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MEUM ATHAMANTICUM (APIACEAE) IN THE EASTERN CARPATHIANS, ROMANIA

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Abstract: *Meum athamanticum*, from the Apiaceae family, was first reported in Romania in the first quarter of the nineteenth century. However, due to the lack of voucher specimens in herbaria (or of information about them) and the fact that it has not been further found in the localities before mentioned in the literature, the occurrence of this species in Romania has long been controversial or even denied. In this paper, we have reported the discovery of *M. athamanticum* in the Eastern Carpathians of Romania, in the area of the Oituz Pass (Covasna county), 77 years after the last record in the country. According to our data, this is the only known place from Romania where this species can be found nowadays. The species is highly threatened due to the intensive anthropogenic impact in the area and the very small number of individuals. Consequently, the authors propose the establishment of a special protected area, and including *Meum athamanticum* as a Critical Endangered (CR) species, in a possible future edition of the *Romanian Red Book* of vascular plants.

Key words: new record, rare plants, Oituz Pass, Red Book, spignel, threatened species

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Introduction

Meum Miller, Gard. Dict. Abridg. Ed 4 (1754), is a monotypic genus of the family Apiaceae (Umbelliferae) (Tutin 1968, Leute 1969). The distribution center of the only species of the genus, *Meum athamanticum* Jacq., Fl. Austr. 4: 2, t. 303 (1776) (spignel), is represented by the western, central and southern European high mountains, extending locally to the north-western and eastern Europe (Spinner 1931, Leute 1969, Hegi 1965, Tutin 1968, Villar 2003, Huck *et al.* 2009) and the North of Africa (Villar 2003). In eastern Europe, it is distributed in isolated patches of the Balkan Mountains (Spinner 1931, Leute 1969, Hegi 1965, Tutin 1968, Villar 2003, Huck *et al.* 2009), Polish Carpathians (Huck *et al.* 2009), Ukrainian Carpathians (Chornogora) (Tsaryk 1997), as well as in the Romanian Carpathians (as it will be discussed below). In addition to the type subspecies (*athamanticum*), with the widest distribution in Europe, two other subspecies are endemic in the Iberian Peninsula, namely: subsp. *labranum* (Gdgr.) Leute and subsp. *nevadense* (Boiss.) Drude (Leute 1969).

According to the literature (Hegi 1965, Tutin 1968, Leute 1969), *M. athamanticum* is a perennial, aromatic plant. Stem glabrous, striate, ± erect, up to 60 cm

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high (shorter at subsp. *nevadense*), more or less branched in the upper half, surrounded at the base by coarse, fibrous remains of petioles. Basal leaves numerous, glabrous, long petiolate, with long-ovate sheaths, blade 2-4 pinnate, triangular ovate (subsp. *athamanticum*) to oblong-elliptic or elliptic-lanceolate (subsp. *labranum* and *nevadense*), ± erect or (subsp. *nevadense*) horizontal-patent to ascendant; lobes opposite or seemingly whorled, those of the last order filiform (2-6 × 0.1- 0.2 mm). Cauline leaves similar in shape but fewer and much smaller. Compound umbels (3-) 6-15 radiate, rays glabrous or (subsp. *labranum*) very papillate-scabrous on the inner side, extending unequally at fruiting time; bracts (0-2) and bracteoles (3-8) linear-setaceous. Flowers many, bisexual, some of them functionally male; receptacle (enclosing ovary) glabrous; sepals obsolete, triangular-ovate; petals white or yellowish-white, more or less incurved at the top; stamen 5, longer than petals, anthers yellowish; stylopod depressed-cone-shaped; styles divergent, later reflect. Fruit brown, glabrous, ovoid-oblong, scarcely compressed, 6-10 mm long; mericarps with 5 prominent, very narrow, unwinged ribs.

Meum athamanticum is restricted to cool (Huck *et al.* 2009) or cool to moderately warm environments (Ellenberg *et al.* 1992), on soils usually ± humid (Spinner 1931, Villar 2003, Huck *et al.* 2009) or of average dampness (Ellenberg *et al.* 1992), acidic (exceptionally nearly neutral) (Spinner 1931, Aubert 1935, Ellenberg *et al.* 1992, Villar 2003), with an optimum *p*H between 4.6 and 6 (Spinner 1931), and ± poor in available nitrogen (Ellenberg *et al.* 1992). The species is a characteristic element of montane, subalpine and lower alpine meadows ranging between 550 and 2900 m a.s.l. (Hegi 1965, Leute 1969, Bruelheide & Lieberum 2001, Huck *et al.* 2009).

The presence of this species in Romania has been long time controversial, given the apparently missing specimens in the herbaria and that it has not been re-discovered anywhere in the localities reported in the literature. The main goals of this study were i) to analyze the available data concerning the presence of *M. athamanticum* in the country and ii) to confirm its presence in the Romanian Carpathians by reporting it in a new locality.

Material and methods

The species was recorded during our recent field work (2017), in the Eastern Carpathians. Voucher specimens collected on the field were deposited in the Herbarium of the University of Agricultural Sciences and Veterinary Medicine "Ion Ionescu de la Brad" Iași (IASI 17980-17982). The geographic coordinates were recorded on the field using an eTrex Legend HCx GPS system. The species was identified and checked using standard floras and monographs (Jávorka 1925, Hegi 1965, Tutin 1968, Leute 1969, Mossberg *et al.* 1992, Villar 2003, Fischer *et al.* 2008, Stace 2010). The nomenclature of the plant taxa follows Sârbu *et al.* (2013).

Results and discussion

a) Hystorical data on the distribution in Romania of *Meum athamanticum*

Făgăraș Mountains, Southern Carpathians. The first report of *M. athamanticum* in the Făgăraș Mts was made by Baumgarten (1816), on the Colții Brezei (in original: "Wârfulo Goltz"). According to Simonkai (1886), the name "Goltz" (Baumg. En.) refers to the Vișstea Mare Peak (from the central area of the Făgăraș

Massif, near the Moldoveanu Peak). However, from the indication given by this author, after Baumgarten, for *M. athamanticum* ("Vista-mare felé a Brázai havasokon"), it appears that the indicated place is represented by one of ridges of the Făgăraș Massif oriented to the North - North-East, in the direction of the Breaza village, and corresponds, actually, to the Colții Brezei, indicated also after Baumgarten (as "Kolczu Breazi") by Fuss (1866). "Wurfu Goltz" can also be assimilated to Colții Brezei based on another work published by Fuss (1846), who reported from that area the species *Allium ochroleucum* W. et K. (as *A. moly* L.): "Im Fogarascher Distrikt hinter Bráza gegen den Wurfu Goltz".

Subsequently, *M. athamanticum* was also reported from Făgăraș Mts in two other places, namely: the Doamnei Valley (Valea Doamnei), to the West of Bâlea Lake, corresponding to a rivulet that springs from the Doamnei Lake, on the Northern slope of Făgăraș Mts (Fronius 1855, cited by Fuss 1866; Simonkai 1886) (in original: "Valie-Doamnithal", "Domna völgye", respectively), and the Arpașul Mare Peak (Schur 1866, Simonkai 1866) (in original: "Arpaser Alpen", "Arpás havasai", respectively).

Bârsei Mountains, Southern Carpathians. The only report of *M. athamanticum* in the Bârsei Mountains is that of Baumgarten (1816), namely "through forests at Râșnov" (in original: "Barcensibus nempe in sylvis ad Rosnyo"), probably towards the foot of the Postăvaru Massif. Later on, this information was taken over in the floristic synthesis published by Fuss (1866), Schur (1866) and Simonkai (1886) (in original: "Rosenauer Alpen", "Kronstädter Alpen" and "Rozsnyó erdeiben", respectivelly).

Data of the Transylvanian authors from the 19th century, referring to the presence of this species in Făgăraș or Bârsei Mts, although credible, have not been confirmed by herbarium specimens (Simonkai 1886: "*sed in herbario ejus deest*"). Perhaps that's why, in the subsequent syntheses of the flora of Transylvania, *M. athamanticum* either was mentioned with uncertainty (Jávorka 1925), or was not mentioned at all (Ungar 1925, Drăgulescu 2010). We cannot agree, however, with the assumption (Hegi 1965) that *M. athamanticum* was (always) mistakenly indicated in Transylvania by confusion with *Ligusticum mutellina* (L.) Crantz. The two species are actually so clearly distinct, especially through their leaves, that even an amateur botanist could easily distinguish them. Both species have been reported, with original locations, both by Baumgarten 1816 (I, no. 524 and 525, respectivelly) and Schur 1866 (no. 1573 and 1574, respectivelly), to mention only two of the most important Transylvanian botanists of that time. Given their high competence in the vascular flora, it is really impossible they had reported the two distinct species, one after another, in the same work, and yet confused them with one another. The only questionable case, noted by Simonkai (1886), seems to be that of Salzer (1860) (see bellow, the Hășmaș Mountains).

Bucegi Mountains, Southern Carpathians. From the Bucegi Mts the species was first reported by Rechinger (1904), who published the floristic material collected by Loitlesberger, during a trip in the Romanian Carpathians, in 1897. According to Rechinger (1904), Loitlesberger collected *M. athamanticum* from the Furnica Peak, near Sinaia (în original: "Alpe Furnica bei Sinaia"), and the herbarium specimen is stored in the Herbarium of the Museum of Natural History, Vienna. The information was subsequently confirmed by Leute (1969), who saw the original specimen of

Loitlesberger ("Rumänien: Alpe Furnica bei Sinaia, Loitlesberger W!") and was recently taken up in some floristic works on the vascular flora in Romania (Ciocârlan 1988, 2000, Oprea 2005, Negrean 2011, Sârbu *et al.* 2013).

A second report of *M. athamanticum* from the Bucegi Mts was made by Prodan (1939). According to this author, *M. athamanticum* was "indicated without certainty" on the Valea-Albă - Coștila Peak (the author did not indicate, however, which was the source of this uncertain information; see also Oprea 2005, Negrean 2011, Sârbu *et al.* 2013).

Shortly after (August 8, 1940), *M. athamanticum* was collected from the Bucegi Massif on the Valea Cerbului (BUCM-3161), as a host plant of a new species of Peronosporaceae, *Plasmopara mei-foeniculi* Săvul. & O. Săvul. (Săvulescu & Săvulescu 1951, 1964, Negrean 2011) (unfortunately, we could only see the label of the herbarium sheet, by courtesy of Mr. Sorin Ştefănuţ and Mrs. Daniela Mogîldea, curators of the BUCM herbarium). This has been the second and the last confirmation with herbarium specimens of *M. athamanticum* in Bucegi Mts (and the whole country), until now. However, the species was not listed in the flora of Bucegi by the Romanian botanists who intensively studied this massif in the last century, such as Grecescu (1911) or Beldie (1967, 1972).

The recent report of *M. athamanticum* from the Piatra Arsă Peak, the same massif (verb. comm., G. Negrean 2004, according to Oprea 2005, Sârbu *et al.*, 2013) is not a certain one, given that in the *Addenda to Flora Romaniae*, 1st part, Negrean (2011) did not confirm it from that place, giving only data from literature.

Iezer-Păpușa Mountains, Southern Carpathians. Reporting of *M. athamanticum* in the Iezer-Păpușa Mts is probably due to a confusion of two toponyms, namely: the Doamnei Valley, from the northern slopes of Făgăraș Mts, in Transylvania (see above), and the Doamnei River, which separates, to the south-east, the Făgăraș and Iezer-Păpușa Mts, in Muntenia. We suppose this could have led to the indication of Prodan (1939) for *M. athamanticum*: "Păpușea", "without certainty". The information has recently been taken over, with doubt, in some floristic syntheses: "? Iezer-Păpușa" (Oprea 2005, Sârbu *et al.* 2013); "Păpușa", "syne certitudine" (Negrean 2011). Alexiu (1998) did not mention *M. athamanticum* in his phytosociological monograph of the Iezer-Păpușa Mts.

Penteleu Mountains, Curvature Carpathians. The only reference to the occurrence of this species in the Penteleu Mts is that of Șerbănescu (1939) who indicated it at "Secuiu" (see also Oprea 2005, Negrean 2011, Sârbu *et al.* 2013, Dihoru 2015). The occurence of this species in Penteleu Mts is, however, doubtful, according to Dihoru (2015).

Hășmaș Mountains, Eastern Carpathians. Reporting of *M. athamanticum* on the Higheș (Hegyes) Peak, in the northern extremity of the Hășmaș Mts, near Tulgheș, by Salzer 1860 (cited by Fuss 1866 and Simonkai 1886) is due, according to Simonkai (1886), to a confusion with *Ligusticum mutellina* (L.) Crantz. ("*Meum mutellina* L. [*M. athamanticum* Salzer Reiseb. 233, non Jacq.]"). Nobody has further reported this species in the Hășmaș Mts, although their flora was carefully studied by many botanists (Nechita 2003).

Stânișoarei Mountains, Eastern Carpathians. Grecescu (1898) reported *M. athamanticum* at the Neamț Monastery perhaps based on the indication given to him by the pharmacist Cania: "Mônăstirea Neamțului (Can.)" (see also Oprea 2005, Sârbu *et al.*

2013). One can suppose that the plant was perhaps cultivated in the garden of the monastery and possibly was seen there or even used by Cania, but its occurrence has been not confirmed subsequently by any botanists. We also did not find it, even cultivated, during our recent surveys (Oprea & Sîrbu 2009) on the flora of Stânișoarei Mts.

In addition to the above, we find an interesting reference about *M. athamanticum* in Romania at Panțu (1906). In his opera "*Plantele cunoscute de poporul român*" (*The plants known by the Romanian people*) this author gave, under the vernacular names "brie (Trans.)" and "brioală", an exact description of this species, noting that it grows "through the orchards in the mountainous region" of the country (without precise location). It is, however, unlikely that such a rare species would have been so well known to the people at the time, to have not one but two vernacular names. In fact, according to the same author, the names above mentioned are also given to other species, such as *Ligusticum mutellina* (brie, brioală) or *Athamantha hungarica* (brie), to mention only those from the Apiaceae family (see also Borza 1968).

Although the most recent reliable report of this species in Romania (Bucegi Mts) dates back to 1940 (Săvulescu & Săvulescu 1951), in the further years, the species was considered dubious or extinct (†) from Romania and deleted ("Delendum") from the flora (Borza 1947), and afterwards, for about 5 decades, it has not been longer listed from Romania, either in regional (e.g. Beldie 1962, 1967), national (Todor 1958, Beldie 1977), or European (Tutin 1968) floras.

More recently, Ciocârlan (1988, 2000) re-introduced *M. athamanticum* into the list of vascular plants of Romania, mentioning it, perhaps after Rechinger (1904) or Leute (1969), from "Bucegi, on Furnica", as a very rare species, on mountain and subalpine meadows. In the third edition of the *Flora Ilustrată a României* (*Illustrated Flora of Romania*), however, Ciocârlan (2009) treated it as unconfirmed in the Bucegi Mts ("old data; it has not been further found").

More complete lists with the localities from where *M. athamanticum* was mentioned in Romania (without data of Transylvanian botanists of the 19th century) published Oprea (2005), Negrean (2011) and Sârbu *et al.* (2013).

The species has been listed about two decades ago into the national red list of vascular plants, as a rare species (Oltean *et al.* 1994), but nowadays it is not included in the *Red Book of Romania* (Dihoru & Negrean 2009).

Dihoru (2015) made the most recent reference to this species in the Romanian botanical literature, but considered it to be "dubious" in the flora of the country.

b) Field data: *Meum athamanticum* re-discovered

During a botanical trip in the area of the Oituz Pass, Covasna county, at the border between Nemira and Breţcu Mountains, Eastern Carpathians (Fig. 1), on June 10, 2017, we found the very rare species *Meum athamanticum*, in two neighboring places, southward of the national road DN11 (N46°03'35.25", E 26°21'38.47", 874 m a.s.l.; N46°03'36.54", E 26°21' 38.23", 867 m a.s.l.).

The total area occupied by *M. athamanticum* does not exceed 10 sq.m, in the first area and is approx. 1 sq.m in the second one, the total number of recorded individuals being 8 and 2, respectively.

All the plants identified by us (Fig. 2, 3, 4) entirely correspond morphologically to the description (Leute 1969) of *M. athamanticum* subsp. *athamanthicum*, except the

very papillate-scabrous rays of the umbel on the inner faces (Fig. 4c), as in subsp. *labranum.*

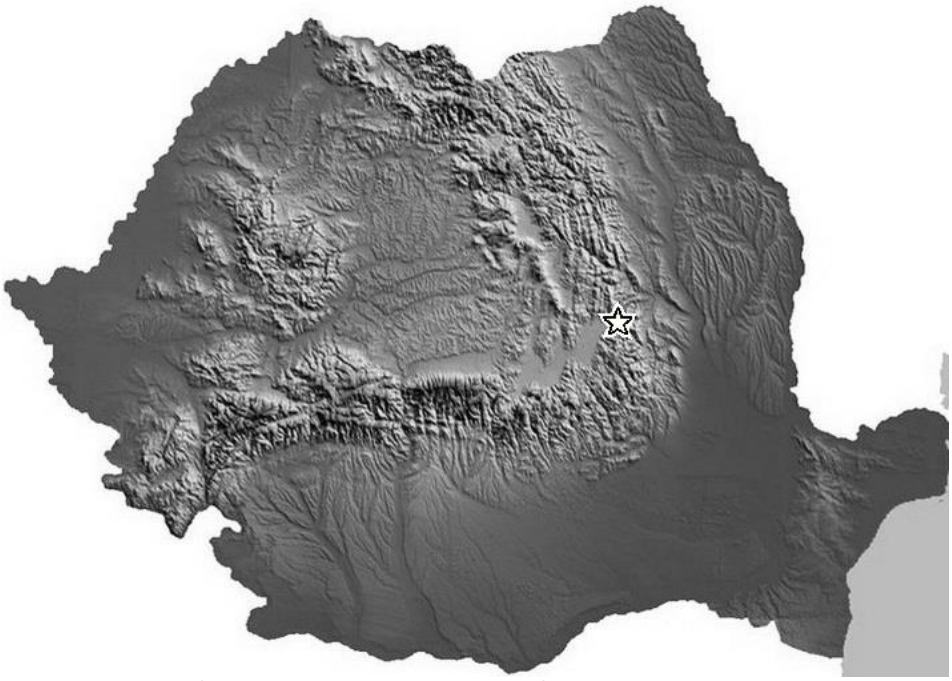

Fig. 1. Location of *Meum athamanticum* in the area of the Oituz Pass, Eastern Carpatians (the mark). Map of Romania from *File:Romania-relief.png*.

Since the year 1940 (77 years ago), when it was the last time collected from the Bucegi Mts, as it has shown above, the species has not been further found until now, neither there nor anywhere else in the country. This means that the Oituz Pass is the only known location in the entire Carpathian chain of Romania where *M. athamanticum* survives nowadays. The fact that the presence of *M. athamanticum* in this relatively accessible place has not been noted so far might seem quite surprising, given the intensity of floristic and phytosociological surveys in the area (Kovács 1968, 1971) or in neighboring regions (Mititelu & Barabaș 1993, Gurău 2014). We suppose this is because both of the small number of individuals (easy to overlook) and the fact that the species grow here in a transitional area between grassland and forest, perhaps less promising in floristic and (especially) phytosociological surveys.

All the plants of *M. athamanticum* were at anthesis on June 10. In August 3, when we reviewed the place, the fruits were already mostly scattered. The few harvested fruits are fully developed, with seemingly viable seeds.

The plant grows on the plateau slightly sloping north, in a mountain hay meadow, at the transitional line to the the nearby forest, together with *Agrostis capillaris* L. subsp. *capillaris*, *Anthoxanthum odoratum* L., *Arnica montana* L., *Avenella flexuosa* (L.) Drejer, *Avenula pubescens* (Huds.) Dumort. subsp. *pubescens*,

Betula pendula Roth, *Briza media* L., *Calluna vulgaris* (L.) Hull, *Campanula abietina* Griseb., *Carex pallescens* L., *Carum carvi* L., *Corylus avellana* L., *Cruciata glabra* (L.) Ehrend. subsp. *glabra*, *Cynosurus cristatus* L., *Deschampsia cespitosa* (L.) Beauv. subsp. *cespitosa*, *Dryopteris carthusiana* (Vill.) H. P. Fuchs, *Fagus sylvatica* L. subsp. *sylvatica*, *Festuca rubra* L. subsp. *rubra*, *Genista tinctoria* L. subsp. *tinctoria*, *Genistella sagitallis* (L.) Gams, *Helianthemum nummularium* (L.) Mill. subsp. *obscurum* (Čelak.) Holub, *Hypericum maculatum* Crantz subsp. *maculatum*, *Luzula luzuloides* (Lam.) Dandy et Wilmott, *Melampyrum bihariense* A. Kern., *Molinia caerulea* (L.) Moench subsp. *caerulea*, *Nardus stricta* L., *Pedicularis comosa* L. subsp. *campestris* (Griseb.) Jáv., *P. sylvatica* L., *Phleum alpinum* L. subsp. *alpinum*, *Phyteuma vagneri* A. Kern., *Plantago atrata* Hoppe subsp. *sudetica* (Pilg.) Holub (a quite surprising occurence at such a low altitude of this very rare taxon in the flora of Romania), *P. lanceolata* L., *Poa chaixii* Vill., *P. nemoralis* L., *P. pratensis* L., *Polygala vulgaris* L. subsp. *vulgaris*, *Potentilla erecta* (L.) Raeusch., *Ranunculus acris* L. subsp. *acris*, *Rhinanthus minor* L., *Salix caprea* L., *Stellaria graminea* L., *Thesium linophyllon* L., *Thymus pulegioides* L. subsp. *pulegioides*, *Trisetum flavescens* (L.) Beauv. subsp. *flavescens*, *Vaccinium myrtillus* L., *Veratrum album* L. subsp. *album*, and *Veronica officinalis* L.

Fig. 2. Meum athamanticum: a - habitus (in the area of the Oituz Pass, Covasna county); b - a compound umbel.

Fig. 3. Meum athamanticum in Romania: herbarium specimens.

Analyzing the average values of the ecological indicators (according to Ellenberg *et al.* 1992, Borhidi 1995 and Sârbu *et al.* 2013) of the accompanying plant species listed above (*i.e*. 4.6 for temperature, 5.2 for soil moisture, 4.5 for soil reaction, and 3.4 for nitrogen preferences), it follows that, in the Oituz Pass, *M. athamanticum* grows in moderate to cool conditions of temperature, on ± acidic, semihumid and ± oligotrophic soil.

These conditions are quite suitable for *M. athamanticum* (see Introduction) and fit well on the general natural features of the area of the Oituz Pass, which are characterized (Kovács 1971) by annual average temperatures ranging from 4 to 6°C, rainfall exceeding 900 mm annually, brown (including podzolic) soils formed under a primary vegetation of deciduous and mixed forests (which, on the deforested areas, have been replaced by secondary grasslands dominated by *Festuca rubra*, *Agrostis capillaris*, *Nardus stricta* etc.).

Recent research (Huck *et al.* 2009, 2012) revealed that existing populations of *M. athamanticum* in north-western and central Europe have persisted during glacial periods in multiple refugia and in isolation from southern European populations. We therefore suppose that the isolated populations in the Carpathians could be also preglacial relics.

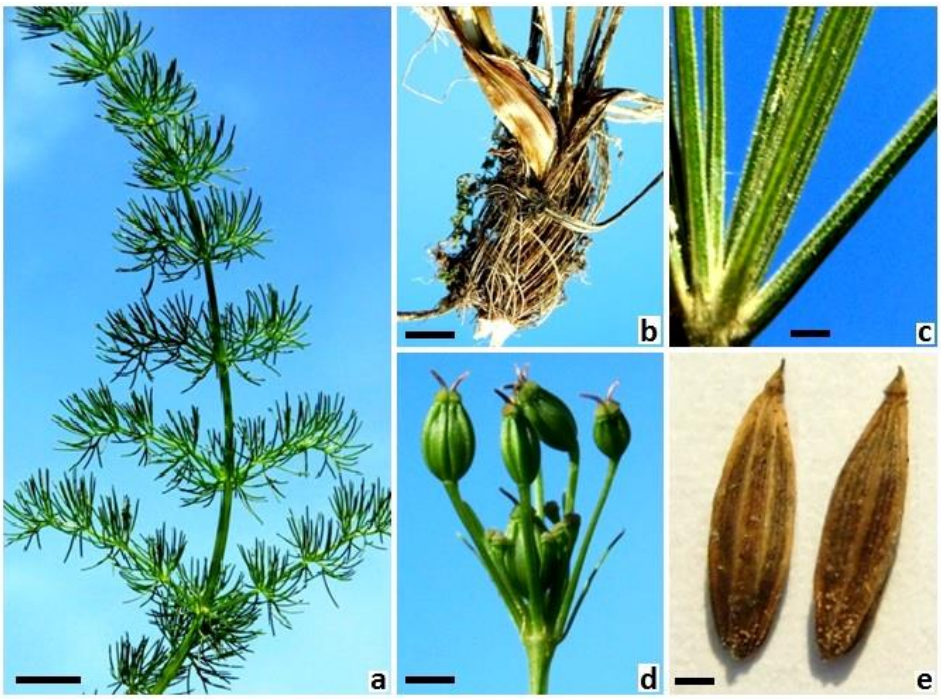

Fig. 4. Meum athamanticum: a - leaf (in part); b - the base of the stem surrounded by fibrous remains of petioles; c - rays of the umbel, toward the base; d - umbellule with young fruits; e - fruit (mericarps). Scale bar: a,b - 10 mm, c – 0.5 mm, d, e - 1 mm.

c) Recommended IUCN threat category

The very limited population of *M. athamanticum*, close to a frequently circulated road and that the area is often grazed by animals are major factors of risk that could lead to its disappearance from this location, as we suppose it happened with the populations from Făgăraş or Bucegi Mts. Trees and shrubs growing nearby probably have a protective effect, to a certain degree, on *M. athamanticum* in the Oituz Pass, assuring its survival so far. Prohibiting grazing at the edge of the forest could provide an extra chance of its survival in the future, despite the small number of individuals. However, additional research is needed in order to further assess the conservation status of the species. We recommend the establishment of a special protected area for this species and its inclusion in the next edition of the *Romanian Red Book* of vascular plants (Dihoru & Negrean), as Critically Endangered (CR). The authors undertake to inform public authorities of the Covasna county, about this discovery, in order that appropriate conservation strategies to be applied.

Conclusions

The presence of the species *Meum athamanticum* in Romania has been long time controversial, given the apparently missing specimens in the herbaria and that it has not been re- discovered anywhere in the localities reported in the literature. In this paper, we have reported the discovery of *M. athamanticum* in the Eastern Carpathians of Romania,

in the Oituz Pass area (Covasna county), 77 years after the last record in the country. We recommend the establishment of a special protected area for this very rare species, in the Oituz Pass, and its inclusion in the next edition of the *Romanian Red Book* of vascular plants, as Critically Endangered.

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THE OCCURRENCE OF THE ALIEN PLANT SPECİES *CENCHRUS LONGİSPİNUS* ON THE DANUBE DELTA SHORE (NORTH WEST BLACK SEA COAST) – THREATS AND POSSİBLE İMPACTS ON THE LOCAL BİODİVERSİTY

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Abstract: One of the main threats to the biodiversity of the Danube Delta Biosphere Reserve (DDBR) is the invasive alien species. To develop a sustainable conservation and to implement protection strategies of biodiversity in protected areas is important the early detection and monitoring of the alien species, especially those which are known as aggressive invaders. In this paper, we report the occurrence of the alien plant species *Cenchrus longispinus* (long-spine sandbur) along the shore dunes from the Danube Delta. This record of *C. longispinus* is the first in Danube Delta and the second for Romanian Black Sea coast. Taking in account that this plant is invasive on sandy shore from the Ukrainian Black Sea coast, its occurrence on deltaic shore can be regarded as a sign of its invasiveness tendency along the Black Sea coastline. In DDBR, *C. longispinus* was identified within two coastal habitats of Community interest, which determines a very high risk to their biodiversity conservation. In order to prevent and counteract the invasion of long-spine sandbur in DDBR and the rest of Romanian territory, a special attention should be paid to its monitoring and control methods.

Key words: long-spine sandbur, invasive alien plant species, Sulina beach, Black Sea coastline, early detection, habitat biodiversity

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Introduction

Within the territory of Romania, the Danube Delta, as a particular wetland type, is an area with high vulnerability to alien species that threat the local biodiversity and habitats natural status due to easy dispersal of propagules by water in a natural way as well as by ship transport. According to Anastasiu and Negrean (2005), 435 alien plant species were identified in Romania, of which 384 are neophytes, and the number is expected to increase as long as new alien species are reported every year. Only in the first decade of the twentieth century 47 new alien plant species for Romanian flora were recorded (Oprea *et al.* 2012).

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Vascular flora of Danube Delta consists from around 955 plant species (Ciocârlan 1994), from which 128 are alien plant species (Doroftei & Covaliov 2009). Half of the alien plant species are trees, shrubs and lianas that are ornamentally cultivated in the area of settlements or in the forest cultures, such as *Robinia pseudoacacia* L., *Elaeagnus angustifolia* L., and *Amorpha fruticosa* L., but they have invasive character (Doroftei & Covaliov 2009, Doroftei *et al.* 2011). Likewise, particularly serious threat to the quality of dune habitats of Sulina is the shrub *Hippophaë rhamnoides* L., which is a native species, but in the past it has been used to stabilize of the coastal dunes (Ceuca & Bakos 1985, Strat 2013, Strat 2016). As a result, nowadays its coverage substantially increased. On the contrary, most herbaceous species were accidentally introduced and have become aggressive invaders, both in terrestrial and aquatic ecosystems that affect the status of populations of native protected and relict species (Protopopova *et al.* 2006). For example, along the beach dune system located between Sulina and Sf. Gheorghe branches mouths of Danube river, one of the most conspicuous examples is *Xanthium italicum* Moretti, a very aggressive and noxious weed that in some shore areas is dominant and makes monospecific stands along hundreds of meters on the entire high beach.

Starting with 21th century, several inventories and particular assessments on the invasive plant species that occur in the Danube Delta have been made (Anastasiu & Negrean 2005, Anastasiu *et al.* 2007, Doroftei & Covaliov 2009, Doroftei *et al.* 2011).

Invasive alien species represent a serious concern for European Union that was highlighted in the Bern Convention that requires member states "to strictly control the introduction of alien species" (Council of Europe 1979, p.5).

The recent policy options were announced by several preparatory studies and by the Commission Communication "Towards an EU Strategy on Invasive Species" in 2008 (COM/2008/748). Further, the EU 2020 Biodiversity Strategy (COM/2011/0244) announced a dedicated legislative instrument on invasive alien species. In this respect, it was adopted the Regulation on Invasive Alien Species (Regulation 1143/2014) that approaches the problem of invasive alien species in a comprehensive manner. The regulation stipulates three types of interventions: prevention, early detection and rapid eradication, and management. According to Regulation 1143/2014, a list of invasive alien species of Union concern has been adopted in 2016 (EU 2016/1141**).**

Starting with 21th century, inventories and particular assessments of the invasive plant species from Danube Delta have been made by Anastasiu & Negrean (2005), Anastasiu *et al.* (2007), Doroftei & Covaliov (2009), Anastasiu *et al.* (2011), Doroftei *et al.* (2011).

In this paper, we report the first occurrence of the alien plant species *Cenchrus longispinus* (Hack.) Fern in the Danube Delta Biosphere Reserve. Based on the literature review, a biological and ecological description of *C. longispinus* is presented. Data regarding its occurrence and range in European countries demonstrate its invasive status. Its potential threats to the biodiversity of sandy shore ecosystems from Danube Delta and potential methods of the control of long-spine sandbur are pointed out.

Material and methods

At the end of August 2016, during a floristic survey along the deltaic shore from North West Black Sea coast, known as "Plaja Sulina" ("Sulina Beach"), on the high beach and embryonic dunes, several individuals of a particular grass, no more 30 cm high, were found. They drew attention because of their spiny burs. On the field, the plant species was identified as belonging to the *Cenchrus* genus. Biological and ecological observations were made, and plant species associated were recorded.

Several specimens were collected for laboratory examination and taxonomic identification. One of the specimens was donated to Herbarium of University of Bucharest, and it is registered under voucher specimen number BUC 405481, Sulina, 26.08.2016. Another two specimens and several spiny burs are deposited in the plant collection at the Faculty of Geography, University of Bucharest.

The collected plant specimens were identified as *C. longispinus* using key morphologic characteristics, based on bur morphology examination according to the literature and following the thorough description given by DeLisle (1962), the taxonomic revision of Verloove & Gullón (2012), as well as the key identification published by Oprea *et al.* (2012). A stereomicroscope was used for close examining of spiny burs and seeds. The pictures were taken with Panasonic Lumix DMC-L10.

Results and discussion

1. Study area and habitat characteristics

The site where *C. longispinus* was found is a sandy shore that belongs to the northern part of the coast of Danube Delta, which is located between the Sf. Gheorghe and the Sulina mouth arms of Danube River. In geomorphological terms, this shore is composed by a beach-dune system that has developed between the rocky groin, build in the south of Sulina Chanel, and the Busurca mouth canal, along 2 km coastline. The beach and dunes sediments are composed by medium-fine sands and shell debris. The vegetal detritus that is washed up along the drift line is composed by "*camca*", the local name for shredded leaves, decayed rhizomes and aerial stems of *Phragmites australis* (Cav.) Trin. ex Steud. that are washed up on shore. Although there is not a clearly continuous band of drift line vegetation, the characteristic plant species of this habitat are *Salsola kali* (L.) Scop., *Argusia sibirica* L., *Cakile maritima* subsp. *euxina* (Pobed.) Nyár. They are accompanied by *Xanthium italicum* Moretti., *Eryngium maritimum* L., *Suaeda maritima* (L.) Dumort. and *Atriplex littoralis* L (Fig. 1).

In the study area, the fore dunes make a quite continue ridge with a very smooth profile but it not exceeds 1 m height. The main plant species identified are: *Eryngium maritimum* L., *Convolvulus persicus* L., *Corispermum nitidum* Kit., *Leymus racemosus* subsp. *sabulosus* (M.Bieb.) Tzvelev, *Secale sylvestre* Host, *Petasites spurius* (Retz.) Rchb., *Xanthium strumarium* L., *Salsola kali* L., *Polygonum arenarium* Waldst. & Kit., *Cynodon dactylon* (L.) Pers., *Cuscuta* sp., *Scolymus hispanicus* L., *Tamarix ramosissima* Ledeb., *Hippophae rhamnoides* L., and *Elaeagnus angustifolia* L.

However, the beach dune system from Sulina has a high biodiversity value that is proved by four habitat types of Community importance which were identified and described in this area (Făgăraș 2013): 1210 Annual vegetation of drift line, 2110 Embryonic shifting dunes, 2130 Fixed coastal dunes with herbaceous vegetation, and 2160 Dunes with *Hippophae rhamnoides.* Also, on the fore dunes, which ecologically

are assessed as embryonic shifting dunes habitat type, there is an enclosure that was made in order to protect *in situ* several populations of *Convolvulus persicus*, a Ponto-Caspian endemic plant species that is listed in Red Book for vascular plants in Romania (Dihoru & Negrean 2009).

The climate of this area may be described as temperate continental with Pontic influences (Bogdan 2005). The mean annual air temperature is 11.3 °C and the annual amplitude 22.3 °C. For the last 25 years, the mean annual rainfall amount is only 281 mm and the potential evapotranspiration is around 730 mm per year, which means a severe water deficit but, due to the proximity of sea, the relative humidity of air is very high (annual mean: 87%). From the bioclimatic point of view, *sensu* Rivas-Martinez (2008), the bioclimate of the deltaic Black Sea coast is Mediterranean xeric continental type (Strat 2010). The period of plant activity – meaning months with mean air temperature > 3.5 °C (Rivas-Martinez 2008) – is nine months. The average growing season length (defined as the average number of days of a year with a 24-hour average temperature of at least 5 °C) has increased from 254 days, for the period 1951-2000, to 268 days, in the first decade of the XXIth century (Strat 2015).

2. Biology, ecology and geographical distribution of *Cenchrus longispinus* (Hack.) Fernald

Cenchrus longispinus (Hack.) Fernald (long-spine sandbur) is one of the 25 species that belong to genus *Cenchrus* L. (Chase 1920, DeLisle 1962), member of tribe Paniceae, Poaceae family. According to Germplasm Resource Information Network of United States Department of Agriculture, 35 different species of *Cenchrus* are recorded (Goel *et al.* 2010). Furthermore, according to the evidences from molecular phylogenetic studies, Verloove & Gullon (2012) recommended the amalgamation of the grass genera *Cenchrus* and *Pennisetum*, which means that all species of *Pennisetum* have to be transferred to *Cenchrus.*

C. longispinus is an annual grass originated from North America. It is native of United States and southern Canada, Mexico, Central America, and the West Indies (DeLisle 1962), but nowadays it is spread and became a noxious weed and invasive species in some European countries, in Morocco, Israel (EPPO 2015/120), Russia, (Schanzer *et al.* 2013, Kulakov & Kulakova 2014), and Australia (Doeney *et al.* 2010).

A comprehensive study of *Cenchrus* genus, including a dichotomous key for identification of *Cenchrus* species, was performed by DeLisle (1962). Based on analyze of 10 morphological characteristics on 20 *Cenchrus* species, DeLisle (1962) found that all species are very much similar in their morphology, but *C. longispinus* belongs to a specialized group characterized by "a definite bur resulting from more or less complete fusion of the spines, the presence of flattened and broad spines, and the absence of prolonged bristles" (p. 35).

Within its native range area *C. longispinus* has often been identified as, and confused with, both *C. tribuloides* L. and *C. incertus* M.A. Curtis (DeLisle 1962, Goel *et al.* 2010). Therefore, is not surprising that within invaded territories, like in the Mediterranean area and Russia, in its early occurrence, *C. longispinus* was widely confused with *C. spinifex* Cav. (syn: *C. incertus*), *C. echinatus* L. (Verloove & Gullón 2012), *C. tribulloides*, and *C. pauciflorus* (Kulakov & Kulakova 2014). Although *C. longispinus* exhibits a wide variation in most vegetative characters, it maintains a

marked stability in several traits, such as spine number of bur and floret length. These are the main characters used as a means of separating these taxa (Verloove & Gullon 2012).

A mature *C. longispinus* plant can grow to 20–90 cm high. It produces several branching culms from the base that are either ascending or sprawl across the ground and mostly are covered by the sheaths of the leaves. Due to harsh environment on the sandy habitats, especially on mobile coastal dunes, the stems produce roots while lying flat, thereby securing the plant against aeolisation processes. Thus, the low profile and rooted stems are adaptive features that reduce wind abrasion and increase water uptake. In this way, *C. longispinus* is a sand binder, although its contribution cannot be comparable to that of *Ammophila arenaria* grass that is a real sand dune builder (Bradshaw & Chadwick 1980). Also, in its native range, *C. longispinus* is a pioneer and opportunistic species in the disturbed areas where will usually persist for 2 to 3 years before being replaced, if there is not reoccurring disturbance to its location (Parsons & Cuthbertson 2001, Eastman 2003).

In the case of *C. longispinus*, the leaves alternate along the entire length of each culm. Leaf blades are 4-27 cm long, 1.5-7.5 mm wide, glabrous or pilose. The upper surface and margins of blades are scabrous. The ligules are short-hairy. Each culm and any upper branches terminate in racemes of 4-20 spiny cupules named burs.

The rachis of raceme zigzags between the burs. The spiny fruits are 6-8 mm across (excluding the spines) and globoid to globoid-ovoid in shape; each fruit consists of a pair of cup-like bracts that are joined together, enclosing 2-3 sessile spikelets about 5-6 mm long. The outer surfaces of these fruits are covered with flattened spines up to 6 mm long, and they are more or less pubescent.

Each bur contains 1-3 grains (caryopsis) that are real fruits. Mature grains are broadly ovate, around 2-4 mm long, 1.5-2.5 mm across. They are ovoid to obovoid in shape, flattened on one side, smooth-textured, and brown. The hard caryopses persist in the burs which when dry become solid with sharp points. The burs easily detach from the plant when are mature, and adhere to animal fur or remain on the soil surface. The spines of the burs are very sharp, causing mechanical injury to the mouth parts of grazing animals, skin punctures and sore wounds to humans.

Seeds possessed physical and non-deep physiological dormancy. Twentyman (1974) found that because long-spine sandbur seeds have different position in bur and resources are not allocated equally to all seeds by mother plant, they may not have the same dormancy-breaking and/or germination requirements. Thus, the seed in the central spikelet, the primary seed, is larger than those in the lateral spikelets and come out of dormancy in dray storage much faster than lateral seeds or secondary seeds (Twentyman 1974, Anderson 1997). Seeds developed from the upper spikelet usually germinate within the first year after dispersal, but seeds produced from the lower spikelets germinate slowly and can remain dormant for over three years (Twentyman 1974). These dormancy differences in long-spine sandbur seed result in germination over a longer period in a given year or germination over years from a given year's seed source. Germination is discouraged in seeds lying on the surface of the soil and also by dense competing vegetation (Boydston 1989). Irrespective of their size, the high rate of optimal germination of long-spine sandbur seeds is at depth of 1-3 cm but in sandy soils seedlings can emerge from depths to 25 cm (Parsons & Cuthbertson 2001).

The seeds germinate within the burs. They soak up soil moisture and hold it until the seeds receive other germination stimulants such as warm temperature, sufficient light and appropriate day length. Under natural conditions, seed buried at greater depth where temperatures are cooler may germinate later than those at shallow depth where temperatures are warmer, thereby extending the spring flush (Anderson 1997).

There are few animals that graze this plant species. In its natural range, *C. longispinus* seeds are gathered and cached by prairie deer mice (Howard & Evans 1961). Mature plants are avoided by livestock because of burs that can injure mouths, noses and eyes. The only bird recorded as feeding on seeds is *Cardinalis sinuatus*, a Paseriformes species found in North and South America that has a bill well adapted to eating seeds enclosed in spiny bur (Reiner 2015). *C. longispinus* is parasited by the fungus *Sporisotium syntherisimae*, which destroys the burs in severe infestations, as well as by *Ustilago* smut and *Puccinia* rusts (Eastman 2003). Also, *C. longispinus* is host for the mite *Aceria tosichella*, which is a vector for wheat streak mosaic.

Although nowadays the long-spine sandbur is treated and perceived as a weed and nuisance plant species, its seeds are mentioned as a traditional plant food for indigenous people from actual Canadian territory (Kuhnlein & Turner 1991).

C. longispinus is well adapted to take advantage of disturbed areas, no matter where they are located. Although it prefers to grow in well drained sandy soils, long-spine sandbur has a large tolerance for soil types, soil moisture and plant neighbor species which explains why is a successful weed an invasive species, and aggressively colonizes disturbed areas. For this plant species, the ecological benefit of burs is that they make it more drought tolerant than other grass species in dry, sandy soils (Twentyman 1974).

Burs, as propagules of *C. longispinus*, mediate dispersal of seeds at long distance from mother plant, protect them against predators, and allow them to survive few years in the wild on the soil surface and buried (Anderson 1997). Because the plant is not eaten by grazing animals it can put all of its energy into reproduction and seeds. A well-developed plant produces until 1000 seeds (Eastman 2003).

Epizoochory and anthropochory is the most effective way of dissemination. Burs cling readily to animal fur and the clothing of humans which helps to distribute the seeds across considerable distances. According to Soltani *et al.* (2009) burs from *C. longispinus* adhere to virtually anything from machinery, tires and livestock. Hydrochory is another way because burs can float and thus travel large distances by water (DeVetter 2006).

The two different dormancy patterns of seeds in accordance with their size make them able to escape from unfavorable conditions and "wait" for better conditions. Experiments showed that in the bur, primary seeds germinated more rapidly than secondary seeds, which require a double time for germination (around 28 days) compared to the seeds formed in the upper spikelet of the bur (Boydston 1989).

Overall, the biological features that make from *C. longispinus* a successful biological invader are: a short life cycle (summer annual), flowering and fruiting several times per season, morphology of propagules, rapid reproduction and high productivity of seeds, dispersal pathways, different seed dormancy and no simultaneous seeds germination, the ability to form adventitious roots on stems, resistance of plant to drought and heat.

Actually, as weeds, all *Cenchrus* species have a "bad reputation" and this fact was emphasized at the end of XIX century by an American biologist wrote that: "Rating weeds in order of badness, I would give the Sandspurs the first place. They are bitter grasses eaten only as a last resort by cattle, and all other weeds in the State combined do not cause as much pain, profanity and danger to life, as these worthless grasses (Neal 1890, quoted by Ward 2010, p. 442)".

3. Distribution of *Cenchrus longispinus* in Europe

The *C. longispinus* is one of the three species of genus *Cenchrus* that occur in Europe. Its occurrence in Europe dates back to first decades of twentieth century. Initially it was discovered in Italy, in 1933, on the beaches near Venice when it was rare until the1960s, but after that has invaded Adriatic and Tyrrhenian shores (Verloove & Gullon 2012, Buffa & Pizzo 2014). In the data base of the DAISIE project (Delivering Alien Invasive Species in Europe), *C. longispinus* species is noticed only in three countries: Italy, Belgium and Ukraine (http://www.europe-aliens.org/species Factsheet.do?speciesId=3332#). However, according to the last report of the European and Mediterranean Plant Protection (EPPO 120/2015) *C. longispinus* was recorded in Belgium, Croatia, France, Greece, Hungary, Italy, Romania, and Ukraine, when it has invaded both coastal environments and inland territories (roadsides, railways, ruderal habitats, agricultural land, grasslands). Also, the occurrence of *C. longispinus* in the Republic of Moldova was reported in 1986 (Kulakov & Kulakova 2014). A possible explanation of missing of some countries from the distribution map of *C. longispinus* in Europe given by DAISIE database could be that this plant species was identified with different name, like in Bulgaria where it was recorded as *C. incertus* (Jehlík & Scholz 2009, Petrova & Vladimirov 2012) and in Romania where, initially, it was also identified and published as *C. incertus* (Sîrbu *et al.* 2011), or it was caused by insufficient information available to experts due to the lack of access to relevant publications.

In the Black Sea coastal region, the first reported record of *C. longispinus* was in Ukraine, in 1951 (Protopopova *et al.* 2006). Twenty five years later, it was recorded in Russia, in Novorossiysk harbor from Krasnodar region (Kulakov & Kulakova 2014). According to Schanzer *et al.* (2013), several independent invasions to Ukraine and Russia have occurred since the first appearance of *C. longispinus* was noticed in Ukraine, and a possible explanation of the success of its spread in this region could be the apomictic mode of propagation. Recently *C. longispinus* was recorded on the coastal dunes from Georgia (Iakushenko *et al.* 2016).

Within the Romanian territory, for the first time, *C. longispinus* was recorded in 2007 along the Black Sea coast, on the sandy beach from Mamaia sand barrier, North to Constanța city, and then within the area of the railway station from Galați city (45°26'38"09 N, 28°03'41"94) (Oprea *et al.* 2012), although, initially, the specimens that were found at Galați were identified as *C. incertus* (Sîrbu *et al.* 2011a). The same authors who identified and published the occurrence of this alien plant species for Romania assert that *C. longispinus* has an invasive character within Romanian territory (Oprea *et al.* 2012), and according to Romanian legislation this plant species is recommended as quarantine pests.

However, at the European level there are serious concerns regarding the spreading of this invasive plant, so since June 2015 *C. longispinus* was officially added on the European and Mediterranean Plant Protection Organization (EPPO) Alert List as an invasive plant in Europe. Its addition to the Alert List was marked by an article in the EPPO Reporting Service that can be accessed at the link https://www.eppo.int/QUARANTINE/Alert_List/invasive_plants/Cenchrus_longispinus.htm.

4. *Cenchrus longispinus* on the coastal sandy habitats from Danube Delta, Sulina beach. Potential threats and impacts

Sulina beach represents the third reported site from Romanian territory where *C. longispinus* was identified. Individuals were solitary with mature burs, scattered on high beach and fore dunes (Fig. 2, Fig. 3). The sparse occurrence on could depict that this plant species is a recent new comer on the Sulina beach. The seed source is unknown but it may be assumed that it could be the imported agricultural commodities, considering the proximity of the Sulina harbor, or the populations of *C. longispinus* from Ukraine, in which case burs possibly were brought by marine currents. However, it should be mentioned that in 1991, on the sandy shore from Vama Veche, which is a place close to the Romanian border with Bulgaria, and over 200 km South away from Sulina, was reported *C. incertus* (Oprea *et al*. 2012), but this fact need to be reconfirmed because there is the possibility of misidentifications.

At the moment of discovery there were not any signs that *C. longispinus* species determined any impact on native species from the Sulina deltaic shore. However, whether or not there is an established population in Sulina site, it is documented and indubitable that this alien species is highly invasive and is a significant threat to local biodiversity in all coastal European countries (Protopopova *et al*. 2006, Blanckaert*et al.* 2007, Doeney *et al*. 2010, Schanzer *et al.* 2013, Buffa & Pizzo 2014, https://www.eppo.int/QUARANTINE/Alert_List/invasive_plants/Cenchrus_longispinus.htm).

The predictable impact of *C. longispinus* on the deltaic shore from Sulina is the change of the local floristic composition, the reduction of plant biodiversity by replacement of the local plants, the alteration of the native vegetation patterns, possibly, in a same way that happened in the Lower Dnipro and sandy steppes and alluvial habitats of Black Sea (Chornomorsky) Biosphere Reserve from Ukraine (Protopopova *et al*. 2006), where this grass was assessed as the most dangerous alien plant species (Protopopova *et al.* 2006), or such as in the Kiskunsági National Park from Hungary (Szigetvari 2002). Under these circumstances, the coastal habitats of community importance that occurs on the Sulina Black Sea coast (Făgăraș 2013) are vulnerable and threatened.

5. Control methods

Prevention is the best weed management tool, but direct control must be part of integrated management of the coastal area. The early detection and reporting of suspected plant species to appropriate officials is one of the first steps. In order to do that, a regular patrol of sandy shore habitats for invasive plants and immediately control of any new infestations is required. Given that the occurrence of *C. longispinus* on the Sulina site is still rare, immediate actions must be taken to restrict its distribution,

although the possibility that this plant could be a casual alien and it may disappear in the future should not be completely excluded. Therefore, in order to estimate both their spread and increase of populations, annual monitoring activities must be carried out on the shore area where *C. longispinus* was originally registered as well as on the others vulnerable sites of the deltaic shore for early detection surveys, and also on the Mamaia sand barrier, when it was the first time recorded for Romanian territory (Oprea *et al.* 2012). Then, the weed must be fully and continuously suppressed and destroyed to avoid the contamination of the coastal habitats with high biodiversity value, and to prevent its establishment and dispersal within Danube Delta Biosphere Reserve.

The key to control this species, as with all the annuals invaders plants, is the elimination of seed production, and the physical removal may be effective for small infestations (Evans *et al.* 2003), as it happens on Sulina shore.

Considering its morphology (annual grass with shallow and fibrous roots) and its habitus that consists in small clumps, without a network of rhizomes, this plant can be manually removed, particularly before the fruit ripening, to be sure that the propagules are not left behind to prosper, especially that the burs easily detach from the plant when are mature. Besides, hand pulling is the most environmentally friendly and labour intensive method of weeds control, in particular in the fragile and sensitive coastal sand dunes, but the key success of the hand pulling method is to remove the entire plant. However, to apply this control method, it requires a good knowledge of plant growth and development and its habitus along the life cycle because, usually, *C. longispinus* is difficult to identify prior to seed production. In the seedling stage sandbur longispine is an innocent looking grass and difficult to distinguish from other common grasses (Forsyth *et al.* 1955).

Even though no effective biological control agents are currently available (Evans *et al.* 2003), because the plant is quite palatable before fructification (Eastman 2003), it must be considered if in the study area there is the possibility to be biologically controlled by cattle grazing in pre-flowering stage, in order to prevent seeding.

Without doubt, significantly more effective is the chemical control (EPPO 2015/120) but this method is suitable and widely applied in cultivated land (Wicks & Wilson 1974, Knezevic 2007). The use of herbicides to control long-spine sandbur in natural ecosystems is questionable and not well documented. It is important to stress that should not be neglected the fact that, as an alien and invasive species within Mediterranean coastal zone and, *C. longispinus* aggressively colonizes sea shores and mobile dunes as well as the disturbed sand dunes (Verloove & Gullón 2012, Buffa & Pizzo 2014), and its ecological success is ensured, inter alia, by its seeds dormancy and particularity of seed bank and germination (DeLisle 1962, Twentyman 1974, Boydston 1989, Anderson 1997).

Public information by leaflets and posters displayed in touristic areas, railway stations, bus stations, and gas stations are needed to raise public awareness about the risks of moving alien invasive plants and their associated pests, including long spine sandbur, during travel and to encourage responsible behavior and civic attitude. Also, as a country which has ratified the Convention for the establishment of the European and Mediterranean Plant Protection (https://www.eppo.int/ABOUT_EPPO/convention/convention.htm#III) and member stat of European Union, Romania must to follows EPPO recommendations (Brunel *et al.* 2010) and to apply the Council Directive

2000/29/EC of 8 May 2000 on protective measures against the introduction into the Community of organisms harmful to plants or plant products and against their spread within the Community (EU Directive 2000/29).

Conclusions

The results of this work strongly support the idea that the Sulina beach is the third site from Romania where it was found *Cenchrus longispinus*. Based on its ecological requirements and invasive behavior, in the DDBR there are propitious environmental conditions for *Cenchrus longispinus* to establish and spread on sandy shores and other sandy habitats. The vulnerability of sandy shore from Sulina is high because in the summer season the entire shore named "Plaja Sulina" is heavily disturbed by touristic activities, cattle grazing, and animal trampling.

The main impact of this plant species on ecosystem services that can be predicted in the coastal area is the environmental impact. This plant species is a real threat for the coastal habitats of Community importance, in particular, and for the biodiversity of Danube Delta Biosphere Reserve, in general. In order to prevent the establishment of *Cenchrus longispinus* population on Sulina beach and to avoid the spread of this alien plant species within Danube Delta and along the Black Sea coast, the sustainable control methods are needed as well as the monitoring of it. The early detection of possible new stations on the Romanian Black Sea coast requires floristic surveys of the most vulnerable and predisposed sandy coastal habitats to invasive plant species.

This new reported occurrence of *Cenchrus longispinus* on Sulina shore, Danube Delta, reveals the invasive tendency of this plant species along the Black Sea coastal zone.

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Fig. 1. The Sulina beach – the area where *Cenchrus longispinus* was found in August 2016 (Photo: Daniela Strat).

Fig. 2. Cenchrus longispinus on the Sulina beach with mature burs (Photo: Irina Holobiuc).

Fig. 3. Specimens of *Cenchrus longispinus* collected from Sulina beach on August 29, 2016 (Photo: Daniela Strat).

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NOTES ON THE GENUS *OENOTHERA*, SECTION *OENOTHERA*, SUBSECTION *OENOTHERA* IN ROMANIA

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Abstract: We present in this paper some results of our studies on the genus *Oenothera*, sect. *Oenothera*, subsect. *Oenothera* in Romania. Several species, including stabilized hybrids (*O. pycnocarpa, O. suaveolens, O. depressa, O.* × *fallax, O.* × *wienii*) are reported for the first time in the flora of the country. Other species are now confirmed in the flora, by herbarium material. We also give an identification key for the species of the subsect. *Oenothera* currently known in the spontaneous flora of Romania.
Key words: alien plants, identification key, new records, vascular flora

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Introduction

Within the family Oenotheraceae (Onagraceae), *Oenothera* is the second genus as number of species (more than 120), after *Epilobium*, but taxonomically it is the most complex (Raven *et al.* 1979, Wagner *et al.* 2007).

