



Rare and threatened plants in the Black Sea coastal area between Cape Midia (Romania) and Cape Kaliakra (Bulgaria)

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ABSTRACT: A list of the rare and threatened vascular plants from the terrestrial coastal zone of Dobrogea between Cape Midia (Romania) and Cape Kaliakra (Bulgaria) are given in the paper. Some considerations regarding the Red Data categories from the Romanian Red List and the Red Data Book of Republic of Bulgaria are also provided. A special attention is paid to plant species protected by the national legislations of Romania and Bulgaria and by the international legislation regarding the conservation of wild flora. We report from studied area *Minuartia bilykiana* as new taxa for the Bulgarian flora. A lot of local endemic, regional endemic (for Dobrogea) and Balkan endemic taxa from studied area are mentioned in the paper.

KEY WORDS: rare plants, threatened plants, coastal zone, Black Sea, Dobrogea.

Received 08 September 2009

Revision Accepted 02 June 2010

UDK 581.55 ; 502.211(262.5.04)(498+497.2)

INTRODUCTION

The coastal area of the Black Sea between Cape Midia (Romania) and Cape Kaliakra (Bulgaria) is a well delineated geographical area with a length of approximately 130 km, located in Dobrogea, historic province divided between Romania and Bulgaria (Fig. 1). It is a heterogeneous area from the point of view of the physico-geographical conditions (sandy beaches, wetlands, loess cliffs, limestone rocky cliffs and limestone plateaus) rich in plants of conservative interest at national and European level.

In the northern coastal area of Bulgaria, the anthropogenic influences are relatively reduced due to the large surfaces with protected areas (approx. 51803 ha). Consequently, the natural habitats are relatively well preserved and they shelter a large diversity of plants, some of them already extinct or critically endangered in the southern Romanian seacoast.

Due to the expansion of the tourist resorts and of the abusive construction in the beach area, the plant diversity in the Romanian southern coast (Cape Midia – Vama Veche) has known a strong decline over the past 20 years. The destruction or serious damage of the dune habitats and littoral cliffs has led to the disappearance of some rare plants, mentioned in the bibliographical sources.

Along the southern Romanian Black Sea coast, the protection of phytodiversity is accomplished in good conditions only in Agigea Marine Dunes Reservation, a tiny reservation (approx. 8 ha) located in the vicinity of the city of Constanta. The other natural reservations (Lake Techirghiol and Herghelie Marsh, near Mangalia) are wetlands with particular importance especially for the bird fauna and have a cumulated surface of 1 325 ha.

In this context, a general evaluation of the coastal Dobrogea plants diversity and an inventory of the rare and threatened plants were necessary.

MATERIAL AND METHODS

The present work is the result of field observations carried out between April and October 2008 within the framework of cross-border project Phare CBC RO2005/017-535.01.02.02, financed by European Community and Romanian Government.

The field work points (Fig. 1) have been established in different type of habitats from the Romanian and Bulgarian Black Sea shore area: wide sandy beaches (Corbu, Taşaul, Siutghiol, Techirghiol, Mangalia, Durankulak, Shabla), narrow beaches at the base of the cliffs (Tuzla, Vama Veche, Durankulak, Krapets), wetlands in the proximity of the littoral lakes or in the marshy valleys (Hergheliei Marsh, Lake Techirghiol, Lake Durankulak, Lake Shabla, Bolata valley), low-height loess cliffs (Corbu, Constanta, Eforie, Tuzla, Vama Veche, Durankulak, Krapets) and high rocky limestone cliffs (Kamen Bryag, Russalka, Bolata, Cape Kaliakra).

The nomenclature of taxa is according to Flora Europaea (TUTIN *et al.* 1993 and TUTIN *et al.* 1964-1980). The life form for each taxa is given after CIOCÂRLAN (2000). The floristic elements are according to CIOCÂRLAN (2000) and ASSYOV & PETROVA (2006). Species distribution in Romanian and Bulgarian part of Dobrogea is given after FĂGĂRAŞ *et al.* 2008.

Rare and threatened species are according to Romanian Red List of higher plants (OLTEAN *et al.* 1994), "Red Data Book of Republic of Bulgaria" (VELCHEV *et al.* 1984), Law no. 77/2002 (Biodiversity Law of Bulgaria), OUG no. 57/2007 (Emergency Ordinance of Romanian Government) and European legislation (Bern Convention; Council Directive 92/43/EEC).

