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Reviewal paper

OCCURRENCE OF MARINE TURTLES (*CARETTA CARETTA* AND *CHELONIA MYDAS*) ALONG THE WEST BLACK SEA COAST

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Nankinov, D. M. (1995-98): *Occurrence of Marine turtles (Caretta caretta and Chelonia mydas) along the west Black Sea coast.*- Bulletin of Natural History Museum, Belgrade, *B49-50*, 7-14.

According to literature sources and fieldwork research the data about occurrence of Marine turtles, *Caretta caretta* and *Chelonia mydas*, along the West Black Sea coast have given.

INTRODUCTION

The report has a preliminary character and aims at making the experts pay attention to the little known facts of the penetration of Marine turtles into the Black Sea basin (Fig. 1). The report was stimulated by the occurrence of Marine turtles close to the Bulgarian coast, as well as the respective suggestions of migrations from the Mediterranean to the Black Sea. Some information, found in the old literature, could be interesting, even more sensational. Besides, in my opinion, the collection even of not so important data about a given rare animal species is one of the guaranties for its proper protection.

MATERIALS AND METHODS

The offered information has collected by means of processing little known literature sources, fieldwork research, inspections of natural history collection and data received from fellow zoologists.

RESULTS

Two species of Marine turtles have been observed near the West Black Sea coast up to now.

LOGGERHEAD TURTLE - *CARETTA CARETTA*

In 1585 the French noble FRANCOIS DE PAVIE, Baron de Fourquevaux started on a galley tour on the Black Sea from Konstantinopol [Istanbul] to Balcik (with stops at Kilios, Igneada, Sozopol and Varna). He wrote: "During that trip we often saw a large number of Marine turtles of an unusual size. They appeared above the water and were so big, bigger than a boat of ours, and almost touched the oars of our galley..." (C v e t k o v a 1975).

A Loggerhead turtle has found dead in 1922 to the North from the Romanian town of Constanta (L e p s i 1925 *ap.* V a l k a n o v 1949).

A second specimen of the same species has thrown, after a severe storm, onto the shore near the cape of Schable on the cold 29th March 1936. The turtle has been stuffed in the Zoological Museum in Bucharest (P o p o v i c i 1936).

At the end of November 1947 a fisherman caught by net a young Loggerhead turtle near Maslen Nos. It was sent to the Aquarium in the town Varna. On the carapace of the animal were found 5 specimens of *Chelonibia testudinaria* Ellis (*Cirripedia*) - inhabitants of the tropical and subtropical seas. The turtle lived till the beginning of March 1948 in a pool with sea water at a temperature of 10° C. It is conserved and kept in the collection of the Aquarium (V a l k a n o v 1949).

In August 1981 PETKO K. PETKOV, the zoologist (*voce viva*) spotted a specimen of that species while surfing in the sea between Kiten and Lozenec.

On 17th August 1987 between Ahtopol and Michurin at a distance of about 1-2 *km* off the shore, three Loggerhead turtles swimming northwards parallel to the shore were observed from a boat.

Besides the observations cited above specimensof Loggerhead turtles from Greece are kept at the National N H Museum in Sofia:

- female, Aegean Sea near Alexandroupolis, 1st May 1913
- skull, near Soros Bay on the sand, leg. I. Buresch, 2nd May 1913
- carapace, the mouth of the river Evros, 30th December 1918
- female laying an egg, the mouth of the river Evros, 1st May 1919

GREEN TURTLE - *CHELONIA MYDAS*

The Green turtle caught at 16th November 1898 by a fisherman from the town of Sozopol (K o v a t c h e v 1912) is kept at the National N H Museum in Sofia.

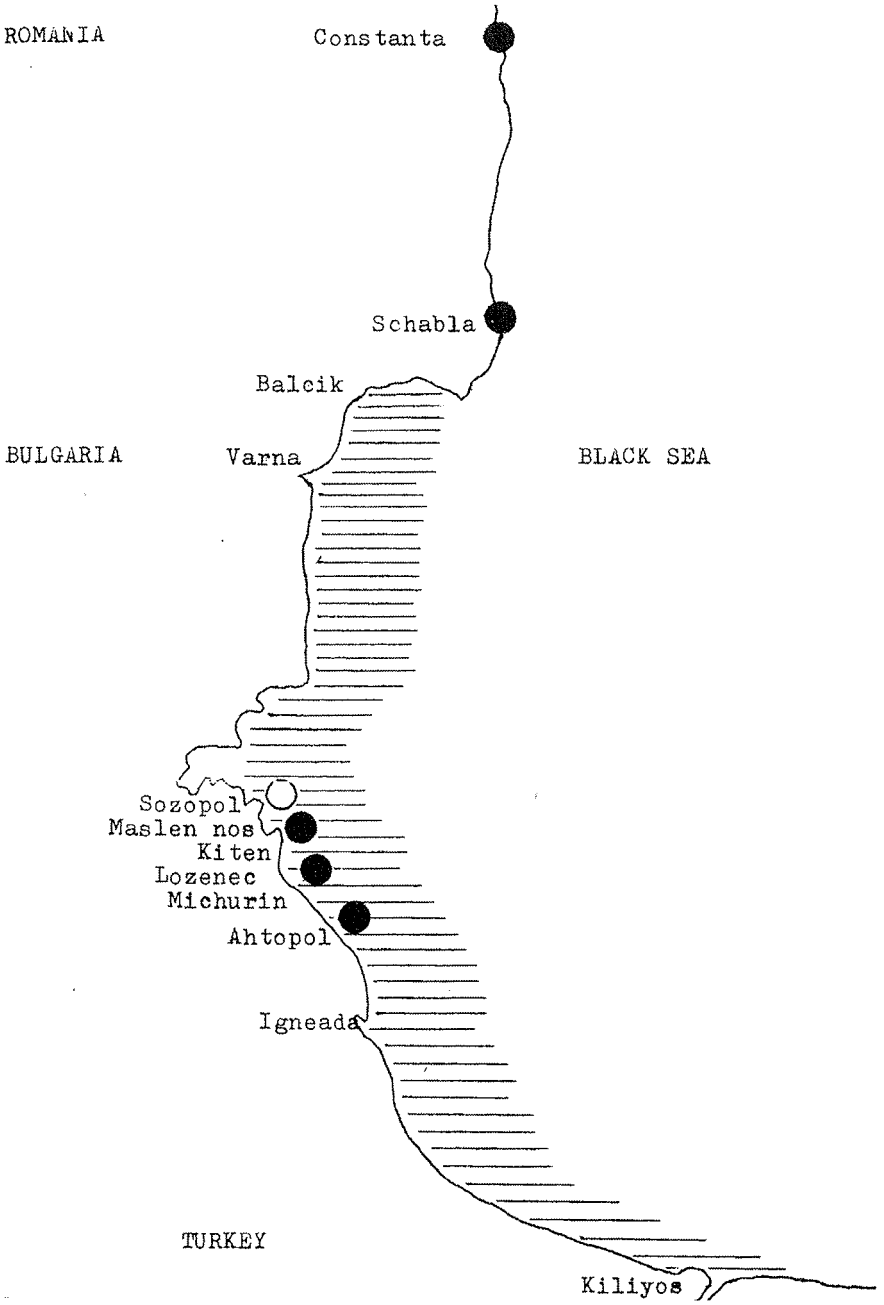

Fig. 1.- Observations of Marine turtle (*Caretta caretta* - black dot, *Chelonia mydas* - white dot) in the Black Sea: striped area - large number of *Caretta caretta* observed in 1585.

Posmatranja morskih kornjača (*Caretta caretta* - crne tačke, *Chelonia mydas* - bela tačka) u Crnom moru: linije - područje posmatranja velikog broja *Caretta caretta* 1585. godine.

Tab. 1. - *Biometric data of Marine turtles, caught in the Black Sea and their preparations (from the Aegean sea) kept in the National Museum of Natural History in Sofia.*

Biometrijski podaci morskih kornjača uhvaćenih u crnom moru i preparati (iz Egejskog mora) u Narodnom Prirodnjačkom muzeju u Sofiji.

Date	Location	Weig. *kg*	Heig. *cm*	CARAPACE *cm* lenght width	HEAD *cm* long thick		Authors
GREEN TURTLE, *CHELONIA MYDAS*							
16.11.1896	Sozopol Bulgaria	42.5	25	70	60	15	32	Buresh & Zonkov 1993
LOGGERHEAD TURTLE, *CARETTA CARETTA*							
1922	Constanta Romania	-	-	50	-	-	-	Valkanov 1949
29.03.1936	Schabla Bulgaria	-	-	69	-	-	-	Popovici 1936
00.11.1947	Maslen Nos, Bulg.	39	22	68	54	15	12	Valkanov 1949
01.05.1913	Alexandro-upolis Greece	-	-	55	50	-	-	Buresh & Zonkov 1993
30.12.1918	Mouth of river Evros Greece	-	-	85	72	-	-	Buresh & Zonkov 1993
01.05.1919	Mouth of river Evros Greece	-	-	75	68	-	-	Buresh & Zonkov 1993

DISCUSSION

The single record of the Green turtle probably represents the case of a migrant from the Atlantic Ocean throughout the East Mediterranean to the Black Sea.