The centre of diversity of the genus *Oenothera* is the south-western North America, from where it irradiated all over the North and South America (Raven *et al.* 1979, Dietrich *et al.* 1997, Wagner *et al.* 2007). Numerous representatives of the genus were introduced into Europe, deliberately or accidentally, and some of them became here naturalized or invasive (Mihulka & Pyšek 2011), but some taxa, unknown in North America, seems to have emerged in Europe, most probably through hybridization between taxa introduced here in historic time (Dietrich *et al.* 1997).

According to Wagner *et al.* (2007), the genus *Oenothera* includes 18 sections. Among these, the section *Oenothera* is divided into 6 subsections, one of which (subsect. *Oenothera*) is the best represented in the flora of Europe. This subsection, the most complex group of species in the Oenotheraceae (Dietrich *et al.* 1997), includes annual or biennial plants (even short-lived perennials), with ± erect stems; hypanthium (*i.e*. the tubular extension of the receptacle) of 10-50 (-160) mm long; petals yellow; capsule ± cylindrical, narrowed to apex, of 5-8 mm wide at the base, seeds prismatic, obviously angled (Dietrich *et al*. 1997, Rostański & Karlsson 2008), with mesotesta nearly crushed (Tobe *et al.* 1987).

There is no general consensus within the literature concerning the species of the subsection *Oenothera*. Taxonomic difficulties are mainly due to some unusual

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cytogenetic and breeding peculiarities, such as the specific interactions between genome and plastome (*i.e*. plastid DNA), the transmission of plastome through pollen, the permanent translocation heterozygosity (PTH), and the hybrid fertility (see Raven *et al.* (1979), Dietrich *et al*. (1997), Greiner *et al.* (2008) and other references listed there, for detailed explanations and discussions.

A narrow species concept in *Oenothera* was developed in Europe especially by O. Renner and K. Rostański, according to which populations characterized by particular chromosome complements (Renner complexes) and distinctive and constant morphological features should be placed in distinct species (Rostański 1982, 1985, Jehlík & Rostański 1995, Rostański *et al.* 1994, 2004, Rostański & Karlsson 2008, Rostański & Verloove 2015). Following this concept, a large number of species and permanent hybrids have been described in this subsection (*e.g.* Renner 1942, 1950, 1956, Hudziok 1968, Linder & Jean 1969, Rostański 1977, 1985, 2007, Soldano 1983, 1993, Jehlík & Rostański 1995, Rostański *et al*. 2004, Deschâtres *et al.* 2013, etc.) and many other species previously described based on morphological characters (*e.g.* Persoon 1805, Greene 1891, Steele 1911, Bartlett 1913, Klebahn 1913, Gates 1936, etc.) were recognized as good species. All these species from the subsect. *Oenothera* are grouped into five series (Rostański 1985), three of which (*Oenothera, Devriesia* Rostański and *Rugglesia* Rostański) are represented in the neophyte flora of Europe.

In contrast, a much broader species concept was applied by Dietrich *et al.* (1997) especially in North America. These authors considered the most of those true-breeding strains in the subsection *Oenothera*, described as "true species" by various botanists (especially the PTH taxa), as representing only phenotypic races (or microspecies) of a more limited number of species. Hence, they combined all those taxonomic entities that share the same fundamental genome (all various Renner complexes were grouped in only three fundamental genomes, designated A, B and C), the same type of plastome and certain related morphological traits into 13 extremely polymorphic species, 6 of which being known in Europe.

As Rostański & Verloove (2015) pointed out, the choice between these two concepts is not straightforward. The narrow species concept is perhaps not applicable in North America, where the number of different phenotypes found in most of the species is considerably greater than that observed in European populations (Dietrich *et al.* 1997). However, in Europe the broad species concept seems to be much too broad because it imposes to bring together, in the same species, a large number of morphologically well-delimited entities (Rostański *et al.* 2004, Rostański & Verloove 2015) which, in addition, most often exhibit clearly distinct ecological preferences, distribution patterns and invasive behaviours (Mihulka & Pyšek 2001, Mihulka *et al.* 2006, Tokhtar & Wittig 2008, 2009, Tokhtar *et al.* 2011, Tokhtar & Groshenko 2014). This is why in this study we follow the narrow species concept, using the plant name according to Rostański *et al.* (2010). However, for each species we also give, between square brackets, the alternative name, according to Dietrich *et al.* (1997).

All species of subsect. *Oenothera* occur in primarily or secondarily open habitats, including old fields, roadsides, stream sides, sand dunes etc., both in the native area (Dietrich *et al.* 1997) and in Europe (Mihulka & Pyšek 2011).

Only two species of this subsection (*O. biennis* L. and *O. glazioviana* Micheli in Martius) have been certainly documented so far in the flora of Romania, based on

herbarium material. Other three species (*O. rubricaulis* Klebahn., *O. parviflora* L. and *O. oakesiana* (A. Gray) Robbins ex Wats. & Coult.) have also been reported by various authors, but their presence has not been proven certainly so far. In this paper, we report 5 taxa from the subsect. *Oenothera* (3 species and 2 hybrids) for the first time in Romania, and confirm the presence of other two species previously mentioned in the country.

Material and methods

The present study is referred to some taxa of *Oenothera* sect. *Oenothera* subsect. *Oenothera* and reflects our field works particularly in the last three years (2015-2017) in Romania. The geographic coordinates were recorded on the field using an eTrex Legend HCx GPS system. Specimens collected on the field were deposited in the Herbarium of the University of Agricultural Sciences and Veterinary Medicine Iași (IASI). Herbarium data were collected from the following main herbaria of Romania (abbreviations according to Holmgren *et al.* 1990): BUC, BUCA, BUCM, CL, I, IAGB, and IASI. All species were identified using various keys published by Linder (1957), Raven (1968), Rostański & Ellis (1979), Jehlík & Rostański (1979), Rostański (1982), Rostański & Forstner (1982), Kerguélen (1985), Jehlík (1988), Soldano (1993), Rostański *et al.* (1994, 2010), Fischer *et al.* (2008), Rostański & Karlsson (2008), Király (2009), Rostański & Verloove (2015).

The nomenclature of the plant taxa follows Rostański (2000), Rostański *et al.* (2004, 2010).

Results and discussion

As a result of our recent field works, we have identified a number of 5 taxa (3 species and 2 hybrids) within the subsection *Oenothera*, which have not been previously known into the flora of Romania, namely: *O. pycnocarpa* Atkinson & Bartlett in Bartlett, *O. suaveolens* Person, *O. depressa* E. Greene, *O.* × *fallax* Renner and *O.* × *wienii* Renner ex Rostański.

Other 5 species (*O. biennis* L., *O. glazioviana* Micheli in Mart., *O. rubricaulis* Klebahn, *O. parviflora* L. and *O. oakesiana* (A. Gray) Robbins ex Wats. & Coult.) were previously reported in the botanical literature (see Sîrbu & Oprea 2011 and references given there), the first 4 being also identified by us in our recent field works.

Therefore, according to the current data, the subsection *Oenothera* is currently represented into the flora of Romania by 10 taxa (8 species and 2 hybrids). However, the presence of *O. oakesiana* in Romania (Jehlík & Rostański 1979, Rostański & Forstner 1982) still requires confirmation by herbarium material. In the Herbarium of the Cluj-Napoca Botanical Garden (CL) there is a specimen (No. 218148), collected (2.VII.1938) by Al. Borza *et al.*, originally identified as *O. biennis* L. and subsequently revised (15.II.1967) by K. Rostański as *O. syrticola* Bartl. (currently a synonym for *O. oakesiana*). However, this specimen was collected from the district Caliacra ("Dobrogea, distr. Caliacra. In arenosis litoris Ponti Euxini Marea Neagră ad pagum Ecrene"), which currently is outside the borders of Romania (in Bulgaria).

We present bellow only those taxa representing novelties for the flora of the country, or which have been ambiguously mentioned in the literature and now confirmed by herbarium specimens.

a) Taxa registered for the first time in the flora of Romania

Oenothera pycnocarpa Atkinson & Bartlett in Bartlett, Rhodora 15: 83. 1913 (Syn.: *O. chicaginensis* de Vries ex Renner var. *minutiflora* Rostański et Jehlík, Folia Geobot. Phytotax. (Praha) 14: 401. 1979) [Treatment in Dietrich *et al.* (1997): phenotype of *O. biennis* L.].

Origin and general distribution. It is native in North America (Bartlett 1913, de Vries 1915, Renner & Cleland 1933) and introduced to Europe, where it has been first recorded in Austria (1917) (Mihulka & Pyšek 2001). According to the literature (Jehlík & Rostański 1979, 1995, Rostański *et al.* 2010, Tokhtar & Groshenko 2014, Rostański & Verloove 2015), it is currently relatively widespread on the continent (France, Belgium, Austria, Switzerland, Italy, Germany, Czech Republic, Slovakia, Poland, Ukraine), quite invasive in Central Europe (Mihulka & Pyšek 2001) and rather rare to the East (Ukraine) (Tokhtar & Groshenko 2014).

Distribution in Romania. We have identified it near the Răchiteni village, Iași county, N47º04'09.6", E26º54'49.4", 188 m a.s.l., leg. Sîrbu 28.08.2016; N47º03'56.61", E26º55'07.32", 188 m a.s.l., leg. Sîrbu 13.07.2017; N47º03'07.1", E26º55'37.7", 184 m a.s.l., leg. Sîrbu 26.08.2017).

Ecology. Similar to other species in the section, it prefers disturbed sites, such as ruderal places associated with roads and railways, industrial areas, river banks, sandy places (Jehlík & Rostański 1979, 1995), excavated grounds (Rostański & Verloove 2015) etc., most often in communities of *Dauco-Melilotion* (Jehlík & Rostański 1979). Near the village Răchiteni (Iași county, Romania), it grows on stable fluvial sands from the right bank of the Siret river, as a component of psammophilous pioneer vegetation or even into more stable plant communities dominated by *Elymus repens*, or in the poplar plantation near the river.

Description of specimens identified on the field (Fig. 1). Plants of ca. 150 cm height. Stem erect, basal branches decumbent at base then arcuate-ascending, green to purplish red in part, hirsute with arcuate-patent stiff hairs (up to 2-3 mm long) with high conical to cylindrical red papillae, and appressed pubescent with shorter crisped hairs. Cauline leaves up to 14 × 2-3 cm, short petiolate, elliptic-lanceolate, flat to slightly waved, with straight apex, and distinct dentate margins, ± patent pubescent on both sides, dark (or greyish) green, with (purplish)-red midrib. Bracts subsessile, ovate-lanceolate, concave, wavy, distinct dentate, tips upcurved, with (purplish)-red midrib, the lowermost ones longer than fruits, persistent, the uppermost of about half the length of open flowers or slightly longer, pubescence similar to the cauline leaves. Inflorescence erect, branched at the base, pyramidal, open flowers do not overtop the upper buds; rhachis green (later could be reddened towards the base), hirsute with arcuate-patent stiff hairs with red papillae, and appressed pubescent with shorter crisped hairs (glandular hairs only in late summer, to the top). Flowers chasmogamous. Ovary (at anthesis) of ca. 12 × 3 mm, green, in the first part of the flowering period with dense long stiff hairs with red papillae, mixed with short crisped hairs, later (August-September) predominantly glandular, with fewer stiff hairs with red papillae. Hypanthium 36-46 × 2-3 mm (in late summer may be shorter), yellowish, patent hairy, with short glandular and long stiff hairs. Buds 15-20 × 4 mm, green (sometime, in late August, slightly red-striped), ± subcylindrical, tapered to the top, with glandular hairs and ± patent stiff hairs, free sepal tips of 3-4(-6) mm long, terminal, adherent at base in

bud, above ± somewhat divergent. Petals yellow, obcordate, of 15-20 × 15-20 mm (smaller in late summer). Anthers of 7-9 mm long. Stygma lobes 5-8 mm long, spreading between anthers or slightly exceeding them. Infructescence rather dense (ca. 0.8-1.5 fruits per cm of rhachis). Capsules 28-32 mm long (usually longer than internodes of the rhachis), 5 mm thick at base, tapered upwards, green (somehow greyish at ripening), without red stripes, with numerous appressed crisped hairs, and (semi-)patent stiff hairs with prominent red papillae (red coloration disappears at the ripe fruits); the fruits which appear in late summer have also glandular hairs; teeth truncate, ca. 1-1.5 mm length. Seeds prismatic, light reddish-brown, of 1.0 -1.5 × 0.5-1.0 mm, with narrow-winged edges.

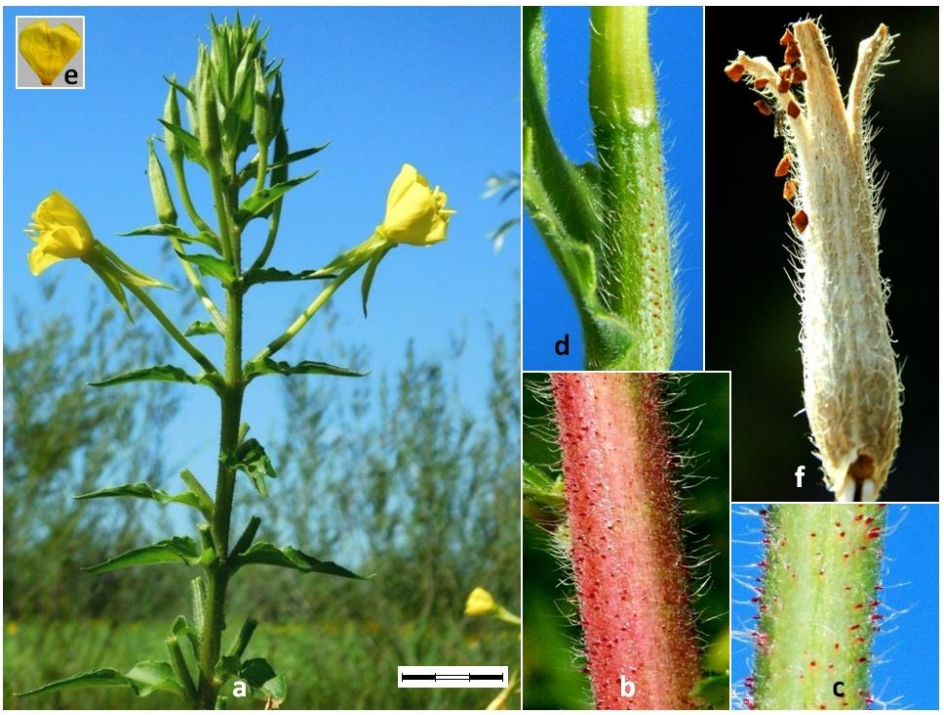

Fig. 1. Oenothera pycnocarpa: a-inflorescence; b, c-stem; d-ovary; e-petal; f-capsule. Scale bar: a-9 mm; b, c, d-1.5 mm; f-2 mm.

Notes. According to Jehlík & Rostański (1995), *O. pycnocarpa* is a very variable species. To a large extent the characters described for this species in the references (*e.g.* Jehlík & Rostański 1979, 1995, Rostański & Forstner 1982, Jehlík 1988, Rostański *et al.* 2004, 2010, Fischer *et al.* 2008, Rostański & Verloove 2015) correspond to those observed in specimens collected by us. Nevertheless, through the coarse hairiness of stem and inflorescence, with dense and long stiff hairs on often cylindrical (slightly curved) papillae, the plant resembles with *O. ersteinensis* Linder & Jean (see Linder & Jean 1969, Rostański & Verloove 2015), against which it differs, however, in many characters, such as: stem partially (not entirely) red, the rhachis of inflorescence always

green at top (not red), buds green (not red-striped), petals ca. as long as wide (no wider than long), hypanthium up to 45-46 mm long (not only 14-18 mm).

The taxonomic relationship between *O. pycnocarpa* Atkinson & Bartlett in Bartlett and *O. royfraseri* Gates (Syn. *O. turoviensis* Rostański) is still unclear in the literature. These two taxa are treated either as the same species (*e.g.* Jehlík & Rostański 1995, Fischer *et al.* 2008), or as distinct ones (*e.g.* Rostański *et al.* 2004, 2010, Rostański & Verloove 2015 etc.) differentiated especially by the size of flowers, *i.e.* petals of 12-18 × 14-20 mm and 5-12 × 5-12 mm, respectively; sepal tips of 4-7 mm and 2-3 mm, respectively, although according to Gates (1936), the typical *O. pycnocarpa* has, on the contrary, slightly smaller flowers (petals of 9-13 × 10-13 mm) than *O. royfraseri* (13-18 × 13-17 mm).

In Romania, *O. pycnocarpa* blooms later than the other species mentioned in this paper, starting with the second decade of July. The late blooming of this species (as *O. chicaginensis*) as against other related ones (*e.g. O. biennis*) was also indicated in Austria by Kappus (1960).

Chromosomes: 2n=14, with Θ12+ 1_{II} (Renner & Cleland 1933; Gates 1958) in the meiotic metaphase I; the Renner complexes are rather uncertain: either *dependens* ♀ and *dentans* ♂ (as *O. pycnocarpa*) (Gates & Catcheside 1932, Gates 1958) or *excellens* ♀ and *punctulans* ♂ (as *O. chicaginensis*) (Renner & Cleland 1933; Gates 1958). According to Dietrich *et al.* (1997), it is a heterogamous PTH strain (*i.e.* one Renner complexe of chromosomes (α) is transmitted through the egg, the other (β) through the pollen), with the genome-plastome combination BA-III.

Oenothera suaveolens Person, Syn. pl.: 1, 408. 1805 (Syn.: *O. suaveolens* Desfontaine *nomen nudum*, Tabl. Ecole Bot. 169. 1804; *O. biennis* L. subsp. *suaveolens* (Persoon) Rouy & Camus, Fl. France 7: 200. 1901) [Treatment in Dietrich *et al.* (1997): phenotype of *O. biennis* L.]

Origin and general distribution. The first report of this species in botanical literature is found at Desfontaines (1804) which listed *O. suaveolens* (as *nomen nudum*) among the species cultivated in the garden of the Museum of Natural History in Paris. A year later, the species was described under this name by Persoon (1805). From the descriptions published in the 19th century (Persoon 1805, Don 1832), one can understand that the species is native in America, while in Europe it did not occur in spontaneous state (at that time), but only cultivated in gardens, for its large flowers with a pleasant scent of orange. It seems, however, that *O. suaveolens* do not occur as a spontaneous plant in North America (Gates 1958, Rostański 1982, Rostański & Karlsson 2008), while in Europe it is frequent, especially in southern regions (Rostański & Forstner 1982). Hence, it should be either native in France (Gates 1958), or in southern Europe (Rostański & Forstner 1982) or of unknown origin (Rostański *et al.* 2010). However, since the entire subsect. *Oenothera*, which includes this taxon, is clearly of North American origin, as shown in the introduction, it is most likely that *O. suaveolens* has a hybridogenous origin in Europe from North American taxa introduced in historic time, having perhaps *O. argillicola* and *O. biennis* as parent species, as suggested by Gates (1958) and Dietrich *et al.* (1997).

As a wild plant, it was first reported from Hungary (1862) (Mihulka & Pyšek 2001), France (1912) (de Vries 1918) and Germany (1938) (Stubbe 1953). It is now quite widely naturalized in Europe (Jehlík & Rostański 1979, Rostański *et al.* 2010),

particularly in the southern regions (Rostański & Forstner 1982), including all countries neighbouring Romania: the Republic of Moldova (first record on the Prut river bank in Toceni, leg. C. Zahariadi, 1936, as *O. biennis*) (Rostański *et al.* 2004), Ukraine (very rare) (Rostański *et al.* 2004, 2010), Hungary (Király 2009) or Serbia (Rostański *et al.* 2010).

Distribution in Romania. We have identified it in several localities from eastern Romania, as follows: Galați county – near the Șendrenii Vechi village (N45º25'08.6", E27º53'08.5", 14 m a.s.l.; stable sands of the left bank of the Siret river, leg. Sîrbu & Oprea 09.09.2015, Sîrbu 02.08.2016), and near Bucești-Ivești (N45º37'45.02", E27º29'29.72", 18 m a.s.l.; stable sands of the left bank of the Siret river; leg. Sîrbu 01.08.2017); Iași county – near the Răchiteni village (between N47º04'20.54", E26º54'52.51", 188 m a.s.l., and N47º03'42.76", E26º554'41.66", 188 m a.s.l.; stable sands of the right bank of the Siret river; leg. Sîrbu 28.08.2016, 28.06.2017; N47º03'12.21", E26º55'33.02", 188 m a.s.l., leg. Sîrbu 26.08.2017, stable sands of the right bank of the Siret river; between N47º03'12.95", E26º55'44.32", 184 m a.s.l. and N47º03'06.67", E26º55'38.02", 188 m a.s.l., leg. Sîrbu 26.08.2017, stable sands of the right bank of the Siret river), and at Socola-Iași (N47º08'27.34", E27º36'36.56", 37 m a.s.l.; N47º08'24.78", E27º37'59.67", 36 m a.s.l.; ruderal places from the railway station and the surrounding areas; leg. Sîrbu 17.07.2016, 15.06.2017).

Surprisingly, this is not the first time when *O. suaveolens* was collected in Romania. In this respect we mention two specimens collected along the road Ungheni-Bosia (Iași county), on the Prut riverbank (the Herbarium of the Faculty of Biology from Iași, I-76706, I-76707, leg. C. Dobrescu, 15.07.1937, as *O. biennis* L.). However, since it has been identified under another name, *O. suaveolens* has remained unknown in the flora so far.

Given that in all mentioned localities, populations of *O. suaveolens* consist of a large number of individuals, both in anthropogenic and natural habitats, in places very distant from one another, we consider that it can be considered fully naturalized (even invasive) in Romania.

Ecology. According to Jehlík & Rostański (1979), *O. suaveolens* is a thermophilous species and grows well especially on sandy places, at forest edges or along communication routes, which is consistent with our field observations.

Description of specimens identified on the field (Fig. 2). Plants of 130-250 cm height. Stem simple or branched, green, slightly light brown towards the base, sometime slightly reddened above, pubescent with arcuate stiff hairs with green or translucent bulbous base and short appressed crisped hairs (sometimes, on the reddened splotches, with slightly reddened papillae). Cauline leaves short petiolate, usually ovate-lanceolate, flat, with straight apex, slightly denticulate along margins, green to grayish green, with white midrib, ± dense patent to sub-appressed pubescent, the lowermost up to 16 × 4 cm, the upper ones gradually smaller. The inflorescence simple or branched at the base, erect. Rhachis green to grayish-green, with long arcuate stiff hairs with green or translucent bulbous base and short appressed crisped hairs. Glandular hairs only on the uppermost part, in the late flowering phase. Bracts lanceolate, subsessile, V-shaped (concave), green to graysh-green, with pubescence as in the cauline leaves, the lowermost ones longer than fruits, the uppermost ones reaching or exceeding the top of the buds (before anthesis) or the top of the hypanthium (at anthesis). Flowers

chasmogamous, with orange flavour. Ovary of ca. 9-12 × 2-3 mm (at anthesis), in the first flowering phase grayish-green (with numerous short appressed crisped hairs and long arcuate stiff hairs, without glandular hairs), in the late flowering phase green (with fewer appressed crisped hairs and arcuate stiff hairs, also with patent glandular hairs). Hypanthium 28-35 × 2-3 mm, in the first flowering phase grayish green, without glandular hairs, densely pubescent with short crisped hairs mixed with longer ± patent stiff hairs, in the late flowering phase green to yellowish, predominantly glandular hairy, with few ± patent stiff hairs. Buds 18-20 × 4-6,5 mm, green to yellowish, ± cylindrical, tapered to the top, free sepal tips of 3-4 mm long, terminal, adherent at base in bud, above ± parallel, in the first flowering phase grayish green (pubescence as at hypanthium), later yellowish-green also with glandular hairs. Petals yellow, obcordate, of (22-)25-35 × (19-)25-35(-40) mm, somewhat smaller in the late flowering phase (plants with petals much larger than long belong probably to the var. *latipetala* Soldano). Anthers of 8.5-10 mm long. Stygma lobes 3-5 mm long, spreading between anthers. Infructescence rather dense (ca. 0.7-1.2 fruits per cm of rhachis). Capsules ± cylindrical, slightly tapered upwards, 25-30 × 5-6 mm (usually longer than internodes of the rhachis), light brown, ± greyish hairy, with numerous appressed crisped hairs and semi-patent stiff hairs (without red punctuation), glandular hairs only on the uppermost (youngest) capsules, with truncate teeth, ca. 1 mm length. Seeds prismatic, dull brown, of 1.5-2 × 1-1.2 mm, with edges without wings.

Fig. 2. Oenothera suaveolens: a-inflorescence, b-stem, c-leaf, d-ovary, e-petals, f-capsule. Scale bar: a-6.5 mm; b, d, f-2 mm; c-8 mm; e-10 mm.

Chromosomes: 2n=14, with Θ12+ 1_{II} in the meiotic metaphase I; the Renner complexes: *albicans* ♀ and *flavens* ♂(♀) (Linder 1957; Gates 1958). According to Dietrich *et al.* (1997), it is a heterogamous PTH strain, with the genome-plastome combination AB-II.

Oenothera depressa E. Greene, Pittonia: 2, 216. 1891 (Syn.: *O. salicifolia* Desfontaines, Tabl. Ecole Bot., ed. 2: 271. 1815, *nomen nudum*, *ex* G. Don, Gen. Syst. 2: 685. 1832; *O. hungarica* (Borbás) Borbás, Magyar Bot. Lapok 2: 246. 1903; *O. bauri* Boedijn, Zeitschr. Abst. Vererb., 32: 360. 1924; *O. strigosa* (Rydberg) Mackenzie & Bush var. *depressa* (Greene) Gates, Tax. Genet. *Oenothera*, 34. 1958; *Onagra salicifolia* (Desfontaines *ex* G. Don) Spach, Hist. Veg. (Phan.), 4: 361. 1835; *On. depressa* (Greene) Small, Bull. Torr. Bot. Club, 23: 170. 1896; *On. hungarica* Borbás, Kert 1902: 204. 1902) [Treatment in Dietrich *et al.* (1997): *Oenothera villosa* Thunberg, subsp. *villosa* Dietrich & Raven, *Ann. Missouri Bot. Gard.*, 63: 382-383. 1976]

Origin and general distribution. It is native to the Great Plains region of North America (Dietrich *et al.* 1997), now established throughout much of North America and naturalized in South America, Asia, South Africa (Dietrich *et al.* 1997) as well as in Europe (Jehlík & Rostański 1979, Dietrich *et al.* 1997, Rostański *et al.* 2010).

It has occurred in Europe since the first half of the 19th century (Rostański & Ellis 1979, Rostański 1982), and now it is naturalized in large part of the continent, less in the southern and south-western regions (Rostański *et al.* 2010, Rostański & Verloove 2015). Among the countries neighboring Romania, it is reported from Hungary – as a wild plant since 1836 (Jehlík & Rostański 1979), Serbia – relatively frequent, first record as a spontaneous plant in 1967 (Zlatković *et al.* 1998) and Ukraine – frequent (Rostański *et al.* 2004).

Distribution in Romania. We found it on the sandy banks of the Siret river, from the Galați county at Șendrenii Vechi (N45º25'07.12", E27º53'05.26", 14 m a.s.l.; leg. Sîrbu 02.08.2016), Bucești-Ivești (N45º37'43.46", E27º29'29.66", 17 m a.s.l.; leg. Sîrbu 01.08.2017), and Movileni (N45º46'12.09", E27º21'14.93", 33 m a.s.l.; leg. Sîrbu 11.08.2017). In the mentioned localities we have identified hundreds of specimens of this species, both in vegetative (rosette) and flowering-fruiting phases. This is a proof that the species successfully reproduces itself, without human help, so we consider it as a naturalized (even invasive) alien species in eastern Romania. We also have found that a specimen of *O. depressa* had been previously collected in Romania from a ruderal place at the Miercurea Ciuc railway station (Harghita county). This specimen (leg. G. Negrean, 06.08.2001, as "*O. ? biennis* L.") is deposited in the Herbarium of the Botanical Garden of Bucharest (BUC - *Flora Romaniae Herbarium G. Negrean* no. 1824).

Ecology. In America de Nord, where it is native, *O. depressa* grows in a variety of habitats, such as prairies, banks of rivers or lakes, open woodlands, old fields, and other disturbed sites (Dietrich *et al.* 1997). Similarly, in Europe it most often colonizes dried riverbeds, sandy riverbanks, dry grasslands, railways, railway stations and other ruderal fields, fallow grounds (Jehlík & Rostański 1979, Rostański 1982, Király 2009, Rostański *et al.* 2004, Rostański & Verloove 2015). In Ukraine, according to Rostański *et al.* (2004), it tolerates well saline conditions on sea dunes and shores.

Description of specimens identified on the field (Fig. 3). Stem of ca. 150 cm high, with arched-erect branches, reddish-peach tinted, dense pubescent with appressed

or semi-appressed stiff hairs with low red conical base and short appressed hairs. Cauline leaves 9 × 1.8 cm, sub-sessile or short petiolate, ovate-lanceolate, sinuous wavy, with twisted apex, denticulate, grey green with midrib white or turned red at base later, dense appressed pubescent. Inflorescence simple, erect, with rhachis red-peach tinted, pubescence as on the stem but denser towards the top, without glandular hairs. Bracts sinuous wavy, ± V-shaped, with twisted apex, the lowermost ovate-lanceolate, much longer than fruits, the upper ones narrow-lanceolate, sub-sessile or sessile, shorter than the open flowers. Flowers cleistogamous or/and chasmogamous. Ovary of 10 × 2 mm (at anthesis), whitish or grayish, densely covered with short and long ± straight appressed stiff hairs (strigose), the latter with or without red papillae, and without glandular hairs.

Fig. 3. Oenothera depressa: a-inflorescence, b-stem, c-leaf, d-flower and bracts, e-ovary, f-bud, g-petal, h-capsule. Scale bar: a-4.5 mm; b, g-2 mm; c-8 mm, d-4 mm; e-1.5 mm; f-2.5 mm.

Hypanthium up to 25-30 mm long, abundant appressed-hairy (also with some sub-appressed longer hairs), without glandular hairs, yellowish or slightly tinted red-peach. Buds ± cylindrical, gradually tapered, 16-18 × 3-4 mm, abundant white appressed hairy (as at hypanthium), without glandular hairs, usually red striped or diffuse stained red, with free sepal tips of ca. 3 mm long, terminal, adherent at base in bud, above ± parallel. Petals yellow, obcordate, of 14-20 × 14-20 mm. Anthers of 7 mm long. Stygma lobes spreading between anthers, ca. 5 mm long. Infructescence rather dense (ca. 0.6-0.7 fruits per cm of rhachis). Capsules ± cylindrical, slightly tapered upwards, greyish appressed hairy, without glandular hairs, of 25-32 × 5-6 mm (obvious

longer than internodes of the rhachis), red punctuated when young, with emarginated teeth of ca. 1 mm length or shorter. Seeds of 1.5 × 1 mm, prismatic, with narrow winged edges or wingless, light brown.

Note. In the North American literature (Dietrich *et al.* 1997), the name *O. depressa* is treated as a synonym of *O. villosa* subsp. *villosa*, a North American taxon widely naturalized outside his native area (Europe, Asia, South America, and South Africa). According to the same references, this subspecies differs from *O. villosa* subsp. *strigosa* (which is indicated only from its native area, *i.e.* the Rocky Mountain region and Pacific Northwest), *inter alia*, by sepals green to yellowish green (in contrast, subsp. *strigosa* should have sepals usually yellow flushed with red, or red). However, according to European literature (Rostański 1982, Rostański *et al.* 2004, 2010, Király 2009 etc.), the plants designated as *O. depressa* have sepals red or red striped, just like our specimens.

Chromosomes: 2n=14, with Θ14 (Linder 1957, Dietrich *et al.* 1997) or Θ12+ 1_{II} (Dietrich *et al.* 1997) in the meiotic metaphase I; the Renner complexes: *laxans* ♀ and *undans* ♂ (Linder 1957, Gates 1958); it is a heterogamous PTH taxon with the genome-plastome combination: AA-I (Dietrich *et al.* 1997).

Oenothera* × *fallax Renner, Zeitschr. Indukt. Abstammungs-Vererbungsl., 18: 176. 1917, *em.* Rostański, Fragm. Flor. Geobot. 11: 507. 1965 (= *O. glazioviana* × *O. biennis*) [Treatment in Dietrich *et al.* (1997): *O. biennis* × *O. glazioviana*]

This is a taxon native in Europe as a stable hybrid between two North-American species, *O. glazioviana* and *O. biennis* (Rostański 1982, Rostański & Forstner 1982, Rostański *et al.* 2010, Rostański & Verloove 2015). The oldest known specimen was collected in the United Kingdom (Rostański 1982, Mihulka & Pyšek 2001). This hybridogenous taxon has become well established (locally abundant) especially in places where the parent species are sympatric (but it occasionally may be found by itself), often in botanical gardens, ruderal places or sand-dunes (Jehlík & Rostański 1979, Rostański & Forstner 1982, Dietrich *et al.* 1997, Rostański *et al.* 2010), in large part of Europe, including countries neighbouring Romania, such as Ukraine (very rare), Hungary and Serbia (Rostański *et al.* 2004, 2010).

According to the available data, in Romania it is very rare. We have identified it, as a sub-spontaneous plant, on a grassland from the taxonomic sector of the Botanical Garden of Iași (leg. Oprea & Sîrbu 20.07.2016) (Fig. 4 a-c).

O. × *fallax* inherits the axis of inflorescence and ovary distinctly red-punctuated, sepals red-striped and capsule teeth somewhat emarginated, from *O. glazioviana*, and the cauline leaves ± plane (only the lower ones crinkled), flowers smaller and stigma lobes spreading between anthers, from *O. biennis* (Rostański 1982, Rostański *et al.* 2010, Rostański & Verloove 2015). From both parental species it inherits the abundance of glandular hairs in inflorescence (the entire rhachis, ovaries and all capsules).

Chromosomes: 2n=14, with Θ12+ 1_{II} in the meiotic metaphase I (like *0e. glazioviana*); the Renner complexes: *velans* ♀ (A genome from *O. glazioviana*) and *rubens* ♂ (B genome from *O. biennis*) (Dietrich *et al.* 1997).

Fig. 4. Oenothera × fallax (a-inflorescence, b-flower, c-capsule) and *Oenothera × wienii* (d- inflorescence, e- capsule). Scale bar: a-6 mm; b-6.5 mm, c-2.5 mm, d-5.5 mm; e-3 mm.

Oenothera* × *wienii Renner, Flora 131: 198 (1937), *nomen nudum*, *ex* Rostański, Fragm. Florist. Geobot. 23: 289. 1977 (= *O. rubricaulis* × *O. depressa*) [Treatment in Dietrich *et al.* (1997): *O. biennis* × *O. villosa* subsp. *villosa*]

This is another stable hybrid which arose in Europe having, as genitors, two North-American species, *O. rubricaulis* × *O. depressa* (Rostański *et al.* 2010). It was originally known from Dantzig / Gdańsk (in Northern Poland) (Gates 1958, Rostański & Forstner 1982), but nowadays it is spread from Central Europe (Rostański & Forstner 1982, Jehlík & Rostański 1995, Rostański *et al.* 2010) to the North (Scandinavia) (Rostański & Karlsson 2008, Rostański *et al.* 2010) and East (Ukraine) (Rostański *et al.* 2004, 2010). It grows mainly in the places of common occurrence of the parental species (Rostański *et al.* 2004).

In Romania we collected it in ruderal places associated with railways from the Sibiu train station (leg. Sîrbu & Oprea, 19.08.2011) (Fig. 4 d-e).

O. × *wienii* is more similar to *O. depressa* (according to Gates 1958, it looks rather as a variety of *O. depressa*), by grayish pubescence of leaves and stem, ovary whitish appressed hairy, capsule teeth emarginate (Gates 1958, Jehlík & Rostański 1995, Rostański & Karlsson 2008), but differs from this by some features from *O. rubricaulis*, such as: flat or only slightly wavy leaves, slightly higher conical red papillae, denser inflorescence, flowers always chasmogamous, shorter hypanthium, flower buds always green, glandular hypanthium, sepals and ovary (Jehlík & Rostański 1995, Rostański & Karlsson 2008).

Chromosomes: 2n=14; the Renner complexes: *tingens* ♀ (A genome) and *undans* ♂ (A genome) (Gates 1958, Dietrich *et al.* 1997, Rostański *et al.* 2004).

b) Taxa confirmed in the flora by herbarium material

Oenothera rubricaulis Klebahn, Jahrb. Hamburg. Wiss. Anst. 31, Beih. 3: 23. 1913 (Syn.: *O. muricata* L. Syst. Nat., ed. 12, 263. 1767. *nomen confusum*) [Treatment in Dietrich *et al.* (1997): phenotype of *O. biennis* L.]

Origin and general distribution. According to Rostański & Ellis (1979) and Rostański (1982), *O. rubricaulis* Klebahn is the same as O. *muricata* L. However, since the name *O. muricata* has most often been misapplied to other species (*e.g. O. ammophila* Focke, *O. parviflora* L. or *O. oakesiana* (A. Gray) Robbins ex Wats. & Coult.), it must be rejected as a *nomen confusum*. Like few other taxa from the subsection *Oenothera*, *O. rubricaulis* do not occur in the wild in North America (Rostański 1982, Dietrich *et al.* 1997). Consequently, it is considered native in Europe (Rostański 1982, Rostański & Forstner 1982, Rostański & Karlsson 2008, Rostański *et al.* 2010), originating perhaps via hybridization, from North-American taxa introduced in Europe long time ago (Dietrich *et al.* 1997, Rostański & Karlsson 2008). The species, originally described from culture, has been recorded in the wild in Europe since the middle of the 19th century, *e.g.* in 1841, Scandinavia (Rostański & Karlsson 2008), or in 1846, Austria (Rostański & Forstner 1982, Mihulka & Pyšek 2001). It is currently widespread in most of Europe, except for southern regions (Spain, Italy, and the Balkan Peninsula) (Rostański *et al.* 2010). Likewise, according to Jehlík & Rostański (1979) and Rostański (1982), it has been reported from Asia. In the neighbourhood of Romania, the species has been reported from Hungary (Rostański & Forstner 1982, Király 2009) and Ukraine (Rostański *et al.* 2004). In Eastern Europe, it is considered (alongside with *O. biennis* and *O. depressa*) the most frequent species of *Oenothera* with the highest invasion rate (Rostański *et al.* 2004, Tokhtar & Groshenko 2014, Rostański & Verloove 2015).

Distribution in Romania. Sîrbu & Oprea (2011) assumed the presence of this species in the flora of Romania (as *O. muricata* L., syn. *O. rubricaulis* Klebahn) based on the reporting of the name "*O. muricata* L.'' in the botanical literature (*e.g.* Schur 1866).

We however have found that the plant designated in the Flora R.P.România, vol. V, pp. 514-519 (Morariu, in Săvulescu 1957), under the name *O. muricata* L. (*Onagra muricata* Mnch.), according to the description (*e.g.* the tip of the inflorescence nodding during flowering time; hypanthium of 4-5.5 cm long etc.), cannot be *O. rubricaulis* Klebahn, but rather *O. parviflora* L. or another species from the same series (*e.g. O. oakesiana* (A. Gray) Robbins ex Wats. & Coult.). In addition, in the herbaria from Romania studied by us no specimen previously collected by various authors could be without doubts assigned to this species.

Nevertheless, we can confirm now the presence of *O. rubricaulis* in Romania. It grows on stable fluvial sands on the right bank of the Siret river, near the Răchiteni village, Iași county (N47º04'07.44", E26º54'49.54", 188 m a.s.l.; leg. Sîrbu 28.08.2016).

Ecology. Like other related species, *O. rubricaulis* prefers disturbed habitats on sandy soils, such as banks of rivers or lakes, forests edges, railway stations, roads, ruderal places etc. (Jehlík & Rostański 1979, Rostański 1982, Rostański *et al.* 2004). According to Tokhtar & Groshenko (2014) this species shows a higher ecological plasticity compared to its relatives.

Fig. 5. Oenothera rubricaulis: a-inflorescence, b-stem and leaf, c-ovary, d-petal, e-capsule. Scale bar: a, b-3 mm; c-1.3 mm, d-10 mm; e-1.5 mm.

Description of specimens identified on the field (Fig. 5). Plants of 80 cm height. Stem simple, reddened in the middle third, pubescent with arcuate stiff hairs with coniform red base and short appressed crisped hairs. Cauline leaves up to 8.5 × 1.7 cm, short petiolate, elliptic-lanceolate, ± flat, slightly denticulate, ± patent pubescent, green with red midrib. Bracts similar to cauline leaves but gradually decreasing in size, the lowermost longer than fruits, the uppermost ones glandular, ca. by the length of the ovary (at anthesis). Inflorescence erect, branched at the base. The rhachis reddish towards the base and to the tip, with pubescence similar to the stem but in addition with numerous glandular hairs. Flowers chasmogamous. Ovary (at anthesis) of ca. 9 × 1 mm, green, with glandular hairs mixed with ± patent stiff hairs with red papillae, and few short appressed crisped hairs. Hypanthium 24 × 1-1.5 mm, yellowish, sparse glandular hairy, also with few ± patent stiff hairs (occasionally with red papillae). Buds 10 × 3 mm, green, ± cylindrical, abruptly narrowed to the top, sparse patent hairy with glandular hairs, and ± patent stiff hairs, occasionally with red papillae; free sepal tips of 2 mm long, terminal, adherent at base in bud, above ± divergent. Petals yellow, obcordate, of 9-12 × 8-12 mm. Anthers of 4-5 mm long. Stygma lobes 3-4 mm long, spreading between anthers. Infructescence dense (ca. 1-1.4 fruits per cm of rhachis). Capsules ± cylindrical, tapered upwards, of ca. 25 × 5-6 mm (longer than internodes of the rhachis), greenish-brown, with glandular and stiff hairs (with red papillae when young), also with few short crisped hairs, with truncate teeth, of ca. 1 mm length.

Chromosomes: 2n=14, with Θ14 (Linder 1957) or Θ6+Θ8 (Gates 1958) in the meiotic metaphase I; the Renner complexes: *tingens* ♀ and *rubens* ♂ (Linder 1957, Gates 1958); it is heterogamous, with the genome-plastome combination: AB-II (Dietrich *et al.* 1997).

Oenothera parviflora L., *Syst. nat.*, ed. 10. 998. 1759 (Syn.: *O. muricata* auct. non L.; *O. biennis* L. var. *parviflora* (L.) Torrey & A. Gray, Fl. N. Amer., 1: 492. 1840) [Treatment in Dietrich *et al.* (1997): *O. parviflora* L.]

Origin and general distribution. It is native to North America, nowadays naturalized in Europe, China, Japan, S Africa, and New Zealand (Dietrich *et al.* 1997, Jiarui *et al.* 2007, Rostański *et al.* 2010). It has been recorded in Europe (in the wild) since 1871 (Austria) (Rostański & Forstner 1982, Mihulka & Pyšek 2001) or even 1612, according to some assumptions (Gates 1958), however yet not very common. According to Rostański *et al.* (2010), it is rather rare (casual) in Eastern and Central Europe, Great Britain and Scandinavia (Jehlík & Rostański 1979, Rostański 1982, Rostański *et al.* 2010). Near Romania, it is known only from Ukraine (very rare – only 3 localities yet known) (Rostański *et al.* 2004).

Distribution in Romania. It seems that various botanical works indicated the occurrence of this species in Romania since the second half of the 19th century. Kanitz (1879-1881) and Brândză (1898) reported "*Oenothera biennis* L. var. *parviflora* Koch non L.", from Dobrogea. Prodan (1939a, b) and Borza (1947) took over this nomenclatural combination as a synonym for *O. muricata* Murray (non L.), with two varieties, *i.e*. *muricata* and *parviflora* (L.) Levi. Indeed, the plant described by Murray (1776), under the name of "*O. muricata* L.", has rather distinguishing features of *O. parviflora* L., *e.g.*: the tip of stem / inflorescence nodding ("*caulis erectus, apice incurvus*"), sepal tips on flower buds divergent ("*calyx*" ... "*denticulis subulatis longioribus divergentibus*"), etc. (the same also applies in the case of the description given by Vail (1907) for "*O. muricata* L.", or by Moench (1794) for "*Onagra muricata*"). In the *Flora of P.R. România*, 5, pp. 516-519, Morariu, in Săvulescu (1957) replaced the name "*O. muricata* Murray", previously reported by Prodan and Borza, with that of "*O. muricata* L.". However, the plant described there could be interpreted (as shown above) either as *O. parviflora* L. or as another species from the same series, but not as "*O. muricata* L." – in its actual meaning. In the botanical works of the last decades, the species is reported in Romania as *O. parviflora* L., with synonyms either *O. muricata* L. (Beldie 1977, Ciocârlan 1994), or *O. muricata* auct. non L. (Ciocârlan 2000, 2009, Sîrbu & Oprea 2011, Sârbu *et al.* 2013). Some authors (Jehlík & Rostański 1979, Rostański *et al.* 2010), taking perhaps into consideration the rarity of the species *O. parviflora* in Europe, compared to the more common *O. oakesiana*, indicate only the latter species from Romania. However, without reliable herbarium specimens, we cannot assert whether previous data could be assigned certainty to one of these two species.

As a result of our field research, we can confirm now the presence of *O. parviflora* in the flora of Romania, based on herbarium specimens collected on a ruderal place from Mediaș, Sibiu county (leg. Oprea 13.08.2016).

Fig. 6. Oenothera parviflora: a-inflorescence, b-stem, c-leaf, d-bud, e-petal, f-capsule. Scale bar: a-2.5 mm, b-1.5 mm; c-7.5 mm, d-2 mm; e-10 mm, f-2.3 mm.

Ecology. In the natural area from North America, *O. parviflora* occurs usually in open or disturbed, sandy or gravelly sites (*e.g.* roadsides, fallows, clearings, river banks, etc.) (Dietrich *et al.* 1997). In Europe it usually grows on open sandy habitats near settlements (Rostański *et al.* 2004).

Description of specimens identified on the field (Fig. 6). Plants of ca. 130 cm height. Stem branched, green, reddened in part, with arcuate stiff hairs with green or translucent, sometime pinkish coniform base and short appressed crisped hairs. Cauline leaves up to 10 × 2 cm, short petiolate, narrow elliptic-lanceolate, short denticulate, flat with straight apex, spars (sub-)appressed pubescent, green, midrib white or reddened toward the base. Bracts subsessile or short petiolate, narrow lanceolate, flat, green or grayish green, the lowermost longer than fruits, the uppermost ± glandular-puberulent on the underside, as long as the ovary or shorter (at anthesis). The tip of the inflorescence rather erect (advanced stage of flowering). The rhachis reddish towards the base, green above with glandular hairs (more abundant to the top) and stiff hairs semi-appressed or erecto-patent, with conical green (or pink) papillae. Flowers chasmogamous. Ovary of ca. 10-12 × 1 mm (at anthesis), green, with glandular hairs mixed with ± semi-appressed stiff hairs with translucent papillae, and few short appressed crisped hairs. Hypanthium yellowish green, of 33-40 × 1 mm, with sparse patent glandular and stiff hairs. Buds 10 × 3 mm, green, ± cylindrical, abruptly narrowed to the top, sparse pubescent (as in hypanthium), with free sepal tips of 1-2 mm

long, clearly subterminal, separated at base in U-shape). Petals yellow, obcordate, of 10-12 × 9-10 mm. Anthers of ca. 4-5 mm long. Stygma lobes 3-4 mm long, spreading between anthers. Infructescence rather dense (ca. 0.7-1 fruits per cm of rhachis). Capsules ± cylindrical, slightly tapered upwards, of ca. 28-37 × 4-6 mm (usually longer than internodes of the rhachis), greenish-brown, with numerous ± appressed stiff hairs (without red papillae), few short crisped hairs, the younger ones also with glandular hairs; teeth truncate to slightly emarginate, of ca. 1-1/5 mm length. Seeds prismatic, brown, of 1.5-1.8 × 0.8-1 mm, edges narrow winged or without wings.

Chromosomes: 2n=14, with Θ14 (Dietrich *et al.* 1997) in the meiotic metaphase I; the Renner complexes: *augens* ♀ and *subcurvans* ♂ (Linder 1959); it is heterogamous, with the genome-plastome combination: BC-IV (Dietrich *et al.* 1997).

c) Identification key.

We give below an identification key for the species referred in this paper, including *O. oakesiana*. Some important diagnostic characteristics, *e.g.* the red pigmentation, the colour of sepals, the size and shape of petals, the shape of the sinus between sepal tips in bud etc., become less obvious in herbarium and should preferably be assessed on fresh material.

1a. Inflorescence erect (*e.g.* Fig. 1a, 2a). Free sepal tips apical, adherent at base in bud, above parallel or divergent (*e.g.* Fig. 3f) **2**

1b. Inflorescence nodding at anthesis (sometimes becoming erect, with time). Free sepal tips subapical, obviously separated from each-other, with space between sepal apices U or V shaped (Fig. 6a,d) (**ser. *Rugglesia*** Rostański) ……..…….... **9**

2a. Ovary and young capsules whitish or grayish, densely covered with short crisped and long ± straight appressed stiff hairs (strigose) (Fig. 3a,e; Fig. 9d), usually without glandular hairs. Papillae of the stiff hairs on stem and rhachis low-conical (Fig. 3b, 9d). Leaves with dense, ± appressed hairs, velvety to the touch, usually grayish-green. Capsule teeth emarginate (Fig. 3h) (**ser. *Devriesia*** Rostański) ……..…. **3**

2b. Ovary and young capsules with short crisped and long arcuate erecto-patent stiff hairs. Glandular hairs on ovaries and young capsules either dominant (ovary and young capsules green, *e.g.* Fig. 7c,e) or few to absent (ovary and young capsules grayish-green, due to the abundance of crisped and stiff hairs, *e.g.* Fig. 2d,f). Papillae of the stiff hairs on stem and rhachis high-conical (Fig. 9b,r,p) to almost cylindrical (Fig. 9p). Leaves ± patent hairy, usually green. Capsule teeth truncate or obtuse (*e.g.* Fig. 1f; Fig. 2f), rarely slightly emarginate (**ser. *Oenothera***) ……. **4**

3a. Cauline leaves and bracts with wavy margins and curved tips. Red papillae very low. Infructescence loose. Flowers often cleistogamous (Fig. 3a). Buds reddish (peach) or red striped. Hypanthium of 25-35 mm long. Plant usually without glandular hairs (Fig. 3) ……..…… ***O. depressa***

3b. Cauline leaves and bracts flat or slightly wavy. Red papillae higher. Infructescence rather dense. Flowers always chasmogamous. Buds always green. Hypanthium of 15-25 mm long. Glandular hairs present at late flowers on hypanthium, buds ovary and capsules (Fig. 4d,e) ……...…… ***O. × wienii***

Fig. 7. Oenothera biennis: a-inflorescence, b-leaf, c-ovary and rhachis, d-petal, e-capsule. Scale bar: a-6.5 mm; b-8 mm; c-1.2 mm; d-7 mm; e-1.3 mm.

4a. The bulbous base of stiff hairs green or translucent (stem, inflorescence axis and ovary without red papillae) (*e.g.* Fig. 2a,b; Fig. 7c; Fig. 9b,s). Inflorescence axis green in the upper part. Sepals in buds green **5**

4b. The bulbous base of stiff hairs red (stem, inflorescence axis and ovary with red papillae) (*e.g.* Fig. 1b,c; Fig. 5c; Fig. 8b; Fig. 9p,r). Sepals in buds green or red striped **6**

5a. Inflorescence axis (from the bottom to the top), ovary and all capsules, always with numerous glandular hairs and fewer stiff and crisped hairs (inflorescence and young capsules predominantly green). Flowers weak fragrant. Cauline leaves elliptic to elliptic-lanceolate, with red midrib (rarely white, at shade-grown plants). Bracts usually do not exceed 1/3-1/2 of the hypanthium length (at anthesis). Petals always wider than long, 15-30 × 18-35 mm (Fig. 7) ..... ***O. biennis***

5b. Inflorescence axis, ovary, hypanthium and capsules with numerous crisped and stiff hairs, without glandular hairs in the first half of the flowering phase (the inflorescence and young capsules are predominantly grayish-green). Glandular hairs present only in the late flowering phase, toward the tip of the inflorescence, even then usually fewer than the stiff and crisped hairs. Flowers with a distinctive orange scent. Cauline leaves lanceolate or oblanceolate, always with white midrib. Bracts often reach or exceed the hypanthium length (at anthesis). Petals (22-)25-35 × (19-)25-35(-40) mm, as long as wide or slightly longer, or (var. *latipetala*) larger than long (Fig. 2) ..... ***O. suaveolens***

Fig. 8. Oenothera glazioviana: a-inflorescence, b-ovaries and rhachis, c-petal, d- capsule. Scale bar: a-8 mm; b-2 mm; c-7 mm; d-1.1 mm.

6a. Stigma lobes considerably exceeding anthers. Sepals red-striped. Petals of 30-50 × 30-58 mm (Fig. 8) ……..... ***O. glazioviana***

6b. Stigma lobes spreading between anthers. Sepals red-striped or green. Petals much smaller ……..……...…… **7**

7a. Sepals red-striped. Petals wider than long, usually more than 20 mm. Capsule teeth truncate to slightly emarginated (Fig. 4a-c) ……..……...….. ***O. × fallax***

7b. Sepals always green. Petals as long as wide or slightly longer, less than 20 mm. Capsule teeth truncate to obtuse …….. **8**

8a. Bracts flat. Rhachis red at tip, entirely glandular. Hypanthium of 15-25 mm long. All ovaries and capsules predominant glandular (Fig. 5) …..……. ***O. rubricaulis***

8b. Bracts wavy. Rhachis green at tip, first eglandular later glandular on the upper part only. Hypanthium of 30-46 mm long. Ovaries and capsules with numerous appressed crisped hairs, and (semi-)patent stiff hairs with prominent red papillae (as in the previous species, red coloration disappears at the ripe fruits); only the late ovaries and capsules with glandular hairs (Fig. 1) …… ***O. pycnocarpa***

Fig. 9. Stiff hairs in *Oenothera* subsect. *Oenothera*: b-*O. biennis*, d-*O. depressa*, p-*O. pycnocarpa*, r-*O. rubricaulis*, s-*O. suaveolens*.
Scale bar: 0.2 mm.

9a. Stem predominantly erecto-patent hairy. Leaves light green. Space between sepal apices U-shaped. Petals of 6-12 mm long. Capsules dark green when dry. Capsule teeth truncate to slightly emarginate (Fig. 6) ..... ***O. parviflora***

9b. Stem predominantly appressed hairy. Leaves grayish-green or dark green. Space between sepal apices V-shaped. Petals of 12-16 mm long. Capsules usually rusty brown when dry. Capsule teeth obtuse to truncate ……... ***O. oakesiana***.

Conclusions

In this paper, we report for the first time in Romania 5 taxa of *Oenothera*, sect. *Oenothera*, subsect. *Oenothera* (3 species and 2 hybrids), namely: *O. pycnocarpa*, *O. suaveolens*, *O. depressa*, *O.* × *fallax* and *O.* × *wienii*. We also confirm in the flora two other species (*O. rubricaulis* and *O. parviflora*), by herbarium material. Finally, we give an identification key for the species discussed in the paper (including *O. oakesiana*).