RESULTS AND DISCUSSIONS

The field studies took place in the coastal area between Cape Midia and Cape Kaliakra and led to the identification of 925 vascular taxa, among which 851 are native and 74 are alien (FĂGĂRAŞ *et al.* 2008). There are 198 species and sub-species of rare and threatened plants, which represent 23.26% of the total native species.

The rare and threatened taxa identified in the coastal area between Cape Midia and Cape Kaliakra are the following: *Achillea clypeolata* Sibth. & Sm. – H, Balc (RO, BG), *Achillea leptophylla* Bieb. – H, Pont-Balc (RO), *Adonis flammea* Jacq. – Th, Pont-Med (RO, BG), *Adonis vernalis* L. – H, Eua(Cont) (BG), *Aegilops geniculata* Roth – Th, Med (BG), *Aegilops triuncialis* L. – Th, Med (RO), *Aeluropus littoralis* (Gouan) Parl. – H, Pont-Med (RO), *Agrostis gigantea* Roth subsp. *maeotica* (Klokov) Tzvelev – H, Pont-Dobr (RO, BG), *Allium albidum* Fisch. ex M.Bieb. subsp. *albidum* – G, Pont (RO), *Allium flavum* L. subsp.

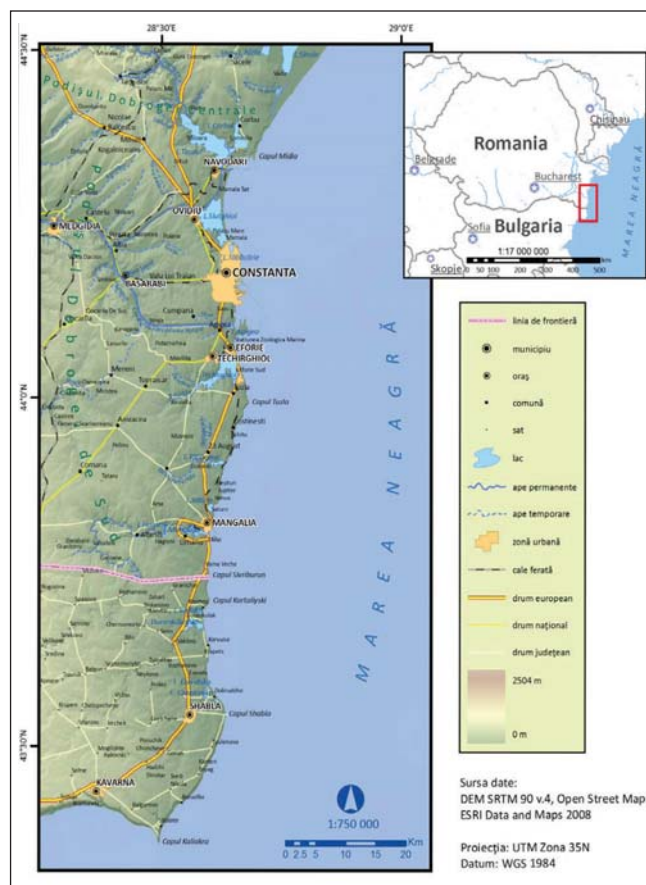


Fig. 1. The map of coastal zone between Cape Midia and Cape Kaliakra

tauricum (Besser ex Rchb.) Stearn – G, Taur-Balc (BG), *Allium guttatum* Steven – G, Pont-Balc (BG), *Allium moschatum* L. – G, Pont-Med (BG), *Allium saxatile* M. Bieb. – G, Eur(Cont) (BG), *Alyssum borzaeanum* Nyár. – Ch, Litt.(Black Sea) (RO), *Alyssum caliacrae* Nyár. (BG), *Alyssum hirsutum* M.Bieb. – Th, E-subMed (RO, BG), *Ammophila arenaria* (L.) Link subsp. *arundinacea* H. Lindb. – H, Med (BG), *Anchusa stylosa* Bieb. – Th, Pont-Balc (BG), *Anchusa thessala* Boiss. & Spruner – Th, Pont-Balc (RO), *Apium graveolens* L. subsp. *graveolens* – TH, Atl-Med (RO), *Argusia sibirica* (L.) Dandy – H, Eua (RO, BG), *Artemisia pedemontana* Balb. – Ch, Med-Taur-Cauc (BG), *Artemisia pontica* L. – H (Ch), Eua(Cont) (RO, BG), *Artemisia tschernieviana* Besser – Ch, Pont (RO, BG), *Asparagus brachyphyllus* Turcz. [*A. pallasii* Miscz.] – G, Pont (RO), *Asparagus verticillatus* L. – G, Pont-Balc (RO, BG), *Asphodeline lutea* (L.) Rchb. – G, Med (BG), *Astragalus cornutus* Pall. – H, Pont-Balc-Anat (BG), *Astragalus hamosus* L. – Th, Med (RO, BG), *Astragalus spruneri* Boiss. – H, Balc (RO, BG), *Astragalus varius* S.G.Gmel. – H, Eua(Cont) (RO, BG), *Astrodaucus littoralis* (Bieb.) Drude – Th, Pont-Med (RO), *Bassia hirsuta* (L.) Asch. – Th, Eua

