

## CHOROLOGY OF *Sedum urvillei* (CRASSULACEAE) IN ROMANIAN DOBROGEA, IMPLICATIONS FOR CONSERVATION

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**Abstract.** *Sedum urvillei* DC. is a xerothermic yellow-flowered perennial species of Crassulaceae with Balkano-Pontic and East-European sub-mediterranean distribution. Its Romanian range includes several disputable populations North of Danube and certainly Dobrogea, where *S. urvillei* is widespread, despite lack of precise data about its actual occurrence in this region. The typical *S. urvillei* has a pronounced xero-thermophilic preference for rocky habitats with shallow topsoil where it escapes competition, being most often but not exclusively found on rocky calcareous outcrops. The lack of a botanical work describing the complete distribution range of *S. urvillei* in Romanian Dobrogea, since more than half a century ago when the only monographic treatment of Crassulaceae family in Romanian flora was published, prompted me to present herein comprehensive (albeit not exhaustive) precise data about the actual occurrence sites of *S. urvillei* in Romanian Dobrogea resulted from personal fieldwork surveys during over 30 years, results comprising over 150 occurrence sites for *Sedum urvillei* was seen, around >30 human settlements, spanning the whole province, from practically sea level up to about 400m elevation a.s.l. The data presented herein document for *S. urvillei* a much larger distribution in Dobrogea than previously precisely documented but co-occurrence of *S. urvillei* with the very similar but more common species *S. acre* and *S. annuum* and/or *S. sexangulare*, predisposes it to confusions with these two species and leads to underreporting. It also is quite important for biodiversity conservation as it participates in several associations harbouring the much rarer congeneric *Sedum caespitosum* and builds the Assoc. *Sedo hillebrandtii-Polytrichetum-piliferi* Horeanu et Mihai 1974 in which it is the main species. Understanding the environmental and phytocoenotic characteristics fostering *S. caespitosum* occurrence in this association would certainly benefit its conservation, together with other rare and locally threatened species like *Festuca callieri*, *Gagea szovitzii*, *Campanula romanica*, *Dianthus nardiformis*, and *Moehringia grisebachii*.

**Keywords:** *Sedum urvillei* DC, Chorology, Dobrogea, biodiversity conservation, Crassulaceae.

**Rezumat. Corologia *Sedum urvillei* (Crassulaceae) în Dobrogea Română, implicații pentru conservare.** *Sedum urvillei* DC. este o specie perenă, xerothermofilă de Crassulaceae cu flori galbene, cu distribuție Balcano-Pontică și Est-Europeană, sub-mediteraneană. Arealul ei românesc include câteva populații disputabile Nord-Dunărene și unele certe în Dobrogea, unde *S. urvillei* e larg răspândit, în ciuda lipsei de date precise despre existența ei actuală în regiune. *S. urvillei* tipic are pronunțate preferințe xerothermofile și pentru habitate stâncoase cu sol superficial unde evită competiția, fiind găsită adesea dar nu exclusiv pe iviri stâncoase calcaroase. Lipsa unei lucrări botanice dedicată descrierii precise a arealului complet al *S. urvillei* în Dobrogea Română, de la publicarea cu mai mult de jumătate de secol în urmă a singurei monografii a familiei Crassulaceae în flora românească, m-a impulsionat să prezint aici date cuprinzătoare (deși nu exhaustive) despre actuala existență a *S. urvillei* în Dobrogea Română, rezultate din cercetări de teren efectuate în aproximativ 20 de ani, cuprinzând peste 150 situri pentru *Sedum urvillei*, în jurul a >30 așezări umane, întinse în toată provincia, practic de la nivelul mării până la cca. 400 m m.d.m. Datele prezentate documentează o mult mai largă distribuție a *S. urvillei* în Dobrogea decât fusese precis documentată, dar coexistența *S. urvillei* cu speciile similare dar mult mai comune *S. acre* și *S. annuum* și/sau *S. sexangulare*, predispune la confuzii cu aceste specii și duce la sub raportare. *S. urvillei* este foarte important pentru conservarea biodiversității întrucât participă în câteva asociații adăpostind mult mai rara congenerică *Sedum caespitosum* și edifică Assoc. *Sedo hillebrandtii-Polytrichetum-piliferi* Horeanu et Mihai 1974 în care e specia principală. Înțelegerea caracteristicilor de mediu și fitocenotice care promovează apariția *S. caespitosum* în aceste asociații ar fi cert benefică pentru conservarea ei, împreună cu alte specii rare și periclitare local precum *Festuca callieri*, *Gagea szovitzii*, *Campanula romanica*, *Dianthus nardiformis* și *Moehringia grisebachii*.

