Chorology and critical notes on *Orobanche* subsect. *Minores* in Bulgaria

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Received: September 23, 2009 ▷ Accepted: November 03, 2009

Abstract. New collected material of genus *Orobanche* sect. *Orobanche* subsect. *Minores* and both specimen existing in Bulgarian herbaria and data published before are revised and used for creation of maps. The chorological data about the species and intraspecific taxa are reconsidered. New data were added for: *O. minor* (4 regions, 1 subregion), *O. amethystea* (2 regions, 2 subregions), *O. esulae* (3 regions, 1 subregion), *O. pubescens* (2 subregions), *O. loricata* (4 regions, 2 subregions), *O. crenata* (4 regions, 3 subregions), The host plants are discussed comparing both herbarium data and literature reviewed.

Key words: chorology, determination key, distribution map, *Minores*, host plants, intraspecific taxa, *Orobanche*, parasitic plants

Introduction

In the Bulgarian flora are known five species of genus *Orobanche* L. sect. *Orobanche* subsect. *Minores* (Beck) Teryokhin – *O. minor, O. pubescens, O. amethystea, O. loricata* (incl. *O. picridis*) and *O. esulae*. The recognition between the members oof this subsection is hard to be done because of the similar morphology. That's why the bigger part of this subsection is united as "group *O. minor*" in many determination keys (Chater & Webb 1972; Gilli 1982; Delipavlov 1995). This problem leads to mistakes in the chorological data about the subsection in Bulgaria.The aim of this study is to revise and represent the known chorological data about the members of subsect. *Minores* in Bulgaria as well to analyze the information of their host plants.

Material and methods

The new material used in this study was collected during 2002–2008 in Bulgaria. An examination of specimens in the Bulgarian herbaria – SOM, SOA, SO was carried out. A comparative and additional data were taken from the herbaria MA (Royal Botanical Gardrn – Madrid), W (Museum of Natural History – Wien) and WU (Institute of Botany – Wien). The chorological data were processed in UTM-grid, according to Kozhuharov & al. (1983) and presented in abbreviated MGRS code. Using these data further maps were created by dSOA computer program (Stoyanov 2003). The collections were cited and grouped as follow: floristic region (in **bold**), locality, altitude, host plant, MGRS coordinates, date, collector(s), herbarium acronym and specimen number. The floristic regions are described and numbered by *Flora Reipublicae Popularis Bulgaricae* (Jordanov 1966) as follow: Black Sea Coast (1), Northeast Bulgaria (2), Danubian Plain (3), Forebalkan (4), Balkan Range (5), Sofia region (6), Znepole region (7), Vitosha region (8), West Frontier Mts (9), River Struma valley (10), Mt Belasitsa (11), Mt Slavyanka (12), River Mesta valley (13), Pirin Mts (14), Rila Mts (15), Mt Sredna Gora (16), Rhodopi Mts (17), Thracian Lowland (18), Tundzha Hilly Country (19) and Mt Strandzha 20). The subregions are marked with letters: **w** – *western*; **s** – *southern*; **e** – *eastern*; **n** – *northern* and **c** – *central*. The same codes were shown in the maps (Figs 1–6).

The staff of the subsection is accepted by the conception of Beck (1890). The position of *O. crenata* is accepted according to Schneeweiss & al. (2004). *Orobanche serbica* seems to be in this subsection, according to the position of the conspecific *O. ozanonis* F.W. Schultz (Carlón & al. 2005, 2008). Its distribution was commented in previous publication for *Orobanche* subsect. *Glandulosae* (Stoyanov 2009).

Result and discussion

Orobanche minor Sm. (Fig. 1)

New and unpublished data: **1s**. Sozopol, 20 m, NG-59, 26.05.1979, coll. *D. Delipavlov* (SOA 39232); Kiten, 15 m, NG-67, 27.05.1963, coll. *I. Cheshmedzhiev* & *D. Delipavlov* (SOA 18599, 18600, 18603, rev.? sub *O. picridis*); Arkutino, 10 m, NG-68, 12.07.2003, coll *K. Stoyanov* (SOA 059535); Ahtopol, 20 m, pl.n. *Stachys thracica*, NG-76, 14.07.2003, coll *K. Stoyanov* (SOA 059458); **12**. Petrovo, 350 m, GL-09, 28.05.2004, coll. *O. Todorov* / *K. Stoyanov* (SOA 059430); Paril, 833–858 m, pl.n. *Viola arvensis*, GL-29, 12.06.2008, coll. *K. Stoyanov* (SOA 059360); **20**. Uzunbudzhak, 200 m, NG-64, 07.1998, coll. *D. Stoyanov* (SO 100723).

The species is confirmed for: **1n**. (Velenovsky 1891); **2.** (Davidov 1905; Urumov 1935a; Georgiev 1937; Китанов 1980); **5c.** (Velenovsky 1891; Urumov 1901, 1928, 1929b); **7.** (Urumov 1905b, 1913a, 1935b); **14n.** (Georgiev 1937); **14s**. (H. Uhlich, pers. commun.); **17w.** (Urumov 1908, 1917); **17c.** (Urumov 1913b); **17e.** (Georgiev 1937), **18.** (Velenovsky 1891; Urumov 1917; Georgiev 1937); **19.** (Urumov 1909).

The species is indicated for: **3.** (Kovachev 1900; Urumov 1905b, 1928, 1935a); **4w.** (Urumov 1898, 1909, 1935a); **4e.** (Urumov 1898, 1901, 1902, 1928); **5w.** (Urumov 1905a, 1905b, 1909, 1935a); **5e.** (Velenovsky 1891; Urumov 1909); **6.** (Velenovsky 1891; Urumov 1902, 1909); **8**. (Urumov 1905b, 1929a, 1930); **9.** (Urumov 1902, 1935b); **10.** (Urumov 1913a, 1935b); **15.** (Velenovsky 1891; Urumov 1908, 1935b); **16w.** (Urumov 1908, 1929b), **16e.** (Toshev 1895); or the whole country (Stojanov & Stefanov 1925, 1933; Georgiev 1937; Stojanov & al. 1967; Delipavlov 1995; Cheschmedzhiev 2003; Assyov & al. 2006), up to 1800 m.