Unlike it, Loggerhead turtle should be taken as an ancient inhabitant of the Black Sea. During the quaternary period the connection was a very broad with the Mediterranean sea and the Black Sea has had a very salty water and a typical Mediterranean fauna (M i s h e v & P o p o v 1978). I suppose that even at that time or earlier Loggerhead turtles inhabited the Black Sea. As C a r r (1984) wrote Marine turtles are ancient inhabitants of the Planet, they

have overlived the one-time migration routes and barriers, the present outlines of the continents, the present sea currents and temperature belts, but unfortunately their range has been hopelessly upset by man.

The strict purposefulness of Loggerhead turtles to the West Black Sea coast, and not to the more favorable for them south Anatolian coast, is not a chance phenomenon (a strong current passes from Bosphorus to the South Anatolian coast and the water temperature there is much higher). This shows that Marine turtles move along their very old, established thousands of years ago, migration route, which has probably led them to their nesting sites that used to be situated along the West Black Sea coast.

Loggerhead turtle lays eggs farther northwards than all the other five monotypical Marine turtle genera, and has been recorded even far beyond the polar circle, at Murmansk (D r o z d o v 1969). In North America it nests on the beaches of North Carolina and Virginia (C a r r 1984). The Black Sea is situated almost a the same geographical width. The climatic conditions during the summer months in the west aquatoria of the sea are favorable for the breeding of Laggerhead turtle: the air temperature reaches 40° *C* (average 22-24° *C*), the water temperature 30° *C* (average 17-20°), sunshine 55-56% of the light part of 24 hour period (up to 333 hours in July). In summer from Africa and Asia Minor flows in the hot air, which causes dry spells and high temperatures along the West Black Sea coast (D i m i t r o v 1978). All this shows that 400 years ago, when FRANCOIS DE PAVIE Baron de Fourquevaux visited the West Black Sea coast, there possibly were Loggerhead turtle bredding ssites along the vast beaches. According to this author, at that time the native did not use for food neither marine nor land turtles, which were numerous too (C v e t k o v a 1975). I suppose that in the past, in the Black Sea basin, Loggerhead turtles migrated seasonally. They come in from the Mediterranean Sea in summer, laid eggs, and towards autumn large numbers of them returned into the Mediterranean Sea and in this way avoided the cold Black Sea winter. The non-breeding individuals as well did similar seasonal for age migrations. The hatched youngs also migrated southwards to the warmer Mediterranean sea. The observations have been recorded in March, August and November up to now. As V a l k a n o v (1949) supposed the specimen found in March 1936, had probably wintered in the Black Sea.

The present penetrations of Loggerhead turtles from the Mediterranean to the Black Sea are not as rare and accidentall as they seem to us. Probably there is some regularity of occurance in the one-time Black Sea habitats that can be felt only by purposeful and continuous research. The specimens found in the Black Sea are non-breeding representatives of the population living in the Aegean Sea. Besides two migration routes of aegean population with southeast and southwest direction (K a s p a r e k 1991) a third route trought the Dardanelles, Marmara Sea and Bosphorus, to the Black Sea basin (Fig. 2) should be added.

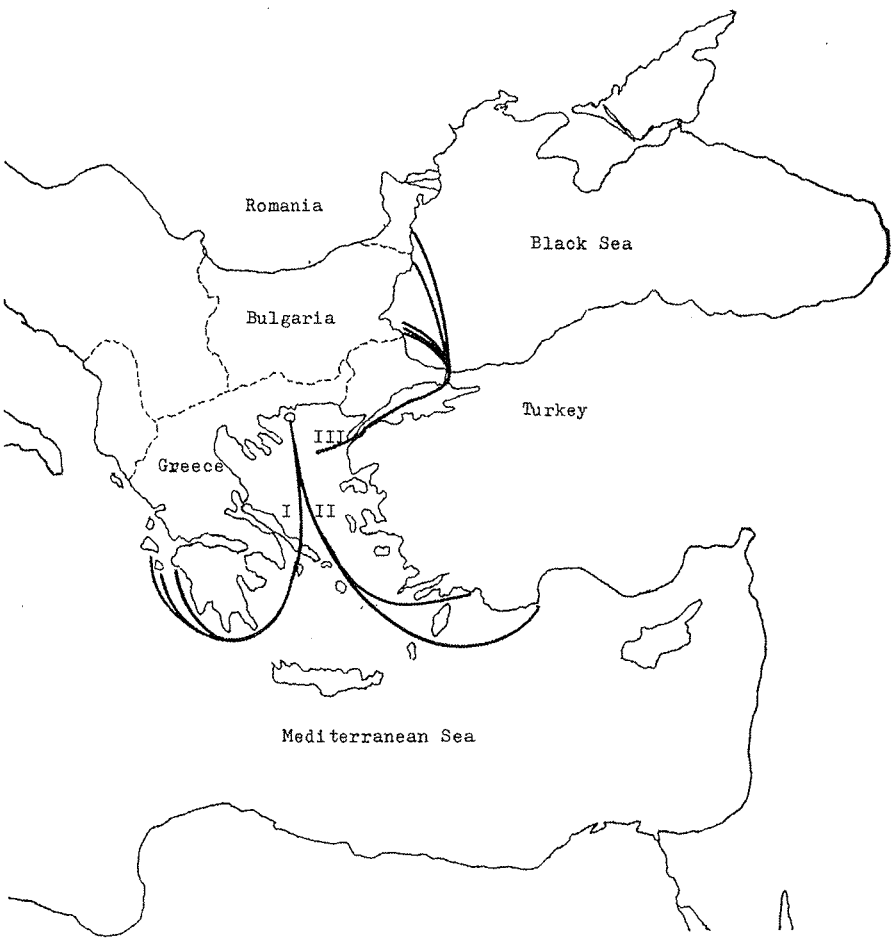

Fig. 2.- Migrations of non-breeding Loggerhead turtle (*Caretta caretta*) of the Aegean populations: I and II - after K a s p a r e k 1991, III - penetration from the Aegean to the Black Sea.

Migracija glavatih kornjača (*Caretta caretta*), koje ne polažu jaja, iz Egejske populacije: I i II - po K a s p a r e k u 1991, III - prodor iz Egejskog u Crno more.

It is very difficult to point out the exact causes for the Loggerhead turtles abandoning the Black Sea. There has probably been negative influence of various factors as for example the growing number of towns and villages and human density along the coastline. By their economic activity or even their presence, people have played the decisive negative part for the strong reduction of the range and for the disappearance of Marine turtles from many regions of the World, including the Black Sea. It may well be that the eggs of Marine turtles were used as a food by the humans. We also suppose pressure on the part of a dense population of land and feathered predators: wild boars (*Sus scrofa*), jackals (*Canus aureus*), dogs, cats and others. Over the west Black Sea coast passes one of the most mass migration routes of birds of prey (*Falconiformes*) in Europe, some of which have also destroyed a part of the young turtles. There have probably been many other reasons as well, that have helped for the destruction of Loggerhead turtles Black Sea population.

Despite the scanty information about occurence of Loggerhead turtles in the Bulgarian sector of the Black Sea, it is necessary that this species be protected by the Law of protection of Nature, and be included in the new issue of the Red Data Book of Bulgaria. That will guarantee to some extent the conservation of Marine turtles in the future and will be some stimulus for their research and preservation.

Future detailed investigations in Bulgaria (fieldwork, questionnaire, literature) can give an additional, new and interesting information about one--time and present occurence of Marine turtles along the West Black Sea coast. They will answer to the question about the real causes and situation that have led to the penetration of Marine turtles into the Black Sea basin, and will outline the region where they could be expected in the future. These investigations, together with an attempt to make a detailed bibliography about Marine turtles in the Black Sea, will no doubt enrich our knowledge of these rare animals and will help us protect them better.

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POJAVA MORSKIH KORNJAČA (*CARETTA CARETTA* I *CHELONIA MYDAS*) DUŽ ZAPADNE OBALE CRNOG MORA

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I z v o d

Svrha ovog preliminarnog izveštaja je da usmeri pažnju stručnjaka prema malo poznatim podacima o prodiranju morskih kornjača u Crnomorski bazen. Pre oko 400 godina, u blizini zapadne obale Crnog mora, između Istambula i Balcika, mornari su viđali, "često i u velikom broju morske kornjače neobičnih veličina... koje su skoro dodirivale vesla galije...". Tokom poslednjih sto godina glavata kornjača (*Caretta caretta*) je viđena 5 puta: Konstanca 1922, Šabla 29. 03. 1936., Maslen Nos 09. 1947., između Kitena i Lozaneca 08. 1981., između Ahtopia i Mičurina 17. 08. 1987. U blizini Sozopola 16. 11. 1898. viđena je zelena kornjača (*Caretta mydas*), koja je migrant iz dalekog Atlantskog okeana. Međutim, glavata kornjača se može smatrati starim stanovnikom Crnomorskog bazena, verovatno još iz perioda kvartara. Sadašnja orijentacija glavate kornjače prema zapadnim obalama Crnog Mora nije slučajna. Životinje se u stvari kreću vrlo starim migratornim putem, koji ih je verovatno nekada vodio do mesta za polaganje jaja. Buduća detaljna istraživanja na terenu, kao i pregled literature, mogu dati odgovor na mnoga pitanja povezana sa prodorom morskih kornjača u Crnomorski bazen.