**Cuvinte cheie:** *Sedum urvillei* DC, corologie, Dobrogea, conservarea biodiversității, Crassulaceae.

### INTRODUCTION

*Sedum urvillei* DC. is a xerothermic yellow-flowered perennial species of Crassulaceae with Balkano-Pontic and East-European sub-Mediterranean distribution, described by A. P. de Candolle in 1828. Since then, according to International Crassulaceae Network, several taxa were synonymised with it, including the following which are more relevant to the territory of my study:

- *S. stribnyi* Velenovsky (1892) and its derivatives *Sedum acre* var. *stribnyi* (Velenovsky) Stojanov & Stefanoff, *Sedum sexangulare* ssp. *stribnyi* (Velenovsky) Fröderström (1932), *Sedum sartorianum* ssp. *stribnyi* (Velenovsky) D. A. Webb (1963);
- *Sedum ponticum* Velenovsky (1891) with its derivatives: *Sedum acre* var. *ponticum* (Velenovsky) Stojanov & Stefanoff, *Sedum sartorianum* ssp. *ponticum* (Velenovsky) D. A. Webb (1963);
- *Sedum sartorianum* Boissier (1856) with its derivatives: *Sedum acre* ssp. *sartorianum* (Boissier) J. A. Huber (1936), *Sedum urvillei* ssp. *sartorianum* (Boissier) Byalt (1997);
- *Sedum hillebrandtii* Fenzl (1856) with its derivatives: *Sedum urvillei* ssp. *hillebrandtii* (Fenzl) D. A. Webb, *Sedum sexangulare* ssp. *hillebrandtii* (Fenzl) Nyman (1890), *Sedum sartorianum* ssp. *hillebrandtii* (Fenzl) D. A. Webb (1963) *Sedum acre* var. *hirsutum* Wierzbicki; and *Sedum novakii* Domin (1929).

Although the first taxa are correctly synonymised with *S. urvillei*, in my opinion and based on the data available from Romanian populations, *Sedum hillebrandtii* Fenzl (1856) which also is native to Romania, shows enough distinctive characters to warrant taxonomic formal recognition at the level of species (but see also PARNELL & FAVARGER, 1993 and HART t', 1991).

Morphologically characterized by fibrous roots and trailing, multi-ramified ascending to erect lignified reddish-brown stems 10-15cm tall, with persistent dried leaves remaining like whitish-grey scales attached to the naked stems with apical tufts of densely imbricate leaves. The non-flowering shoots are quite brittle and easily break apart; the detached segments serve as propagules and lead to formation of wide clonal mats.

The flowering shoots are also ramified, a few centimeters taller than the sterile shoots, usually erect or ascending. The inflorescences are cymes with 2-5 cincinni, usually having 2 bracts per flower.

The leaves are alternate, densely imbricate, semi-terrete with broadly truncate spur and conical distal third, linear-oblong, sub-acute, about 10mm long and 1-2mm at the widest part, with highly variable color. Depending on the insolation degree, they vary in color between yellow-grey-green with reddish papillae in the early spring, dark green or glaucous to dark red to burgundy in summer under bright sun.

The flowers are (ob)diplostemonous, sessile to very shortly-pedicellate, the calyx consists of dark-red to glaucous dark-green basally fused lanceolate, subacute sepals, much less unequal than in *S. annuum*, the corolla is pentamerous, with yellow lanceolate, acuminate, petals 5 - 8 mm long, 1-2mm wide, the staminal filaments yellow, anthers yellow, pollen yellow.

With 3-20 flowers/plant, *S. urvillei* shows a certain degree of polymorphism and variability, similar to *S. annuum* L (see BÂRCĂ, 2016b; NICULAE & BÂRCĂ, 2006) with a considerable variation in many characters as: number of stem branches, shoot length, size and shape of floral parts and inflorescence, and floral morphology. Typically, it perennates through "sterile" lignified and apically densely foliated shoots.

According to International Crassulaceae Network (which submerges *Sedum hillebrandtii* Fenzl into *S. urvillei*), its general distribution comprises Southeastern Europe, from Danube plains in Hungary, Serbia and Southern and Eastern Romania, through the Balkan Peninsula and Greece down to Central and Southern Anatolia in Turkey, and Eastwards through R. Moldova to Southern Ukraine and Crimea.

In my opinion, I maintain these two taxa separated as bona species and I regard *S. urvillei* as a truly Ponto-euxinic species extending through the Balkans and Greece into Anatolia and probably the Caucasus.

Its Romanian range includes several disputable populations North of Danube and certainly Dobrogea, region where *S. urvillei* is considered widespread, despite lack of exhaustive, precise data about its actual occurrence in this region (but see also PETRESCU 2012).

The typical *S. urvillei* develops well in rocky habitats with shallow topsoil where it doesn't face a lot of competition from taller plants. It has a pronounced xeric- and thermophylic preference, as opposed to *Sedum borissovae* which prefers milder habitats with better water availability. It is most often, -but not exclusively, found on calcareous substrates, on rocky outcrops, and the nominotypical taxon spans habitats up to 2000m, although in Dobrogea it just reaches about 400m elevation a.s.l.