Distribution. According to the own collections and herbar data species is distributed in the next regions: Black Sea Coast (1), Northeast Bulgaria (2), Balkan Range (5c), Znepole region (7), Mt Slavyanka (12), Pirin Mts (14), Rhodopi Mts (17), Thracian Lowland (18), Tundzha Hilly Country (19) and Mt Strandzha (20), up to 2000 m.

This species is polyphagous. The reported host plants for this species are from the families *Fabaceae* (Georgiev 1937; Delipavlov 1995) [*Trifolium* (Stojanov & Stefanov 1933, 1948; Stojanov & al. 1967), *Medicago* (Stojanov & al. 1967), *Asteraceae* (Davidov 1905, Delipavlov 1995), *Apiaceae* etc. (Delipavlov 1995). The col-

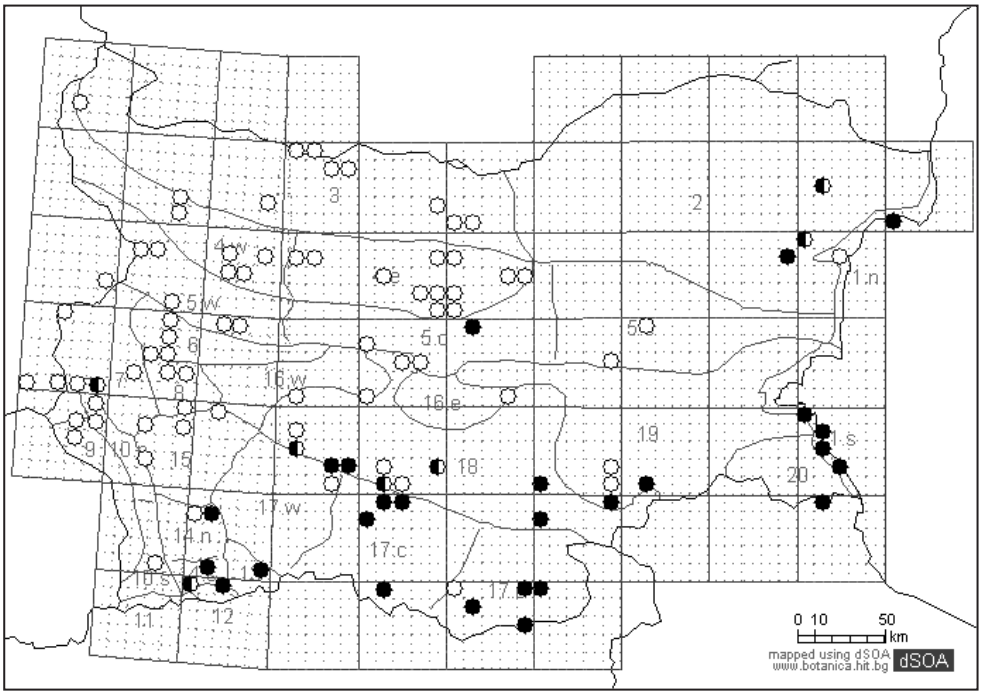

Fig. 1. Distribution map of *O. minor*.

○ – literature data
◐ – confirmed data
● – new and unpublished data

lections and herbar sheets confirm the host *Medicago falcata* and add new trophic relationships for Bulgaria: *Campanula lingulata*, *Hippocrepis unisiliquosa, Linaria* sp., *Stachys thracica*, *Vicia hirsuta, Viola arvensis*.

Orobanche minor f. *minima* Beck (Georgiev 1937; Stojanov & Stefanov 1948; Stojanov & al. 1964, Delipavlov 1995) is accepted as distributed in the country, and documented by two herbar sheets (SOM 69697; SOA 059465). These specimens, compared to the materials of *O. minor* f. *minor* didn't show an exact difference.

Orobanche amethystea Thuill. (Fig. 2)

New and unpublished data: **12**. Paril, 768 m, GL-29, 06.07.2004, coll. *A. Quantanar* & al. / *K. Stoyanov* (MA 726501); **14n.** Tisata, 400 m, FM-82, 2002, coll. ?/*K. Stoyanov* (SOA 059420); **15**. Dupnitsa, 535 m, FM-78, 19.06.2005, coll. *K. Stoyanov*, (SOA 059493); **17c**. Yugovo, 733 m, LG-13, 26.05.2007, coll. *K. Stoyanov* (SOA 059503); Kriv Kamuk peak, 1106 m, pl.n. *Eryngium campestre*, LG-05, 09.08.2005, coll. *K. Stoyanov* (SOA 059460); Markovo, 422–475 m, pl.n. *E. campestre*, LG-15, 9.05.2002, coll. *K. Stoyanov* (SOA 059419); 29.07.2004, coll. *K. Stoyanov* (SOA 059413); 31.05.2008, coll. *K. Stoyanov* (SOA 059334); Asenovgrad, 300 m, LG-25, 29.05.2003, coll. *K. Stoyanov* (SOA 059367).

The species is confirmed for: **1n.** (Georgiev 1937; Stojanov & al. 1967; Andreev 1992; Delipavlov 1995; Cheschmedzhiev 2003; Assyov & al. 2006); **1s.** (Andreev 1992; Cheschmedzhiev 2003; Assyov & al. 2006); **6.** (Stojanov & Stefanov 1925, 1933); **17w.** (Urumov 1906; Stojanov & Stefanov 1925, 1948); **18.** (Velenovsky 1891; Stojanov & Stefanov 1925, 1948; Aandreev 1992; Delipavlov 1995; Cheschmedzhiev 2003; Assyov & al. 2006); **19.** (Georgiev 1937; Cheschmedzhiev 2003; Assyov & al. 2006); **20.** (Georgiev 1937; Stojanov & al. 1967; Andreev 1992; Delipavlov 1995; Cheschmedzhiev 2003; Assyov & al. 2006).

