



The chorology of the *Sedum caespitosum* (Cav.) DC. (Crassulaceae) in Romania

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Abstract. The *Sedum caespitosum* species occurs naturally in skeletal or halophilous soils, in rocky or stony areas: edges of roads, disturbed roadsides, grasslands, mostly between 0 and 1000 m above sea level. In Romania, this species has been quoted from the silvosteppe to the forest beech area, on sandy or rocky soils. In the Flora of Romania there were some confusions related to the corology of this species, because one of the synonyms is *Crassula rubens*, considered today *Sedum rubens*. In Romania, the species is indicated in the following counties: Bihor, Arad, Timiș, Dolj, Constanța, Tulcea, Bacău. Some choronyms, from the old publications, are considered indications for another taxon. So, in Flora of Romania, both *S. caespitosum* and *S. rubrum* (with synonym *Crassula rubens*) are indicated from Alba county - „Zlatna on Piatra Caprei”. The error was then taken over by other authors. Therefore, it is almost certain that the information relates to *S. rubrum*. Also, there are two copies FEAH no. 2569 from the BP collection (BP 615580, BP 615581) where Simonkai corrected the „classicus place”, namely „Kisjenő, Cottu Arad” in opposition to Montes Vulkan supra Abrudbánya (Abrud mine). In addition, Bernatsky support this. For this reason, we consider our study relevant for the knowledge of the species occurrence in Romania.

Key Words: *Sedum caespitosum*, Crassulaceae, rare plants, chorology, Romania.

Introduction. According to the literature (Dihoru & Dihoru 1994; Oltean et al 1994; Negrean 2001) *Sedum caespitosum* (Cav.) DC. (Crassulaceae) is found in the Red List of vascular plants of Romania as rare (R).

As it was showed in a previous article (Simion 2017), Antonio José Cavanilles described it for the first time in 1771 (1791), under the name *Crassula caespitosa* (which later became homotypic synonym) (Marhold 2011). It occurs in the Mediterranean and sub-Mediterranean area, from Portugal to Anatolia, Syria, and Jordan. From the Balkans and N of It: Hungary & Romania; it grows in Crimea and from Turkey; it extend to western Iran. In Africa, the species has been reported only from Morocco (Duchon 2012). From ecological point of view, the plant occurs naturally in skeletal soils, in rocky or stony areas; edges of roads, disturbed roadsides, grasslands, mostly between 0 and 1000 m above sea level (Duchon 2012; PlanNET-NSW Flora Online 2014). In Romania, this species has been reported from the silvosteppe to the forest beech area, on sandy and halophilous or rocky soils (Sârbu et al 2013).

References to the species have also been made under the following names, which also went into synonyms: *Aithales caespitosa* (Cav.) Webb & Berth., *Crassula diffusa* Lam., *Crassula magnolii* DC., *Crassula verticillaris* L., *Procrassula caespitosa* (Cav.) Fourr., *Procrassula magnolii* (DC.) Griseb., *Sedum cespitosum* Boiss., *Sedum louisii* (Thieb. & Gomb.) Fröder., *Sedum magnolii* Bubani, *Sedum melanoleucum* Schlecht. ex Ledeb., *Sedum rubens* subsp. *caespitosum* (Cav.) Bonnier & Layens, *Sedum rubrum* var. *louisii* Thieb. & Gomb., *Sedum stellatum* Friv. ex Nyman, *Tillaea erecta* DC. (The Plant List 2013); *Sedum erythrocarpum* Pau, *Sedum rubrum* (L.) Thell., *Tillaea rubra* L. (Marhold 2011); *Sedum rubro* (L.) Thell., *Sedum deserti-hungarici* Simonkai (Răvărut 1956).

According to the literature (Simonkai 1890), the first recorded in Romania was as *Sedum deserti-hungarici*, from Șimand and Socodor salty soils.

In the Romanian Flora there were some confusions related to the chorology of *S. caespitosum* species, because one of the synonyms is *Crassula rubens* L., considered today *Sedum rubens* L. Some choronyms, from the old indications, are considered indications for another taxon. For this reason, we consider our study relevant for the knowledge of the species occurrence in Romania.

Material and Method. Determination and identification of the taxa has been done using the „floras”: Săvulescu (1956), Ciocârlan (2009) and Sârbu et al (2013).