The area covered by this study extends East of the Danube and comprises approximately the entire province of Dobrogea, between Danube river in the West and the shores of the Black sea in the East. This region encompasses a wide variety of habitats from the Danube flood plain to the highest peaks of the Hercynian-age Macinului Mountain range (elevations ranging roughly between 0m and about 450m a.s.l.).

The climate in the studied region is extreme continental, characterized by wide annual and diurnal variations in temperature and rainfall, with milder winters towards the sea shore and very arid Central-South region. The edaphic conditions are not so diverse, with a characteristic blanket of loess covering Sarmatic/Triassic or other types of limestones, but also some of the oldest rocks like green schists of hercynic origin.

No botanical work precisely describing the complete distribution range of *S. urvillei* D.C. in Romanian Dobrogea is available since the only monographic treatment of Crassulaceae family in Romanian flora has been published more than half a century ago (RAVARUȚ 1956). This fact, together with the increasing interest for the taxonomy, ecology, chorology and medicinal properties of Crassulaceae from the Carpathians (ARBUNE et al., 2009), (NICULAE & BÂRCĂ 2005, 2006), (BÂRCĂ & NICULAE 2005, 2006, 2008, 2011, 2018a), (BÂRCĂ 2015, 2016a, 2018b), (STANCIU et al., 2009), (NICULAE, 2018a, 2018b), prompted me to present hereby comprehensive (albeit not exhaustive) precise data about the actual occurrence sites of *S. urvillei* in Romanian Dobrogea.

## MATERIAL AND METHODS

This distribution study includes data obtained by surveys performed mainly by me and dr. BÂRCĂ Valentin during fieldwork trips; and locations cited in unpublished personal communications by other researchers, that we verified on spot.

The geographical coordinates for the locations cited were derived from GPS coordinate readings from surveys done by the author, using a handheld GPS with a reported error of less than 5m at full reception, and where later crosschecked in the lab using ACME MAP version 2.1.

The data are presented in tabular format in Table 1, with the actual sites grouped around the closest human settlement from where the sites could be reached by foot by the author.

The "locality" names for the collection sites were given when possible for the closest human permanent settlement available, and due to the lack of space here and because the sites could be reached using the given geographical coordinates with the help of a handheld GPS, no toponyms are given for the actual sites besides the geographical coordinates which are given as indications to where the plants were found. Because of the limited available space and because this was not the objective of the present study, I give in this report only distribution data, omitting the collection dates which, together with phenological, edaphic, ecological and phytosociological information, will form the object of a future article.

To avoid any confusion, I mention the diagnostic criteria used to positively assign the individual plants to species, as follows:

– **General habitus:** – plants with dark red lignified, erect or ascending sterile glabrous stems, 5-15cm tall, Fresh leaves glaucous; with dried white/grey leaves persistent.

– **Flower habitus:** – (ob)diplostemonous, 5-merous flowers with pale-yellow petals, patent follicles, dark brown, with recurved margins inflorescence cime, with 7(3-25) flowers.

– **Leaf habitus:** – leaves oblong-elliptic acute small papillose, acute conical subacute, with the tip abruptly rounded of obtuse The leaf spur is broad and massive.

The morphological characters used as diagnostic features to distinguish other similar species locally sympatric are:

- from *S. acre* *S. urvillei* differs s in flower by the sepals basally fused with the receptacle, and
- from *S. annuum* *S. urvillei* differs by more uniform calyx with sepals more equal and shorter.

## RESULTS

I present herein results of over 30 years of fieldwork, results which comprise over 150 sites of occurrence where *Sedum urvillei* D.C. was seen, linked to locations of more than 30 human settlements. Spanning the whole province of Romanian Dobrogea, from the southernmost point in Canaraua Fetei/Băneasa literally just a few meters north of the Romanian-Bulgarian state border, to Niculitel hills close to the village of Niculitel, which is one of the northern-most points in Dobrogea. Out of these, most are new locations or older locations in which I positively confirmed the presence of *S. urvillei*. The data are presented below in tabular format (Table 1; Fig. 1). The locations were sorted alphabetically by local geographic name (mostly village names), and then the geographical coordinates of the actual sites followed in the next column. I also present some descriptive documentary in situ photographs of *S. urvillei* taken by Barca Valentin from the surveyed populations.

Table 1. List of the sites of occurrence of *Sedum urvillei* in Romanian Dobrogea, with their geographical coordinates, grouped around the closest human settlement.