Unconfirmed data exist from the regions: **2.** (Georgiev 1937; Stojanov & al. 1967; Andreev 1992; Delipavlov 1995; Cheschmedzhiev 2003; Assyov & al. 2006); **5w**. (Urumov 1909; Stojanov & Stefanov 1925); **5c.** (Stojanov & Stefanov 1925; Stojanov & Stefanov 1948; Delipavlov 1995; Cheschmedzhiev 2003; Dimtrov 2002); **5e.** (Velenovsky 1891; Urumov 1909; Stojanov & Stefanov 1925, 1933; Baev 1947); **7.** (Georgiev 1937; Andreev 1992; Delipavlov 1995; Cheschmedzhiev 2003; Assyov & al. 2006); **9.** (Andreev 1992; Delipavlov 1995; Cheschmedzhiev 2003; Assyov & al. 2006).

Distribution. Black Sea Coast (1), Sofia region (6), Znepole region (7), Mt Slavyanka (12), Pirin Mts (14n), Rila Mts (15), Rhodopi Mts (17w & c), Thracian Lowland (18), Tundzha Hilly Country (19) and Strandzha (20), up to 1300 m.

Orobanche amethystea has a contraversal information about its trophic relationships. The reported host plants are *Apiaceae* [*Eryngium* (Velenovsky 1898; Georgiev 1937; Stojanov & Stefanov 1933, 1948; Delipavlov 1995), *Daucus* (Stojanov & al. 1967)], *Ballota*,

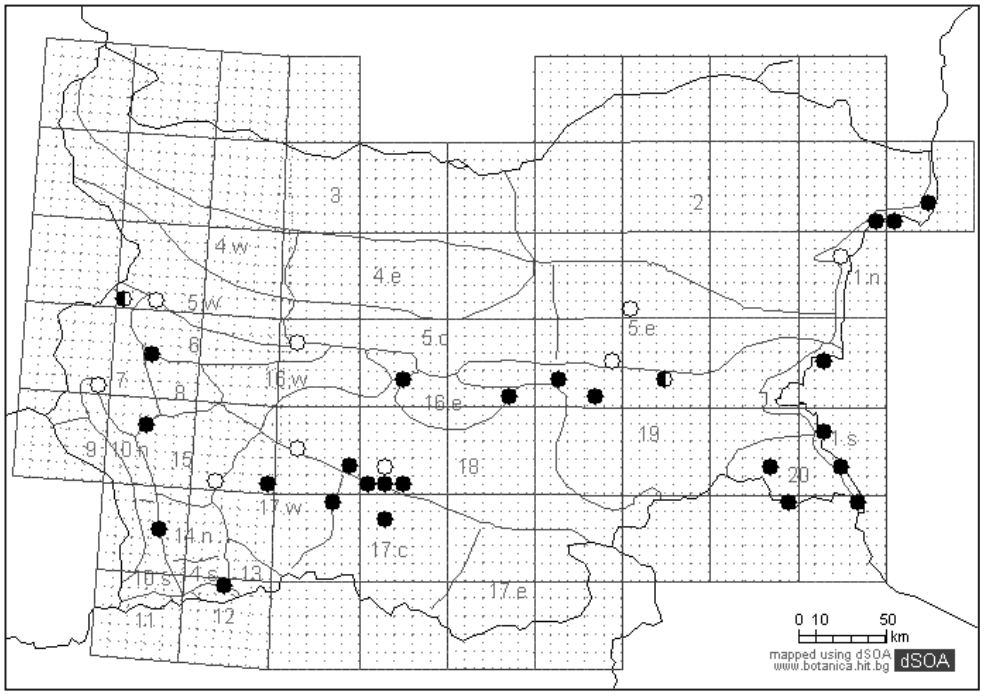

Fig. 2. Distribution map of *O. amethystea*.

○ – literature data
◐ – confirmed data
● – new and unpublished data

Asteraceae (Delipavlov 1995) [*Carthamus* (Stojanov & al. 1967)]. The confirmed hosts are *Eryngium campestre*, *Hedera helix, Orlaya grandiflora*, *Lagoseris, Oenanthe millefolium, Thymus* (?).

The indicated in the literature *O. amethystea* var. *evonymi* and *O. a.* var. *attica* (Georgiev 1937; Stojanov & Stefanov 1948) are not confirmed with Bulgarian herbar materials.

Orobanche esulae Pančić (Fig. 3)