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PRELIMINARY OBSERVATIONS CONCERNING THE HABITATS FROM THE "PĂDUREA HAGIENI-LACUL LIMANU-COTUL VĂII" NATURA 2000 SITE

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Abstract: Within the „Pădurea Hagieni – Lacul Limanu – Cotul Văii" Natura 2000 site there were identified four community interest habitats, all priority ones. Among the 12 plant communities observed within these habitats most of them are vulnerable (5 coenotaxa), followed by endangered (4 coenotaxa), respectively rare (3 coenotaxa) ones. The ruderal species invasive tendency is low for most of the coenotaxa. Exceptions are represented by the undisturbed plant communities (*Rhamno catharticae-Jasminietum fruticantis*), as well as the medium disturbed ones (*Paeonio peregrinae-Carpinetum orientalis*), or with a low to high perturbation due to ruderal species, respectively with a low invasive trend of the alien species (*Agropyro-Thymetum zygioidi*). The richest in threatened species can be considered *Stipo ucrainicae-Festucetum valesiacae* (14 species), followed by *Saturejetum coeruleae*, *Botriochloetum ischaemi* (13 species), *Agropyro-Thymetum zygioidi* (10 species), *Rhamno catharticae-Jasminietum fruticantis, Medicagini minimae-Festucetum valesiacae, Thymio pannonici-Chrysopogonetum grylli, Paeonio peregrinae-Carpinetum orientalis* (7 species), *Asphodelino luteae-Paliuretum* (6 species). Within the site most of the threatened species are endangered also at the local level. They are followed by the sporadic species, respectively by the vulnerable ones (*Artemisia alba, Stipa ucrainica, Mercurialis ovata*), or critically endangered (*Genista sessilifolia*). The species indentified in Dobrogea only here, within proper studies, are represented by: *Crocus biflorus, Salvia ringens, Chamaecytisus jankae, Jurinea tzar-ferdinandii.*

Keywords: Hagieni, Cotul Văii, Limanu, community interest habitats, threatened species, Ponto-Sarmatic steppes, sub-Mediterranean forests

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Introduction

Within the present paper there are exposed proper updated preliminary data concerning the habitats and the higher plant species of national or community interest, as a continuation of the inventories presented in previous works, undertaken within this site (Petrescu 2012). The site, especially the Hagieni forest, was previously studied from the flora and plant communities point of view (Arcuş 1999, Cristurean 1976, Cristurean & Ionescu-Ţeculescu 1970, Ionescu-Ţeculescu & Cristurean 1967), but the latest were not framed into the Palaearctic Classification. This is why the present research was undertaken, in order to obtain an updated inventory of the habitats and species of community interest, including priority ones. The aim of the study is also to establish, at

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least at a preliminary level, the threat categories within this site of these habitats and species and also their conservation status, as a base for the establishment of conservative management measures.

Material and methods

The community interest site Pădurea Hagieni-Lacul Limanu-Cotul Văii (3.652 ha) includes the western part of the Limanu lake, the Hagieni forest, as well as the main valley and its secondary hollows that follow more or less the line between the localities Albeşti, Vârtop, Cotu Văii, Vâlcelele, reaching the Bulgarian border. In the present study the site was divided in four sectors: the Limanu Lake (LL), including all its adjacent steppe grasslands, the Hagieni forest (PHG), Albeşti-Cotu Văii (ACV), respectively Cotu Văii (CV). The penultimate sector folds all the grasslands, thickets and forestry plantations between the western limit of the Hagieni forest and Cotu Văii. The last sector is framed between Cotu Văii and the Bulgarian border. The updated map of the site can be visualized through the Natura 2000 Network Viewer (http://natura 2000.eea.europa.eu/).

The complex landscape of the site includes several units.

Limanu lake follows the sinuous course, frequently with rocky slopes, of the thalweg of the main valley, bounded by reed beds (53.1111 Freshwater *Phragmites* beds). They form westwards a compact area, interrupted by water pools. The lake is bounded by salt marshes (15.A21275), while on the adjacent slopes steppe grasslands (34.92) and steppe or sub-Mediterranean thickets occur (31.8B731).

Hagieni forest is composed of sub-Mediterranean forests (71.73723), steppe (31.8B721) and sub-Mediterranean thickets (31.8B731), steppe grasslands (34.92), that occur mostly on slopes, respectively of forestry plantations, that bend especially on plateaux (Fig. 1).

Albeşti-Cotu Văii, respectively Cotu Văii, are sectors where mainly steppe grasslands (34.92) occur, on nearly all kind of relief, except the areas more humid than the average; the steppe (31.8B721) or sub-Mediterranean (31.8B731) thickets occur on more reduced areas, especially on rocky slopes or in the steppe zone on negative relief. Between Cotu Văii and the Bulgarian border also forestry plantations occur, but to a lower extent in comparison with the Hagieni forest area (Fig. 2).

Except the habitat 53.1111, that is not presented in this paper, as it is not a community interest one, the others' codes are detailed below, within the presentation of the Natura 2000 habitats.

The scientific names are in accordance with widely used references, for the species (Oltean *et al.* 1994, Ciocârlan 2009, Dihoru & Negrean 2009), as well as for the plant communities and habitats, including the correspondence between them (Devilliers *et al.* 1996, Sanda & Arcuş 1999, Sanda 2002, Petrescu 2007, Sanda *et al.* 2008, European Comission – DG Environment 2007). Unlike the other common taxa, that were framed to the species level, *senso lato*, the threatened taxa were determined to the subspecies level, wherever this was necessary for their framing into the national red list (Oltean *et al.* 1994) or into the European red list (United Nations 1991). There were also mentioned the synonymous denominations, wherever they differ in the three references quoted above, used for their identification.

The field data were collected in plots according to the Braun-Blanquet methodology. The preliminary assessment of the importance and conservation status of threatened species or habitats/coenotaxa, as a basis for the evaluation of the conservation priorities, was based upon their framing into several local threat categories, within the analyzed coenotaxa (for the species), by using a scale presented in previous papers (Petrescu 2007, Petrescu 2016). For the species the first three gradations correspond to the IUCN threat categories (endangered, vulnerable, rare), to which the "critically endangered" category was added. For the next three gradations, that correspond to the "not threatened" IUCN category, the following frequency categories were used: sporadic, frequent and very frequent. A correspondence was also set between these categories and the Braun-Blanquet scale for the assessment of the dominance within the plots. For the preliminary evaluation of the habitat threat categories an adapted form of the previous scale was used, based on the estimation of the percentage limits in the research route within which the habitat/coenotaxa was noticed. If a species or habitat is framed into a high threat category (endangered, vulnerable) its local conservation status can be considered low, closer to an unfavorable status and vice versa. In the case of habitats/plant communities, the higher is their threatened species number, the better can be considered their conservation value and status, taking into account that these taxa, sensitive to human activities, are in general considered as environment indicators.

Wherever data allowed there was assessed also the conservation status of the plant communities/habitats induced by the intensity of human activities. There was used a simple scale that estimates a high, medium, low or null level of disturbance, taking into account the dominance indices and the number of ruderal and/or non-native species identified in the plant communities, within the studied habitats.

Within each shrub or herbaceous plant community the presence of at least one ruderal/ non-native species with a certain dominance index corresponds to a level of disturbance, respectively: r – very low; + – low, 1 – medium; 2-5 – high. If the number of recorded ruderal or non-native species is equal or exceeds 50% of the total number of species, even if these kind of taxa have low dominance indices, (like for example +-low), there can be considered that the respective plant community has a level of disturbance that corresponds to the next higher level (such as in this case 1-medium).

For the oak forests, if the oak species proportion is: higher or equal to 2 (20%) – low disturbance; between (or equal to) 1(10%) and 2 (20%) – medium disturbance; no oaks – high disturbance. The highest disturbance level in the canopy or shrub/grasses layer is considered representative for the overall plant community.

Results and discussion

Within the site all the habitats mentioned below are of community interest, except the reed beds, that were not analyzed, the subject of the present paper being the habitats with conservation value.

1530* Pannonic salt steppes and salt marshes

15.A21275 Western Pontic *Cynodon* saline beds

***Trifolio fragifero-Cynodontetum* Br.-Bl. et Bolos 1958 plant community**, considered endangered within the site, is situated in the transition zone between the steppe grasslands and the marsh vegetation adjacent to the Limanu lake (LL), being

identified on its southern shore, northwards of the Limanu township. The ruderal species invasive tendencies can be considered as low, taking into account the dominance indices of the three such species, underlined within the plot.

Key species: *Cynodon dactylon* (2; LL), *Trifolium fragiferum* (1; LL, PHG).

Other species: *Achillea setacea* (+; LL), *Cichorium intybus* (+; LL, PHG), *Lolium perenne* (+; LL), *Lotus tenuis* (+; LL), *Plantago major* (+; LL, PHG), *Potentilla reptans* (+; LL).

40C0* Ponto-Sarmatic deciduous thickets

31.8B721 Ponto-Sarmatic hawthorn-blackthorn scrub

***Pruno spinosae-Crataegetum* Soó (1927) 1931 plant community**, a vulnerable coenotaxa, identified in the Hagieni forest (PHG), shows a low level of disturbance due to human activities, in its inventory being observed two ruderal species with a reduced dominance. There were also noticed three threatened species, rare at the national level, that can be considered as endangered within this community, except the vulnerable *Paliurus spina-christi*.

Key species: *Crataegus monogyna* (+; PHG), *Prunus spinosa* (3; PHG).

Threatened species: *Asparagus verticillatus* (+; PHG), *Jasminum fruticans* (+; PHG), *Paliurus spina-christi* (1; PHG).

Other species:

-grasses/ undershrubs: *Bromus sterilis* (+; PHG), *Clematis vitalba* (+; PHG), *Galium aparine* (+; PHG), *Orlaya grandiflora* (+; PHG), *Pisum sativum* subsp. *elatius* (+; PHG).

31.8B731 Western Pontic jasmine Christ's thorn scrub

***Asphodelino luteae-Paliuretum* Sanda *et al.* 1999 plant community** was analyzed in the Hagieni forest (PHG), where it can be considered rare. The respective phytocoenoses contain both characteristic species for this community, *Paliurus spina-christi* and *Asphodeline lutea*, as well as other important taxa like *Jasminum fruticans*, *Asparagus verticillatus*, *Crocus chrysanthus* and *Vicia peregrina*. At least at the level of this plant community these species can be considered as mostly endangered, except the sporadic (*Asphodeline lutea*, *Paliurus spina-christi*) and vulnerable (*Jasminum fruticans*) taxa. There can be estimated a low degree of ruderal plant invasion, indicated by species with a low dominance like *Euphorbia agraria* or *Eryngium campestre.*

Key species: *Asphodeline lutea* (+-3; PHG), *Paliurus spina-christi* (1-3; PHG).

Threatened species: *Asparagus verticillatus* (+-1; PHG), *Asphodeline lutea* (+-3; PHG), *Crocus chrysanthus* (+; PHG), *Jasminum fruticans* (1; PHG), *Paliurus spina-christi* (1-3; PHG), *Vicia peregrina* (+; PHG).

Other species:

-shrubs/ lianas: *Crataegus monogyna* (1; PHG), *Evonymus verrucosus* (+; PHG), *Fraxinus ornus* (+; PHG), *Hedera helix* (+; PHG), *Ligustrum vulgare* (1; PHG).

-grasses/ undershrubs: *Crocus biflorus* (+; PHG), *Dichantium ischaemum* (+; PHG), *Eryngium campestre* (+; PHG), *Euphorbia agraria* (+; PHG), *Filipendula vulgaris* (+; PHG), *Fragaria viridis* (+; PHG), *Heracleum sphondylium* (+; PHG), *Orlaya grandiflora* (+; PHG), *Teucrium chamaedrys* (+; PHG).

Fig. 1. Hagieni forest - habitat complex of sub-Mediterranean forests (71.73723), steppe grasslands (34.92), steppe (31.8B721) and sub-Mediterranean thickets (31.8B731)

Fig. 2. Cotul Văii – habitat complex of steppe (31.8B721), sub-Mediterranean thickets (31.8B731), loess steppe (34.92) and rocky steppe (34.9211)

***Rhamno catharticae-Jasminietum fruticantis* (Mihai *et al.* 1964) Mititelu *et al.* 1993 plant community** is estimated as endangered within the Hagieni forest (PHG). This plant community is rich in threatened species, here being identified seven rare taxa of this category, among which *Paliurus spina-christi* and *Opopanax chironium* subsp. *bulgaricum* (syn. *O. bulgaricus*) are considered vulnerable. In the analyzed situations most of the threatened species can be considered as endangered, except the sporadic *Jasminum fruticans* and *Paliurus spina-christi*, vulnerable at the local level. The species composition is characteristic for this coenotaxa, as in this situation there were not identified ruderal or alien taxa.

Key species: *Jasminum fruticans* (3; PHG).

Threatened species: *Asphodeline lutea* (+; PHG), *Jasminum fruticans* (3; PHG), *Paeonia peregrina* (+; PHG), *Paliurus spina-christi* (1; PHG), *Opopanax chironium* subsp. *bulgaricum* (syn. *Opopanax bulgaricus*) (+; PHG), *Scorzonera mollis* (+; PHG), *Vicia serratifolia* (+; PHG).

Other species:

- shrubs: *Crataegus monogyna* (+; PHG), *Rosa canina* (+; PHG).

- grasses: *Convolvulus cantabricus* (+; PHG), *Eryngium campestre* (+; PHG), *Jurinea mollis* s.l. (+; PHG), *Lithospermum purpurocaeruleum* (+; PHG), *Salvia austriaca* (+; PHG), *Salvia nutans*(+; PHG), *Tanacetum corymbosum* (+; PHG), *Veronica chamaedrys* (+; PHG).

62C0* Ponto-Sarmatic steppes

34.92 Ponto-Sarmatic steppes

***Medicagini minimae-Festucetum valesiacae* Wagner 1941 plant community** can be estimated as a rare coenotaxa in the area of Cotu Văii (CV) and between Albeşti and Cotu Văii (ACV). In this community there were observed seven taxa, threatened at the national level, among which *Artemisia alba* and especially *Genista sessilifolia* are rarely or not at all observed in other studied sites in Dobrogea (Petrescu 2007). *Paeonia tenuifolia* and *Crocus chrysanthus* are included in the „vulnerable and rare" category. Within the plant community most of the seven taxa can be considered as endangered, except the vulnerable species *Artemisia alba* and the critically endangered taxa *Genista sessilifolia*. The low participation of the ruderal species in this plant community is indicated by the reduced dominance indices (+) of six such species, underlined within the following list.

Key species: *Festuca valesiaca* (2, 3-4; CV).

Threatened species: *Artemisia alba* (1; ACV), *Crocus chrysanthus* (+; CV), *Echinops ritro* subsp. *ruthenicus* (+; ACV), *Genista sessilifolia* (r; ACV), *Paeonia tenuifolia* (+; CV), *Satureja coerulea* (+; ACV), *Tanacetum millefolium* (+; ACV, CV).

Other species: *Achillea setacea* (+; CV), *Adonis vernalis* (+; ACV), *Agropyron cristatum* (+; ACV), *Astragalus onobrychis* (+; CV), *Bombycilaena erecta* (+; CV), *Cichorium intybus* (+; CV), *Convolvulus cantabricus* (+; ACV), *Crocus biflorus* (+; CV), *Cynodon dactylon* (1; CV), *Dichanthium ischaemum* (+; ACV), *Erophila verna* (+; CV), *Eryngium campestre* (+; ACV, CV), *Euphorbia glareosa* subsp. *glareosa* (+; CV), *Euphorbia seguieriana* (+; CV), *Filipendula vulgaris* (+; CV), *Gypsophila pallasii* (+; ACV), *Iris pumila* (+; CV), *Inula oculus-christi* (+; CV), *Linum austriacum* (+; CV), *Marrubium peregrinum* (+; CV), *Plantago lanceolata* (+; ACV), *Poa bulbosa* (+; CV), *Salvia*

austriaca (+; CV), *Salvia nemorosa* (+; CV), *Sanguisorba minor* (+; CV), *Teucrium chamaedrys* (+; CV), *Teucrium polium* subsp. *capitatum* (+; ACV), *Thymus pannonicus* (+; CV), *Xeranthemum annuum* (+; ACV).

***Saturejetum coeruleae* Cristurean et Ionescu-Țeculescu 1970 plant community**, a vulnerable taxa, occurs on rocky limestone substrata, being studied in the steppe clearings of the Hagieni forest (PHG) and at Cotu Văii (CV). Within this coenotaxa there were inventoried numerous threatened taxa (13), framed mostly in the "rare" category. Therefore, it is situated on the second place, after *Stipo ucrainicae-Festucetum valesiacae,* as threatened species richness. Typical for this site are especially *Salvia ringens, Astragalus spruneri, Chamaecytisus jankae,* rarely or not at all identified in other studied sites. It worths to underline the presence of the vulnerable and rare *Ononis pusilla,* as well as of the subendemic taxa *Euphorbia nicaeensis* (syn. *E. glareosa*) subsp. *cadrilateri.* Most of the threatened species can be considered as localy endangered within the respective phytocoenoses, except the frequent/ dominant species, like *Satureja coerulea* or the vulnerable *Thymus zygioides.* The low level of ruderal species invasion can be deduced from the reduced dominance of species like *Eryngium campestre* or *Euphorbia helioscopia.*

Key species: *Satureja coerulea* (3; CV, PHG).

Threatened species: *Achillea clypeolata* (+;CV, PHG), *Astragalus spruneri* (+; PHG), *Artemisia alba* (+; CV), *Chamaecytisus jankae* (+; CV), *Coronilla scorpioides* (+; CV, PHG), *Euphorbia nicaeensis* (syn. *E. glareosa*) subsp. *cadrilateri* (+; PHG), *Hyacinthella leucophaea* (+; PHG), *Ononis pusilla* (+; CV, PHG), *Potentilla bornmuelleri* (+; CV), *Scorzonera mollis* (+; PHG), *Salvia ringens* (+; CV), *Satureja coerulea* (3; CV, PHG), *Thymus zygioides* (1; CV).

Other species: *Asperula tenella* (+; CV), *Adonis vernalis* (+; CV, PHG), *Crataegus monogyna* (+; CV) *Erysimum diffusum* (+; CV), *Eryngium campestre* (+; CV, PHG), *Euphorbia helioscopia* (+; PHG), *Euphorbia seguieriana* (+; CV), *Inula oculus-christi* (+; PHG), *Jurinea mollis* s.l. (+; PHG), *Koeleria macrantha* (+; CV), *Leontodon crispus* (+; CV, PHG), *Linum austriacum* (+; PHG), *Potentilla taurica* (+; PHG), *Salvia austriaca* (+; PHG), *Sanguisorba minor* (+; CV), *Stipa pulcherrima* (+; PHG), *Teucrium chamaedrys* (+; CV), *Teucrium polium* (+; CV).

***Botriochloetum (Andropogonetum) ischaemi* Pop 1977 plant community** occurs on reduced areas, being considered endangered. Some plots were placed between Albești and Cotu Văii (ACV) close to Vârtop, as well as in the clearings of the Hagieni forest (PHG). As in the case of the *Saturejetum coerulae* plant community, within the plots there were identified 13 threatened species, mainly rare at the national level, among which *Crocus chrysanthus* and *Paliurus spina-christi* are vulnerable. Within the plant community most of these taxa are endangered, except the vulnerable *Paliurus spina-christi, Salvia ringens, Satureja coerulea*. A low level of disturbance due to ruderal species is indicated by the reduced dominance of species like *Eryngium campestre* and *Erodium cicutarium.*

Key species: *Dichanthium ischaemum* (3-4; ACV, PHG).

Threatened species: *Asparagus verticillatus* (+; PHG), *Asphodeline lutea* (+; PHG), *Achillea clypeolata* (+; PHG), *Coronilla scorpioides* (+; PHG), *Crocus chrysanthus* (+; PHG), *Echinops ritro* subsp. *ruthenicus* (+; PHG), *Jasminum fruticans* (+; PHG), *Paliurus spina-christi* (1; PHG), *Salvia ringens* (1; PHG), *Satureja coerulea*

(1; PHG), *Tanacetum millefolium* (+; ACV), *Vicia peregrina* (+; PHG), *Ziziphora capitata* (+; PHG).

Other species: *Chrysopogon gryllus* (+; PHG), *Convolvulus cantabricus* (+; PHG), *Crupina vulgaris* (+; PHG), *Crocus biflorus* (+; PHG), *Cynodon dactylon* (1; ACV), *Erodium cicutarium* (+; PHG), *Eryngium campestre* (+; ACV, PHG), *Euphorbia glareosa* subsp. *glareosa* (+; ACV), *Festuca valesiaca* (1; PHG), *Haplophyllum suaveolens* (+; PHG), *Isatis tinctoria* s.l. (+; PHG), *Koeleria macrantha* (+; PHG), *Marrubium peregrinum* (+; ACV), *Medicago minima* (+; PHG), *Orlaya grandiflora* (+; PHG), *Plantago lanceolata* (+; ACV), *Sanguisorba minor* (+; PHG), *Salvia nemorosa* (+; PHG), *Salvia nutans* (+; PHG), *Scabiosa ochroleuca* (+; CV), *Stipa capillata* (+; ACV), *Tanacetum corymbosum* (+; PHG), *Teucrium chamaedrys* (+; PHG), *Teucrium polium* subsp. *capitatum* (+;PHG), *Verbascum banaticum* (+; PHG), *Xeranthemum annuum* (+; ACV).

***Thymio pannonici-Chrysopogonetum grylli* Doniţă *et al.* 1992 plant community** was studied at the edge of the Hagieni forest and within its clearings, where it can be considered vulnerable. Even though it is a tall grass steppe, the dominant *Chrysopogon gryllus* does not form a dense layer, allowing the occurrence of numerous taxa, including seven threatened taxa, mostly rare at the national level, among which *Paliurus spina-christi* and *Paeonia tenuifolia* are vulnerable and rare. Within the plant community most of these species can be considered as endangered, except the vulnerable taxa *Asphodeline lutea*. The level of ruderal species contribution to this community is low, three such species being recorded.

Key species: *Chrysopogon gryllus* (3; PHG).

Threatened species: *Achillea clypeolata* (+; PHG), *Asphodeline lutea* (1; PHG), *Coronilla scorpioides* (+; PHG), *Jasminum fruticans* (+; PHG), *Paeonia tenuifolia* (+; CV), *Paliurus spina-christi* (+; PHG), *Vicia peregrina* (+; PHG).

Other species: *Dichanthium ischaemum* (1; PHG), *Euphorbia glareosa* subsp. *glareosa* (+; PHG), *Euphorbia helioscopia* (+; PHG), *Falcaria vulgaris* (+; PHG), *Filipendula vulgaris* (+; PHG), *Lithospermum arvense* (+; PHG), *Orlaya grandiflora* (+; PHG), *Stipa capillata* (+; PHG), *Stipa pulcherrima* (+; PHG).

***Stipetum capillatae* (Hueck 1931) Krausch 1961 plant community** is an endangered coenotaxa, observed on restricted areas, low grazed, between Vârtop and Albeşti (ACV). In these phytocoenoses there were noticed two rare threatened species, among which *Paliurus spina-christi* is also vulnerable. In this plant community the two species can be framed in the endangered category. *Eryngium campestre, Plantago lanceolata, Senecio vernalis* indicate a low degree of ruderal plant invasion.

Key species: *Stipa capillata* (3; ACV).

Threatened species: *Echinops ritro* subsp. *ruthenicus* (+; ACV, *Paliurus spina-christi* (+; ACV).

Other species: *Achillea setacea* (+; ACV), *Dichanthium ischaemum* (1; ACV), *Eryngium campestre* (+; ACV), *Euphorbia glareosa* subsp. *glareosa* (+; ACV), *Euphorbia seguieriana* (+; ACV), *Festuca valesiaca* (1; ACV), *Plantago lanceolata* (+; ACV), *Salvia nemorosa* s.l. (+; ACV), *Senecio vernalis* (+; ACV), *Teucrium chamaedrys* (+; ACV), *Teucrium polium* subsp. *capitatum*(+; ACV), *Thymus pannonicus* (+; ACV), *Xeranthemum annuum* (+; ACV).

34.9211 Western Pontic thyme steppes

***Agropyro-Thymetum zygioidi* Dihoru (1969) 1970 plant community**, a cenotaxa assessed as vulnerable within this site, is situated on the third place as number of threatened taxa, after *Stipo ucrainicae-Festucetum valesiacae, Saturejetum coeruleae* and *Botriochloetum ischaemi*, the latest two having the same number of rare species.The 10 such taxa are framed into the "rare" category, except the dominant *Thymus zygioides* and *Jurinea tzar-ferdinandii*, mentioned as vulnerable in the *Red book of vascular plants of Romania* (Dihoru & Negrean 2007). This site is the only one in Dobrogea where the last species was identified, at least within proper studies, as well as *Ajuga salicifolia* subsp. *bessarabica*. The analyzed phytocoenoses are framed between a low, respectively high level of ruderal plant invasion, taking into account the significant dominance (2) of *Poa bulbosa*. Thus there can be considered an overall high level of ruderal species invasive tendency. In some plots there was also recorded a low participation of some alien species like *Pinus nigra* s.l., represented by rare seedlings from the natural regeneration from the extensive forestry plantations. These have fragmented and partially eliminated the previous steppe grasslands of this site.

Key species: *Thymus zygioides* (3; CV).

Threatened species: *Ajuga salicifolia* subsp. *bessarabica* (+; CV), *Artemisia alba* (+; CV), *Dianthus pseudarmeria* (+; CV), *Euphorbia nicaeensis* (*Euphorbia glareosa*) subsp. *dobrogensis* (+; CV), *Hyacinthella leucophaea* (+; PHG), *Jurinea tzar-ferdinandii* (+; CV), *Potentilla bormuelleri* (+; CV), *Satureja coerulea* (+-1; CV), *Scutellaria orientalis* subsp. *pinnatifida* (+; CV), *Thymus zygioides* (3; CV).

Other species: *Agropyron ponticum* (2; CV), *Adonis vernalis* (+; CV), *Asperula tenella* (+; CV), *Chrysopogon gryllus* (+; CV), *Cichorium intybus* (+; CV), *Convolvulus cantabricus* (+; CV), *Euphorbia seguieriana* (+; CV), *Filipendula vulgaris* (+; CV), *Linum tenuifolium* (+; CV), *Poa bulbosa* (2; CV), *Pinus nigra* s.l (+; CV), *Pulsatilla balcana* (+; CV), *Sanguisorba minor* (+; CV), *Teucrium chamaedrys* (+; CV), *Teucrium polium* subsp. *capitatum* (+; CV).

34.9213 Western Pontic feathergrass steppes

***Stipo ucrainicae-Festucetum valesiacae* Dihoru (1969) 1970 plant community**, rare within the site, identified at Cotu Văii (CV), respectively in the clearings of the Hagieni forest (PHG), is the richest in threatened species. Among the 14 such species *Stipa ucrainica* is of European importance, while *Paeonia peregrina* and *Paeonia tenuifolia* are also considered vulnerable within Romania. In this plant community these 14 taxa can be framed in the „endangered" category, only *Stipa ucrainica* being vulnerable at the local level. It is important to underline the presence of some species rarely or not at all found within other sites in Dobrogea such as: *Ajuga salicifolia* subsp. *bessarabica, Astragalus spruneri, Asyneuma anthericoides, Cerinthe auriculata, Onosma heterophylla.* The reduced dominance indices of the five ruderal species show a low disturbance.

Key species: *Festuca valesiaca* (2-3; CV, PHG), *Stipa ucrainica* (1; CV, PHG).

Threatened species: *Achillea clypeolata* (+; PHG), *Ajuga salicifolia* subsp. *bessarabica* (+; CV), *Allium saxatile* (+; CV), *Astragalus spruneri* (+; CV), *Asyneuma anthericoides* (+; CV), *Cerinthe auriculata* (+; PHG), *Echinops ritro* subsp. *ruthenicus* (+; PHG, CV), *Ferulago confusa* (+; CV), *Jasminum fruticans* (+; PHG), *Onosma*

heterophylla (+; CV), *Paeonia peregrina* (+; PHG), *Paeonia tenuifolia* (+; CV), *Rumex tuberosus* (+; PHG), *Stipa ucrainica* (1; CV).

Other species: *Achillea setacea* (+; PHG), *Adonis vernalis* (+; CV), *Astragalus vesicarius* subsp. *pseudoglaucus* (+; CV), *Aster oleifolius* (+; CV), *Carduus thoermeri* (+; PHG), *Crataegus monogyna* (+; CV, PHG), *Dactylis glomerata* (+; PHG), *Dianthus giganteiformis* (+; PHG), *Dichanthium ischaemum* (+; CV), *Eryngium campestre* (+, CV), *Erysimum diffusum* (+; CV), *Euphorbia agraria* (+; PHG), *Euphorbia glareosa* subsp. *glareosa* (+; PHG), *Fragaria viridis* (+; PHG), *Koeleria macrantha* (+; PHG), *Leontodon crispus* (+; LL, CV), *Linaria genistifolia* (+; PHG), *Ligustrum vulgare* (+; PHG), *Linum austriacum* (+; CV), *Linum tenuifolium* (+; CV), *Marrubium peregrinum* (+; PHG), *Medicago minima* (+-1; CV), *Orlaya grandiflora* (+; PHG), *Plantago lanceolata* (+; CV), *Poa angustifolia* (+; PHG), *Polygala major* (+; CV), *Salvia austriaca* (+; PHG), *Salvia nemorosa* s.l. (+; PHG), *Salvia nutans* (+; PHG), *Sanguisorba minor* (+; CV, LL), *Scorzonera hispanica* (+; PHG), *Teucrium chamaedrys* (+; CV), *Teucrium polium* subsp. *capitatum* (+; PHG), *Veronica chamaedrys* (+; PHG).

91AA* Eastern white oak woods

41.73723 Moesian *Paeonia peregrina* - white oak woods

***Paeonio peregrinae-Carpinetum orientalis* Doniţă 1970 plant community** was studied in the Hagieni forest (PHG), where it can be considered as vulnerable. It occurs mainly on the limestone slopes, there being identified 7 rare threatened taxa at the national scale, of which *Paeonia peregrina* is also a vulnerable species. Within this plant community these taxa can be estimated as endangered. The inventory of the grasses layer can be considered as typical for a natural status, as no ruderal nor alien species were identified. Still, the reduced white oak proportion in the tree layer indicates partially derived phytocoenoses, respectively a medium level of disturbance due to human activities.

Key species:*Carpinus orientalis* (3-4; PHG), *Quercus pubescens* (1; PHG).

Threatened species: *Corydalis solida* subsp. *slivenensis* (+; PHG), *Galanthus elwesii* (+; PHG), *Mercurialis ovata* (+-1; PHG), *Paeonia peregrina* (+; PHG).

Other species:

-trees: *Acer campestre* (+-1; PHG), *Cerasus mahaleb* (+; PHG), *Fraxinus ornus* (+-1; PHG).

-shrubs: *Berberis vulgaris* (+; PHG), *Clematis vitalba* (+; PHG), *Cornus mas* (+; PHG), *Crataegus monogyna* (+; PHG), *Evonymus verrucosus* (+; PHG), *Hedera helix* (+-2; PHG), *Ligustrum vulgare* (+; PHG), *Viburnum lantana* (+; PHG).

-grasses: *Arum orientale* (r-+; PHG), *Brachypodium sylvaticum* (+; PHG), *Corydalis solida* subsp. *solida* (r; PHG), *Laser trilobum* (1; PHG), *Geum urbanum* (+; PHG), *Polygonatum odoratum* (+; PHG), *Ranunculus ficaria* (+; PHG), *Scilla bifolia* (+; PHG), *Viola odorata* (+; PHG).

In the present paper the individuals of *Crocus* sp. with a white corolla, observed in this site blooming in february 2016 were framed, according to the volume 5 of *Flora Europaea* (Tutin *et al.* 1980) within the taxa *Crocus biflorus*, considered a critical taxonomic group, that also includes *Crocus chrysanthus*. Even though for the individuals of both species collected in this site the corm-tunic splitts into rings at the

base, the flower color is different, respectively white for *Crocus biflorus* and yellow for *Crocus chrysanthus*. This corresponds precisely to the description from *Flora Europaea*, including the flowering in springtime of both species and the yellow anthers. Within the description of *Crocus biflorus* it is mentioned that the individuals with white flowers from the European Turkey can be either *Crocus biflorus* or pale forms of *Crocus chrysanthus* or hybrids between the two species. In the populations observed at Hagieni both come into flower in the same time, frequently closely together, which excludes the possibility of soil condition variations that could determine different colors of the flowers. There were not noticed individuals with intermediate color between the two species, which could rescind the hybrid forms hypothesis. In the *Red book of vascular plants of Romania* (Dihoru & Negrean 2007) it is mentioned that the individuals with white flowers from the Dobrogea populations could belong to *Crocus biflorus* (*Crocus chrysanthus* var. *albidus*). Some other older references (Ionescu-Ţeculescu & Cristurean 1967) consider that the individuals with white flowers from Hagieni belong to *Crocus chrysanthus* f. *albidus*, that only differs by the flower color from *Crocus chrysanthus* f. *citrinus*, the last with a yellow corolla. The clarifying of theses aspects requires adequate genetical studies.

Even though the invasive tendencies of alien species have a low occurrence, they should be controled. This could include the elimination of the alien species, at least the ones that expand through natural regeneration outside the forestry plantations boundaries. It is necessary to avoid new reafforestations and to promote the substitution of artificial habitats by natural community interest habitats, preferably through natural regeneration, wherever possible. It is necessary to emphasize that the outstanding conservation value of the natural habitats of this site, characterized by one of the highest concentration of threatened species within Dobrogea, was drastically reduced by reafforestations, including with alien species (pine, juniper, bastard acacia etc.). These have diminished the natural habitat areas and therefore the threatened species populations.

In this site there would be necessary also studies on the impact of grazing upon the threatened species and habitats. Proper preliminary studies reveal surprisingly that in general the sheep and goats avoid grazing threatened species. Quite rarely there was observed grazing of their leaves, much more rare being observed the grazing of their reproduction organs (flowers, fruits). This could be maybe explained by their specific chemical composition or other adaptations, or to the fact that grazing sensitive taxa have already disappeared. These aspects could explain the preservation of a high biodiversity, not only in the forestry areas, but also in those always used as pastures.

Conclusions

Within the site there were identified four community interest habitats, all priority ones, respectively 1530* Pannonic salt steppes and salt marshes, 40C0* Ponto-Sarmatic deciduous thickets, 62C0* Ponto-Sarmatic steppes, 91AA* Eastern white oak woods.

Among the 12 plant communities observed within these habitats most of them are vulnerable (five coenotaxa), like *Pruno spinosae-Crataegetum, Saturejetum coeruleae, Thymio pannonici-Chrysopogonetum grylli, Agropyro-Thymetum zygioidi, Paeonio peregrinae-Carpinetum orientalis*. These are followed by four endangered coenotaxa: *Trifolio fragifero-Cynodontetum, Rhamno catharticae-Jasminietum fruticantis,*

Botriochloetum (*Andropogonetum*) *ischaemi, Stipetum capillatae,* respectively by three rare ones: *Asphodelino luteae-Paliuretum, Medicagini minimae-Festucetum valesiacae, Stipo ucrainicae-Festucetum valesiacae*.

The ruderal species invasive tendency is low for most of the coenotaxa. Exceptions are represented by the undisturbed plant communities (*Rhamno catharticae-Jasminietum fruticantis*), as well as the medium disturbed ones (*Paeonio peregrinae-Carpinetum orientalis*), or with a low to high perturbation due to ruderal species, respectively with a low invasive trend of the alien species (*Agropyro-Thymetum zygioidi*).

The richest in threatened plants can be considered the *Stipo ucrainicae-Festucetum valesiacae* (14 species) plant community, followed by *Saturejetum coeruleae, Botriochloetum ischaemi* (13 species), *Agropyro-Thymetum zygioidi* (10 species), *Rhamno catharticae-Jasminietum fruticantis, Medicagini minimae-Festucetum valesiacae, Thymio pannonici-Chrysopogonetum grylli, Paeonio peregrinae-Carpinetum orientalis* (7 species), *Asphodelino luteae-Paliuretum* (6 species).

Within the site most of the threatened species are endangered also at the local level. They are followed by the sporadic species (*Asphodeline lutea, Jasminum fruticans, Paliurus spina-christi, Satureja coerulea, Thymus zygioides*), respectively by the vulnerable ones (*Artemisia alba, Stipa ucrainica, Mercurialis ovata*), or critically endangered (*Genista sessilifolia*).

The species indentified in Dobrogea only in this site, within proper studies, are represented by: *Crocus biflorus, Salvia ringens, Chamaecytisus jankae, Jurinea tzar-ferdinandii, Ajuga salicifolia* subsp. *bessarabica, Vicia serratifolia, Opopanax chironium* subsp. *bulgaricum* (syn. *Opopanax bulgaricus*).Taking into account this restricted distribution one can consider that they are more threatened with extinction than other speciesof conservation interest, identified also in other locations within Dobrogea.

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NATURE RECLAIMING ITS TERRITORY IN URBAN AREAS. CASE STUDY: VĂCĂREŞTI NATURE PARK, BUCHAREST, ROMANIA

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Abstract: The floristic research carried out at "Balta Văcăreşti", Bucharest, provided the scientific foundation for the establishment of the Văcăreşti Nature Park in 2016. Between 2012 and 2016 a total of 331 species and subspecies were identified in the researched area. Around 80% of the plants are native (including archaeophytes), while 20% are aliens, some of them being recognised as invasive species (*Elodea nuttallii*, *Azolla filiculoides*, *Ailanthus altissima*, *Acer negundo*, *Ambrosia artemisiifolia*, *Fraxinus pennsylvanica*, *Parthenocissus inserta*, *Elaeagnus angustifolia*, etc.). A large number of plants with Least Concern and Data Deficient status in the IUCN Red List was noted, most of which are aquatic and paluster species currently threatened due to the reduction or even loss of their habitat (*Cyperus fuscus*, *Cyperus glomeratus*, *Lemna trisulca*, *Hydrocharis morsus-ranae*, *Persicaria amphibia*, *Sparganium erectum*, *Typha laxmannii*, *Utricularia vulgaris*). As regards species threatened at national level, *Wolffia arrhiza* and *Utricularia vulgaris* were inventoried at "Balta Văcăreşti".
Key words: urban flora, nature park, invasive plants, Văcăreşti, Bucharest, Romania

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Introduction

Studies on species diversity in urban areas have a long history (see Sukopp 2002). They have intensified in the last years and many scientific papers have been published related to urban flora (*e.g.*, Kowarik 1991, Pyšek 1993, Brandes 1995, Pyšek 1998, Celesti-Grapow & Blasi 1998, Brandes 2003, Sukopp 2003, Interdonato *et al.* 2003, Chocholoušková & Pyšek 2003, Kühn *et al.* 2004, McKinney 2006, Moraczewski & Sudnik-Wójcikowska 2007, Godefroid & Koedam 2007, Knapp *et al.* 2008, Thomson & McCarthy 2008, Knapp *et al.* 2010, Milović & Mitić 2012, Eskin *et al.* 2012, Alegro *et al.* 2013, etc.). The subject is very interesting not only in terms of biodiversity knowledge, but also in relation to the issues posed by the urbanisation, by the necessity to manage efficiently green spaces in urban areas or to manage those species that are problematic for citizens health (e.g., *Ambrosia artemisiifolia*).

Thus, as regards flora, urban areas are often associated with low biodiversity (Goddard *et al.* 2010), a decreasing number of native species and increasing number of non-native species (Godefroid & Koedam 2003). However, some urban flora studies

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show an increase in species richness, both native and non-native species (Sukopp 2003, Kühn *et al.* 2004, Wania *et al.* 2006), but also an increasing negative impact on the quality of the flora by the presence of non-native species (Dolan *et al.* 2011, Godefroid 2001) and a high risk of plant invasions that can reduce native species richness (Von der Lippe & Kowarik 2008, Pyšek 1998).

In the process of urbanisation, existing habitats are destroyed or profoundly modified and new habitats are created (Godefroid & Koedam 2007). Thus, the process of urbanisation has effects such as habitats transformation or fragmentation, changes in ecological condition as well as changes in flora composition (Hudina *et al.* 2012). Urbanisation does promote, in many cases, the biological homogenisation (McKinney 2006).

But what happens in a big city, when an area is abandoned over 25 years? How many plant species could be in a such an area? Are there any rare species? What is the proportion of alien species? Where do they originate from? What are the plants communities installed in this area? We had the opportunity to find answers researching such an area in Bucharest city known as "Balta Văcăreşti".

We have to point out that the main data regarding flora of Bucharest are published by Brândză (1876, 1879-1883), Grecescu (1880, 1898), Panţu (1908, 1909, 1910, 1912, 1931), Morariu (1937, 1939, 1941, 1943, 1944, 1946, 1949, 1960), but only a few authors refer to the Văcăreşti area. Thus, Panţu (1908, 1909, 1910) mentions the following plants: *Equisetum palustre* – edge of the ponds near Văcăreşti Penitentiary; *Lemna trisulca* – Bucharest, ponds near Văcăreşti Penitentiary; *Wolffia arrhiza* – Bucharest, ponds on the edge of Dâmboviţa River, near Văcăreşti Penitentiary; *Caltha cornuta* (valid name *Caltha palustris* L.) – Bucharest, ponds on the edge of Dâmboviţa River, near Văcăreşti Penitentiary; *Cardamine pratensis* – Bucharest, ponds on the edge of Dâmboviţa River, near Văcăreşti Penitentiary; *Ranunculus paucistamineus* (probably *Batrachium trichophyllum* var. *paucistamineum* (Tausch) Hand.-Mazz.) – Bucharest, ponds on the edge of Dâmboviţa River, near Văcăreşti Penitentiary; *Prunus spinosa* f. *dasyphylla* – Bucharest, on the slopes near Văcăreşti Penitentiary; *Acer campestre* – Bucharest, on the slopes near Văcăreşti Penitentiary; *Acer tataricum* – Bucharest, on the slopes near Văcăreşti Penitentiary. Later, Morariu (1943) reports from the slopes from Văcăreşti the shrub *Syringa vulgaris*.

Nagodă *et al.* (2013) recently published two new alien species from Văcăreşti area, *Phemeranthus confertiflorus* and *Portulaca pilosa*, and their accompanying species: *Tragus racemosus, Sedum acre, Setaria viridis, Lotus tenuis, Portulaca oleracea* subsp. *oleracea, Vulpia myuros, Eragrostis minor, Eragrostis pilosa, Echium vulgare, Erigeron annuus* s.l., *Digitaria sanguinalis, Galium humifusum, Cichorium intybus, Berteroa incana, Convolvulus arvensis, Petrorhagia prolifera, Plantago lanceolata, Bromus tectorum.*

Material and methods

Investigated area. Bucharest is the capital city of Romania, located in the Romanian Plain, subzone of submesophilous- thermophilous oak tree forests (Doniţă *et al.* 2005). Biogeographic region is continental. According to the Romanian Statistical Yearbook (Andrei 2017), Bucharest has a surface of 240 km^2 and 2,101,413 inhabitants. The average altitude is 85 m. Yearly average of the air temperature is 11°C and the

yearly average of temperature amplitude is 25.1°C. Regarding the precipitations, the yearly average for the last 100 years is 567.7 mm (Andrei 2017).

Our investigated area, "Balta Văcărești", is located in the South-East part of Bucharest (Fig. 1), at 3.6 km away from the second largest building in the world, Palace of the Parliament or the People's House as it is also known as (Fig. 2). This area has a very interesting history. An old mention of Văcărești area dates back to 1770, when the Turks were defeated by the Russian prince Repnin, the capital being at that time occupied by the Russians (Lahovari *et al.* 1899). Another note about Văcărești is found in "Bucureștii de altădată. 1871-1877" by Constantin Bacalbașa (2014). According to this author, more than 140 years ago, more precisely in 1873, there was a marshy ground here, where iron-rich water springs were discovered. For a while, it was a fashion for the elite of Bucharest to come here on weekends and to consume water from the springs while walking around. But the Văcărești area remains known in the history of Bucharest for the monastery that functioned here for over 250 years and which was demolished in 1986 by the order of the dictator Nicolae Ceauşescu. This monastery also functioned as a penitentiary in the second half of the nineteenth century.

Before 1989, "Balta Văcărești" was conceived as part of the complex development of the river Dâmboviţa and remains an unfinished hydrologic project to this day. It stretches over an area of 190 hectares and is enclosed by a concrete dyke. The altitude is about 60-65 m at the level of flat area, and with 10 m higher on the dyke. The flat area presents numerous depressions with water forming a large pond (baltă, in Romanian). Nowadays "Balta Văcărești" includes swampy areas with reedbeds, grassland and ponds fed by underground springs (Fig. 2).

In 2016, "Balta Văcărești" has been declared a Nature Park (Guvernul României 2016). This is the first urban nature park in Romania and the only protected area in Bucharest.

Research methods. The inventory of the plant species was done on walking transects, so that the entire area be covered. The study visits for the complete inventorying of the flora from "Balta Văcărești" were conducted regularly during the vegetation period, between 2012 and 2016, so that all the stages of vegetation be observed and as many species as possible be recorded. In 2016 only seven new species were added to the previous list. For the taxa whose identity was difficult to determine on the field, 1–2 specimens were collected and subsequently identified in the laboratory. Furthermore, the area was thoroughly researched in order to identify the strictly protected plant species and the rare species, mentioned in the Romanian Red Book (Dihoru & Negrean 2009) and in the National Red List (Oltean *et al.* 1994). The data were collected in standard forms and stored electronically. The results obtained were organised in tables using Microsoft Excel, and presented graphically in charts. For each species there were noted and analysed the systematic classification, the geographic element, the life form and the ecological indicators, according to Popescu & Sanda (1998). The definitions and comments suggested by Cristea *et al.* (2004) were taken into account for the interpretation of the data regarding the geographic elements and the life forms. Furthermore, for each species the degree of threat according to international and national documents was noted (Bilz *et al.* 2011, Dihoru & Negrean 2009, Oltean *et al.* 1994).

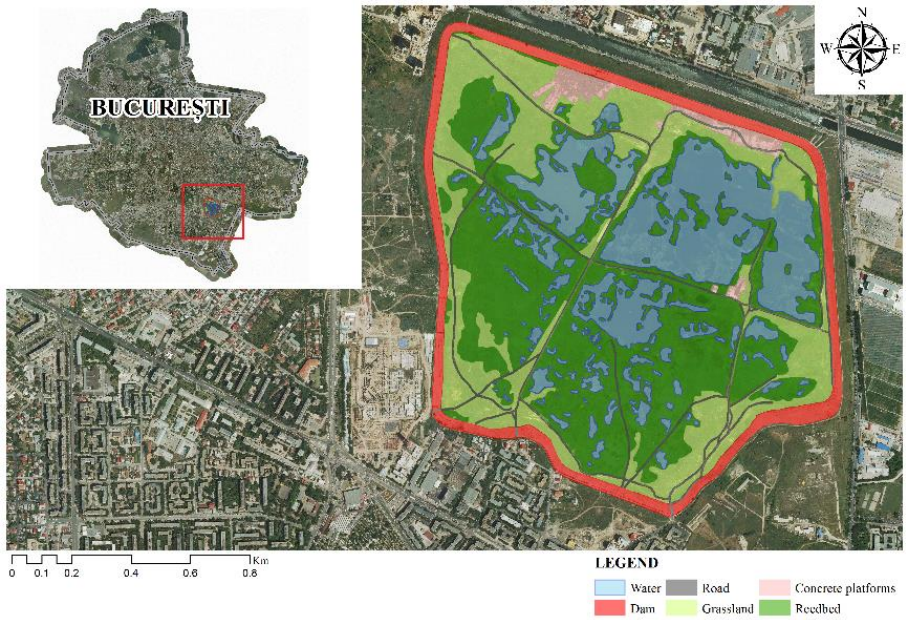

Fig. 1. The location of "Balta Văcăreşti" in Bucharest
(map compiled by Tiberiu Săhlean)

Fig. 2. "Balta Văcăreşti" – view from the East side to West (photo: Cezar Camen-Comănescu).
With red arrow the Parliament House is indicated.

The native status of species is according to the database The Euro+Med PlantBase (http://ww2.bgbm.org/EuroPlusMed). We included here the archaeophytes too. The assessment of the invasiveness status was made using the definitions developed by Richardson *et al.* (2000). For the urbanity status we used BiolFlor (Klotz *et al.* 2002, available at www2.ufz.de/biolflor). The nomenclature of the inventoried species is according to The Plant List (www.theplantlist.org) and Sârbu *et al.* (2013).

Abbreviations used in charts and annexes 1 & 2: **Distribution**: Afr – Africa; Am – America; As – Asia; Balc – Balkanic; Eu – Europe; Euras – Eurasia; Cauc – Caucasus; Circ – Circumboreal; Cosm – Cosmopolite; Temp – Temperate; Trop – Tropical; Cont – Continental; Med – Mediterranean; Submed – Submediterranean; Pont– Pontic; N – North; E – East; S – South; W – West; C – Centre (central). **Life form**: Ch – Chamaephytes; G – Geophytes; H – Hemicryptophytes; Hd – Hydrophytes; HH – Helohydatophytes; Ht – Hemitherophytes; Ph – Phanerophytes; PhL – Liana; PhM – Megaphanerophytes; PhN – Nanophanerophytes; T – Therophytes; **Moisture (M)**: 0 = euriphyte, 1 = xerophyte, 1.5 = xerophyte-xeromesophyte, 2 = xeromesophyte, 2.5 = xeromesophyte-mesophyte, 3 = mesophyte, 3.5 = mesophyte-mesohygrophyte, 4 = mesohygrophyte, 4.5 = mesohygrophyte-hygrophyte, 5 = hygrophyte. **Temperature (T)**: 0 = eurithermophyte, 1 = hekistothermophyte, 1.5 = hekistothermophyte-psichrothermophyte, 2 = psichrothermophyte, 2.5 = psichrothermophyte-microthermophyte, 3 = microthermophyte, 3.5 = microthermophyte-mesothermophyte, 4 = mesothermophyte, 4.5 = mesothermophyte-submesothermophyte, 5 = subthermophyte. **Soil reaction (R)**: 0 – Euryionic; 1 – Extremely acidophilic; 2 – Acidophilic; 3 – Acid-neutral; 4 – Weakly acid-neutral; 5 – Neutrobasiphilic. **IUCN Red List**: LC – Least Concern, DD – Data Deficient, CWR – Crop wild relatives, AqS – Aquatic species. **Urbanity**: 1 = urbanophobic, 2 = moderately urbanophobic, 3 = urbanoneutral, 4 = moderately urbanophilic, 5 = urbanophilic.

Results and discussion

During the 5 years of investigations, we inventoried 331 species and subspecies, of which 266 are natives (including archaeophytes) (Annex 1) and 65 are alien taxa for Romanian flora (Annex 2). The ratio between native and alien is 4.09 / 1. Three inventoried native species have been reported previously from this area: *Lemna trisulca*, *Wolffia arrhiza*, *Ranunculus trichophyllus* (Panţu 1908, 1909, 1910). Even *Sedum rupestre* and *Sedum telephium* subsp. *fabaria* are native taxa in the Romanian flora, it seems to have escaped from the gardens around the investigated area. They grow in the crevices of the dyke's concrete. Other species as *Corydalis solida* subsp. *solida*, *Narcissus poëticus*, *Narcissus pseudonarcissus*, *Phemeranhus confertiflorus*, *Tulipa gesneriana* could be the result of direct human actions, some people throwing away the vegetal waste from their gardens in to places such as "Balta Văcărești". The alien species recorded for "Balta Văcărești" represent about one third (29.6%) of those recorded from Bucharest and its surroundings (Nagodă 2015).

The high level of the vascular plant diversity recorded in the "Balta Văcărești", especially of native ones, is due to the very low impact of human activity in the last 20 years in this area. Usually, the maximal diversity is found in vegetation affected by low human influences (Kowarik 1991).

Native species and subspecies belong to 57 families. Among the richest families in the investigated area are: Asteraceae (41 taxa), Poaceae (36 taxa), Fabaceae (24 taxa), Brassicaceae (13 taxa), Polygonaceae (12 taxa), Cyperaceae (10 taxa), Apiaceae (8 taxa), Rosaceae (8 taxa), Caryophyllaceae (7 taxa), Plantaginaceae (7 taxa) (Fig. 3). Most of the families identified by us as the richest in species are in fact among the 20 top families richest in species, in the world (Christenhusz *et al.* 2017). The pattern for the first four families is similarly to some European cities as Roma, Thessaloniki, Zürich (Stešević & Jovanović 2008).

Approximately 51% (136 taxa) of the native species and subspecies are Eurasian elements (including here Continental and sub-Mediterranean Eurasian domain, as well) (Fig. 4). Most of them are terrestrial plants characteristic to ruderal communities or to dry grasslands. Only a small number of Eurasian elements are found in swamp or aquatic areas: *Alisma lanceolatum*, *Butomus umbellatus*, *Carex acutiformis*, *Carex vulpina*, *Carex riparia*, *Cyperus fuscus*, *Cyperus glomeratus*, *Hydrocharis morsus-ranae*, *Juncus inflexus*, *Juncus compressus*, *Lysimachia nummularia*, *Mentha longifolia*,

Mentha pulegium, *Ranunculus repens*, *Ranunculus trichophyllus*, *Rumex palustris*, *Sparganium erectum*. Another 16% of the identified species and subspecies (43) belong to the European domain (including the Central, Western and Northern European). These are present at the edge of the ponds (*Mentha aquatica* subsp. *aquatica*, *Rumex hydrolapathum*), but especially in the vegetal communities along the roads (*Vicia dasycarpa*, *V. lathyroides*, *V. villosa*, *Geranium pusillum*, etc.).

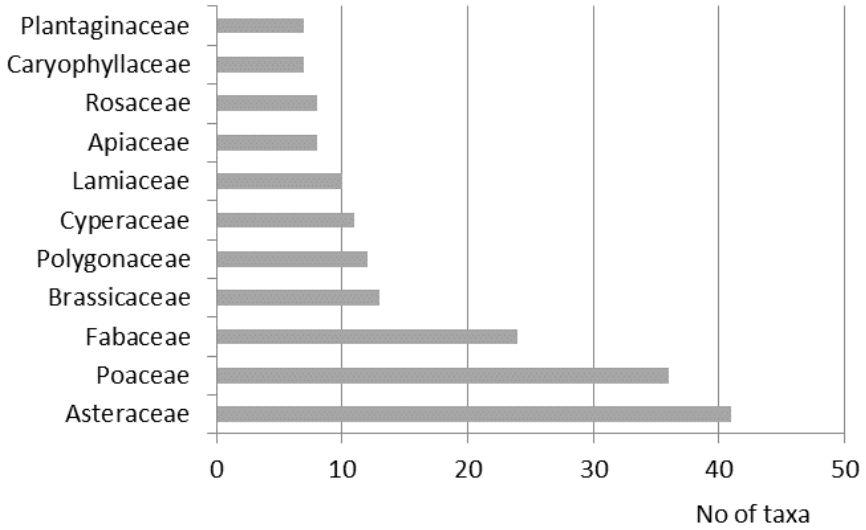

Fig. 3. Taxonomic spectrum of the main plant families of the native species (≥ 7 species) in "Balta Văcăreşti".