No.	Closest human settlement	Geographical coordinates of the sites of occurrence of <i>Sedum urvillei</i> situated close to this locality
1	Adamclisi	N 44 6' 3" E 27 57' 15"; ---N 44 6' 5" E 27 57' 19"; ---N 44 6' 5" E 27 57' 22;
2	AlahBair	N 44 30' 2" E 28 12' 40; # 44 29' 53" E 28 12' 47; # 44 29' 51" E 28 13' 10; # 44 30' 3" E 28 13' 21; # 44 30' 10" E 28 13' 12; # 44 30' 12" E 28 13' 25; # 44 30' 13" E 28 13' 44; # 44 29' 58" E 28 13' 49; # 44 29' 53" E 28 13' 48; # 44 30' 36" E 28 13' 34; # 44 30' 41" E 28 12' 53; # 44 30' 52" E 28 12' 40; # 44 30' 47" E 28 12' 43; # 44 30' 34" E 28 12' 23; # 44 30' 50" E 28 12' 6; # 44 31' 25" E 28 12' 30; # 44 31' 19" E 28 12' 43; # 44 31' 26" E 28 12' 12;
3	Albești	N 43 48' 14" E 28 27' 15; # N 43 47' 54" E 28 27' 38; # N 43 48' 25" E 28 27' 37; # N 43 47' 54" E 28 27' 49;
4	Băltagești	N 44 28' 46" E 28 12' 13"; ---N 44 29' 6" E 28 13' 6"; ---N 44 29' 47" E 28 12' 16;
5	Băneasa Canaraua Fetei	N 44 2' 49" E 27 38' 34; # N 44 2' 51" E 27 38' 41; # N 44 2' 43" E 27 38' 17; # N 44 2' 30" E 27 37' 59; # N 44 3' 47" E 27 38' 40; # N 44 3' 41" E 27 38' 59; # N 44 4' 36" E 27 38' 39; # N 44 5' 14" E 27 38' 13; # N 44 5' 20" E 27 38' 16;
6	Camena	N 44 47' 57" E 28 36' 51"; ---N 44 48' 4" E 28 36' 50"; ---N 44 48' 13" E 28 36' 31"; ---N 44 48' 22" E 28 36' 18"; ---N 44 48' 14" E 28 35' 58;
7	Capidava	N 44 29' 48" E 28 5' 55"; ---N 44 29' 31" E 28 5' 46"; ---N 44 29' 36" E 28 6' 27"; ---N 44 29' 4" E 28 6' 38;
8	Casimcea	N 44 43' 44" E 28 23' 9"; ---N 44 43' 52" E 28 22' 11"; ---N 44 43' 54" E 28 23' 24"; ---N 44 41' 20" E 28 22' 37"; ---N 44 41' 14" E 28 22' 50"; ---N 44 41' 25" E 28 22' 25"; ---N 44 40' 22" E 28 22' 40"; ---N 44 39' 8" E 28 21' 49"; ---N 44 39' 1" E 28 22' 26"; ---N 44 38' 46" E 28 22' 21"; ---N 44 38' 36" E 28 22' 22"; ---N 44 38' 41" E 28 22' 43"; ---N 44 38' 46" E 28 22' 39"; ---N 44 38' 38" E 28 22' 49"; ---N 44 38' 33" E 28 23' 1"; ---N 44 38' 28" E 28 23' 4"; ---N 44 38' 21" E 28 22' 54;
9	Cassian	N 44 29' 17" E 28 28' 4"; ---N 44 28' 58" E 28 28' 19"; ---N 44 28' 54" E 28 28' 32"; ---N 44 28' 43" E 28 28' 22"; ---N 44 28' 28" E 28 28' 29; N 44 29' 20" E 28 27' 43"; ---N 44 29' 42" E 28 29' 43"; ---N 44 29' 43" E 28 29' 15"; ---N 44 29' 57" E 28 29' 9;
10	Cerna	N 45 3' 42" E 28 19' 18"; ---N 45 3' 34" E 28 19' 19"; ---N 45 3' 5" E 28 19' 35"; ---N 44 52' 47" E 28 50' 39;
11	Cernavodă	N 44 20' 16" E 28 1' 7;
12	Cheia	N 44 30' 50" E 28 25' 9"; ---N 44 30' 32" E 28 25' 30"; ---N 44 30' 27" E 28 25' 45"; ---N 44 30' 24" E 28 25' 55"; ---N 44 29' 57" E 28 26' 31"; ---N 44 29' 31" E 28 27' 0"; ---N 44 29' 23" E 28 27' 21"; ---N 44 29' 17" E 28 27' 40"; ---N 44 29' 17" E 28 27' 49;
13	Corugea	N 44 44' 19" E 28 20' 0"; ---N 44 44' 33" E 28 20' 22;
14	Enisala	N 44 52' 38" E 28 51' 1"; ---N 44 52' 50" E 28 50' 29"; ---N 44 53' 5" E 28 50' 10"; ---N 44 53' 7" E 28 49' 58"; - --N 44 53' 7" E 28 49' 58"; ---N 44 53' 3" E 28 50' 12"; ---N 44 52' 58" E 28 50' 8"; ---N 44 53' 4" E 28 50' 2"; -- -N 44 47' 43" E 28 37' 14;