UDK: 623.454.8:582.28
Originalni naučni članak

KONTAMINACIJA GLJIVA RADIONUKLIDIMA

M. MARTIĆ i NADEŽDA AJDAČIĆ

Institut za opštu i fizičku hemiju, Beograd, Jugoslavija

Martić, M., Ajdačić Nadežda (1995-98): *Contamination of fungi by radionuclides.* - Bulletin of Natural History Museum, Belgrade, *B49-50*, 15-22.

The paper offers complete data on over thirty quantitatively determined radionuclides in the gamma-ray spectrum of fallout samples during the first few days of May 1986, as well as the results of measurements of their total beta radioactivity as the source of general biosphere contamination. Also presented are the results of gamma spectrometric analyses of the samples of edible mushrooms gathered for export in the area of central Serbia after the Chernobyl accident. The data on ^{132}Te, ^{131}J, ^{134}Cs, and ^{137}Cs content in the samples of *Boletus edulis*, composite samples of *Boletus* sp. and *Cantharellus* sp. are also given.

UVOD

U vreme primene nuklearnog naoružanja (Hirošima, Nagasaki...), u vreme vazdušnih nuklearnih proba (1945-1980) (UNSCEAR 1988) ili kada se dogode kvarovi velikih razmera na nuklearnim objektima (Čeljabinsk, Ostrvo tri milje, Černobilj...), primarno dolazi do kontaminacije atmosferskog sloja radionuklidima fisionog porekla. Fisioni readionuklidi su radioaktivna jezgra hemijskih elemenata koji nastaju pri fisiji, odnosno lančanoj nuklearnoj reakciji cepanja jezgra ^{235}U na dva lakša fragmenta, uz oslobađanje velike količine toplotne energije.

Zbog velike pokretljivosti vazdušnih masa, kontaminacija se prenosi relativno brzo na široka prostranstva oko mesta događaja. Pod dejstvom gravitacije radioaktivna prašina se spušta ka tlu. Dospevši u oblast delovanja atmosferskih strujanja, srazmerno intenzitetu primarnog događaja i zavisno od

količine lokalnih padavina, dolazi u većoj ili manjoj meri do opšte kontaminacije biosfere. Od navedenih parametara zavisi i koliko će dugo da traje kontaminacija biosfere na posmatranom lokalitetu - od nekoliko dana do više godina. Iz tog razloga su od izuzetne važnosti kontinuirana merenja radioaktivnosti 24-časovnih uzoraka padavina i slobodno nataložene prašine (*fallout*), na osnovu kojih se opaža i najmanja promena u odnosu na osnovnu radioaktivnost (*fon*), koja potiče od prirodno radioaktivnih materijala prisutnih u našem okruženju. Na našim prostorima, ona se u normalnim uslovima, za totalnu beta radioaktivnost nalazi u opsegu 0,04 do 5,0 Bq/m^2. U slučaju radioaktivnosti koja je iznad gornje granice ovog opsega, smatra se da je vazdušni sloj kontaminiran. Zavisno od nivoa povišenja radioaktivnosti i njegovog trajanja, pristupa se širem obimu kontrole i gama spektrometrijskom identifikovanju uzročnika kontaminacije atmosfere. Na osnovu dobijenih podataka trebalo bi da se preduzmu mere zaštite od jonizujućeg zračenja. Nažalost, ova dugogodišnja praksa je kod nas definitivno ukinuta najnovijom zakonskom regulativom (Službeni list SRJ 1997).

U ovom radu je izložen deo numeričkih podataka o svakodnevnom gamaspektrometrijskom merenju uzoraka padavina i slobodno nataložene prašine, sa kontrolne tačke u Institutu za nuklearne nauke u Vinči, u periodu posle havarije nuklearnog reaktora u Černobilju (M a r t i ć 1991). Takođe, izloženi su i rezultati merenja kontaminacije jestivih gljiva, koje su nam dostavljane na kontrolu radi atestiranja za izvoz.

REZULTATI I DISKUSIJA

Posle eksplozije i katastrofalnog požara koji su se dogodili 26. aprila 1986. godine na IV bloku nuklearne elektrane u Černobilju (M e d v e d e v 1989), prve promene radioaktivnosti padavina kod nas, registrovane su već 28. aprila. Narednih dana ispoljio se nagli porast, tako da je već od 1. do 2. maja, u 24-časovnom uzorku padavina, bio izmeren nivo ukupne gama radioaktivnosti preko 10 000 000 puta veći u odnosu na dane koji su prethodili ovom događaju (A j d a č i ć & M a r t i ć 1986). Da bi se mogao sagledati značaj nastalih promena navodimo da je u prethodnom periodu (dokumentacija u našoj laboratoriji se vodi od 1958.) maksimalna vrednost konntaminacije atmosfere zabeležena 12.04.1963. (1094±48 Bq/m^2) i 19.08.1963. (768±7 Bq/m^2).

Na Tabeli 1. prikazani su svi podaci za prva četiri dana meseca maja 1986. godine, relevantni za procenu radijacionog rizika, budući da je kontaminacija atmosfere tih dana u najvećoj meri doprinela kontaminaciji tla, voda, flore i faune, a preko ishrane i ljudi (za koje je, tih dana, najdominantniji put unosa radiokontaminanata u organizam bio inhalacioni put). Visokoj opštoj kontaminaciji biosfere, doprinele su i obilne padavine na dan 1. maja posle podne.

Relevantnost podataka koje smo, počev od 2. maja, svakodnevno dostavljali državnim institucijama, po službenoj dužnosti (A j d a č i ć 1986),

Tab. 1. - *Rezultati gama-spektrometrijske analize, ukupne gama-aktivnosti, totalne beta-aktivnosti i količine padavina, 24-časovnih uzoraka padavina i slobodno nataložene prašine, sakupljanih u Vinči tokom maja meseca 1986. godine*

Results of gamma-spectrometric analysis, the total gamma-activity, the total beta--activity, and the amount of fallout, 24-hour fallout samples gathered in Vinča during May 1986.

	01.05.	02.05.	03.05.	04.05.
IZOTOP / ISOTOPE	A K T I V N O S T / A C T I V I T Y			
	Bq/m^2	kBq/m^2	Bq/m^2	Bq/m^2
^{7}Be	66 ± 47	4 ± 2	90 ± 90	21 ± 16
^{40}K	«0,2	0,63 ± 0,08	«0,2	«0,2
^{51}Cr	48 ± 39	13 ± 5	484 ± 246	+
^{54}Mn	2 ± 2	0,13 ± 0,05	31 ± 13	1 ± 1
^{59}Fe	20 ± 20	2,3 ± 0,9	15 ± 15	4 ± 4
^{60}Co	«0,02	0,34 ± 0,06	105 ± 25	7 ± 2
^{65}Zn	99 ± 23	0,13 ± 0,09	39 ± 19	61 ± 9
^{72}Zn, ^{72}Ga	7 ± 4	2 ± 1	29 ± 12	1 ± 1
^{95}Zr	10 ± 8	14,6 ± 0,5	569 ± 53	110 ± 9
^{95}Nb	13 ± 6	21 ± 2	529 ± 32	126 ± 8
^{99}Mo	20 ± 4	51 ± 1	320 ± 26	1,4± 0,8
^{103}Ru	49 ± 10	224 ± 1	2032 ± 51	297 ± 11
^{106}Ru	107 ± 62	56 ± 2	1704 ± 230	612 ± 150
^{110m}Ag	90 ± 12	1,6 ± 0,1	+	88 ± 8
^{125}Sb	38 ± 31	5,1 ± 0,6	75 ± 75	18 ± 16
^{126}Sb	2 ± 2	14,6 ± 0,9	6 ± 6	3 ± 3
^{132}Te	308 ± 14	790 ± 4	5333 ± 59	484 ± 9
^{131}J	435 ± 20	564 ± 5	3324 ± 56	499 ± 11
^{132}J	343 ± 32	739 ± 7	6023 ± 107	535 ± 16
^{134}Cs	51 ± 10	62 ± 3	469 ± 30	52 ± 6
^{137}Cs	111 ± 14	128 ± 3	860 ± 40	97 ± 7
^{140}Ba, ^{140}La	141 ± 20	210 ± 5	1789 ± 72	264 ± 14
^{141}Ce	2 ± 2	23,7 ± 0,7	652 ± 41	113 ± 5
^{144}Ce	4 ± 4	16,5 ± 0,5	349 ± 105	96 ± 16
^{226}Ra, ^{214}Bi	+	$<1,8*10^{-3}$	+	174 ± 25
^{228}Ac	13 ± 9	0,6 ± 0,3	67 ± 55	46 ± 15
^{234}Th	«0,04	0,5 ± 0,4	755 ± 165	127 ± 42
^{235}U	0,6 ± 0,6	0,15 ± 0,07	32 ± 18	11 ± 5
UKUP. GAMA Total gamma	1963 ± 251	14155 ± $18*10^2$	25571 ± $32*10^2$	3105 ± 398
UKUP. BETA Total beta	168 ± 3	od 590 do $28*10^2$ from to	1423 ± 110	280 ± 8
PADAVINE (mm) Precipitation	1,2	63,5	-	-

« ispod granice detektabilnosti / bellow the detectability level

od do opseg vrednosti dobijen ekstrapolacijom / from to value range obtained by extrapolation

Tab. 2. - *Radiokontaminacija vrganja (Boletus edulis), sakupljanih na tlu Srbije u periodu maj-juli 1986. godine*

Radiocontamination of the Boletus mushroom (*Boletus edulis*), collected in Serbia in the period May-June 1986.