- (RO, BG), *Bassia laniflora* (S.G.Gmel.) A.J.Scott – Th, Eua (RO), *Bassia sedoides* (Pall.) Asch. – Th, Eua (RO), *Bellevalia sarmatica* (Pall. ex Georgi) Woronow – G, Pont (BG), *Beta trigyna* Waldst. & Kit. – H, Pont-Med (BG), *Bombocilaena erecta* (L.) Smoljan. – Th, Pont-Med (BG), *Buglossoides arvensis* (L.) I.M.Johnst. subsp. *sibthorpiana* (Griseb.) R.Fern. – Th, Eua (RO, BG), *Cakile maritima* Scop. subsp. *euxina* (Pobed.) Nyár. – Th, Pont (RO, BG), *Carex extensa* Good. – H, Atl-Med (RO, BG), *Centaurea alba* L. subsp. *caliacrae* (Prodan) Dostál – TH-H, Pont-Balc (BG), *Centaurea arenaria* M.Bieb. ex Willd. subsp. *borysthenica* (Gruner) Dostál – H, Pont-Pan-Balc (RO, BG), *Centaurea napulifera* Rochel subsp. *thirkei* (Sch.Bip.) Dostál – H(G), Balc (RO, BG), *Centaurea salonitana* Vis. – H, Pont-Balc (RO, BG), *Centaurea thracica* (Janka) Hayek – H, Balc-Anat (BG), *Centaurea varnensis* Velen. – H, Balc(BG), *Centaurium erythraea* Rafin s.l. – Th-TH, Balc (RO), *Centaurium spicatum* (L.) Fritsch – Th-TH, Pont-Med (RO), *Cerastium gracile* Dufour – Th, Pont-Balc (BG), *Cerinthe minor* L. subsp. *auriculata* (Ten.) Domac – Th-TH, Pont-Med (BG), *Chamaecytisus jankae* (Velen.) Rothm. – Ph(subarbust), Balc (BG), *Cirsium alatum* (S. G.Gmel.) Bobrov – G, Pont (RO), *Cladium mariscus* (L.) Pohl – HH, Cosm (RO, BG), *Clypeola jonthlaspi* L. – Th, Med (BG), *Colutea arborescens* L. – Ph(arbust), Euc-Med (RO, BG), *Convolvulus lineatus* L. – H, Pont-Med (RO, BG), *Convolvulus persicus* L. – H, Pont-Casp (RO, BG), *Corispermum nitidum* Kit. – Th, Pont-Pan (RO, BG), *Coronilla emerus* L. subsp. *emeroides* (Boiss. & Spruner) Hayek – Ph(arbust), Med-Euc (BG), *Coronilla scorpioides* (L.) W.D.J.Koch – Th, Med (RO, BG), *Crambe maritima* L. – H, Atl (RO, BG), *Crithmum maritimum* L. – H, subMed (BG), *Crocus pallasii* Goldb. – G, Pont-Balc (RO, BG), *Cynoglossum creticum* Mill. – TH, Med (RO, BG), *Daucus guttatus* Sibth. & Sm. subsp. *zahariadii* Heywood – Th, Balc (RO), *Dianthus bessarabicus* (Kleopow) Klokov – H, Pont (RO), *Dianthus leptopetalus* Willd. – H, Pont-Balc (RO, BG), *Dianthus monadelphus* Vent. subsp. *pallens* (Sm.) Greuter & Burdet – H, Balc (RO), *Dianthus pseudarmeria* Bieb. – Th(TH), Pont-Balc (BG), *Ecballium elaterium* (L.) A. Richard – Th, Med (RO, BG), *Echinops ritro* L. subsp. *ruthenicus* (M.Bieb.) Nyman – H, Pont-Pan-Balc (RO, BG), *Elymus farctus* (Viv.) Runemark ex Melderis subsp. *bessarabicus* (Sävul. & Rayss) Melderis – H, Pont (RO, BG), *Elymus pycnanthus* (Godr.) Melderis – G, Atl-Med (RO, BG), *Ephedra distachya* L. – Ph(arbust), Eua(Cont) (RO, BG), *Eryngium maritimum* L. – H, Atl-Med (RO, BG), *Erysimum bulgaricum* (Velen.) Ančev & Polatschek – Th, Balc(Moes) (BG), *Euphorbia myrsinites* L. – H-Ch, Med (BG), *Euphorbia paralias* L. – Ch, Atl-Med (BG), *Euphorbia peplis* L. [syn. *Chamaesyca peplis* (L.) Prokh.] – Th, Atl-Med (RO, BG), *Festuca beckeri* (Hackel) Trautv. subssp. *arenicola* (Prodan) Soó – H, Pont (BG), *Ficus carica* L. – Ph(arbust), Med (RO, BG), *Frankenia pulverulenta* L. – Th, Pont-Med (RO), *Fumaria kralikii* Jord. – Th, Med (BG), *Galanthus elwesii* Hook. – G, Balc (BG), *Galium verticillatum* Danthoine – Th, subMed (BG), *Geranium tuberosum* L. – G, subMed (BG), *Glaucium flavum* Crantz subsp. *flavum* – Th, Atl-Med (RO, BG), *Glaucium flavum* Crantz subsp. *leiocarpum* (Boiss.) Ciocârlan – Th, Balc (RO), *Goniolimon besseranum* (Schult. ex Rchb.) Kusn. – H, Pont (RO, BG), *Gypsophila pallasii* Ikonn. – H, Pont (BG), *Gypsophila perfoliata* L. – Ch, Pont (RO, BG), *Helianthemum salicifolium* (L.) Mill. – Th, Med (RO, BG), *Hordeum bulbosum* L. – G, Med (BG), *Hornungia petraea* (L.) Rchb. – Th, Med (RO, BG), *Hyacinthella leucophaea* (K.Koch) Schur – G, Pan-Balc (RO, BG), *Hymenolobus procumbens* (L.) Nutt. – H, Cosm (BG), *Hypocoum procumbens* L. – Th, Med (BG), *Iris sintenisii* Janka – G, Balc-Anat (BG), *Jasminum fruticans* L. – Ph (arbust), Med (RO, BG), *Jurinea tzar-ferdinandii* Davidov – H, Balc(Dobr) (BG), *Koeleria glauca* (Schrad.) DC. subsp. *glauca* – H, Eua(Cont) (RO), *Koeleria lobata* (M. Bieb.) Roem. & Schult. [syn. *Koeleria brevis* Steven] – H, Pont-Balc (BG), *Lactuca tatarica* (L.) C.A.Mey. – H, Eua(Cont) (RO, BG), *Lactuca viminea* (L.) J.Presl & C.Presl – TH, Eua(Med) (BG), *Legousia speculum-veneris* (L.) Chaix – Th, Med (BG), *Leymus racemosus* (Lam.) Tzvelev subsp. *sabulosus* (Bieb.) Tzvelev. – H, Pont(Vest) (RO, BG), *Limonium bellidifolium* (Gouan) Dumort. – H, Eua (Cont) (RO), *Limonium latifolium* (Sm.) Kuntze – H, Pont-Med (RO, BG), *Limonium meyeri* (Boiss) Kuntze – H, Pont (RO, BG), *Linum tauricum* Willd. – H, Pont-Balc (BG), *Lolium rigidum* Gaudin subsp. *lepturoides* (Boiss.) Sennen & Mauricio – Th, subMed (BG), *Matthiola odoratissima* (M. Bieb.) R.Br. – H, Taur-Dobr (BG), *Medicago marina* L. – H, Pont-Med (BG), *Medicago orbicularis* (L.) Bartal. – Th, Med (RO, BG), *Merendera sobolifera* C.A. Mey. – G, Eua(Cont) (RO), *Minuartia bilykiana* Klokov – Th, Pont (BG), *Myrrhoides nodosa* (L.) Cannon – Th, Med (BG), *Nectaroscordum siculum* (Ucria) Lindl. subsp. *bulgaricum* (Janka) Stearn – G, subMed (BG), *Onobrychis gracilis* Besser – H, Pont-Balc (RO, BG), *Ononis pusilla* L. – H, Med (BG), *Onosma heterophylla* Griseb. – H, Dac-Balc (BG), *Opopanax chironium* (L.) W.D.J.Koch subsp. *bulgaricum* (Velen) Ciocârlan – H, Balc (BG), *Orchis laxiflora* Lam. subsp. *elegans* (Heuffel) Soó – G, Pont-Pan (RO), *Ornithogalum comosum* L. – G, Euc(Med) (BG), *Paeonia peregrina* Mill. – H(G), Balc (BG), *Paeonia tenuifolia* L. – G, Pont-Balc (BG), *Paliurus spina-christi* Mill. – Ph (arbust), Med (RO, BG), *Parietaria lusitanica* L. subsp. *serbica* (Pančić) P.W.Ball – Th, Pont-Balc (BG), *Periploca graeca* L. – Ph (liană), Med (BG), *Peucedanum arenarium* Waldst. & Kit. – H, Pont-Pan-Balc (BG), *Phleum subulatum* (Savi) Asch. & Graebn. – Th, Pont-Med (BG), *Picnomon acarna* (L.) Cass. – Th, Med (BG), *Pimpinella*

