

# Critical reassessment of the distribution of some taxa of *Rumex* subgenus *Rumex* (*Polygonaceae*) in Bulgaria – 2

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**Abstract.** The chorology of *Rumex patientia* (subsp. *patientia*, *recurvatus*, *orientalis*), *R. obtusifolius* (subsp. *obtusifolius*, *sylvestris*, *subalpinis*, *transiens*), *R. crispus* (subsp. *crispus*, var. *crispus*, var. *unicallosus*, var. *strictissimus* and subsp. *robustus*), *R. kernerii*, *R. maritimus* and *R. aquaticus* in Bulgaria has been updated. The specimens deposited in the Bulgarian herbaria (SOM, SOA and SO) and the herbaria in Vienna (W and WU) have been revised. For *R. patientia*, *R. obtusifolius*, and *R. crispus* and their intraspecific taxa as well as for *R. kernerii*, and *R. maritimus* new localities have been reported. The study has not confirmed *R. aquaticus* for the Bulgarian flora. New taxa of *R. crispus* (subsp. *robustus* and var. *strictissimus*) have been discovered in the country. The localities of the studied taxa are presented on UTM-grid maps.

**Key words:** Bulgaria, chorology, ecology, *Rumex*, UTM-grid maps

## Introduction

In Bulgaria genus *Rumex* L., subgenus *Rumex* comprises 16 species and 11 subspecies (Delipavlov 2003). The diversity of ecological conditions in which the representatives of this group occur presupposes high rate of morphological variability, hence, a number of intraspecific taxa. The current paper is a continuation of efforts to clarify and update the chorology and the taxonomic structure of subgenus *Rumex* in the Bulgarian flora and covers the most variable species of the group. The study is based on literature data, herbarium collections and recent field collections of the author. It includes original identification keys for the intraspecific taxa of each polymorphic species.

## Material and methods

Plant material was collected in the period 2003–2008 and herbarium specimens were deposited in SOM and SOA. The collections in SOM, SO and SOA have been revised.

For some critical taxa with no, or with few herbarium specimens in the national herbaria, vouchers from the herbaria of Vienna University (WU) and Vienna Natural History Museum (W) have been used for comparison.

The chorological information for each species has been mapped with the “dSOA” software (Stoyanov 2003). The maps are divided into floristic regions and sub-regions as accepted in the multivolume edition of *Flora RP Bulgaricae*, and the localities are mapped according to Kozhuharov & al. (1983). The chorological information from literature sources and national herbaria is given in Table 1.

## Results and discussion

### 1. *R. patientia* L.

Bulgarian Floras and Field guides report the species for the Forebalkan (including Vrachanski Balkan Mt), Balkan Range (Western), Sofia Region, Mt Vitosha Region, Rhodopi Mts, and Thracian Lowland. Stojanov & Stefanov

(1948) report the species as randomly distributed in the whole country. The observations show that the species is widely distributed in Bulgaria, especially in urban places where it is being cultivated as a leaf vegetable. The three subspecies (*patientia*, *recurvatus* and *orientalis*), that occur in Europe also participate in the Bulgarian flora as well.

### Variability

1. Flower-whorls with 15–20(25) flowers, remote; on the lateral branches at 1.5–2.0 cm from each other. Valves almost as equal as wide (6.5–9.0 mm) . . . . .  
 . . . . . **1.1.** subsp. *patientia*

- 1\*. Flower-whorls with more than 25 flowers, close to each other; on the lateral branches at 1.0–1.5 cm from each other. Valves differ in length and width . . . . . **2**
2. Valves longer than wide (7.5–9.5 × 6–7 mm), elongated-triangular, cordate at base, with acute apex. Lateral branches of the inflorescence arcuate towards the apex . . . . . **1.2.** subsp. *recurvatus*
- 2\*. Valves wider than long (8–10 × 6–8 mm), oval-rotundate, cordate at base, obtuse. Lateral branches of the inflorescence not arcuate towards its apex . . . . . **1.3.** subsp. *orientalis*

Table 1. Chorological data on some species of *Rumex* subg. *Rumex*.

Distribution in floristic regions and altitude			
Literature date		Herbarium specimens	
Floristic region, author, year of the records	Altitude	Floristic region	Altitude
1	2	3	4
<i>R. patientia</i> L. 3 (Urumov 1928); <b>4.1</b> (Urumov 1905a, 1928, 1935a); <b>4.2</b> (Širjaev 1922; Urumov 1928; Stojanov & Stefanov 1924); <b>5.1</b> (Velenovsky 1891; Urumov 1935a; Stojanov & Stefanov 1924); <b>5.2</b> (Širjaev 1931); <b>6</b> (Velenovsky 1891; Urumov 1935a; Stojanov & Stefanov 1924; Dimitrov & Georgiev 1999); <b>7</b> (Urumov 1928, 1930); <b>8</b> (Urumov 1930); <b>13</b> (Kitanov 1953); <b>16.1</b> (Urumov 1917); <b>17</b> (Stojanov & Stefanov 1924); <b>17.1</b> (Urumov 1917); <b>17.2</b> (Urumov 1913); <b>18</b> (Velenovsky 1891, 1898; Urumov 1913; Davidov 1915; Stojanov & Stefanov 1924)	up to 400 m	<b>1.1*</b> ; <b>1.2*</b> ; 2; 3; 4; 5.1; 5.2; <b>5.3</b> ; 6; 7; 8; <b>9*</b> ; <b>10*</b> ; 13; <b>14.1*</b> ; <b>15*</b> ; 16.1; <b>16.2*</b> ; 17.1; 17.2; <b>17.3*</b> ; 18; <b>19*</b>	up to 1700 m
<i>R. patientia</i> subsp. <i>patientia</i> 2 (Delipavlov 2003); 7 (Rechinger 1933; Stojanov & al. 1966; Delipavlov 2003); <b>10**</b> (Delipavlov 2003); <b>15</b> (Rechinger 1933); <b>18**</b> (Delipavlov 2003)	–	<b>1.1*</b> ; <b>1.2*</b> ; 2; 3; 4; 5.1; 5.2; 5.3; 6; 7; 8; <b>9*</b> ; 10; <b>12*</b> ; 13; <b>14.1*</b> ; 15; 16.1; <b>16.2*</b> ; 17.1; 17.2; <b>17.3*</b> ; 18; <b>19*</b>	up to 1700 m
<i>R. patientia</i> subsp. <i>recurvatus</i> (Rech.) Rech. f. 2 (Rechinger 1933, 1943; Stojanov & al. 1966; Andreev 1992; Delipavlov 2003); 7 (Andreev 1992; Delipavlov 2003).	–	<b>5.2*</b> ; <b>10.1*</b> ; <b>13*</b> ; <b>16.2*</b> ; <b>17.3*</b>	up to 1000 m
<i>R. patientia</i> L. subsp. <i>orientalis</i> (Bernh.) Danser 2 (Rechinger 1933; **Stojanov & al. 1966; **Andreev 1992; **Delipavlov 2003); 7 (Rechinger 1933; Stojanov & al. 1966); <b>5.3</b> (Denchev & al. 1997; **Delipavlov 2003); <b>18**</b> (Andreev 1992; Delipavlov 2003)	–	<b>1.1*</b> ; <b>17.1*</b> ; <b>17.2*</b>	up to 700 m
<i>R. crispus</i> L. <b>1.1</b> (Urumov 1908c; Panov 1987); <b>1.2</b> (Rechinger 1933; Urumov 1905b); <b>2</b> (Kovachev 1900; Rechinger 1933; Andreev 1992); <b>3</b> (Urumov 1917; Andreev 1992); <b>4</b> (Urumov 1897, 1905b, 1917, 1926, 1930, 1935a; Neychev 1903, 1908); <b>5</b> (Andreev 1992); <b>5.1</b> (Urumov 1905b, 1935a; Rechinger 1933); <b>5.2</b> (Velenovsky 1898; Urumov 1901, 1906, 1926, 1928, 1929b); <b>5.3</b> (Velenovsky 1891; Urumov 1897, 1909); <b>6</b> (Velenovsky 1891; Urumov 1905b, 1909; Stoeva 1987; Panov 1987; Dimitrov & Georgiev 1999); <b>7</b> (Velenovsky 1891; Urumov 1897, 1901, 1913, 1930, 1935b); <b>8</b> (Velenovsky 1891; Urumov 1929a, 1930; Ganchev 1953; Andreev 1992); <b>9</b> (Urumov 1935b); <b>10</b> (Urumov 1935b); <b>11</b> (Pančić 1874; Stojanov & Acharov 1951); <b>15</b> (Urumov 1935b; Andreev 1992); <b>16.1</b> (Urumov 1908b); <b>16.2</b> (Toshev 1903); <b>17.1</b> (Urumov 1906, 1917); <b>18</b> (Toshev 1895; Urumov 1908c, 1929b; **Andreev 1992; **Delipavlov 2003; **Assyov & Petrova 2006) Reported by Stojanov & Stefanov (1924, 1933, 1948) for the whole country, like ruderal plant.	up to 1000 m	1.1; 1.2; 2; 3; 4.1; 4.2; 5.1; 5.2; 5.3; 6; 7; 8; 9; 10; 11; <b>12*</b> ; <b>13*</b> ; <b>14.1*</b> ; 15; 16.1; 16.2; 17.1; 17.2; 17.3; 18; <b>19*</b> ; <b>20*</b>	up to 1400 m
<i>R. crispus</i> L. subsp. <i>crispus</i> var. <i>crispus</i> –	–	1.1; 1.2; 2; 3; 4.1; 4.2; 5.1; 5; 6; 7; 8; 9; 10; 11; 12; 13; 14.1; 15; 16; 16.1; 16.2; 17.1; 17.2; 17.3; 18; 19; 20	up to 1400 m

Table 1. Continuation.