NICULAE Marilena

15	Făurei	N 44 2' 22" E 27 41' 30;
16	Greci	---N 45 13' 33" E 28 12' 3"; ---N 45 13' 32" E 28 12' 7"; ---N 45 13' 28" E 28 12' 11"; ---N 45 13' 27" E 28 12' 17"; ---N 45 12' 51" E 28 12' 29"; ---N 45 12' 53" E 28 12' 17"; ---N 45 12' 53" E 28 14' 25"; ---N 45 12' 46" E 28 14' 27"; ---N 45 12' 42" E 28 14' 32"; ---N 45 12' 40" E 28 14' 37"; ---N 45 12' 42" E 28 14' 43"; ---N 45 12' 31" E 28 15' 6"; ---N 45 12' 39" E 28 15' 9"; ---N 45 12' 40" E 28 15' 8"; ---N 45 12' 43" E 28 15' 9"; ---N 45 12' 41" E 28 15' 16"; ---N 45 12' 38" E 28 15' 28"; ---N 45 12' 39" E 28 14' 45"; ---N 45 12' 36" E 28 14' 46"; ---N 45 12' 35" E 28 14' 41"; ---N 45 12' 34" E 28 14' 58;
17	Gura Dobrogei	N 44 28' 8" E 28 29' 24"; ---N 44 28' 3" E 28 29' 46"; ---N 44 27' 51" E 28 29' 27"; ---N 44 27' 45" E 28 30' 13"; ---N 44 27' 27" E 28 30' 30"; ---N 44 27' 50" E 28 30' 50"; ---N 44 28' 21" E 28 30' 43"; ---N 44 28' 32" E 28 30' 8"; ---N 44 29' 1" E 28 29' 40" N 44 28' 24" E 28 28' 47"; ---N 44 27' 58" E 28 28' 13"; ---N 44 27' 57" E 28 28' 34"; ---N 44 28' 2" E 28 28' 47" N 44 28' 6" E 28 28' 58" N 44 29' 11" E 28 29' 30;
18	Hagieni	N 43 47' 31" E 28 29' 0; # N 43 47' 53" E 28 29' 3; # N 43 47' 55" E 28 29' 32;
19	Istria	N 44 33' 50" E 28 45' 33"; ---N 44 33' 45" E 28 45' 27"; ---N 44 33' 53" E 28 45' 44"; ---N 44 34' 21" E 28 45' 53;
20	Iulia/Izvoarele	N 45 1' 19" E 28 30' 50"; ---N 45 1' 26" E 28 31' 10"; ---N 45 1' 16" E 28 31' 8"; ---N 45 0' 53" E 28 31' 17"; ---N 45 0' 48" E 28 31' 46"; ---N 45 0' 28" E 28 31' 9"; ---N 44 59' 58" E 28 31' 59;
21	Limanu	N 43 48' 31" E 28 30' 51"; ---N 43 48' 55" E 28 30' 53;
22	Luminița C-ța	N 44 22' 11" E 28 38' 30"; ---N 44 21' 44" E 28 38' 40"; ---N 44 21' 43" E 28 38' 57"; ---N 44 21' 43" E 28 37' 41"; ---N 44 21' 37" E 28 38' 25;
23	Nicolae Bălcescu	N 44 59' 24" E 28 32' 20"; ---N 44 58' 57" E 28 31' 3"; ---N 44 57' 50" E 28 30' 59;
24	Niculitel	N 45 9' 57" E 28 28' 15"; ---N 45 10' 34" E 28 28' 16"; ---N 45 10' 38" E 28 27' 27"; ---N 45 11' 20" E 28 27' 30"; ---N 45 11' 30" E 28 27' 29;
25	Nistorești	N 44 37' 34" E 28 22' 33"; ---N 44 37' 20" E 28 22' 47"; ---N 44 37' 0" E 28 23' 4"; ---N 44 36' 52" E 28 22' 53"; ---N 44 36' 47" E 28 22' 46"; ---N 44 36' 42" E 28 22' 30"; ---N 44 36' 49" E 28 22' 17"; ---N 44 36' 30" E 28 22' 26"; ---N 44 36' 10" E 28 22' 39"; ---N 44 35' 46" E 28 22' 51;
26	Palazu	N 44 27' 6" E 28 30' 48"; ---N 44 26' 46" E 28 30' 47"; ---N 44 26' 44" E 28 30' 13"; ---N 44 26' 30" E 28 30' 17"; ---N 44 26' 14" E 28 30' 30"; ---N 44 25' 49" E 28 31' 1"; ---N 44 25' 15" E 28 30' 33"; ---N 44 25' 5" E 28 31' 12"; ---N 44 24' 41" E 28 31' 18"; ---N 44 24' 35" E 28 33' 5"; ---N 44 24' 12" E 28 33' 2"; ---N 44 23' 58" E 28 32' 9"; ---N 44 24' 10" E 28 31' 57"; ---N 44 23' 5" E 28 32' 33"; ---N 44 23' 1" E 28 33' 7"; ---N 44 22' 50" E 28 33' 31"; ---N 44 22' 32" E 28 34' 47;
27	Măcin	---N 45 15' 47" E 28 10' 3"; ---N 45 15' 46" E 28 10' 16"; ---N 45 15' 53" E 28 10' 24"; ---N 45 15' 57" E 28 10' 31"; ---N 45 15' 53" E 28 10' 32"; ---N 45 15' 54" E 28 10' 35"; ---N 45 15' 57" E 28 10' 35"; ---N 45 16' 0" E 28 10' 29"; ---N 45 16' 1" E 28 10' 32"; ---N 45 16' 3" E 28 10' 29"; ---N 45 16' 7" E 28 10' 28"; ---N 45 16' 3" E 28 10' 32"; ---N 45 16' 3" E 28 10' 37"; ---N 45 16' 16" E 28 10' 42"; ---N 45 16' 10" E 28 10' 47"; ---N 45 16' 13" E 28 10' 49"; ---N 45 16' 6" E 28 10' 50"; ---N 45 16' 3" E 28 10' 52"; ---N 45 15' 56" E 28 10' 44"; ---N 45 15' 51" E 28 10' 44"; ---N 45 15' 51" E 28 10' 59"; ---N 45 15' 48" E 28 10' 58"; ---N 45 15' 42" E 28 10' 50"; ---N 45 15' 39" E 28 10' 49"; ---N 45 15' 39" E 28 10' 44"; ---N 45 15' 37" E 28 10' 40"; ---N 45 15' 34" E 28 10' 43"; ---N 45 15' 36" E 28 10' 53"; ---N 45 15' 34" E 28 10' 59"; ---N 45 15' 28" E 28 10' 59"; ---N 45 15' 25" E 28 11' 1"; ---N 45 15' 23" E 28 11' 13"; ---N 45 15' 20" E 28 11' 14"; ---N 45 15' 16" E 28 11' 15"; ---N 45 15' 14" E 28 11' 19"; ---N 45 