Species names follow Săvulescu (1952-1976), Tutin et al (1964-1980), Tutin et al (1996) and The Euro+Med PlantBase (ww2.bgbm.org).

The distribution of *S. caespitosum* in Romania has been analysed based on data from the herbarium collections, and specialty literature. Also, there are included the results of the field studies of the authors (April 2017, 2018, 2019) .

Listing of choronyms was made from Nord to South and from West to East.

Abbreviations used:

- AFE - Atlas Florae Europaeae (vol. 12);
- FEAH - Flora Exsiccata Austro-Hungarica;
- FDE - Flora Dobrogeae Exsiccata (Sălăgeanu & Horeanu 1971);
- FMDE - Flora Moldaviae et Dobrogeae Exsiccata (Iași);
- FRE - Flora Romaniae Exsiccata (Cluj/Napoca).

Herbarium abbreviation follows Index Herbariorum (Thiers 2012):

- W - Herbarium Naturhistorisches Museum Wien;
- MPU - Herbarium University Montpellier - Institute of Botany;
- MNHN-P - Museum National d Histoire Naturelle (National Museum of Natural History) - Herbarium Musei Parisiensis;
- PRC - Herbarium Carolinae Praga;
- BP - Herbarium Hungarian Natural History Museum - Budapest;
- CL - Herbarium Babeş-Bolyai University Cluj-Napoca;
- BUC - Herbarium D.Brandza Botanical Garden;
- [?GT, or P] - herbariums where the material could be in Gothenburg or Paris;
- I - Herbarium „Alexandru Ioan Cuza” University of Iasi.

Signs used:

- * = *Crassula caespitosa* Cav.
- ◆ = *Crassula magnolii* DC.
- = *Sedum deserti-hungarici* Simonk.
- ▼ = *Sedum rubrum* (L.) Thell., non Royle ex Edgew.
- ◀ = *Sedum rubrum* (L.) Thell.
- △ = *Sedum caespitosum* (Cav.) DC.

Results and Discussion. In the Romanian Flora there were some confusions related to the chorology of this taxon, because one of the synonyms is *Crassula rubens* L. considered today *Sedum rubens* L. Some choronyms, from the old indications, were passed to another taxon. Thus, the same choronym, in Romanian Flora, was passed to both *S. caespitosum* „Zlatna on Piatra Caprei” (Răvăruț 1956) as well as to *Sedum rubrum* L. (with synonyms *Crassula rubens* L.) „Zlatna on Piatra Caprei” (Răvăruț 1956). The error was then taken over by other authors. Therefore, it is almost certain that the information relates to *S. rubrum*.

As it was showed in a previous article (Simion et al 2018), there are some herbarium specimens that illustrates the nomenclature used for the species described in Romania, nomenclature that generated confusion over identification.

Simonkai (1890) has described the plant as *Sedum (Procrassula) deserti-hungarici* from the plants collected between Șimand and Socodor, in 3 May 1890. The plant is distributed in some exsiccata:

- HERBARIUM NORMALE 2635, Nov. Ser., Cent. 27 2635 L. von F. Schultz
- Ungaria /Hungary; of these are found in the following other herbariums:
 - 1 specimens Isotypus in collection W 1891-0001665,

- 2 specimens Isotypus in collection MPU (duplicates: UM-MPU-MPU015099; UM-MPU-MPU015100) (https://science.mnhn.fr/taxon/species/sedum/deserti-hungarici?lang=en_US),
- 3 specimens in collection MNHN-P (MNHN-P P03693202 from Herbar Th. Delacour, received on 10 April 1970 from the Faculty of Pharmacy in Paris; MNHN-P P03194707, received on 5 January 1891 (anonymous); MNHN-P P03194708, from E. Drake Herbarium) (<https://science.mnhn.fr/institution/mnhn/collection/p/item/search>),
- 3 specimens Syntypus in collection PRC (Virtual Herbaria JACQ: (PRC 454196 - isotypus according teste V. Byalt (LE) XI-XII 2003; PRC 454197 det. Ragmond-Hamet as „*Sedum rubrum* (L.) Thellung – Nomenclaturae Leges 1910; *Sedum caespitosum* (Cav.) D.C. – Nomenclaturae Leges 1930”, teste V. Byalt (LE) XII 2003; PRC 454198 det. Ragmond-Hamet as „*Sedum rubrum* (L.) Thellung – Nomenclaturae Leges 1910; *Sedum caespitosum* (Cav.) D.C. – Nomenclaturae Leges 1930”, teste V. Byalt (LE) XII 2003) (<http://herbarium.univie.ac.at/database/index.php>);
- FEAH – 2569 *Sedum deserti-hungarici*/ „In Montes Vulkan supra Abrudbánya”:
 - 1 specimen in collection MNHN-P (MNHN-P P03194709, received on 20 November 1899) (<https://science.mnhn.fr/institution/mnhn/collection/p/item/search>);
 - 1 specimen/49462 at Herbarium of Cluj University/48462, from Florian Porcius Herbarium.