1	2	3	4
<i>R. crispus</i> L. subsp. <i>crispus</i> var. <i>unicallosus</i> Peterm. 5.1 (Stojanov & al. 1966); 7** (Stojanov & al. 1966); 8 (Valev 1966)	–	1.2*; 5.2*; 6; 8; 18*; 19*; 20*	up to 900 m
<i>R. crispus</i> L. subsp. <i>crispus</i> var. <i>strictissimus</i> Rech. p. 2** (Stojanov & al. 1966); 18** (Stojanov & al. 1966)	–	17.2*; 17.3*	up to 600 m
<i>R. crispus</i> L. subsp. <i>robustus</i> (Rech.) Pestova –	–	5.2*; 17.2*; 17.3*	from 450 up to 1500 m
<i>R. obtusifolius</i> L. 1.2 (Velenovsky 1891; Urumov 1909); 2 (Urumov 1901, 1905b, 1909); 3 (Urumov 1901, 1905b, 1928, 1935a, b); 4.1 (Urumov 1928, 1935a, 1905b); 4.2 (Urumov 1897, 1898a; Velenovsky 1898); 5.1 (Velenovsky 1891; Urumov 1902, 1905b, 1935a; Jordanov 1923); 5.2 (Velenovsky 1891; Urumov 1898b, 1905b, 1929b; Rechinger 1932); 5.3 (Velenovsky 1891; Urumov 1908a, 1909, 1929a); 6 (Velenovsky 1891; Davidov 1904; Urumov 1905b, 1935b; Rechinger 1932); 7 (Urumov 1906, 1935b); 8 (Rechinger 1932); 9 (Urumov 1904, 1935b); 10 (Urumov 1906); 15 (Urumov 1906, 1908a, 1917, 1935b); 16.1 (Urumov 1902, 1908a, 1929b; Baev 1947); 17.1 (Urumov 1913, 1917, 1935b); 17.2 (Urumov 1908a, 1913; Stranski 1921); 18 (Rechinger 1932; Urumov 1913, 1929b; Stojanov 1932); 19 (Urumov 1908c); 20 (Gusseff & al. 1997) According to different Bulgarian Floras the species is distributed in the whole country.	0–2000 m	1.1; 2; 3; 4.1; 4.2; 5.1; 5.2; 5.3; 6; 7; 8; 9; 10; 11*; 12*; 13*; 14.1*; 14.2*; 15; 16; 16.1; 17.1; 17.2; 17.3*; 18; 19; 20	from 0 up to 1900 m
<i>R. obtusifolius</i> L. subsp. <i>obtusifolius</i> Reported by Delipavlov (2003) for the whole country.	–	1.1; 2; 3; 4.1; 4.2; 5.1; 5.2; 5.3; 6; 7; 8; 9; 10; 11*; 12*; 13*; 14.1*; 14.2*; 15; 16; 16.1; 17.1; 17.2; 17.3*; 18; 19; 20	0 up to 1900 m
<i>R. obtusifolius</i> L. subsp. <i>subalpinus</i> (Schur) Čelak. 5 (Stojanov & Stefanov 1948; Andreev 1992; Delipavlov 2003); 5.1 (Rechinger 1932; Stojanov & al. 1966); 5.2 (Stojanov 1932; Rechinger 1932; Stojanov & al. 1966); 8 (Rechinger 1935); 14** (Delipavlov 2003); 15 (Rechinger 1932, 1933; Stojanov & Stefanov 1948; Andreev 1992; Delipavlov 2003); 17** (Stojanov & Stefanov 1948); 17.2 (Rechinger 1933; Rechinger 1935; Andreev 1992; Delipavlov 2003)	1100–1600 m	5.1; 5.2; 7*; 8; 9*; 11*; 14.1; 14.2; 15; 16.1*; 17.1; 17.2; 18	from 300 up to 1600 m
<i>R. obtusifolius</i> L. subsp. <i>sylvestris</i> (Wallr.) Rech. –	–	5.1; 8; 17.2	from 500 up to 1600 m
<i>R. obtusifolius</i> L. subsp. <i>transiens</i> (Simonk.) Rech. f. 5.1 (Rechinger 1932, 1933; Stojanov & al. 1966; Andreev 1992; Delipavlov 2003); 18 (Rechinger 1932; Stojanov & al. 1966; Cheshmedzhiev & al. 1998)	up to 850 m	5.2; 8*; 9*; 13*; 16.1*; 17.2*; 17.3*; 18; 20*	up to 1200 m
<i>R. kernerii</i> Borbás 5** (Stojanov & Stefanov 1948; Andreev 1992); 5.1 (Rechinger 1933; Stojanov & al. 1966); 8** (Andreev 1992); 15 (Rechinger 1933; Stojanov & Stefanov 1948; Stojanov & al. 1966); 17** (Stojanov & Stefanov 1948); 17.1** (Stojanov & al. 1966); 17.2 (Rechinger 1933; Stojanov & al. 1966; Andreev 1992)	up to 1500 m	17.1; 17.2; 17.3*	from 300 up to 1000 m
<i>R. maritimus</i> L. 3 (Dimitrov 1997; Dimitrov 2002; Delipavlov 2003)	up to 100 m	2*; 3	up to 50 m
<i>R. aquaticus</i> L. 2 (Andreev 1992; Delipavlov 2003); 4 (Velenovsky 1922; Andreev 1992; Delipavlov 2003); 4.2 (Stojanov & Stefanov 1924; Stojanov & Stefanov 1933); 5.1 (Velenovsky 1891; Urumov 1905a, 1935a, Stojanov & Stefanov 1924; Stojanov & Stefanov 1933; Andreev 1992; Delipavlov 2003); 6** (Andreev 1992; Delipavlov 2003); 10.1 (Valev 1966); 15** (Andreev 1992; Delipavlov 2003); 16.1 (Urumov 1905b, 1935b); 17** (Stojanov & Stefanov 1933); 17.3** (Stojanov & Stefanov 1924)	up to 1800 m	Lacking in national herbariums	–

(\* – new data; \*\* – the taxon is reported for the respective floristic region without specific locality).

1 – Black Sea Coast (1.1 – North, 1.2 – South); 2 – NE Bulgaria; 3 – Danubian Plain; 4 – Forebalkan (4.1 – West, 4.2 – East); 5 – Balkan Range (5.1 – West, 5.2 – Central, 5.3 – East); 6 – Sofia Region; 7 – Znepole Region; 8 – Mt Vitosha Region; 9 – West Frontier Mts; 10 – the Valley of Struma River (10.1 – South, 10.2 – North); 11 – Mt Belasitsa; 12 – Mt Slavyanka; 13 – the Valley of Mesta River; 14 – Pirin Mts (14.1 – South, 14.2 – North); 15 – Rila Mts; 16 – Mt Sredna Gora (16.1 – West, 16.2 – East); 17 – Rhodopi Mts (17.1 – West, 17.2 – Central, 17.3 – East); 18 – Thracian Lowland; 19 – Tundzha Hilly Country; 20 – Mt Strandzha.

### 1.1. *R. patientia* subsp. *patientia* (Fig. 1)

Rechinger (1933) reported the subspecies for the West Frontier Mts (Radomir town) and the foothills of Rila Mts (Dupnitsa town). The specimens deposited in the national herbaria prior to the present study belong to this subspecies.

The field studies and herbarium collections confirm the wide distribution of the subspecies throughout the range of the species in Bulgaria. So far, the subspecies has not been registered in Mt Strandzha.

### 1.2. *R. patientia* subsp. *recurvatus* (Rech.) Rech. f. (Fig. 2)

Rechinger (1933) reported the subspecies for North-east Bulgaria (Obraztsov Chiflik, Russe district). Until these studies no herbarium specimens from this subspecies of Bulgarian origin have been deposited in the national herbaria. It has been found that the only specimen deposited as *R. patientia* subsp. *recurvatus* belongs to the typical subspecies – Mt Sredna Gora (Western): Panagyurski kolonii, 1052 m, KH-71, 29.06.2002, coll. *Bancheva & Delcheva*, sub *R. patientia* subsp. *recurvatus* (SOM 157894).