15' 10" E 28 11' 19"; ---N 45 15' 4" E 28 11' 22"; ---N 45 15' 13" E 28 11' 35"; ---N 45 15' 10" E 28 11' 40"; ---N 45 15' 4" E 28 11' 41"; ---N 45 15' 2" E 28 11' 46"; ---N 45 14' 58" E 28 11' 47"; ---N 45 14' 57" E 28 11' 45"; ---N 45 14' 53" E 28 11' 52"; ---N 45 14' 54" E 28 12' 1"; ---N 45 14' 52" E 28 12' 4"; ---N 45 14' 49" E 28 12' 6"; ---N 45 14' 47" E 28 12' 1"; ---N 45 14' 47" E 28 11' 58"; ---N 45 14' 44" E 28 12' 8"; ---N 45 14' 41" E 28 12' 10"; ---N 45 14' 38" E 28 12' 10"; ---N 45 14' 39" E 28 12' 4"; ---N 45 14' 41" E 28 12' 2"; ---N 45 14' 37" E 28 11' 58"; ---N 45 14' 34" E 28 12' 1"; ---N 45 14' 37" E 28 11' 52"; ---N 45 14' 33" E 28 11' 50"; ---N 45 14' 30" E 28 11' 44"; ---N 45 14' 27" E 28 11' 38"; ---N 45 14' 22" E 28 11' 48"; ---N 45 14' 19" E 28 11' 38"; ---N 45 14' 16" E 28 11' 43"; ---N 45 14' 12" E 28 11' 48"; ---N 45 14' 12" E 28 11' 47"; ---N 45 14' 12" E 28 11' 43"; ---N 45 14' 9" E 28 11' 43"; ---N 45 14' 8" E 28 11' 47"; ---N 45 14' 8" E 28 11' 49"; ---N 45 14' 6" E 28 11' 47"; ---N 45 14' 4" E 28 11' 50"; ---N 45 14' 3" E 28 11' 49"; ---N 45 14' 4" E 28 11' 55"; ---N 45 14' 7" E 28 11' 58"; ---N 45 14' 8" E 28 12' 2"; ---N 45 14' 10" E 28 12' 1"; ---N 45 14' 13" E 28 12' 5"; ---N 45 14' 16" E 28 12' 3"; ---N 45 14' 19" E 28 12' 7"; ---N 45 14' 22" E 28 12' 5"; ---N 45 14' 20" E 28 12' 7"; ---N 45 14' 24" E 28 12' 17"; ---N 45 14' 33" E 28 12' 20"; ---N 45 14' 15" E 28 12' 22"; ---N 45 14' 9" E 28 12' 20"; ---N 45 14' 6" E 28 12' 4"; ---N 45 14' 3" E 28 12' 7"; ---N 45 14' 0" E 28 12' 8"; ---N 45 13' 59" E 28 12' 10"; ---N 45 13' 57" E 28 12' 7"; ---N 45 13' 58" E 28 12' 2"; ---N 45 14' 0" E 28 11' 58"; ---N 45 13' 59" E 28 12' 3"; ---N 45 13' 57" E 28 12' 8"; ---N 45 13' 56" E 28 12' 7"; ---N 45 13' 53" E 28 12' 10"; ---N 45 13' 55" E 28 12' 13"; ---N 45 13' 56" E 28 12' 18"; ---N 45 14' 0" E 28 12' 19"; ---N 45 13' 56" E 28 12' 13"; ---N 45 13' 56" E 28 12' 9"; ---N 45 13' 54" E 28 12' 8"; ---N 45 13' 52" E 28 12' 11"; ---N 45 13' 50" E 28 12' 10"; ---N 45 13' 48" E 28 12' 7"; ---N 45 13' 45" E 28 11' 58"; ---N 45 13' 41" E 28 11' 59"; ---N 45 13' 35" E 28 11' 53"; ---N 45 13' 31" E 28 11' 46;
28	Pantelimon	N 44 33' 4" E 28 22' 43"; ---N 44 32' 56" E 28 23' 0"; ---N 44 32' 26" E 28 23' 47"; ---N 44 32' 22" E 28 24' 11"; ---N 44 33' 8" E 28 21' 8";
29	Pantelimon de jos	N 44 34' 26" E 28 21' 42"; ---N 44 34' 26" E 28 22' 13"; ---N 44 34' 14" E 28 22' 31;
30	Războieni	N 44 45' 42" E 28 25' 40"; ---N 44 44' 51" E 28 23' 49"; ---N 44 44' 46" E 28 23' 35;
31	Runcu	N 44 35' 49" E 28 18' 55"; ---N 44 35' 51" E 28 18' 22"; ---N 44 34' 42" E 28 18' 59"; ---N 44 34' 48" E 28 19' 15"; ---N 44 35' 4" E 28 19' 39"; ---N 44 35' 8" E 28 20' 12"; ---N 44 34' 51" E 28 20' 40"; ---N 44 34' 34" E 28 21' 20;
32	Sipotele	N 44 2' 27" E 27 58' 7; # N 44 2' 43" E 27 57' 58; # N 44 3' 0" E 27 58' 8; # N 44 3' 19" E 27 57' 53; # N 44 3' 49" E 27 57' 41; # N 44 3' 53" E 27 57' 33;
33	Turcoaia	N 45 7' 29" E 28 14' 55"; ---N 45 7' 21" E 28 15' 1"; ---N 45 7' 16" E 28 15' 4"; ---N 45 7' 9" E 28 15' 12"; ---N 45 7' 9" E 28 15' 24"; ---N 45 6' 59" E 28 15' 27"; ---N 45 6' 49" E 28 15' 41"; ---N 45 6' 42" E 28 15' 51"; ---N 45 6' 32" E 28 16' 6"; ---N 45 6' 25" E 28 16' 19"; ---N 45 6' 19" E 28 16' 31"; ---N 45 6' 5" E 28 16' 50"; ---N 45 5' 54" E 28 16' 59"; ---N 45 5' 46" E 28 17' 11"; ---N 45 5' 47" E 28 16' 15"; ---N 45 5' 37" E 28 16' 1"; ---N 45 5' 57" E 28 15' 27"; ---N 45 5' 50" E 28 15' 26"; ---N 45 5' 44" E 28 15' 30"; ---N 45 6' 14" E 28 15' 15"; ---N 45 6' 19" E 28 15' 10"; ---N 45 6' 32" E 28 14' 57"; ---N 45 6' 43" E 28 14' 43"; ---N 45 6' 53" E 28 14' 28"; ---N 45 7' 1" E 28 14' 26"; ---N 45 7' 8" E 28 14' 20"; ---N 45 6' 28" E 28 12' 52"; ---N 45 6' 26" E 28 12' 30"; ---N 45 6' 40" E 28 12' 30;
34	Zorile	N 44 3' 57" E 27 55' 57; # N 44 4' 17" E 27 56' 0; # N 44 3' 21" E 27 56' 2; # N 44 3' 22" E 27 56' 51; # N 44 3' 40" E 27 56' 34"