Cosmopolite are 12.8% (34 taxa), and circumpolar 6.8% (18 taxa). Among the cosmopolite species there are many aquatic and swamp plants: *Eleocharis palustris*, *Lemna minor*, *Lemna trisulca*, *Phragmites australis*, *Persicaria amphibia*, *P. lapathifolia*, *P. maculosa*, *Schoenoplectus lacustris*, *S. tabernaemontani*, *Typha latifolia*, *Wolffia arrhiza*. The situation is similar for circumpolar elements, many of them being aquatic and swamp plants: *Alisma plantago-aquatica*, *Alopecurus aequalis*, *Berula erecta*, *Myriophyllum spicatum*, *Myriophyllum verticillatum*, *Persicaria hydropiper*, *Potamogeton natans*, *Stachys palustris*, *Typha angustifolia*, *Utricularia vulgaris*. An important category of elements is those of Southern origin which require a mild climate, with a water deficit in the summer time: Mediterranean, Ponto-Balkan, Ponto-Mediterranean, sub-Mediterranean (32 taxa – 12%) (Fig. 4). We mention some of them: *Anchusa ochroleuca*, *Cynanchum acutum*, *Geranium rotundifolium*, *Melissa officinalis*, *Tragus racemosus*, *Vicia grandiflora*.

The dominating life forms in the flora of the "Balta Văcăreşti" are represented by hemicryptophytes, with 90 taxa (34%). These are followed by: therophytes with 68 taxa (25.5%), therophytes-hemitherophytes with 21 taxa (%), hemitherophytes with 19 taxa (8%), geophytes with 13 taxa (5%), hydrophytes with 11 taxa (4.1%), geophytes

(helohydatophytes) with 10 taxa (3.7%), megaphanerophytes with 10 taxa (3.7%), and nanophanerophytes with 8 taxa (3%) and other categories of elements with 16 taxa (Fig. 5).

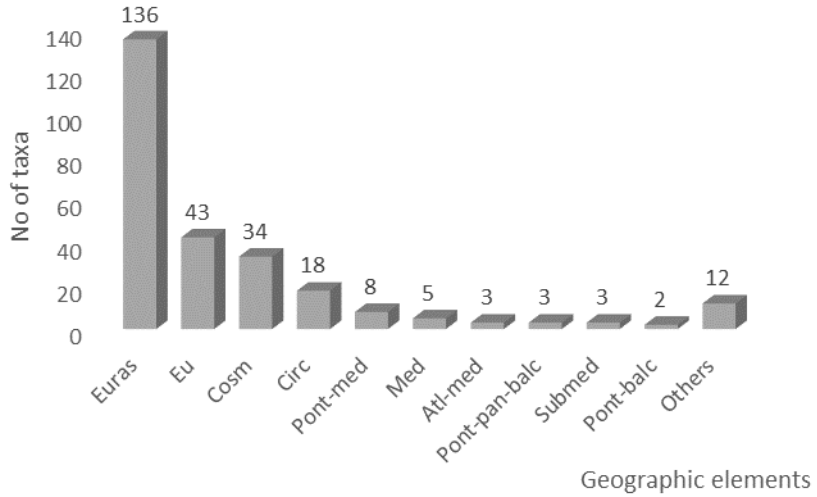

Fig. 4. Spectrum of geographic elements for native species recorded in "Balta Văcăreşti".

According to Cristea *et al.* (2004), hemicryptophytes usually indicate a climate with a thermic and hydric deficit and the abundance of grass formations edified by perennial poaceaes. In the investigated area, 13 of these hemicryptophytes are perennial poaceaes, especially in the dry places. Therophytes are usually associated with a high degree of flora anthropisation. They represent a dominant category in urban areas as Chernihiv – Ukraine (Zavyalova 2008), Split – Croatia (Jasprica *et al.* 2010), Roma, Cagliari, Palermo – Italy (Celesti-Grapow & Blasi 1998), as well as in many old town centres (Brandes 1995). In the "Balta Văcăreşti" the therophytes occur predominantly along the trails and on the dyke. The most geophytes are present at the edge of the ponds. We have to mention here the presence of *Corydalis solida* subsp. *solida*, an unexpected forest species. We supose that people living around the lake brought some plants from the forest for their own gardens, and then they threw away the garden soil and vegetal remains on the ground of "Balta Văcăreşti". Hydrophytes and helohydatophytes are typical of the aquatic and swamp formations. We mention here *Bolboschoenus maritimus*, *Eleocharis palustris*, *Phragmites australis*, *Schoenoplectus lacustris*, *S. tabernaemontani*, *Typha angustifolia*, *T. latifolia*, *T. laxmannii*. A study on British flora reveal that hydrophytes "appeared to be more favoured by urbanization" (Thompson & McCarthy 2008). In "Balta Văcăreşti" area hydrophytes are favoured by the specific condition of the place which is actually a large swamp isolated by the urban space through a big dyke. Phanerophytes are distributed around the ponds (*Salix* spp., *Populus* spp.), but they are also present on the dyke, in concrete's crevices (*Acer platanoides*, *Acer pseudoplatanus*, *Colutea arborescens*, *Cornus sanguinea*, *Rosa canina*, *Ulmus procera*).

The analysis of the ecological indicators of the inventoried plants in ”Balta Văcăreşti” area reveals that the flora of this area is dominated by elements with medium requirements in terms of moisture and heat, but prefer weakly acidneutrophilic soils or euryionic soils (Fig. 6).

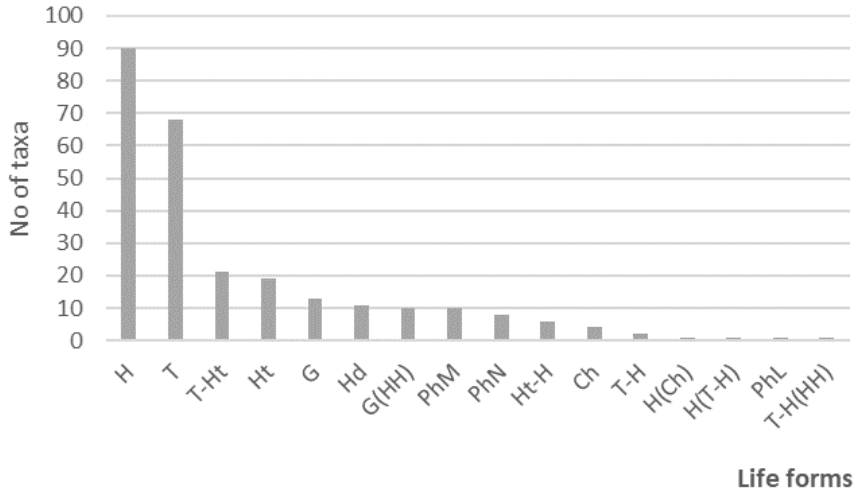

Fig. 5. Spectrum of life forms for native species recorded in “Balta Văcăreşti”.

In terms of the moisture, the highest number of taxa is represented by mesophytes (57 – 21.5%). These are followed by xeromesophytes (47 – 17.7%) and xeromesophytes to mesophytes (46 – 17.3%). 42 taxa (15.8%) are hydrophytes and ultrahydrophytes, characteristic to the aquatic and swamp plants’ communities. Only 11 taxa are euryphytes, adapted to great moisture variations (Fig. 6). Among these we mention: *Bromus hordeaceus*, *Buglossoides arvensis*, *Carex hirta*, *Elymus repens*, *Epilobium tetragonum* subsp. *lamyi*, *Tragus racemosus*, *Tribulus terrestris*, *Tussilago farfara*.

Concerning the requirements in terms of heat, we note the presence of only one thermophilic element (*Botriochloa ischaemum*), growing in the grasslands installed on the dyke, and three microthermic elements (*Festuca pratensis* subsp. *pratensis*, *Silene latifolia* subsp. *alba* and *Viola tricolor*). The great majority is represented by mesothermic (118 taxa – 44.5%), mesothermic to moderate thermohilic (46 taxa – 17.2%) and moderate thermophilic elements (55 taxa – 20.7%) (Fig. 6).

In regard to the plants’ preferences for the soil pH, we noticed the presence of a large number of elements with wide ecological amplitude to soil reaction (97 – 36.6%) and elements which prefer weakly acid to neutral soils (103 taxa – 38.8%) (Fig. 6). The number of elements which prefer neutral to basic soil is very low (5 taxa – 1.8%). “Generally, urban areas appear to favour plants of base-rich soils” (Thompson & McCarthy 2008), but the situation recorded for the “Balta Văcăreşti” area is different, quite similar to that of British flora where “the model for urban frequency of natives indicated highest frequency at intermediate pH values” (Thompson & McCarthy 2008).

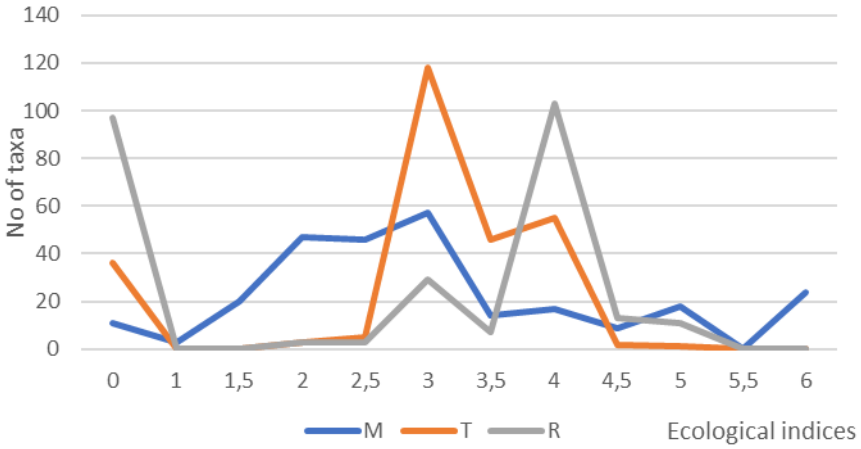

Fig. 6. Spectrum of ecological forms for native species recorded in "Balta Văcăreşti".

The analysis of the floristic inventory shows that 64 taxa are listed in different categories of the IUCN Red List (Bilz *et al.* 2011). A significant percentage of these are aquatic or swamp plants (64% – 41 taxa), listed as Least Concern. Another category is represented by Crop Wild Relative with 21 taxa (32.8%) evaluated as Least Concern. *Agrostis stolonifera* subsp. *stolonifera* is listed as Least Concern both for Aquatic Species and Crop Wild Relative. *Malva sylvestris* is included as Data Deficient taxa in IUCN Red List (Bilz *et al.* 2011).

Utricularia vulgaris and *Wolffia arrhiza* are listed in the National Red List (Oltean *et al.* 1994), as rare and, respectively, insufficiently known. *Wolffia arrhiza* is included also in the Romanian Red Book (Dihoru & Negrean 2011) as endangered species.

The alien taxa are distributed in 32 families (Annex 2), the richest being Asteraceae with 11 species. This is followed by Rosaceae (5 taxa), Poaceae (4 taxa), Amaranthaceae (3 taxa), Chenopodiaceae (3 taxa), Solanaceae (3 taxa) and Ulmaceae (3 taxa). Eight families are represented by two taxa each and 17 families are represented by one taxon each. Most of the alien plant species from "Balta Văcăreşti" are therophytes – 30 taxa (46.1%) (Fig. 7). The second place is occupied by trees (megaphanerophytes) with 20 taxa (30.7%), and the third is occupied by geophytes with 7 taxa (10.7%) (Fig. 7). About half of the alien species recorded in investigated area are the native distribution in America (33 taxa – 50.7%). Other 21 taxa (32.3%) are Asiatic elements. Among them there are a few known for their invasive status: *Acer negundo*, *Ailanthus altissima*, *Amaranthus albus*, *Amaranthus retroflexus*, *Ambrosia artemisiifolia*, *Ambrosia trifida*, *Azolla filiculoides*, *Cuscuta campestris*, *Elaeagnus angustifolia*, *Elodea nuttallii*, *Helianthus tuberosus*, *Iva xanthiifolia*, *Lycium barbarum*, *Panicum capillare*, *Parthenocissus inserta*, *Fallopia japonica*, *Sorghum halepense*, *Veronica persica*, *Xanthium italicum*, *Xanthium spinosum*. The most widespread in the

area is *Ambrosia artemisiifolia* which grows very well especially on the dyke, in the crevices of the concrete, but also in the flat area, even in vegetation with *Phragmites australis*.

According to Kowarik (1991), the spreading processes of alien species start very often from intensively disturbed sites. This is confirmed in the "Balta Văcăreşti" where the most alien species were recorded on the dyke or along the trails, and only few could be find in the aquatic or swamp habitats.

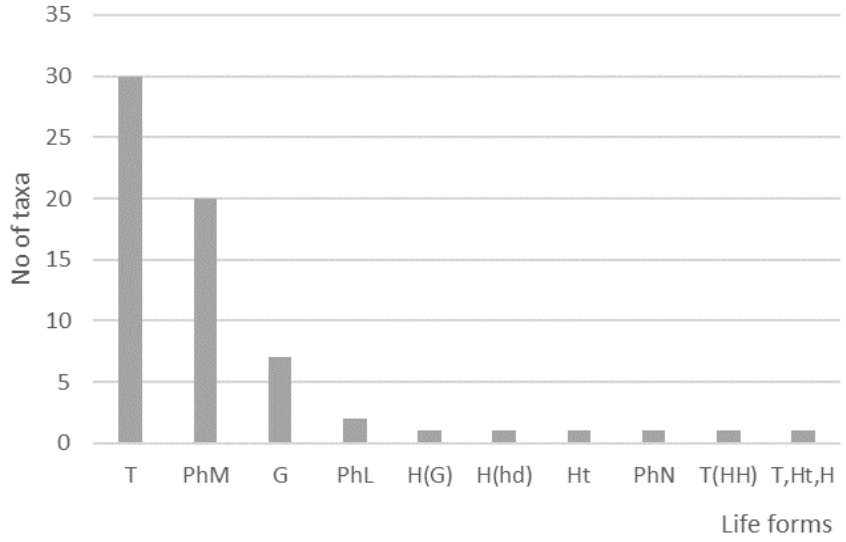

Fig. 7. Spectrum of life forms of the alien species recorded in "Balta Văcăreşti".

The analysis of the urbanity indices reveals a very interesting situation. Despite the fact that the investigated are is located in an urban area, very close to the city centre, about 40% of the taxa are urbanophobic (41 taxa) and moderately urbanophobic (91 taxa) (Fig. 8, Annex 1, 2). With only few exceptions (*Oenothera glazioviana*, *Fraxinus pennsylvanica*, *Narcissus pseudonarcissus*, *Tulipa gesneriana*, *Xanthium italicum*), these are native taxa, characteristic especially for the aquatic and swamp habitats installed in the "Balta Văcăreşti". Urbanophilic taxa (about 7% of the total flora of investigated area) are dominated by alien species, but there are nine native species in this category as well: *Bromus squarrosus*, *Chenopodium strictum*, *Eragrostis minor*, *Eragrostis pilosa*, *Hibiscus trionum*, *Melissa officinalis*, *Portulaca oleracea* subsp. *oleracea*, *Tragus racemosus*, *Verbascum speciosum*. The moderately urbanophilic category (11.7%) is dominated by native elements, with 21 taxa. Among them, there are species very common for the ruderal places of the city: *Artemisia annua*, *Artemisia vulgaris*, *Ballota nigra* subsp. *nigra*, *Chelidonium majus*, *Cynodon dactylon*, *Hordeum murinum*, *Lactuca serriola*, *Sambucus ebulus*, *Tanacetum vulgare*, *Urtica dioica*, *Verbena officinalis*.

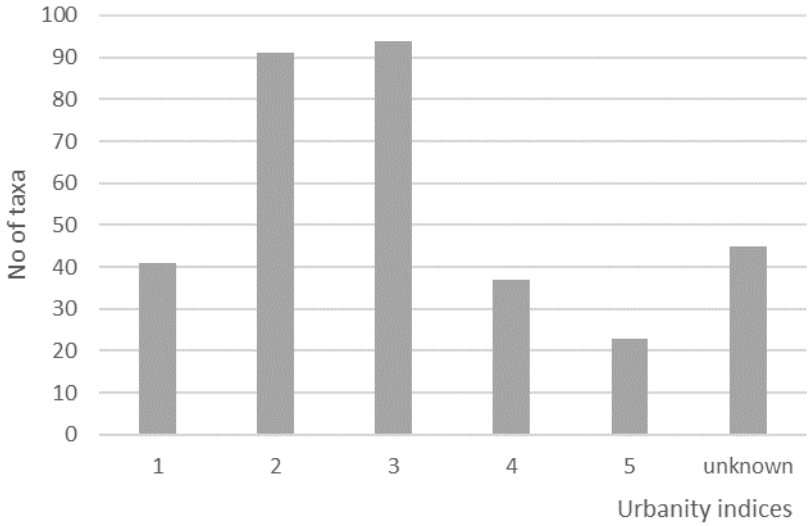

Fig. 8. Spectrum of urbanity indices for the Balta Văcăreşti.

In regard to the vegetation, we identified aquatic communities with *Lemna minor*, *Wolffia arrhiza*, *Lemna trisulca*, *Myriophyllum verticillatum*, *Myriophyllum spicatum*, *Hydrocharis morsus-ranae*, *Ceratophyllum demersum*, *Potamogeton natans*, *Ranunculus trichophyllus*, *Utricularia vulgaris*. Unfortunately, these communities are already contaminated with the alien species *Elodea nuttallii*, now included in the updated list of invasive alien species of the Union Concern (European Comission 2017).

At the edge of ponds there are large communities dominated either by *Phragmites australis*, or by species of cattails (*Typha latifolia*, *Typha angustifolia*, *Typha laxmannii*). These are accompanied by numerous species such as: *Alisma lanceolatum*, *Alisma plantago-aquatica*, *Althaea officinalis*, *Bolboschoenus maritimus*, *Carex riparia*, *Carex acutiformis*, *Carex vulpina*, *Cyperus fuscus*, *Cyperus glomeratus*, *Elaeocharis palustris*, *Epilobium hirsutum*, *Juncus inflexus*, *Lycopus europaeus*, *Lythrum salicaria*, *Mentha aquatica*, *Mentha longifolia*, *Nasturtium officinale*, *Persicaria amphibia*, *Persicaria hydropiper*, *Persicaria lapathifolia*, *Ranunculus repens*, *Rumex hydrolapathum*, *Rumex palustris*, *Shoenoplectus lacustris*, *Sparganium erectum*, *Stachys palustris*, etc.. Few woody species grow also to the edge of ponds: *Salix alba*, *Salix cinerea*, *Salix fragilis*, *Populus nigra*, *Populus canescens*.

In the eastern part of the dyke, on the outside, as well as on the elevated places from the flat area, the grassland dominated by *Botriochloa ischaemum* have been installed. We inventoried here species such as *Artemisia austriaca*, *Bromus hordeaceus*, *Cephalaria transsylvanica*, *Cichorium intybus*, *Chondrilla juncea*, *Carduus acanthoides*, *Plantago lanceolata*, *Petrorhagia prolifera* (Fig. 9).

Fig. 9. The vegetation of "Balta Văcăreşti". In the foreground, grassland with *Botriochloa ischaemum* (Photo: Paulina Anastasiu).

Fig. 10. The vegetation of dyke in "Balta Văcăreşti" (Photo: Paulina Anastasiu).

In crevices of the dyke's concrete (Fig. 10) we recorded: *Ambrosia artemisiifolia*, *Artemisia annua*, *Bromus tectorum*, *Ailanthus altissima*, *Acer negundo*, *Morus alba*, *Cephalaria transsylvanica*, *Petrorhagia prolifera*, *Galium humifusum*, *Erigeron annuus*, *Xanthium italicum*, *Daucus carota* subsp. *carota*, *Euphorbia maculata*, *Gleditsia triacanthos*, *Crepis foetida* subsp. *rhoeadifolia*, *Polygonum aviculare*, *Lolium perenne*, etc.

Between the flat area and the lower part of the dyke, on superficial soil, we inventoried species such as *Phemeranthus confertiflorus*, *Portulaca pilosa*, *Portulaca oleracea*, *Sedum acre*, *Eragrostis minor*, etc.

Along the trails there are communities with *Lolium perenne*, *Elymus repens*, *Polygonum aviculare*, *Sclerochloa dura*, *Erodium cicutarium*.

Conclusions

An abandoned project in Bucharest, the capital of Romania, has given nature opportunities for new habitats and plant species. With minimal human interventions, on a surface of about 190 ha, in over 25 years, nature did its job very well, reclaiming its territory in this urban area. Thus, 331 plant species have grown here, many of them being native to Romania. A robust awarness of the existence of these plants can contribute to a better understanding of the structure and function of urban ecosystems, can provide opportunities to educate the public and policy makers (Pickett & Cadenasso 2008), and can be useful for the management activities in order to protect the biodiversity.

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Annex 1. Native species and subspecies (including archaeophytes) recorded to "Balta Văcărești" between 2012-2016

No.	Taxon	Family	Native Distribution	Life form	H	T	R	IUCN Red List	Urbanity
1.	Acer platanoides L.	Aceraceae	Eu	PhM	3	3	3		3
2.	Acer pseudoplatanus L.	Aceraceae	EuC	PhM	3.5	3	3		3
3.	Achillea millefolium L.	Asteraceae	Euras	H	2	4	3.5		3
4.	Achillea nobilis L. subsp. neilreichii (A.Kern.) Velen.	Asteraceae	Pont-pan-balc	H	2	3.5	4.5		4
5.	Achillea setacea Waldst. & Kit.	Asteraceae	Euras.cont	H	2	3	5		1
6.	Aegilops cylindrica Host	Poaceae	Euras.cont	T	1.5	3	0	LC(CWR)	unknown
7.	Agrimonia eupatoria L.	Rosaceae	Euras	H	2.5	3	4		2
8.	Agrostis stolonifera L. subsp. stolonifera	Poaceae	Circ	H	4	0	0	LC(AqS&CWR)	3
9.	Alisma lanceolatum With.	Alismataceae	Euras	Hd	6	0	4	LC(AqS)	1
10.	Alisma plantago-aquatica L.	Alismataceae	Circ	Hd	6	0	0	LC(AqS)	2
11.	Alopecurus aequalis Sobol.	Poaceae	Circ	T-Ht	5	3	5	LC(AqS)	2
12.	Althaea officinalis L.	Malvaceae	Euras.cont	H	3	4	4		1
13.	Alyssum alyssoides (L.) L.	Brassicaceae	Euras.cont	T	1.5	4	5		1
14.	Anchusa ochroleuca M.Bieb.	Boraginaceae	Pont-cauc	H	2	4	4		unknown
15.	Anthriscus cerefolium (L.) Hoffm. subsp. trichosperma (Schult.) Arcang.	Apiaceae	Pont-med	T	3	4	0		4
16.	Arctium lappa L.	Asteraceae	Euras	Ht	3.5	3	4		4
17.	Arctium minus (Hill) Bernh.	Asteraceae	Eu	Ht	3	3	4.5		4
18.	Arenaria serpyllifolia L. subsp. serpyllifolia	Caryophyllaceae	Circ	T	2	2.5	0		2
19.	Arrhenatherum elatius (L.) P.Beauv. ex J.Presl & C.Presl.	Poaceae	Euras	H	3	3	4		2
20.	Artemisia absinthium L.	Asteraceae	Euras	H	2	3	4		2
21.	Artemisia annua L.	Asteraceae	AsC&SW	T	3	4	4		4
22.	Artemisia austriaca Jacq.	Asteraceae	Euras.cont	Ch	2	4	4.5		3
23.	Artemisia vulgaris L.	Asteraceae	Circ	H	2.5	3	4		4

24.	Astragalus cicer L.	Fabaceae	Euras.cont	H	2.5	4	4	LC(CWR)	2
25.	Atriplex oblongifolia Waldst. & Kit.	Chenopodiaceae	Euras.cont	T	2	3.5	4		2
26.	Atriplex sagittata Borkh.	Chenopodiaceae	Euras.cont	T	3	3	0		3
27.	Atriplex tatarica L.	Chenopodiaceae	Euras	T	2	4	0		3
28.	Avena fatua L.	Poaceae	Euras(submed)	T-Ht	3	3.5	4	LC(CWR)	2
29.	Ballota nigra L. subsp. nigra	Lamiaceae	EuC&NE	H	2	3.5	4		4
30.	Berteroa incana (L.) DC.	Brassicaceae	Euras	T-Ht	2	3	4		3
31.	Berula erecta (Huds.) Coville	Apiaceae	Circ	H(Hd)	6	3.5	0	LC(AqS)	1
32.	Bidens tripartita L.	Asteraceae	Euras	T	4.5	3	0	LC(AqS)	2
33.	Bolboschoenus maritimus (L.) Palla	Cyperaceae	Cosm	G(HH)	4.5	3	5	LC(AqS)	2
34.	Bothriochloa ischaemum (L.) Keng	Poaceae	Euras(submed)	H	1.5	5	3		2
35.	Bromus arvensis L.	Poaceae	Euras(submed)	T-Ht	2.5	3	0		1
36.	Bromus hordeaceus L.	Poaceae	Euras(submed)	T-Ht	0	3	0		3
37.	Bromus inermis Leyss.	Poaceae	Euras.cont	H	2.5	4	4		3
38.	Bromus squarrosus L.	Poaceae	Euras.cont	T-Ht	1.5	4	4		5
39.	Bromus sterilis L.	Poaceae	Euras(submed)	T	2	4	4		3
40.	Bromus tectorum L.	Poaceae	Euras.cont	T	1.5	3.5	0		3
41.	Buglossoides arvensis (L.) I.M.Johnst.	Boraginaceae	Euras	T	0	0	4		2
42.	Butomus umbellatus L.	Butomaceae	Euras	Hd	6	3	0	LC(AqS)	2
43.	Calamagrostis epigeios (L.) Roth	Poaceae	Euras	G	2	3	0		3
44.	Calystegia sepium (L.) R.Br.	Convolvulaceae	Euras	G(H)	5	3	4		3
45.	Capsella bursa-pastoris (L.) Medik.	Brassicaceae	Cosm	T-Ht	3	0	0		3
46.	Carduus acanthoides L.	Asteraceae	Eu	Ht	2	3	0		3
47.	Carex acutiformis Ehrh.	Cyperaceae	Euras	G(HH)	6	3	4	LC(AqS)	2
48.	Carex cuprina (Sándor ex Heuff.) Nendtv. ex A.Kern.	Cyperaceae	Euras	H	5	3	0		2
49.	Carex hirta L.	Cyperaceae	Circ	G	0	3	0		3
50.	Carex riparia Curtis	Cyperaceae	Euras	G	5	4	4	LC(AqS)	1
51.	Carex vulpina L.	Cyperaceae	Euras	H	4	3	4		1
52.	Carthamus lanatus L.	Asteraceae	Pont.-med	T	2.5	4	0		unknown

53.	Centaurea biebersteinii DC.	Asteraceae	Pont-pan-balc	Ht-H	1.5	4	4		2
54.	Centaurea iberica Trevir.	Asteraceae	Pont-balc	Ht	1.5	4	0		unknown
55.	Centaurea jacea L.	Asteraceae	Eu	H	3	0	0		unknown
56.	Centaurea nigrescens Willd.	Asteraceae	EuC	H	3.5	3	3		1
57.	Cephalaria transylvanica (L.) Schrad. ex Roem. & Schult.	Dipsacaceae	Pont-med	Ht	2	3.5	4		unknown
58.	Cerastium dubium (Bastard) Guépin	Caryophyllaceae	Pont-med	T	3	3	0		1
59.	Cerastium semidecandrum L.	Caryophyllaceae	Eu	T	2	3.5	0		2
60.	Ceratophyllum demersum L. s.l.	Ceratophyllaceae	Cosm	Hd	6	3	0	LC(AqS)	1
61.	Chelidonium majus L.	Papaveraceae	Euras	H	3	3	4		4
62.	Chenopodium album L.	Chenopodiaceae	Cosm	T	3	3	0		3
63.	Chenopodium strictum Roth	Chenopodiaceae	EuC	T	2.5	4	0		5
64.	Chondrilla juncea L.	Asteraceae	Euras.cont	Ht-H	1.5	3.5	4		2
65.	Cichorium intybus L.	Asteraceae	Euras	H	3	0	3	LC(AqS)	3
66.	Cirsium arvense (L.) Scop.	Asteraceae	Euras	G	2.5	3	0		3
67.	Cirsium vulgare (Savi) Ten.	Asteraceae	Euras	Ht	3	3	0		3
68.	Clematis vitalba L.	Ranunculaceae	EuC	PhL	3	3	3		3
69.	Colutea arborescens L.	Fabaceae	EuS&SC	PhN	2	4.5	4.5		4
70.	Conium maculatum L.	Apiaceae	Euras	T-Ht	3	3	3		4
71.	Convolvulus arvensis L.	Convolvulaceae	Cosm	G(H)	2.5	3.5	3.5		3
72.	Cornus sanguinea L. s.l.	Cornaceae	EuC	PhN	3	3	4		2
73.	Corydalis solida (L.) Clairv. subsp. solida	Papaveraceae	Eu	G	3	3	4		2
74.	Cota austriaca (Jacq.) Sch.Bip.	Asteraceae	Centr.eur.pont.	T	2	4	4.5		1
75.	Crataegus monogyna Jacq.	Rosaceae	Euras	PhN	2.5	3.5	3		2
76.	Crepis capillaris (L.) Wallr.	Asteraceae	EuC&S	T-Ht	3	3	4		3
77.	Crepis foetida L. subsp. rhoeadifolia (M.Bieb.) Čelak.	Asteraceae	Pont-med	T	2.5	3.5	3		2
78.	Cyanus segetum Hill	Asteraceae	Med(azi Cosm)	Ht	3	4	0		2
79.	Cynanchum acutum L.	Asclepiadaceae	Pont-med	H	2.5	4	0		unknown
80.	Cynodon dactylon (L.) Pers.	Poaceae	Cosm	G	2	3.5	0		4

81.	Cyperus fuscus L.	Cyperaceae	Euras	T	6	3	4	LC(AqS)	1
82.	Cyperus glomeratus L.	Cyperaceae	Euras(submed)	T-H(HH)	5	3	4	LC(AqS)	unknown
83.	Dactylis glomerata L. s.l.	Poaceae	Euras	H	3	0	4		3
84.	Daucus carota L. carota	Apiaceae	Euras	Ht	2.5	3	0	LC(CWR)	3
85.	Descurainia sophia (L.) Webb ex Prantl	Brassicaceae	Euras	T-Ht	2.5	3.5	4		3
86.	Digitaria ischaemum (Schrader) Muhl.	Poaceae	Circ	T	1.5	3	4		3
87.	Digitaria sanguinalis (L.) Scop.	Poaceae	Cosm	T	1.5	0	4		3
88.	Diplotaxis muralis (L.) DC.	Brassicaceae	Centr.eur.med.	T-Ht	2.5	4.5	4.5		3
89.	Dipsacus fullonum L.	Dipsacaceae	Submed	Ht	3.5	3.5	4		3
90.	Dipsacus laciniatus L.	Dipsacaceae	Euras.cont	Ht	4	3.5	4		4
91.	Echinochloa crus-galli (L.) P.Beauv.	Poaceae	Cosm	T	4	0	3		3
92.	Echium vulgare L.	Boraginaceae	Euras	Ht	2	3	4		3
93.	Eleocharis palustris (L.) Roem. & Schult.	Cyperaceae	Cosm	G(HH)	5	0	4	LC(Aqs)	2
94.	Elymus repens (L.) Gould. s.l.	Poaceae	Circ	G	0	0	0		unknown
95.	Epilobium hirsutum L.	Onagraceae	Euras	H	4	3	3		2
96.	Epilobium parviflorum Schreb.	Onagraceae	Euras	H	5	3	4.5		unknown
97.	Epilobium tetragonum subsp. lamyi (F.W.Schultz) Nyman	Onagraceae	Atl-med	H	0	3.5	0		3
98.	Equisetum arvense L.	Equisetaceae	Cosm	G	3	3	0		3
99.	Eragrostis minor Host	Poaceae	EuC-med	T	3	4	0		5
100.	Eragrostis pilosa (L.) P.Beauv.	Poaceae	EuC-med	T	3	3.5	0		5
101.	Erodium cicutarium (L.) L'Hér.	Geraniaceae	Cosm	T	2.5	0	0		3
102.	Erophila verna (L.) DC.	Brassicaceae	Eu	T	2.5	3.5	0		2
103.	Euphorbia cyparissias L.	Euphorbiaceae	Euras	H	2	3	4		2
104.	Euphorbia esula subsp. tommasiniana (Bert ol.) Kuzmanov	Euphorbiaceae	Euras.cont	H	2	4	3		3
105.	Falcaria vulgaris Bernh.	Apiaceae	Euras(submed)	T	2	4	4		2
106.	Fallopia convolvulus (L.) Á.Löve	Polygonaceae	Circ	T	2.5	3	3		3
107.	Festuca arundinacea Schreb.	Poaceae	EuC	H	4	3	4		1
108.	Festuca pratensis Huds. subsp. pratensis	Poaceae	Euras	H	3.5	2	0		2

109.	Fraxinus angustifolia Vahl subsp. oxycarpa (Willd.) Franco & Rocha Afonso	Oleaceae	MedW	PhM	4.5	4	4.5		unknown
110.	Fumaria schleicheri Soy.-Will.	Papaveraceae	Euras	T	2.5	4	4		2
111.	Galega officinalis L.	Fabaceae	Pont-med	H	4.5	3	4		2
112.	Galium humifusum M.Bieb.	Rubiaceae	Pont-balc	H	2	4	4.5		unknown
113.	Geranium pusillum L.	Geraniaceae	Eu	T	2.5	3	0		3
114.	Geranium rotundifolium L.	Geraniaceae	Submed	T	2	3.5	4		unknown
115.	Glechoma hederacea L.	Lamiaceae	Euras	H(Ch)	3	3	0		3
116.	Heracleum sibiricum L.	Apiaceae	Euras	Ht-H	3	2.5	5		2
117.	Hibiscus trionum L.	Malvaceae	Euras	T	2.5	4	4		5
118.	Holosteum umbellatum L. subsp. umbellatum	Caryophyllaceae	Euras	T	2	3.5	0		2
119.	Hordeum murinum L.	Poaceae	Euras	T	2.5	4	0	LC(CWR)	4
120.	Hordeum marinum subsp. gussoneanum (P arl.) Thell.	Poaceae	Euras.cont	T	2	4	4.5	LC(CWR)	2
121.	Humulus lupulus L.	Cannabaceae	Euras,AmN	H	3.5	3	4		3
122.	Hydrocharis morsus-ranae L.	Hydrocharitaceae	Euras	Hd	6	3.5	3.5	LC(AqS)	1
123.	Hypericum perforatum L.	Hypericaceae	Euras	H	3	3	0		3
124.	Inula britannica L.	Asteraceae	Euras	Ht	3	3	0		1
125.	Juglans regia L.	Juglandaceae	EuC-balc-cauc	PhM	3	4	4		2
126.	Juncus compressus Jacq.	Juncaceae	Euras	G	4	3	4		2
127.	Juncus inflexus L.	Juncaceae	Euras	H	4	4	4		2
128.	Lactuca saligna L.	Asteraceae	EuC&S	T-Ht	1.5	4	4	LC(CWR)	1
129.	Lactuca serriola L.	Asteraceae	Euras	T-Ht	1.5	3.5	0	LC(CWR)	4
130.	Lamium amplexicaule L.	Lamiaceae	Euras	T	2.5	3.5	0		3
131.	Lamium purpureum L.	Lamiaceae	Euras	T	3	0	0		3
132.	Lappula squarrosa (Retz.) Dumort.	Boraginaceae	Euras	T-Ht	1.5	3.5	4		2
133.	Lathyrus tuberosus L.	Fabaceae	Euras	H	2	4	4	LC(CWR)	2
134.	Lemna minor L.	Lemnaceae	Cosm	Hd	6	3	0	LC(AqS)	unknown
135.	Lemna trisulca L.	Lemnaceae	Cosm	Hd	6	3	4	LC(AqS)	unknown

136.	Lepidium draba L.	Brassicaceae	Euras.med	H	2	4	4		3
137.	Lepidium ruderale L.	Brassicaceae	Euras	T-Ht	2	3.5	0	LC(CWR)	3
138.	Linaria genistifolia (L.) Mill.	Plantaginaceae	Euras.cont	H	1	3.5	5		2
139.	Linaria vulgaris Mill.	Plantaginaceae	Euras	H	2	3	3		3
140.	Lolium perenne L.	Poaceae	Cosm	H	3	3	0	LC(CWR)	3
141.	Lotus corniculatus L.	Fabaceae	Euras	H	2.5	0	0	LC(CWR)	3
142.	Lotus tenuis Waldst. & Kit.	Fabaceae	Euras	H	3.5	3	4		1
143.	Lycopus europaeus L.	Lamiaceae	Euras	H	5	3	0	LC(AqS)	2
144.	Lysimachia nummularia L.	Primulaceae	Euras,AmN	Ch	4	3	3	LC(AqS)	3
145.	Lythrum salicaria L.	Lythraceae	Circ	H	4	2.5	0		2
146.	Malva sylvestris L.	Malvaceae	Euras	Ht-H	3	3	0	DD(CWR)	unknown
147.	Matricaria chamomilla L.	Asteraceae	Euras	T	2.5	3.5	5		3
148.	Medicago falcata L.	Leguminoase	Euras	H	2	3	5		2
149.	Medicago lupulina L.	Leguminoase	Euras	H(T-H)	2.5	3	4	LC(CWR)	3
150.	Medicago minima (L.) L.	Fabaceae	Submed	T	1.5	4	4	LC(CWR)	1
151.	Medicago sativa L.	Fabaceae	EuS,AsC	H	2	3	5	LC(CWR)	unknown
152.	Melica ciliata L.	Poaceae	EuC-med	H	1.5	4	4		1
153.	Melilotus alba Ledeb.	Fabaceae	Euras	Ht	2.5	3	0	LC(CWR)	3
154.	Melilotus officinalis (L.) Pall.	Fabaceae	Euras	Ht	2.5	3.5	0	LC(CWR)	3
155.	Melissa officinalis L.	Lamiaceae	Med	H	2	4	0		5
156.	Mentha aquatica L. subsp. aquatica	Lamiaceae	Eu	H	5	3	0	LC(AqS)	1
157.	Mentha longifolia (L.) L.	Lamiaceae	Euras	H	4.5	3	4		2
158.	Mentha pulegium L.	Lamiaceae	Euras(submed)	H	4.5	3	5	LC(AqS)	2
159.	Myriophyllum spicatum L.	Haloragaceae	Circ	H	6	0	4.5	LC(AqS)	1
160.	Myriophyllum verticillatum L.	Haloragaceae	Circ	H	6	3.5	3.5	LC(AqS)	2
161.	Nasturtium officinale R.Br.	Brassicaceae	Cosm	H	5	2.5	4		1
162.	Odontites vulgaris Moench [syn. Odontites serotina (Lam.) Dumort. s.l.]	Orobanchaceae	Euras(submed)	T	3	3	0		1
163.	Onobrychis viciifolia Scop.	Fabaceae	Euras	H	2	4	4.5	LC(CWR)	1
164.	Ononis spinosa subsp. hircina (Jacq.) Gams	Fabaceae	Euras.cont	H	3	4	0		1

165.	Onopordum acanthium L.	Asteraceae	Euras	Ht	2.5	4	4		4
166.	Papaver rhoeas L.	Papaveraceae	Cosm	T	3	3.5	4		2
167.	Pastinaca sativa L. s.l.	Apiaceae	Euras	Ht	3	4	4		3
168.	Persicaria amphibia (L.) Delarbre	Polygonaceae	Cosm	H	6	3	0	LC(AqS)	2
169.	Persicaria hydropiper (L.) Delarbre	Polygonaceae	Circ	T	5	3	4	LC(AqS)	2
170.	Persicaria lapathifolia (L.) Delarbre	Polygonaceae	Cosm	T	4	0	3	LC(AqS)	2
171.	Persicaria maculosa Gray	Polygonaceae	Cosm	T	4.5	3	0	LC(AqS)	2
172.	Petrorhagia prolifera (L.) P.W.Ball & Heywood	Caryophyllaceae	Atl-med	T	1.5	4	3		1
173.	Phragmites australis (Cav.) Trin. ex Steud.	Poaceae	Cosm	G(HH)	6	0	4	LC(AqS)	2
174.	Picris hieracioides Sibth. & Sm.	Asteraceae	Euras	Ht-H	1.5	3	4		2
175.	Pilosella piloselloides subsp. bauhinii (Schult.) S.Bräut. & Greuter	Asteraceae	EuC&E	H	2.5	3.5	4		2
176.	Plantago lanceolata L.	Plantaginaceae	Euras	H	3	0	0		3
177.	Plantago major L. s.l.	Plantaginaceae	Euras	H	3	0	0		3
178.	Poa angustifolia L.	Poaceae	Euras	H	2	3	0		3
179.	Poa bulbosa L.	Poaceae	Euras	H	1.5	3.5	4		2
180.	Poa compressa L.	Poaceae	Euras.cont	H	1.5	3	0		3
181.	Poa pratensis L. subsp. pratensis	Poaceae	Cosm	H	3	0	0		3
182.	Polygonum aviculare L.	Polygonaceae	Cosm	T	2.5	0	3		3
183.	Populus canescens L.	Salicaceae	Eu	PhM	3.5	3	3		3
184.	Populus nigra L.	Salicaceae	Euras	PhM	4	3	4		2
185.	Portulaca oleracea L. subsp. oleracea	Portulacaceae	Cosm	T	3	0	0		5
186.	Potamogeton natans L.	Potamogetonaceae	Circ	Hd	6	2.5	4		3
187.	Potentilla argentea L.	Rosaceae	Euras	H	2	4	2		2
188.	Potentilla reptans L.	Rosaceae	Euras	H	3.5	4	4		3
189.	Pulicaria dysenterica (L.) Gaertn.	Asteraceae	EuC	H	3.5	3	4		1
190.	Pyrus pyraster (L.) Du Roi	Rosaceae	Eu	PhM	2	3	4		1
191.	Ranunculus ficaria L. s.l.	Ranunculaceae	Euras	H	3.5	3	3		2
192.	Ranunculus repens L.	Ranunculaceae	Euras.Afr	H	4	0	0	LC(AqS)	3

193.	Ranunculus sardous Crantz	Ranunculaceae	Euras-AftN	T	3	3	4			2
194.	Ranunculus trichophyllus Chaix ex Vill.	Ranunculaceae	Euras	Hd	6	0	0	LC(AqS)		unknown
195.	Reseda lutea L.	Resedaceae	Euras	Ht-H	2	3	0			3
196.	Rorippa austriaca (Crantz) Spach	Brassicaceae	Pont	H	4	3.5	4			1
197.	Rorippa sylvestris (L.) Besser	Brassicaceae	Euras	H	4	3	4	LC(CWR)		1
198.	Rosa canina L.	Rosaceae	Eu	PhN	2	3	3			2
199.	Rubus caesius L.	Rosaceae	Eu	PhN	4.5	3	4			3
200.	Rubus discolor Weihe & Nees [Rubus praecox Bertol.]	Rosaceae	EuC&NW	PhN	2.5	3.5	0			unknown
201.	Rumex confertus Willd.	Polygonaceae	Euras.cont	H	3.5	4	4			unknown
202.	Rumex hydrolapathum Huds.	Polygonaceae	Eu	H	6	4	4	LC(AqS)		1
203.	Rumex maritimus L.	Polygonaceae	Cosm	T	5	3.5	4.5			1
204.	Rumex palustris Sm.	Polygonaceae	Euras	T	5	3	4			1
205.	Rumex patientia L. s.l.	Polygonaceae	Euras.cont	H	3	4	0			4
206.	Rumex thyrsiflorus Fingerh.	Polygonaceae	Eu-S Siberian	H	2	0	4			3
207.	Salix alba L.	Salicaceae	Euras	PhM	5	3	4			2
208.	Salix cinerea L.	Salicaceae	Euras	PhN	5	3	3			2
209.	Salix fragilis L.	Salicaceae	Euras	PhM	5	3	4			2
210.	Sambucus ebulus L.	Caprifoliaceae	Euras-submed	H	3	3	3			4
211.	Schoenoplectus lacustris (L.) Palla	Cyperaceae	Cosm	G(HH)	6	3	4	LC(AqS)		1
212.	Schoenoplectus tabernaemontani (C.C.Gmel.) Palla	Cyperaceae	Cosm	G(HH)	6	3	4	LC(AqS)		2
213.	Sclerochloa dura (L.) P.Beauv.	Poaceae	Med	T	2.5	3	3			1
214.	Securigera varia (L.) Lassen [syn. Coronilla varia L.]	Leguminoase	EuC-submed	H	2	3	4	LC(CWR)		2
215.	Sedum acre L.	Crassulaceae	Euras	H	1	3	0			3
216.	Sedum rupestre L. (cultivar)	Crassulaceae	EuN,C&SW	Ch	1.5	3	2.5			2
217.	Sedum telephium L. subsp. fabaria (W.D.J.Koch) Kirschl.	Crassulaceae	EuW&C	H	2.5	0	4			2
218.	Senecio jacobaea L.	Asteraceae	Euras	H	2.5	3	3			2

219.	Senecio vernalis Franch.	Asteraceae	Euras.cont	T	2.5	4	0		3
220.	Senecio vulgaris L.	Asteraceae	Euras	T	3	3	3		3
221.	Setaria viridis (L.) P.Beauv.	Poaceae	Cosm	T	2	3.5	0		3
222.	Silene latifolia Poir. subsp. alba (Mill.) Greuter & Burdet	Caryophyllaceae	Euras	T-H	3.5	2	3		3
223.	Sisymbrium loeselii L.	Brassicaceae	Euras.cont	T-Ht	2.5	4	3		3
224.	Solanum dulcamara L.	Solanaceae	Euras	Ch	4.5	3	4		3
225.	Solanum nigrum L.	Solanaceae	Cosm	T	3	4	0		3
226.	Sonchus arvensis L.	Asteraceae	Euras	G	3	0	0		2
227.	Sparganium erectum L.	Sparganiaceae	Euras	G(HH)	6	3	0	LC(AqS)	unknown
228.	Stachys palustris L.	Lamiaceae	Circ	H	4	3	4		2
229.	Stellaria media (L.) Vill. s.l.	Caryophyllaceae	Cosm	T-Ht	3	0	0		3
230.	Symphytum officinale L.	Boraginaceae	Euras	T-Ht	4	3	0		2
231.	Tamarix ramosissima Ledeb.	Tamaricaceae	Euras.cont	PhN	0	3.5	4		unknown
232.	Tanacetum vulgare L.	Asteraceae	Euras	H	3	3	4		4
233.	Taraxacum officinale Webb s.l.	Asteraceae	Euras	H	3	0	0		3
234.	Torilis arvensis (Huds.) Link	Apiaceae	EuC	T	2.5	3.5	4		1
235.	Tragopogon dubius Scop.	Asteraceae	EuC-med	T-Ht	2.5	3.5	0		2
236.	Tragus racemosus (L.) All.	Poaceae	Med	T	0	0	4		5
237.	Tribulus terrestris L.	Zygophyllaceae	EuC-med	T	0	4	4		unknown
238.	Trifolium fragiferum L. s.l.	Fabaceae	Euras	H	3	3	5		2
239.	Trifolium pratense L. s.l.	Fabaceae	Euras	H	3	0	0	LC(CWR)	2
240.	Trifolium repens L. s.l.	Fabaceae	Euras	H	3.5	0	0		3
241.	Tripleurospermum maritimum subsp. inodorum (L.) Appleq.	Asteraceae	Euras	T	0	0	3.5		3
242.	Tussilago farfara L.	Asteraceae	Euras	G	0	3	4		3
243.	Typha angustifolia L.	Typhaceae	Circ	G(HH)	6	4	0	LC(AqS)	2
244.	Typha latifolia L.	Typhaceae	Cosm	G(HH)	6	3.5	0	LC(AqS)	2
245.	Typha laxmannii Lepech.	Typhaceae	EuSE,AsC	G(HH)	5	4	0	LC(AqS)	2
246.	Ulmus procera Salisb.	Ulmaceae	Eu	Ph	2	3	3.5		unknown

247.	Urtica dioica L.	Urticaceae	Cosm	H	3	3	4	LC(AqS)	4
248.	Utricularia vulgaris L.	Lentibulariaceae	Circ	Hd	6	0	3.5	LC(AqS)	unknown
249.	Verbascum blattaria L.	Scrophulariaceae	Euras(submed)	Ht	2.5	3.5	3		2
250.	Verbascum phlomoides L.	Scrophulariaceae	EuC&SE	Ht	2.5	3.5	4		2
251.	Verbascum speciosum Schrad.	Scrophulariaceae	Pont-pan-balc	Ht	2	4	4		5
252.	Verbena officinalis L.	Verbenaceae	Cosm	H	2.5	3	0		4
253.	Veronica beccabunga L.	Plantaginaceae	Euras	H	5	3	4	LC(AqS)	1
254.	Veronica hederifolia L.	Plantaginaceae	Euras	T	2.5	3	4		3
255.	Veronica verna L.	Plantaginaceae	Euras	T	2	3	2		1
256.	Vicia dasycarpa Ten.	Fabaceae	Eu	T	3	3	0		unknown
257.	Vicia grandiflora Scop.	Fabaceae	Pont-balc-cauc	T	3	3	0		4
258.	Vicia hirsuta (L.) Gray	Fabaceae	Euras	T	2.5	3	0		2
259.	Vicia lathyroides L.	Fabaceae	Eu	T-Ht	2	4	2.5		2
260.	Vicia sativa subsp. nigra (L.) Ehrh.	Fabaceae	Euras	T	0	3	0		2
261.	Vicia villosa Roth	Fabaceae	Eu	T-Ht	2.5	3.5	2.5		2
262.	Viola arvensis Murray	Violaceae	Cosm	T	3	3	0		2
263.	Viola odorata L.	Violaceae	Atl-med	H	2.5	3.5	4		2
264.	Viola tricolor L.	Violaceae	Euras	T-H	3	2	0		2
265.	Vulpia myuros (L.) C.C.Gmel.	Poaceae	Euras	T	1	3.5	2		1
266.	Wolffia arrhiza (L.) Horkel ex Wimm.	Lemnaceae	Cosm	Hd	6	0	4	LC(AqS)	unknown

Annex 2. Alien species and subspecies recorded to "Balta Văcărești" between 2012-2016

No	Taxon	Family	Native Distribution	Life form	Urbanity
1.	Acer negundo L.	Aceraceae	AmN	PhM	4
2.	Aesculus hippocastanum L.	Hippocastanaceae	Med	PhM	4
3.	Ailanthus altissima (Mill.) Swingle	Simaroubaceae	As(China)	PhM	5
4.	Amaranthus albus L.	Amaranthaceae	AmN&C	T	5
5.	Amaranthus blitoides S.Watson subsp. blitoides	Amaranthaceae	AmN-C&W	T	5
6.	Amaranthus retroflexus L.	Amaranthaceae	AmN	T	3
7.	Ambrosia artemisiifolia L.	Asteraceae	AmN	T	5
8.	Ambrosia trifida L.	Asteraceae	AmN	T	5
9.	Armoracia rusticana P.Gaertn., B.Mey. & Scherb.	Brassicaceae	unknown(EuSE,AsW?)	H(G)	4
10.	Atriplex hortensis L.	Chenopodiaceae	AsC	T	5
11.	Azolla filiculoides Lam.	Azollaceae	AmN	T(HH)	unknown
12.	Bassia scoparia (L.) A.J.Scott	Chenopodiaceae	AsTemp	T	5
13.	Bassia sieversiana (Pall.) W.A.Weber	Chenopodiaceae	As	T	5
14.	Bidens frondosa L.	Asteraceae	AmN	T	3
15.	Brassica juncea (L.) Czern.	Brassicaceae	As	T	4
16.	Bromus madritensis L.	Poaceae	EuS&W	T	4
17.	Cannabis sativa L.	Cannabaceae	AsS&W	T	5
18.	Catalpa bignonioides Walter	Bignoniaceae	AmN	PhM	unknown
19.	Catalpa fargesii Bureau	Bignoniaceae	As(China-Tibet)??	PhM	unknown
20.	Celtis australis L.	Ulmaceae	EuS-med	PhM	unknown
21.	Celtis occidentalis L.	Ulmaceae	AmN	PhM	unknown
22.	Citrullus lanatus (Thunb.) Matsum. & Nakai	Cucurbitaceae	AfrSW	T	unknown
23.	Conyza canadensis (L.) Cronquist	Asteraceae	AmN	T	3
24.	Cucurbita pepo L.	Cucurbitaceae	AmC	T	unknown
25.	Cuscuta campestris Yunck.	Cuscutaceae	AmN	T	3
26.	Datura stramonium L.	Solanaceae	AmN	T	3
27.	Elaeagnus angustifolia L.	Elaeagnaceae	AsTemp	PhM	5

28.	Elodea nuttallii (Planch.) H.St.John	Hydrocharitaceae	AmN	H(Hd)	unknown
29.	Erigeron annuus (L.) Pers. s.l.	Asteraceae	AmN	T,Ht,H	3
30.	Euphorbia maculata L.	Euphorbiaceae	AmN	T	5
31.	Fraxinus americana L.	Oleaceae	AmN	PhM	unknown
32.	Fraxinus pennsylvanica Marshall	Oleaceae	AmN	PhM	2
33.	Gleditsia triacanthos L.	Leguminoase	AmN-C&E	PhM	unknown
34.	Helianthus annuus L.	Asteraceae	AmN	T	4
35.	Helianthus tuberosus L.	Asteraceae	AmN	G	3
36.	Impatiens balfourii Hook.f.	Balsaminaceae	As(Himalaya)	T	unknown
37.	Iva xanthiifolia Nutt.	Asteraceae	AmN	T	4
38.	Lycium barbarum L.	Solanaceae	As(China)	PhN	4
39.	Lycopersicon esculentum Mill.	Solanaceae	AmS	T	4
40.	Malus domestica Borkh.	Rosaceae	AsC	PhM	3
41.	Matricaria discoidea DC.	Asteraceae	AsNE,AmN	T	4
42.	Morus alba L.	Moraceae	As(China)	PhM	unknown
43.	Narcissus poeticus L.	Amaryllidaceae	Med	G	4
44.	Narcissus pseudonarcissus L.	Amaryllidaceae	Atl-med	G	2
45.	Oenothera glazioviana Micheli	Onagraceae	AmN	Ht	1
46.	Panicum capillare L.	Poaceae	AmN	T	5
47.	Panicum dichotomiflorum Michx.	Poaceae	AmN	T	4
48.	Parthenocissus inserta (A.Kern.) Fritsch	Vitaceae	AmN	PhL	4
49.	Parthenocissus quinquefolia (L.) Planch.	Vitaceae	AmN	PhL	unknown
50.	Phemeranthus confertiflorus (Greene) Hershkovitz	Montiaceae	AmN	G	unknown
51.	Portulaca pilosa L.	Portulacaceae	As	T	unknown
52.	Prunus armeniaca L.	Rosaceae	As	PhM	4
53.	Prunus cerasifera Ehrh.	Rosaceae	Pont-balc	PhM	4
54.	Prunus persica (L.) Stokes	Rosaceae	As(ChinaNW)	PhM	4
55.	Prunus cerasus L.	Rosaceae	AsSW&Eu	PhM	3
56.	Fallopia japonica (Houtt.) Ronse Decr.	Polygonaceae	As(Japon)	G	3

57.	Ricinus communis L.	Euphorbiaceae	AfrTrop	T	unknown
58.	Robinia pseudoacacia L.	Leguminoase	AmN	PhM	3
59.	Salix babylonica L.	Salicaceae	As(China)	PhM	unknown
60.	Sorghum halepense (L.) Pers.	Poaceae	AfrN,AsSW	G	5
61.	Tulipa gesneriana L.	Liliaceae	AsSV&C	G	2
62.	Ulmus pumila L.	Ulmaceae	As	PhM	unknown
63.	Veronica persica Poir.	Plantaginaceae	AsSV	T	3
64.	Xanthium italicum Moretti	Asteraceae	AmN&S	T	2
65.	Xanthium spinosum L.	Asteraceae	AmS(Cosm)	T	5

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OPTIMIZATION OF PCR-ISSR TECHNOLOGY FOR THE GENETIC ANALYSIS OF THE BASIDIOMYCOTA SPECIES

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Abstract: The present study has tested the efficiency of PCR-ISSR technique for the taxonomic identification, the quantification of the genetic diversity and the reconstruction of phylogenetic relationships in *Phellinus igniarius* (Hymenochaetaceae Family, Basidiomycetes). *P. igniarius* is used in the traditional medicine for anti-inflammatory, antitumoral and immunostimulating effects. The PCR-ISSR is one of the simplest and widely used methods based on DNA markers, since the ISSR markers are dominant, stable and reproducible. The application of this technique to superior mushrooms is a novelty, so that, each step (DNA extraction, PCR amplification with ISSR primers) involved testing, selection and optimization of the working protocols. The validation of the ISSR-PCR efficiency implied the interpretation of the molecular data assisted by specialized software in order to clarify some aspects not elucidated by classical morphological, biochemical and physiological methods.
Key words: Basidiomycota, ISSR, *Phellinus igniarius* (L.) Quél., genetic diversity

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Introduction

Fungi are one of the major eukaryotic groups, having important role in decomposition and nutrient cycling. They are obligate mutualistic symbionts with plants, algae, and cyanobacteria (Gadd 2013) and are used in pharmacology, biotechnologies and industrial fermentation (Lane *et al.* 2012). The phylum Basidiomycota is the second largest of the Fungi kingdom and comprises approximately 30% of all described fungal species (112 families, 1037 genus and 20391 species) (Tănase & Șesan 2006, Hibbett 2014). This phylum includes primarily macroscopic fungi, some of them being wood-decaying fungi (Floudas *et al.* 2012) that have a woody consistency and a sessile fruiting body with various shapes (spherical, hoof, fan, etc.) (Tănase & Șesan 2004).