The taxon has been newly registered for the Balkan Range (Central): ruderal places near Zlatitsa, 710 m, KH-63, 03.07.2005, coll. *Ts. Raycheva* (SOA 057074);

Valley of Struma River (Northern): along river Struma, near Boboshevo village, 375 m, FM-66, 18.06.2005, coll. *Ts. Raycheva* (SOA 057075);

Valley of Mesta River: ruderal places near Hvoshtyane village, 482 m, GM-30, 12.06.2008, coll. *Ts. Raycheva* (SOA 059479);

Mt Sredna Gora (Eastern): above Rozovets village, 572 m, LH-40, 04.06.2005, coll. *Ts. Raycheva* (SOA 059269);

Rhodopi Mts (Eastern): ruderal places near Ivaylovgrad town, 234 m, 19.06.2008, MF-29, coll. *Ts. Raycheva* (SOA 059252).

### 1.3. *R. patientia* L. subsp. *orientalis* (Bernh.) Danser (Fig. 3)

According to Rechinger (1933) in Bulgaria the taxon occurred in the regions of Russe and Dragoman. This information was not supported by herbarium specimens but was included in the different Floras (Stojanov & Stefanov 1948; Stojanov & al. 1966). Denchev & al. (1997) reported the species for the Balkan Range (Eastern). However, the herbarium specimen that is cited for this report belongs to the typical subspecies (Omurtag town, 470 m, MH-57, 22.06.1948, coll. *N. Stojanov*, det. *D. Stoyanov*, sub *R. patientia* subsp. *orientalis*, SO 96728).

So far, the field studies have confirmed the distribution of the subspecies along the Black Sea Coast (Northern): between Varna town and Vinitsa village, 40 m, NH-89, 15.08.2005, coll. *Ts. Raycheva* (SOA 057076) and in the Rhodopi Mts (Western): over Varvara village, 320 m, GM-45, 17.06.2005, coll. *Ts. Raycheva* (SOA 059236); be-

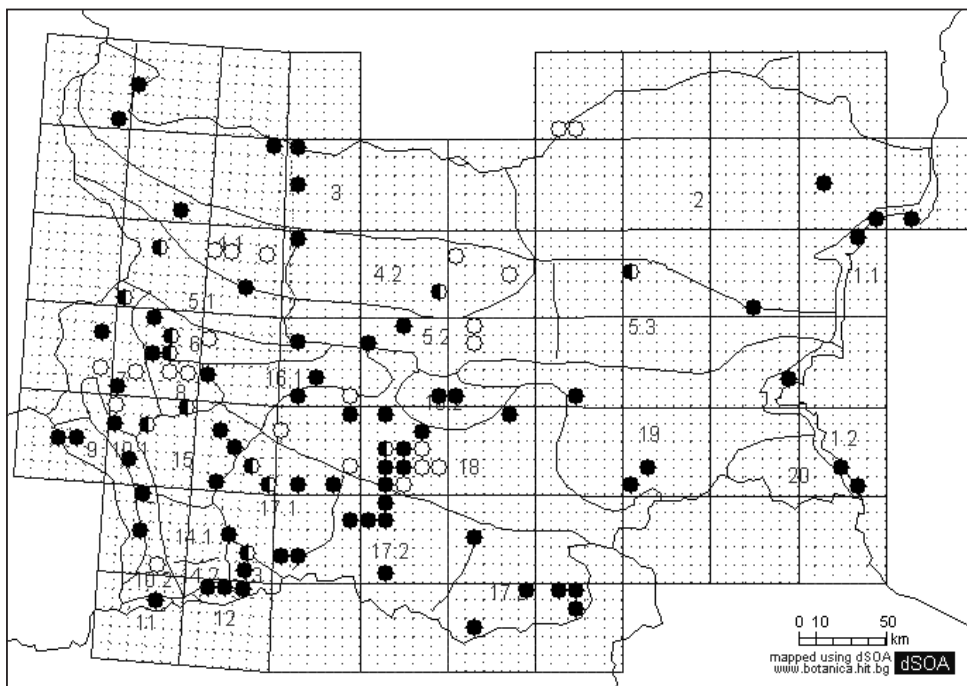


Fig. 1. Distribution map for *R. patientia* subsp. *patientia*

- – new and unpublished data
- ◐ – herbarium specimens
- – literature data

tween Bratsigovo and Peshtera towns, 599 m, KG-85, 15.07.2005, coll. *Ts. Raycheva* (SOA 057077); (*Central*): near Chokmanovo village, 973 m, LG-10, 22.07.2005, coll. *Ts. Raycheva* (SOA 059237).

## 2. *R. crispus* L.

Stojanov & Stefanov (1924, 1933, 1948) treated the species as a ruderal, distributed all over the country. Literature sources report the species for: Danubian Plain

(Urumov 1905b); Forebalkan (Urumov 1926); Balkan Range (Urumov 1897, 1901, 1935a; Velenovsky 1898; Neychev 1908;); Mt Vitosha (Velenovsky 1891; Urumov 1930); West Frontier Mts (Urumov 1913); Mt Sredna Gora (Toshev 1903) and Thracian Lowland (Toshev 1895, 1903; Urumov 1908c, 1917). The subspecies was reported in the contemporary floristic sources for: Northeast Bulgaria, Danubian Plain, Sofia Region (Dimitrov & Georgiev 1999), Mt Vitosha, Ri-

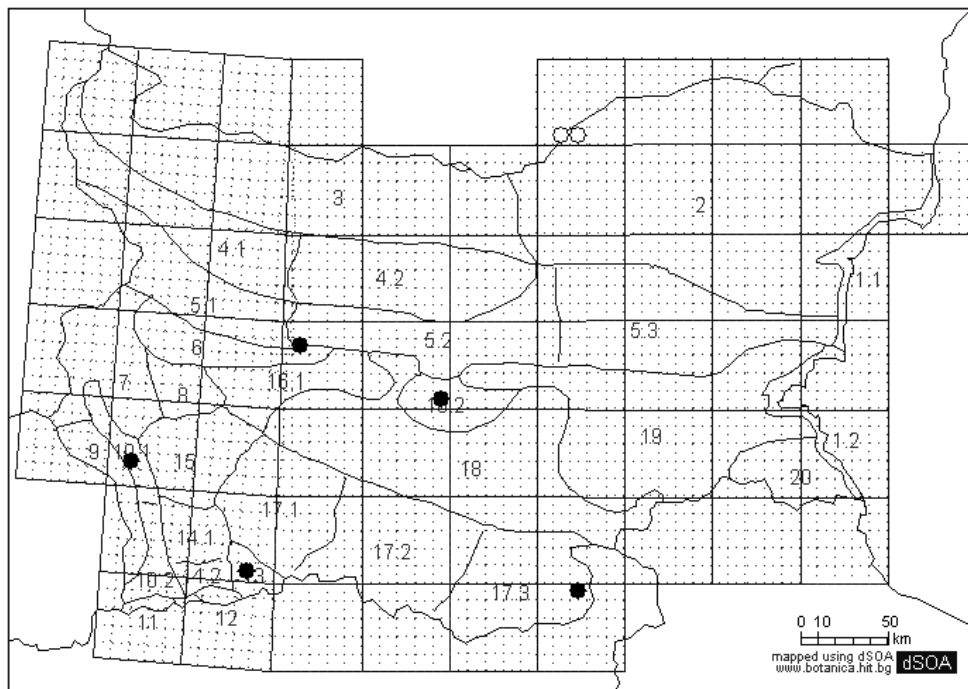


Fig. 2. Distribution map for *R. patientia* subsp. *recurvatus*

- – new and unpublished data
- – herbarium specimens
- – literature data

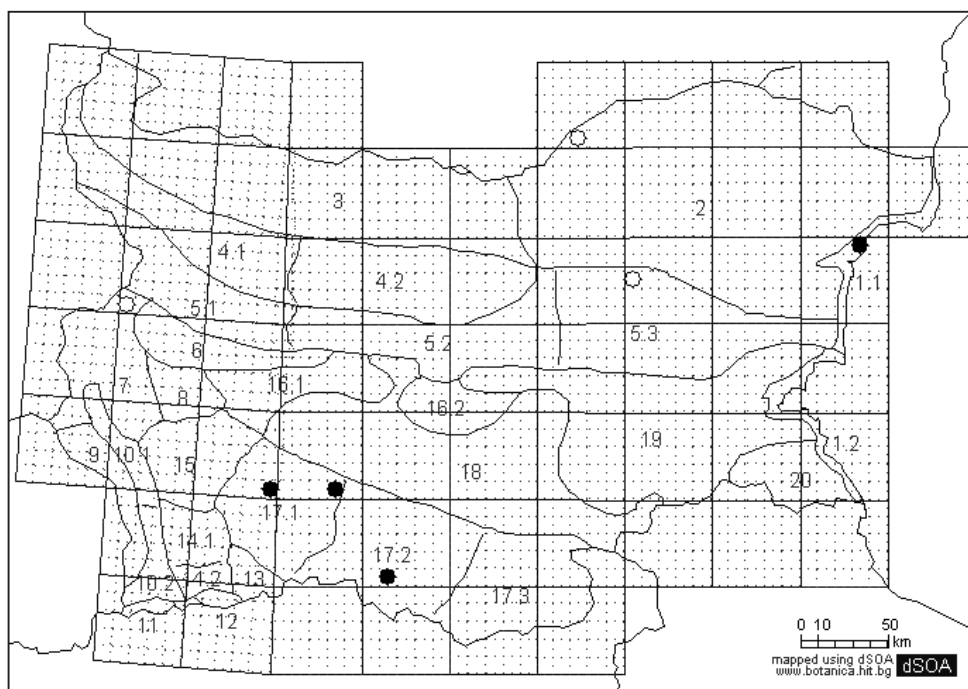


Fig. 3. Distribution map for *R. patientia* subsp. *orientalis*

- – new and unpublished data
- – herbarium specimens
- – literature data

la Mts, Thracian Lowland (Valev 1966; Andreev 1992; Delipavlov 2003). The existing data and author collections show that the species is ecologically very plastic, behaves like a ruderal and is distributed all over the country from 0 up to 1400 m alt.