New and unpublished data: **4e.** Lovtscha [Lovech], 190 m, LH-17, 1895, coll. Urumov / Beck sub *O. grisebachii* (WU s.n.); **11.** Klyuch, 300 m, FL-68, 25.05.2004, coll. O. Todorov / K. Stoyanov (SOA 059392); **17c.** Yagodina, 1000 m, KG-71, coll. *D. Gyurova* / *K. Stoyanov*, (SOA 059561); Byrdo peak, 1000 m, pl.n. *Euphorbia myrsinites*, KG-83, 02.07.2005, coll. *Kiril Stoyanov*, (SOA 059432, 059532); Murzyan, 880 m, LF-29, 30.07.2005, coll. *K. Stoyanov*, (SOA 059548); Zlatograd, 486 m, pl.n. *E. myrsinites*, LF-38, 27.07.2005, coll. *K. Stoyanov* (SOA 059549); Vurgov Dol, 440 m, pl.n.? *E. esuloides*, LF-39, 28.07.2005, coll. *K. Stoyanov* (SOA 059433); Pavelsko, 717 m, pl.n. *E. esuloides*, LG-03, 10.06.2007, coll. *K. Stoyanov* (SOA 059453); Yugovo, 731 m, pl.n. *E. esuloides*, LG-13, 26.05.2007, coll. *K. Stoyanov* (SOA 059456); Narechen, 860 m, pl.n. *E. esula*, LG-14, 12.06.2005, coll. *Ts. Raycheva* / *K. Stoyanov* (SOA 059501); Kuklen, 400 m,.pl.n. *E. esuloides*, LG-15, 06.05.2004, coll. K. Stoyanov (SOA 059396); 404 m, pl.n. *E. esuloides*, 20.05.2006, coll. *K. Stoyanov* (SOA 059414); Chervenata Stena, 1240 m, pl.n. *E. esuloides*, LG-24, 26.06.2004, coll. *K. Stoyanov* (SOA 059391); Asenova Krepost, 270–309 m, pl.n. *E. esuloides*, LG-25, 09.05.2007, coll. *K. Stoyanov* (SOA 059424); Lyaskovo, 749–832 m, pl.n. *E. esuloides*, LG-15, 06.05.2007, coll. *K. Stoyanov* (SOA 059507); **18**. Elenski peak, 330–450 m, pl.n. *E. myrsinites,* KG-84, 02.05.2005, coll. *K. Stoyanov* (SOA 059446); 360 m, pl.n. *E. myrsinites*, 01.06.2005, coll. *K. Stoyanov* (SOA 059417); Krichim, 450 m, pl.n. *E. cyparissias*, KG-85, 02.07.2003, coll. *K. Stoyanov* (SOA 059389); Trivoditsi, 235 m, pl.n. *E. myrsinites*, KG-86, 20.05.2006, coll. *K. Stoyanov* (SOA 059449); Shirokiya peak, 300–400 m, pl.n. *E. myrsinites*, KG-96, 15.05.2003, coll. *K. Stoyanov* (SOA 056353, 056346); **19**. MH-11. Banya, 252 m, 10.07.2007 (KS) SOA 059551; MH-30. Kotlenitsa peak, 181 m, pl.n. *E. myrsinites*, 09.07.2007 (KS) SOA 059550; **20**. NG-36. Zvezdets, 299 m, pl.n. *E. niciciana*, 13.06.2006 (KS) SOA 059332; NG-65. Pirena, 250 m, pl.n. ? *E. seguierana*, 11.07.2003 (KS) SOA 059541.

This species is confirmed for: **1n.** (Georgiev 1937; Andreev 1992; Delipavlov 1995; Cheschmedzhiev 2003; Assyov & al. 2006); **1s.** (Georgiev 1937; Stojanov & Stefanov 1948, Stojanov & al. 1967; Andreev 1992; Delipavlov 1995; Cheschmedzhiev 2003; Assyov & al. 2006); **5w.** (Georgiev 1937; Stojanov & Stefanov 1948, Stojanov & al. 1967); **17w.** (Georgiev 1937; Stojanov & Stefanov 1948; Stojanov & al. 1967) up to 700 m.

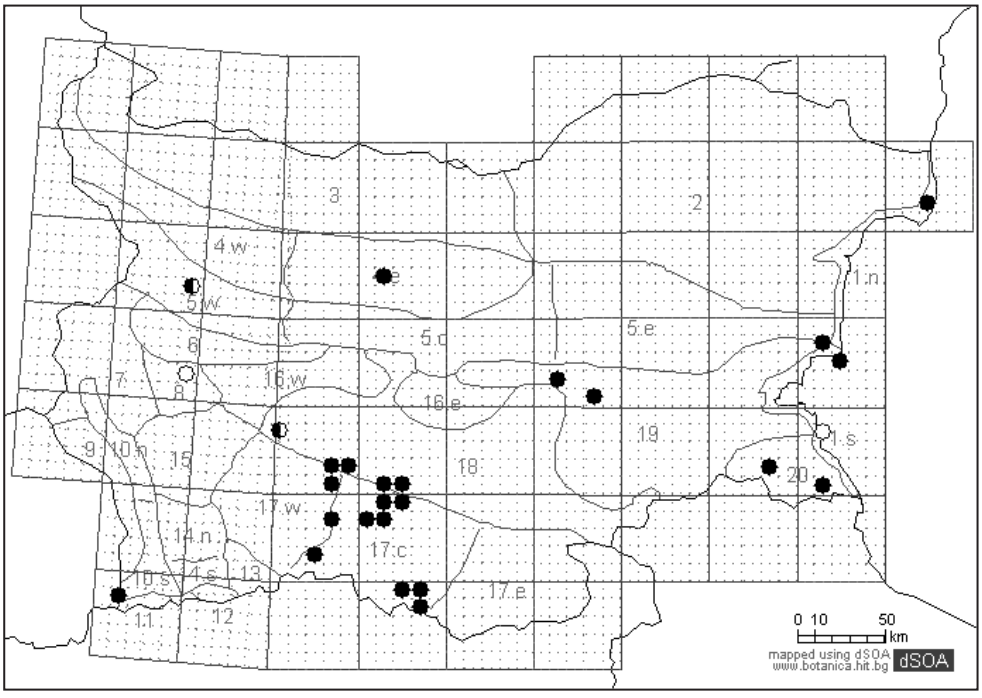

Fig. 3. Distribution map of *O. esulae*.

○ – literature data
◐ – confirmed data
● – new and unpublished data

The species is indicated for **6.** (Andreev 1992; Delipavlov 1995; Cheschmedzhiev 2003; Assyov & al. 2006) and **8.** (Georgiev 1937).

Distribution. The own collections and herbar specimens show the distribution for: Black Sea Coast (1), Forebalkan (4e), Balkan Range (5w), Mt Belasitsa (11), Rhodopi Mts (17w & c) Thracian Lowland (18), Tundzha Hilly Country (19) and Mt Strandzha (20). This species is known as **endemic** for the Balkans.

This species is oligophagous. The reported hosts are *Euphorbia* (Stojanov & Stefanov 1948; Stojanov & al. 1967); *E. esula* and *E. esuloides* (Georgiev 1937; Delipavlov 1995). The own collections add the species *E. seguierana, E. myrsinites, E. niciciana* and *E. cyparissias*.

Variation

1. Calyx segments up to the half of corolla. Filaments attached on 5–6 mm up of the corolla base. Stigma yellow ..... var. ***esulae***

1*. Calyx segments approximately equal to corolla. Filaments attached on 2–5 mm up of the corolla base. Stigma purple or pink ..... var. ***bulgarica***

Lectotypus: *O. esulae* var. *bulgarica* T. Georgiev, Svoge, May 1914, leg. *B. Stefanov*; SOA 10451 (**!**). (Delipavlov 1995).