One of the most important species from this phylum is the medicinal fungi *Phellinus igniarius* (L.) Quél (Hymenochaetaceae Family), known as willow

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bracket or fire sponge. The various compounds extracted from the fruiting body of this fungi exhibits anti–tumor (Zhou *et al.* 2014, Ding *et al.* 2016) and anti-viral activity (Kim *et al.* 2016). This fungus is also used in the traditional medicine due to its high content in secondary metabolites (like polyphenols, and triterpenoids) as an anti-inflammatory and immune-simulative agent (Dai *et al.* 2010, Yang *et al.* 2006).

The use of the molecular techniques in the study of macromycetes is at the beginning, both at national and international level. It is well known that DNA markers are useful in basic (e.g. phylogenetic analysis and search for useful genes) and applied researches (e.g. marker assisted selection and food traceability). Molecular techniques have proven their usefulness in the investigation of the species origin and their subsequent migrations, as well as in providing information on the evolutionary relationships (phylogenetic trees), and identifying geographical areas of admixture among populations of different genetic origins. Genetic diversity is frequently analyzed with the help of AAD sequences (arbitrarily amplified dominant sequences) which include RAPDs, ISSRs, AFLPs, RFLPs and microsatellites. In selecting the appropriate molecular techniques to be applied should be taken into consideration the objective and genetic information available for each particular species and, also, the intrinsic particularities of the DNA sequence (level of polymorphism that is capable to detect, reproducibility, costs) (Constantin *et al.* 2011).

In the present paper the efficiency of PCR-ISSR technique for taxonomic identification, quantification of the genetic diversity and reconstruction of the phylogenetic relationships in *Phellinus igniarius* species was investigated, in order to clarify some aspects difficult to elucidate by classical morphological and physiological methods.

Material and methods

Biological material was represented by small pieces of basidiocarp from 4 individuals belonging to *Phellinus igniarius* species. The biological material was harvested from March 15 to April 4, 2017, from Circus' Park, Bucharest, processed and stored at -20°C in the Laboratory of Plant Genetics, Faculty of Biology, Bucharest.

Genomic DNA was extracted using two different methods: Wizard Genomic DNA Purification Kit (Promega) and a modified CTAB method (Dehestani & Kazemi 2007, Pavlusenco *et al.* 2015) and then stored at -20°C for further analysis. DNA quantification was made using NanoVue V2.0.3 Plus Spectrophotometer (GE Healthcare).

ISSR methodology. Three ISSR primers (UBC817, HB11, ISSR-4a) (Integrated DNA Tehnologies, Inc. US) were used (Table 2). For each reaction (12 µl final reaction volume) 2X Go Taq® Green Master Mix (Promega, U.S.A.), 10µM primer and 8-14 ng/µl DNA were used. The PCR program involved one cycle of 4 min at 94°C; 40 cycles of: 45 s at 94°C, 1 min at 40-57°C (see Table 2), 2 min at 72°C; 1 cycle of 10 min at 72°C. All PCR reactions were conducted in a PTC-100 thermal cycler. PCR products were visualized in 2% agarose gel electrophoresis.

Data Analysis. The electrophoretic ISSR profiles were analyzed with PyElph 1.3 software package (Pavel & Vasile 2012). The DNA fragments were scored as present (1) or absent (0) and were used to compute primer banding characteristics: total number of bands (TNB), number of polymorphic bands (NPB), percentage of polymorphic

bands (PPB), number of monomorphic bands (NMB) and percentage of monomorphic bands (PMB) (Anderson *et al.* 1993, Prevost *et al.* 1999). Using POPGENE Version 1.31 (Yeh *et al.* 1997), Nei's gene diversity (h) and Shannon's information index (I) (Nei *et al.* 1979) were calculated. The genetic distance matrix generated by PyElph 1.3 was used to construct an UPGMA dendrogram based on the ISSR data.

Results and discussion

PCR amplification of ISSR markers is strongly influenced by the amount and the quality of the extracted DNA (Sardaro *et al.* 2013), mainly due to the co-precipitation of inhibitors or to the DNA fragmentation during isolation.

Phellinus igniarius forms a perennial fruiting body, and has a tough-woody consistency that can persist for many years, forming a new annual area (Arora 1986). The basidiocarp of the mushroom contains high levels of fiber and fat, but also polysaccharides, flavonoids and polyphenols compounds (Yang *et al.* 2016, Suabjakyong *et al.* 2015). All this bioactive compounds can co-precipitate along with the DNA and, therefore, can interfere with the PCR amplifications. In order to obtain a high quality DNA, i.e. free of inhibitors, various treatments should be applied: different detergents, concentrated acetate solutions, etc. These procedures usually involve many successive processing steps (like vortexing and centrifugation) which can cause fragmentation of the DNA.

Due to these considerations, two extraction methods were tested, one represented by a commercial DNA extraction kit (Wizard Genomic DNA Purification, Promega) and a complex protocol, optimized in the Laboratory of Plant Genetics, Faculty of Biology, suitable for vegetable tissues with high content of secondary metabolites. The commercial kit represents a rapid method for purifying DNA from numerous types of biological samples, but the quality of the extracts varies according to the chemical composition of the sample.

Unlike this, the complex method (optimized from Dehestani et Kazemi 2007) uses three different detergents to remove polysaccharides, proteins and other secondary metabolites. From them, CTAB (cetyltrimethylammonium bromide) is a cationic detergent that participates in the membrane destruction, sarcosyl (sodium N-lauroil sarcosinate) is an ionic surfactant derived from sarcosine, used as a cleansing agent that determine the elimination of cellular debris and the third, PVP (polyvinylpyrrolidone) is a good polyphenol absorber.

DNA yield

The DNA concentration was determined on the basis of the absorbance at 260 nm (OD260) with 1 OD equaling 50 µg/ml DNA (Sambrook *et al.* 1989). For both extraction methods and all samples, the A_{260}/A_{280} and A_{260}/A_{230} ratios were recorded (Table 1).

The complex CTAB/sarcosyl method provided the highest DNA average concentration (112 ng/µl DNA), compared with the commercial kit (88.37 ng/µl), although significant differences were recorded between samples.

The differences between sample concentrations when the same extraction method was used can be explained if it's taken into consideration: i) the contribution of single strand nucleic acid and single nucleotides to the final value of the absorbance and

ii) the interference of the contaminants that have the same absorbance as DNA (Turci *et al.* 2010).

Tabel 1. The concentrations, $A_{260/}$ A_{280} and $A_{260/}$ A_{230} ratios of the DNA isolated from *P. igniarius* using the two different extraction methods

S.	Wizard Genomic DNA purification			CTAB/sarcosil method		
	$A_{260/}$ A_{280}	**$A_{260/}$ A_{230}**	**Conc. (ng/µl)**	**$A_{260/}$ A_{280}**	**$A_{260/}$ A_{230}**	**Conc. (ng/µl)**
1	1.493	0.550	163.5	1.490	0.602	115.5
2	1.,487	0.630	78.5	1.418	0.828	103.5
3	1.415	0.720	111.5	1.387	0.676	82.5
6	-	-	-	1.550	0.710	146.5

S. = sample, Conc. = concentration

However, both methods failed to completely eliminate the protein and polysaccharide contaminants, as it can be observed from the values obtained for A_{260}/A_{280} and A_{260}/A_{230} ratios. For the commercial kit, the average values for the two ratios were 1.098 and 0.475; for the complex CTAB/sarcosyl method the values were slightly higher, 1.461 and 0.704, but still far from the optimum (1.8-2 for protein contamination and over 2 for polysaccharide).

Since spectrophotometric and electrophoretic analyzes of the DNA extracts were not conclusive, the quality of the extracted DNA was verified by amplifying a single ISSR marker, using serial dilutions. This method highlighted that the complex protocol CTAB/sarcosyl allowed obtaining a DNA suitable for further analysis by ISSR technique. These results are due to the fact that this method uses two-stage precipitation of the genetic material (first with isopropanol and potassium acetate and second with ammonium acetate and ethanol), in addition to the action of the three different detergents. Therefore, inhibitors of the PCR reaction were eliminated, which was not the case for the commercial kit extract, probably because in this situation the amount of remaining contaminants was too high. Thus, at 1/5 and 1/10 dilutions of the initial extracts, clear and scorable ISSR profiles were obtained, proving that the contaminants have lost inhibitory effect once their concentration has been reduced.

Genetic analysis of *Phellinus igniarius* species using ISSR markers

Three ISSR primers (ISSR4b, UBC817 and HB11) were used to amplify the genetic material from *P. igniarius* and generated a large number of clear and reproducible fragments (ISSR markers), that could be interpreted with specialized computer programs (Fig. 1).

Electrophoresis images have been analyzed with PyElph 1.3 software package, which identified each individual band, for each specimen and primer. Therefore, the DNA fragments were scored as present (1) or absent (0), each band being treated as an independent character and the resulting binary data matrix was used to compute primer banding characteristics (Table 2).

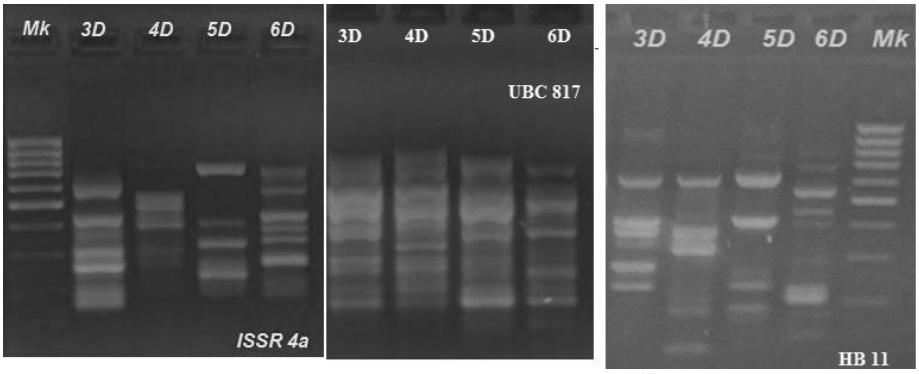

Fig. 1. ISSR band pattern in *Phellinus igniatus* using 3 different ISSR primers. 3D-6D – *P. igniatus* individuals, Mk = Gene Ruler 100 DNA Ladder (Fermentas).

Table 2. Details regarding the used ISSR primers and the results of amplifications for *Phellinus igniarius* individuals

Primer	Anneling temp. (°C)	TNB	NPB	%PB	NMB	% MB
ISSR 4a [$(AC)_8CT$]	45	27	27	100%	0	0%
UBC 817 [$(CA)_8A$]	57	32	30	93.75%	2	6.25%
HB11 [$(GT)_{11}CC$]	54	29	29	100%	0	0%
TOTAL	-	88	86	-	2	-

TNB=total number of bands, NPB=number of polymorphic bands, NMB=number of monomorphic bands, %PB=percent of polymorphic bands, %MB=percent of monomorphic bands

The three ISSR primers generated a total number of 88 bands, from which 86 were polymorphic (Table 2). The number of bands per primer varied between 27 (for ISSR 4a) and 32 (for UBC 817), with a mean of 29.33 bands/primer. For two of the primers, HB 11 and ISSR 4a, the percentage of the polymorphic bands was 100%.

The molecular data were further analyzed with POPGENE Version 1.31 and Nei's gene diversity index (h) and Shannon's information index (I) were computed, (Table 3), their values varying between 0.3309 and 0.4029 for h, and between 0.4904 and 0.5926 for I, with an average slightly higher. These data reflected the level of genetic diversity among the specimens under study and confirmed the ability of ISSR markers in identification of the different strains of *P. igniarius.*

Based on Dice similarity coefficient, PyElph program generated the genetic distance matrix which was implemented in POPGENE Version 1.31 program and used to construct an UPGMA dendrogram. Two of the analyzed individuals were more closely related as has been observed in the dendrogram in Fig. 2.

Table 3. Parameters of the genetic diversity

Primer	Nei's genetic diversity (h)	Shannon's information Index (I)
UBC 817	0.4029	0.5926
ISSR 4a	0,3114	0.4904
HB 11	0,3309	0.5130
Mean	**0.3484**	**0.5320**

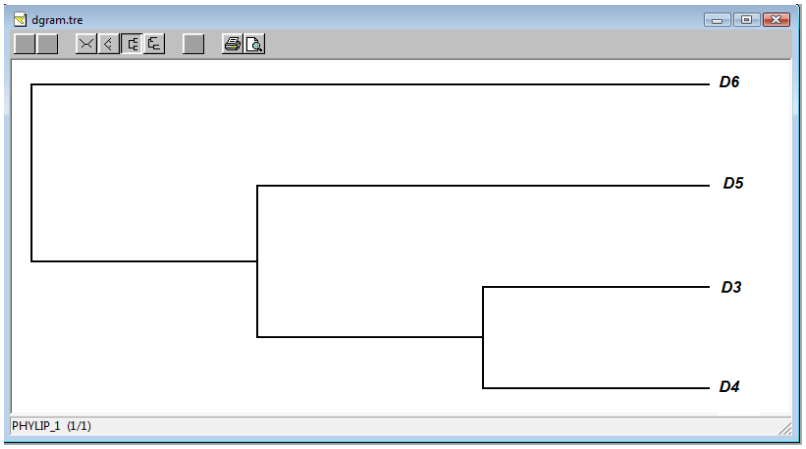

Fig. 2. UPGMA dendrogram based on ISSR data for the *Phellinus igniarius* specimens.

Conclusions

The molecular data analysis have shown the discrimination power of the ISSR markers and have proven the utility of this technique for the quantification of the genetic diversity, and to reconstruct, through an UPGMA dendrogram, phylogenetic relationships between specimens belonging to the *Phellinus igniarius* species.

The taxonomy of the genus *Phellinus* has been based on the morphology of fruiting body, the development of basidiocarps and the association with host plant which are similar for many species (*P. igniarius, P. nigricans, P. laevigatus, P. robustus, P. linteus, P. hartigii and P. baumii*) (Nam *et al.* 2003, Kim *et al.* 2005). Till date, the molecular taxonomic studyes were based on rDNA, using universal primers that target conserved regions from 18S and 28S rDNA genes, followed by RFLP analysis (Kim *et al.* 2005) and on RAPD markers (Random Amplyfied Polymorphic DNA) (Sheng & Bao 2007). Although this techniques were able to distinguishing between different species of *Phellinus* genus or different strains, they present some disadvantages. For example, the rDNA – PCR – RFLP methodology is

time consuming, due to the necessity of using restriction endonucleases while the PCR – RAPD techniques are not very reproducible.

The PCR-ISSR technology allowed us to obtain a unique and stable genetic fingerprint for each analyzed individual. As a result, this simple, fast and relatively inexpensive method can be used to clarify at DNA level some aspects of the taxonomy of Basidiomycetes with therapeutic and bioremediation potential, and for estimating the overall level of genetic variation in these species to date less investigated.

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BROWN ALGAE COLLECTION OF THE HERBARIUM OF THE BOTANIC GARDEN "D. BRANDZA", UNIVERSITY OF BUCHAREST

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Abstract: The inventory of the brown algae of the Herbarium of the Botanic Garden "D. Brandza" Bucharest revealed the existence of a number of 808 specimens. For 723 specimens, valid names were identified in the AlgaeBase database. For 85 specimens was not indicated the genus or species on the label or the name of the specimen could not be identified as valid in AlgaeBase. The collection preserves specimens collected by over 100 collectors, between 1836 and 1979, and which belong to approximately 50 exsiccata, herbaria or other types of collection.
Key words: brown algae, Phaeophyceae, Herbarium specimens, collections databases

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Introduction

The Herbarium of the Botanic Garden "D. Brandza", University of Bucharest, was founded by professor Dimitrie Brândză in 1882. The herbarium was affected twice over the time, first in 1884 when it burned completely, and then in 1944 when a bombardment during World War II destroyed it substantially. Only 20% of the collection, generally representing the groups of the inferior plants, could be saved. The Herbarium was then partially and with difficulty restored throught donation. At present the Herbarium includes over 250.000 inventoried sheets (Sârbu 2010) and many others not yet inventoried.

The Herbarium is organized in two sections: "lower plants" (bacteria, algae, fungi, lichens and mosses) and higher plants (ferns, gymnosperms and angiosperms). The Herbarium is registered in the Index Herbariorum with the BUC code that we will continue to use in this paper with reference to this herbarium (Holmgren *et al.* 1990).

The Lower Plants Section of the BUC Herbarium hosts important collections, such as: Algae Europeae (Rabenhorst), Mycotheca Universalis (Thümen F.E.), Herbarium Mycologicum Romanicum (Săvulescu T.), Hepatica Europeae Exiccatae (Schiffner V.F.), Myxomycetes collection (Brândză M., Forstner S., Săvulescu T.), Mycoflora Herbarium of Romania (Săvulescu O., Eliade E.) etc. (Nedelcu 1992).

Herbaria plant specimens are important sources as comparative material, as study material in various disciplines of biology (taxonomy, systematics, ecology, anatomy, morphology, conservation biology, biodiversity, ethnobotany, paleobiology), as well as being used for teaching and by the public (Funk 2003).

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Numerous institutions in the world (Botanical Gardens, Natural History Museums etc.) publish their herbarium collections in scientific articles or in online databases (Dosmann 2012). There are also scientific articles that treat herbarium collections of brown algae in particular (Biberdžić 2011, Miesch 2016).

This paper is focused on the brown algae collection of the Lower Plants section of the BUC Herbarium.

Material and methods

A general inventory of all brown algae specimens within the BUC Herbarium has been performed. Data collected on each herbarium sheet have been organized in a database using Excel program. The following information has been assigned to each specimen as specified in the herbarium sheet: genus, species, author, subspecies, variety, form, collection locations (continent, sea / ocean / lake, country, region / province, county / department, locality, toponim, ecology), collection date (year, mounth, day), legit (collector), inventory number and name of exssicata / herbaria from which the specimen originates. The valid name is according to AlgaeBase (Guiry & Guiry 2017), an online source for nomenclatural information for all algae (Guiry *et al*. 2014).

If some information from the label is missing or undetectable, the corresponding heading in the database was marked with "unknown" or "unreadable".

The list in Appendix 1 contains for each specimen only information that is known or readable.

Results and discussion

Performing the inventory of the brown algae specimens, 808 specimens were recorded of the BUC Herbarium collection (Appendix 1). For 723 specimens, currently accepted names were identified in the AlgaeBase database (Guiry & Guiry 2017). Thus 723 specimens can be associated with 246 taxa (Appendix 2).

The collection also preserves several specimens that are no longer considered to be brown algae. The following specimens are in a such situation:

- *Scytosiphon velutinus* Lyng. [valid name: *Prasiola velutina* (Lyngbye) Trevisan, Phylum Chlorophyta, Subphylum Chlorophytina, Class Trebouxiophyceae];
- *Fucus tomentosus* [valid name: *Codium tomentosum* Stackhouse, Phylum Chlorophyta, Subphylum Chlorophytina, Class Ulvophyceae];
- *Fucus obtusus* [valid name: *Laurencia obtusa* (Hudson) J.V. Lamouroux, Phylum Rhodophyta, Subphylum Eurhodophytina, Class Florideophyceae];
- *Fucus capillaceus* Gmel. [valid name: *Pterocladiella capillacea* (S.G. Gmelin) Santelices & Hommersand, Phylum Rhodophyta, Subphylum Eurhodophytina, Class Florideophyceae].

Most of the specimens in the collection belong to the following taxa: *Cystoseira foeniculacea* (L.) Greville (26), *Padina pavonica* (L.) Thivy (24), *Halopteris scoparia* (L.) Sauvageau (21) *Fucus vesiculosus* L. (18), *Cladostephus spongiosum* f. *verticillatum* (Lightfoot) Prud'homme van Reine (17), *Cystoseira barbata* (Stackhouse) C. Agardh (16).

Analyzing the collection of brown algae, we have noticed that brown algae specimens were collected between 1836-1979. The oldest specimens are *Punctaria*

plantaginea (Roth) Greville and *Punctaria tenuissima* (C. Agardh) Greville which were collected by Hansen in 1836 from the Baltic Sea and belong to the exsiccata "Hauck et Richter. Phykotheka universalis". The newest specimen is *Halopteris scoparia* (L.) Sauvageau which was collected in 1979 by Piccone A. from the Mediterranean Sea (Italy) and belong to the exsiccata "Societa Elvetica'.

The specimens found in the herbarium collection were collected from the most continents (except Antarctica), from countries such as: South Africa, Algeria, England, Austria, Canada, Chile, Croatia, Denmark, Florida, France, Germany, Italy, Jamaica, Norway, Netherlands, Romania, Scotland, Slovenia, USA.

The most numerous specimens from the collection are collected from Europe (481 specimens), frecvency from the country like France (112 specimens), Italy (87 specimens), Germany (73 specimens), Croatia (64 specimens), Slovenia (21 specimens), England (14 specimens) etc. Of the 808 specimens in the collection, for 443 the locality is not indicated or readable. For the rest, the most frequent localities from which specimens were collected are Cherbourg (49 specimens), Spalato (29 specimens), Roscoff (24 specimens), Pirano (20 specimens).

The collection comprises only two specimens from Romania: *Ectocarpus siliculosus* (Dillwyn) Lyngbye, collected by Celan M. and Șerbănescu G. in 1956 and *Cystoseira bosphorica* Sauvageau, collected by Șerbănescu G. in 1957. Both specimens are collected from the Black Sea, Constanța County.

This rich collection of brown algae of BUC is due to the contribution of about 100 collectors. The most prominent collector is Titius with 123 specimens collected. The Romanian Panca Eftimiu have a major contribution to the brown algae collection of the Bucharest Herbarium, by 32 specimens collected in 1935 from France.

The speciemns of brown algae from BUC belong to about 50 exsicata or herbaria. The most important ones are: Exsiccata Hauck et. Richter. Phykotheka Universalis (83 specimens); Rabenhorst, Algen Europe's (61 specimens); Herbarul Institutului Botanic București (35 specimens); Flora Exsiccata Austro-Hungarica (20 specimens); Rabenhorst, Algen Sachs. Resp. MittelEurope's (20 specimens); Algae Floridanae (19 specimens).

Conclusions

With its 808 specimens, the brown algae collection in the Herbarium of the Botanic Garden "D. Brândză" (BUC), University of Bucharest, is considered quite important, especially with the contribution of many collectors who collected brown algae from most of the world's continents. The collection also includes specimens which are over 180 years old and which have been very well preserved in the Herbarium.

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Appendix 1 **List of the brown algae specimens from BUC Herbarium:**

Genus / Species / Author/ subspecies / variety/ form / Valid name / Continent / Sea / Ocean Lake Country / Region / Province / County / Departament / Locality / Toponym / Ecology / Date - year / Data - month / Data - day / Legit / Inventory number / Exsiccata/Herbaria

Alaria esculenta (L.) Grev. / ***Alaria esculenta*** **(Linnaeus) Greville** / North America / Atlantic Ocean / SUA / Massachusetts / Essex County / Nahant / From tide pool al low water mark / 1889 / April / Collins S. Frank / BUC6290 / Hauck et Richter. Phykotheka universalis

Alaria esculenta Grev. / ***Alaria esculenta*** **(Linnaeus) Greville** / Europe / English Channel / France / Normandy / Finistère / Roscoff / 1935 / July-august / Eftimiu Panca / BUC6293 / Institutul Botanic-București. Herbariul Laboratorului de Morfologie și Sistematică Vegetală

Alaria esculenta Grev. / ***Alaria esculenta*** **(Linnaeus) Greville** / Europe / English Channel / France / Normandy / Finistère / Roscoff / 1935 / Eftimiu Panca / BUC6292 / Institutul Botanic-București. Erbarul General

Alaria esculenta Grev. / ***Alaria esculenta*** **(Linnaeus) Greville** / Europe / North Sea / Scotland / Aberdeen / BUC6291

Alaria esculenta / ***Alaria esculenta*** **(Linnaeus) Greville** / North America / Atlantic Ocean / SUA / Massachusetts / Essex County / Nahant / From tide pool al low water mark / 1888 / April / Collins S. Frank / BUC6289 / Hauck et Richter. Phykotheka universalis

Arthrocladia villosa Duby / ***Arthrocladia villosa*** **(Hudson) Duby** / 1875 / BUC6460

Arthrocladia villosa Duby / ***Arthrocladia villosa*** **(Hudson) Duby** /unknown / "Sur les juimes et les coquilles" / 1874 / June / Chiebaut C. / BUC6458

Arthrocladia villosa Duby / ***Arthrocladia villosa*** **(Hudson) Duby** / Europe / Mediteraneean Sea / Italy / Ligura/Imperia / Porto Maurizio / "Dall'alto mare" / 1879 / Strafforello / BUC6456 / Erb. Critt. Ital. Ser. II.

Arthrocladia villosa Duby / ***Arthrocladia villosa*** **(Hudson) Duby** / Europe / Mediteraneean Sea / Italy / Ligura/Imperia / Porto Maurizio / "Dall'alto mare" / 1879 / Strafforello / BUC6457 / Erb. Critt. Ital. Ser. II.

Arthrocladia villosa Zonand / ***Arthrocladia villosa*** **(Hudson) Duby** / Europe / Adriatic Sea / Slovenia / Primorska / Pirano / Titius / BUC6459

Arthrocladia villosa / ***Arthrocladia villosa*** **(Hudson) Duby** / 1875 / Agarth / BUC6461

Ascocyclus foecundus (Stromf) Rke / ***Myrionema foecundum*** **(Strömfelt) Sauvageau** / Europe / Norwegian Sea / Norway / Northern Norway / Troms / Mestervik / 1890 / Septembrie / 20 / Foslie M. / BUC6686 / Hauck et Richter. Phykotheka universalis

Ascophyllum mackayi (Turn) Holmes & Batters / ***Ascophyllum nodosum*** **f.** ***mackayi*** **(Turner) Nathieson & Dawes** / North America / Oceanul Nord Atlantic / SUA / Connecticut / Bridgeport / 1891 / martie / Collins S. Frank / BUC6125 / Hauck et Richter. Phykotheka universalis

Ascophyllum nodosum (L.) Le Jolis / ***Ascophyllum nodosum*** **(Linnaeus) Le Jolis** / Europe / North Sea / Germany / Helgoland / "En erratischen Bloken beim Junggat (Westkuste)" / 1893 / May / 19 / Kuckuck P. / BUC6118 / Phykotheka universalis

Ascophyllum nodosum L. f. scorpioides / ***Ascophyllum nodosum*** **f.** ***scorpioides*** **Hauck** / Europe / Germany / Nordschleswig / Golful Gjenner / "Am sudlichen Uferrande der Gjenner Bucht in Nordschleswig, bei ca. 1 m Wasserstandesiculoss wachsend zwischen Fucus vesiculosus wachsend" / 1886 / august / Reinke J. / BUC6124 / Hauck et Richter. Phykotheka universalis

Ascophyllum nodosum Le Jol / ***Ascophyllum nodosum*** **(Linnaeus) Le Jolis** / Europe / English Channel / France / Normandy / Finistère / Roscoff / 1935 / July-august / Eftimiu Panca / BUC6119 / Institutul Botanic-București. Herbariul Laboratorului de Morfologie și Sistematică Vegetală

Asperococcus bullosus (Ag.) Lamourx / ***Asperococcus bullosus*** **J.V. Lamouroux** / Europe / Adriatic Sea / 1845 / BUC6526

Asperococcus bullosus Ag. / ***Asperococcus bullosus*** **J.V. Lamouroux** / BUC6525 / Leipziger Botan. Tauschverei

Asperococcus bullosus Lamourx / ***Asperococcus bullosus*** **J.V. Lamouroux** / Europe / Titius / BUC6524

Asperococcus bullosus Lamourx / ***Asperococcus bullosus*** **J.V. Lamouroux** / Europe / English Channel / France / Normandy / Roscoff / 1935 / July / Eftimiu Panca / BUC6523 / Institutul Botanic - București. Herbariul Laboratorului de Morfologie și sistematică Vegetală

Asperococcus compressus Ggriff. / ***Asperococcus ensiformis*** **(Delle Chiaje) M.J. Wynne** / Europe / Adriatic Sea / Titius / BUC6532

Asperococcus compressus Ggriff. / ***Asperococcus ensiformis*** **(Delle Chiaje) M.J. Wynne** / Europe / Adriatic Sea / Italy / Triest / 1889 / martie / 30 / Hauck F. / BUC6531 / Hauck et Richter. Phykotheka universalis

Asperococcus compressus Ggriff. Mspt. / ***Asperococcus ensiformis*** **(Delle Chiaje) M.J. Wynne** / Europe / Atlantic Ocean / France / Normandy / Manche (dep.) / Cherbourg / "Sur les pierres dans les flaques sablouneuses, a basse mer" / April / Le Jolis / BUC6532 / Rabenhorst, Algen Europe's

Asperococcus echinatus (Mert.) / ***Asperococcus fistulosus*** **(Hudson) W.J. Hooker** / 1865 / July / Deipner Adolph / BUC6529 / Rabenhorst, Algen Europe's

Asperococcus echinatus (Mert.) Grev. / ***Asperococcus fistulosus*** **(Hudson) W.J. Hooker** / North America / Atlantic Ocean / Mayne (SUA) / Spectacle Island / Penobscot Bay / On Fucus vesiculosus und Fucus evanescens / 1889 / July / 17 / Collins S. Frank / BUC6527 / Hauck et Richter. Phykotheka universalis

Asperococcus echinatus Grev / ***Asperococcus fistulosus*** **(Hudson) W.J. Hooker** / Europe / Atlantic Ocean / France / Normandy / Manche (dep.) / Cherbourg / BUC6529

Asperococcus echinatus Lamour. / ***Asperococcus fistulosus*** **(Hudson) W.J. Hooker** / Europe / English Channel / France / Normandy / Roscoff / 1935 / Eftimiu Panca / BUC6528 / Institutul Botanic din București - Erbarul General

Asperococcus sinuosus Ag. / ***Colpomenia sinuosa*** **(Mertens ex Roth) Derbès & Solier** / Europe / Adriatic Sea / Croatia / Spalatino-Dalmata / Spalato / 1850 / Titius / BUC6518

Asperococcus sinuosus Bory. / ***Colpomenia sinuosa*** **(Mertens ex Roth) Derbès & Solier** / Europe / Adriatic Sea / Italy / Puglia / Lesina / Botteri / BUC6519

Asperococcus sinuosus Bory. / ***Colpomenia sinuosa*** **(Mertens ex Roth) Derbès & Solier** / North America / Atlantic Ocean / Gulf of Mexico / Florida / Key West / 1896 / April / Curtiss. A.H. / BUC6517 / Algae Floridanae

Asperococcus clathratus / ***Hydroclathrus clathratus*** **(C. Agardh) M. Howe** / Europe / Adriatic Sea / Slovenia / Primorska / Pirano / Titius / BUC6522

Asterotrichia ulvicola / ***Asterotrichia ulvicola*** **Zanardini** / Europe / Mediteraneean Sea / Italy / Liguria / Genova / BUC6359

Bifurcaria tuberculata Stackh. / ***Bifurcaria bifurcata*** **R. Ross** / 1959 / February / 12 / BUC6048

Capea biruncinata Montagn. / ***Ecklonia biruncinata*** **(Bory) Papenfuss** / Africa / Atlantic Ocean / South Africa / Cap Agulhas / BUC6317

Carpomitra inermis Kützing / ***Perithalia caudata*** **(Labillardière) Womersley** / Australia / Victoria / Western Port / BUC6328

Carpophyllum scalare Suhr / ***Oerstedtia scalaris*** **(Suhr) Jensen** / Africa / The Kowie (River) / South Africa / 1893 / October / 25 / Becker H. / BUC5906 / Algae Marinae. Africae Australis. The Kowie. H. Becker, M.D., F.L.S

Carpophyllum scalare / Suhr / ***Oerstedtia scalaris*** **(Suhr) Jensen** / Africa / The Kowie (River) / South Africa / Becker H. / BUC5905 / Algae Marinae. Africae Australis. The Kowie. H. Becker, M.D., F.L.S

Carpophyllum scalare Suhr / ***Oerstedtia scalaris*** **(Suhr) Jensen** / Africa / Atlantic Ocean / South Africa / Cap Agulhas / Breutel / BUC5904

Castagnea contorta Thuret / ***Cladosiphon contortus*** **(Thuret) Kylin** / Europe / Atlantic Ocean / France / Normandy / Manche (dep.) / Cherbourg / BUC6364
Castagnea sp. / Robbilard M. / BUC6366 / Herbier de Marie Olgues
Castagnea virescens (Carmichael ex Harvey) Thuret / ***Eudesme virescens*** **(Carmichael ex Berkeley) J. Agardh** / Europe / Baltic Sea / Germany / Kieler Hafen / "An Steinen in ca. 1 m Tiefe im Kieler hafen bei Moltenort" / 1887 / June / Reinke J. / BUC6365 / Hauck et Richter. Phykotheka universalis
Chaetopteris plumosa (Lyngb.) Kutz / ***Chaetopteris plumosa*** **(Lyngbye) Kützing** / Europe / North Sea / Germany / Trizone / Kiel / "In BUC5-15 m Tiefe an Muscheln und Steinen bei Bulk un-weit Kiel" / 1888 / October / Reinke J. / BUC6566 / Hauck et Richter. Phykotheka universalis
Chlorosiphon shuttleworthianus Ktz / ***Scytosiphon lomentaria*** **(Lyngbye) Link** / Europe / Adriatic Sea / Croatia / Istrien / bei Pirano / Titius / BUC6485 / Rabenhorst, Algen Europe's
Chnoospora implexa J. Agardh / ***Chnoospora implexa*** **J. Agardh** / Africa / Indian Ocean / Mauritius Islands / M. De Robillard / BUC6462 / Herbier Ed. Marie-Algues
Chorda filum (L.) Stackh. var. pumila Reinke / ***Chorda filum*** **var.** ***pumila*** **Reinke** / Europe / North Sea / Germany / Trizone / Kiel / bei Bulk / "In 12 m Tiefe auf einer Kiesbank bei Bulk unweit Kiel" / 1888 / October / Reinke J. / BUC6282 / Hauck et Richter. Phykotheka universalis
Chorda filum (L.) Stackh. / ***Chorda filum*** **(Linnaeus) Stackhouse** / Europe / Baltic Sea / Germany / Kieler Hafen / 1886 / October / Reinke J. / BUC6273 / Hauck et Richter. Phykotheka universalis
Chorda filum (Roth.) Lamx / ***Chorda filum*** **(Linnaeus) Stackhouse** / Europe / English Channel / France / Normandy / Manche (dep.) / Granville / BUC6279
Chorda filum Ktz. / ***Chorda filum*** **(Linnaeus) Stackhouse** / BUC6275
Chorda filum Lamour f. spermatiis / 1863 / June / Roettig / BUC6274 / Rabenhorst, Algen Europe's
Chorda filum Lamour / ***Chorda filum*** **(Linnaeus) Stackhouse** / Europe / English Channel / France / Normandy / Finistère / Roscoff / 1935 / July-august / Eftimiu Panca / BUC6280 / Institutul Botanic-București. Erbarul General
Chorda filum Lamourx. / ***Chorda filum*** **(Linnaeus) Stackhouse** / Europe / Adriatic Sea / Italy / Puglia / Lesina / BUC6278
Chorda filum Lamourx. / ***Chorda filum*** **(Linnaeus) Stackhouse** / Europe / Atlantic Ocean / France / Normadia de Jos / Cherbourg / Lenormand / BUC6276
Chorda filum Stackh. / ***Chorda filum*** **(Linnaeus) Stackhouse** / North America / Booth. M.A. / BUC6277
Chorda fistulosa Huds. / ***Chorda fistulosa*** **Zanardini** / Europe / Adriatic Sea / Croatia / Spalatino-Dalmata / Spalato / Titius / BUC6286
Chorda lomentaria Lyng. var. tennuis / ***Scytosiphon lomentaria*** **(Lyngbye) Link** / Europe / Adriatic Sea / Croatia / Spalatino-Dalmata / Spalato / 1856 / Titius / BUC6499
Chorda lomentaria Lyng. / ***Scytosiphon lomentaria*** **(Lyngbye) Link** / Europe / Adriatic Sea / Croatia / Dalmatia / Spalato / 1856 / Titius / BUC6498
Chorda lomentaria Lyng. / ***Scytosiphon lomentaria*** **(Lyngbye) Link** / Europe / Adriatic Sea / Croatia / Raguseo-narentana / Ragusa vecchia / Bolhar / BUC6497
Chorda lomentaria Tit var. capillaris / ***Scytosiphon lomentaria*** **(Lyngbye) Link** / Europe / Adriatic Sea / Italy / Veneția / Veneto / Venice / Titius / BUC6496
Chorda tomentosa Lyngb. / ***Halosiphon tomentosus*** **(Lyngbye) Jaasund** / Europe / Alsener Sundes / Denmark / Syddanmark / Sonderburg / "An der südlichen Mündung des Alsener Sundes bei Sonderburg an Pfählen und Steinen im flächen Wasser" / 1888 / May / Reinbold Th. U. Reinke J. / BUC6283 / Hauck et Richter. Phykotheka universalis
Chorda tomentosa Lyngb. / ***Halosiphon tomentosus*** **(Lyngbye) Jaasund** / Europe / Adriatic Sea / Italy / Veneția / Veneto / Venice / 1854 / Titius / BUC6284
Chordaria attenuata Foslie / ***Scytosiphon lomentaria*** **(Lyngbye) Link** / Europe / Norway / Tovig / 1887 / august / 31 / Foslie M. / BUC6393 / Hauck et Richter. Phykotheka universalis
Chordaria flagelliformis Ag. var. capensis / ***Chordariopsis capensis*** **(C. Agardh) Kylin** / Africa / Atlantic Ocean / South Africa / Western Cape / Knysna / BUC6392
Chordaria flagelliformis Ag. / ***Chordaria flagelliformis*** **(O.F. Müller) C. Agardh** / North America / Atlantic Ocean / SUA / Long Island Sound / BUC6391
Chordaria flagelliformis Ag. / ***Chordaria flagelliformis*** **(O.F. Müller) C. Agardh** / South America / Chile / Detroit de Magellan / BUC6389
Chordaria flagelliformis Ag. / ***Chordaria flagelliformis*** **(O.F. Müller) C. Agardh** / Lenormand / BUC6388
Chordaria flagelliformis Ag. / ***Chordaria flagelliformis*** **(O.F. Müller) C. Agardh** / Europe / North Sea / Germany / Helgoland / Averswale / BUC6387

Chordaria flagelliformis Lyngb. / ***Chordaria flagelliformis*** **(O.F. Müller) C. Agardh** / Europe / Atlantic Ocean / France / Normandy / Manche (dep.) / Cherbourg / BUC6390

Chordaria nemalion / ***Chordaria nemalion*** **(Bertoloni) C. Agardh** / Europe / Austria / Vienna / 1846 / Parreyss / BUC6394

Chordaria nemalion / ***Chordaria nemalion*** **(Bertoloni) C. Agardh** / 1844 / BUC6395

Cladosiphon mediterraneus Ktz. / ***Cladosiphon mediterraneus*** **Kützing** / Europe / Mediteraneean Sea / Italy / Livorno/Toscana / Isola d Elba / 1867 / Caldesi et Marcucci / BUC6367 / Rabenhorst, Algen Europe's

Cladosiphon zostericolus Barn. / ***Polycerea zostericola*** **(Harvey ex Kützing) Kylin** / Australia / BUC6368

Cladostephus myriophyllum Ag. / ***Cladostephus spongiosum*** **f.** ***verticillatum*** **(Lightfoot) Prud'homme van Reine** / BUC6585 /

Cladostephus myriophyllum Ag. / ***Cladostephus spongiosum*** **f.** ***verticillatum*** **(Lightfoot) Prud'homme van Reine** / BUC6584 / Botanischer Tauschverein in Wien

Cladostephus myriophyllum Ag. / ***Cladostephus spongiosum*** **f.** ***verticillatum*** **(Lightfoot) Prud'homme van Reine** / Europe / Adriatic Sea / Croatia / Dalmatien / Dalmatien / Pavlovsky (com.) / BUC6581

Cladostephus myriophyllum Ag. / ***Cladostephus spongiosum*** **f.** ***verticillatum*** **(Lightfoot) Prud'homme van Reine** / Genova / BUC6580 /

Cladostephus myriophyllum Ag. / ***Cladostephus spongiosum*** **f.** ***verticillatum*** **(Lightfoot) Prud'homme van Reine** / 1865 / septembrie / Caldesi L. / BUC6578 / Rabenhorst, Algen Europe's

Cladostephus myriophyllum Ag. / ***Cladostephus spongiosum*** **f.** ***verticillatum*** **(Lightfoot) Prud'homme van Reine** / Titius / BUC6579

Cladostephus myriophyllum Ag. / ***Cladostephus spongiosum*** **f.** ***verticillatum*** **(Lightfoot) Prud'homme van Reine** / Europe / Ligurean Sea / Italy / Genova / San Giuliano / Presso Genova / Ardissone / BUC6577 / Rabenhorst, Algen Sachs. Resp. MittelEurope'S

Cladostephus myriophyllum / ***Cladostephus spongiosum*** **f.** ***verticillatum*** **(Lightfoot) Prud'homme van Reine** / Lenormand / BUC6586

Cladostephus myriophyllum / ***Cladostephus spongiosum*** **f.** ***verticillatum*** **(Lightfoot) Prud'homme van Reine** / Africa / Algeria / El Tarf Province / La Calle / El Kala / La calle, Rochers sous marins / 1839 / June / Bove M. / BUC6582 / Herb. Mus. Paris

Cladostephus myriophyllum / ***Cladostephus spongiosum*** **f.** ***verticillatum*** **(Lightfoot) Prud'homme van Reine** / Europe / Tyrrhenian Sea / France / Corsica / Haute-Corse (dep.) / Bastia / 1869 / February / Debray F. / BUC6576 / Herbier de O. Debeaux

Cladostephus myriophyllum / ***Cladostephus spongiosum*** **f.** ***verticillatum*** **(Lightfoot) Prud'homme van Reine** / Algerie / "La calle, Rochers sous marins" / 1839 / July / Bove M. / BUC209650 / Herb. Mus. Paris

Cladostephus spongiosus Ag. / ***Cladostephus spongiosum*** **(Hudson) C. Agardh / Europe** / North Sea / Germany / Helgoland / BUC6570

Cladostephus spongiosus Ag. / ***Cladostephus spongiosum*** **(Hudson) C. Agardh / Europe** / France / Calvados / Arromanches / Lenormand / BUC6569

Cladostephus spongiosus Ag. Syst. / ***Cladostephus spongiosum*** **(Hudson) C. Agardh** / Europe / Atlantic Ocean / France / Normandy / Manche (dep.) / Cherbourg / "Sur les rochers recouverts de sable, a basse mer" / Le Jolis / BUC6568 / Rabenhorst, Algen Europe's

Cladostephus spongiosus Huds. / ***Cladostephus spongiosum*** **(Hudson) C. Agardh** / Europe / English Channel / England / Dorsetshire / Weymouth / "In the sea on rocks and stones" / 1864 / July / Leipner. Ad. / BUC6567 / Rabenhorst, Algen Europe's

Cladostephus / BUC6583

Cladostephus verticillatus (Lightf.) Ag. / ***Cladostephus spongiosum*** **f.** ***verticillatum*** **(Lightfoot) Prud'homme van Reine** / Europe / Mediteraneean Sea / Italy / La Spezia/Liguria / Porto Vener, Grotta di Byron / "Grotta di Byron a Porto Venere presso Spezia. Sugli scogli a 1 m. Circa di profondita" / 1875 / July / 25 / Piccone A. / BUC6571 / Hauck et Richter. Phykotheka universalis

Cladostephus verticillatus J.C. Agardh / ***Cladostephus spongiosum*** **f.** ***verticillatum*** **(Lightfoot) Prud'homme van Reine** / Europe / English Channel / France / Normandy / Finistère / Roscoff / 1935 / July / Eftimiu Panca / BUC6380 / Institutul Botanic - București Herbariu laboratorului de morfologie și sistematcă vegetală

Cladostephus verticillatus J.C. Agardh / ***Cladostephus spongiosum*** **f.** ***verticillatum*** **(Lightfoot) Prud'homme van Reine** / Europe / Adriatic Sea / Croatia / Istria / Lovranam / Zay. / BUC6574 / Flora Exsiccata Austro-Hungarica

Cladostephus verticillatus J.C. Agardh / ***Cladostephus spongiosum*** **f.** ***verticillatum*** **(Lightfoot) Prud'homme van Reine** / Rudolphi / BUC6572

Cladostephus verticillatus J.C. Agardh / ***Cladostephus spongiosum* f. *verticillatum* (Lightfoot) Prud'homme van Reine** / Europe / Mediteraneean Sea / Italy / Savona/Liguria / Albissola / "Su scogli poco profondi" / 1877 / august / Piccone A. / BUC6573 / Societa Elvetica

Colpomenia sinuosa / ***Colpomenia sinuosa* (Mertens ex Roth) Derbès & Solier** / Finistere / 1935 / July-august / Eftimiu Panca / BUC6513 / Institutul Botanic din București - Erbarul General

Cutleria collaris (Ag.) Zanard / ***Gymnosorus collaris* (C. Agardh) J.Agardh** / "Mari Neapolitano" / 1868 / Pedicino N.A. / BUC6259 / Rabenhorst, Algen Europe's

Cutleria multifida (Ag.) Grev. / ***Cutleria multifida* (Turner) Greville** / Mari Neapolitano / 1869 / Pedicino N.A. / BUC6267

Cutleria multifida (Sm.) Grev. / ***Cutleria multifida* (Turner) Greville** / Bothan / BUC6252

Cutleria multifida (Sm.) Grev. / ***Cutleria multifida* (Turner) Greville** / BUC6251 / Ex. Herb. D. Bothan.