Figure 1. *Sedum urvillei* general habitus of 2 forms, in characteristic habitat on Triassic limestone, in situ in Dobrogea; -1A a 1-year-old fresher plant, a bit later in spring, with unligified greener stems with old leaves persistent like whitish-grey scales, Figure 1B: the habitus of a 2 years-old, overwintered shoot in very early spring, behaving like a vegetative propagule, with the characteristic lignified stems and with similarly persistent last-year's leaves.

## DISCUSSIONS

The data presented herein (Table 1) indicate that, like for *Sedum hispanicum* L (NICULAE & BÂRCĂ, 2005) and *S. annuum* L in the Southern and Eastern Carpathians (NICULAE & BÂRCĂ, 2006; BÂRCĂ, 2016b), the range occupied by *S. urvillei* D.C. is larger than previously documented (RĂVĂRUȚ, 1956; WEBB, 1964; MEUSEL et al., 1965; LIPPERT, 1995; JALAS et al., 1999). Like with *S. annuum* in the Carpathians, *S. urvillei* D.C. was probably confounded with *S. acre* L. and/or *Sedum sexangulare*, or *Sedum annuum*, as the last 2 species share the same comparium of Ser. Alpestrina A. Berger ('t Hart 1991) and probably often under-reported by previous authors, and similarly to *S. annuum* L. and *Sedum hispanicum* L its occurrence was probably considered unworthy of mentioning from all locations where it was found. This fact combined with the misidentification issue mentioned above hinders the effort to ascertain a correct distribution range of *S. urvillei* in Dobrogea.