There are two copies FEAH no. 2569 from the BP collection (BP 615580, BP 615581) where Simonkai corrected the „locus classicus”, namely „Kisjenő, Cottu Arad” in opposition to Montes Vulkan supra Abrudbánya (Abrud mine). Bernatsky (1905) support this: „in Flora exsiccata Austro-Hungarica also appeared, known as the *Sedum deserti-hungarici* (erroneously from the Abrud mine) (2569)”.

The plants collected in other areas of Romania are stored at Herbarium Babeş-Bolyai University Cluj-Napoca (CL) under different names:

- HERBARIUM MUSEI TRANSILVANICI:
 - from collection Flora Hungarica, Arad, V 1905, leg. Thaisz [CL 92158[♦]];
 - „Arad, prope Kisjenő”, V, 1906, leg. Wagner [CL 92160*].
- HERBARIUM MUSEI BOTANICI UNIVERSITATIS CLUJ – FLORA ROMANIAE:
 - Mădăraş, Salonta District, the Oradea Region, 20 V 1955, leg. Ioan Pop [CL 509.055[◄]].
- FRE A MUSEO BOTANICO UNIVERSITATIS CLUSIENSIS (IN TIMIŞOARA) EDITA:
 - Foeni - Timiş, 21 V 1943, leg. Borza et Todor [CL 207729[◄]].
- HERBARIUM MUSEI BOTANICI UNIVERSITATIS NAPOCENSIS – FLORA ROMANIAE:
 - Dobrogea, district Tulcea, Beştepe, 30 IV 1993, leg. Gh. Groza [CL 622732^Δ];
 - Dobrogea, distr. Constanţa, Sibioara E, the shore of Lake Taşaul, 10 VII 2017, leg. Gavril Negrean, [CL 661567^Δ].
- FDE A INSTITUTO PEDAGOGICO TOMITANO EDITA:
 - Dobrogea, District Tulcea, Războieni, 30 IV 1970, leg. Cl. Horeanu, 1 specimen^Δ.
- HERBARIUM „ALEXANDRU IOAN CUZA” UNIVERSITY OF IASI (I):
 - “Denis Tepe Mountain (Tulcea)”, 23 IV 1912, leg. C-tin Petrescu, [1 specimen^Δ I] from the Herbarium Constantin Petrescu.

The chorology of species *Sedum caespitosum* (Cav.) DC. (*Crassula caespitosa* Cav.*; *Crassula rubens* DC.; *Sedum deserti-hungarici* Simonk.[▪]; *Sedum rubens* auct., non L.; *Sedum rubrum* (L.) Thell., non Royle ex Edgew.[▼]) „*Sedum rubrum* (L.) Thell.[◄] (*Crassula caespitosa* Cav.; *Sedum deserti-hungarici* Simk.): „Crişana” (Borza 1947[▼]). **BH:** (Ciocârlan 2009); near Mădăraş, on a semi-salted land, where it grows abundantly