tragiolum Vill. subsp. *lithophila* (Schischk.) Tutin – H, Med (BG), *Piptatherum holciforme* (M.Bieb.) Roem. & Schult. – H, Taur-Balc (BG), *Plantago cornuti* Gouan – H, Eur(Med) (RO), *Plumbago europaea* L. – H, Med (BG), *Polygonum maritimum* L. – H, Med (RO), *Polygonum mesembrium* Chrtek – Th -TH, Eur (Med) (RO, BG), *Polypogon monspeliensis* (L.) Desf. – Th, Med (RO, BG), *Psilurus incurvus* (Gouan) Schinz & Thell. – Th, Med (RO, BG), *Pyrus elaeagrifolia* Pall. – Ph(arbust), Anat-Balc (BG), *Ranunculus oxyspermus* Willd. – H, Balc-Cauc (RO, BG), *Rumex longifolius* DC. – H, Circ (RO, BG), *Rumex tuberosus* L. – H, Eua(Cont) (RO, BG), *Ruppia maritima* L. – HH(HD), Cosm (RO), *Ruscus aculeatus* L. – G-Ch, Pont-Med (BG), *Ruta graveolens* L. – H, Med (BG), *Salvia aethiopis* L. – TH(H), Pont-Med (RO, BG), *Salvia amplexicaulis* Lam. – H, Balc-Anat (NW) (BG), *Salvinia natans* (L.) All. – HH, Eua (BG), *Samolus valerandi* L. – H, Cosm (RO, BG), *Satureja coerulea* Janka – Ch, Cauc-Balc (RO, BG), *Scabiosa micrantha* Desf. – Th, Pont-Balc (BG), *Scandix australis* L. – Th, Med (RO, BG), *Scandix pecten-veneris* L. – Th, Atl-Med (RO, BG), *Scirpus litoralis* Schrad. – G(HH), Med (RO), *Scirpus triqueter* L. – G(HH), Eua (BG), *Scleropoa rigida* (L.) Griseb. – Th, subMed (BG), *Scolymus hispanicus* L. – TH, Med (RO, BG), *Scorzonera mollis* M.Bieb. – H, Pont-Balc (BG), *Scutellaria orientalis* L. var. *pinnatifida* Reichenb. – Ch, Balc-Cauc (BG), *Secale sylvestre* Host – Th, Eua(Cont) (RO, BG), *Sedum caespitosum* (Cav.) DC. – Th, Med (BG), *Senecio borysthenticus* (DC.) Stankov – H, Med (RO), *Seseli campestre* Besser – H, Pont (RO, BG), *Seseli rigidum* Waldst. & Kit. – H, Dac-Balc (BG), *Seseli tortuosum* L. – TH (H), Pont-Med (RO, BG), *Silene borysthentica* (Gruner) Walters – H, Eua (RO, BG), *Silene caliacrae* Jordanov & Panov – H, Dobr (BG), *Silene exaltata* Friv. – H, Balc (RO, BG), *Silene thymifolia* Sibth & Sm. – H, Med(Est) (RO, BG), *Stachys maritima* Gouan – H, Med (RO, BG), *Sternbergia colchiciflora* Waldst. & Kit. – G, subMed (BG), *Stipa lessingiana* Trin. & Rupr. – H, Pont-Med (BG), *Symphytum tauricum* Willd. – TH-H, Pont-Balc (BG), *Syrenia cana* (Piller & Mitterp.) Neilr. – TH, Pont (RO), *Syrenia montana* (Pall.) Klokov – TH, Pont-Dobr (RO), *Tanacetum millefolium* (L.) Tzvelev – H, Balc-Cauc (RO, BG), *Taraxacum bessarabicum* (Hornem.) Hand.-Mazz. – H, Eua(Cont) (RO, BG), *Thymus zygioides* Griseb. – Ch, Balc (BG), *Torilis nodosa* (L.) Gaertn. – Th, Med (RO, BG), *Tragopogon floccosus* Waldst. & Kit. – H, Euc(Med) (RO), *Trifolium angustifolium* L. – Th, Med (RO, BG), *Triglochin maritima* L. – H, Circ (RO), *Trigonella gladiata* Steven ex M.Bieb. – Th, Med (RO, BG), *Typha laxmannii* Lepech. – G(HH), Eua(Cont) (RO, BG), *Typha minima* Funk – HH, Eua (RO), *Utricularia vulgaris* L. – HH, Circ (BG), *Valerianella pumila* (L.) DC. – Th, Eua(Med) (RO, BG), *Verbascum ovalifolium* Donn ex Sims subsp. *ovalifolium* –