DATUM I MESTO UZORKOVANJA / DATE AND PLACE OF SAMPLING	RADIONUKLID [*Bq/kg*] SVEŽEG UZORKA / RADIONUCLIDE [*Bq/kg*] OF FRESH SAMPLE				
	^{132}Te	^{131}J	^{103}Ru	^{134}Cs	^{137}Cs
Jastrebac, 07.05.	230 ± 20	760 ± 40	400 ± 30	98 ± 18	150 ± 20
Jastrebac, 11.0.5.	21 ± 3	78 ± 5	35 ± 3	9 ± 2	17 ± 3
Toljevac-Juhor,14.05.	9 ± 3	6,1 ± 0,9	13 ± 3	1,4 ± 0,9	3 ± 1
Bijelo Polje 10.-25.05. osušen uzorak / dried sample	i. g. d.+	15 ± 5++	105 ± 10	68 ± 9	147 ± 13
Blace, Brus, Kraljevo 25.05.-10.06. uzorak iz salamure / sample from brine	i. g. d.	i. g. d.	40 ± 4	47 ± 5	93 ± 7
Kraljevo okolina/environs 19.06 uzorak iz salam. kuvan / sample from brine, cooked	i. g. d.	i. g. d.	6 ± 1	7 ± 2	40 ± 10
Golubac, 05.07	i. g. d.	1,1 ± 0,8	8 ± 2	7 ± 2	24 ± 3

+ ispod granice detektabilnosti / bellow the detectability level

++ radioaktivnost [*Bq/kg*] suvog uzorka / radioactivity [*Bq/kg*] of dry sample

kao i naše pretpostavke da je većina zemalja Evrope približno jednako, visoko kontaminirana, potvrđeni su saglasnošću naših proračuna izotopskih odnosa pojedinih radionuklida (UNESCAR 1988, M a r t i ć 1991) sa kasnije objavljenim svetskim podacima. Ovo se odnosi i na faktore prenosa radionuklida ^{131}J i ^{137}Cs iz atmosferskog sloja u prehrambene artikle.

Uzorci jestivih gljiva, dostavljani po nalogu Republičkog komiteta za rad, zdravlje i soc. politiku radi izdavanja atesta o upotrebljivosti u konzumne svrhe, a po preporukama Evropske zajednice radi izvoza, podvrgnuti su gama-spektrometrijskoj analizi. Sva gamaspektrometrijska merenja obavljana su pomoću *HP (Ge)* poluprovodničkog detektora gama zračenja i 4096-kanalnog analizatora *ND* 2400. Rezultati su dati na tabelama 2. i 3. Kako uzorci nisu sakupljani u istraživačke svrhe, mnogi parametri nam nisu bili poznati, a naročito

Tab. 3. - *Radiokontaminacija lisičarki (Cantharellus sp.) sakupljanih na tlu Srbije tokom perioda maj -juni 1986.g.*
Radiocontamination of cantharelles (*Cantharellus* sp.) collected in Serbia in the period May-June 1986.

MESTO I VREME UZORKOVANJA PLACE AND TIME OF SAMPLING	RADIONUKLID [*Bq/kg*] SVEŽEG UZORKA RADIONUCLIDE [*Bq/kg*] OF FRESH SAMPLE			
	^{131}J	^{103}Ru	^{134}Cs	^{137}Cs
Čačak, Svetozarevo; okolina/environs 09.05.	6 ± 2	26 ± 3	32 ± 4	84 ± 6
Svetozarevo, Čačak 09.0.5.	7 ± 2	40 ± 4	47 ± 5	93 ± 7
Čačak, okolina/environs 05.05.	14 ± 3	n. o.+	35 ± 4	69 ± 5
Čačak, Svetozarevo; okolina/environs 07.06.	11 ± 4	n. o.	16 ± 4	55 ± 8
Čačak; okolina/environs 09.06.	9 ± 2	13 ± 2	29 ± 3	59 ± 4
Čačak, Svetozarevo; okolina/environs 12.06.	5 ± 3	30 ± 3	36 ± 4	78 ± 6
Čačak; okolina/environs 14.06.	11 ± 3	20 ± 2	15 ± 3	20 ± 3
Čačak; okolina/environs 17.06.	7 ± 2	22 ± 3	17 ± 4	40 ± 5

+ nije određivano / not estimated

oni koji se odnose na lokalitete sakupljanja. Ovo u velikoj meri predstavlja ograničavajući faktor pri interpretaciji rezultata analiza.

Prikupljene količine, po kontingentima, od kojih smo za analizu dobijali alikvote od po 2-3 *kg*, iznosile su od 420 *kg* do 7000 *kg*. U ovoj činjenici takođe leži nepoznanica: koliko je uzorak uzet za analizu, reprezentativan u odnosu na ukupnu količinu. Takođe, navod lokacije sakupljanja gljiva (u nalogu za rad) ukazuje na neizvesnost porekla nama dostavljenog alikvota (Čačak - Svetozarevo), naročito ako se zna da je meteorološka situacija tih dana, dovela do razlika u nivoima kontaminacije tla i za red veličine, na rastojanjima od samo nekoliko kilometara (A j d a č i ć & M a r t i ć 1997). Ipak, ovo su unikatni rezultati analiza ove biološke vrste iz tog vremena, pa ćemo pokušati da iz raspoloživog materijala izvedemo zaključke u meri koliko nam ti rezultati kazuju.

Imajući u vidu navedena ograničenja, poređenjem vrednosti radioaktivnosti fisionih produkata, u ove dve analizirane vrste, zapaža se da *Boletus edulis*, kao i kompozitni uzorci vrganjevki, izrazitije prate nivo kontaminacije okruženja, što zaključujemo po većim fluktuacijama radioaktivnosti uzoraka sa istih lokaliteta, sakupljenih u različitim terminima. Za razliku od njih, *Cantharellus* sp., kao da imaju prag zasićenja, preko koga ne akumuliraju radionuklide. Čak je neobjašnjivo niska akumulacija kratkoživećeg, a u visokim koncentracijama prisutnog u prvoj polovini maja meseca, radionuklida ^{131}J. Uočljiv je i konstantan sadržaj radionuklida cezijuma (unutar jednog reda veličine), iako je ova vrsta gljiva uzorkovana sa vrlo široke teritorije. Ovaj zaključak, naravno, is

kazujemo sa velikom rezervom, ali sugeriramo laboratorijski eksperiment uzgoja ovih vrsta gljiva na kontaminiranom tlu. Ako bi rezultati eksperimenta potvrdili selektivnost u akumulaciji radionuklida kod vrste *Cantharellus*, to bi svakako bio ključ za objašnjenje nekih specifičnih fizioloških i biohemijskih procesa. Takvo saznanje, sa stanovišta njihove radijacionohigijenske ispravnosti u akcidentalnim uslovima, u odnosu na druge prehrambene proizvode, imalo bi poseban značaj.

Mnogo godina kasnije, merenja obavljena tokom 1990. i 1991. u Ukrajini (W a s s e r & G r o d z i n s k a j a 1993), potvrdila su relevantnost zaključaka u odnosu na *Boletus* sp. kao i zaključak o različitosti nivoa akumulacije radionuklida u analiziranim vrstama jestivih gljiva. Naše nalaze za *Cantharellus* sp. samo je delimično moguće poreditì sa podacima pomenutih ukrajinskih autora, budući da su oni analizirali samo sadržaj radioizotopa cezijuma. Tako, naše rezerve u pogledu iskazanih zaključaka ostaju, kao i potreba ciljanih, laboratorijskih istraživanja.

Iz izloženih rezultata merenja (Tab. 1) očigledno je da tehnologijom prerade, gljive samo u izvesnoj meri bivaju dekontaminirane. Naime odlaganjem u prerađenom stanju, omogućava se prirodna fizička dezintegracija kratkoživećih radionuklida, a kuvanjem i odbacivanjem tečnosti pre dalje pripreme (konzerviranje, siliranje), umanjuje se sadržaj ostalih radiokontaminanata. Ova mera je efikasna samo u slučaju kada početna radioaktivnost svežih gljiva ne premašuje znatnije maksimalnu dozvoljenu koncentraciju, koja je inače predviđena zakonskim propisima.