Cutleria multifida Grev. var. penicillata / ***Cutleria multifida* (Turner) Greville** / BUC6265

Cutleria multifida Grev. / ***Cutleria multifida* (Turner) Greville** / Europe / English Channel / France / Normandy / Carantec / 1935 / august / Eftimiu Panca / BUC6250 / Institutul Botanic din București - Erbarul General

Cutleria multifida Grev. / ***Cutleria multifida* (Turner) Greville** / Europe / Adriatic Sea / Italy / Triest / Hafen von Trieste / 1885 / martie / Hauck F. / BUC6249 / Hauck et Richter. Phykotheka universalis

Cutleria multifida Grev. / ***Cutleria multifida* (Turner) Greville** / Lenormand / BUC6253

Cutleria multifida Grev. / ***Cutleria multifida* (Turner) Greville** / Europe / Adriatic Sea / Croatia / Spalatino-Dalmata / Spalato / 1856 / Titius / BUC6254

Cutleria multifida Kutz. / ***Cutleria multifida* (Turner) Greville** / Europe / Adriatic Sea / Slovenia / Primorska / Pirano / Titius / BUC6256

Cutleria multifida / ***Cutleria multifida* (Turner) Greville** / Europe / Austria / Vienna / 1846 / BUC6255

Cutleria penicillata Kutzing / ***Cutleria penicillata* Kützing** / Triest / BUC6263

Cutleria penicillata Kutzing / ***Cutleria penicillata* Kützing** / Europe / Adriatic Sea / Titius / BUC6264

Cystophora cephalornithos J. Ag. / ***Caulocystis cephalornithos* (Labillardière) Areschoug** / Australia / Victoria / Melbourne / Port Phillip. / BUC5909

Cystophora paniculata J. Ag. / ***Acrocarpia paniculata* (Turner) Areschoug** / Australia / Victoria / Western Port / BUC5911

Cystophora retroflexa J. Ag. / ***Cystophora retroflexa* (Labillardière) J. Agardh** / Australia / Victoria / Melbourne / Port Phillip. / BUC5910

Cystophyllum geminatum Ag. / ***Stephanocystis geminata* (C. Agardh) Draisma**, **Ballesteros, F. Rousseau & T. Thibaut** / North America / Canada / British-Columbia / Victoria Vacouver / May / 25 / Roll J. (det. Reinbold) / BUC5925 / National-Arboretum Zoeschen bei Merseburg (Dr. G. Dieck.) Cryptogamen - Herbar. Abtheilung Nordwest-America

Cystophyllum thunbergii (Mert.) J. Ag. / ***Sargassum thunbergii* (Mertens ex Roth) Kuntze** / Ahlburg. Det. Reinbold Th. / BUC5927 / Phykotheka universalis

Cystoseira abies-marina (Gmel) / ***Cystoseira abies-marina* (S.G. Gmelin) C. Agardh** / Europe / Atlantic Ocean / Spania / Santa Cruz de Tenerife / Teneriffa / prope Orotava / 1900 / July / Bornmuller J. / BUC5936 / J. Bornmuller: Planta exsiccatae Canarienses

Cystoseira abies-marina (Gmel) Ag. var. major Kg. / ***Cystoseira abies-marina* (S.G. Gmelin) C. Agardh** / Lenormand / BUC5941

Cystoseira abies-marina (Turn.) Ag. / ***Cystoseira abies-marina* (S.G. Gmelin) C. Agardh** / Europe / Atlantic Ocean / Spania / Santa Cruz de Tenerife / Orotava / Honegger J (leg) Collins F. (com) / BUC5933 / Hauck et Richter. Phykotheka universalis

Cystoseira abies-marina Binder / ***Cystoseira abies-marina* (S.G. Gmelin) C. Agardh** / Europe / Atlantic Ocean / Spania / Santa Cruz de Tenerife / Teneriffa / Binder / BUC5934

Cystoseira abies-marina f. graillima Kg. / ***Cystoseira abies-marina* (S.G. Gmelin) C. Agardh** / Europe / Atlantic Ocean / Portugalia / Funchal / 1900 / Bornmuller / BUC209655 / J. Bornmuller, flora exsiccata Maderensis

Cystoseira abies-marina / ***Cystoseira abies-marina* (S.G. Gmelin) C.Agardh** / Europe / Atlantic Ocean / Spania / Insulele Canare / 1863 / BUC5935

Cystoseira abrotanifolia (Linn.) / ***Cystoseira foeniculacea* (Linnaeus) Greville** / Ad scopulos marit. Pr. Genuam / Piccone A. / BUC6004 / Rabenhorst, Algen Europe's

Cystoseira abrotanifolia Ag. / ***Cystoseira foeniculacea* (Linnaeus) Greville** / Africa / Algeria / St. Eugene / 1959 / June / Debray F. / BUC209657

Cystoseira abrotanifolia Ag. / ***Cystoseira foeniculacea*** **(Linnaeus) Greville** / Europe / Mediteraneean Sea / Italy / Savona / Liguria occid. / Albissola Marina / ”Su scogli a fior d'aqua presso Albissola marina, Liguria occ.” / 1874 / April / Piccone A. / BUC209656

Cystoseira abrotanifolia Ag. / ***Cystoseira foeniculacea*** **(Linnaeus) Greville** / Europe / Mediteraneean Sea / Italy / Savona / Liguria occid. / Albissola Marina / "Su scogli a fior d'aqua presso Albissola marina, Liguria occ." / 1874 / April / Piccone A. / BUC6001 / Societa Elvetica

Cystoseira abrotanifolia Ag. / ***Cystoseira foeniculacea*** **(Linnaeus) Greville** / Africa / Algeria / St. Eugene / 1895 / June / Debray F. / BUC5998 / Hauck et Richter. Phykotheka universalis

Cystoseira abrotanifolia Ag. / ***Cystoseira foeniculacea*** **(Linnaeus) Greville** / Europe / Adriatic Sea / Italy / Rimini / Emilia-Romagna / Rimini / 1876 / July / Ardissone / BUC6008

Cystoseira abrotanifolia Ag. / ***Cystoseira foeniculacea*** **(Linnaeus) Greville** / Europe / Adriatic Sea / Slovenia / Primorska / Pirano / Titius / BUC6007

Cystoseira abrotanifolia Ag. / ***Cystoseira foeniculacea*** **(Linnaeus) Greville** / Europe / Adriatic Sea / BUC6006

Cystoseira abrotanifolia Ag. / ***Cystoseira foeniculacea*** **(Linnaeus) Greville** / Europe / Mediteraneean Sea / Italy / Liguria / Genova / Alla Cava / Ardissone / BUC6005 / Rabenhorst, Algen Europe's

Cystoseira abrotanifolia Ag. / ***Cystoseira foeniculacea*** **(Linnaeus) Greville** / Europe / Adriatic Sea / tengerben Zava / 1845 / BUC6002

Cystoseira abrotanifolia Ag. / ***Cystoseira foeniculacea*** **(Linnaeus) Greville** / Europe / Mediteraneean Sea / Italy / Savona / Liguria occid. / Albissola Marina / "Su scogli a fior d'aqua presso Albissola marina, Liguria occ." / 1874 / April / Piccone A. / BUC5931 / Societa Elvetica

Cystoseira abrotanifolia / ***Cystoseira foeniculacea*** **(Linnaeus) Greville** / Europe / Adriatic Sea / Croatia / Dalmatia / Ragusam / In mari prope ragusam / "In mari prope Ragusam" / Zay. / BUC6000 / Flora Exsiccata Austro-Hungarica

Cystoseira abrotanifolia / ***Cystoseira foeniculacea*** **(Linnaeus) Greville** / Europe / Adriatic Sea / Croatia / Dalmatia / Ragusam / In mari prope ragusam / "In mari prope Ragusam" / Zay. / BUC5999 / Flora Exsiccata Austro-Hungarica

Cystoseira abrotanifolia / ***Cystoseira foeniculacea*** **(Linnaeus) Greville** / 1850 / BUC6003

Cystoseira abrotanifolia f. boryana Meneghini / ***Cystoseira abrotanifolia*** **var.** ***boryana*** **Meneghini** / Europe / Adriatic Sea / Titius / BUC6016

Cystoseira abrotanifolia f. boryana Meneghini / ***Cystoseira abrotanifolia*** **var.** ***boryana*** **Meneghini /** Europe / Adriatic Sea / Italy / Puglia / Lesina / Dotteri (com) / BUC6015

Cystoseira abrotanifolia / ***Cystoseira foeniculacea*** **(Linnaeus) Greville** / Europe / Adriatic Sea / Croatia / Dalmatia / Spalato / Titius / BUC6017

Cystoseira amentacea Ag / ***Cystoseira amentacea*** **(C. Agardh) Bory** / Titius / BUC5952

Cystoseira amentacea Bory. / ***Cystoseira amentacea*** **(C. Agardh) Bory** / "Ad scopulus marit. Prope Genuam" / Baglietto F. et Piccone / BUC5951 / Rabenhorst, Algen Europe's

Cystoseira amentacea Bory. / ***Cystoseira amentacea*** **(C. Agardh) Bory** / Africa / Algeria / St. Eugene / 1894 / June / Debray F. / BUC5950 / Hauck et Richter. Phykotheka universalis

Cystoseira arbuscula Ag. / BUC6024

Cystoseira articulata J. Ag. / ***Hormophysa cuneiformis*** **(J.F. Gmelin) P.C. Silva** / Europe / Adriatic Sea / Slovenia / Primorska / Pirano / Titius / BUC6050

Cystoseira barbata Ag / ***Cystoseira barbata*** **(Stackhouse) C. Agardh** / BUC5971

Cystoseira barbata Ag / ***Cystoseira barbata*** **(Stackhouse) C. Agardh** / Europe / Adriatic Sea / Slovenia / Primorska / Pirano / BUC5972

Cystoseira barbata Ag / ***Cystoseira barbata*** **(Stackhouse) C. Agardh** / Lenormand / BUC5970

Cystoseira barbata Ag / ***Cystoseira barbata*** **(Stackhouse) C. Agardh /** Europe / Marea Neagră / Ucraina / Odesa / Odesa / Szovits / BUC5967

Cystoseira barbata Ag / ***Cystoseira barbata*** **(Stackhouse) C. Agardh /** Europe / Adriatic Sea / Titius / BUC5968

Cystoseira barbata Ag / ***Cystoseira barbata*** **(Stackhouse) C. Agardh** / Africa / Algeria / El Tarf Province / La Calle / "Rochers sous-marius" / 1839 / Bove M. / BUC5966 / Herb. Mus. Paris

Cystoseira barbata Agar. / ***Cystoseira barbata*** **(Stackhouse) C. Agardh** / Europe / Adriatic Sea / 1874 / BUC5969

Cystoseira barbata var. concatenata / ***Cystoseira barbata*** **var.** ***concatenata*** **Kützing** / February / Caldesi L. / BUC5985

Cystoseira barbata var. concatenata / ***Cystoseira barbata*** **var.** ***concatenata*** **Kützing** / Europe / Adriatic Sea / Italy / Veneția / Veneto / Venice / 1853 / Titius / BUC5984

Cystoseira barbata / ***Cystoseira barbata*** **(Stackhouse) C. Agardh** / Europe / Adriatic Sea / Croatia / Istria / Prope Abbaziam / Zay. / BUC5965 / Flora Exsiccata Austro-Hungarica
Cystoseira barbata / ***Cystoseira barbata*** **(Stackhouse) C. Agardh** / Europe / Adriatic Sea / Croatia / Istria / Prope Abbaziam / Zay. / BUC5964 / Flora Exsiccata Austro-Hungarica
Cystoseira bosforica / ***Cystoseira bosphorica*** **Sauvageau** / Europe / Marea Neagră / România / Dobrogea / Constanța / Eforie Sud / 1957 / Șerbănescu / BUC209658 / Herbarul Grădinii Botanice București
Cystoseira concatenata Mengh. / ***Cystoseira foeniculacea*** **(Linnaeus) Greville** / Europe / Adriatic Sea / Titius / BUC6025
Cystoseira corniculata Zan. / ***Cystoseira corniculata*** **(Turner) Zanardini** / Europe / Adriatic Sea / Italy / Puglia / Lesina / Botteri / BUC5929
Cystoseira corniculata Zanard / ***Cystoseira corniculata*** **(Turner) Zanardini** / Europe / Adriatic Sea / BUC5928
Cystoseira crinita Ag. / ***Cystoseira crinita*** **Duby** / Europe / Adriatic Sea / Titius / BUC5961
Cystoseira discors Ag. var. microcarpa / Ag. / ***Cystoseira discors*** **var.** ***microcarpa*** **Kützing** / Europe / Adriatic Sea / Italy / Veneția / Veneto / Venice / Titius / BUC5996
Cystoseira discors Ag. / ***Cystoseira foeniculacea*** **(Linnaeus) Greville** / Europe / Mediteraneean Sea / Italy / Ligura/Imperia / Porto Maurizio / BUC5992
Cystoseira discors Ag. / ***Cystoseira foeniculacea*** **(Linnaeus) Greville** / BUC5993
Cystoseira discors Ag. / ***Cystoseira foeniculacea*** **(Linnaeus) Greville** / Europe / Adriatic Sea / Italy / Puglia / Lesina / Botteri / BUC5991
Cystoseira discors Ag. / ***Cystoseira foeniculacea*** **(Linnaeus) Greville** / Europe / Adriatic Sea / Croatia / Fiume (Rijeka) / 1874 / BUC5990
Cystoseira discors Ag. / ***Cystoseira foeniculacea*** **(Linnaeus) Greville** / Atlantic Ocean / Lenormand / BUC5989
Cystoseira discors Ag. / ***Cystoseira foeniculacea*** **(Linnaeus) Greville** / Europe / Adriatic Sea / Croatia / Fiume (Rijeka) / Bilimek / BUC5988
Cystoseira discors Ag. / ***Cystoseira foeniculacea*** **(Linnaeus) Greville** / Europe / Adriatic Sea / Kovats / BUC5987
Cystoseira discors Ag. / ***Cystoseira foeniculacea*** **(Linnaeus) Greville** / 1862 / BUC5987
Cystoseira discors / ***Cystoseira foeniculacea*** **(Linnaeus) Greville** / Europe / Adriatic Sea / Croatia / Fiume (Rijeka) / Bilimek / BUC209659
Cystoseira divaricata Kg. / ***Cystoseira divaricata*** **Kützing** / Europe / Adriatic Sea / Italy / Veneția / Veneto / Venice / 1853 / Titius / BUC6009
Cystoseira erica Ag. / Europe / Adriatic Sea / Croatia / Spalatino-Dalmata / Spalato / 1856 / Titius / BUC6027
Cystoseira erica var. nana / Europe / Mediteraneean Sea / Italy / Ragusa / Sicilia / Ragusa / 1849 / Titius / BUC6028
Cystoseira ericoides (L.) / ***Cystoseira tamariscifolia*** **(Hudson) Papenfuss** / BUC5957
Cystoseira ericoides Ag. / ***Cystoseira tamariscifolia*** **(Hudson) Papenfuss** / Europe / Mediteraneean Sea / Spania / Malaga / Malaga / Bolle Carl / BUC5954
Cystoseira ericoides Ag. / ***Cystoseira tamariscifolia*** **(Hudson) Papenfuss** / Lenormand / BUC5953
CystoseiraericoidesAg. / ***Cystoseira tamariscifolia*** **(Hudson) Papenfuss** / Europe / Adriatic Sea / Titius / BUC5955
Cystoseira ericoides Good et Woodw. / ***Cystoseira tamariscifolia*** **(Hudson) Papenfuss** / Europe / English Channel / England / Dorsetshire / Weymouth / 12 miles to the east of Weymouth, Dorsetshire / In the sea on roks near low-water mark. / 1864 / July / Leipner Ad. / BUC5956 / Rabenhorst, Algen Europe's
Cystoseira fibrosa Ag. / ***Cystoseira baccata*** **(S.G. Gmelin) P.C.Silva** / Europe / Canal La Manche / BUC6020
Cystoseira fibrosa Ag. / ***Cystoseira baccata*** **(S.G. Gmelin) P.C.Silva** / BUC6019
Cystoseira fibrosa Ag. / ***Cystoseira baccata*** **(S.G. Gmelin) P.C. Silva** / Lenormand / BUC6018
Cystoseira flaccida Ag. / ***Cystoseira flaccida*** **Kützing** / Europe / Mediteraneean Sea / Greece / Laconia / Neapoli / Zaluski / BUC5963
Cystoseira flaccida Kg. / ***Cystoseira flaccida*** **Kützing** / Europe / Adriatic Sea / Croatia / Spalatino-Dalmata / Spalato / 1856 / Titius / BUC5962
Cystoseira glomerata Kg. / ***Cystoseira glomerata*** **Kützing** / 1856 / July / Caldesi L. / BUC6011
Cystoseira glomerata Kg. / ***Cystoseira glomerata*** **Kützing** / Europe / Mediteraneean Sea / Greece / Laconia / Neapoli / Zaluski / BUC6010
Cystoseira glomerata Zan. / ***Cystoseira glomerata*** **Kützing** / Europe / Adriatic Sea / Croatia / Insula Lesina / Insula Lesina / Botteri / BUC6029
Cystoseira granulata Ag. / ***Cystoseira usneoides*** **(Linnaeus) M. Roberts** / Europe / Adriatic Sea / BUC5946

Cystoseira granulata Ag. / ***Cystoseira usneoides*** **(Linnaeus) M. Roberts** / BUC5945
Cystoseira granulata Ag. / ***Cystoseira usneoides*** **(Linnaeus) M. Roberts** / BUC5944
Cystoseira granulata Ag. / ***Cystoseira usneoides*** **(Linnaeus) M. Roberts** / Europe / English Channel / France / Normandy / Finistère / Roscoff / 1935 / august / Eftimiu Panca / BUC5943 / Institutul Botanic- București. Herbariul Laboratorului de Morfologie și Sistematică Vegetală
Cystoseira granulatus / ***Cystoseira usneoides*** **(Linnaeus) M. Roberts** / BUC5947
Cystoseira hoppei Ag. / ***Cystoseira barbata*** **(Stackhouse) C. Agardh** / Europe / Adriatic Sea / Slovenia / Primorska / Pirano / Titius / BUC5981
Cystoseira hoppei Ag. / ***Cystoseira barbata*** **(Stackhouse) C. Agardh** / Europe / Adriatic Sea / Italy / Trieste / Friuli-Venezia Giulia / Tergestum / Trieste / 1874 / BUC5978
Cystoseira hoppei Ag. / ***Cystoseira barbata*** **(Stackhouse) C. Agardh** / Europe / Adriatic Sea / Italy / Trieste / Friuli-Venezia Giulia / Triest / BUC5977
Cystoseira hoppei Ag. / ***Cystoseira barbata*** **(Stackhouse) C. Agardh** / BUC5976
Cystoseira hoppei Ag. / ***Cystoseira barbata*** **(Stackhouse) C. Agardh** / Europe / Adriatic Sea / Italy / Trieste / Friuli-Venezia Giulia / Tergestum / Trieste / 1874 / BUC5975
Cystoseira hoppei / / / Europe / Adriatic Sea / BUC6047
Cystoseira hoppei / ***Cystoseira barbata*** **(Stackhouse) C. Agardh** / BUC5980
Cystoseira hoppei / ***Cystoseira barbata*** **(Stackhouse) C. Agardh** / Europe / Marea Ligurianǎ / Italy / La Spezia/Liguria / Lunae portu / 1865 / december / Caldesi L. / BUC5979
Cystoseira leptocarpa Ag / ***Cystoseira abrotanifolia*** **var.** ***leptocarpa*** **(Kützing) Rodríguez y Femenías** / Europe / Adriatic Sea / Croatia / Spalatino-Dalmata / Spalato / 1856 / Titius / BUC6014
Cystoseira leptocarpa Ag / ***Cystoseira abrotanifolia*** **var.** ***leptocarpa*** **(Kützing) Rodríguez y Femenías** / Europe / Mediteraneean Sea / Greece / Laconia / Neapoli / Zaluski / BUC6013
Cystoseira montagnei Ag. / ***Cystoseira montagnei*** **J. Agardh** / Europe / Adriatic Sea / Italy / Veneția / Veneto / Venice / 1853 / Titius / BUC5937
Cystoseira montagnei Ag. / ***Cystoseira montagnei*** **J. Agardh** / Europe / Adriatic Sea / Italy / Veneția / Veneto / Venice / 1853 / Titius / BUC5937
Cystoseira montagnei Ag. / ***Cystoseira montagnei*** **J. Agardh** / Bilimek / BUC5939
Cystoseira muricata C. Agardh / ***Cystoseira trinodis*** **(Forsskål) C.Agardh** / BUC6030
Cystoseira myrica Ag. / ***Polycladia myrica*** **(S.G. Gmelin) Draima, Ballesteros, F.Rousseau & T.Thibaut** / Red Sea / BUC5958
Cystoseira myrica Ag. / ***Polycladia myrica*** **(S.G. Gmelin) Draima, Ballesteros, F. Rousseau & T. Thibaut** / North America / SUA / Florida / Monroe / Duck Key / 1896 / April / Curtiss A. H. / BUC5958 / Algae Floridanae
Cystoseira myriophylloides Grev. / ***Cystoseira humilis*** **var.** ***myriophylloides*** **(Sauvageau) J.H. Price & D.M. John** / Europe / Atlantic Ocean / France / Finistere / 1935 / July / Eftimiu Panca / BUC6033 / Institutul Botanic - București. Herbariul Laboratorului de Morfologie și sistematică Vegetală
Cystoseira opuntioides / Bory. / ***Cystoseira zosteroides*** **(Turner) C. Agardh** / Europe / Mediteraneean Sea / Italy / Ligura/Imperia / Porto Maurizio / "Dall' alto mare" / 1879 / Strafforello / BUC5942 / Erb. Critt. Ital. Ser. II.
Cystoseira paniculata / ***Cystoseira paniculata*** **(Turner) C. Agardh** / Titius / BUC5995
Cystoseira patentissima Kg. / ***Cystoseira patentissima*** **Kützing** / Europe / Adriatic Sea / Italy / Veneția / Veneto / Venice / 1853 / Titius / BUC6012
Cystoseira sedoides Ag. / ***Cystoseira sedoides*** **(Desfontaines) C. Agardh** / Africa / Algeria / El Tarf Province / La Calle / / "La calle, Rochers sous marins" / 1839 / June / Bove M. / BUC5949 / Herb. Mus. Paris
Cystoseira sedoides / Desfont. / ***Cystoseira sedoides*** **(Desfontaines) C. Agardh** / Africa / Algeria / St. Eugene / 1888 / May / Debray F. / BUC5948 / Hauck et Richter. Phykotheka universalis
Cystoseira siliquosa Ag. / ***Cystoseira siliquosa*** **(Linnaeus) C. Agardh /** Europe / Baltic Sea / "Aus Ostsee. Diese, und die 7 folgenden Arten verdanke ich der Gute des H. Apoth. Rudolphi" / Rudolphi / BUC5921 / Cryptogamische Gewachse besonders des Fichtelgebirges- Heinrichs Christian Funck
Cystoseira squarrosa Dntrs. / ***Cystoseira squarrosa*** **De Notaris** / Europe / Ligurean Sea / Italy / Genova / San Nazzaro / "Su scogli sommersi, alla spiaggia di S. Nazzaro presso Genova." / 1860 / June / Baglietto F. et Piccone A. / BUC5930 / Erb. Critt. Ital. Ser. II.
Cystoseira squarrosa Dntrs. / ***Cystoseira squarrosa*** **De Notaris** / Europe / Ligurean Sea / Italy / Genova / San Giuliano / "Su scogli a piccola profondita" / 1878 / May / Piccone A. / BUC5932 / Societa Elvetica
Cystoseira triquetra Ag. / ***Hormophysa cuneiformis*** **(J.F. Gmelin) P.C. Silva** / Red Sea / BUC6022
Cystoseira triquetra Ag. / ***Hormophysa cuneiformis*** **(J.F. Gmelin) P.C. Silva** / BUC6023

Cystoseira sp. / Africa / Algeria / El Tarf Province / La Calle / "Rochers sous-marius" / 1839 / June / Bove M. / BUC6036 / Herb. Mus. Paris
Cystoseira sp. / Africa / Algeria / El Tarf Province / La Calle / "Rochers sous-marius" / 1839 / June / Bove M. / BUC6035 / Herb. Mus. Paris
Cystoseira sp. / Africa / Algeria / El Tarf Province / La Calle / "Rochers sous-marius" / 1839 / July / Bove M. / BUC6036 / Herb. Mus. Paris
Cystoseira sp. / Europe / România / Dobrogea / Constanța / Agigea / 1946 / July / 28 / Gușuleac / BUC6040
Cystoseira sp. / Africa / Algeria / "Bone. Rochers sous marins." / 1839 / June / Bove M. / BUC6039 / Herb. Mus. Paris
Cystoseira sp. / Africa / Algeria / "Bone. Rochers sous marins." / 1839 / June / Bove M. / BUC6038 / Herb. Mus. Paris
Cystoseira sp. / Africa / Algeria / "Bone. Rochers sous marins." / 1839 / June / Bove M. / BUC6037 / Herb. Mus. Paris
Cystoseira variegata End. / BUC6032
Cystoseira variegata Endicher / BUC6031
Cystoseira virgata / ***Cystoseira trinodis*** **(Forsskål) C. Agardh** / Siegmund W. / BUC5926 / Richter Lajos noveny gyujtemenye. Budapest Thonetudvar
Desmarestia aculeata (L.) f. vernalis / ***Desmarestia aculeate*** **(Linnaeus) J.V. Lamouroux** / Mari Bahusiae / Domina Sophia Akermark / BUC6444 / Rabenhorst, Algen Europe's
Desmarestia aculeata (L.) f. vernalis / ***Desmarestia aculeata*** **(Linnaeus) J.V. Lamouroux** / Mari Bahusiae / Domina Sophia Akermark / BUC6445 / Rabenhorst, Algen Europe's
Desmarestia aculeata (L.) Lamour. / ***Desmarestia aculeata*** **(Linnaeus) J.V. Lamouroux** / Europe / Baltic Sea / Denmark/Germany / Flensburger Fohrde / "Sehr zarte Form. Ostsee, Flensburger Fohrde, ca. 11 m tief (Ochsen-Insel)" / 1888 / May / Reinbold Th. / BUC6442 / Hauck et Richter. Phykotheka universalis
Desmarestia aculeata (L.) Lamour. / ***Desmarestia aculeata*** **(Linnaeus) J.V. Lamouroux** / Europe / Baltic Sea / Denmark/Germany / Flensburger Fohrde / "Sehr zarte Form. Ostsee, Flensburger Fohrde, ca. 11 m tief (Ochsen-Insel)" / 1889 / June / Reinbold Th. / BUC6443 / Hauck et Richter. Phykotheka universalis
Desmarestia aculeata Lamour. / ***Desmarestia aculeata*** **(Linnaeus) J.V. Lamouroux** / Europe / Atlantic Ocean / France / Normandy / Manche (dep.) / Cherbourg / Lenormand / BUC6446
Desmarestia aculeata Lamouroux / ***Desmarestia aculeata*** **(Linnaeus) J.V. Lamouroux** / BUC6447 /
Desmarestia aculeata Lamouroux / ***Desmarestia aculeata*** **(Linnaeus) J.V. Lamouroux** / North America / Pacific Ocean / Canada / British-Columbia / Victoria Vancouver Island / May / 25 / Roll Julius / BUC6448 / National Arboretum Zoeschen bei Merseburg
Desmarestia filiformis Ag. / ***Nereia filiformis*** **(J. Agardh) Zanardini** / Europe / Adriatic Sea / Titius / BUC6326
Desmarestia filiformis J. Ag. / ***Nereia filiformis*** **(J. Agardh) Zanardini** / Straff. / BUC6327
Desmarestia ligulata Lamouroux / ***Desmarestia aculeata*** **(Linnaeus) J.V. Lamouroux** / Europe / English Channel / France / Normandy / Finistère / Carantec /"Au large Carantec" / 1935 / Eftimiu Panca / BUC6454 / Institutul Botanic din București - Erbarul General
Desmarestia ligulata Lamouroux / ***Desmarestia aculeata*** **(Linnaeus) J.V. Lamouroux** / Europe / English Channel / France / Normandy / Finistère / Carantec /"Au large Carantec" / 1935 / Eftimiu Panca / BUC6453 / Institutul Botanic din București - Erbarul General
Desmarestia ligulata Lamouroux / ***Desmarestia aculeata*** **(Linnaeus) J.V. Lamouroux** / Europe / North Sea / Sena River / France / Normandia de Sus / Seine inferiore (dep.) / Fecamp / 1886 / septembrie / Debray F. / BUC6452 / Hauck et Richter. Phykotheka universalis
Desmarestia viridis (Fl. Dan.) Lamour. / ***Desmarestia viridis*** **(O.F. Müller) J.V. Lamouroux** / Europe / North Sea / Germany / Trizone / Kiel / "Im kieler Hafen an Mytilus edulis, später auch oft frei auf dem Boden liegend, in ca. 3-4 m Tiefe" / 1887 / May / Reinke J. / BUC6435 / Hauck et Richter. Phykotheka universalis
Desmarestia viridis (Flor. Danic.) Lamour. / ***Desmarestia viridis*** **(O.F. Müller) J.V.Lamouroux** / Europe / Mari Bahusiae / Domina Sophia Akermark / BUC6436 / Rabenhorst, Algen Europe's
Desmarestia viridis Lamour. / ***Desmarestia viridis*** **(O.F. Müller) J.V. Lamouroux** / Europe / Baltic Sea / Germany / Flensburger Meerbusen / 1877 / BUC6437
Desmarestia viridis Lamour. / ***Desmarestia viridis*** **(O.F. Müller) J.V. Lamouroux** / Europe / North Sea / Germany / Helgoland / BUC6439
Desmarestia viridis Lmx. / ***Desmarestia viridis*** **(O.F. Müller) J.V. Lamouroux** / Orient, L.I. / Booth. M.A. / BUC6438 / Algae Marinae

Desmarestia viridis / ***Desmarestia viridis*** **(O.F. Müller) J.V. Lamouroux** / Asia / Japonia / Hokkaido / Hakodade / April / 25 / BUC6440

Desmarestia / Fucus aculeata Lam. / Ag. / ***Desmarestia aculeata*** **(Linnaeus) J.V. Lamouroux** / BUC6451

Dichloria viridis / ***Desmarestia viridis*** **(O.F. Müller) J.V. Lamouroux** / Europe / Atlantic Ocean / France / Normandy / Manche (dep.) / Cherbourg / Lenormand / BUC6441

Dictyopteris polypodioides / ***Dictyopteris polypodioides*** **(A.P. De Candolle) J.V. Lamouroux** / Europe / Adriatic Sea / Croatia / Dalmatien / Dubrovnik / Ragusa / "In mari ad Ragusam" / Zay. / BUC6194 / Flora Exsiccata Austro-Hungarica

Dictyopteris polypodioides / ***Dictyopteris polypodioides*** **(A.P. De Candolle) J.V. Lamouroux** / Europe / Adriatic Sea / Croatia / Dalmatien / Dubrovnik / Ragusa / "In mari ad Ragusam" / Zay. / BUC6193 / Flora Exsiccata Austro-Hungarica

Dictyosiphonadriaticus Lyng. / Europe / Adriatic Sea / Croatia / Spalatino-Dalmata / Spalato / 1856 / Titius / BUC6432

Dictyosiphon capillare Lamour. / Europe / Adriatic Sea / Slovenia / Primorska / Pirano / Titius / BUC6433

Dictyosiphon chordaria Aresch. var. gelatinosus Stromf. / Europe / Baltic Sea / Germany / Schleswig-Holstein / Kieler Fohrde / Moltenort / "Auf steinen bei Moltenort in der Kieler Fohrde" / 1887 / July / Reinke J. / BUC6430 / Hauck et Richter. Phykotheka universalis

Dictyosiphon chordaria Aresch. / ***Dictyosiphon chordaria*** **Areschoug** / Europe / Baltic Sea / Germany / Kieler Hafen / Moltenort / "Unweit Moltenort in ca. 1 m Tiefe, besonders an Scytosiphon lomentarius wachsend" / 1887 / June / Reinke J. / BUC6429 / Hauck et Richter. Phykotheka universalis

Dictyosiphon filiformis Tit. / ***Dictyosiphon filiformis*** **(Foslie) De Toni** / Europe / Adriatic Sea / BUC6431

Dictyosiphon foeniculaceus (Huds.) Grev. var. filiformis Reinke / ***Dictyosiphon foeniculaceus*** **var.** ***filiformis*** **Reinke** / Europe / Baltic Sea / Germany / Schleswig-Holstein / Kieler Fohrde / "An Mytilus in ca. 4 m Tiefe in der Kieler Fohrde." / 1887 / June / Reinke J. / BUC6428 / Hauck et Richter. Phykotheka universalis

Dictyosiphon foeniculaceus (Huds.) Grev. / ***Dictyosiphon foeniculaceus*** **(Hudson) Greville** / Europe / Baltic Sea / Germany / Kieler Hafen / 1861 / May / Luders Johanna / BUC6414 / Hauck et Richter. Phykotheka universalis

Dictyosiphon foeniculaceus Grev. F. / major / ***Dictyosiphon foeniculaceus*** **(Hudson) Grevill**e / BUC6420 / Hohenack. Meeralgen. No. BUC510

Dictyosiphon foeniculaceus Grev. / ***Dictyosiphon foeniculaceus*** **(Hudson) Greville** / Europe / North Sea / Germany / Helgoland / BUC6426

Dictyosiphon foeniculaceus Grev. / ***Dictyosiphon foeniculaceus*** **(Hudson) Greville** / Europe / Baltic Sea / Germany / Flensburger / 1878 / June / Wienemann / BUC6424

Dictyosiphon foeniculaceus Grev. / ***Dictyosiphon foeniculaceus*** **(Hudson) Greville** / 1877 / august / BUC6424

Dictyosiphon foeniculaceus Grev. / ***Dictyosiphon foeniculaceus*** **(Hudson) Greville** / Europe / Atlantic Ocean / France / Normandy / Manche (dep.) / Cherbourg / Lenormand / BUC6422

Dictyosiphon foeniculaceus Grev. / ***Dictyosiphon foeniculaceus*** **(Hudson) Greville** / Bauer / BUC6422

Dictyosiphon foeniculaceus Grev. / ***Dictyosiphon foeniculaceus*** **(Hudson) Greville** / Europe / Adriatic Sea / Croatia / Spalatino-Dalmata / Spalato / 1856 / Titius / BUC6421

Dictyosiphon foeniculaceus Grev. / ***Dictyosiphon foeniculaceus*** **(Hudson) Greville** / BUC6419

Dictyosiphon foeniculaceus Huds. / ***Dictyosiphon foeniculaceus*** **(Hudson) Greville** / 1865 / Deipner Adolph / BUC6417 / Rabenhorst, Algen Europe's

Dictyosiphon foeniculaceus Huds. / ***Dictyosiphon foeniculaceus*** **(Hudson) Greville** / Mari Bahusiae / Domina Sophia Akermark / BUC6417 / Rabenhorst, Algen Europe's

Dictyosiphon foeniculaceus Huds. / ***Dictyosiphon foeniculaceus*** **(Hudson) Greville** / "Auf Fucus vesiculosus" / Bader R. / BUC6415 / Rabenhorst, Algen Scahs. Resp. MittelEurope"s

Dictyosiphon foeniculaceus Huds. / ***Dictyosiphon foeniculaceus*** **(Hudson) Greville** / "Auf Fucus vesiculosus" / Bader R. / BUC6415 / Rabenhorst, Algen Scahs. Resp. MittelEurope"s

Dictyosiphon hippuroides (Lyngb.) Aresch. / ***Dictyosiphon foeniculaceus*** **(Hudson) Greville** / Europe / Baltic Sea / Germany / Schleswig-Holstein / Kieler Fohrde / "Form, welche Dictyosiphon foeniculaceus" / 1888 / July / Reinbold Th. / BUC6413 / Hauck et Richter. Phykotheka universalis

Dictyota acuta unknown / ***Dictyota dichotoma*** **(Hudson) J.V. Lamouroux** / Europe / Adriatic Sea / Croatia / Spalatino-Dalmata / Spalato / 1856 / Titius / BUC6210

Dictyota bartayresiana Lamour. f. angustiloba / ***Dictyota cervicornis*** **Kützing** / Europe / Denmark / Danisch Westindische Inseln / BUC6198 / Hohenack. Meeralgen. No. 428

Dictyota bartayresiana Lmx. / ***Dictyota bartayresiana*** **J.V. Lamouroux** / North America / Atlantic Ocean / Gulf of Mexico / Florida / Key West / 1896 / April / Curtiss. A.H. / BUC6199 / Algae Floridanae

Dictyota cervicornis Kutz. / ***Canistrocarpus cervicornis*** **(Kützing) De Paula & De Clerck** / North America / Atlantic Ocean / Gulf of Mexico / Florida / Key West / 1896 / April / Curtiss. A.H. / BUC6234 / Algae Floridanae

Dictyota ciliata Ag. / ***Dictyota ciliolata*** **Sonder ex Kützing** / North America / Lake Worth Inlet / Florida / Palm Beach County / 1895 / May / Curtiss. A.H. / BUC6224 / Algae Floridanae

Dictyota dentata Lam. / ***Dictyota mertensii*** **(C. Martius) Kützing** / Europe / Atlantic Ocean / Bahama Islands / Nassau / 1894 / April / Curtiss. A.H. / BUC6223 / Algae Floridanae

Dictyota dentata Lamour. / ***Dictyota mertensii*** **(C. Martius) Kützing** / North America / Caribbean Sea / JaMayca / Port Antonio / Washed ashore near Port Antonio, JaMayca / Pearse Cora E., Butler Eloise; det. Collins S. Frank / BUC6222 / Hauck et Richter. Phykotheka universalis

Dictyota denticulata Lamourx. / ***Dictyota fasciola*** **(Roth) J.V. Lamouroux** / Titius / BUC6235

Dictyota dichotoma (Bert.) Grev. / ***Dictyota dichotoma*** **(Hudson) J.V. Lamouroux** / Europe / Adriatic Sea / Slovenia / Pirano / Piran / Titius / BUC6205 / Rabenhorst, Algen Europe's

Dictyota dichotoma (Huds.) Lamour. / ***Dictyota dichotoma*** **(Hudson) J.V. Lamouroux** / Europe / North Sea / Golful German / Germany / Helgoland, Westseite / "Helgolan, Westeseite, auf den Felsplatten schaarenweise emergierend." / 1894 / septembrie / 5 / Kuckuck P. / BUC6200 / Hauck et Richter. Phykotheka universalis

Dictyota dichotoma (Huds.) Lmx. / ***Dictyota dichotoma*** **(Hudson) J.V. Lamouroux** / Europe / Adriatic Sea / BUC6203 / Ex. Herb. D. Bothan.

Dictyota dichotoma (Huds.) Lmx. / ***Dictyota dichotoma*** **(Hudson) J.V. Lamouroux** / Europe / Adriatic Sea / BUC6204 / Ex. Herb. D. Bothan.

Dictyota dichotoma Grev. var. intricata / ***Dictyota dichotoma*** **var.** ***intricata*** **(C. Agardh) Greville** / Titius / BUC6214

Dictyota dichotoma Grev. / ***Dictyota dichotoma*** **(Hudson) J.V. Lamouroux** / Europe / Adriatic Sea / Titius / BUC6206

Dictyota dichotoma Grev. / ***Dictyota dichotoma*** **(Hudson) J.V. Lamouroux** / Europe / Adriatic Sea / BUC6207

Dictyota dichotoma Lamour. / ***Dictyota dichotoma*** **(Hudson) J.V. Lamouroux** / Europe / English Channel / France / Normandy / Finistère / Roscoff / 1935 / July / Eftimiu Panca / BUC6208 / Institutul Botanic - București Herbariu laboratorului de morfologie și sistematcă vegetală

Dictyota dichotoma Lamour. / ***Dictyota dichotoma*** **(Hudson) J.V. Lamouroux** / Europe / English Channel / France / Normandy / Finistère / Roscoff / 1935 / Eftimiu Panca / BUC6209 / Institutul Botanic - București Erbarul General

Dictyota dichotoma Lamourx. var. intricate / ***Dictyota dichotoma*** **var.** ***intricata*** **(C.Agardh) Greville** / Europe / Adriatic Sea / Croatia / Raguseo-narentana / Ragusa Vecchia / 1883 / BUC6215

Dictyota dichotoma var. intricata / ***Dictyota dichotoma*** **var.** ***intricata*** **(C. Agardh) Greville** / Europe / Atlantic Ocean / France / Normandy / Manche (dep.) / Cherbourg / BUC6216

Dictyota dichotoma / / / / Europe / Adriatic Sea / Croatia / Spalatino-Dalmata / Spalato / 1850 / Titius / BUC6218

Dictyota dichotoma / ***Dictyota dichotoma*** **(Hudson) J.V. Lamouroux** / Europe / Adriatic Sea / Croatia / Lovranam / "In mari prope Lovranam." / Zay. / BUC6201 / Flora Exsiccata Austro-Hungarica

Dictyota dichotoma / ***Dictyota dichotoma*** **(Hudson) J.V. Lamouroux** / Europe / Adriatic Sea / Croatia / Lovranam / "In mari prope Lovranam." / Zay. / BUC6202 / Flora Exsiccata Austro-Hungarica

Dictyota divaricata J. Ag. / ***Dictyota cervicornis*** **Kützing** / North America / Atlantic Ocean / Florida / Broward / Fort Lauderdale / 1897 / April / Curtiss. A.H. / BUC6227 / Algae Floridanae

Dictyota divaricata / ***Dictyota cervicornis*** **Kützing** / Europe / Adriatic Sea / Slovenia / Primorska / Pirano / Titius / BUC6228

Dictyota divergens Ag. / Titius / BUC6236

Dictyota fasciola (Roth) Lamour. / ***Dictyota fasciola*** **(Roth) J.V. Lamouroux** / 1856 / Titius / BUC6232

Dictyota fasciola (Roth) Lamourx. / ***Dictyota fasciola*** **(Roth) J.V. Lamouroux** / Europe / Adriatic Sea / BUC6231

Dictyota fasciola Lamourx. var. capillaris / ***Dictyota fasciola*** **(Roth) J.V. Lamouroux** / Europe / Adriatic Sea / Croatia / Insula Lesina / Dotteri (com) / BUC6233

Dictyota fasciola Lamourx. / ***Dictyota fasciola*** **(Roth) J.V. Lamouroux** / North America / Atlantic Ocean / Gulf of Mexico / Florida / Key West / 1896 / April / Curtiss. A.H. / BUC6229 / Algae Floridanae

Dictyota fasciola Lamourx. / ***Dictyota fasciola*** **(Roth) J.V. Lamouroux** / Titius / BUC6230

Dictyota implexa Lam. / ***Dictyota implexa*** **(Desfontaines) J.V. Lamouroux** / Europe / Adriatic Sea / Croatia / Spalatino-Dalmata / Spalato / 1856 / Titius / BUC6219

Dictyota implexa Lamourx. / ***Dictyota implexa*** **(Desfontaines) J.V. Lamouroux** / Europe / Tyrrhenian Sea / France / Corsica / Haute-Corse (dep.) / Bastia / Costa de Bastia / 1869 / April / Debeaux O. / BUC6213 / Herbier de O. Debeaux

Dictyota laciniata Lam. / ***Dictyota laciniata*** **J.V. Lamouroux** / BUC6261

Dictyota laciniata Lam. / ***Dictyota laciniata*** **J.V. Lamouroux** / Europe / Adriatic Sea / Croatia / Spalatino-Dalmata / Spalato / 1856 / Titius / BUC6262

Dictyota ligulata Kütz. / ***Dictyota spiralis*** **Montagne** / Eftimiu Panca / BUC6237 / Institutul Botanic din București - Erbarul General

Dictyota linearis Grev. / ***Dictyota implexa*** **(Desfontaines) J.V. Lamouroux** / BUC6228

Dictyota linearis Grev. / ***Dictyota implexa*** **(Desfontaines) J.V. Lamouroux** / Europe / Ligurean Sea / Italy / Genova / San Giuliano / 1861 / June / Ardissone / BUC6225 / Rabenhorst, Algen Europe's

Dictyota officinalis Lam. / Europe / Adriatic Sea / Titius / BUC6238

Dictyota paniculata J. Ag. / ***Dictyota paniculata*** **J. Agardh** / Australia / Victoria / Melbourne / Port Phillip. / BUC6243

Dictyota radicans Lam. / ***Rugulopteryx radicans*** **(Harvey) De Clerck & Coppejans** / Titius / BUC6240

Dictyota repens J. Ag. / ***Dictyota fasciola*** **var. *repens* (J. Agardh) Ardissone** / BUC6244

Dictyota striolata Kutzing / ***Dictyota dichotoma*** **var. *intricata* (C. Agardh) Greville** / Europe / Adriatic Sea / Croatia / Spalatino-Dalmata / Spalato / 1856 / Titius / BUC6241

Dictyota unreadable Tit. / Europe / Adriatic Sea / Croatia / Insula Lesina / Insula Lesina / 1856 / Titius / BUC6239

Dictyota unreadable / BUC6242

Dictyota volubilis Leucrom. / ***Dictyota dichotoma*** **(Hudson) J.V. Lamouroux** / 1856 / Titius / BUC6211

Durvillaea utilis Bory / ***Durvillaea antarctica*** **(Chamisso) Hariot** / Africa / Oceanul Sud Pacific / Chile / Concepción / Bio bio / / Lota / 1891 / July / Heydrich. F. / BUC6138 / Hauck et Richter. Phykotheka universalis

Ectocarpus approximatus & mediterraneus Kutz. / Europe / Mediteraneean Sea / Italy / Liguria / Savona / "Sulla Zostera nel Porto di Savona" / 1862 / April / Piccone A. / BUC6658 / Rabenhorst, Algen Europe's

Ectocarpus arachnoideus Zanardini / ***Ectocarpus arachnoideus*** **Zanardini** / Europe / Adriatic Sea / Titius / BUC6657

Ectocarpus arctus / ***Ectocarpus siliculosus*** **var. *arctus* (Kützing) Gallardo** / / BUC6649 / Ex herb. Dominicus Bilimek

Ectocarpus aureus Ag. / ***Ectocarpus auratus*** **Bory ex Kützing** / Titius / BUC6673

Ectocarpus brevifructus Lebel / Europe / Atlantic Ocean / France / Normandy / Manche (dep.) / Cherbourg / BUC6674

Ectocarpus castaneus / ***Ectocarpus castaneus*** **Kützing** / Titius / BUC6675 / Ex herb. Dominicus Bilimek

Ectocarpus compactus Agardh / ***Pylaiella littoralis*** **(Linnaeus) Kjellman** / Europe / Adriatic Sea / Italy / Veneția / Veneto / Venice / BUC6628

Ectocarpus confervoides (Roth) Le Jol / ***Ectocarpus siliculosus*** **(Dillwyn) Lyngbye** / BUC6654

Ectocarpus confervoides (Roth) Le Jol / ***Ectocarpus siliculosus*** **(Dillwyn) Lyngbye** / Europe / Adriatic Sea / Croatia / "In mari prope Gravosam" / Zay. / BUC6655 / Flora Exsiccata Austro-Hungarica

Ectocarpus confervoides (Roth) Le Jol / ***Ectocarpus siliculosus*** **(Dillwyn) Lyngbye** / 1870 / February / Bilimch / BUC6656

Ectocarpus confervoides (Roth) Le Jolis / ***Ectocarpus siliculosus*** **(Dillwyn) Lyngbye** / Europe / Slovenia / Slovenian Littoral / Capodistria / Koper / "Capodistria, in Salinengraben" / 1885 / May / Hauck F. / BUC6660 / Hauck et Richter. Phykotheka universalis

Ectocarpus fasciculatus Ag. / ***Ectocarpus fasciculatus*** **Harvey C** / ***Ectocarpus fasciculatus*** **Kützing S** / Europe / Adriatic Sea / Italy / Veneția / Veneto / Venice / 1854 / Titius / BUC6676

Ectocarpus ferrugineus / ***Ectocarpus ferrugineus*** **C. Agardh** / Europe / Adriatic Sea / Slovenia / Primorska / Pirano / Titius / BUC6672

Ectocarpus firmus J. Ag. / ***Pylaiella littoralis*** **(Linnaeus) Kjellman** / Europe / Mari Bahusiae / 1872 / Akermark S. / BUC6629 / Rabenhorst, Algen Europe's

Ectocarpus firmus J. Ag. / ***Pylaiella littoralis*** **(Linnaeus) Kjellman** / Europe / English Channel / France / Normandy / Roscoff / "parasite sur les Fuscus" / 1882 / martie / Miciol. / BUC6631 / Societe dauphinoise, 1883

Ectocarpus flagelliformis Kutz. / ***Ectocarpus flagelliformis*** **Kützing** / Europe / Italy / Puglia / Lesina / Titius / BUC6659

Ectocarpus funicularis Tit. / Europe / Adriatic Sea / Titius / BUC6677
Ectocarpus globifer Kuetzing / ***Feldmannia globifera*** **(Kützing) Hamel** / Europe / Adriatic Sea / Croatia / Istria / Rovigno / "In mari Adriatico in lapidibus prope Rovigno; 0-5 m sub m" / Gran. / BUC6635 / Flora Exsiccata Austro-Hungarica
Ectocarpus granulosus Agardh / ***Hincksia granulosa*** **(Smith) P.C. Silva** / Europe / Atlantic Ocean / France / Normandy / Manche (dep.) / Cherbourg / BUC6662
Ectocarpus hiemalis Crouan / ***Ectocarpus siliculosus*** **var.** ***hiemalis*** (P. Crouan & H. Crouan ex Kjellman) Gallardo / Europe / Atlantic Ocean / France / Brittany / Lannion / "Pres Brest (Finistere): sur la Zostere et autres algues" / 1877 / February / Chiebaut C. / BUC6652
Ectocarpus hincksiae Harv. / ***Hincksia hincksiae*** **(Harvey) P.C. Silva** / Europe / English Channel / France / Saint-Malo / "Sur les Laminaire" / 1935 / June / Eftimiu Panca / BUC6637 / Institutul Botanic - București. Herbariul Laboratorului de Morfologie și sistematică Vegetală
Ectocarpus intermedius Kutz. / ***Ectocarpus intermedius*** **Kützing** / 1844 / martie / 20 / Titius / BUC6651
Ectocarpus landsburgii Harvey / ***Ectocarpus fasciculatus*** **Harvey** / North America / Oceanul Nord Atlantic / SUA / Florida / St. Johns / St. Augustine / 1897 / April / Curtiss. A.H. / BUC6638 / Algae Floridanae
Ectocarpus littoralis Aresch. / ***Pylaiella littoralis*** **(Linnaeus) Kjellman** / Mari Bahusiae / septembrie / Akermark S. / BUC6626 / Rabenhorst, Algen Europe's
Ectocarpus littoralis Kjellman / ***Pylaiella littoralis*** **(Linnaeus) Kjellman** / Europe / English Channel / France / Normandy / Roscoff / 1935 / august / Eftimiu Panca / BUC6678 / Institutul Botanic din București - Erbarul General
Ectocarpus littoralis Lyngb. var. compactus Agardh / ***Pylaiella littoralis*** **(Linnaeus) Kjellman** / Europe / Atlantic Ocean / France / Normadia de Jos / Cherbourg / BUC6627
Ectocarpuslittoralis var. compactuss / ***Pylaiella littoralis*** **(Linnaeus) Kjellman** / Europe / Atlantic Ocean / France / Normandy / Manche (dep.) / Cherbourg / Lenormand / BUC6679 / Institutul Botanic din București - Erbarul General
Ectocarpus lumbricalis Ktz. / ***Halothrix lumbricalis*** **(Kützing) Reinke** / Europe / Baltic Sea / Germany / Flensburger Meerbufen / "Un Zostera marina im Flensburger Meerbufen" / May / Bader R. / BUC6410 / Rabenhorst, Algen Sanchs. Resp. MittelEurope's
Ectocarpus mertensii Ag. / ***Tilopteris mertensii*** **(Turner) Kützing** / Europe / Atlantic Ocean / France / Normandy / Manche (dep.) / Cherbourg / BUC6247
Ectocarpus monocarpus Ag. / ***Compsonema minutum*** **(C. Agardh) Kuckuck** / Europe / Adriatic Sea / Titius / BUC6636
Ectocarpus penicillatus Lyngb. / ***Ectocarpus penicillatus*** **(C. Agardh) Kjellman** / Europe / Adriatic Sea / Titius / BUC6639
Ectocarpus pusillus Harv. / ***Acinetospora crinita*** **(Carmichael) Sauvageau** / Europe / Atlantic Ocean / France / Normandy / Manche (dep.) / Cherbourg / BUC6680
Ectocarpus ramullosus Ag. / ***Pylaiella ramellosa*** (Kützing) Laing / Europe / Adriatic Sea / Slovenia / Primorska / Pirano / Titius / BUC6681
Ectocarpus refractus Kützing / ***Ectocarpus fasciculatus*** **var.** ***refractus*** **(Kützing) Ardissone** / Titius / BUC6661
Ectocarpus rufulus Kütz. / ***Ectocarpus rufulus*** **Kützing** / Europe / Adriatic Sea / Titius / BUC6650
Ectocarpus siliculosus (Dillw.) Lyngbye / ***Ectocarpus siliculosus*** **(Dillwyn) Lyngbye** / Europe / Black Sea / România / Dobrogea / Constanța / Constanța / "In saxosis ad littus Ponti Euxini, una cum Scytosiphone limentariae" / 1956 / December / 10 / Celan M. Șerbănescu G. / Flora Romaniae Exsiccata a Horto et Museo Botanico Universitatis Clujensis Edita
Ectocarpus siliculosus Dillw. f. typica / ***Ectocarpus siliculosus*** **(Dillwyn) Lyngbye** / Europe / North Sea / Germany / Trizone / Helgoland / "Kalbertan an Steinen und grossen Algen im flachen Wasser" / 1893 / July / 4 / Kuckuck P. / BUC6648 / Phykotheka universalis
Ectocarpus siliculosus Dillw. / ***Ectocarpus siliculosus*** **(Dillwyn) Lyngbye** / Europe / Ligurean Sea / Italy / Genova / San Nazzaro / "Alla spiaggia di S. Nazzaro pr. Genova" / 1860 / February / Piccone A. / BUC6641 / Rabenhorst, Algae Europeea
Ectocarpus siliculosus Lyngb. var. penicillatus / ***Ectocarpus penicillatus*** **(C. Agardh) Kjellman** / Titius / BUC6653
Ectocarpus siliculosus Lyngb. / ***Ectocarpus siliculosus*** **(Dillwyn) Lyngbye** / Europe / Adriatic Sea / Croatia / Spalatino-Dalmata / Spalato / 1856 / Titius / BUC6643
Ectocarpus siliculosus Lyngb. / ***Ectocarpus siliculosus*** **(Dillwyn) Lyngbye** / Europe / France / Calvados / Arromanches / BUC6645

Ectocarpus siliculosus Lyngb. / ***Ectocarpus siliculosus*** **(Dillwyn) Lyngbye** / Mari Bahusiae / "In mari Bahusiae" / Domina Sophia Akermark / BUC6640 / Rabenhorst, Algae Europeea

Ectocarpus siliculosus Lyngb. / ***Ectocarpus siliculosus*** **(Dillwyn) Lyngbye** / North America / SUA / BUC6642 / Herbaris

Ectocarpus siliculosus / ***Ectocarpus siliculosus*** **(Dillwyn) Lyngbye** / Europe / Austria / Vienna / 1846 / Parreyss / BUC6644

Ectocarpus sphaerophorus Carmichael / ***Isthmoplea sphaerophora*** **(Carmichael) Gobi** / Europe / Atlantic Ocean / France / Normandy / Manche (dep.) / Cherbourg / BUC6685

Ectocarpus tomentosus (Huds.) Lyngb. / ***Spongonema tomentosum*** **(Hudson) Kützing** / Europe / Baltic Sea / Germany / Schleswig-Holstein / Schleimundung / "Auf Fucus vesiculosus" / 1888 / July / Reinbold Th. / BUC6663 / Hauck et Richter. Phykotheka universalis

Ectocarpus tomentosus (Huds.) Lyngb. / ***Spongonema tomentosum*** **(Hudson) Kützing** / Europe / Baltic Sea / Germany / Mecklenburg-Vorpommern / Warnemunde / On Fucus vesiculosus / 1888 / Septembrie / Heiden H. / BUC6664 / Hauck et Richter. Phykotheka universalis

Ectocarpus tomentosus Lyngb. / ***Spongonema tomentosum*** **(Hudson) Kützing** / Mari Bahusiae / Akermark S. / BUC6669 / Rabenhorst, Algen Europe's

Ectocarpus tomentosus Lyngb. / ***Spongonema tomentosum*** **(Hudson) Kützing** / Europe / Atlantic Ocean / France / Bretania / Finistère / Brest / Goulet de Brest / "Sur les Fucus" / 1875 / April / 22 / Chiebaut C. / BUC6667

Ectocarpus tomentosus Lyngb. / ***Spongonema tomentosum*** **(Hudson) Kützing** / Europe / Atlantic Ocean / France / Bretania / Finistère / Brest / Goulet de Brest / "Sur les Fucus" / 1876 / May / 23 / Chiebaut C. / BUC6668

Ectocarpus tomentosus Lyngb. / ***Spongonema tomentosum*** **(Hudson) Kützing** / Europe / Atlantic Ocean / France / Bretania / Finistère / Brest / Pointe du Diable, goulet de Brest (Finistere) / "Sur les Fucus, dans les flaques - Alt. Mi-maree" / 1875 / April-May / Thiebaut C. / BUC6665 / Societe dauphinoise

Ectocarpus tomentosus Lyngb. / ***Spongonema tomentosum*** **(Hudson) Kützing** / Europe / Atlantic Ocean / France / Bretania / Finistère / Brest / Pointe du Diable, goulet de Brest (Finistere) / "Sur les Fucus, dans les flaques - Alt. Mi-maree" / 1875 / April-May / Thiebaut C. / BUC6666 / Societe dauphinoise

Ectocarpus / Europe / Austria / Vienna / 1846 / Parreyss / BUC6682

Ectocarpus velutinus Kutz. / ***Ectocarpus velutinus*** **(Greville) Kützing** / Europe / Adriatic Sea / BUC6352

Ectocarpus viridis Harv / ***Ectocarpus viridis*** **Harvey** / North America / 1877 / BUC6647

Ectocarpus viridis / ***Ectocarpus viridis*** **Harvey** / Europe / Adriatic Sea / Titius / BUC6646

Elachista flaccida unreadable / ***Elachista flaccida*** **(Dillwyn) Fries** / Europe / Atlantic Ocean / France / Normandy / Manche (dep.) / Cherbourg / BUC6400 / Herbarul Institutului Botanic București

Elachista fucicola/(Velley) Fries / ***Elachista fucicola (*Velley) Areschoug** / Europe / Baltic Sea / Germany / Flensburger Meerbufen /”Uuf Fucus vesiculosus im Flensburger Merrbufen” / september / Bader R. / BUC6405 / Rabenhorst, Algen Sachs. Resp. MittelEurope'S

Elachista fucicola (Velley) Fries / ***Elachista fucicola*** **(Velley) Areschoug** / Europe / Baltic Sea / Germany / Flensburger Meerbufen /”Uuf Fucus vesiculosus im Flensburger Merrbufen” / september / Bader R. / BUC6406 / Rabenhorst, Algen Sachs. Resp. MittelEurope'S

Elachista fucicola (Velley) Fries / ***Elachista fucicola*** **(Velley) Areschoug** / Europe / Baltic Sea / Germany / Mecklenburg-Vorpommern / Warnemunde / On Fucus vesiculosus / Septembrie / Heiden H. / BUC6402 /

Elachista fucicola Fries / ***Elachista fucicola*** **(Velley) Areschoug** / Europe / France / Calvados / Arromanches / BUC6404

Elachista fucicola Fries / ***Elachista fucicola*** **(Velley) Areschoug** / ”parazit pe Fucus vesiculosus” / 1894 / august / BUC6403 /

Elachista fucicola Velley / ***Elachista fucicola*** **(Velley) Areschoug** / Europe / Mari Bahusiae / Domina Sophia Akermark / BUC6407 / Rabenhorst, Algen Europe's

Elachista lubrica Ruprecht / ***Elachista fucicola*** **(Velley) Areschoug** / Europe / Barent Sea / Norway / Finnmark / Mehavn / 1887 / June / Foslie M. / BUC6408 / Hauck et Richter. Phykotheka universalis

Elachista scutulata Duby / ***Elachista scutulata*** **(Smith) Areschoug** / Europe / Adriatic Sea / Slovenia / Primorska / Pirano / Titius / BUC6397

Elachista scutulata Duby / ***Elachista scutulata*** **(Smith) Areschoug** / Europe / Atlantic Ocean / France / Normandy / Manche (dep.) / Cherbourg / / BUC6398

Elachista scutulata Duby. Kg. / ***Elachista scutulata*** **(Smith) Areschoug** / Europe / Atlantic Ocean / France / Normandy / Manche (dep.) / Cherbourg / BUC6396 / Hohenack. Meeralgen. No. 363

Elachista stellaris Areschoug / ***Elachista stellaris*** **Areschoug** / Mari Bahusiae / ”In mari Bahusiae, in algis marinis majoribus parasitica” / Domina Sophia Akermark / BUC6399 / Rabenhorst, Algen Europe's

Encoelium sinuosum Ag. / ***Colpomenia sinuosa*** **(Mertens ex Roth) Derbès & Solier** / "Alla spiaggia di S. Guiliano rigettato dai fluti" / 1861 / June-July / Baglietto F. / BUC6515 / Rabenhorst, Algen Europe's

Encoelium sinuosum Kg. / ***Colpomenia sinuosa*** **(Mertens ex Roth) Derbès & Solier** / Europe / Adriatic Sea / Titius / BUC6516

Fucodium canaliculatum L. / ***Pelvetia canaliculata*** **(Linnaeus) Decaisne & Thuret** / BUC6129

Fucus acinarius L. / ***Sargassum acinarium*** **(Linnaeus) Setchell** / Grailich (com) / BUC5885

Fucus banksii / ***Hormosira banksii*** **(Turner) Decaisne** / BUC6049

Fucus canaliculatus / ***Pelvetia canaliculata*** **(Linnaeus) Decaisne & Thuret** / Europe / Canal La Manche / BUC6131

Fucus carneus / BUC6110

Fucus ceranoides L. / ***Fucus ceranoides*** **Linnaeus** / Europe / Atlantic Ocean / France / Bretania / Brest / Riviere marine de Penfeld / "Sur les rochers et les pierres ou coule l'eau douce" / 1875 / ianuarie / Thiebaut C. / BUC6069 / Societe Helvetique

Fucus ceranoides L. / ***Fucus ceranoides*** **Linnaeus** / Europe / Atlantic Ocean / France / Bretania / Brest / Riviere marine de Penfeld / "Sur les rochers et les pierres ou coule l'eau douce" / 1876 / February / Thiebaut C. / BUC6070 / Societe Helvetique

Fucus ceranoides L. / ***Fucus ceranoides*** **Linnaeus** / Europe / Atlantic Ocean / France / Normadia de Jos / Manche (dep.) / Greville pres Cherbourg / "Dans les ruisseaux d"eau douce, qui coulent per les rochers, a haute mer et a mi-maree" / Le Jolis / BUC6071 / Rabenhorst, Algen Europe's

Fucus ceranoides L. / ***Fucus ceranoides*** **Linnaeus** / Europe / France / Normandy / Calvados / Port-en Bassin / Lenormand / BUC6072

Fucus crispus var. sanguineus / ***Chondrus crispus*** **Stackhouse** / Marea Atlantică / BUC5849

Fucus edentatus De la Pyl. / ***Fucus distichus*** **subsp.** ***edentatus*** **(Bachelot de La Pylaie) H.T. Powell** / North America / Atlantic Ocean / SUA / Massachusetts / Essex / Marblehead / Growing about al low water mark, on the most exposed rocks / 1886 / April / 8 / Collins S. Frank / BUC6054 / Hauck et Richter. Phykotheka universalis

Fucus evanescens Ag. / ***Fucus distichus*** **subsp.** ***evanescens*** **(C. Agardh) H.T. Powell** / Europe / Arctic Ocean / Norway / Insulae Spetsbergenses / 1872-1873 / Kjellman F.R. / BUC6056 / Hauck et Richter. Phykotheka universalis

Fucus evanescens Ag. / ***Fucus distichus*** **subsp.** ***evanescens*** **(C. Agardh) H.T. Powell** / North America / S.UA. / Massachusetts / Suffolk / Revere / Revere beach / "Growing on loose stones and bowlders near low water mark" / 1886 / April / 14 / Collins S. Frank / BUC6055 / Hauck et Richter. Phykotheka universalis

Fucus filiformis Gmelin. / ***Fucus filiformis*** **S.G. Gmelin,** nom. illeg. / North America / Atlantic Ocean / SUA / Massachusetts / Essex / Marblehead / In the higher rocky tide pools / 1886 / April / 8 / Collins S. Frank / BUC6053 / Hauck et Richter. Phykotheka universalis

Fucus fueci / ***Fucus distichus*** **Linnaeus** / Europe / Norway arctica / Ingo / 1891 / July / 23 / Foslie M. / BUC6052 / Phykotheka universalis

Fucus hirsutus / ***Cladostephus spongiosum*** **f.** ***verticillatum*** **(Lightfoot) Prud'homme van Reine** / Richter Ludovicus. / BUC6111 / Herbario Franciscus Xaver Ebenhoch

Fucus inflatus / ***Fucus vesiculosus*** **Linnaeus** / Europe / Norway arctica / Troms / Tromso / 1887 / June / 28 / Foslie M. / BUC6051 / Hauck et Richter. Phykotheka universalis

Fucus serratus L. / ***Fucus serratus*** **Linnaeus** / BUC6101

Fucus serratus L. / ***Fucus serratus*** **Linnaeus** / Europe / North Sea / Rudolphi / BUC6102 / Cryptogamische Gewachse besonders des Fichtelgebirges- Heinrichs Christian Funck

Fucus serratus L. / ***Fucus serratus*** **Linnaeus** / Europe / North Sea / Germany / Helgoland / BUC6103

Fucus serratus /L. / ***Fucus serratus*** **Linnaeus** / Europe / Atlantic Ocean / France / Normandy / Manche (dep.) / Cherbourg / Lenormand / BUC6104

Fucus serratus L. / ***Fucus serratus*** **Linnaeus** / Europe / North Sea / Germany / Helgoland / 1874 / BUC6105

Fucus sherardi Ag. / Europe / Adriatic Sea / Croatia / Spalatino-Dalmata / Spalato / 1856 / Titius / BUC6066

Fucus sherardi Ag. / Europe / Adriatic Sea / Italy / Veneţio / Veneto / Venice / BUC6065 / Aus butzelmann's herbarium in Prag.