The herbar revision did not confirm the distribution of *O. e.* var. *esulae* is Bulgaria. In other case, *O. esulae* var. *bulgarica* have a wider area than the previously reported.

In contrast of the description of *O. e.* var. *bulgarica*, the bracts and calyx are shorter than the corolla. Inspite of the trophic and phenologic differences, the morphological similarity between *O. e.* var. *bulgarica* and *O. minor* leads to inaccuracy of the determination keys. The facts about the variation of *O. esulae* show that the stigma color is not a reliable character and necessitate changing the determination key of the subsection.

The limited distribution in Serbia suggests that the center of distribution of this species is in Bulgaria, and is possible to find it in Macedonia, Greece and Turkey.

Orobanche pubescens d'Urv. (= *O. versicolor* Schultz) (Fig. 4)

New and unpublished data: **5e**. Gavrailovo, 260 m, pl.n. *Orlaya*, MH-32, 23.05.1963, coll. *D. Jordanov* & *A. Yanev* (SO 91319, sub *O. coerulescens*); **17e**. Krayno Selo, 238 m, 14.05.1995, LG-61, coll. *D. Delipavlov* (SOA 48605); 04.05.1995, coll. *D. Delipavlov* (SOA 48579, sub *O. nana*).

The species is confirmed for: **1.** (Andreev 1992; Delipavlov 1995; Cheschmedzhiev 2003; Assyov & al. 2006) – **1n.** (Georgiev 1937); **2.** (Georgiev 1937; Stojanov & al. 1967; Kitanov 1980; Andreev 1992; Delipavlov 1995; Cheschmedzhiev 2003; Assyov & al.); **4.** (Stojanov & Stefanov 1925, Andreev 1992; Delipavlov 1995; Cheschmedzhiev 2003; Assyov & al.

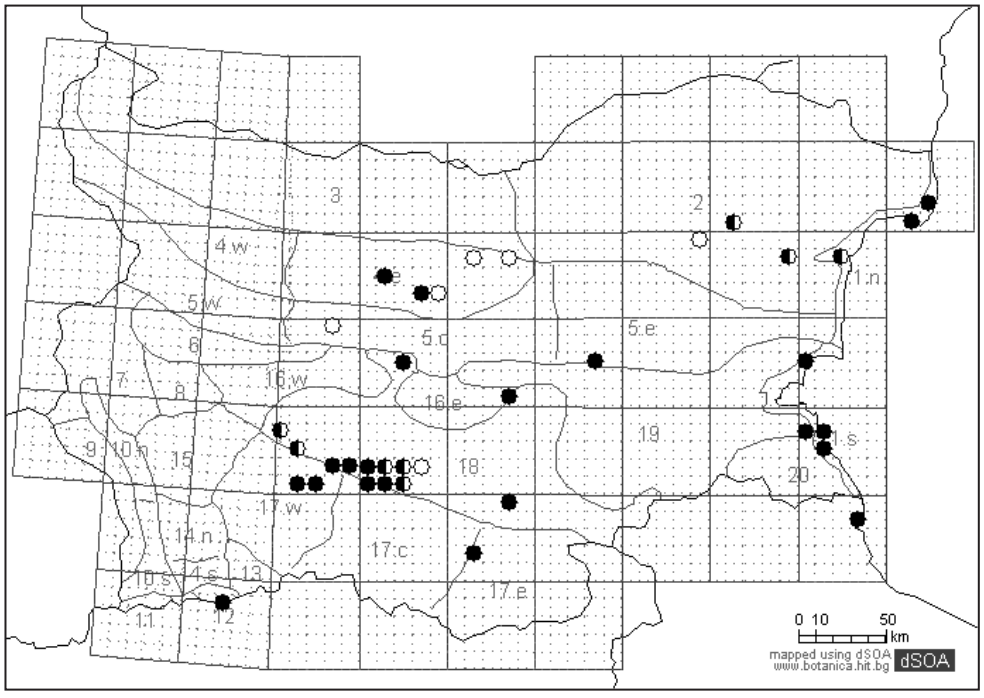

Fig. 4. Distribution map of *O.pubescens*.

○ – literature data
◐ – confirmed data
● – new and unpublished data

2006); **4e.** (Neichev 1908; Urumov 1928; Stojanov & Stefanov 1933, 1948); **5c.** (Baev 1947); **12.** (Stojanov & al. 1967; Andreev 1992; Delipavlov 1995; Cheschmedzhiev 2003; Assyov & al. 2006); **17w.** (Urumov 1917; Georgiev 1937; Andreev 1992; Delipavlov 1995; Cheschmedzhiev 2003; Assyov & al. 2006), **17c.** (Velenovsky 1898; Stojanov & Stefanov 1925, 1933, 1948; Andreev 1992; Delipavlov 1995; Cheschmedzhiev 2003; Assyov & al. 2006); **18.** (Velenovsky 1898; Stojanov & Stefanov 1925, 1948; Georgiev 1937; Andreev 1992; Stojanov & al. 1967; Delipavlov 1995; Cheschmedzhiev 2003; Assyov & al. 2006) and indicated for, up to 1800 m.

Unproved data are indicated for **6.** (Andreev 1992; Assyov & al. 2006); **14n.** (Delipavlov 1995; Cheschmedzhiev 2003); **14s.** (Stojanov & al. 1967; Andreev 1992; Delipavlov 1995; Cheschmedzhiev 2003; Assyov & al. 2006),

Distribution. Black Sea Coast (1), Northeast Bulgaria (2), Forebalkan (4e), Balkan Range (5c & e), Mt Slavyanka (12), Rhodopi Mts (17) and Thracian Lowland (18) up to 750 m.

