I), *Vulpia myuros* C.C.Gmel. (4 IV), *Poa bulbosa* L. var *vivipara* (1 I), *Hordeum leporinum* Link. (2 I), *Trifolium repens* L. (1 III), *Medicago minima* (L.) Bart. (1 II), *M. lupulina* L. (1 II), *Euphorbia cyparissias* L. (3 IV), *E. helioscopia* L. (1 I), *Eryngium campestre* L. (1 II), *Taraxacum officinale* Web. (1 II), *Cerastium semidecandrum* L. (1 I), *Erodium cicutarium* (L.) L'Her (1 I), *Erysimum diffusum* Ehrh. (1 I), *Ranunculus sardous* Crantz (1 I), *Verbascum* sp. (1 I), *Achillea millefolium* L. (1 I), *Verbena officinalis* L. (1 I),) *Merendera sobolifera* C. A. Mey (1 II).

4) At Hadjiiska river mouth (6b) *Merendera sobolifera* is an element of the *Juncus acutus* - *Poa sylvicola* association. The soil substrate is sandy and extremely humid. The projection cover of the vegetation is 95%. A few *Eleagnus angustifolia* L. individuals were observed in the association. The floristic composition, observed on 2 June 1992, comprises the following species:

Poa sylvicola Guss (3 IV), *Bromus racemosus* L. (2 II), *B. sterilis* L. (1 II), *Hordeum leporinum* (2 I), *H. hystrix* (3 I), *Festuca pratensis* Huds. (1 II), *Lolium perenne* L. (1 I), *Alopecurus myosuroides* Huds. (1 I), *Elymus repens* (L.) Gould. (1 I), *Juncus acutus* L. (3 IV), *Carex divisa* Huds. (1 I), *Vicia hirsuta* (L.) S.F.Gray (2 I), *V. pannonica* Crantz (2 II), *Trifolium campestre* Schreb. (1 I), *Medicago minima* (L.) Bart. (1 I), *M. lupulina* L. (1 I), *Trigonella procumbens* (Bess.) Rchb. (1 I), *Ononis spinosa* L. (1 I), *Merendera sobolifera* C. A. Mey (1 I), *Geranium pusillum* L. (1 I), *Torilis nodosa* (L.) Gaertn. (1 I), *Cerastium semidecandrum* L. (1 I), *Plantago lanceolata* L. (1 I), *Taraxacum officinale* Web. (1 I), *Helianthemum nummularium* (L.) Mill. (1 I), *Limonium* sp. (1 I), *Galium debile* Desv. (1 I), *Cynanchum acutum* L. (1 I), *Cardaria draba* (L.) Desv. (1 I), *Ranunculus sardous* Crantz. (1 I), *Rumex acetosa* L. (1 I), *Potentilla reptans* L. (1 I), *Artemisia campestris* L. (1 I), *Althaea officinalis* L. (1 I).

Obviously *Merendera sobolifera* is found in herbaceous communities which have mesophytic character. The classification of Stefanov (1943) was used in the analyses of the influence of the anthropogenic factor on the floristic composition. According to the species' confinement to specific habitats and their ability for wider dispersal, the author

distinguishes "stationary" species: highly specialized, with paleomorphic organization, exclusively confined to their typical habitats; "mobile" species: more versatile, which retain their original habitats but are able to adapt to a wider range of conditions, and "secondary settlers": species closely related to human activity (cultivated species and weeds). A summary of the presence of annuals, perennials, and the groups according to Stefanov (1943) is presented in Table 5. Considerable differences among the associations are established. The highest abundance of perennials could be found in meadows of Dunavci (2) and Ravno pole (1), less in the community at Hadjiiska river (6b), while in Ovoshtik (3) mainly annuals with dominant role are represented.

The community in locality (2) has the highest percentage of stationary species emphasizing that it has had little human influence, while in locality (3) the only stationary species is *Merendera sobolifera* and most of the remaining species are secondary.

The similarity coefficients of the studied communities are as follows:

Ravno pole (1) - Dunavci (2) = 0.28
Ovoshtnik (3) - Hadjiiska river (6δ) = 0.18
Ovoshtnik (3) - Dunavci (2) = 0.16
Ovoshtnik (3) - Ravno pole (1) = 0.16
Hadjiiska river (6δ) - Ravno pole (1) = 0.09
Hadjiiska river (6δ) - Dunavci (2) = 0.09

The different range of similarity coefficients illustrates the ability of *Merendera sobolifera* to live in diverse communities, with different species composition.

Table 5. Analysis of species composition in studied localities.