(Pop 1957); Câmpia Crișurilor, Crișul Negru – Crișul Repede interfluves, through dry meadows with salty soil, near Mădăraș, frequent (Pop 1968); Salonta NW, ass. *Artemisietum monogynae* Rapaics (Pop 1968); Mădăraș (Beldie 1977). **AR**: „dried, alkaline steps from all over the county to Arad (Ceala Forest)” (Prodan 1939[▼]); „Massively in the poverty of Șimand to Mâsca and Pîlu, but especially at Chișineu-Criș and Adea on Corhan, Prince Joseph plains; replaces in our poverty on southern European *Sedum caespitosum* (Cav.)” (Simonkai 1893[■]); Chișineu-Criș, surroundings, on dry and stony slopes (Ardelean 1990); Șimand, Chișineu-Criș, Mâsca, Adea, Pîlu, Socodor, Pecica, Arad (Beldie 1977); Mădăraș, Arad, Șimand, Chișineu-Criș, Adea, Mâsca, Pîlu, Grăniceri, Socodor (Simonkai 1890[■]; Soó & Máthé 1938); Șimand, Chișineu-Criș, Adea, Pîlu, Grăniceri, Socodor (Răvăruț 1956); On salty soils, behind the railway station Chișineu-Criș, 3 VI 1953 (Prodan 1956*); On salty soils from the front and right of the railway station Chișineu-Criș, 3 VI 1953 (Prodan 1956*); Socodor, V-VII 1959 (Bujorean et al 1961); On dry and stony slopes at Șimand, Chișineu-Criș, Adea, Pîlu (Ardelean 1999); On sandy and gravel on dry slopes, at Mâsca, Șimand, Chișineu-Criș, Adea, Pîlu, rare (Ardelean 2006); Mâsca, Arad at Haduța and Ceala forests (Răvăruț 1956); On sandy places and stony, on dry slopes at Mâsca (Hodișan 1978). „Banat” (Borza 1947[▼]). **TM**: (Ciocârlan 2009). Districts: Timișoara, Jimbolia and Sânnicolaul Mare (Samoilă & Oprin 1957[▼]); Timișoara-Diniaș-Sânmartinul Sârbesc-Ivanda-Ionel (Iohanisfeld), salty meadows (Popescu & Samoilă 1962); Sânmihaiul Român, ass. *Pholiuro-Plantaginetum tenuiflorae*, 25 V 1975 (Pop 1980); Sânmihaiul Român, ass. *Puccinellietum limosae*, 3 IX 1975 (Pop 1980); Becicherecu Mic, ass. *Puccinellietum limosae*, 11 V 1974 (Pop 1980); Diniaș, ass. *Puccinellietum limosae*, 20 V 1975 (Pop 1980); Sărăturile Diniaș Nature Reserve, 45°38'..”N, 21°21'..”E, about 75 m elevation (Grigore 1977); Peciu Nou, at “Coroda”, ass. *Pholiuro-Plantaginetum tenuiflorae*, 21 V 1975 (Pop 1980); Giulvăz, ass. *Puccinellietum limosae*, 15 VI 1975 (Pop 1980); „District Timiș-Torontal. In semi-alkaline argillaceous pastures at village Foeni, 85 m elevation, 21 May 1943, legit A. Borza & I. Todor” [FRE 2534] (Borza 1944[▲]); Foeni (Răvăruț 1956; Beldie 1977). **DJ**: „Ciuperceii Vechi, Danube Meadow, flooded area, in Northeast of Bogdan Island” (Simion 2017), in *Artemisio austriacae - Poëtum bulbosae* l. Pop 1970 - subas. *medicaginetosum minimae* (Popescu et Sanda 1975) stat nov. Chifu, Irimia, Zamfirescu 2014] [syn. *Cynodonti-Poëtum angustifoliae* Rapaics ex Soó – subas. *medicaginetosum minimae* Sanda et al (2001)] and (Simion Ioana and Pătruțoiu Ion personal observations in 2018, 2019).