The trophic data show that the species is polyphagous for five families. The reported hosts in the literature are *Asteraceae* (Velenovsky 1898; Georgiev 1937; Stojanov & Stefanov 1925, 1933, 1948; Stojanov & al. 1967; Delipavlov 1995), *Apiaceae* (*Smyrnium*, *Torilis, Orlaya, Caucalis*) (Velenovsky 1898; Georgiev 1937; Stojanov & Stefanov 1925, 1933, 1948; Stojanov & al. 1967; Delipavlov 1995), *Fabaceae* (Delipavlov 1995). The confirmed hosts are *Anchusa officinalis*, Anthriscus* (?), *Cirsium*, Hedera helix* (?), *Lactuca serriola*, Lamium garganicum*, Myrrhoides nodosa*, Orlaya grandiflora, O. daucoides*.

The wide host range gives a high modificational polymorphism, systemized in 6 forms according to Beck (1890). The typical form is reported for the whole country. *O. pubescens* f. *homochroa* is collected by Davidov near Varna (SOA s.n.; SOM 69775). One specimen of *O. pubescens* f. *lanifera* is collected near Slantchev Bryag (W 1972-13083 coll. *Mandl* / det. *Gilli*). In spite of the polymorphism, it is impossible to show a discrete difference between the forms. The task becomes more complicated because of the albinism, which is usual in this species.

Orobanche loricata Rchb. (= *O. picridis* F.W. Schultz; *O. freynii* Nyman) (Fig. 5)

New and unpublished data: **10s.** Rupite, 150 m, pl.n. *Anthemis tinctoria*, FL-89, 24.05.2004, coll. *K. Stoyanov* (SOA 059427); **17c.** Narechenski Bani, 900 m, LG-14, 17.08.2004, coll. *K. Stoyanov* (SOA 059393); Kuklen, 400 m, pl.n. ?*Cephalaria*, 31.05.2003, LG-15, coll. *Ts. Raycheva* / *K. Stoyanov* (SOA 059366); Anatema loc., 300–350 m, LG-25, 27.05.1967, coll. *I. Cheshmedzhiev* (SOA 18604, 18605, sub *O. picridis*); **18**. Kurucheshme loc., 400 m, KG-86, 25.05.2008, coll. *K. Stoyanov* (SOA 059365); Stara Zagora, 260 m, LH-80, 05.05.2005, coll.

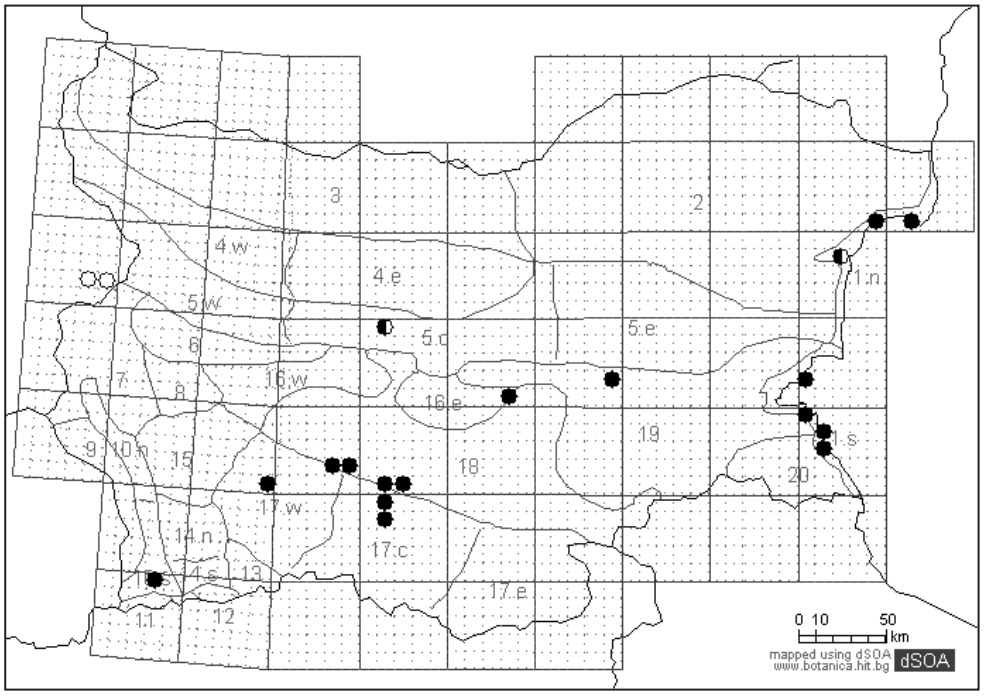

Fig. 5. Distribution map of *O. loricata*.

○ – literature data
◐ – confirmed data
● – new and unpublished data

K. Stoyanov (SOA 059445); **19**. Karasanli [Panaretovtsi], 144 m, MH-41, 05.1913, coll. I. Neichev (SOM 69790, sub *O. amethystea* rev. *D. Stoyanov*).

The species is reported for: **1n.** (Velenovsky 1898; Stoyanov & Stefanov 1925; sub *O. picridis*: Georgiev 1937); **1s.** (Delipavlov 1995; sub *O. picridis*: Andreev 1992, Assyov & al. 2006); **5c.** (Stojanov & al. 1967; Andreev 1992; Delipavlov 1995; Cheschmedzhiev 2003; Assyov 2006; sub *O. picridis*: Gerorgiev 1937), up to 650 m.

Distribution. Black Sea coast (1), Balkan Range (5c), River Struma valley (10s), Rhodopi Mts (17w & c), Thracian Lowland (18) and Tundzha Hilly Country (19), up to 900 m.

This species is reported as polyphagous for: two families: *Asteraceae* (Stojanov & al. 1967; Delipavlov 1995) [*Achillea* (Velenovsky 1898; Adamovich 1901), *Artemisia* (Velenovsky 1898), *Picris* (Hayek 1929), *Leontodon* (Hayek 1929)], *Apiaceae* (Stojanov & al. 1967; Delipavlov 1995) [*Daucus* (Stojanov & Stefanov 1933, 1948), *Eryngium* (Hayek 1929), *Orlaya*], The confirmed hosts are *Artemisia maritima, A. tinctoria*, Centaurea, Cirsium, Eryngium campestre, Jurinea kilaea*, Lapsana grandiflora* (?). The fact that this species parasitizes two different families causes a modificational variation described as two different species – *O. picridis* (on *Asteraceae*) and *O. loricata* (on *Apiaceae*). The Bulgarian authors till 1995 accept *O. picridis* as distributed in Bulgaria. Hayek (1929) and Andreev (1992) accept the both species in the country, recognized by the host specimens. Delipavlov (1995) considers the name *O. picridis* as a synonym of *O. loricata.*

The data for Serbia – near Tsaribrod and Pirot (Velenovský 1898; Adamovich 1901) suggest distribution of this species in Znepole region.