**Variation**

- 1. Lateral branches of the inflorescence spreading. Valves slightly cordate at base, almost as long as wide – 5–5.5(6) mm, with 1 tubercle, 1.5 mm long ..... **2.2. subsp. *robustus***
- 1\*. Inflorescence with lateral branches adpressed to the axis. Valves truncate at base, longer than wide or almost as long as wide (3.5–5.0 mm), with 1–3 unequal, orbicular tubercles, more than 2 mm long ..... **2.1. subsp. *crispus*.....2**
- 2. Lateral branches of the panicle long and branched. Valves longer than wide (5–5.5 × 4–4.5 mm) ..... **var. *strictissimus* Rech.**
- 2\*. Lateral branches of the panicle short and not branched. Valves almost as long as wide ..... **3**
- 3. The three valves with unequal tubercles ..... **var. *crispus***
- 3\*. Only one valve with tubercle ..... **var. *unicallosus* Peterm.**

**2.1. *R. crispus* L. subsp. *crispus*** (Figs 4, 5, 6)

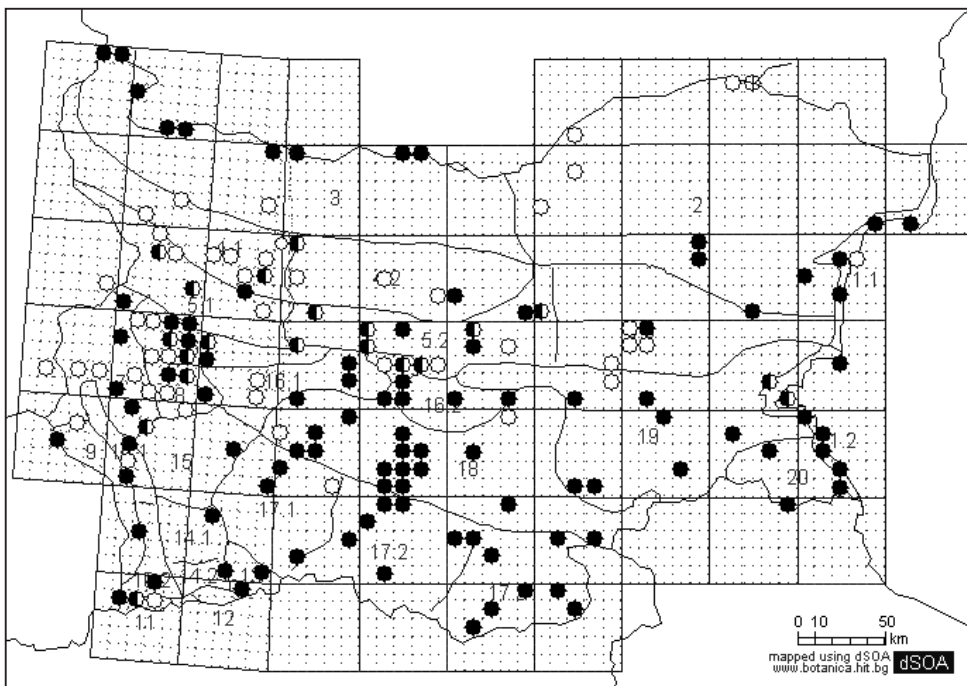
Two or three varieties have been reported in the Bulgarian floristic literature. However the chorological

data are very general and in most of the cases are not supported by herbarium specimens. The typical variety *R. crispus* subsp. *crispus* var. *crispus* was widely distributed throughout the range of the species (Valev 1966). This is proven by the author’s collections too (Fig. 4). Most of the specimens in the Bulgarian herbaria belong to this variety. No herbarium specimens of *R. crispus* var. *strictissimus* have been deposited until the present study. Only Stojanov & al. (1966) give information about the distribution of this taxon (Russe and Plovdiv districts), without describing precise localities. Probably, as a result of the lack of herbarium specimens this variety has not been mentioned for Bulgaria in the consequent floristic literature. Comparative specimens of foreign origin (W 6676, Jugoslavia, Rechinger, 1955; W 3068, Thrakien, Rechinger, 1965) have been studied as well.

In the current study *R. crispus* var. *strictissimus* is newly registered for:

Rhodopi Mts (*Central*): herbaceous places above Hvoyna village, 695 m, LG-03, 18.07.2006, coll. Ts. Raycheva (SOA 057095); (*Eastern*): wet places near Svirachi village, 235 m, MF-29, 15.07.2005, coll. Ts. Raycheva (SOA 057091); near Chernoochene village, 564 m, LG-62, 14.07.2005, coll. Ts. Raycheva (SOA 050382) (Fig. 5).

The distribution of *R. crispus* var. *unicallosus* in Sofia Region (Lyulin Mt – Kurlezha) is proven by herbarium specimens. The revision of herbarium specimens, erroneously identified by Panov (1987) as *R. crispus* var.



**Fig. 4.** Distribution map for *R. crispus* subsp. *crispus* var. *crispus*  
 ● – new and unpublished data  
 ◐ – herbarium specimens  
 ○ – literature data

*microcarpus* (Brihn.) Murb. has proved the distribution of *R. crispus* var. *unicallosus* for Sofia Region and the Black Sea Coast as well (SOM 145061, 145062).

In the course of the present study this variety has been newly found in:

Black Sea Coast (*Southern*): Sozopol town, 20 m, NG-59, 03.07.2004, coll. *Ts. Raycheva* (SOA 058594), Kiten town, 20 m, NG-67, 06.06.2006, coll. *Ts. Raycheva* (SOA 059542);

Balkan Range (*Central*): before Plakovo village along the road to Elena town, 263 m, LH-96, 10.07.2008, coll. *Ts. Raycheva* (SOA 059183);

Thracian Lowlands: herbaceous places in Plovdiv town, 160 m, LG-16, 08.05.2003, coll. *Ts. Raycheva* (SOA 056567);

Tundzha Hilly Country: herbaceous places before Aytos town, 95 m, NH-22, 06.06.2006, coll. *Ts. Raycheva* (SOM 163895);