Fucus sherardi var. tenuifrons / Europe / Adriatic Sea / Slovenia / Primorska / Pirano / 1856 / Titius / BUC6116

Fucus sherardi / Europe / Adriatic Sea / Croatia / Istria / Prope Abbaziam / Zay. / BUC6067 / Flora Exsiccata Austro-Hungarica

Fucus sherardi / Europe / Adriatic Sea / Croatia / Istria / Prope Abbaziam / "In mari prope Abbaziam" / Zay. / BUC6068 / Flora Exsiccata Austro-Hungarica

Fucus siliquosus Lyngb. / ***Fucus siliculosus*** **Linnaeus** / Europe / North Sea / Germany / Helgoland / BUC5923
Fucus siliquosus Lyngb. / ***Fucus siliculosus*** **Linnaeus** / Europe / North Sea / Germany / Helgoland / bei Helgoland / BUC5922
Fucus unknown / France / Brândză / BUC6117
Fucus unknown / BUC6076 / Botanischer Tauschverein in Wien
Fucus vesiculosus L var. nana Batters / Europe / North Sea / England / Berwick on Tweed / "Rocks between tide-marks" / 1889 / ianuarie / Batters E. / BUC6089 / Hauck et Richter. Phykotheka universalis
Fucus vesiculosus L var. nanus Ag. / ***Fucus vesiculosus*** **Linnaeus** / Europe / Trave / Germany / Travemunde / "In ber Trave bei Travemunde" / 1859 / Septembrie / Bader R. / BUC6092 / Rabenhorst, Algen Europe's
Fucus vesiculosus L var. nanus Ag. / ***Fucus vesiculosus*** **Linnaeus** / Europe / Germany / Travemunde / Hacker R. / BUC6093
Fucus vesiculosus L. var. nanus Ag. / ***Fucus vesiculosus*** **Linnaeus** / 1858 / June / BUC6090 / Botanischer Tauschverein in Wien
Fucus vesiculosus L. var. nanus Ag. / ***Fucus vesiculosus*** **Linnaeus** / 1859 / July / BUC6091 / Botanischer Tauschverein in Wien
Fucus vesiculosus L. var. sherardi Rff. / Europe / Adriatic Sea / Bothar / BUC209652
Fucus vesiculosus L. var. sherardi Turn / BUC6064 / Botanischer Tauschverein in Wien
Fucus vesiculosus L var. sherardi Turn / Europe / Adriatic Sea / Italy / Triest / BUC6062
Fucus vesiculosus L. var. evesiculosus / ***Fucus vesiculosus*** var. ***linearis*** (Hudson) Kützing / Europe / Baltic Sea / Germany / Flensburger Meerbufen / BUC6088
Fucus vesiculosus L. var. minor angustilobus / Europe / Oceanul Nord Atlantic / Denmark / Gronland / Friedrichsthal / BUC6086 / Hohenack. Meeralgen. No. BUC523
Fucus vesiculosus L. var. sherardi / BUC209653
Fucus vesiculosus L. var. sherardi Ag. / Europe / Adriatic Sea / Bothar / BUC6061
Fucus vesiculosus L. var. sherardi Ag. / Europe / Adriatic Sea / BUC6060
Fucus vesiculosus L. var. sherardi Ag. / Europe / Adriatic Sea / Italy / Veneția / Veneto / Venice / 1854 / Titius / BUC6059
Fucus vesiculosus L. var. sherardi Ag. / "Im bafen von Trieft" / 1860 / February / Tommafini / BUC6058 / Rabenhorst, Algen Sach. Resp. MittelEurope's
Fucus var. vesiculosus L. / / Europe / Baltic Sea / Germany / Flensburger Meerbufen / Hansen L. / BUC6087
Fucus vesiculosus L. f. baltica (Ag.) J. Ag. / ***Fucus vesiculosus*** **Linnaeus** / Europe / North Sea / England / Tweed near Berwick / Muddy banks of the Tweed near Berwick / 1889 / ianuarie / Batters E. / BUC6083 / Hauck et Richter. Phykotheka universalis
Fucus vesiculosus L. f. baltica Ag. / ***Fucus vesiculosus*** **Linnaeus** / Europe / Baltic Sea / Suedia / Gotland / Gotland / Slite / Cleve P.T. / BUC6084 / Rabenhorst, Algen Europe's
Fucus vesiculosus L. / ***Fucus vesiculosus*** **Linnaeus** / 1858 / Bentzel S. (com) / BUC6085
Fucus vesiculosus L. / ***Fucus vesiculosus*** **Linnaeus** / Europe / Baltic Sea / Germany / Schleswig-Holstein / Kieler Fohrde / "Form der oberen Litoralregion (zeitweise trocken liegend). Die Form variirt so sehr, dass es unmoglich war, dieselbe genaue Form in allen Exemplaren zu sammeln. - Meist sehr kurzstielig und ohne Luftblasen. - Kieler Fohrde" / 1889 / May / Reinbold Th. / BUC6074 / Hauck et Richter. Phykotheka universalis
Fucus vesiculosus L. / ***Fucus vesiculosus*** **Linnaeus** / Europe / English Channel / England / Dorsetshire / Weymouth / In sea, on rocks, between tidemarks / 1864 / July / Leipner Ad. / BUC6075 / Rabenhorst, Algen Europe's
Fucus vesiculosus L. / ***Fucus vesiculosus*** **Linnaeus** / Europe / Atlantic Ocean / France / Normandy / Manche (dep.) / Cherbourg / BUC6077
Fucus vesiculosus Linn. var. sherardi Ag. / "Im bafen von Trieft" / 1860 / February / Tommafini / BUC6057 / Rabenhorst, Algen Sach. Resp. MittelEurope's
Fucus vesiculosus f. papofava / Europe / Adriatic Sea / Slovenia / Primorska / Pirano / Titius / BUC6094
Fucus vesiculosus var. sherardi / BUC6063
Fucus vesiculosus var. sherardi Rff. / Europe / Adriatic Sea / BUC209654
Fucus vesiculosus var. subescostatus Ag. / ***Fucus vesiculosus*** **Linnaeus** / Europe / Trave / Germany / Travemunde / Bader R. / BUC6095 / Rabenhorst, Algen Europe's
Fucus vesiculosus / ***Fucus vesiculosus*** **Linnaeus** / BUC6114
Fucus vesiculosus / ***Fucus vesiculosus*** **Linnaeus** / BUC6078
Fucus vesiculosus / ***Fucus vesiculosus*** **Linnaeus** / BUC6079
Fucus vesiculosus / ***Fucus vesiculosus*** **Linnaeus** / 1882 / BUC6080

Fucus vesiculosus / ***Fucus vesiculosus*** **Linnaeus** / 1866 / Bothar / BUC6082
Fucus aculeatus Lamouroux / ***Desmarestia aculeata*** **(Linnaeus) J.V .Lamouroux** / Europe / North Sea / Germany / Helgoland / BUC6450 /
Fucus barbatus / ***Cystoseira foeniculacea*** **(Linnaeus) Greville** / BUC5982
Fucus interruptus J. Agardh / ***Zonaria turneriana*** **J.Agardh** / BUC6145
Fucus nodosus L. / ***Ascophyllum nodosum*** **(Linnaeus) Le Jolis** / Europe / North Sea / Germany / Bei Husum / Hansen L. / BUC6123
Fucus serratus L. var. angustifolius Hacker / ***Fucus serratus*** **Linnaeus** / BUC6106
Fucus serratus L. var. angustifolius Hacker / ***Fucus serratus*** **Linnaeus** / Bothar / BUC6107
Fucus serratus L. / ***Fucus serratus*** **Linnaeus** / Pommern / Halbinsel Darss / 1872 / July / BUC6100 / Botanischer Tauschverein in Wien
Fucus serratus Linn / ***Fucus serratus*** **Linnaeus** / Europe / Atlantic Ocean / France / Normandy / Manche (dep.) / Cherbourg / 1898 / martie / BUC6099 / Herbier Cryptogamique de la Cote-D'Or (France) PAR F. FAUTREY
Fucus serratus / ***Fucus serratus*** **Linnaeus** / Europe / English Channel / France / Normandy / Finistère / Roscoff / 1935 / Eftimiu Panca / BUC6098 / Institutul Botanic din București - Erbarul General
Fucus sherardi var. tenuifrons / Europe / Adriatic Sea / Croatia / Spalatino-Dalmata / Spalato / 1856 / Titius / BUC6115
Fucus spiralis L. / ***Fucus spiralis*** **Linnaeus** / North America / SUA / Washington / Pierce / Tacoma / May / 18 / Roll J. (det. Reinbold) / BUC6096 / National-Arboretum Zoeschen bei Merseburg (Dr. G. Dieck.) Cryptogamen - Herbar. Abtheilung Nordwest-America
Fucus vesiculosus var. spiralis Ag. / ***Fucus spiralis*** **Linnaeus** / Europe / France / Normandy / Calvados / Arromanches / Lenormand / BUC6097
Fucus vesiculosus / ***Fucus vesiculosus*** **Linnaeus** / 1887 / BUC6081
Giraudya sphacelarioides Derb. / ***Giraudya sphacelarioides*** **Derbès & Solier** / Europe / Mediteraneean Sea / Italy / Genova/Liguria / Portofino / "Sulle foglie della Posidonia a Portolino, Ligura orient." / 1870 / May / Piccone A. Si Gibelli G. / BUC6412 / Rabenhorst, Algen Europe's
Giraudya sphacelarioides Derb. / ***Giraudya sphacelarioides*** **Derbès & Solier** / Europe / Mediteraneean Sea / Italy / Genova/Liguria / Portofino / "Sur les feuiles du Posidonia oceanica" / 1877 / May / Piccone A. / BUC6411 / Societe dauphinoise, 1880
Halidrys siliquosa (L.) Lyngb / ***Halidrys siliquosa*** **(Linnaeus) Lyngbye** / Europe / North Sea / Sena River / France / Normandia de Sus / Seine inferiore (dep.) / Fecamp / 1886 / august / Debray F.
Halidrys siliquosa Lyngh. / ***Halidrys siliquosa*** **(Linnaeus) Lyngbye** / Holtz / BUC5924
Halidrys siliquosa Lyngh. / ***Halidrys siliquosa*** **(Linnaeus) Lyngbye** / Europe / English Channel / France / Normandy / Finistère / Roscoff / 1935 / Eftimiu Panca / BUC5920 / Institutul Botanic din București - Erbarul General
Halidrys siliquosa Lyngh. / ***Halidrys siliquosa*** **(Linnaeus) Lyngbye** / Europe / Atlantic Ocean / France / Normandy / Manche (dep.) / Cherbourg / BUC5919
Halidrys siliquosa Lyngh. / ***Halidrys siliquosa*** **(Linnaeus) Lyngbye** / 1858 / BUC5918
Halidrys siliquosa Lyngh. / ***Halidrys siliquosa*****(Linnaeus) Lyngbye** / 1888 / BUC5917
Halidrys siliquosa Lyngh. / ***Halidrys siliquosa*** **(Linnaeus) Lyngbye** / Lenormand / BUC5916
Halidrys siliquosa Lyngh. / ***Halidrys siliquosa*** **(Linnaeus) Lyngbye** / Europe / English Channel / England / Dorsetshire / Weymouth und Lullworth / 1865 / July / Leipner Adolph / BUC5915 / Rabenhorst, Algen Europe's
Halidrys siliquosa Lyngh. / ***Halidrys siliquosa*** **(Linnaeus) Lyngbye** / Europe / Atlantic Ocean / France / Bretania / Finistère / Brest / Goulet de Brest / "Rouches" / 1880 / ianuarie / Chiebaut C. / BUC5914 / Societe Helvetique
Halidrys siliquosa Lyngh. / ***Halidrys siliquosa*** **(Linnaeus) Lyngbye** / Europe / France / Nouvelle-Aquitaine / "Pres de l'ile d`Oleron (Charente inferieure)" / "Dans la mer" / 1855 / december / 18 / Franqueville / BUC5913 / Flora Gallia et Germany exsiccata de C. Billot
Halidrys siliquosa Lyngh. / ***Halidrys siliquosa*** **(Linnaeus) Lyngbye** / Europe / North Sea / Sena River / France / Normandia de Sus / Seine inferiore (dep.) / Fecamp / 1886 / august / Debray F. / BUC5912 / Hauck et Richter. Phykotheka universalis
Haliseris delicatula J. Ag. / ***Dictyopteris delicatula*** **J.V. Lamouroux** / North America / Atlantic Ocean / Florida / Broward / Fort Lauderdale / 1897 / April / Curtiss. A.H. / BUC6184 / Algae Marinae
Haliseris delicatula J. Ag. / ***Dictyopteris delicatula*** **J.V. Lamouroux** / BUC6184
Haliseris justii Lamon. / ***Dictyopteris justii*** **J.V. Lamouroux** / North America / Florida / Jupiter Inlet / 1895 / septembrie / Curtiss. A.H. / BUC6196 / Algae Floridanae

Haliseris plagiogramma Montagne / ***Dictyopteris plagiogramma*** **(Montagne) Vickers** / North America / Florida / Palm Beach / 1895 / May / Curtiss. A.H. / BUC6197 / Algae Floridanae

Haliseris polypodioides (Lamourx.) Ag. / ***Dictyopteris polypodioides*** **(A.P. De Candolle) J.V. Lamouroux** / BUC6189

Haliseris polypodioides Ag. var. tenuifrons / Europe / Mediteraneean Sea / Greece / Laconia / Neapoli / 1853 / Zaluski / BUC6195

Haliseris polypodioides Ag. / ***Dictyopteris polypodioides*** **(A.P. De Candolle) J.V. Lamouroux** / 1870 / BUC6192

Haliseris polypodioides Ag. / ***Dictyopteris polypodioides*** **(A.P. De Candolle) J.V. Lamouroux** / Europe / Adriatic Sea / Croatia / Spalatino-Dalmata / Spalato / 1856 / Titius / BUC6188

Haliseris polypodioides Ag. / ***Dictyopteris polypodioides*** **(A.P. De Candolle) J.V. Lamouroux** / Europe / Mediteraneean Sea / Italy / Liguria / Savona / "Ai scogli sommersi nel Porto di Savona (Liguria)" / 1861 / martie / Piccone / BUC6186 / Rabenhorst, Algen Europe's

Haliseris polypodioides Ag. / ***Dictyopteris polypodioides*** **(A.P. De Candolle) J.V. Lamouroux** / Europe / Ligurean Sea / Italy / Genova / San Nazzaro / 1861 / June / Ardissone / BUC6186 / Rabenhorst, Algen Europe's

Haliseris polypodioides / ***Dictyopteris polypodioides*** **(A.P. De Candolle) J.V. Lamouroux** / Africa / Algeria / El Tarf Province / La Calle / El Kala / "La calle, Rochers sous marins" / 1839 / June / Bove M. / BUC6189 / Herb. Mus. Paris

Haliseris polypodioides / ***Dictyopteris polypodioides*** **(A.P. De Candolle) J.V. Lamouroux** / Europe / Austria / Vienna / 1846 / Parreyss / BUC6191

Halopteris sertularia Bonn. / ***Halopteris sertularia*** **(Bonnem.) Kützing** / Europe / Atlantic Ocean / France / Bretania / Brest / Lenormand / BUC6590

Halothrix lumbricalis (Kutz.) Reinke / ***Halothrix lumbricalis*** **(Kützing) Reinke** / Europe / North Sea / Germany / Trizone / Kiel /" Bulk, unweit Kiel" / 1890 / July / Reinke J. / BUC6409 / Hauck et Richter. Phykotheka universalis

Halothrix lumbricalis (Kutz.) Reinke / ***Halothrix lumbricalis*** **(Kützing) Reinke** / Europe / North Sea / Germany / Trizone / Kiel /" Hin und wieder mit Desmotrichum undulatum (ocazional cu Desmotrichum undulatum)" / 1890 / May / Reinbold Th. / / Hauck et Richter. Phykotheka universalis

Haplospora globosa Kjellm. / ***Haplospora globosa*** **Kjellman** / Europe / North Sea / Germany / Helgoland Island / Helgoland, Nordhafen / "An Stein und zwischen grosseren Algen in BUC5 m Tiefe" / 1888 / June / la inceputul lunii / Reinbold Major Th. / BUC6248 / Hauck et Richter. Phykotheka universalis

Himanthalia lorea (L.) Lyngh. / ***Himanthalia elongata*** **(Linnaeus) S.F. Gray** / Europe / North Sea / England / Berwick on Tweed / "Rocks near high-water mark" / 1889 / ianuarie / Batters Ed. / BUC6132 / Hauck et Richter. Phykotheka universalis

Himanthalia lorea Lyngh. / ***Himanthalia elongata*** **(Linnaeus) S.F. Gray** / Europe / English Channel / France / Normandy / Finistère / Roscoff / 1935 / Eftimiu Panca / BUC6137 / Institutul Botanic din București - Erbarul General

Himanthalia lorea Lyngh. / ***Himanthalia elongata*** **(Linnaeus) S.F. Gray** / BUC6133

Himanthalia lorea Lyngh. / ***Himanthalia elongata*** **(Linnaeus) S.F. Gray** / Europe / Atlantic Ocean / France / Bretania / Finistère / Brest / "Roches du chateau" / 1880 / ianuarie / 13 / Chiebaut C. / BUC6136 / Societe Helvetique

Himanthalia lorea Lyngh. / ***Himanthalia elongata*** **(Linnaeus) S.F. Gray** / Europe / Atlantic Ocean / France / Normandy / Manche (dep.) / Cherbourg / Lenormand / BUC6135

Himanthalia lorea Lyngh. / ***Himanthalia elongata*** **(Linnaeus) S.F. Gray** / Europe / English Channel / England / Dorsetshire / Lullworth / "In the sea, upon rocks al low-water mark" / 1864 / July / Leipner. Ad. / BUC6134 / Rabenhorst, Algen Europe's

Hydroclatus sinuosus (Roth.) zam / ***Colpomenia sinuosa*** **(Mertens ex Roth) Derbès & Solier** / Africa / Algeria / St. Eugene / 1890 / June / Debray F. / BUC6517 / Hauck et Richter. Phykotheka universalis

Istmoplea sphaerophora (Harv.) Kjellm. / ***Isthmoplea sphaerophora*** **(Carmichael) Gobi** / Europe / Norway / Northern Norway / Finnmark / Kjøllefjord / 1887 / June / 16 / Foslie M. / BUC6684 / Hauck et Richter. Phykotheka universalis

Laminaria cuneata Suhr. / Europe / Baltic Sea / Germany / Flensburger Hafen / Hansen L. / BUC6506 /

Laminaria digitata (L.) Lamour. / ***Laminaria digitata*** **(Hudson) J.V. Lamouroux** / Riendorf / BUC6299 / Rabenhorst, Algen Europe's

Laminaria digitata Lamour. / ***Laminaria digitata*** **(Hudson) J.V. Lamouroux** / Titius / BUC6298 /

Laminaria digitata / ***Laminaria digitata*** **(Hudson) J.V. Lamouroux** / BUC6314

Laminaria fascia Ag. / ***Petalonia fascia* (O.F. Müller) Kuntze** / Europe / Atlantic Ocean / France / Normandy / Manche (dep.) / Cherbourg / Lenormand / BUC6507

Laminaria flexicaulis Le Jol. Lamin / ***Laminaria digitata* (Hudson) J.V. Lamouroux** / Europe / North Sea / Netherlands / Nordholland / Helder / 1893 / October / Frau A. Weber - van Bosse / BUC6300 / Phykotheka universalis

Laminaria latifolia Ag. / ***Laminaria digitata* (Hudson) J.V. Lamouroux** / Europe / Germany / Schleswig / Flensburger Meerbufen / 1880 / august / Hinrichsen N / BUC6309 / Baenitz, Herbarium Europeeum

Laminaria latifolia Ag. / ***Laminaria digitata* (Hudson) J.V. Lamouroux** / Europe / Germany / Schleswig / Flensburger Meerbufen / 1880 / august / Hinrichsen N / BUC6308 / Baenitz, Herbarium Europeeum

Laminaria latifolia / Europe / Baltic Sea / Germany / Flensburger Meerbusen / Hansen L. / BUC6310 /

Laminaria phyllitis Lam**. / *Saccharina latissima* (Linnaeus) C.E. Lane, C. Mayes, Druehl & G.W. Saunders** / Europe / Atlantic Ocean / France / Normandy / Manche (dep.) / Cherbourg / BUC6312

Laminaria phyllitis Stackh. / ***Saccharina latissima* (Linnaeus) C.E. Lane, C. Mayes, Druehl & G.W. Saunders** / North America / Atlantic Ocean / SUA / Massachusetts / Essex / Marblehead / Marblehead Neck / Just above low water mark / 1889 / May / 4 / Collins S. Frank / BUC6311 / Hauck et Richter. Phykotheka universalis

Laminaria saccharina / ***Saccharina latissima* (Linnaeus) C.E. Lane, C. Mayes, Druehl & G.W. Saunders** / BUC6315

Leathesia berkeley (Grev.) Ktz / ***Petrospongium berkeleyi* (Greville) Nägeli ex Kützing** / Europe / Atlantic Ocean / France / Normandy / Manche (dep.) / Cherbourg /"Sur les rochers, a basse mer" / Septembrie / Le Jolis / BUC6369 / Rabenhorst, Algen Europe's

Leathesia difformis (L.) / ***Leathesia marina* (Lyngbye) Decaisne** / Europe / "Mari Bahusiae" / "Bon ben unter nr. 1738 vertbeilten exemplaren im ulter verfbieden" / June / Akermark / BUC6372 / Rabenhorst, Algen Europe's

Leathesia difformis (L.) / ***Leathesia marina* (Lyngbye) Decaisne** / Europe / "Mari Bahusiae" / Akermark / BUC6373 / Rabenhorst, Algen Europe's

Leathesia difformis (L.) Aresch. / ***Leathesia marina* (Lyngbye) Decaisne** / "Die pflanze entwickelt sich an Cladophora und anderen Algen haftend und liegt später frei auf dem boden des meeres" / Reinke J. / BUC6371 / Hauck et Richter. Phykotheka universalis

Leathesia marina Ag. / ***Leathesia marina* (Lyngbye) Decaisne** / Europe / Atlantic Ocean / France / Normandy / Manche (dep.) / Cherbourg / Lenormand / BUC6375 /

Leathesia tuberiformis Gray. / ***Leathesia marina* (Lyngbye) Decaisne** / Europe / Baltic Sea / Germany / Flensburger Meerbufen / Flensburg / 1858 / Bader R. / BUC6374 / Rabenhorst, Algen Sanchs. Resp. MittelEurope's

Leathesia tuberiformis Gray. / ***Leathesia marina* (Lyngbye) Decaisne** / Europe / Baltic Sea / Germany / Flensburger Meerbufen / Flensburg / 1858 / Bader R. / BUC6376 / Rabenhorst, Algen Sanchs. Resp. MittelEurope's

Leathesia umbellata (Ag.) Menegh / ***Corynophlaea umbellata* (C. Agardh) Kützing** / Europe / Adriatic Sea / Italy / Trieste / Friuli-Venezia Giulia / Triest / On Cystoseira barbata / 1885 / July / Hauck F. / BUC6370 / Hauck et Richter. Phykotheka universalis

Leathesia unknown unknown / Europe / English Channel / France / Normandy / Finistère / Roscoff / 1935 / July / Eftimiu Panca / BUC6377 / Institutul Botanic - București Herbariu laboratorului de morfologie și sistematcă vegetală

Lessonia nigrescens Bory. / ***Lessonia nigrescens* Bory**. / Africa / Atlantic Ocean / South Africa / Cap Agulhas / BUC6318

Lithoderma fatiscens Arech. Verandert / ***Lithoderma fatiscens* Areschoug** / Europe / North Sea / Germany / Helgoland Island / Helgoland, Nordhafen / "Helgoland, im alten Hafen und im Nordhafen, in ca. 10 m Tiefe die nicht selten in ganzen Banken auftretenden Feuersteine mit oft sehr ansehnlichen schwarzen Krusten" uberziehend / 1894 / ianuarie / 19 / Kuckuck P. / BUC6268 / Hauck et Richter. Phykotheka universalis

Litosiphon pusillus Harv. / ***Litosiphon laminariae* (Lyngbye) Harvey** / Atlantic Ocean / Lenormand / BUC6484

Litosiphon pusillus Harv. / ***Litosiphon laminariae* (Lyngbye) Harvey** / France / Normandy / Calvados (dep.) / Coter du Calvados / Coter du Calvados / BUC6483

Litosiphon pusillus Harv. / ***Litosiphon laminariae* (Lyngbye) Harvey** / Mari Bahusiae / In Chorda Filum parasiticus / august / Domina Sophia Akermark / BUC6482 / Rabenhorst, Algen Europe's

Macrocystis pyrifera Ag. / ***Macrocystis pyrifera* (Linnaeus) C. Agardh** / Becker H. / BUC6323 / Ex Herb. Dr. H. Becker, F.L.S.

Mesogloia griffithsiana Greville / ***Sauvageaugloia divaricata*** **(Clemente) Cremades** / Europe / English Channel / France / Normandy / Finistère / Roscoff / 1935 / Eftimiu Panca / BUC6383 / Institutul Botanic - București Erbarul General Phaeophyta

Mesogloia griffithsiana Greville / ***Sauvageaugloia divaricata*** **(Clemente) Cremades** / Europe / Atlantic Ocean / France / Normandy / Manche (dep.) / Cherbourg / Lenormand / BUC6363

Mesogloia leveillei Kg. / ***Liebmannia leveillei*** **J. Agardh** / BUC6386 / Hohenack. Meeralgen. No. BUC507

Mesogloia mediterranea Lam. / ***Mesogloia mediterranea*** **J. Agardh** / 1856 / Titius / BUC6384

Mesogloia mediterranea / ***Mesogloia mediterranea*** **J. Agardh** / Europe / Austria / Vienna / 1846 / Parreyss / BUC6385

Mesogloia vermicularis Ag. / ***Mesogloia vermiculata*** **(Smith) S.F. Gray** / Europe / Atlantic Ocean / France / Normandy / Manche (dep.) / Cherbourg / Lenormand / BUC6382

Mesogloia vermicularis Ag. / ***Mesogloia vermiculata*** **(Smith) S.F. Gray** / 1844 / martie / 28 / Titius / BUC6381

Mesogloia vermicularis Ag. / ***Mesogloia vermiculata*** **(Smith) S.F. Gray** / BUC6379 /

Mesogloia vermicularis Ag. / ***Mesogloia vermiculata*** **(Smith) S.F. Gray** / Europe / Mediteraneean Sea / Italy / Imperia / Ligura / Imperia / 1884 / Sitrafforello / BUC6378 / Erb. Critt. Ital. Ser. II.

Mesogloia vermiculata Le Jol / ***Mesogloia vermiculata*** **(Smith) S.F. Gray** / Europe / English Channel / France / Normandy / Finistère / Roscoff / 1935 / July / Eftimiu Panca / BUC6380 / Institutul Botanic - București Herbariu laboratorului de morfologie și sistematcă vegetală

Mesogloia virescens Berth. / ***Eudesme virescens*** **(Carmichael ex Berkeley) J. Agardh** / Europe / Atlantic Ocean / France / Normandy / Manche (dep.) / Cherbourg / Lenormand / BUC6361

Mesogloia virescens Carm. / ***Mesogloia virescens*** **Carmichael ex Berkeley** / Europe / North Sea / Scotland / Aberdeen / BUC6360

Myrionema leclancherii Harvey / ***Myrionema strangulans*** **Greville** / Europe / Atlantic Ocean / France / Normandy / Manche (dep.) / Cherbourg / BUC6353

Myrionema maculiforme Kützing / ***Myrionema strangulans*** **Greville** / Europe / Adriatic Sea / Slovenia / Primorska / Pirano / Titius / BUC6355

Myrionema maculiforme Kützing / ***Myrionema strangulans*** **Greville** / Europe / Atlantic Ocean / France / Normandy / Manche (dep.) / Cherbourg / "Sur L'Ulva latissima" / Lenormand / BUC6356

Myrionema maculiforme Kützing / ***Myrionema strangulans*** **Greville** / Europe / Marea Ligurian**ă** / Italy / Province of Genoa / Liguria / Voltri (Genoa) / "Sulle Ulve" / 1871 / Baglietto F. / BUC6354 / Erb. Critt. Ital. Ser. II.

Myrionema orbiculare J. Ag. / ***Myrionema orbiculare*** **J. Agardh** / Europe / Norwegian Sea / Norway / Inderöen (Trodhjemsfjord) / 1893 / august / 1 / Foslie M. / BUC6688 / Phykotheka universalis

Myrionema vulgare Thuret / ***Myrionema strangulans*** **Greville** / Europe / Mediteraneean Sea / Italy / Ligura Occidentale / Porto Maurizio / "Sulle Ulva al Porto Maurizio nella Liguria occidentale" / 1882 / Strafforello I. / BUC6357 / Erb. Critt. Ital. Ser. II.

Myrionema vulgare Thuret / ***Myrionema strangulans*** **Greville** / Europe / Adriatic Sea / Croatia / Peninsula Istria (Isola) / "Auf Ulva Lactuca - Isola (Istrien)" / 1886 / May / 30 / Hauck F. / BUC6358 / Hauck et Richter. Phykotheka universalis

Myriotrichia filiformis Harv. / ***Myriotrichia clavaeformis*** **Harvey** / Europe / Atlantic Ocean / France / Lower Normandy / Cherbourg / "Sur le Chorda lomentaria" / Le Jolis A. / BUC6623 / Rabenhorst, Algen Europe's

Nereia filiformis Zanardini / ***Nereia filiformis*** **(J. Agardh) Zanardini** / Europe / Adriatic Sea / 1878 / Titius / BUC6324 /

Nereocystis luetkeana Postels & Ruprecht / ***Nereocystis luetkeana*** **(K. Mertens) Postels & Ruprecht** / North America / Pacific Ocean / Canada / British Columbia / Victoria / Victoria Island Vancouver / May / 25 / Reinbold / BUC6320 / National-Arboretum Zoeschen bei Merseburg (Dr. G. Dieck.) Cryptogamen - Herbar. Abtheilung Nordwest-America

Nereocystis luetkeana / ***Nereocystis luetkeana*** **(K. Mertens) Postels & Ruprecht** / Breutel / BUC6319

Padina collaris Grev. / ***Gymnosorus collaris*** **(C. Agardh) J.Agardh** / Lenormand / BUC6267

Padina pavonia Gaill / ***Padina pavonica*** **(L.) Thivy** / Europe / Tyrrhenian Sea / France / Corsica / Haute-Corse (dep.) / Bastia / 1869 / July / BUC6168 / Herbier de O. Debeaux

Padina pavonia L. / ***Padina pavonica*** **(L.) Thivy** / Europe / English Channel / England / Dorsetshire / Weymouth / In the sea on shaly rocks in shallow tide-pools, at half-tide level. / 1864 / July / Leipner Ad. / BUC6476 / Rabenhorst, Algen Europe's

Padina pavonia L. / ***Padina pavonica* (L.) Thivy** / Europe / English Channel / England / Dorsetshire / Weymouth / In the sea on shaly rocks in shallow tide-pools, at half-tide level. / 1864 / July / Leipner Ad. / BUC6163 / Rabenhorst, Algen Europe's

Padina pavonia L. / ***Padina pavonica* (L.) Thivy** / BUC6164

Padina pavonia L. / ***Padina pavonica* (L.) Thivy** / BUC6169

Padina pavonia Lamouroux / ***Padina pavonica* (L.) Thivy** / Europe / Adriatic Sea / Croatia / Spalatino-Dalmata / Spalato / 1856 / Titius / BUC6165

Padina pavonia Lamouroux / ***Padina pavonica* (L.) Thivy** / Europe / Adriatic Sea / Titius / BUC6166

Padina pavonia Lamouroux / ***Padina pavonica* (L.) Thivy** / Europe / France / Martinica Island / BUC6167

Padina reptans Crouan / ***Cutleria multifida* (Turner) Greville** / Lenormand / BUC6260

Padina commersonii Bory / ***Padina boryana* Thivy** / 1879 / June / Hildebrandt / BUC6178 / Flora von Madagascar

Padina durvillaei Ag. / ***Padina durvillei* Bory Saint-Vincent** / North America / Lake Worth Inlet / Florida / Near lake Worth Inlet / 1895 / May / Curtiss. A.H. / BUC6177 / Algae Floridanae

Padina pavonia (L.) Gaillon / ***Padina pavonica* (Linnaeus) Thivy** / Europe / Mediteraneean Sea / Italy / Golf von Neapel / Naegeli / BUC6154 / Hauck et Richter. Phykotheka universalis

Padina pavonia (L.) Lamourx / ***Padina pavonica* (Linnaeus) Thivy** / Adriatic Sea / BUC6160

Padina pavonia Gaill. / ***Padina pavonica* (Linnaeus) Thivy** / Europe / Mediteraneean Sea / Italy / Genova/Liguria / Portofino / "In estate su scogli poco profondi" / Baglietto F. / BUC6157 / Erb. Critt. Ital. Ser. II.

Padina pavonia Gaillon / ***Padina pavonica* (Linnaeus) Thivy** / 1935 / august-septembrie / Eftimiu Panca / BUC6159 / Institutul Botanic - București Herbariul Laboratorului de Morfologie și Sistematcă vegetală

Padina pavonia Linne / ***Padina pavonica* (Linnaeus) Thivy** / Europe / Adriatic Sea / Croatia / Istria / Ikam / Zay. / BUC6155 / Flora Exsiccata Austro-Hungarica

Padina pavonia Linne / ***Padina pavonica* (Linnaeus) Thivy** / Europe / Adriatic Sea / Croatia / Istria / Ikam / Zay. / BUC6156 / Flora Exsiccata Austro-Hungarica

Padina pavonia Lmx / ***Padina pavonica* (Linnaeus) Thivy** / North America / Atlantic Ocean / Gulf of Mexico / Florida / Key West / 1895 / august / Curtiss. A.H. / BUC6158 / Algae Floridanae

Padina squammaria Grev. / Africa / Algeria / El Tarf Province / La Calle / El Kala / "La calle, Rochers sous marins" / 1839 / June / Bove M. / BUC6179 / Herb. Mus. Paris

Padina / unkbown

Pelvetia canaliculata (L.) Decne et Thur. / ***Pelvetia canaliculata* (Linnaeus) Decaisne & Thuret** / Europe / Norway / Rogaland / Rogaland / Stavanger / 1872 / July / 10 / Kjellman F.R. / BUC6126 / Hauck et Richter. Phykotheka universalis

Pelvetia canaliculata Decaisne et Thuret / ***Pelvetia canaliculata* (Linnaeus) Decaisne & Thuret** / Europe / Atlantic Ocean / France / Normadia de Jos / Cherbourg / "Sur les rochers, a la linute superieure de la maree" / July / Le Jolis / BUC6127 / Rabenhorst, Algen Europe's

Pelvetia canaliculata Thur. / ***Pelvetia canaliculata* (Linnaeus) Decaisne & Thuret** / Europe / English Channel / France / Normandy / Finistère / Roscoff / 1935 / July-august / Eftimiu Panca / BUC6128 / Institutul Botanic-București. Herbariul Laboratorului de Morfologie și Sistematică Vegetală

Phloeospora brachiata Born / ***Stictyosiphon griffithsianus* (Le Jolis) Holmes & Batters** / North America / Atlantic Ocean / SUA / Massachusetts / Essex County / Nahant / On Rhodymenia palmata in a tide pool on an exposed rocky point (Pe Rhodymenia palmata într-un bazin de maree pe un punct stâncos expus) / 1886 / June / 16 / Collins S. Frank / BUC6466 / Hauck et Richter. Phykotheka universalis

Phloeospora tortilis (Rupr.) Aresch. / ***Stictyosiphon tortilis* (Gobi) Reinke** / Europe / England / Berwick on Tweed / 1888 / ianuarie / Batters Ed. A. / BUC6465 / Hauck et Richter. Phykotheka universalis

Phloiocaulon squamulosum Geyler / ***Phloiocaulon squamulosum* (Suhr) Geyler** / Africa / The Kowie (River) / South Africa / 1896 / Becker H. / BUC6621 /

Phycocelis maculans Collins / ***Hecatonema terminale* (Kützing) Kylin** / North America / Atlantic Ocean / Mayne (SUA) / Spectacle Island / Penobscot Bay / "On Rhodymenia palmata in warm, shallow tide pool, spectacle Island, Penobscot Bay, Mayne, July, 1895" / 1895 / July / Collins S. Frank / BUC6687 / Phycotheca Boreali-Americana. Collins, Holden, and Setchell

Phycolapathum cuneatum Ktz / ***Petalonia fascia* (O.F. Müller) Kuntze** / Europe / Baltic Sea / Germany / Flensburger Hafen / 1859 / June / Bader R. / BUC6508 / Rabenhorst, Algen Sachs. resp. MittelEurope"s

Phycophyla flaccida Kutz / ***Phycophila flaccida* (Dillwyn) Kützing** / Europe / English Channel / France / Normandy / Port-en Bassin (Calvados) / "Parasite sur le Cystoseira granulata plage a l Ouest de Port-en-Bessin (Calvados)" / 1891 / martie / 26 / Bertot / BUC6401 / Societe Rochelaise 1891

Phycopteris interrupta Kg. / ***Zonaria subarticulata* (J.V. Lamouroux) Papenfuss** / Africa / Atlantic Ocean / South Africa / Cap Agulhas / BUC6144

Phyllacantha affinis Kg. / ***Phyllacantha affinis* Kützing** / Europe / Adriatic Sea / Croatia / Spalatino-Dalmata / Spalato / BUC5940

Phyllacantha boryana Kg. / ***Phyllacantha boryana* Kützing** / Europe / Atlantic Ocean / France / Normandy / Manche (dep.) / Cherbourg / BUC6026 / Hohenack. Meeralgen. No. BUC553

Phyllacantha fibrosa Kutz. / ***Cystoseira baccata* (S.G. Gmelin) P.C. Silva** / Europe / Atlantic Ocean / France / Normandy / Manche (dep.) / Cherbourg / 1893 / July / 30 / Bertot / BUC6021 / Societe Rochelaise 1894

Phyllacantha myrica Kg. var. hispida / ***Phyllacantha myrica* var. *hispida* Kützing** / Asia-Africa / Red Sea / BUC5960 / Hohenack. Meeralgen. No. 432

Phyllitis caespitose (J. Ag.) Le Jolis / ***Petalonia fascia* (O.F. Müller) Kuntze** / Europe / Baltic Sea / Germany / Schleswig-Holstein / Flensburg / 1879 / martie / Weisemann G. / BUC6505

Phyllitis debilis / ***Petalonia fascia* (O.F. Müller) Kuntze** / Europe / Adriatic Sea / Croatia / Dalmatien / "In mari ad Ragusam" / Zay. / BUC6511 / Flora Exsiccata Austro-Hungarica

Phyllitis debilis / ***Petalonia fascia* (O.F. Müller) Kuntze** / Europe / Adriatic Sea / Croatia / Dalmatien / "In mari ad Ragusam" / Zay. / BUC6510 / Flora Exsiccata Austro-Hungarica

Phyllitis debilis / ***Petalonia fascia* (O.F. Müller) Kuntze** / Europe / Mediteraneean Sea / Italy / Liguria occid. / Savona / Porto di Savona / 1876 / April / Piccone A. / BUC6509 / Societa Elvetica

Phyllitis fascia (Ag.) Ktz. f. caespitosa Hauck / ***Phyllitis fascia* f. *caespitosa* (J. Agardh) Ardissone** / Europe / Adriatic Sea / Italy / Trieste / Friuli-Venezia Giulia / Muggia / Muggia nachst Triest / 1886 / April / 3 / Hauck F. / BUC6503 / Hauck et Richter. Phykotheka universalis

Phyllitis fascia (Ag.) Ktz. f. caespitosa Hauck / ***Phyllitis fascia* f. *caespitosa* (J. Agardh) Ardissone** / "Kleine form. Mit vielfacherigen zoosporangien. Vom gleichen Standorte" / 1885 / martie / Hauck F. / BUC6503 / Hauck et Richter. Phykotheka universalis

Phyllitis fascia (Ag.) Ktz. / ***Petalonia fascia* (O.F. Müller) Kuntze** / Europe / Atlantic Ocean / France / Normadia de Jos / Cherbourg / Port militaire de Cherbourg / "Sur lei bois immerges" / martie / Le Jolis / BUC6504 / Rabenhorst, Algen Europe's

Phyllitis zosterifolia Rke. / ***Planosiphon zosterifolius* (Reinke) McDevit & G.W. Saunders** / Europe / North Sea / Germany / Helgoland / "Helgoland, auf Hummerkasten, auch auf den Kreidefelsen am Kridbrunnen" / 1893 / martie / Kuckuck P. / BUC6512 / Phykotheka universalis

Pleurocladia lacustris A. Braun / ***Pleurocladia lacustris* A. Braun** / Europe / Germany / Berlin / "In einem Teiche zu Tempelhof und Mariendorf bei Berlin, Wurzeln und Stengeln uberziehend, zumeist von Equisetum" / 1882 / May / 2 / Hennings P. / BUC6622 / Hauck et Richter. Phykotheka universalis

Pogotrichum filiforme Rke. / ***Pogotrichum filiforme* Reinke** / Europe / North Sea / Germany / Helgoland / Auf alter Laminaria / 1888 / June / Reinbold Th. / BUC6481 / Hauck et Richter. Phykotheka universalis

Punctaria latifolia Grev. / ***Punctaria latifolia* Greville** / Europe / Atlantic Ocean / France / Normadia de Jos / Cherbourg / "A basse mer, entre les Zosteres, sur les plages sablonneuses, pres de Cherbourg" / 1863 / May / Le Jolis / BUC6471 / Rabenhorst, Algen Europe's

Punctaria latifolia / ***Punctaria latifolia* Greville** / Europe / Austria / Vienna / 1846 / Parreyss / BUC6471

Punctaria plantaginea (Roth) Grev. / ***Punctaria plantaginea* (Roth) Greville** / Mari Bahusiae / July / Domina Sophia Akermark / BUC6474

Punctaria plantaginea (Roth) Grev. / ***Punctaria plantaginea* (Roth) Greville** / Europe / Baltic Sea / Denmark/Germany / Flensburger Fohrde / bei Holnis / "An Pfahlen bei Holnis" / 1836 / April / Hansen, comm. Reinke J. / BUC6473 / Hauck et Richter. Phykotheka universalis

Punctaria plantaginea Grev. / ***Punctaria plantaginea* (Roth) Greville** / Europe / Atlantic Ocean / France / Normadia de Jos / Cherbourg / Lenormand / BUC6474 / unknoen

Punctaria tenuissima Grev. / ***Punctaria tenuissima* (C. Agardh) Greville** / Europe / Baltic Sea / Denmark/Germany / Flensburger Fohrde / 1836 / April / Hansen (comm. Reinke J.) / BUC6478 / Hauck et Richter. Phykotheka universalis

Punctaria tenuissima Grev. / ***Punctaria tenuissima* (C. Agardh) Greville** / Europe / Baltic Sea / Germany / Flensburger Meerbufen / Bader R. / BUC6479 / Rabenhorst, Algen Europe's

Punctaria tenuissima Grev. / ***Punctaria tenuissima* (C. Agardh) Greville** / Europe / Baltic Sea / Germany / Flensburger Meerbufen / Bader R. / BUC6480 / Rabenhorst, Algen Europe's

Punctaria undulata J. Ag. / ***Punctaria tenuissima* (C. Agardh) Greville** / Europe / Atlantic Ocean / France / Lower Normandy / Cherbourg / Lenormand / BUC6477

Pylaiella curta Foslie / ***Fosliea curta* (Foslie) Reinke** / Europe / Barent Sea / Norway / Finnmark / Mehavn / 1887 / June / Foslie M. / BUC6634 / Hauck et Richter. Phykotheka universalis

Pylaiella littoralis (L.) Kjellm. Var. robusta (Farl.) / ***Pylaiella littoralis* var. *robusta* (Farlow) W.R.Taylor** / North America / Atlantic Ocean / SUA / Massachusetts / Essex County / Nahant / 1891 / June / 14 / Collins S. Frank / BUC6633 / Hauck et Richter. Phykotheka universalis

Pylaiella littoralis (Linnaeus) Kjellman / ***Pylaiella littoralis* (Linnaeus) Kjellman,** nom. cons. / BUC6624 / Leipziger Botan. Tauschverei

Pylaiella littoralis (Linnaeus) Kjellman / ***Pylaiella littoralis* (Linnaeus) Kjellman**, nom. cons. / Europe / Baltic Sea / Germany / Schleswig-Holstein / Flensburg / 1880 / May / 5 / BUC6625

Pylaiella littoralis (Linnaeus) Kjellman / ***Pylaiella littoralis* (Linnaeus) Kjellman**, nom. cons. / Europe / Adriatic Sea / Italy / Friuli-Venezia Giulia / Monfalcone im Porto Rosega / 1886 / May / 25 / Hauck F. / BUC6632 / Hauck et Richter. Phykotheka universalis

Ralfsia deusta Ag. (non Berk.) / ***Ralfsia fungiformis* (Gunnerus) Setchell & N.L. Gardner** / North America / Atlantic Ocean / SUA / Massachusetts / Essex / Marblehead / 1889 / April / 20 / Collins S. Frank / BUC6272 / Hauck et Richter. Phykotheka universalis

Ralfsia verrucosa (Aresch.) J. Ag. / ***Ralfsia verrucosa* (Areschoug) Areschoug** / Europe / North Sea / England / Northumberland / Berwick / "Rocks near high-water mark" / 1889 / ianuarie / Batters E. / BUC6269 / Hauck et Richter. Phykotheka universalis

Ralfsia verrucosa (Aresch.) J. Ag. / ***Ralfsia verrucosa* (Areschoug) Areschoug** / Europe / Baltic Sea / Germany / Schleswig-Holstein / Kieler Fohrde / "Auf Ziegelstein und Kieseln in der oberen Litoralregion, zeitweise trocken liegend" / 1888 / november / Reinbold. Th. / BUC6269 / Hauck et Richter. Phykotheka universalis

Ralfsia verrucosa Aresch. / ***Ralfsia verrucosa* (Areschoug) Areschoug** / Europe / Baltic Sea / Germany / Schleswig-Holstein / Flensburg / 1879 / martie / BUC6271

Ralfsia verrucosa Aresch. / ***Ralfsia verrucosa* (Areschoug) Areschoug** / BUC6270

Saccorhiza bulbosa / ***Saccorhiza polyschides* (Lightfoot) Batters** / Europe / English Channel / France / Normandy / Finistère / Roscoff / 1935 / Eftimiu Panca / BUC6288 / Institutul Botanic din București - Erbarul General

Saccorhiza bulbosa / ***Saccorhiza polyschides* (Lightfoot) Batters** / Europe / Atlantic Ocean / France / Lower Normandy / Cherbourg / Lenormand / BUC6287

Sargassum parvifolium Meng / ***Sargassum parvifolium* (Turner) C. Agardh** / Europe / Adriatic Sea / Italy / Veneția / Veneto / Venice / 1854 / Titius / BUC5893

Sargassum affine Ag. / ***Sargassum filipendula* C. Agardh** / North America / Atlantic Ocean / Gulf of Mexico / Florida / Key West / 1896 / April / Curtiss. A.H. / BUC5889 / Algae Floridanae

Sargassum affine J. Ag - Ktz / ***Sargassum filipendula* C. Agardh** / Breutel / BUC5890

Sargassum agardhianum Farl. / ***Sargassum agardhianum* Farlow** / North America / Pacific Ocean / California / San Diego / La Jolla / Snyder E. / BUC5848 / Hauck et Richter. Phykotheka universalis

Sargassum asperifolium Agardh / ***Sargassum asperifolium* Hering & G. Martens ex J.Agardh** / Europe / Mediteraneean Sea / Spania / Malaga / Malaga / Binder / BUC5856

Sargassum bacciferum Ag. / ***Sargassum natans* (Linnaeus) Gaillon** / BUC209664

Sargassum bacciferum Ag. / ***Sargassum natans* (Linnaeus) Gaillon** / BUC209663

Sargassum bacciferum Ag. / ***Sargassum natans* (Linnaeus) Gaillon** / BUC209662 / Herbarul Grădinii Botanice București

Sargassum bacciferum Ag. / ***Sargassum natans* (Linnaeus) Gaillon** / Europe / Adriatic Sea / BUC5865

Sargassum bacciferum Ag. / ***Sargassum natans* (Linnaeus) Gaillon** / BUC5864

Sargassum bacciferum Ag. / ***Sargassum na*tans (Linnaeus) Gaillon** / Binder / BUC5862

Sargassum bacciferum Ag. / ***Sargassum natans* (Linnaeus) Gaillon** / BUC5863

Sargassum bacciferum Ag. / ***Sargassum natans* (Linnaeus) Gaillon** / BUC5861

Sargassum bacciferum Ag. / ***Sargassum natans* (Linnaeus) Gaillon** / BUC5859

Sargassum bacciferum Ag. / ***Sargassum natans* (Linnaeus) Gaillon** / Lenormand / BUC5860

Sargassum bacciferum Ag. / ***Sargassum natans* (Linnaeus) Gaillon** / North America / Atlantic Ocean / Florida / Monroe / Key Largo / 1895 / July / Curtiss. A.H. / BUC5858 / Algae Floridanae

Sargassum bacciferum Turn / ***Sargassum natans* (Linnaeus) Gaillon** / South America / Brazilia / Rio de Janeiro / BUC5866

Sargassum bacciferum Turn / ***Sargassum natans* (Linnaeus) Gaillon** / Europe / Adriatic Sea / Titius / BUC5866

Sargassum boryanum Mont. / ***Sargassum boryanum* Montagne** / Europe / Adriatic Sea / Italy / Foggia / Puglia / "prope Lesina" / Parreyss / BUC5892 / Botanischer Tauschverein in Wien

Sargassum cymosum Ag. / ***Sargassum cymosum* C. Agardh** / North America / Atlantic Ocean / Florida / Broward / Fort Lauderdale / 1897 / April / Curtiss. A.H. / BUC5876 / Algae Floridanae