	Localities							
	6b		3		4		1	
	number	%	number	%	number	%	number	%
Total species	34		21		29		27	
Perennials	19	55.6	9	24.8	24	82.7	20	74.1
Annuals & biennials	15	44.4	12	57.2	5	17.3	7	25.9
Stationary species	7	21	1	5	10	37	4	16
Mobile species	12	38	5	24	13	46	14	58
Secondary distributed species	13	40	15	71	5	18	6	25

Discussion

The new found locality of *Merendera sobolifera* in Bulgaria (7) is part of seaside distribution along the West Black Sea coast. The localities near Dunavci (2), Ovoshtnik (3), Gorno Alexandrovo (4) and Karnobat (8) draw another species chorology line in the Tundja river valley. Series of localities (5, etc.) are in the valley of the Maritza river. Finally, the localities in the Sofia plain (1) form the fourth distribution zone. A careful analysis shows that about 100 years ago all localities were wide wetlands later drained by man.

The comparison between the recent *Merendera sobolifera* localities and the distribution of Neogenic water basins in South Bulgaria (Popov 1994) points to a significant coincidence. This fact encouraged us to go back in the history of the genesis and migration

ways of the species. So far researchers are positive about the ancient Mediterranean origin of *Merendera* species (Oganezova 1986, Popov 1983). The recent distribution of the species in Asia includes the mountainous district of Badgis, and the southern parts of the mountains Pamir, Altai, Copetdag and Caucasus. We accept the occurrence of the species in these territories as an evidence of its origin in the beginning of the orogenic activity there when the mountains were still islands in Parathetis. Once arised *Merendera sobolifera* kept growing in these areas and simultaneously with the orogenesis it spread its altitudinal distribution up to 2000 m as noted in recent floras (Cherniakovska 1935, Davis 1984).

Our observations on the species ecology according to the water factor confirmed its preference for wet habitats and its considerable tolerance of fluctuations in their water regime. At the same time we established its tolerance of salty soils which could be observed in the localities on the Black Sea coast and is apparent also by Kovalevskaya's (1971) statement that in Central Asia *Merendera sobolifera* survives in moist and salty regions.

Basing on these facts we suggest that the ecological tolerance of *Merendera sobolifera* helped the species survive in a historical aspect while within the distribution area a lot of different kinds of water basins appeared and vanished. Simultaneously with the periods of income and withdrawal of the Parathetis waters, the migration routes of the species probably followed the shores. This way of migration led to the distribution westwards (to Syria and Balkan peninsula) through Asia Minor.

Speciation events leading to *Merendera sobolifera* probably precede the xerophytisation phase of the ancient Mediterranean region as discussed by Popov (1983) and Kamelin (1973). We find the evidence for this in ephemeroid character of the species and in its relation with wetlands everywhere in its areal.

Taking into consideration all historical suggestions, we asked the question: how could the species disperse? Proceeding from the seed morphology, the populations structure, and the recent species distribution we think the following suggestion for the spread of *Merendera sobolifera* becomes logical: In short distances (up to several tens of meters) the seeds are spread by ants (synzoochorology). This fact together with the specificity of the underground system for vegetative spread finally leads to the observed patchy population structure. Migration in long distances could be explained by epizoochory, through seeds carried in the mud sticking to the feet of waterfowl. Ridley (1930) gives an extended list of hygrophytic species, whose appearance along the margins of isolated ponds could be explained by such kind of epizoochry by birds. One can support this suggestion looking at the current species distribution along bird migratory routes such as "Via Pontica" along the West Black Sea coast and also Maritza and Tundja river valleys (Michev & Jankov 1993). The localities in Greece and in Former Yugoslav Republic of Macedonia are also connected with migratory routes of birds along the Vardar river. It could not be expected that bird supported spread occurs very often because of the large seeds and sandy substrates on many places.

Merendera sobolifera and human activity

In Bulgaria *Merendera sobolifera* is a rare species distributed in lowlands, where the human influence is extreme. According to our observations the species has considerable

tolerance of different activities such as trampling or grazing, as noted in Ovoshtnik (3) and Slanchev Briag (6). Regular ploughing does not exterminate the plants but supports intensive vegetative propagation (Slanchev Briag (6); Novo Oriahovo (7)).

We also found that despite the enormous soil accumulation in some places (6), *Merendera sobolifera* individuals can penetrate to the surface and develop flowers. Some collected plants had 27 cm long perigons.

We agree with Avrorin (1977) and Furse (1967) that *Merendera sobolifera* may be used as a horticultural species especially for grassplots in parks.

Although there is a limited number of localities of *Merendera sobolifera* in Bulgaria, it may be supposed that the species existence is not yet endangered. Only the draining of the wetlands could diminish the populations and obstruct natural species dispersal.

Acknowledgements

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Addresses of the authors:
Iva Apostolova, Institute of Botany, 23 Acad. G. Bonchev Str., BG-1113 Sofia, Bulgaria.
Antoaneta Petrova, Botanical Garden, P.O. Box 664, BG-1000 Sofia, Bulgaria.