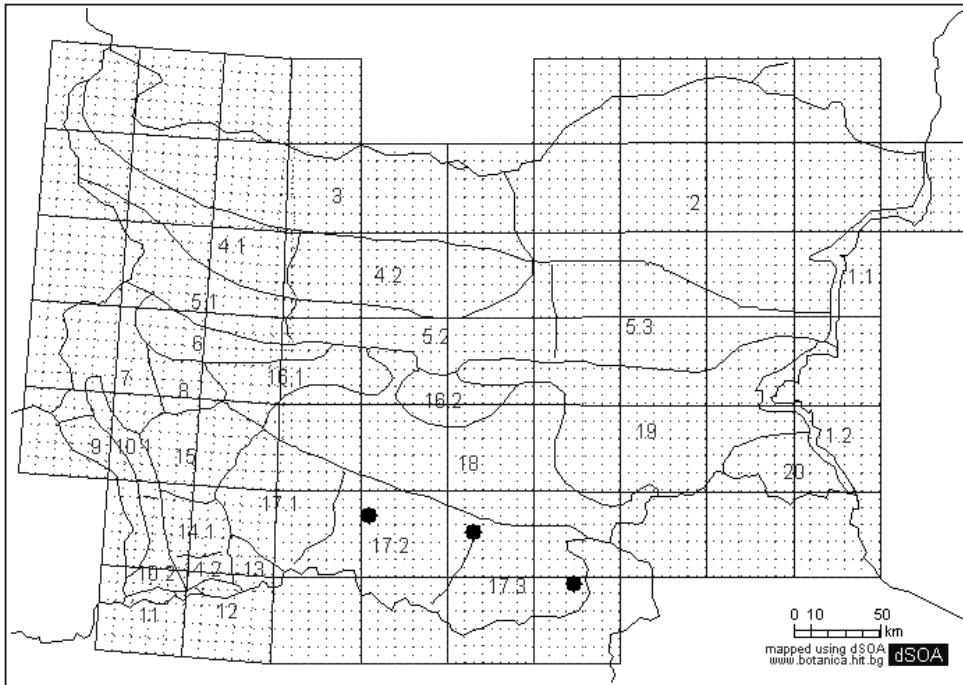


Fig. 5. Distribution map for *R. crispus* subsp. *crispus* var. *strictissimus*

- – new and unpublished data
- ◐ – herbarium specimens
- – literature data

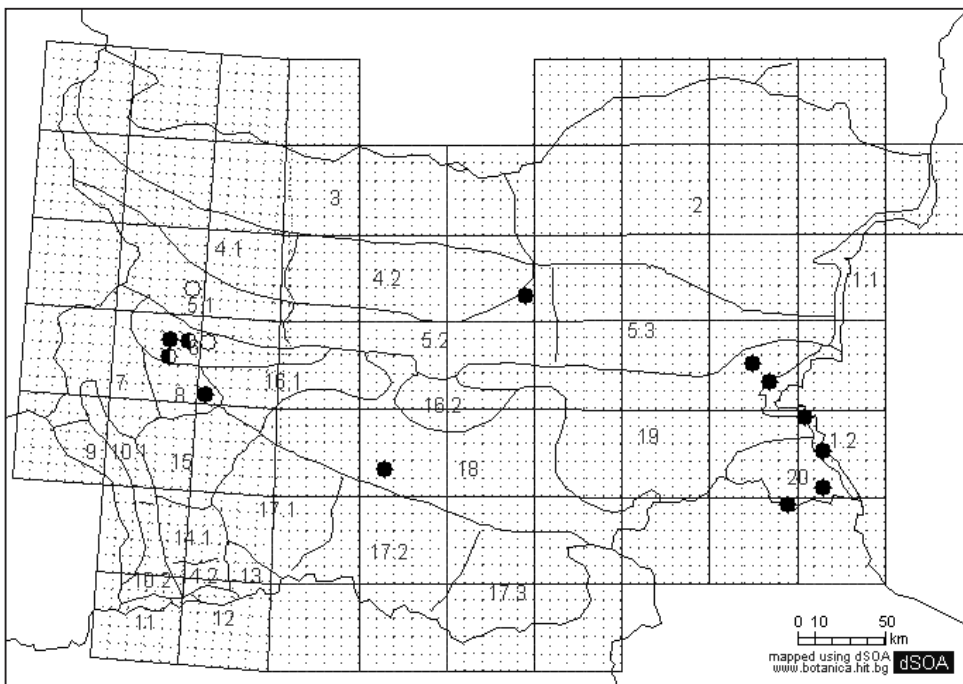


Fig. 6. Distribution map for *R. crispus* subsp. *crispus* var. *unicallosus*

- – new and unpublished data
- ◐ – herbarium specimens
- – literature data

Mt Strandzha: near of Malko Tarnovo town, 340 m, NG-44, 04.07.2004, coll. Ts. Raycheva (SOA 058592); around Kosti village, 130 m, NG-65, 06.06.2006, coll. Ts. Raycheva (SOM 163979) (Fig. 6).

The distribution of this variety in Mt Vitosha Region was confirmed (along Iskar dam, 820 m, GN-00, 05.07.2005, coll. Ts. Raycheva, SOA 059256).

**2.2. *R. crispus* L. subsp. *robustus* (Rech.) Pestova (Fig. 7)**

This subspecies is reported for the first time for the flora of Bulgaria. It has been reported for the floras of Ukraine, Austria and Iran (Rechinger 1968, Pestova 1998). Comparative specimens of foreign origin (W 16588, 16589, Helsinki, A. Valda, 1973) have been studied as well. It was newly discovered in the course of the present study for the:

Balkan Range (*Central*): herbaceous places before Plachkovtsi village, 510 m, LH-75, 19.06.2008, coll. Ts. Raycheva (SOA 059253);

Rhodopi Mts (*Central*): wet meadows over Zornitsa village, 1450 m, LG-02, 18.06.2006, coll. Ts. Raycheva (SOA 059620); (*Eastern*): meadows around Zvezdel village, 434 m, LF-79, 18.06.2006, coll. Ts. Raycheva (SOA 059230).

**3. *R. obtusifolius* L.**

Precise localities of the species were reported by Urumov (1898a) for the Forebalkan and the Balkan

Range (*Eastern*). So far, the chorological information about this species has not been critically assessed as a result of which the distribution of the four subspecies needs further revision. Despite the ample literature data about the species distribution *R. obtusifolius* s.l. has not been reported from Belasitsa, Slavyanka, and Pirin Mts and the Valley of River Mesta – no specimens have been deposited in the national herbaria.

The species occurs in Bulgaria with the four subspecies distributed throughout the range of the species.

**Variation**

- 1. Valves with 3 unequal tubercles, exceptionally only 1 developed tubercle; the valve irregularly dentate or almost entire, some of the teeth up to 1–1.5 mm long ..... 2
- 1\*. Valves with 1 tubercle, exceptionally the other 2 very small; the valves with distinct, irregular teeth, some of them longer than 1.5 mm ..... 3
- 2. Valves broadly lingulate, with short teeth at base; tubercles unequal, the largest covering up to a half of the valve width ..... 3.4. subsp. *transiens*
- 2\*. Valves narrowly lingulate or obtuse, almost entire or vaguely dentate at base; tubercles unequal, the largest covering more than a half of the valve width ..... 3.3. subsp. *sylvestris*
- 3. Valves up to 5 mm long, triangular; teeth as long as half of the valves ..... 3.2. subsp. *subalpinus*

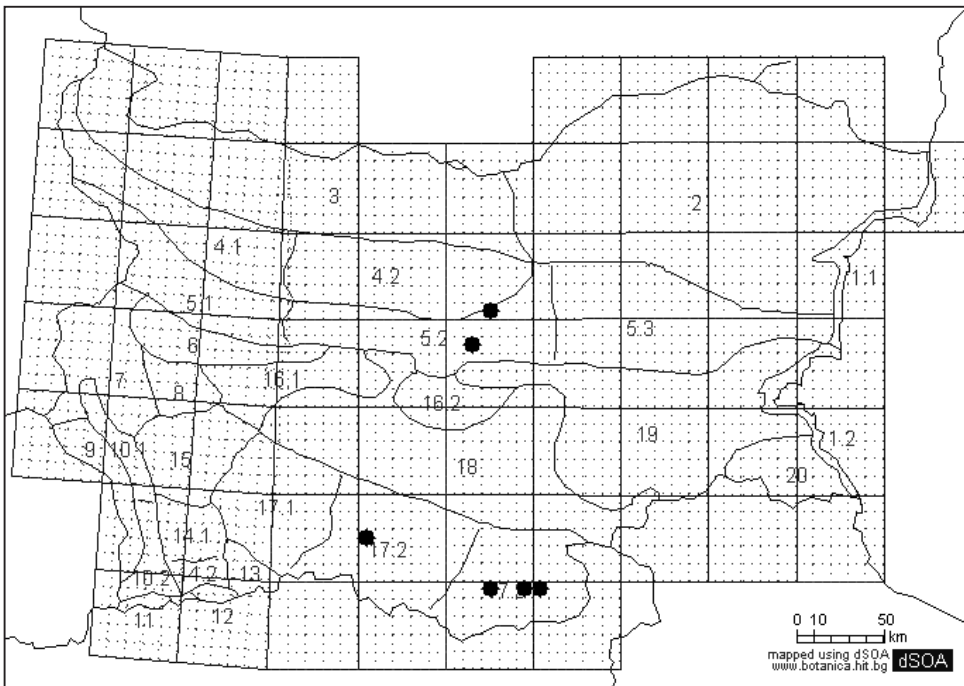


Fig. 7. Distribution map for *R. crispus* subsp. *robustus*

- – new and unpublished data
- ◐ – herbarium specimens
- – literature data



3\*. Valves 5.5–6 mm long, triangular-ovate; teeth equal or longer than the valve width .....  
 ..... 3.1. subsp. *obtusifolius*

**3.1. *R. obtusifolius* L. subsp. *obtusifolius* (Fig. 8)**

Delipavlov (2003) reported the subspecies for the whole country but without its precise localities. The field work and a significant part of the specimens in the national herbaria confirm the wide distribution of this subspecies.