Posle nesreće u Černobilju priroda je na ukupnom tlu Evrope pa i kod nas, postala jedna džinovska laboratorija. Konstatujemo sa žaljenjem da je učinjen veliki propust što se sa istraživačkog stanovišta tada gljivama nije poklonila veća pažnja. U uslovima radiokontaminacije, sigurno bi se došlo do dragocenih saznanja o njima kao konstituentima ekosistema u interakciji sa okruženjem. Zahvaljujući kratakom vegetacionom periodu, u nekim specifičnim regijama, gljive mogu da predstavljaju dragocene bioindikatore pri praćenju dinamike radiokontaminacije životne sredine i migracije radiokontaminanata.

Neka ovaj rad bude podsticaj za buduća istraživanja gljiva, kao značajne karike u lancu života na Zemlji, osuđenoj na trajanje u stalnoj pretnji događanjem nuklearnih nesreća.

Na kraju može da se postavi pitanje: zašto i posle deset godina govoriti o havariji u Černobilju? Odgovor može da se nađe u radu M o r g a n a (1979) publikovanom mnogo pre černobiljske katastrofe, u kome se na osnovu višedecenijskog rada, nalaze sublimovana iskustva o posledicama delovanja jonizujućeg zračenja na morbiditet i mortalitet ljudske populacije. Iskustveni podaci ukazuju na porast mortaliteta prouzrokovan oboljenjima od raka u periodu 10-15 godina nakon akcidenta. A černobiljska katastrofa je najveća od svih koje su se dogodile u savremenoj istoriji čovečanstva.

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CONTAMINATION OF FUNGI BY RADIONUCLIDES

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S u m m a r y

Contamination of atmospheric layer causes general contamination of biosphere. This paper first presents numerical data on the content of over thirty radionuclides found in fallout samples during the first four days of May 1986, when contamination of atmosphere, after the accident at the Chernobyl nuclear power station, reached the maximum level in our country. Also given are the results of gamma-ray spectrometric measurements of radioactivity of edible mushrooms (*Boletus edulis*, *Boletus* sp., and *Cantharellus* sp.), sent for control to be attested for export in the period May - June 1986.

It was inferred from the contents of ^{132}Te, ^{131}J, ^{134}Cs, and ^{137}Cs in the samples analysed that *Boletus edulis* as well as composite samples of *Boletaceae* (*Boletus* sp.) followed the contamination level of environment more closely than *Cantharellus* sp., which did not accumulate radionuclides

after a certain level, and particularly striking was a low accumulation of the short-lived ^{131}J, then present in the atmosphere in great concentrations.

The paper lays special emphasis on the need for technological treatment of edible mushrooms in the conditions of high contamination of biosphere (cooking, ensilaging, preserving), so as to improve its radiation hygienic quality when the level of contamination of edible mushrooms exceeds the maximum allowed level prescribed by the Law.

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Original scientific paper

VARIABILITY OF ANATOMICAL STRUCTURE OF TWO-YEAR OLD NEEDLES OF *PICEA OMORIKA* (PANČIĆ) PURKYNE IN TEN HALF-SIB FAMILIES

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Vilotić Dragica, Isajev, V. (1995-98): *Variability of Anatomical Structure of two-year-old Needles of Picea omorika (Pančić) Purkyne, in Ten Half-Sib Families.* - Bulletin of Natural History Museum, Belgrade, *B49-50*, 23-32.

The paper presents the results of the analysis of anatomical structure variability in *Picea omorika* (Serbian spruce) needles. Two-year-old needles collected in a generative seed orchard, from eight-year-old plants of ten Serbian spruce half-sib families, have been analyzed. In microscopic preparations obtained by the paraffin method, two resin canals have been recorded, in eight families, and three canals in two families. There is only one vascular bundle, circular in T. S. Those results increase our knowledge of the morphological variability of Serbian spruce assimilatory organs, and thus provide a basis for the selection of genotypes more resistant to harmful air pollutants.

INTRODUCTION

The increasingly significant issue of forest dying an increased interest in the study of species with significant spontaneous resistance. According to H o r n v e d t & R o b a k (1975), Serbian spruce is higly resistant to dying, especially in urban conditions and environments with unfavourable ecological feature. Not knowing the concrete causes, and also the mechanisms of species defence, leads to different methodological approaches in the study of this problem. The knowledge of variability of needle structure, in addition to its taxonomic significance, can contribute to our knowledge of the nature of the

causes of Serbian spruce resistance to harmful agents in the atmosphere. The rich Serbian spruce gene pool and its high physiological and morphological variability have been conditioned by a high degree of heterozygosity of the species, which is one of the bases for a quicker and a comprehensive reconstruction of the species, in the direction of the synthesis of cultivared taxa the desired properties.

MATERIAL AND METHODS

The study of anatomic characteristics of *Picea omorika*, Serbian spruce, has so far been carried out on the level of the species (P l a v š i ć 1933, 1936, 1938, B u l a r d 1948, V a s i l j e v i ć 1974), however the directed and urgent utilization of the genetic potential requires the work on the level of the individual, half sibs and full sibs.

Plant material for the microscopic analysis of needles originated from a Serbian spruce generative seed orchard, eight years old and established in West Serbia, Yugoslavia (I s a j e v *et al.* 1990). The samples were collected from five seedlings from ten halb-sib families planted in blocks. Micro-site conditions in the stand are uniform. Two-year-old branches were taken at the third node from the terminal shoot of the seedling, north-west exposition. From each seedling 25 needles were taken for the analysis, and were marked for identification pruposes.

The needles were kept in a fixative for seven days, and then they were treated by the paraffin method (C h a m b e r l a i n 1921) to produce permanent microscopic preparations.

On these permanent preparations of needle cross sections, the diametars (parallel to loriger axis of ellipse of T. S.) of resin canals and vascular bundles were measured using. An ocular micrometer and multipliying by a coefficient of 11.5 in order to obtain the readings in.

The following statistical parameters were calculated for the analyzed characters: mean ($\bar{X}$), standard deviations (S), variation coefficeient as well as mean errors of these statistical indicators (S_x S_s S_v). The statistical justification of mean values was determined by t - test by the formula:

$$t = X_1\text{-}X_2/\sqrt{S^2_{x_1} + S^2_{x_2}}$$

When t amounted to 2.00 and more, it was considered that the difference was controlled mainly by internal factors, or it was the consequence of the

treatment, and when it was less then 2.00, that it was predominantly the effect of external factors, i. e. that it belongs to the category of modifications.

RESULTS AND DISCUSSION

By the analysis of the anatomical characteristics of the needles, the internal structure of the assimilatory organs of Serbian spruce was investigated in detail, and by the application of statistical indicators, the variability of resin canal and vascular bundle diameters was studied. The results will be shown separately as similar investigations at the level of half-sib families have not been reported in the literature.

GENERAL DESCRIPTION OF NEEDLE CROSS SECTION

The needle otuline in cross section is elliptical with a convex upper surface and a slightly concave lower surface, (Fig. 1). Under the cuticle, there are two rows of epidermal cells. Parenchymatous cells are in several layers, and the only vascular bundle is more or less in the central part of the section. The present of only one vascular bundle points to the adaptation of the species to more mesophytic life conditions, and confirms that Serbian spruce has much

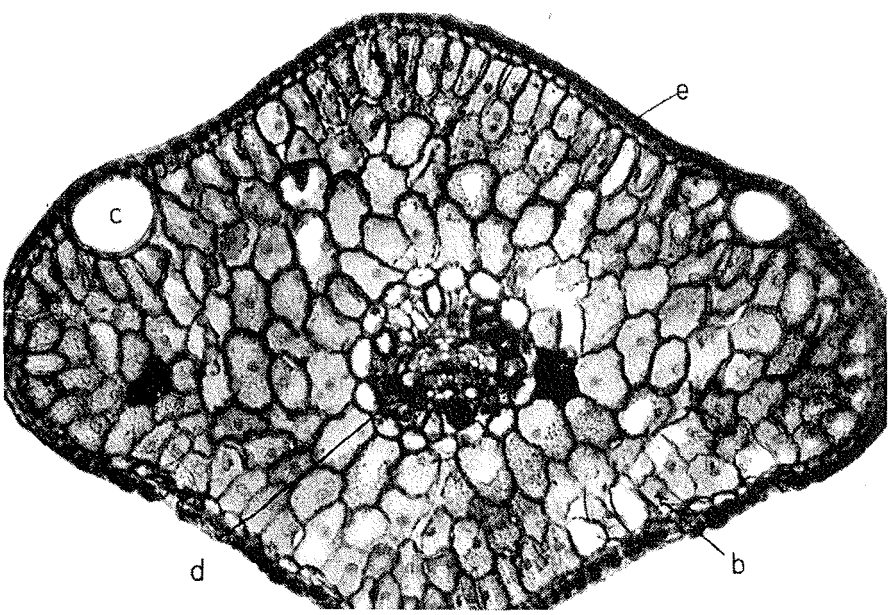

Fig. 1.- *Picea omorika*: two-year-old needles - anatomical structure of cross sections: e) epidermis, B) chlorenchyma, c) resin canal, d) vascular bundle.