DOBROGEA. „Dobrogea. In desertis lapidos. Passim US” (Kanitz 1880[◆]) [??GT, or P]; „/Dobrogea/in the stony steppe. Everywhere common” (Brandza 1898[◆]); „In the stony places, from Dobrogea” (Prodan 1939[▼]). „Dobrogea” (Borza 1947[▼]); „In Dobrogea in the stony steppe” (Răvăruț 1956). **CT**: Casimcea Plateau, ass. *Festucetum callieri* Șerbănescu 1965, emend. Dihoru (1969) 1970 (syn. *Sclerantho - Festucetum callieri* Burduja & Horeanu 1976, var. *calciphila**), Cheia and Gura Dobrogei, ass. *Sedo hillebrandtii - Polytrichetum piliferi* Horeanu & Mihai 1974 (Horeanu 1976a*); Gura Dobrogei (Niculae 2018); Cheia Nature Reserve (Horeanu 1976a); „Călugăreni..., the bank of the Casimcea creek” (Horeanu 1976b); in the east of Palazul Mic, on the bank of the Casimcea creek, 44°26'11.10”N, 28°31'05.17”E, about 27 m elevation, 10 V 1978, G. Negrean (N 27.243) [BUC]; in the east of Târgușor, on the bank of the Seid-Orman creek, in schistose (green shale), 44°25'22.37”N, 28°29'43.25”E, about 110 m elevation, 10 V 1978, G. Negrean (N 27.244) [CL]; in the north of Târgușor, Cheia Nature Reserve, narrow path on the cliff, 44°30'45”N, 28°25'57”E, 10 m elevation, 6 V 2004, G. Negrean (GN: 4082a) [Herbarium Gavril Negrean]; in the southwest of Gura Dobrogei S, on the bank of the Vistorna creek, on limestone cliffs, 44°28'11.21”N, 28°30'51.27”E, about 14 m elevation, 9 V 1980, G. Negrean (N 27.245) [BUC]; in the south of Palazul Mic, to the right of the Seid-Orman Valley, on limestone cliffs, together with *Astragalus subuliformis* DC., 44°25'23”N, 28°31'30”E, about 50 m elevation, 10 V 1978, G. Negrean (N: 27.082); in AFE (H 3067) it is indicated and south of Casimcea Plateau (Jalas et al 1999); Cheile Dobrogei Natural Park: Casian, inter Cheile Dobrogei and Gura Dobrogei (Petrescu 2007: 53); **TL**: Tulcea Hills, Beștepe Hill, 25 V 2007, Beiului Hill, 19 V 2007, ass. *Teucro capitatae - Convolvuletum lineatae* Chifu & Țupu, ass. novum (Chifu & Țupu 2009); Babadag Plateau (Dihoru 1970, ass. *Agropyro - Thymietum*

zygoidi Dihoru 1970); „..., „Colțanii Mari”, the bank of the Casimcea creek” (Horeanu 1976b); in ass. *Agropyro brandzae* – *Thymetum zygoidi* (Dihoru 1969) Dihoru 70: Mahmudia, Beștepe Hills Nature Reserve; Horia, Consul Mountain Nature Reserve (Petrescu 2007); Casimcea Platreau - plot with negligible coverage, in ass. *Sedo hillebrandtii* – *Polytrichetum piliferae* (Horeanu & Mihai 1974); Beidaud Nature Reserve, Casimcea, Măcin Mountains National Park, Greci (Petrescu 2007); Măcin Mountains National Park, 10% coverage/6 sites (Petrescu 2007); Mahomencea Valley Nature Reserve (Petrescu 2007); Beștepe Hills Nature Reserve, ±/6 sites (Petrescu 2007); Beidaud Nature Reserve, ±1/6 sites (Petrescu 2007), idem, 34.92 Ponto-Sarmatic steppes, in ass. *Medicagini minimae* – *Festucetum valesiacaе* Wagner 1941, and 34.9211 Western Pontic thyme steppes, in ass. *Sedo hillebrandtii* – *Polytrichetum piliferae* Horeanu & Mihai 1974, as endangered plant community (Petrescu et al 2014); Mahomencea Valley Nature Reserve, ±/6 sites (Petrescu 2007); „in pago dicto Beștepe, distr. Tulcea, in pratis glareosis, 27 IV 1993, leg. I. Sârбу & N. Ștefan, det. I. Sârбу – FMDE 826 (Oprea & Mititiuc 2005); „In schistosis viridibus prope pagum Războieni, about 65 m elevation, 30 IV 1970 – Flora Dobrogeae Exsiccata no 32 (Sălăgeanu & Horeanu 1971); Beidaud, in 62C0* Ponto-Sarmatic steppes [in ass. *Taraxaco serotini-Festucetum valesiacaе* (Burduja et al 1956; Răvăruș et al 1956) Sârбу, Coldea et Chifu 1999, *Artemisio austriacaе-Poëtum bulbosae* I. Pop 1979], in 8230 Siliceous rock with pioneer vegetation of the *Sedo-Scleranthion* or of the *Sedo albi-Veronicion dilleni* [in ass. *Sedo hillebrandtii-Polytrichetum piliferae* Horeanu & Mihai 1974), 30 IV 2019 (Ioana Simion and I. Pătrușoiu personal observations in 2019); in the grassland from Băii Hill, 44°45'4.26"N/28°39'14.84"E, in 8230 (in ass. *Sedo hillebrandtii-Polytrichetum piliferi* Horeanu et Mihai 1974), in 62C0* [in ass. *Taraxaco serotini-Bothriochloëtum ischaemi* (Burduja et al 1956) Sârбу, Coldea et Chifu 1999, 44°44'44.49"N / 28°39'40.29"E 28 IV 2019 (Ioana Simion and I. Pătrușoiu personal observations in 2019); Țicala Hill, in 8230 [in ass. *Festucetum callieri* (Șerbănescu 1965) Dihoru et Doniță 1970, 2 V 2019 (Ioana Simion and I. Pătrușoiu personal observations in 2019)]; **BC**: Fântânele, Țepoia, Vladnic (Mititelu & Barabaș 1978; Mititelu et al 1993); „Fântânele, Țepoia, Vladnic” (Chifu et al 2006).