**3.2. *R. obtusifolius* L. subsp. *subalpinus* (Schur) Čelak. (Fig. 9)**

The first report of this taxon from Bulgaria was given by Stojanov (1932) from Gabrovo town and Sinya Lokva village based on material collected by Neychev in 1901 and identified by Rechinger. Additional data about the chorology of the subspecies is provided by Rechinger (1933) from Rila Mts (below peak Mussala and near Rila Monastery) and Rhodopi Mts (around Byala Cherkva). Speci-

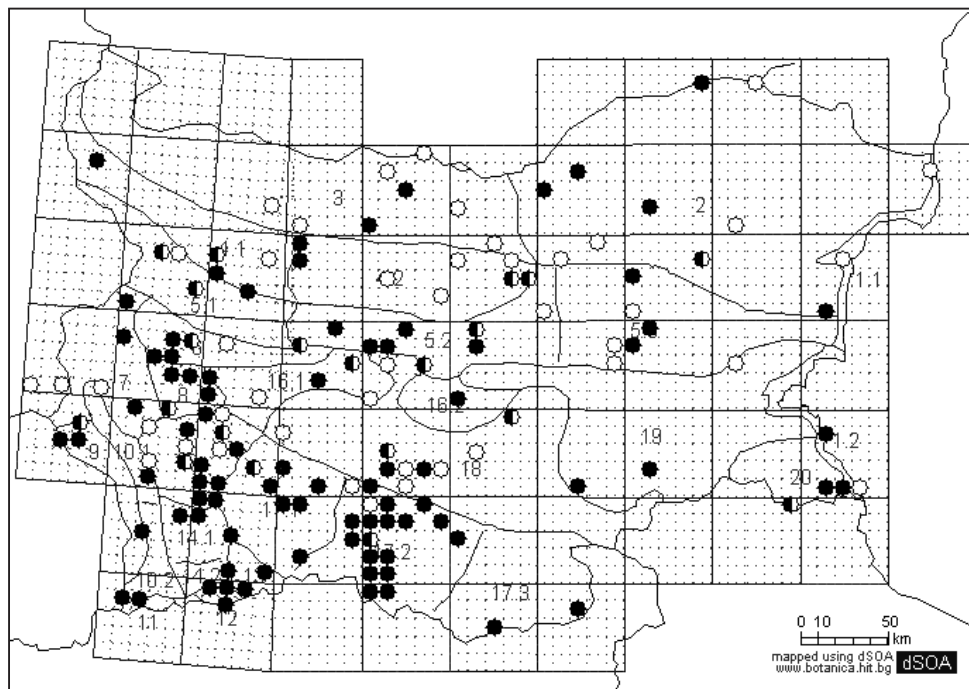


Fig. 8. Distribution map for *R. obtusifolius* subsp. *obtusifolius*

- – new and unpublished data
- ◐ – herbarium specimens
- – literature data

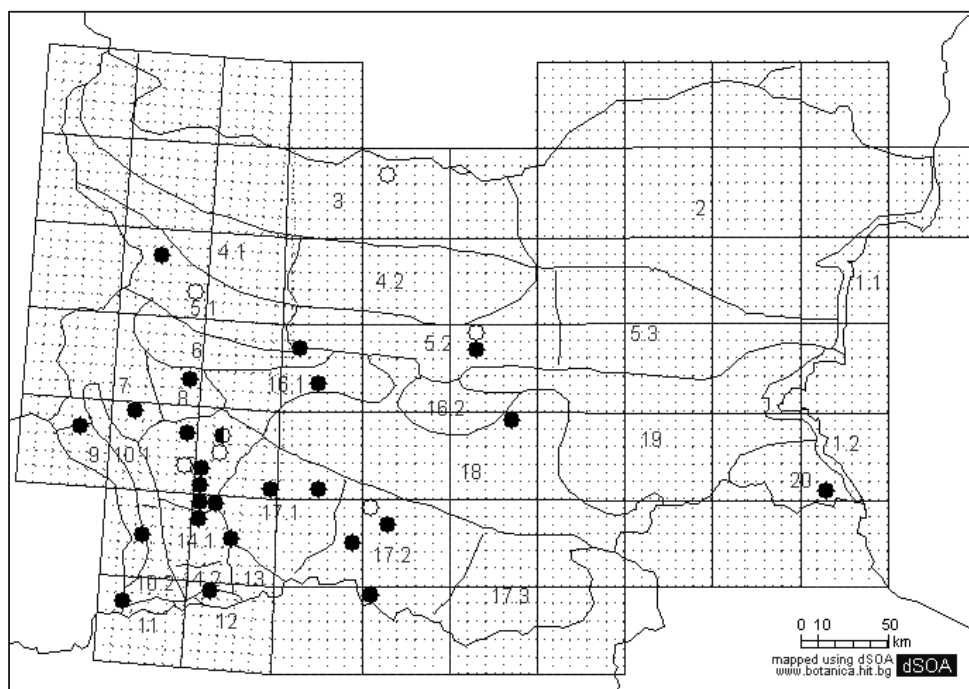


Fig. 9. Distribution map for *R. obtusifolius* subsp. *subalpinus*

- – new and unpublished data
- ◐ – herbarium specimens
- – literature data

mens from Rhodopi Mts (collected by *Urumov* 1912, and revised by *Rechinger*) and the Thracian Lowland (collected by *Achtarov* and revised by *Rechinger*) are also present in the national herbaria. The present study confirms a wide distribution of the subspecies. It is found in:

West Frontier Mts: above Vratitsa village, Kyustendil district, 799 m, FM-38, 19.06.2005, coll. *Ts. Raycheva* (SOA 059267);

Mt Belasitsa: between Skrat and Gabrene villages, 30 m, FL-68, 18.06.2005, coll. *Ts. Raycheva* (SOA 057079);

Mt Sredna Gora (*Western*): herbaceous places above the lake in Panagyurski Kolonii, 1050 m, KH-71, 03.07.2005, coll. *Ts. Raycheva* (SOA 059607).

The field studies confirm the subspecies for Rila and Rhodopi Mts (*Western & Eastern*).

### 3.3. *R. obtusifolius* L. subsp. *sylvestris* (Wallr.)

Rech. (Fig. 10)

No specific literature data and herbarium collections exist for this subspecies, although it is reported in all Floras and Field guides. According to *Rechinger* (1932) the subspecies occurred in East and Central Europe, but so far no specific localities of the subspecies have been reported from Bulgaria. Comparative specimens of foreign origin (W 6162, Austria, leg. d-r *Korb*, det. *Rechinger*, 1930) have been studied as well. The field studies show that the subspecies occurs in:

Balkan Range (*Western*): around Parshevitsa chalet, 1290 m, GN-07, 05.09.2004, coll. *Ts. Raycheva* (SOA 057084);

Mt Vitosha Region: Bistrishko Branishte Reserve, 1750 m, FN-91, 13.09.2005, coll. *Ts. Raycheva* (SOA 057086);

Rhodopi Mts (*Central*): above the road between Chokmanovo and Arda villages, 1100 m, LG-10, 22.07.2005, coll. *Ts. Raycheva* (SOA 057082).

Vouchers from this investigation are the only specimens deposited in the Bulgarian herbaria.

### 3.4. *R. obtusifolius* L. subsp. *transiens* (Simonk.)

Rech. f. (Fig. 11)

The subspecies is treated as a lowland taxon in the Bulgarian floristic literature. It is reported for the Balkan Range (without herbarium specimens) and Thracian Lowland (Plovdiv district, with a herbarium specimen). In the course of the present study the subspecies has been confirmed for the Balkan Range (*Central*): in the orchards above Kalofer town, 665 m, LH-32, 03.08.2005, coll. *Ts. Raycheva* (SOA 058620). The subspecies is newly found in:

Mt Vitosha: wet meadows near Dolni Pasarel villages, 620 m, GN-01, 05.07.2006, coll. *Ts. Raycheva* (SOA 059266);

West Frontier Mts: herbaceous places of Kyustendil town, 525 m, FM-28, 19.06.2005, coll. *Ts. Raycheva* (SOA 059260);

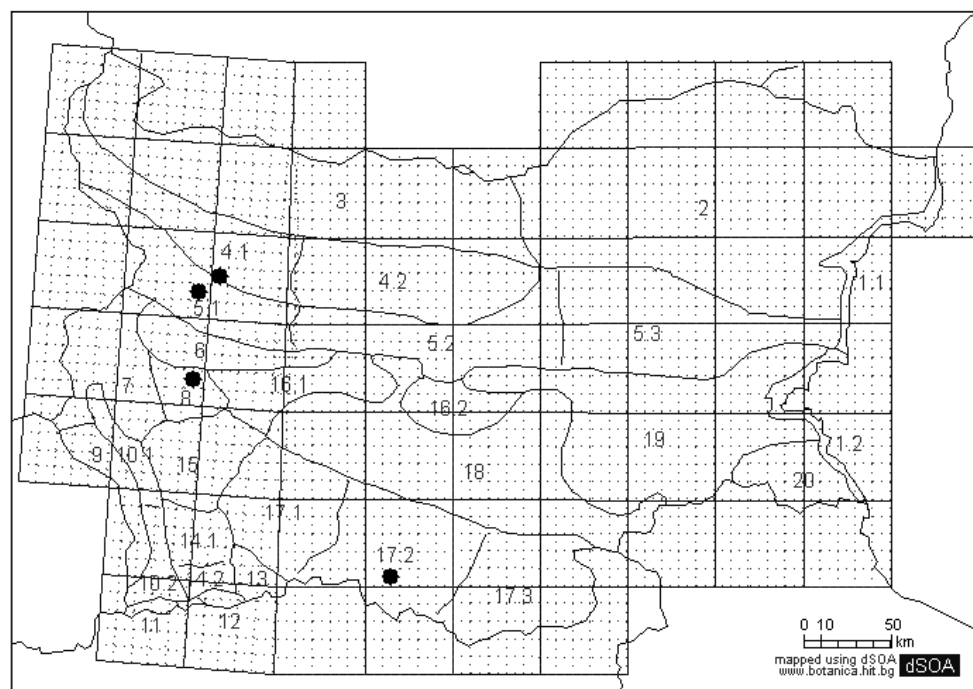


Fig. 10. Distribution map for *R. obtusifolius* subsp. *sylvestris*

- – new and unpublished data
- – herbarium specimens
- – literature data

Valley of River Mesta: along the road near Ilinden village, 625 m, GL-39, 17.06.2005, coll. *Ts. Raycheva* (SOA 059264);