In Figure 1 A and B I present the general habitus of the plants in situ near Casian in Dobrogea, exemplifying two forms; in Figure 1B the habitus of a 2 years-old, overwintered shoot in very early spring, behaving like a vegetative propagule, with the characteristic lignified stems with old leaves persistent like whitish-grey scales; and in Figure 1A a 1-year-old fresher plant, a bit later in spring, with unligified greener stems but with similarly persistent last-year's leaves.

From an ecological standpoint, typically the species prefers sunny, dryer or well drained slopes with shallow topsoil, and early succession with open canopy as it cannot stand competition. It apparently has a pronounced calciphilous character, sometimes dominating the open xerothermophilic pioneer communities developing on shallow calcareous soils, but it is not restricted to calcareous soils, just that in the region studied most of the habitats are developed on such calcareous bedrock (see figure 1 for the aspect of the extreme habitat, where *S. urvillei* grows on karstic pockets in Triassic reef limestone, in situ near Cheile Dobrogei, Dobrogea).

Throughout the whole Dobrogea it builds an Assoc. *Sedo hillebrandtii-Polytrichetum piliferi* Horeanu et Mihai 1974 included in Western Pontic thyme steppes with *Thymus zygoides* (code 34.9211), a peculiar association on skeletal, shallow soils, in which it is the main founder species, together with some mosses in the genus *Polytrichum* like *P. piliferum*. According to PETRESCU (2012) and PETRESCU et al. (2014) this association also hosts several species of European interest, like *Campanula romanica*, *Dianthus nardiformis*, *Moehringia grisebachii* and also other rare locally threatened species like *Festuca callieri* and *Gagea szovitzii*, which warrant more thorough zoological research.

One important finding is that it is sometimes accompanied by *Sedum caespitosum* (Cav) D.C. as species much less frequent and which is considered of community interest for conservation (see also NICULAE 2018b). Interestingly though, they do not always associate, even on very similar habitats with similar edaphic characteristics which promote building the special Assoc. *Sedo hillebrandtii-Polytrichetum piliferi* Horeanu et Mihai 1974, fact which, when studied, could give hints to the differences in frequency and abundance between these two species of Crassulaceae.

In several populations of *S. urvillei* in Dobrogea adult weevils of the steno-monophagous *Aizobius sedi* Germ. (Apionidae, Coleoptera) were seen associated with plants, and plants showed characteristic bite-marks suggesting that the weevils are using *S. urvillei* as food plant in Dobrogea; albeit further research is needed to ascertain this fact, this does not seem impossible.

The Assoc. *Sedo hillebrandtii-Polytrichetum piliferi* Horeanu et Mihai 1974, build by *S. urvillei*, also hosts, besides *Aizobius sedi*, another steno-monophagous weevil *Pericartellus telephii* Bedel, 1900 (Nanophyidae, Coleoptera) and the butterfly *Scolitantides orion* Pallas, (Lycaenidae, Lepidoptera) which is locally endangered and protected in Northern Europe all of them used as food plant Crassulacean species which accompany *S. urvillei* in Dobrogea.

Like the cases of other species (BÂRCĂ & NICULAE 2011, 2018a, b; BÂRCĂ et al., 2011; BÂRCĂ, 2018a), this makes *S. urvillei* even more important in biodiversity conservation, not only for the conservation of plants, but also in the conservation of the steno-monophagous insects using it or other Crassulacean species hosted in the associations formed by *S. urvillei*.

The ecological and phyto-sociological characteristics of *S. urvillei* in Dobrogea warrant a more thorough study in comparison with those of the putative sister taxon *Sedum hillebrandtii* Fenzl from Banat, and form the substance of another article (NICULAE & BÂRCĂ in presse)

## CONCLUSIONS

The number of new sites presented herein documents for *S. urvillei* a distribution in the Romanian Dobrogea that is much larger than previously documented. In many of the sites, *S. urvillei* occurs together with the very similar species *S. acre* and/or *S. sexangulare*, fact that predisposes it to confusions with these two species and leads to underreporting.

It also is quite important from a conservation point of view as it builds associations which harbour the much rarer congeneric *Sedum caespitosum* (Cav) D.C. of which in the Assoc. *Sedo hillebrandtii-Polytrichetum piliferi* Horeanu et Mihai 1974 it being the main species. Therefore, the understanding of the environmental and phytocoenotic characteristics which foster *Sedum caespitosum* occurrence in this association would certainly benefit its conservation, together with other rare and locally threatened species like *Festuca callieri* and *Gagea szovitzii*, and several species of European interest, like *Campanula romanica*, *Dianthus nardiformis*, *Moehringia grisebachii* which occur in these associations built with the more or less important contribution of *S. urvillei*.

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