Picea omorika:dvogodišnje iglice - anatomska struktura na poprečnom preseku.

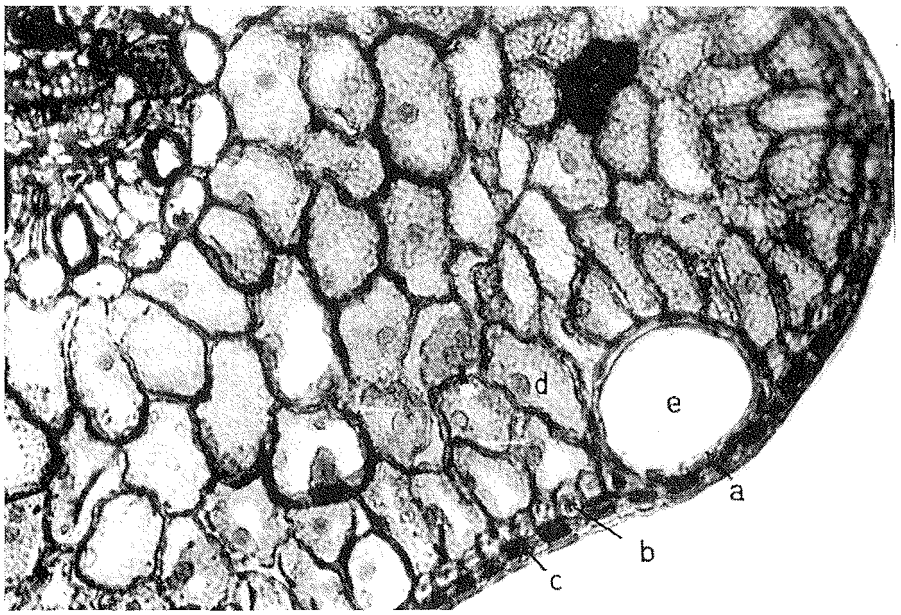

Fig. 2.- Resin canal and tissues: a) epithelial cells, b) hypodermis, c) epidermis, d) chlorenchyma, e) resin canal.

Smoni kanali i tkiva.

wider ecological range of distribution than might be considered by the size of its range (T u c o v i ć & I s a j e v 1983). An cercular in shape endodermis of one layer of cells surrounds the vascular bundle, wich is always cercular in shape. There are 2 to 3 resin canals. The number and morfological characteristics of the resin canals are of taxonomic significance, and their presence increases durability, resistance to decay, as well as the percentage of moisture absorbtion. A detail of needle cross section with a resin canal is shown in (Fig. 2). The position of the resin canals is symmetrical, their diametar ranges between 230 and 69 μm, extreme values, whereas the avarage of the needles of all families is 119,6 μm (Tab. 1).

The presence of the third resin canals has been identified in two out of ten analyzed families. Twelve preparations, per each family, were selected by a random sampling method, and it has been recorded that the proportion of needles with three resin canals in family (1) amounts to 75%, and in family (9) it is 50%. The third resin canal always adjoins one of the lateral ones, and its diameter is always smaller then that of the adjoining canal, (Fig. 3). The third resin canal is an indicator of an extreme form of variability in the anatomical structure of Serbian spruce needles, and it is significant for taxonomic classification. As, in the available literature, the above findigs in the investigations of Serbian spruce needles have not been found, our results can be applied in future analyses of physiological processes in Serbian spruce needles, especially those treating the transport of liquids and gaseous substances.

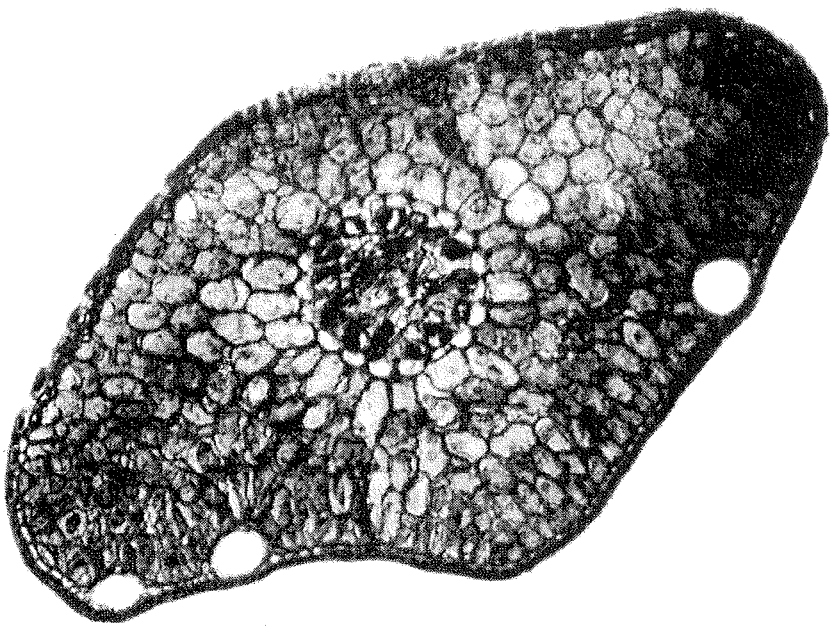

Fig. 3.- Cross sections of needles from the families with three resin canals.

Poprečni presek iglica iz porodica sa tri smona kanala.

In addition to the number and size of resin canals, the open stomata were also counted. Significant differences between families is probably the consequence of individual physiological reactions of the plant and by the number of resin canals. Family (10) is characterized by three open stomata, whereas in family (8) there are alwayse two open stomata. The greatest variation in the number of open stomata has been noticed in family (1) where there exists the third resin canal. In this family the share of cross sections with two open stomata is 25%, with four 41,7%, and with five 16,7%. Fifve open stomata, in addition to family (1), occur only in family (3) in only one cross section.

The arrangement of stomata as seen in surface veiw may be signifikant also, numbers per unit area.

The vascular bundle is surrounded by endodermal cells, and their diameter ranges between the extreme values of 483 and 253 μm, while the mean for all families amount to 375.2 μm. The endodermal cells are elangated in the tangential direction and they are compactly arranged. Within the endodermis there are two collateral vascular bundles and associated transfusion tissue. On one side of the bundles there is a group of cells containing protein substances. They transport organic substances from the chlorenchyma to the phloem. Inorganic substances are transported from xylem to chlorenchyma through the transfusion tissue (Fig. 4).

VARIABILITY OF RESIN CANAL DIAMETERS

The reliability of the application of the results obtained in the measurement of anatomic elements of resin canal diameter have been presented in (Tab. 1).

Tab. 1. - *Extreme and mean values of resin canal and vascular bundle (diameters in mikrons).*

Ekstremne i srednje vrednosti smonih kanala i sprovodnih snopića (prečnici u mikronima).

FAMILY	RESIN CANAL DIAMETER STATISTICAL PARAMETERS				VASCULAR BUNDLE DIAMETER STATISTICAL PARAMETERS			
	Extreme values	$\bar{X} \pm S_{\bar{x}}$	$S + S_s$	$V + S_v$	Extreme values	$\bar{X} \pm S_{\bar{x}}$	$S + S_s$	$V + S_v$
1	161 - 80,5	116.39 ±3.42	19.68 ±2.42	16.90 ±2.14	402,5-287,5	358.42 ±10.09	34.96 ± 7.14	9.75 ±2.01
2	230 - 92	153.81 ±9.38	45.98 ±6.64	29.89 ±4.68	437 -345	386.21 ± 6.86	23.75 ± 4.85	6.15 ±1.26
3	161 - 92	125.06 ±3.87	18.98 ±3.87	15.17 ±2.24	391 -345	373.75 ± 4.36	15.11 ± 3.08	4.04 ±0.83
4	172,5 - 62	102.54 ±4.49	24.43 ±3.53	23.82 ±3.63	392 -253	329.75 ±14.00	48.49 ± 9.90	14.71 ±3.07
5	138 - 69	106.85 ±3.35	16.43 ±2.37	15.38 ±2.27	460 -345	397.67 ±11.46	39.69 ± 8.10	9.98 ±2.06
6	207 - 92	117.40 ±5.58	27.34 ±5.58	23.28 ±3.54	379,5-299	345.00 ± 7.75	26.86 ± 5.48	7.78 ±1.60
7	138 - 69	112.12 ±3.74	18.34 ±2.65	16.36 ±2.42	437 -345	369.75 ± 9.44	32.71 ± 6.68	8.24 ±1.69
8	218,5 - 92	128.42 ±5.02	24.61 ±3.55	19.16 ±2.27	437 -333,5	381.21 ± 7.89	2735 ± 5.58	7.17 ±1.47
9	161 - 69	112.70 ±4.28	23.47 ±3.03	20.83 ±2.80	471,5-368	421.67 ±10.53	3648 ± 7.45	8.65 ±1.78
10	161 - 80,5	120.75 ±4.45	22.24 ±3.21	18.42 ±2.75	483 -356	389.08 ±10.67	36.97 ±10.67	9.50 ±1.96

The variability of resin canals ranges between the extremes of 230 and 69 μm. The variability of mean values of diameters ranges between 102.54 ± 4.99 μm in family A_2, and 153.81 ± 9.38 μm in family C_4. Means of resin canal diameters where there are three of them in a needle, are approximate to the mean for all the families. The mean value of the diameter of the third resin canal is 116.39 ± 3.42 μm (family A_2) to 112.70 ± 4.28 μm (family A_3). Based on the variable values of resin canal diametres for all the families, it can be concluded that for this character there exist a high variability. The lowest dispersion has been identified in family D_1-16.43 ± 2.37, and the highest in family C_4 - 45.98 ± 6.64. The standard deviations for families (1) and (9) were close to the avarage of all the families.