TH, Pont-Balc-Anat(W) (BG), *Verbascum purpureum* (Janka) Hub. – H, Tra-Moes (BG), *Vicia dalmatica* A.Kern. – H, Pont-Balc (RO, BG), *Vicia narbonensis* L. – Th, Med (RO, BG), *Vicia peregrina* L. – Th, Med (BG), *Vicia sativa* L. subsp. *amphicarpa* (Dorthes) Asch. & Graebn. – Th, Med (BG), *Ziziphora capitata* L. – Th, Med (BG), *Zygophyllum fabago* L. – H, Med (RO, BG).

Among the 198 rare and threatened plants, 87 taxa (43.93%) were observed only in the northern coastal area of Bulgaria, while 32 taxa (16.16%) only in the southern coastal area of Romania; other 79 taxa (39.89%) are located both in the Romanian and Bulgarian coastal area of Dobrogea (Fig.2).

The number of rare and threatened plant taxa is significantly higher in the coastal zone of Bulgaria (166 taxa) compared to that of the taxa present in the Romanian seashore (111 taxa). This is explained by the remarkable diversity of habitats in the Bulgarian Black Sea coast (sandy beaches, wetlands, loess and rocky seawalls, limestone plateaus), by the sub-Mediterranean climate influences and less intensive tourism in this area.

In the Romanian seacoast the rocky cliffs and limestone plateaus are missing and the sub-Mediterranean climate influence is obvious only south of the town of Mangalia, in the border area with Bulgaria.

Among the 198 rare and threatened plants, 177 taxa are included in one of the Red Data categories used in the Romanian Red List, while only 42 taxa are indexed in the Red Data Book of Republic of Bulgaria (Table 1). Species of European conservative interest such as *Salvinia natans*, *Erysimum bulgaricum*, *Ruscus aculeatus* or *Bellevallia sarmatica*, indexed in the Law 77/2002 (Biodiversity Law of Bulgaria), in the Annexes of the Bern Convention and of the Directive 92/43/EEC are missing in the Red Data Book of Republic of Bulgaria (first edition).

In the Red Book of Republic of Bulgaria, 34 rare taxa (17.17%) and 8 threatened taxa (4.04%) from the coastal

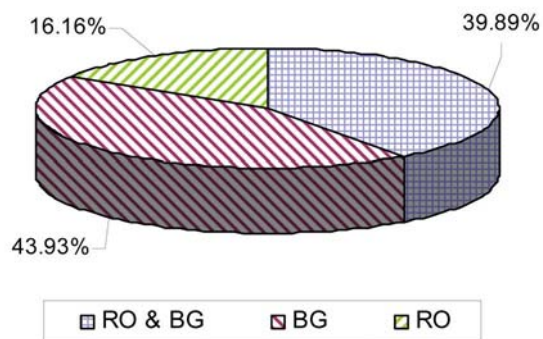
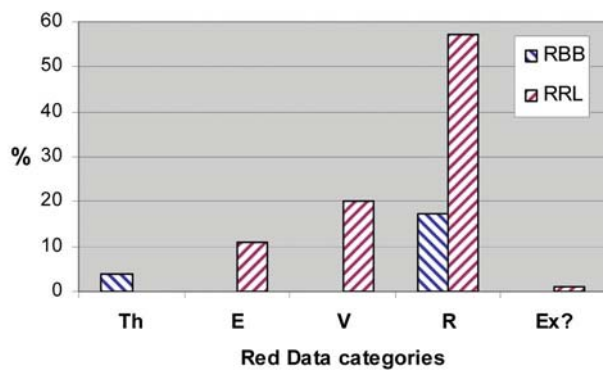


Fig. 2 – Distribution rate of rare and threatened plants in the coastal zone Cape Midia - Cape Kaliakra (RO - Romania; BG - Bulgaria)

Table 1. The number of rare and threatened taxa from studied area according to Romanian Red List (OLTEAN *et al.* 1994) and Red Book of Republic of Bulgaria (VELCHEV *et al.* 1984)