Mt Sredna Gora (*Western*): along River Stryama, before Klisura town, 740 m, KH-92, 04.07.2005, coll. *Ts. Raycheva* (SOA 057085);

Rhodopi Mts (*Central*): wet places between Topolovo and Novakovo villages, 450 m, LG-34, coll. *Ts. Raycheva* (SOA 057087); (*Eastern*): ruderal places

around Mandritsa village, 120 m, MF-28, 15.07.2005, coll. *Ts. Raycheva* (SOA 057081).

Mt Strandzha: near Brodilovo village, 56 m, NG-75, 23.06.2007, coll. *Ts. Raycheva* (SOA 059219).

#### 4. *R. kernerii* Borbás (Fig. 12)

Until now, no specimens from *R. kernerii* have been deposited in the Bulgarian herbaria. Possibly, that is why Delipavlov (2003) has treated the species as not

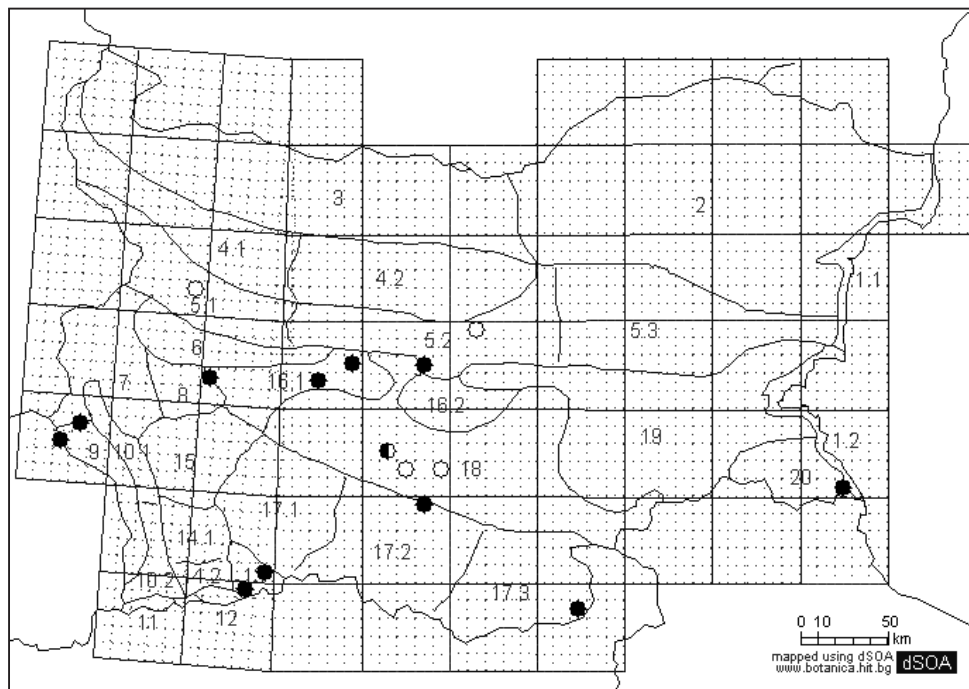


Fig. 11. Distribution map for *R. obtusifolius* subsp. *transiens*

- – new and unpublished data
- – herbarium specimens
- – literature data

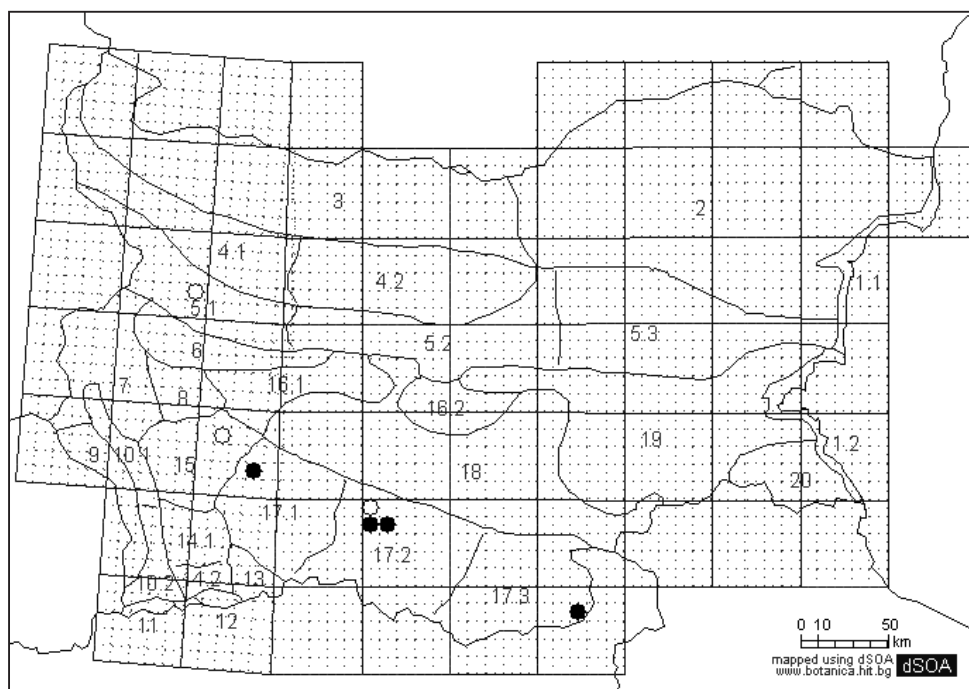


Fig. 12. Distribution map for *R. kernerii*

- – new and unpublished data
- – herbarium specimens
- – literature data

confirmed for the flora of Bulgaria. Comparative specimens of foreign origin (W 00104, Yugoslavia, *Rechinger*, 1956; W 6679, Macedonia, *Rechinger*, 1955; WU 1916-32, Nord Albanien, coll. *Dörfler*, det. *Rechinger*, 1916) have been studied as well. In the course of the current study the species is registered in:

Rhodopi Mts (*Western*): above Yundola village, 1350 m, GM-36, 15.07.2003, coll. *Ts. Raycheva* (SOA 056414); Rhodopi Mts (*Central*): herbaceous places around Yugovo village, 780 m, LG-13, 10.07.2003, coll. *Ts. Raycheva* (SOA 059204); meadows above Hvoyna village, 700 m, LG-03, 22.07.2005, coll. *Ts. Raycheva* (SOA 059605);

Rhodopi (*Eastern*): between Siv Kladenets and Mandritsa villages, 200 m, MF-28, 18.06.2008, coll. *Ts. Raycheva* (SOA 059243).

Specimens from this taxon are deposited for the first time in the Bulgarian herbaria and are the only specimens that confirm the species for the Bulgarian flora.

### 5. *R. maritimus* L. (Fig. 13)

The species was reported for the first time for the Bulgarian flora by Dimitrov (1997), based on material collected by Kotseva from the Danubian Plain (Vardim island, near Svistov town, 120 m, LJ-63, 7.07.1992, coll. *S. Kotseva*, det. *D. Stoyanov* (SO 96404).

The existing herbarium specimens confirm the species also for Northeast Bulgaria (along the Dan-

ube river, Srebarna Managed Nature Reserve (northern part), 18 m, NJ-08, 12.07.1987, coll. *G. Baeva* (SO 98273). The chorological data mentioned above are also confirmed also by the author's observations and collections:

Northeast Bulgaria: on the bank of the Danube at Popina village, 20 m, MJ-98, 19.06.2004, coll. *Ts. Raycheva*, (SOA 059590); Danubian Plain: on the bank of the Danube at Dolni Vadim village, 183 m, NJ-28, 24.07.2006, coll. *Ts. Raycheva* (SOA 057092).