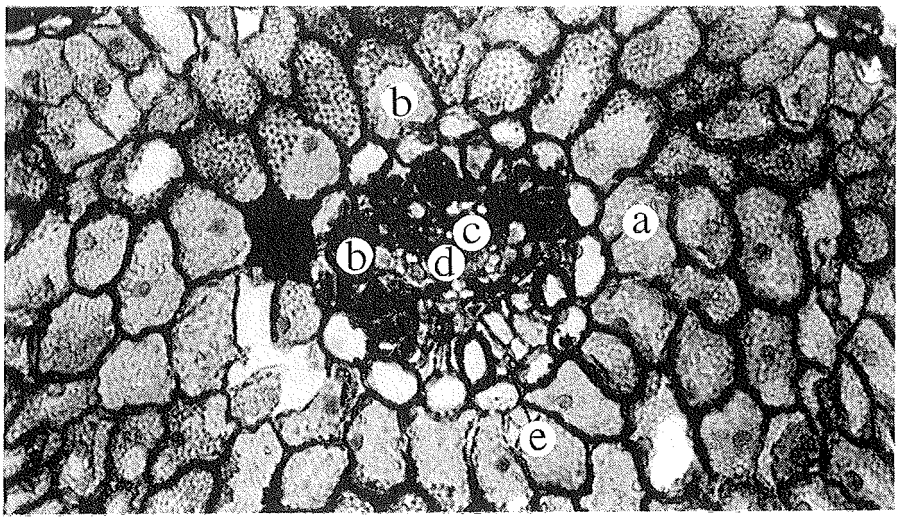

Fig. 4.- Vascular bundles: a) endodermis, b) conducting parenchyma, c) xylem, d) phloem, e) transfusion tissue.

Sprovodni snopići.

The statistical parameter *t* the justification of statistical differences between the means (Tab. 2) indicates that the highest number of significant differences is between family (2) and other families. In family (2) the most frequent *t* value is above 1.60 and it occurs nine times, whereas in families (6), (7), (9) and (10) it is the least frequent.

Tab. 2.- *Diferences between mean values of resin canal - statistical significance (diameters in t-values): HF = HALF SIB Family; FV = Frequency of t-values above 1.60.*

Statistički signifikantne razlike srednjih vrednosti smonih kanala (prečnici u *t*-vrdnostima).

HF	A_2	C_4	C_5	A_1	D_1	B_5	B_1	B_4	A_3	A_4	FV
1	2	3	4	5	6	7	8	9	10	11	12
1.		3.7	1.7	2.3	2.0	0.1	0.8	2.0	0.7	0.7	5
2.	3.7		2.8	4.8	4.7	3.3	4.1	2.4	4.0	3.2	9
3.	1.7	2.8		3.6	3.6	1.1	2.4	0.5	2.1	0.7	6
4.	2.3	4.8	3.6		0.7	2.0	1.5	3.7	1.5	2.7	6
5.	2.0	4.7	3.6	0.7		1.6	1.0	3.6	1.1	2.5	6
6.	0.1	3.4	1.1	2.0	1.6		0.8	1.5	0.7	0.5	3
7.	0.8	4.1	2.4	1.5	1.0	0.8		2.6	0.1	1.5	3
8.	2.0	2.4	0.5	3.7	3.6	1.5	2.6		2.4	1.1	6
9.	0.7	4.0	2.1	1.5	1.1	0.7	0.1	2.4		1.3	3
10.	0.8	3.2	0.7	2.7	2.5	0.5	1.5	1.1	1.3		3
FV	5	9	6	6	6	3	3	6	3	3	

VARIABILITY OF VASCULAR BUNDLE DIAMETERS

The vascular bundle diameter in all the families varied between the extreme values of 483 μm in family (10) and 253 μm in family (4). The avarage diameter in all the families was 375.2 ± 9.30 μm. According to the variable values of standard deviation, the lowest intrafamiliar variability has been recorded in family (3) : 15.11 ± 3.08 μm, and the highest in family (5) : 48.49 ± 9.900 μm.

The results of *t*-test (Tab. 3), show more precisly the statistically significant differences in vascular bundle diametars. Significant differences have been observed between families (9) and (4), and between families (9) and (6.). In families (9) and (4), the most frequent *t* values is above 1.60, i. e. eight times. The least frequent *t* values occur in families (2), (3), (7), (8) and (10), i. e. four times.

CONCLUSIONS

The cross section of needles shows the elliptical form where the width is larger then the height, and the lower side is midly concave towards the centre. External cover consists of a cuticle under which there are two rows of epidermal cells. Resin canals are distributed symmetrically left and right to the axis of the croos section. Their diameters range between 102.54 in families (4) and 153.81 μm in family (2). Extreme variability in the numbers of resin canals has been observed in two families- i. e. the third resin canal has been recorded.

Tab. 3. - *Diferences between mean values of vascular bundle - statistical significance (diameters in t-values): HF = HALF SIB Family; FV = Frequency of t-values above 1.60.*

Statistički signifikantne razlike srednjih vrednosti sprovodnih snopića (prečnici u *t*-vrednostima).

HF	A_2	C_4	C_5	A_1	D_1	B_5	B_1	B_4	A_3	A_4	FV
1	2	3	4	5	6	7	8	9	10	11	12
1.		2.9	1.4	1.7	2.6	1.0	0.8	1.8	4.3	2.1	6
2.	2.3		1.5	3.6	0.9	4.0	1.4	0.5	2.8	0.2	4
3.	1.4	1.5		3.0	1.9	3.2	0.4	0.8	4.2	1.3	4
4.	1.7	3.6	3		0.9	2.4	3.2	5.2	3.4	3.4	8
5.	2.6	0.9	1.9	3.7		3.8	1.9	1.2	1.5	0.5	5
6.	1.1	4.0	3.2	0.9	3.8		2.0	3.3	5.9	3.3	7
7.	0.8	1.4	0.4	2.4	1.9	2.0		0.9	3.7	1.4	4
8.	1.8	0.5	0.8	3.2	1.2	3.3	0.9		3.1	0.6	4
9.	4.3	2.8	4.2	5.2	1.5	5.8	3.7	3.0		2.2	8
10.	2.1	0.2	1.3	3.4	0.5	3.3	1.4	0.6	2.2		4
FV	6	4	4	8	5	7	4	4	8	4	

There is only one vascular bundle in a needle, it is round and surrounded by a row of elongated endoderm cells. Vascular bundle diameter varies from 483 μm in family (10) to 253 μm in family (4). In all the preparations, the number of open stomata varies between two and five (averagely three open stomata per preparation).

The measured values of anatomical elements have been processed statistically. A *t*-test has been applied as an indicator in the assessment of the quantity of genetic variability, wich is lower if it approximates 1.60, i. e. it is higher if its value is higher.

By selection and breeding of Serbian spruce, it is possible to synthesize the resistant taxa, thanks to the hypothesis that plant resistence to harmful pollunants in the air is affected by the structure and dimensions of anatomic elements of assimilations organs, and not only the specific reactions and the composition of cell sap.

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VARIJABILNOST ANATOMSKE STRUKTURE DVOGODIŠNJIH ČETINA OMORIKE, *PICEA OMORIKA* (PANČIĆ) PURKYNE, KOD DESET FAMILIJA POLUSRODNIKA

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I z v o d

Obavljena analiza promenjivosti mikroskopske strukture dvogodišnjih četina omorike iz deset familija polusrodnika, ukazala je na postojanje znatnog varijabiliteta prečnka sprovodnog snopića i prečnika i broja smonih kanala. Četina je na poprečnom preseku (na sredini) eliptičnog oblika. Sprovodni snopić je na poprečnom preseku kružnog oblika, prečnika od 253 do 483 μm. Smoni kanali su simetrični u odnosu na osu poprečnog preseka četine, prečnika od 102,54 do 153,81 μm. Kod četina dve familije polusrodnika evidentirano je prisustvo trećeg smonog kanala. Varijabilnost prečnika sprovodnog snopića i smonih kanala analizirana je primenom statističkih metoda, a signifikantnost opravdanosti između srednjih vrednosti, za analizirana svojstva, utvrđena je primenom t - testa.

Dobijeni rezultati, pored taksonomskog značaja, mogu se koristiti u daljim istraživanjima usmerenim na bliže upoznavanje prirode rezistentnosti omorike na aerozagađenja i sintezu otpornih kulturnih taksona.