The distribution of the *S. caespitosum* in Romania is presented in Figure 1.

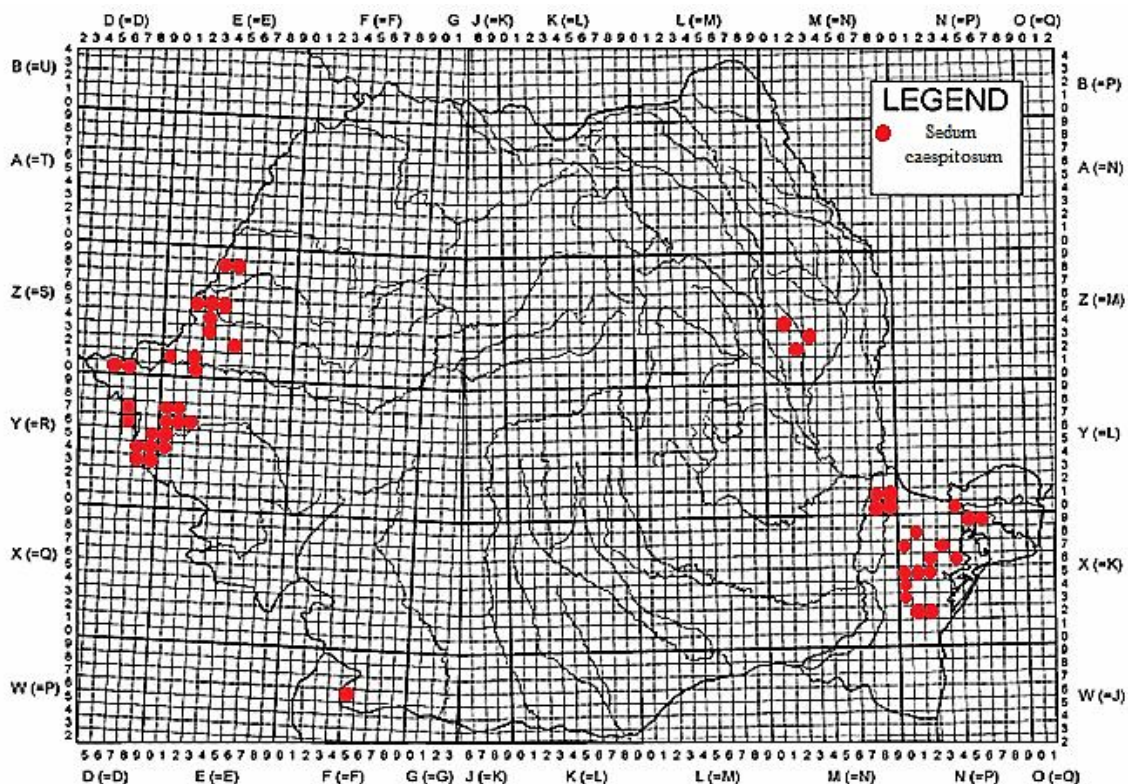


Figure 1. Distribution of *S. caespitosum* in Romania (original).

Conclusions. The article presents the complete chorology from Romania of *S. caespitosum* species. Based on analyses of herbarium material and literature data, the authors corrects errors that have appeared in the literature concerning chorology of species. Also, there were added the choronyms in which the authors identified the species.

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