Orobanche crenata Forssk. (Fig. 6)

New and unpublished data: **1n.** Balchik, 60 m, NJ-90, 08.09.2003, coll. *K. Stoyanov* (SOA 059533); **1s.** Arkutino, 10 m, NG-68, 23.05.2005, coll. *K. Stoyanov* (SOA 059344); **2**. Abrit, 206 m, NJ-66, 22.05.1959, coll. *D. Delipavlov* (SOA 18615, 18616); **5c**. Tekiya [Hristo Danovo], 700 m, LH-03, 29.07.1923, coll. *D. Jordanov* (SO 68491);

The species is confirmed for: **18.** (Velenovsky 1891; Urumov 1908, 1908b, 1929b; Stoyanov & Stefanov 1925, 1933, 1948; Georgiev 1937; Stojanov & al. 1967; Andreev 1992; Cheschmedzhiev 2003), and indicated for **8.** (Urumov 1908); **10.** (Andreev 1992; Delipavlov 1995; Cheschmedzhiev 2003, Assyov & al. 2006); **15.** (Georgiev 1937; Stojanov & Stefanov 1925, 1933, 1948); **16w.** (Urumov 1929b); **19.** (Assyov & al. 2006).

Distribution. Black Sea Coast (1), Northeast Bulgaria (2), Balkan Range (5c), Rhodopi Mts (17c) and Tracian Lowland (18), up to 2000 m.

The reported hosts are from 3 families: *Fabaceae* (Georgiev 1937; Stojanov & Stefanov 1933, 1948; Stojanov & al. 1967; Delipavlov 1995) – *Vicia*, *Trifolium,*

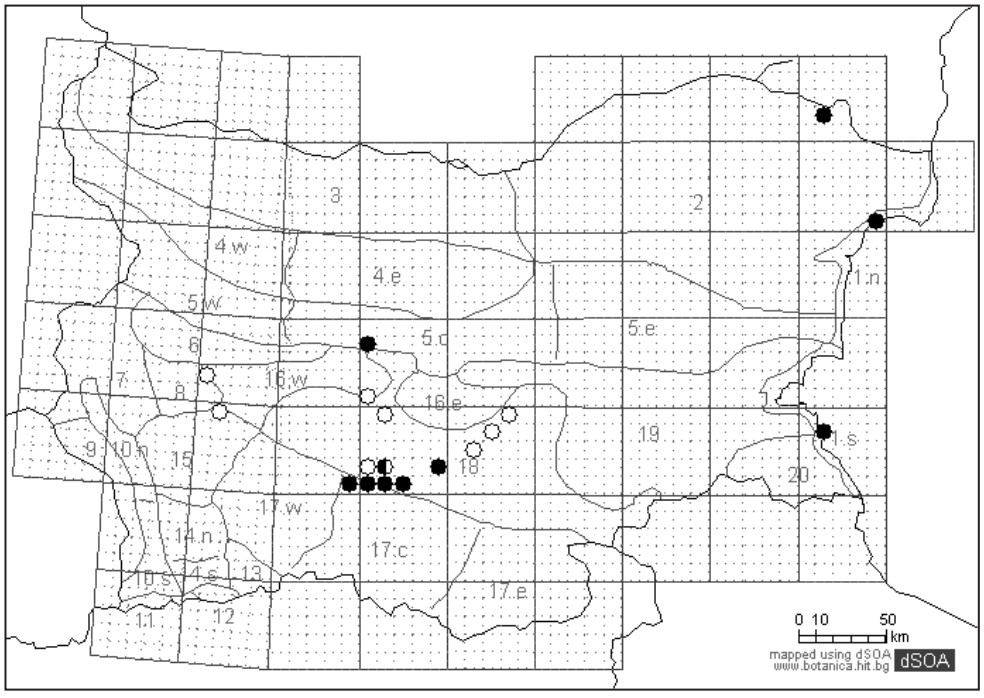

Fig. 6. Distribution map of *O. crenata*.

○ – literature data
◐ – confirmed data
● – new and unpublished data

Lathyrus, Pisum; *Apiaceae*; *Coryllus avellana*. The confirmed hosts are only members of Fabaceae – *Medicago*, Vicia, Astragalus*.

The trophic data shows that *O. crenata* is oligophagous species in *Fabaceae*.

This species is sporadically distributed in Bulgaria, and it is not known as a weed, in contrast to the data from Greece and Turkey.

Some samples in the collection of Urumov are determinated as *O. grisebachii* Reut. According to them, this species is indicated for Lovech region (Urumov 1897). Stojanov & Stefanov (1925, 1933, 1948) indicate the lack of herbar sheets and this species is excluded from the flora of Bulgaria (Georgiev 1937). The only specimen of Urumov since 1889 (SOM 69708 – spec. incompl.) is dramatically damaged. The saved lower part is similar to *O. esulae, O. minor* or *O. pubescens*. Many of the specimens collected by Urumov have been deposited in WU. There was found only one unnumbered specimen from Bulgaria determinated by Urumov as *O. grisebachii*. In fact this specimen is *O. esulae*.

A summary of the specified chorological data is shown in Table 1. The known host plants are given in Table 2. On the basis of the specified data an identification key was compiled.

Table 1. Distribution of *O.* subsect. *Minores* in Bulgaria – comparison by floristic regions.