Red Data categories	Threatened	Endangered	Vulnerable	Rare	Possibly extinct	No. of taxa in studied area
Romanian Red List of the higher plants	–	22	40	113	2	177
Red Data Book of the Republic of Bulgaria	8	–	–	34	–	42

**Fig. 3.** Comparative percentages of rare and threatened taxa according to Romanian Red List (RRL) and Red Book of Republic of Bulgaria (RBB) (Th-threatened; E-endangered; V-vulnerable; R-rare; Ex?-possibly extinct)**Fig. 4.** *Minuartia bilykiana* Klokov in Yailata protected area

zone Cape Midia-Cape Kaliakra are indexed (Fig. 3). The threatened species include those vulnerable and endangered.

The percentage of floral rarities in the studied area, according to Romanian Red List is given in Fig. 3. - 22 endangered taxa (11.11%), 40 vulnerable (20.20%) and 113 rare (57.07%), while 2 taxa (1.01%) are present in Bulgaria but not were found in the Romanian seacoast over the past 15 years (*Ammophila arenaria* subsp. *arundinacea* and *Hypocoum procumbens*). They are possibly extinct in Romania as a consequence of human activities within sand dunes area. Two other species - *Calystegia soldanella* and *Corispermum canescens* cited from the studied area in the old botanical references (PANȚU 1925; PRODAN 1935, 1936) disappeared from Romanian seacoast before the mid 20th century.

Minuartia bilykiana (Fig. 4) is newly reported from studied area for the Bulgarian flora. This taxa was found in some points of the northern coastal area of Bulgaria (Kamen Bryag/Yailata, Bolata and Kaliakra Reserve), on the limestone plateaus and rocky seawall. It must be placed in one of the IUCN Red Data categories, probably critically endangered.

Among the rare and threatened plants inventoried in the coastal area between Cape Midia and Cape Kaliakra, one is Bulgarian endemic (*Silene caliacrae*), three are endemics for Dobrogea region (*Centaurea alba* subsp. *caliacrae*, *Centaurea varnensis*, *Jurinea tzar-ferdinandii*) and seven are Balkan endemics (*Erysimum bulgaricum*, *Astragalus spruneri*, *Chamaecytisus jankaea*, *Achillea clypeolata*, *Centaurea napulifera* subsp. *thirkei*, *Onosma heterophylla*, *Opopanax chironium* subsp. *bulgaricum*), according to Flora Europaea (TUTIN *et al.* 1964-1980) and other Romanian and Bulgarian papers (JORDANOV *et al.* 1964-1995; KITANOV & PENEV, 1980; KOZHUHAROV *et al.* 2001; ANASTASIU *et al.* 2001; SĂVULESCU *et al.* 1952-1976; PAȘCOVSCHI, 1938).

A number of 48 threatened taxa (24.24%) in the coastal area Cape Midia – Cape Kaliakra are included in the annexes of national laws or international directives and conventions (Fig. 5). Of the total floral rarities identified, 36 taxa (18.18%) are indexed in Annexes II, III and IV of the Law no. 77/2002 of Bulgarian Government, 4 taxa (2.02%) are reported in Annex I of the Bern Convention, one taxa (0.50%) is mentioned in Annex V of the Habitats Directive, while 7 species and subspecies (3.53%) are listed in annex 4B and 5A of the Emergency Ordinance no.

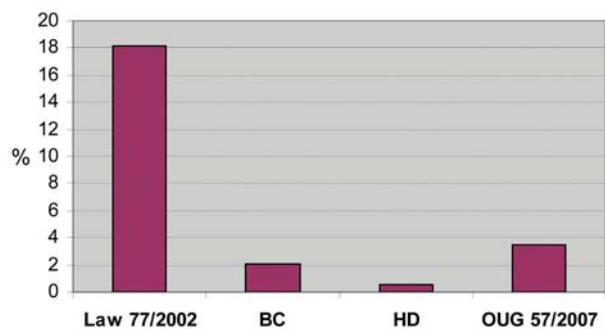


Fig. 5. Percentages of protected taxa by national laws and international conventions and directives (Law 77/2002 – Biodiversity Law of Bulgaria; BC-Bern Convention; HD – Habitats Directive; OUG 57/2007 – Emergency Ordinance of Romanian Government)

57/2007 of Romanian Government (OUG no. 57/2007).

The percentage of rare and threatened littoral taxa present in the Law no. 77/2002 of Bulgaria (18.18%) (Fig. 5) is much higher compared to the taxa within OUG 57/2007 (3.53%).