The distribution of the species remains unconfirmed for the Black Sea Coast (*Northern & Southern*). The revision of the herbarium specimens identified as *R. maritimus* shows that they belong to *R. palustris*:

Black Sea Coast (*Northern*): wet places between Balchik town and Balchishka Tuzla locality, 120 m, NJ-90, 07.07.1967, coll. *N. Vichodtsevsky*, det. *D. Stoyanov*, (SO 17561); Black Sea Coast (*Southern*): wet places on the right bank of Aheloy river, 25 m, NH-52, 04.07.2003, coll. *D. Stoyanov*, (SOM 158443);

Danubian Plain: the bank of the Danube River near Cherkovitsa village, Nikopol district, 40 m, LJ-24, 28.06.2003, coll. *R. Tsonev* (SOM 158877); Tundzha Hilly Country (wet places along the road Sliven-Yambol, 200 m, MH-43, 30.06.1962, leg Stefanov, Kitanov, det *D. Stoyanov* (SO 96296).

Very often plants of *R. palustris* have been determined as *R. maritimus* due to similar morphological features and sympatric distribution. However, while

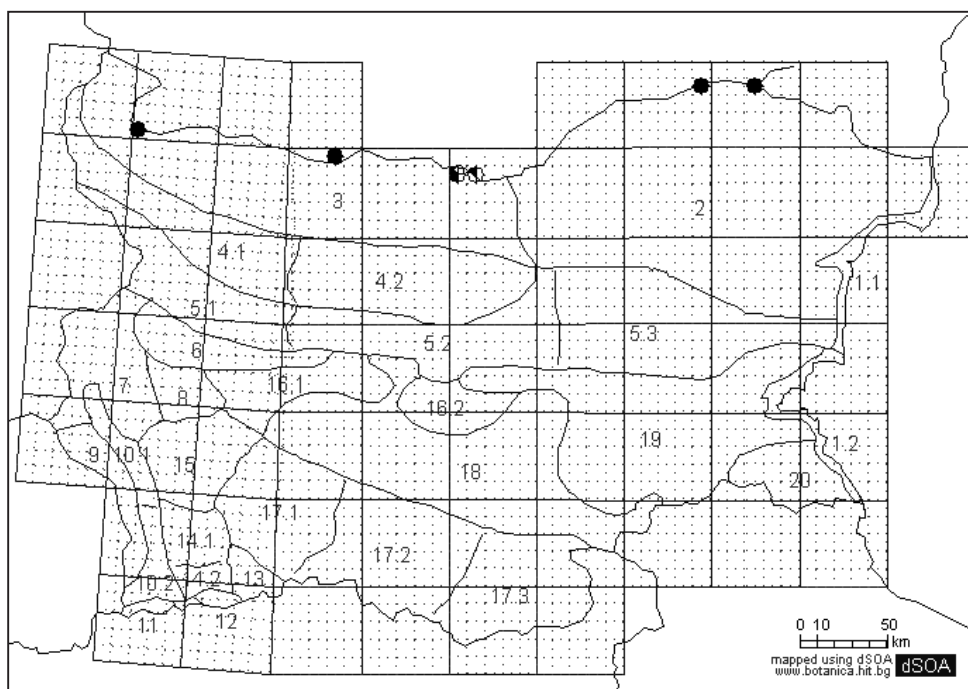


Fig. 13. Distribution map for *R. maritimus*

- – new and unpublished data
- – herbarium specimens
- – literature data

the first species makes dense populations along the Danube, the second one is very rare.

The literature data and the herbarium collections from *R. maritimus*, show that until now it has been discovered only along the Danube – randomly in the Danubian Plain and Northeast Bulgaria.

#### 6. *R. aquaticus* L. (Фиг. 14)

The information about the distribution of the species in the Bulgarian floristic literature is contradictory. It was reported for the first time for Bulgaria by Velenovsky (1891) from the Balkan Range (*Western* – Petrochan Balkan) and subsequently (1922) for the Forebalkan (Veliko Tarnovo district). Urumov (1905b, 1935b) reported the species for the Balkan Range (*Western*, Murgash peak), Znepole Region (Mt Ruy), Mt Sredna Gora (*Western*). Stoyanov & Stefanov (1924, 1933) report the species for the Forebalkan (Veliko Tarnovo district), Balkan Range (*Western*) and Rhodopi Mts. The species was not included in the third edition of the *Flora of Bulgaria* (Stojanov & Stefanov 1948). In the contemporary floristic sources the species is reported for wet places along rivers and streams and in the forests of Northeast Bulgaria, Forebalkan, Balkan Range (*Western*), Sofia Region, Rila Mts (Blagoevgrad district) up to 1500–1800 m (Valev 1966, Andreev 1992, Dimitrov 2002, Delipavlov 2003, Assyov & Petrova 2006).

The distribution of the species in the Forebalkan, Balkan Range (*Western*) and Mt Sredna Gora (*Western*)

is not supported by herbarium specimens. Most herbarium specimens are without developed fruits or in bad condition, hence, their identification is difficult. However, the vouchers from Rila Mts (Blagoevgrad district: SOM 17673, 17674, 17675 “Gorna Dzhumaya – Varosha gorge, near springs, at 480–700 m”, coll. *N. Fenenko*, det. *B. Achtarov*) and SO 17498 (Koru-Vaglar of Sofia, coll. *S. Georgiev*, 1899) have been identified as *R. crispus*. The specimen SO 17499 (Sofia Region, the vicinities of Kostin Brod town, coll. *S. Georgiev*) are collected in the early stage of development and are with underdeveloped valves and fruits (sp. incompl.). The specimen SO 17495 (Rhodopi Mts, Brestovitsa village, coll. *S. Georgiev*, 1899), have been indentified as *R. obtusifolius*. However, these specimens are with few flowers in the whorls and with a distinct node of the peduncle at the fruit (features that are absent in *R. aquaticus*). This is a consistent reason to consider that these specimens do not belong to *R. aquaticus*. The comparison of the existing specimens with vouchers from abroad did not prove the species for the Bulgarian flora. The existing herbarium specimens from Bulgaria identified as *R. aquaticus* are collected more than 100 years ago (the earliest collections are from 1881). Any recently collected specimens are absent. Despite the existing specimens, Stojanov & Stefanov (1948) did not report the species for the Bulgarian flora. The known localities have been visited in the course of the current study but the species has not been found.

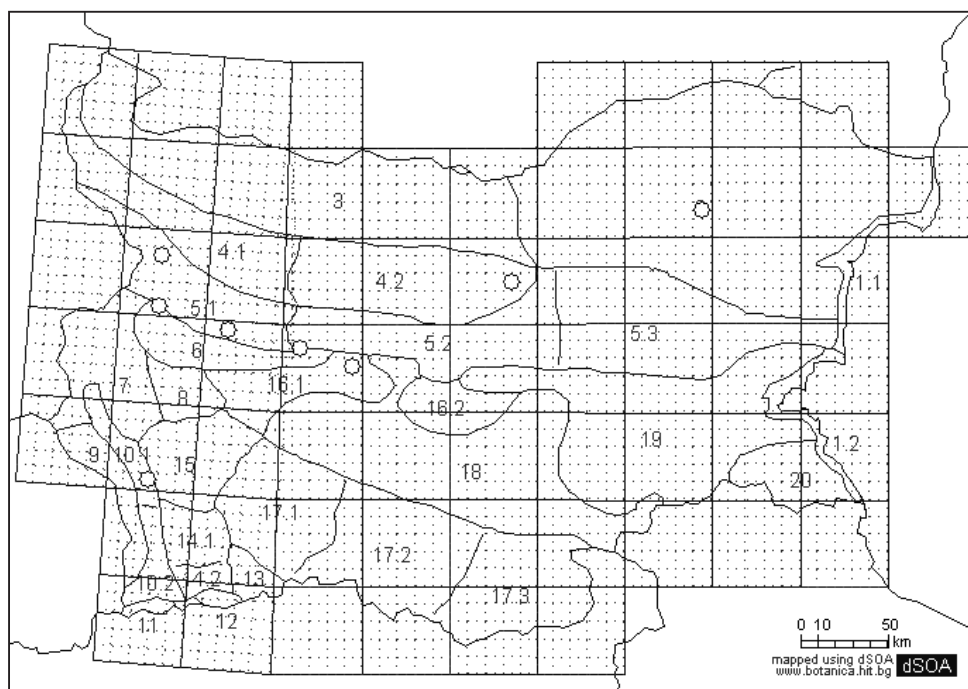


Fig. 14. Distribution map for *R. aquaticus*

- – new and unpublished data
- ◐ – herbarium specimens
- – literature data

According to Dubyna (1998), *R. aquaticus* is a Euroasian species with sporadic distribution. Rechinger (1949) and Mosyakin (2005) have also confirmed its Euroasian range of distribution. They did not report any data confirming the distribution of this species in the Balkans. It was not reported for the flora of Turkey, Greece (Snogerup & Snogerup 1997) and Serbia (Slavnich 1972). According to Meikle (1985) the species was reported for the flora of Cyprus by Sibthorp & Smith (1809) but has not been proven by any contemporary collections. The nearest locality of the species is in North Romania.

On the basis of the existing information about the whole distribution of the species can conclude that *R. aquaticus* does not participate in the contemporary Bulgarian flora.

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