Taxon	Floristic regions		New data	Altitude (m)
	indicated	confirmed		
O. minor	3, 4w, 4e, 5w, 5e, 6, 8, 9, 10, 15, 16w, 16e	1n, 2, 5c, 7, 14n, 14s, 17w, 17c, 17e, 18, 19	1s, 12, 20	5–2000 m
O. amethystea	2, 5w, 5c, 5e, 7, 9	1n, 1s, 6, 17w, 18, 19, 20	12, 14n, 15, 17c	15–1300 m
O. esulae	6, 8	1n, 1s, 5w, 17w	4e, 11, 17c, 18, 19, 20	40–1400 m
O. pubescens	6, 14s, 14n	1n, 1s, 2, 4e, 5c, 12, 17w, 17c, 18	5e, 17e	10–750 m
O. loricata	–	1s, 1n, 5c	10s, 17c, 18, 19	5–900 m
O. crenata	8, 10, 15, 16w, 19	18	1s, 1n, 2, 5c	10–1800 m

Identification key of genus *Orobanche* subsect. *Minores* in Bulgaria

1. Corolla longer than 20 mm. Filaments pilose in the lower 1/3, sparsely glandulose in the upper 2/3 . . . . . ***O. crenata***

1*. Corolla shorter than 23 mm. Filaments pilose in the lower half, smooth in the upper half **2**

2. Corolla with long curly hairs on the back side . . . . . ***O. pubescens***

2*. Corolla without curly hairs on the back side . . . **3**

3. Corolla usually shorter than 15 mm **4**

3*. Corolla longer than 15 mm **5**

4. Bracts shorter than corolla . . . . . ***O. esulae***

4*. Bracts longer than corolla or equal . . . . ***O. minor***

5. Calyx teeth with one visible nerve. Corolla with deeply bilobe upper lip, arched back line, pinched over the ovarium . . . . . ***O. amethystea***

Table 2. Hosts of *O.* subsect. *Minores* in Bulgaria (the new hosts are marked with *)

indicated hosts	confirmed and new* hosts
O. minor	
Fabaceae [*Trifolium*, *Medicago*, *Ornithopus*], ***Asteraceae*** [*Hieracium*, *Helichrysum*], *Apiaceae*	***Campanulaceae*** [*Campanula lingulata**], ***Fabaceae*** [*Medicago falcata*, *Vicia hirsuta**, *Hippocrepis unisiliquosa**], ***Scrophulariaceae*** [*Linaria**], ***Lamiaceae*** [*Stachys thracica **], ***Violaceae*** [*Viola arvensis**]
O. amethystea	
Apiaceae [*Eryngium*, *Daucus*, *Carthamus*], ***Lamiaceae*** [*Ballota*], ***Asteraceae***	***Apiaceae*** [*Eryngium campestre*, *Orlaya grandiflora**, *Oenanthe millefolia**], ***Araliaceae*** [*Hedera helix**], Asteraceae [*Lagoseris**], ***Lamiaceae*** [*Thymus* (?)]
O. esulae	
Euphorbiaceae [*Euphorbia esula*, *E. esuloides*]	***Euphorbiaceae*** [*Euphorbia esula*, *E. esuloides*, *E. seguieriana**, *E. myrsinites**, *E. niciciana**]
O. loricata	
Asteraceae [*Artemisia*, *Picris*, *Leontodon …*]; ***Apiaceae*** [*Daucus*, *Eryngium*, *Orlaya*]	***Asteraceae*** [*Artemisia maritima*, *Anthemis tinctoria**, *Centaurea*, *Cirsium*, *Jurinea kilaea**, *Lapsana grandiflora*]; ***Apiaceae*** [*Eryngium campestre*]
O. pubescens	
Asteraceae, ***Apiaceae*** [*Smyrnium*, *Torilis*, *Orlaya*, *Caucalis*], *Fabaceae*	***Asteraceae*** [*Anthriscus* (?), *Cirsium**, *Lactuca serriola**, *Myrrhoides nodosa**, *Orlaya grandiflora*, *O. daucoides*]; ***Araliaceae*** [*Hedera helix*]; ***Boraginaceae*** [*Anchusa officinalis**], ***Lamiaceae*** [*Lamium garganicum**].
O. crenata	
Fabaceae [*Vicia*, *Trifolium*, *Lathyrus*, *Pisum*]; ***Apiaceae***; ***Corylaceae*** [*Coryllus avellana*]	***Fabaceae*** [*Medicago**, *Vicia**, *Astragalus* (?)]

5*. Calyx teeth with unclear on invisible nerves. Corolla with slightly bilobe upper lip, straight part of the back side, not pinched over the ovarium .... ***O. loricata***

Conclusion

The high morphological similarity in *Orobanche* subsect. *Minores* is a reason for the unsure chorological and trophic data in Bulgaria. The hue of stigma is not a reliable criterion for identification of the species in this subsection because it is changing during the flower development.

Orobanche minor is known as distributed in the whole country but it is confirmed for 10 regions. The reported forms of this species can't be recognized clearly. *Orobanche amethystea* is confirmed for 10 regions. The Balkan endemic *O. esulae* is confirmed for 8 regions. The species *O. pubescens* is confirmed for 7 regions, in lower altitude than the indicated. Six regions confirm the distribution of *O. loricata* in Bulgaria. *Orobanche crenata* is confirmed for 5 regions.

The review of existing herbarium data about host plants of genus *Orobanche* subsect. *Minores* in Bulgaria presents that occasionally the information is not sufficient. A large part of the specimens are not supported by information concerning host plant. In other cases the information on the specimen label is not proved with enclosed host. Probably most of the data about host plants are based on the plants found in neighborhood to the parasite. The information obtained in the study shows a unclear specificity according to the host plants. The most polyphagous species is *O. minor* – parasitizes the members of five families. It is followed by *O. pubescens* and *O. amethystea*. Two species can be classified as oligophags – *O. loricata* (2 families) and *O. crenata* (1 family). The endemic *O. esulae* can be classified as monophag (only in genus *Euphorbia*).

Aknowledgements. The study was supported by SYNTHESYS Projects (AT–TAF–3133 and ES-TAF-4407) which are financed by European Community – Research Infrastructure Action under the FP6 "Structuring the European Research Area" Programme. The author is also thankful to the anonymous reviewer for the critical notes and suggestions.

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