A lot of taxa within area of the coastal Dobrogea are mentioned in the Annexes of Law no. 77/2002 of Bulgaria: *Cladium mariscus*, *Elymus picnanthus* (syn. *Agropyron litorale*), *Eryngium maritimum*, *Jurinea tzarferdinandii*, *Matthiola odoratissima*, *Paeonia tenuifolia*, *Pancreatium maritimum*, *Salvinia natans*, *Verbascum purpureum* (Annex II and III), *Adiantum capillus-veneris*, *Aegilops geniculata*, *Alyssum borzaeanum*, *Argusia sibirica*, *Artemisia pedemontana*, *Astragalus cornutus*, *Astrodaucus littoralis*, *Chamaesyce peplis* (syn. *Euphorbia peplis*), *Convolvulus lineatus*, *Convolvulus persicus*, *Ephedra distachya*, *Galanthus elwesii*, *Goniolimon besseranum*, *Gypsophylla trichotoma*, *Hymenolobus procumbens*, *Limonium latifolium*, *Limonium meyeri*, *Opopanax chironium* subsp. *bulgaricum*, *Ruta graveolens*, *Scorzonera parviflora*, *Silene caliacrae*, *Scirpus littoralis*, *Scirpus triqueter*, *Stachys maritima*, *Vicia amphicarpa* (Annex III), *Paeonia peregrina*, *Ruscus aculeatus* (Annex IV).

The Annexes 4B and 5A of OUG 57/2007 of Romanian Government contain only 7 taxa from the studied area, five of them different by those of Biodiversity Law of Bulgaria: *Alyssum caliacrae*, *Centaurea varnensis*, *Elymus farctus* subsp. *bessarabicus*, *Leymus racemosus* subsp. *sabulosus*, *Silene thymifolia*, *Paeonia tenuifolia* and *Ruscus aculeatus*.

Some species present both in Romanian and Bulgarian coastal zone of Dobrogea are protected by international legislation: *Alyssum borzaeanum*, *Paeonia tenuifolia*, *Salvinia natans*, *Verbascum purpureum* (Bern Convention, Annex I), *Ruscus aculeatus* (Directive 92/43/EEC, Annex V).

Since the Red Data Book of Republic of Bulgaria and the Romanian Red List have only consultative and scientific value and haven't legislative importance, practically only

48 species and subspecies are protected by the national legislations of both countries. They are also protected by the international legislation regarding the protection and conservation of spontaneous flora.

CONCLUSIONS

851 native vascular taxa, among which 198 rare and threatened species, were identified in the coastal area between Cape Midia and Cape Kaliakra as a result of our researches.

The percentage of rare and threatened taxa in the Bulgarian northern coastal area is significantly higher than that of the taxa in the Romanian southern coastal area, due to the high diversity of habitats and the reduced anthropogenic influences.

Among the rare and threatened inventoried plants, 177 are registered in one of the IUCN Red Data categories used in the Romanian Red List of the higher plants, while 42 are indexed in the Red Book of the Republic of Bulgaria.

We report from studied area *Minuartia bilykiana* Klokov as new species for the Bulgarian flora.

Among the inventoried plants one is Bulgarian endemic, three taxa is endemic for Dobrogea region and seven taxa are Balkan endemics.

Only 49 taxa (24.74%) from the studied area are included in the annexes of national and international laws and consequently they are protected by legislative regulations.

Romania, like Bulgaria, needs a Law of Biodiversity that should regulate the status of a much larger number of rare and threatened littoral taxa.

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REZIME

Retke i ugrožene biljke priobalja Crnog mora između rta Midia (Rumunija) i rta Kaliakra (Bugarska)

Marius FĂGĂRAȘ, Paulina ANASTASIU, Negrean GAVRIL

U radu su dati podaci o ranjivim, ugroženim i vjerojatno izumrlim (u Rumuniji) vaskularnim biljkama koje su konstatovane u tresetičnim ekosistemima priobalja Dobrudže između rta Midia (Rumunija) i rta Kaliakra (Bugarska). Lista taksona data je u odnosu na IUCN kategorije iz Crvene liste viših biljaka Rumunije i Crvene kljige Bugarske. Naročita pažnja posvećena je vrstama koje su zakonom o zaštiti divlje flore zaštićene u Rumuniji i Bugarskoj. U radu se također navode lokalni endemiti (za Dobrudžu) i Balkanski endemiti koji su konstatovani u okviru istraživanog područja.

Ključne reči: retke biljke, ugrožene biljke, Crno more, obalska zona, Dobrudža.