Sargassum dentifolium / ***Sargassum dentifolium*** **(Turner) C. Agardh** / BUC5855
Sargassum desfontainesii / ***Sargassum desfontainesii*** **(Turner) C. Agardh** / Europe / Atlantic Ocean / Spania / Santa Cruz de Tenerife / Teneriffa / Ag. / BUC5844 / Cryptogamische Gewachse besonders des Fichtelgebirges- Heinrichs Christian Funck
Sargassum filipendulum Ag. / ***Sargassum filipendula*** **C. Agardh** / Atlantic Ocean / Bahamas / New Providence / Nassau / 1897 / martie / Russell. H. / BUC5887 / Algae Floridanae
Sargassum horneri Ag. / ***Sargassum horneri*** **(Turner) C. Agardh** / Asia / Japonia / Nagasaki / 1861 / April / BUC5845
Sargassum hornschuchii Ag. / ***Sargassum hornschuchii*** **C. Agardh** / 1856 / Titius / BUC5852
Sargassum hornschuchii Ag. / ***Sargassum hornschuchii*** **C. Agardh** / BUC5853
Sargassum hornschuchii Ag. / ***Sargassum hornschuchii*** **C. Agardh** / 1896 / April / BUC5851
Sargassum hornschuchii Ag. / ***Sargassum hornschuchii*** **C. Agardh** / Europe / Mediteraneean Sea / Italy / Ligura Occidentale / Porto Maurizio / "Nell'alto mare" / Strafforello / BUC5850 / Erb. Critt. Ital. Ser. II.
Sargassum hornschuchii / ***Sargassum hornschuchii*** **C. Agardh** / BUC5854 / Ex herb. Dominicus Bilimek
Sargassum incisifolium J. Ag. / ***Sargassum incisifolium*** **(Turner) C. Agardh** / Africa / Atlantic Ocean / South Africa / Cap Agulhas / BUC5846
Sargassum latifolium / ***Sargassum latifolium*** **(Turner) C. Agardh** / BUC5857
Sargassum lendigerum L. / ***Sargassum lendigerum*** **(Linnaeus) C. Agardh** / Africa / The Kowie (River) / South Africa / Becker H. / BUC5877 / Algae Marinae. Africae Australis. The Kowie. H. Becker, M.D., F.L.S.
Sargassum linifolium (Turn) Ag. / ***Sargassum acinarium*** **(Linnaeus) Setchell** / Europe / Mediteraneean Sea / Italy / Neapel / Bortici bei Neapel / BUC5881 / Rabenhorst, Algen Europe's
Sargassum linifolium (Turn) Ag. / ***Sargassum acinarium*** **(Linnaeus) Setchell** / Africa / Algeria / 1888 / Debray F. / BUC5878 / Hauck et Richter. Phykotheka universalis
Sargassum linifolium Ag. / ***Sargassum acinarium*** **(Linnaeus) Setchell** / Maria di Cattano / BUC5882
Sargassum linifolium Ag. / ***Sargassum acinarium*** **(Linnaeus) Setchell** / Europe / Adriatic Sea / Croatia / Dalmatia / Papafava / BUC5883
Sargassum linifolium Ag. / ***Sargassum acinarium*** **(Linnaeus) Setchell** / 1864 / May / Caldesi L. / BUC5880
Sargassum linifolium / ***Sargassum acinarium*** **(Linnaeus) Setchell** / Europe / Adriatic Sea / Croatia / In mari prope Portere / In mari / Zay. / BUC5879 / Flora Exsiccata Austro-Hungarica
Sargassum linifolium Zan. / ***Sargassum acinarium*** **(Linnaeus) Setchell** / Europe / Adriatic Sea / Croatia / Spalatino-Dalmata / Spalato / 1856 / Titius / BUC5884
Sargassum longifolium Ag. / ***Anthophycus longifolius*** **(Turner) Kützing** / Becker H. / BUC5907 / Ex Herb. Dr. H. Becker, F.L.S.
Sargassum lunense Cald. / ***Sargassum hornschuchii*** **var.** ***lunense*** **(Caldesi) Grunow** / Europe / Marea Liguriană / Italy / La Spezia/Liguria / Porto Lunae / 1865 / Septembrie / Caldesi L. / BUC5891 / Rabenhorst, Algen Europe's
Sargassum montagnei Bailey / ***Sargassum filipendula*** **var.** ***montagnei*** **(Bailey) Grunow** / BUC5888
Sargassum obovatum Harv. / ***Sargassum obovatum*** **Harvey** / Europe / Oceanul indian / République de Maurice. / Ile Maurice / Robbilard M. / BUC5847 / Herbier Ed. Marie. - Algues
Sargassum salicifolium Bory f. vulgare C. Ag / Ragusa / 1882 / Bothar / BUC5894
Sargassum salicifolium Bory / ***Sargassum salicifolium*** **Naccari** / Europe / Adriatic Sea / Titius / BUC5897
Sargassum salicifolium Lang / ***Sargassum salicifolium*** **Naccari** / BUC5898
Sargassum turbinatum Ag. / ***Turbinaria turbinata*** **(Linnaeus) Kuntze** / Titius / BUC5908
Sargassum / Atlantic Ocean / BUC5902 / Ex herb. Dominicus Bilimek
Sargassum / BUC5901 / Ex herb. Dominicus Bilimek
Sargassum / BUC5900 / Ex herb. Dominicus Bilimek
Sargassum / BUC209667 / Ex herb. Dominicus Bilimek
Sargassum / unkbown / Atlantic Ocean / BUC209666
Sargassum / BUC209665
Sargassum vulgare Ag var. barrifolium / Europe / Adriatic Sea / Italy / Veneția / Veneto / Venice / 1854 / Titius / BUC5875
Sargassum vulgare Ag. var. confestum / Europe / Adriatic Sea / Italy / Veneția / Veneto / Venice / BUC5874
Sargassum vulgare Ag. var. montagnei / ***Sargassum vulgare*** **C. Agardh** / North America / SUA / New York / Orient / 1878 / BUC5869
Sargassum vulgare Ag. / ***Sargassum vulgare*** **C. Agardh** / Europe / Adriatic Sea / Titius / BUC5872
Sargassum vulgare Ag. / ***Sargassum vulgare*** **C. Agardh** / Europe / Marea Egee / Turcia / Ionia / Smyrna / Fleischer / BUC5871 / Ex herb. Dominicus Bilimek

Sargassum vulgare Ag. / ***Sargassum vulgare*** **C. Agardh** / North America / SUA / New York / Orient / BUC5870
Sargassum vulgare Ag. / ***Sargassum vulgare*** **C. Agardh** / Europe / Adriatic Sea / Titius / BUC5868
Sargassum vulgare / ***Sargassum vulgare*** **C. Agardh** / BUC5873
Sargassum vulgare / ***Sargassum vulgare*** **C. Agardh** / BUC5870
Sargassum vulgare / ***Sargassum vulgare*** **C. Agardh** / BUC5869 / Ex herb. Dominicus Bilimek
Sargassum wightii / ***Sargassum swartzii*** **C. Agardh** / Africa / 1874 / martie / 4 / BUC5899
Scytosiphon canaticulata / Europe / Baltic Sea / BUC6281
Scytosiphon filiforme Tit. / Europe / Adriatic Sea / BUC6500
Scytosiphon filiforme Tit. / Europe / Adriatic Sea / BUC6501
Scytosiphon filum Ag. var. fistulosum / ***Asperococcus fistulosus*** **(Hudson) W.J. Hooker** / Hansen / BUC6495
Scytosiphon filum Ag. / ***Chorda filum*** **(Linnaeus) Stackhouse** / Europe / Baltic Sea / Germany / Flensburger Meerbufen / Flensburger Meerbufen / Hansen L. / BUC6494
Scytosiphon foeniculaceus Ag. / ***Dictyosiphon foeniculaceus*** **(Hudson) Greville** / Hansen L. / BUC6427
Scytosiphon lomentarium Lyng / ***Scytosiphon lomentaria*** **(Lyngbye) Link** / Europe / Baltic Sea / Germany / Schleswig-Holstein / Flensburg / 1880 / May / 8 / Weisemann G. / BUC6492
Scytosiphon lomentarius (Lyngb.) Ag. / ***Scytosiphon lomentaria*** **(Lyngbye) Link** / Europe / Adriatic Sea / Italy / Friuli-Venezia Giulia / Muggia / "Muggia (Istrien) auf Steinblöcken in dichten Rasen wachsend; zwischen Flut- und Ebbespiegel" / 1886 / April / 3 / Hauck F. / BUC6487 / Hauck et Richter. Phykotheka universalis
Scytosiphon lomentarius (Lyngb.) J. Ag. / ***Scytosiphon lomentaria*** **(Lyngbye) Link** / Europe / North Sea / Germany / Helgoland / "Helgoland, auf Hummerkasten. Das ganze Jahr hindurch gemein, besonders auf schwimmenden Gegenstanden" / 1893 / august / Kuckuck P. / BUC6489 / Phykotheka universalis
Scytosiphon lomentarius (Lyngb.) J. Ag. / ***Scytosiphon lomentaria*** **(Lyngbye) Link** / Europe / Baltic Sea / Germany / Kieler Hafen / "Im Kieler Hafen in einer Tiefe von 1/2 - 1 m sehr haufig." / 1887 / April / Reinke J. / BUC6488 / Hauck et Richter. Phykotheka universalis
Scytosiphon lomentarius J. G. Agardh / ***Scytosiphon lomentaria*** **(Lyngbye) Link** / Europe / English Channel / France / Normandy / Finistère / Roscoff / 1935 / July-august / Eftimiu Panca / BUC6493 / Institutul Botanic-București. Herbariul Laboratorului de Morfologie și Sistematică Vegetală
Scytosiphon lomentarius Lyng. / ***Scytosiphon lomentaria*** **(Lyngbye) Link** / Europe / Adriatic Sea / Croatia / Dalmatia / Ragusam / In mari prope ragusam / "In mari prope Ragusam" / Zay. / BUC6491 / Flora Exsiccata Austro-Hungarica
Scytosiphon lomentarius Lyng. / ***Scytosiphon lomentaria*** **(Lyngbye) Link** / Europe / Adriatic Sea / Croatia / Dalmatia / Ragusam / In mari prope ragusam / "In mari prope Ragusam" / Zay. / BUC6491 / Flora Exsiccata Austro-Hungarica
Scytothamnus australis Hook. Harv. / ***Scytothamnus australis*** **(J. Agardh) J.D. Hooker & Harvey** / BUC6434 / Hohenack. Meeralgen. No. 509
Sorocarpus uvaeformis Pringsh. / ***Botrytella micromora*** **Bory** / Europe / North Sea / Germany / Helgoland / "Kiesbank an der Westseite, Grenze des niedrigen Wassers" / 1888 / June / 6 / Reinbold / BUC6683 / Hauck et Richter. Phykotheka universalis
Spatoglossum schroederi Ag. / ***Spatoglossum schroederi*** **(C. Agardh) Kützing** / North America / / Florida / Jupiter Inlet / Near jupiter Inlet. / 1895 / September / Curtiss. A.H. / BUC6183 / Algae Floridanae
Spatoglossum spanneri Meneghini / ***Spatoglossum spanneri*** **(Meneghini) Meneghini** / Europe / Adriatic Sea / Titius / BUC6181
Spatoglossum variabile Figari et Notaris / ***Spatoglossum variabile*** **Figari & De Notaris** / 1875 / April / Hildebrandt / BUC6180 / Flora von Africa
Sphacelaria bertiana De Notaris / ***Sphacelaria bertiana*** **De Notaris** / Titius / BUC6554
Sphacelaria bertiana De Notaris / ***Sphacelaria bertiana*** **De Notaris** / Europe / Mediteraneean Sea / Italy / Liguria / Genova / Caldesi L. / BUC6555
Sphacelaria bertiana De Notaris / ***Sphacelaria bertiana*** **De Notaris** / unnknown / BUC6553
Sphacelaria cervicornis / ***Sphacelaria cervicornis*** **C. Agardh** / Europe / Italy / Ligura/Imperia / Porto Maurizio / "Sue varie alghe dell'alto mare" / 1884 / toamna / Strafforello I. / BUC6552 / Erb. Critt. Ital. Ser. II.
Sphacelaria cirrhosa (Roth) Ag. / ***Sphacelaria cirrosa*** **(Roth) C. Agardh** / Europe / Baltic Sea / Germany / Flensburger Meerbufen / "Reid befent mit Synedra affinis" / Bader R. / BUC6542 / Rabenhorst, Algen Sachs. Resp. MittelEurope"s

Sphacelaria cirrhosa (Roth) Ag. / ***Sphacelaria cirrosa* (Roth) C. Agardh** / Europe / Baltic Sea / Germany / Flensburger Meerbufen / "Reid befent mit Synedra affinis" / Bader R. / BUC6543 / Rabenhorst, Algen Sachs. Resp. MittelEurope”s

Sphacelaria cirrhosa (Roth) Ag. / ***Sphacelaria cirrosa* (Roth) C. Agardh** / Europe / Baltic Sea / Germany / bei Bulk. Kiel / "In 9-10 m tiefe an Fucus und andern Algen bei Bulk, unweit Kiel" / 1888 / October / Reinke J. / BUC6541 / Hauck et Richter. Phykotheka universalis

Sphacelaria cirrhosa (Roth) Ag. / ***Sphacelaria cirrosa* (Roth) C. Agardh** / Europe / North Sea / Norway / Vest-Agder / Svinor, prope Lindesnas / 1885 / august / Foslie M. / BUC6540 / Hauck et Richter. Phykotheka universalis

Sphacelaria cirrhosa Ag. / ***Sphacelaria cirrosa* (Roth) C. Agardh** / Europe / Baltic Sea / Germany / Flensburger Meerbufen / "An Fuscus vesiculosus" / Bader R. / BUC6544 / Rabenhorst, Algen Sachs. Resp. MittelEurope”s

Sphacelaria cirrhosa C. A. Agardh / ***Sphacelaria cirrosa* (Roth) C. Agardh** / Europe / Marea Celtică / France / Normandy / Roscoff / 1935 / august / Eftimiu Panca / BUC6550 / Institutul Botanic - București Herbariul Laboratorului de Morfologie și Sistematcă vegetală

Sphacelaria cirrhosa C. A. Agardh / ***Sphacelaria cirrosa* (Roth) C. Agardh** / Europe / Adriatic Sea / Croatia / Dalmatien / Dalmatien / Titius / BUC6548

Sphacelaria cirrhosa C. A. Agardh / ***Sphacelaria cirrosa* (Roth) C. Agardh** / Europe / Atlantic Ocean / France / Normandy / Manche (dep.) / Cherbourg / Lenormand / BUC6549

Sphacelaria cirrhosa C. A. Agardh / ***Sphacelaria cirrosa* (Roth) C. Agardh** / BUC6545

Sphacelaria cirrhosa C. A. Agardh / ***Sphacelaria cirrosa* (Roth) C. Agardh** / Europe / Baltic Sea / Germany / Flensburger Meerbufen / "An Fuscus vesiculosus" / Bader R. / BUC6546 / Rabenhorst, Algen Sachs. Resp. MittelEurope”s

Sphacelaria cirrhosa C. A. Agardh / ***Sphacelaria cirrosa* (Roth) C. Agardh** / BUC6547

Sphacelaria disticha Lyng. / ***Halopteris filicina* (Grateloup) Kützing** / Europe / Adriatic Sea / Croatia / Spalatino-Dalmata / Spalato / 1856 / Titius / BUC6618

Sphacelaria olivacea Ag var. radicans / ***Protohalopteris radicans* (Dillwyn) Draisma, Prud'homme & H. Kawai** / Europe / France / Normandy / Cherbourg / Lenormand / BUC6536

Sphacelaria pygmaea Lenormand / ***Sphacelaria bracteata* (Reinke) Sauvageau** / Australia / Victoria / Melbourne / Port Phillip. / "Sur un Cystophora" / BUC6556 / Herbarul Institutului Botanic București

Sphacelaria radicans (Dillw.) Ag. var. olivacea / ***Protohalopteris radicans* (Dillwyn) Draisma**, **Prud'homme & H. Kawai** / Europe / England / Berwick on Tweed / 1888 / ianuarie / Batters Ed. A. / BUC6534 / Hauck et Richter. Phykotheka universalis

Sphacelaria radicans Harv. / ***Protohalopteris radicans* (Dillwyn) Draisma, Prud'homme & H. Kawai** / Europe / North Sea / Germany / Helgoland / 1859 / July / Bulnbeim D. / BUC6535 / Rabenhorst, Algen Sachs. Resp. MittelEurope”s

Sphacelaria scoparia Ag var. pennata / 1849 / Titius / BUC6558

Sphacelaria scoparia Ag. var. aestivalis / ***Stypocaulon scoparium* (Linnaeus) Kützing** / Europe / Adriatic Sea / Croatia / Spalatino-Dalmata / Spalato / Titius / BUC6559

Sphacelaria scoparia Ag. var. aestivalis / ***Stypocaulon scoparium* (Linnaeus) Kützing** / BUC6559

Sphacelaria scoparia Ag. var. hienalis distycha Mengh / ***Stypocaulon scoparium* (Linnaeus) Kützing** / Europe / Adriatic Sea / Croatia / Dalmatien / Kovals / BUC6616

Sphacelaria scoparia / ***Halopteris scoparia (Linnaeus) Sauvageau*** / Europe / Austria / Vienna / 1846 / Parreyss / BUC6616

Sphacelaria scoparia Ag. / ***Halopteris scoparia (Linnaeus) Sauvageau*** / BUC6607 /

Sphacelaria scoparia L. / ***Halopteris scoparia (Linnaeus) Sauvageau*** / Europe / English Channel / England / Dorsetshire / Weymouth / On rocks in the sea near low-water mark. / 1864 / July / Leipner. Adolph / BUC6614 / Rabenhorst, Algen Europe's

Sphacelaria scoparia Lyngb. / ***Halopteris scoparia (Linnaeus) Sauvageau*** / "Aus dem Mittellaudischen Merr" / Heinrich Christian Funck / BUC6613 / Cryptogamische Gewachse besonders des Fichtelgebirges- Heinrichs Christian Funck

Sphacelaria scoparia Lyngb. / ***Halopteris scoparia (Linnaeus) Sauvageau*** / BUC6612

Sphacelaria scoparia Lyngb. / ***Halopteris scoparia (Linnaeus) Sauvageau*** / Europe / Adriatic Sea / BUC6609 / Botanischer Tauschverein in Wein

Sphacelaria scoparia Lyngb. / ***Halopteris scoparia (Linnaeus) Sauvageau*** / Europe / BUC6606 /

Sphacelaria scoparia Lyngb. / ***Halopteris scoparia (Linnaeus) Sauvageau*** / Europe / Adriatic Sea / Muntenegru / Budva / Spammer (com.) / BUC6604

Sphacelaria scoparia Lyngb. / ***Halopteris scoparia (Linnaeus) Sauvageau*** / Europe / Mediteraneean Sea / Italy / Liguria occid. / Albissola / "Sugli scogli a poca profondita ad Albissola marina Liguria occid" / 1979 / august / 30 / Piccone A. / BUC6605 / Societa Elvetica

Sphacelaria scoparia Lyngb. / ***Halopteris scoparia (Linnaeus) Sauvageau*** / Europe / Mediteraneean Sea / Italy / Liguria occid. / Albissola / "Sur les rochers peu profonds" / 1879 / august / 30 / Piccone A. / BUC6603 / Societe dauphinoise, 1880

Sphacelaria scoparia subsp. disticha / ***Stypocaulon scoparium*** **(Linnaeus) Kützing** / Europe / Mediteraneean Sea / Italy / Genova/Liguria / Portofino / 1870 / noiembrie / Baglietto F. / BUC6615

Sphacelaria scoparia / ***Halopteris scoparia (Linnaeus) Sauvageau*** / BUC6611

Sphacelaria scoparia / ***Halopteris scoparia (Linnaeus) Sauvageau*** / Europe / Adriatic Sea / Titius / BUC6610

Sphacelaria / Lyng. / 1849 / May / Titius / BUC6551

Sphacelaria aegagropila / 1853 / BUC6557

Sphacelaria filicina Ag. / ***Halopteris filicina*** **(Grateloup) Kützing** / Europe / Mediteraneean Sea / Italy / Liguria / Genova / Caldesi L. / BUC6589 / Herbarul Institutului Botanic București

Sphacelaria filicina Ag. / ***Halopteris filicina*** **(Grateloup) Kützing** / Europe / Mediteraneean Sea / Croatia / Regione raguseo-narentana / Lacroma / 1848 / Titius / BUC6588

Sphacelaria filicina Ag. / ***Halopteris filicina*** **(Grateloup) Kützing** / Africa / Algeria / El Tarf Province / La Calle / El Kala / ~La calle, Sablemarins~ / 1839 / June / Bove M. / BUC6587 / Herb. Mus. Paris

Sphacelaria paniculata / ***Stypocaulon paniculatum*** **(Suhr) Kützing** / Australia / Victoria / Melbourne / Port Phillip. / BUC6591

Sphacelaria scoparia Agarth. / ***Halopteris scoparia*** (Linnaeus) Sauvageau / Europe / Atlantic Ocean / France / Normandy / Manche (dep.) / Cherbourg / BUC6564 "

Sphacelaria scoparia var. disteuta / Titius / BUC6563

Sphacelaria scoparia var. disticha / Lemour. / BUC6561

Sphacelaria scoparia var. disticha / BUC6561

Sphacelaria tribuloides Meneghini / ***Sphacelaria tribuloides*** **Meneghini** / BUC6539

Sphacelaria tribuloides Meneghini / ***Sphacelaria tribuloides*** **Meneghini** / Dufour. Ludov. / BUC6537 / Rabenhorst, Algen Sachs. Resp. MittelEurope"s

Sphacelaria tribuloides Meneghini / ***Sphacelaria tribuloides*** **Meneghini** / Europe / Adriatic Sea / Slovenia / Primorska / Pirano / Titius / BUC6538

Sphacelaria unknown Ag. / BUC6565

Splachnidium rugosum (L.) Grev. / ***Splachnidium rugosum*** **(Linnaeus) Greville** / BUC6140 / Ex Herb. Dr. H. Becker, F.L.S.

Splachnidium rugosum Kutz. / ***Splachnidium rugosum*** **(Linnaeus) Greville** / Africa / Atlantic Ocean / South Africa / Western Cape / Cape Town (Sea Point) / 1894 / Weber A., van Bosse / BUC6139 / Hauck et Richter. Phykotheka universalis

Sporochnus ciliatus / North America / BUC6336

Sporochnus ligulatus / ***Desmarestia ligulata*** **(Stackhouse) J.V. Lamouroux** / BUC6455

Sporochnus pedunculatus Ag. / ***Sporochnus pedunculatus*** **(Hudson) C. Agardh** / Europe / Mediteraneean Sea / Italy / Liguria / "In alto mare con le reti" / 1873 / BUC6343

Sporochnus pedunculatus Ag. / ***Sporochnus pedunculatus*** **(Hudson) C. Agardh** / Europe / Mediteraneean Sea / Italy / Ligura Occidentale / Porto Maurizio / "Estratta Dall"alto mare con le reti da pesca" / 1875-78 / May-July / Strafforello / BUC6333 / Erb. Critt. Ital. Ser. II.

Sporochnus pedunculatus Ag. / ***Sporochnus pedunculatus*** **(Hudson) C. Agardh** / Europe / Atlantic Ocean / France / Brittany / Lannion / "Pres Brest (Finistere): rejete par les versante" / 1880 / July / 24 / Chiebaut C. / 1881 / Societe Helvetique

Sporochnus pedunculatus Ag. / ***Sporochnus pedunculatus*** **(Hudson) C. Agardh** / Europe / Atlantic Ocean / France / Finistere / Rade de Breste / "Sur les perres, les coquilles et les lithothamnion -Atl dragued a 15 met. De profondeur" / 1874 / May / Thiebaut C. / BUC6331 / Societe Dauphinoise

Sporochnus pedunculatus Ag. / ***Sporochnus pedunculatus*** **(Hudson) C. Agardh** / Europe / Atlantic Ocean / France / Finistere / Rade de Breste / "Sur les perres, les coquilles et les lithothamnion -Atl dragued a 15 met. De profondeur" / 1874 / May / Thiebaut C. / BUC6330 / Societe Dauphinoise

Sporochnus pedunculatus Ag. / ***Sporochnus pedunculatus*** **(Hudson) C. Agardh** / Europe / Atlantic Ocean / France / Finistere / Rade de Breste / "Sur les perres, les coquilles et les lithothamnion -Atl dragued a 15 met. De profondeur" / 1875 / June / Thiebaut C. / BUC6329 / Societe Dauphinoise

Sporochnus aculeatus Ag. / ***Desmarestia aculeata*** **(Linnaeus) J.V. Lamouroux** / Europe / Baltic Sea / Funk Christian (com.) / BUC6449 / Cryptogamische Gewachse besonders des Fichtelgebirges- Heinrichs Christian Funck

Stilophora capillaris / ***Stilophora capillaris*** **Meneghini** / 1856 / Titius / BUC6346
Stilophora granulata J. Ag. / Titius / BUC6350
Stilophora lynghyei J. Ag. / ***Spermatochnus paradoxus*** **(Roth) Kützing** / Mari Bahusiae / Domina Sophia Akermark / BUC6337 / Rabenhorst, Algen Europe's
Stilophora lynghyei J. Ag. / ***Spermatochnus paradoxus*** **(Roth) Kützing** / Europe / Baltic Sea / Germany / Kieler Hafen / "Kieler Hafen. Die Art entwickelt sich im Laufe des Sommers auf dem Laube von Fucus serratus und vesiculosus, worauf die Thallome sich von ihrem Substrate losen und auf dem Grunde des Wassers in der Tiefe von einigen Metern liegend in grossen Rasen weiter wachsen. Mit Eintritt des Winters geht die Phlanze zu Grunde" / Reinke J. / BUC6338 / Hauck et Richter. Phykotheka universalis
Stilophora parasitica Tit / 1856 / Titius / BUC6351
Stilophora rhizodes (Ehrh.) J.Ag. / ***Stilophora tenella*** **(Esper) P.C. Silva** / Europe / Baltic Sea / Germany / Schleswig-Holstein / Kieler Fohrde / "Bei Bulk am Ausgange der Kieler Fohrde an Fucus vesiculosus" / 1886 / October / Reinke J. / BUC6341
Stilophora rhizodes Ag. var adriatica Ag. / ***Stilophora rhizodes*** **var.** ***adriatica*** **J. Agardh** / Europe / Adriatic Sea / Slovenia / Primorska / Pirano / Titius / BUC6345
Stilophora rhizodes Ag. / ***Stilophora tenella*** **(Esper) P.C. Silva** / Europe / Atlantic Ocean / France / Normandy / Manche (dep.) / Cherbourg / BUC6343
Stilophora rhizodes Ag. / ***Stilophora tenella*** **(Esper) P.C. Silva** / Lenormand / BUC6342
Stilophora rhizodes J. Ag. var. papillosa Hauck / ***Stilophora tenella*** **(Esper) P.C. Silva** / Titius / BUC6349
Stilophora rhizodes J. Ag. var. papillosa Hauck / ***Stilophora tenella*** **(Esper) P.C. Silva** / 1859 / Titius / BUC6348
Stilophora rhizodes J. Ag. var. papillosa / Hauck / ***Stilophora tenella*** **(Esper) P.C. Silva** / Europe / Adriatic Sea / Croatia / Spalatino-Dalmata / Spalato / 1856 / Titius / BUC6347
Striaria attenuata Grev / ***Striaria attenuata*** **(Greville) Greville** / Mari Bahusiae / Akermark / BUC6468 / Rabenhorst, Algen Europe's
Striaria attenuata Grev. / ***Striaria attenuata*** **(Greville) Greville** / Europe / Adriatic Sea / Slovenia / Primorska / Pirano / Titius / BUC6468
Striaria attenuata Grev. / ***Striaria attenuata*** **(Greville) Greville** / Europe / Mediteraneean Sea / Italy / Ligura Occidentale / Porto Maurizio / "Estratta Dall'alto mare con le reti da pesca" / 1881 / vara / Strafforello / BUC6467 / Erb. Critt. Ital. Ser. II.
Striaria crinita Grev. / ***Striaria attenuata*** **(Greville) Greville** / Europe / Adriatic Sea / Titius / BUC6470
Stypocaulon distichum Kg. / Europe / Adriatic Sea / Croatia / Spalatino-Dalmata / Spalato / 1856 / Titius / BUC6620
Stypocaulon distichum Kg. / BUC6619
Stypocaulon scoparium L. Kutz. / ***Halopteris scoparia*** **(Linnaeus) Sauvageau** / BUC6601
Stypocaulon scoparium (Linn.) Ktz. var. distichum (Lyngb.) Ktz. / Europe / Adriatic Sea / Slovenia / Pirano / Titius / BUC6598 / Rabenhorst, Algae Europeea
Stypocaulon scoparium (Linn.) Ktz. / ***Halopteris scoparia*** **(Linnaeus) Sauvageau** / Europe / Mediteraneean Sea / Italy / Genova /unknown / august /unknown/ Ardissone / BUC6599 / Rabenhorst, Algen Sachs. Resp. MittelEurope's
Stypocaulon scoparium (Lnn.) Ktz. / ***Halopteris scoparia*** **(Linnaeus) Sauvageau** / Europe / Ligurean Sea / Italy / Genova / august / Ardissone F. / BUC6595 / Rabenhorst, Algen Sachs. Resp. MittelEurope"s
Stypocaulon scoparium Ag. - Kg. f. aestivalis / ***Halopteris scoparia*** **(Linnaeus) Sauvagea**u / Europe / Mediteraneean Sea / Italy / Savona/Liguria / Albissola / April / BUC6600 / Hohenack. Meeralgen. No. BUC505
Stypocaulon scoparium Kutz. var. virgatum / ***Halopteris scoparia*** **(Linnaeus) Sauvageau** / Europe / Ligurean Sea / Italy / Genova / 1870 / Ardissone / BUC6592
Stypocaulon scoparium Kutz. / ***Halopteris scoparia*** **(Linnaeus) Sauvageau** / Europe / Ligurean Sea / Italy / Genova / BUC6593 / Erbario F. ARDISSONE ALGHE ITALICHE
Stypocaulon scoparium Kutz. / ***Halopteris scoparia*** **(Linnaeus) Sauvageau** / Europe / Tyrrhenian Sea / France / Corsica / Haute-Corse (dep.) / Bastia / 1869 / April / Debeaux O. / BUC6596 /
Stypocaulon scoparium Kutz. / ***Halopteris scoparia*** **(Linnaeus) Sauvageau** / Europe / English Channel / France / Normandy / Roscoff / 1935 / July / Eftimiu Panca / BUC6594 / Institutul Botanic - Bucureşti. Herbariul Laboratorului de Morfologie şi sistematică Vegetală
Stypocaulon scoparium Lyngb. f. glomeratum Ktz / Europe / Adriatic Sea / Titius / BUC6597 / Rabenhorst, Algae Europeea

Taonia atomaria Agardh. / ***Taonia atomaria* (Woodward) J. Agardh** / Europe / English Channel / France / Normandy / Roscoff / 1935 / Eftimiu Panca / BUC6151 / Institutul Botanic din București - Erbarul General

Taonia atomaria J. Ag. / ***Taonia atomaria* (Woodward) J. Agardh** / Europe / Mediteraneean Sea / Italy / Liguria / Savona /"Ai scogli sommersi nel Porto di Savona (Pe roci scufundate în portul din Savona)" / 1862 / April / Piccone A. / BUC6149 / Rabenhorst, Algen Europe's

Taonia atomaria J. Ag. / ***Taonia atomaria* (Woodward) J. Agardh** / Europe / Mediteraneean Sea / Italy / Liguria / Savona / "Ai scogli sommersi nel Porto di Savona (Pe roci scufundate în portul din Savona)" / 1862 / April / Piccone A. / BUC6150 / Rabenhorst, Algen Europe's

Taonia atomaria J. Ag. / ***Taonia atomaria* (Woodward) J. Agardh** / Europe / English Channel / France / Normandia / Arromanches / Lenormand / BUC6152

Taonia atomaria / ***Taonia atomaria* (Woodward) J. Agardh** / Europe / Adriatic Sea / Croatia / Spalatino-Dalmata / Spalato / 1856 / Titius / BUC6152

Tilopteris mertensii Kutz. / ***Tilopteris mertensii* (Turner) Kützing** / Europe / North Sea / Germany / Helgoland Island / Helgoland, Nordhafen / "An kleinen Muscheln und Steinchen auf einer kleinen Bank von sogenanntem Tock (Thon) in BUC5 m Tiefe. Sehr selten und nur an dieser einen Stelle gefuden" / Reinbold Th. / BUC6245 / Hauck et Richter. Phykotheka universalis

Tilopteris mertensii Kutz. / ***Tilopteris mertensii* (Turner) Kützing** / Europe / Atlantic Ocean / France / Normandy / Manche (dep.) / Cherbourg / BUC6246

Zonaria dichotoma Ag. var. implexa / ***Dictyota implexa* (Desfontaines) J.V. Lamouroux** / Europe / Atlantic Ocean / France / Normandy / Manche (dep.) / Cherbourg / Lenormand / BUC6217

Zonaria dichotoma Ag. var. intricata / ***Dictyota dichotoma* var. *intricata* (C. Agardh) Greville** / Europe / Adriatic Sea / Croatia / Spalatino-Dalmata / Spalato / 1856 / Titius / BUC6212

Zonaria flava (Clem.) Ag. / ***Zonaria tournefortii* (J.V. Lamouroux) Montagne** / Africa / Algeria / Saint Eugene / 1887 / June / Debray F. / BUC6141 / Hauck et Richter. Phykotheka universalis

Zonaria interrupta Lamour. / ***Zonaria subarticulata* (J.V. Lamouroux) Papenfuss** / Africa / The Kowie (River) / South Africa / Becker H. / BUC6142 / Algae Marinae. Africae Australis. The Kowie. H. Becker, M.D., F.L.S

Zonaria interrupta Lamour. / ***Zonaria subarticulata* (J.V. Lamouroux) Papenfuss** / Africa / The Kowie (River) / South Africa / 1894 / august / 15 / Becker H. / BUC6142 / Algae Marinae. Africae Australis. The Kowie. H. Becker, M.D., F.L.S

Zonaria lobata Ag. / ***Stypopodium zonale* (J.V. Lamouroux) Papenfuss** / North America / Atlantic Ocean / Gulf of Mexico / Florida / Old Rhodes Key / 1895 / July / Curtiss. A.H. / BUC6148 / Algae Floridanae

Zonaria parvula Grev. / ***Cutleria multifida* (Turner) Greville** / Europe / Italy / Ligura/Imperia / Porto Maurizio / "Dall'alto mare" / 1878 / October / Strafforello / BUC6258 / Erb. Critt. Ital. Ser. II.

Zonaria pavonia Gaill. / ***Padina pavonica* (Linnaeus) Thivy** / Europe / Ligurean Sea / Italy / Genova / San Giuliano / 1857 / august / Ardissone / BUC6171 / Rabenhorst, Algen Sachs. Resp. MittelEurope's

Zonaria pavonia Lam. / ***Padina pavonica* (Linnaeus) Thivy** / Europe / Adriatic Sea / Italy / Trieste / Friuli-Venezia Giulia / Tergestum / Trieste / 1874 / BUC6175

Zonaria pavonia Lam. / ***Padina pavonica* (Linnaeus) Thivy** / Europe / Adriatic Sea / Italy / Trieste / Friuli-Venezia Giulia / Tergestum / Trieste / 1875 / BUC6176

Zonaria pavonia Lamouroux / ***Padina pavonica* (Linnaeus) Thivy** / Europe / Mediteraneean Sea / Italy / Ragusa / Sicilia / Ragusa / 1882 / BUC6161

Zonaria pavonia Lamouroux / ***Padina pavonica* (Linnaeus) Thivy** / Europe / Mediteraneean Sea / Greece / Creta / kalamaki / 1867 / august / 12 / BUC6162

Zonaria pavonia / ***Padina pavonica* (Linnaeus) Thivy** / com. Caminhoa / BUC6170 / Flora Brasiliensis

Zonaria pavonia / ***Padina pavonica* (Linnaeus) Thivy** / com. Caminhoa / BUC6172 / Flora Brasiliensis

Zonaria pavonia / ***Padina pavonica* (Linnaeus) Thivy** / Europe / Adriatic Sea / BUC6173 / Botanischer Tauschverein in Wien

Zonaria pavonia / ***Padina pavonica* (Linnaeus) Thivy** / South America / Brazilia / Rio de Janeiro / 1875 / July / BUC6174

Zonaria plantaginea Ag. / ***Punctaria plantaginea* (Roth) Greville** / Europe / Baltic Sea / Germany / Flensburger Meerbufen / BUC6476

Zonaria squamaria Ag. / ***Zonaria squamaria* (S.G. Gmelin) C. Agardh** / 1856 / Titius / BUC6146

Zonaria / "Bone. Rochers sous marins." / 1839 / June / Bove M. / BUC6147 / Herb. Mus. Paris

***Appendix 2* List of brown algae taxa currently accepted taxonomically and their number of specimens from BUC Herbarium**

Taxa / Number of specimens		Taxa / Number of specimens	
Acinetospora crinita (Carmichael) Sauvageau	1	*Fucus spiralis* Linnaeus	2
Acrocarpia paniculata (Turner) Areschoug	1	*Fucus vesiculosus* Linnaeus	18
Alaria esculenta (Linnaeus) Greville	5	*Fucus vesiculosus* var. *linearis* (Hudson) Kützing	1
Anthophycus longifolius (Turner) Kützing	1	*Fucus ceranoides* Linnaeus	4
Arthrocladia villosa (Hudson) Duby	6	*Fucus serratus* Linnaeus	8
Ascophyllum nodosum (Linnaeus) Le Jolis	3	*Giraudya sphacelarioides* Derbès & Solier	2
Ascophyllum nodosum f. *mackayi* (Turner) Nathieson & Dawes	1	*Gymnosorus collaris* (C.Agardh) J.Agardh	2
Ascophyllum nodosum f. *scorpioides* Hauck	1	*Halidrys siliquosa* (Linnaeus) Lyngbye	11
Asperococcus bullosus J.V.Lamouroux	4	*Halopteris filicina* (Grateloup) Kützing	4
Asperococcus ensiformis (Delle Chiaje) M.J.Wynne	3	*Halopteris scoparia* (Linnaeus) Sauvageau	21
Asperococcus fistulosus (Hudson) W.J.Hooker	5	*Halopteris sertularia* (Bonnem.) Kützing	1
Asterotrichia ulvicola Zanardini	1	*Halosiphon tomentosus* (Lyngbye) Jaasund	2
Bifurcaria bifurcata R.Ross	1	*Halothrix lumbricalis* (Kützing) Reinke	3
Botrytella micromora Bory	1	*Haplospora globosa* Kjellman	1
Canistrocarpus cervicornis (Kützing) De Paula & De Clerck	1	*Hecatonema terminale* (Kützing) Kylin	1
Caulocystis cephalornithos (Labillardière) ??Areschoug	1	*Himanthalia elongata* (Linnaeus) S.F.Gray	6
Chaetopteris plumosa (Lyngbye) Kützing	1	*Hincksia granulosa* (Smith) P.C.Silva	1
Chnoospora implexa J.Agardh	1	*Hincksia hincksiae* (Harvey) P.C.Silva	1
Chondrus crispus Stackhouse	1	*Hormophysa cuneiformis* (J.F.Gmelin) P.C.Silva	3
Chorda filum (Linnaeus) Stackhouse	8	*Hormosira banksii* (Turner) Decaisne	1
Chorda filum var. *pumila* Reinke	1	*Hydroclathrus clathratus* (C.Agardh) M.Howe	1
Chorda fistulosa Zanardini	1	*Isthmoplea sphaerophora* (Carmichael) Gobi	2
Chordaria flagelliformis (O.F.Müller) C.Agardh	5	*Laminaria digitata* (Hudson) J.V.Lamouroux	6
Chordaria nemalion (Bertoloni) C.Agardh	2	*Leathesia marina* (Lyngbye) Decaisne	6
Chordariopsis capensis (C.Agardh) Kylin	1	*Lessonia nigrescens* Bory.	1
Cladosiphon contortus (Thuret) Kylin	1	*Liebmannia leveillei* J.Agardh	1
Cladosiphon mediterraneus Kützing	1	*Lithoderma fatiscens* Areschoug	1
Cladostephus spongiosum f. *verticillatum* (Lightfoot) Prud'homme van Reine	17	*Litosiphon laminariae* (Lyngbye) Harvey	3
Cladostephus spongiosum (Hudson) C.Agardh	4	*Macrocystis pyrifera* (Linnaeus) C.Agardh	1
Colpomenia sinuosa (Mertens ex Roth) Derbès & Solier	7	*Mesogloia mediterranea* J.Agardh	2
Compsonema minutum (C.Agardh) Kuckuck	1	*Mesogloia vermiculata* (Smith) S.F.Gray	5
Corynophlaea umbellata (C.Agardh) Kützing	1	*Mesogloia virescens* Carmichael ex Berkeley	1
Cutleria multifida (Turner) Greville	12	*Myrionema foecundum* (Strömfelt) Sauvageau	1
Cutleria penicillata Kützing	2	*Myrionema strangulans* Greville	6
Cystophora retroflexa (Labillardière) J.Agardh	1	*Myrionema orbiculare* J.Agardh	1
Cystoseira abies-marina (S.G.Gmelin) C.Agardh	6	*Myriotrichia clavaeformis* Harvey	1
Cystoseira abrotanifolia var. *leptocarpa* (Kützing) Rodríguez y Femenías	2	*Nereia filiformis* (J.Agardh) Zanardini	3
Cystoseira baccata (S.G.Gmelin) P.C.Silva	4	*Nereocystis luetkeana* (K.Mertens) Postels & Ruprecht	2

Cystoseira barbata (Stackhouse) C.Agardh	16	*Oerstedtia scalaris* (Suhr) Jensen	3
Cystoseira barbata var. *concatenata* Kützing	2	*Padina boryana* Thivy	1
Cystoseira corniculata (Turner) Zanardini	2	*Padina pavonica* (Linnaeus) Thivy	24
Cystoseira flaccida Kützing	2	*Padina durvillei* Bory Saint-Vincent	1
Cystoseira foeniculacea (Linnaeus) Greville	26	*Pelvetia canaliculata* (Linnaeus) Decaisne & Thuret	5
Cystoseira glomerata Kützing	1	*Perithalia caudata* (Labillardière) Womersley	1
Cystoseira humilis var. *myriophylloides* (Sauvageau) J.H.Price & D.M.John	1	*Petalonia fascia* (O.F.Müller) Kuntze	7
Cystoseira montagnei J.Agardh	3	*Petrospongium berkeleyi* (Greville) Nägeli ex Kützing	1
Cystoseira patentissima Kützing	1	*Phloiocaulon squamulosum* (Suhr) Geyler	1
Cystoseira squarrosa De Notaris	2	*Phycophila flaccida* (Dillwyn) Kützing	1
Cystoseira tamariscifolia (Hudson) Papenfuss	5	*Phyllacantha affinis* Kützing	1
Cystoseira trinodis (Forsskål) C.Agardh	2	*Phyllacantha boryana* Kützing	1
Cystoseira usneoides (Linnaeus) M.Roberts	5	*Phyllacantha myrica* var. *hispida* Kützing	1
Cystoseira zosteroides (Turner) C.Agardh	1	*Phyllitis fascia* f. *caespitosa* (J.Agardh) Ardissone	2
Cystoseira abrotanifolia var. *boryana* Meneghini	2	*Planosiphon zosterifolius* (Reinke) McDevit & G.W.Saunders	1
Cystoseira amentacea (C.Agardh) Bory	3	*Pleurocladia lacustris* A.Braun	1
Cystoseira bosphorica Sauvageau	1	*Pogotrichum filiforme* Reinke	1
Cystoseira crinita Duby	1	*Polycerea zostericola* (Harvey ex Kützing) Kylin	1
Cystoseira discors var. *microcarpa* Kützing	1	*Polycladia myrica* (S.G.Gmelin) Draima, Ballesteros, F.Rousseau & T.Thibaut	2
Cystoseira divaricata Kützing	1	*Protohalopteris radicans* (Dillwyn) Draisma, Prud'homme & H.Kawai	3
Cystoseira glomerata Kützing	2	*Punctaria plantaginea* (Roth) Greville	4
Cystoseira paniculata (Turner) C.Agardh	1	*Punctaria tenuissima* (C.Agardh) Greville	4
Cystoseira sedoides (Desfontaines) C.Agardh	2	*Punctaria latifolia* Greville	2
Cystoseira siliquosa (Linnaeus) C.Agardh	1	*Pylaiella littoralis* (Linnaeus) Kjellman	10
Desmarestia aculeata (Linnaeus) J.V.Lamouroux	6	*Pylaiella littoralis* var. *robusta* (Farlow) W.R.Taylor	1
Desmarestia ligulata (Stackhouse) J.V.Lamouroux	1	*Pylaiella ramellosa* (Kützing) Laing	1
Desmarestia viridis (O.F.Müller) J.V.Lamouroux	7	*Ralfsia fungiformis* (Gunnerus) Setchell & N.L.Gardner	1
Desmarestia aculeata (Linnaeus) J.V.Lamouroux	7	*Ralfsia verrucosa* (Areschoug) Areschoug	4
Dictyopteris delicatula J.V.Lamouroux	2	*Rugulopteryx radicans* (Harvey) De Clerck & Coppejans	1
Dictyopteris justii J.V.Lamouroux	1	*Saccharina latissima* (Linnaeus) C.E.Lane, C.Mayes, Druehl & G.W.Saunders	3
Dictyopteris plagiogramma (Montagne) Vickers	1	*Saccorhiza polyschides* (Lightfoot) Batters	2
Dictyopteris polypodioides (A.P.De Candolle) J.V.Lamouroux	9	*Sargassum acinarium* (Linnaeus) Setchell	8
Dictyosiphon foeniculaceus (Hudson) Greville	2	*Sargassum agardhianum* Farlow	1
Dictyosiphon chordaria Areschoug	1	*Sargassum dentifolium* (Turner) C.Agardh	1
Dictyosiphon filiformis (Foslie) De Toni	1	*Sargassum desfontainesii* (Turner) C.Agardh	1
Dictyosiphon foeniculaceus (Hudson) Greville	13	*Sargassum filipendula* C.Agardh	3
Dictyosiphon foeniculaceus var. *filiformis*	1	*Sargassum filipendula* var. *montagnei*	1

Reinke	
Dictyota cervicornis Kützing	3
Dictyota ciliolata Sonder ex Kützing	1
Dictyota dichotoma (Hudson) J.V.Lamouroux	12
Dictyota dichotoma var. *intricata* (C.Agardh) Greville	2
Dictyota fasciola (Roth) J.V.Lamouroux	6
Dictyota fasciola var. *repens* (J.Agardh) Ardissone	1
Dictyota implexa (Desfontaines) J.V.Lamouroux	3
Dictyota laciniata J.V.Lamouroux	2
Dictyota mertensii (C.Martius) Kützing	2
Dictyota paniculata J.Agardh	1
Dictyota spiralis Montagne	1
Dictyota bartayresiana J.V.Lamouroux	1
Dictyota dichotoma var. *intricata* (C.Agardh) Greville	3
Dictyota implexa (Desfontaines) J.V.Lamouroux	2
Durvillaea antarctica (Chamisso) Hariot	1
Ecklonia biruncinata (Bory) Papenfuss	1
Ectocarpus arachnoideus Zanardini	1
Ectocarpus auratus Bory ex Kützing	1
Ectocarpus fasciculatus Harvey	1
Ectocarpus fasciculatus Harvey C / Ectocarpus fasciculatus Kützing S	1
Ectocarpus fasciculatus var. *refractus* (Kützing) Ardissone	1
Ectocarpus ferrugineus C.Agardh	1
Ectocarpus flagelliformis Kützing	1
Ectocarpus penicillatus (C.Agardh) Kjellman	1
Ectocarpus siliculosus (Dillwyn) Lyngbye	11
Ectocarpus siliculosus var. *arctus* (Kützing) Gallardo	1
Ectocarpus siliculosus var. *hiemalis* (P.Crouan & H.Crouan ex Kjellman) Gallardo	1
Ectocarpus velutinus (Greville) Kützing	1
Ectocarpus castaneus Kützing	1
Ectocarpus intermedius Kützing	1
Ectocarpus penicillatus (C.Agardh) Kjellman	1
Ectocarpus rufulus Kützing	1
Ectocarpus siliculosus (Dillwyn) Lyngbye	1
Ectocarpus viridis Harvey	2
Elachista fucicola (Velley) Areschoug	1
(Bailey) Grunow	
Sargassum hornschuchii C.Agardh	5
Sargassum hornschuchii var. *lunense* (Caldesi) Grunow	1
Sargassum latifolium (Turner) C.Agardh	1
Sargassum lendigerum (Linnaeus) C.Agardh	1
Sargassum natans (Linnaeus) Gaillon	13
Sargassum obovatum Harvey	1
Sargassum salicifolium Naccari	2
Sargassum swartzii C.Agardh	1
Sargassum thunbergii (Mertens ex Roth) Kuntze	1
Sargassum asperifolium Hering & G.Martens ex J.Agardh	1
Sargassum boryanum Montagne	1
Sargassum cymosum C.Agardh	1
Sargassum horneri (Turner) C.Agardh	1
Sargassum incisifolium (Turner) C.Agardh	1
Sargassum vulgare C.Agardh	8
*Sargassumpar*vifolium (Turner) C.Agardh	1
Sauvageaugloia divaricata (Clemente) Cremades	2
Scytosiphon lomentaria (Lyngbye) Link	13
Scytothamnus australis (J.Agardh) J.D.Hooker & Harvey	1
Spatoglossum variabile Figari & De Notaris	1
Spatoglossum schroederi (C.Agardh) Kützing	1
Spatoglossum spanneri (Meneghini) Meneghini	1
Spermatochnus paradoxus (Roth) Kützing	2
Sphacelaria bracteata (Reinke) Sauvageau	1
Sphacelaria bertiana De Notaris	3
Sphacelaria cervicornis C.Agardh	1
Sphacelaria cirrosa (Roth) C.Agardh	11
Sphacelaria tribuloides Meneghini	3
Splachnidium rugosum (Linnaeus) Greville	2
Spongonema tomentosum (Hudson) Kützing	7
Sporochnus pedunculatus (Hudson) C.Agardh	6
Stephanocystis geminata (C.Agardh) Draisma, Ballesteros, F.Rousseau & T.Thibaut	1
Stictyosiphon griffithsianus (Le Jolis) Holmes & Batters	1
Stictyosiphon tortilis (Gobi) Reinke	1
Stilophora tenella (Esper) P.C.Silva	6

Elachista scutulata (Smith) Areschoug	3	*Stilophora capillaris* Meneghini	1
Elachista stellaris Areschoug	1	*Stilophora rhizodes* var. *adriatica* J.Agardh	1
Elachista flaccida (Dillwyn) Fries	1	*Striaria attenuata* (Greville) Greville	4
Elachista fucicola (Velley) Areschoug	6	*Stypocaulon paniculatum* (Suhr) Kützing	1
Eudesme virescens (Carmichael ex Berkeley) J.Agardh	2	*Stypocaulon scoparium* (Linnaeus) Kützing	4
Feldmannia globifera (Kützing) Hamel	1	*Stypopodium zonale* (J.V.Lamouroux) Papenfuss	1
Fosliea curta (Foslie) Reinke	1	*Taonia atomaria* (Woodward) J.Agardh	5
Fucus distichus Linnaeus	1	*Tilopteris mertensii* (Turner) Kützing	3
Fucus distichus subsp. *edentatus* (Bachelot de La Pylaie) H.T.Powell	1	*Turbinaria turbinata* (Linnaeus) Kuntze	1
Fucus distichus subsp. *evanescens* (C.Agardh) H.T.Powell	2	*Zonaria subarticulata* (J.V.Lamouroux) Papenfuss	3
Fucus filiformis S.G.Gmelin.	1	*Zonaria tournefortii* (J.V.Lamouroux) Montagne	1
Fucus serratus Linnaeus	2	*Zonaria turneriana* J.Agardh	1
Fucus siliculosus Linnaeus	2	*Zonaria squamaria* (S.G.Gmelin) C.Agardh	1

INSTRUCTIONS TO THE AUTHORS

Acta Horti Botanici Bucurestiensis publishes original research papers and critical reviews on plant anatomy and morphology, systematic botany, plants, algae and fungi biodiversity, plant physiology and biochemistry, plant genetic and bio technology, plant pathology, horticulture.

The manuscript (in English) should be submitted electronically as MS-Word file to the editor, Paulina Anastasiu, e-mail: paulina.anastasiu@bio.unibuc.ro

The paper should be of maximum 20 pages edited according to the journal's requirements. **Authors are expected to cover the cost of supplementary pages as well as the colour reproductions**.

The title of the paper should be informative and as short as possible. Write the title centred, with bold capitals, size font 10, Times New Roman. Use *italics* only for the plant names and do not add the authority to species names in the title.

Below the title, aligning right, list the **authors' names** with font size 10, bold capitals. For each author include a superscription number to indicate, as footnote, the affiliation, complete address and e-mail of the corresponding author.

The abstract should be written as a single paragraph and should not exceed 200 words, font size 9, Times New Roman, justify. Do not include authority in the names of taxa.

The keywords should not be more than 8 words or phrases identifying the subject matter of the paper. Use Times New Roman, font size 9, justify.

The text of paper must be typed using 10 Times New Roman, one spaced, justify, on A4 format with the next margins: top 57 mm, bottom 50 mm, left 42.5 mm, right 42.5 mm. First line of each paragraph should be at 10 mm. It is recommended to divide the text into: **Introduction**, **Material and methods**, **Results and discussion**, **Conclusions**, **Acknowledgements** and **References**. The critical reviews are excepted from this rule. Write all main headings in bold.

Scientific plant names should be given in italics. The author's name should be written in normal print at least once, when mentioned for the first time in the text or in a table, and should be omitted subsequently. They should be abbreviated according to *Authors of Plant Names*, Royal Botanic Gardens, Kew (Brummitt & Powell 1992). After the first mention, the generic name should be abbreviated to its initial, except where its use causes confusion.

References in the text should be cited in the following form: (Petrescu 1997) or Petrescu (1997) for one author, (Metcalfe & Chalk 1950) or Metcalfe & Chalk (1950) for two authors, (Popescu *et al.* 1999) or Popescu *et al.* (1999) for more than two authors (Dumitrescu 2000a, b) or Dumitrescu (2000a, b) for several references by the same author(s) published in the same year. References in the text should be cited chronologically, not alphabetically: (Metcalfe & Chalk 1950, Popescu *et al.* 1999, Dumitrescu 2000). All references quoted in the text, and only those quoted, must be listed at the end of the manuscript, under the heading **References**, in a format strictly analogous to the examples below. The material in *preparation* or *unpublished* should be referred in the text using the author(s) name(s) followed by "unpubl." or "pers. comm." and cannot be included in the reference list.

Tables should be numbered with Arabic numerals in the order in which they are cited in the text (e.g. Table 3). They must have brief, concise titles and legends that will make the general meaning of the table comprehensible. The titles should be placed at the top of the tables. Explanatory footnotes may be placed below the table written with lowercase letters. All abbreviations must be explained in the legends. The size of table should be proportional to the journal's page (125 × 190 mm).

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2. Borza, A. (1966). Cercetări asupra florei şi vegetaţiei din Câmpia Română (i). *Contrib. Bot. Cluj*, /1966/(2), 141-162.
3. Buttler, K.P. (1969). Chromosomanzahlen und Taxonomische bemerkungen zu einigen Rumanischen Angiospermen. *Rev. Roumaine Biol., Bot.*, 14(5), 275-282.

- **For books**

1. Brandza, D. (1879 – 1883). *Prodromul Florei Române sau enumeraţiunea plantelor până astă-di cunoscute în Moldova şi Valachia*. Bucuresci: Tipogr. Academiei Române.
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2. Borza, A. (1931). Die Vegetation und Flora Rumänien:. In A. Borza (Ed.). *Guide de la Sixième Excursion Phytogeographique Internationale Roumanie* (pp. 1-55). Cluj: Institutul de literatură şi Tipografie Minerva S.A.

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- **For a thesis**

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- **For a web page**

The Plant List 2010. *Version 1*. Retrieved October 25, 2012, from: http://www.theplantlist.org/

Kuo, M. (May 2007). *MushroomExpert.Com*. Retrieved 15 May 2013, from http://www.mushroomexpert.com/peziza_badioconfusa.html

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