UDK: 581.9: 582:5(497.115)
Originalni naučni članak

FLORISTIČKE PRINOVE ZA TERITORIJU KOSOVA I METOHIJE (SRBIJA)

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The total of seven species, which were as yet unknown in literature on the territory of Kosovo and Metohija, we announce their presence on this territory. For another four we quote new localities on the Kosovo and Metohija.

UVOD

U sklopu proučavanja flore i vegetacije, a u vezi sa projektom "Istraživanje nekih bioloških karakteristika flore Kosova" sakupljen je bogat biljni materijal. Provera spornih, naročito polimorfnih, kao i retkih i potencijalno novih vrsta, izvršena je upoređivanjem sa materijalom iz Herbarijuma Prirodnjačkog muzeja u Beogradu (BEO).

Podaci do kojih smo došli, govore u prilog mišljenja mnogih istraživača flore Srbije, da je poznavanje flore Kosova i Metohije još uvek daleko od potpunog, što opravdava neophodnost budućih intenzivnih istraživanja.

Ovom prilikom navodimo dve grupe biljaka, vrste koje su po prvi put konstatovane za ovu teritoriju, kao i vrste koje su nađene na novim lokalitetima.

Za pomoć prilikom rada dugujemo veliku zahvalnost naučnom savetniku Prirodnjačkog muzeja dr N. DIKLIĆU i kustosu M. NIKETIĆU.

REZULTATI

PRINOVE ZA FLORU KOSOVA I METOHIJE

Euphorbia exigua L.

U Flori SR Srbije za ovu vrstu mlečike kaže se da je poznata samo sa dva lokaliteta, jugoistočna Srbija: okolina Pirota i južna Srbija: Sokolica na Vidojevici (Diklić 1977, Nikolić *et al.* 1986). Lakušić i Niketić (1988) navode je za klisuru Ždrelo kod Soko Banje.

Ova je vrsta konstatovana na sunčanim padinama Grmije (planina pored Prištine) u okolini sela Sofalije, duž kolskog puta, kao i kod sela Hade, na jalovini površinskog kopa Belaćevac kod Obilića u neposrednoj okolini Prištine.

Vrsta se može smatrati tipičnom korovsko - ruderalnom, a masovno je zastupljena na jalovini površinskog kopa zajedno sa mlečikama *Euphorbia falcata* L. i *E. plathyphyllos* L. i drugim korovsko - ruderalnim vrstama.

Tragus racemosus (L.) All.

Opšte rasprostranjenje ove vrste obuhvata tropske i subtropske oblasti obeju hemisfera, ali prodire i u oblasti umerene klime (Cincović & Kojić 1976).

O rasprostranjenju vrste daju se u Flori SR Srbije sledeći podaci: Deliblatska pešča, Bela Crkva (Banat), Ramski pesak, Požeženska i Kladovska peščara, Veliko Gradište, Avala, Košutnjak, Šumadija, Kragujevac, Radujevac (Prahovo), Pirot (Cincović & Kojić 1976), Aleksinac, Rujan planina, u jugoistočnoj Srbiji rasprostranjena (Nikolić *et al.* 1986).

Na teritoriji Kosova i Metohije vrstu smo konstatovali prvi put kod naselja Sočanice i Leposavića, neposredno pored asfaltnog puta, na peskovitoj podlozi.

Na osnovu morfoloških odlika ploda (krupa) vrste zaključujemo da je na ove lokalitete doneta transportnim sredstvima.

Rubia tinctorum L.

Poreklo ove vrste je istočnomediteransko, a opšte rasprostranjenje je Južna Evropa i Mala Azija (Gajić 1973).

Na teritoriji Srbije vrsta je relativno široko rasprostranjena. U Flori SR Srbije navodi se na sledećim lokalitetima: Banat (Novi Kneževac), Srem (Fruška Gora: Maradik, Petrovaradin), Karagača, a u jugoistočnoj Srbiji u okolini Pirota i Babušnice (Nikolić *et al.* 1986).

Na teritoriji Kosova i Metohije vrsta je nađena kod sela Rudara, neposredno pored Kosovske Mitrovice, gde raste pored puta uz plot, koji ograničava njivu sa žitom.

Kako su uslovi staništa slični onima koje navodi Šilić (1977), smatramo da se njegova konstatacija o subspontanom širenju vrste može prihvatiti i za teritoriju Srbije. S obzirom na to da se koren biljke koristio za dobijanje crvena boja, opravdano je pretpostaviti da je vrsta u tu svrhu nekada gajena i da je izašla iz kulture.

Cnidium silaifolium (Jacq.) Simk. subsp. ***orientale*** (Boiss.) Tutin

Vrsta je rasprostranjena u Južnoj Evropi: od Balkanskog poluostrva preko Italiji do Alpa u Francuskoj, kao i u Maloj Aziji, Siriji i Jermeniji (Nikolić 1973).

Na teritoriji Srbije, podvrsta *orientale* je do sada bila poznata iz okoline Niša, sa planine Seličevice i kod Pirota (Vidlič) (Nikolić 1973).

Na teritoriji Kosova i Metohije konstatovana je na Grmiji (planina pored Prištine), u hrastovoj šumi na oko 940 *m* n. v., isključivo na severnoj ekspoziciji i na krečnjačkoj podlozi.

Lactuca quercina L. subsp. ***chaixii*** (Vill.) Čelak.

Vrsta je rasprostranjena u Srednjoj i Južnoj Evropi, Maloj Aziji i na Kavkazu, a naročito bogato u submediteranskoj oblasti.

Na osnovu podataka iz literature podvrsta je zastupljena na lokalitetima u Bačkoj (Ratno ostrvo, Futog), Sremu (Fruška Gora: Karlovci) i na dva lokaliteta u istočnoj Srbiji, Miroč i Stara Planina (Gajić 1975, Nikolić *et al.* 1986).

Na planini Grmiji kraj Prištine našli smo primerke ove podvrste na obodu hrastove šume i uz stazu na nadmorskoj visini iznad 900 *m*.

Valeriana tuberosa L.

Na osnovu podataka iz literature stiče se utisak da se nedovoljno zna o rasprostranjenju ove vrste, jer se samo neodređeno navodi kao sporadična (Kojić 1973).

Na teritoriji Kosova i Metohije vrstu smo našli na pašnjacima razvijenim na serpentinskoj podlozi u dolini reke Ibra između Kosovske Mitrovice i raskršća puta za Banjsku i u šikari na krečnjaku u okolini sela Sečišta kod Đeneral Jankovića.

Gagea pusilla (F. W. Schmidt) Schultes & Schultes fil.

U Flori SR Srbije za vrstu se ne navode određeni lokaliteti, već se samo kaže da je rasprostranjena sporadično (Diklić 1975).

Na teritoriji Kosova i Metohije nađena je na dva lokaliteta, na planini Grmiji na sušnim zatravljenim površinama po obodu šume iznad sela Sofalije i u podnožju planine Rogozne u neposrednoj okolini Banjske, na serpentinskoj podlozi.

NOVA NALAZIŠTA VRSTA NA TERITORIJI KOSOVA I METOHIJE

Ptilostemon strictus (Ten.) Greuter

Kao prinova za floru Srbije ova vrsta je objavljena sa područja Dečanske Bistrice (Greuter 1973), a takođe se navodi i za planinu Grmiju (Krivošej & Tatić 1991).

U toku naših kasnijih istraživanja zapazili smo da je ova vrsta relativno široko zastupljena u oblasti Siriničke župe. Sreće se oko sela Broda (Cikljar mahala), u hrastovoj šumi pored reke Lepenca, u donjem delu toka Ižanske reke ispod sela Pojatarca, na potezu lojzišta [vinograd], a u Sredačkoj župi oko sela Rečana, Mušnikova, Manastirice i u neposrednoj okolini Prizrena, kao i u rejonu sela Kabaša.

Lathyrus grandiflorus Sibth. & Sm.

Ova vrsta je rasprostranjena u oblastima jugoistočne Evrope: Albanija, Grčka, Jugoslavija i Italija, Sredozemlja i Male Azije (Kojić 1972).

Na teritoriji Srbije vrsta je nađena na Dečanskoj planini (Kojić 1972), dok smo je mi našli na planini Grmiji u svetloj hrastovoj šumi na oko 900 *m* n. v.

Hypericum annulatum Moris

Opšte rasprostranjenje vrste je južni deo Balkanskog poluostrva, Sardinija i Mala Azija. U Jugoslaviji se sreće u Makedoniji, Srbiji i Bosni i Hercegovini (Stjepanović- Veselićić 1972).

U Flori SR Srbije pod imenom *Hypericum atomarium* Boiss. subsp. *degenii* (Bornm.) Hayek, navodi se za okolinu Vranja i Niške Banje, kao i za donji pojas Kopaonika (Stjepanović- Veselićić 1972).

Na teritoriji Kosova i Metohije nađena je na Grmiji u šumi belograbića na silikatnoj steni pored *Asplenium trichomanes, A. septentrionale* i drugih vrsta.

Silene retzdorffiana (K. Malý) Walters subsp. ***nikolicii*** Selinger & T. Wraber

Kao područje rasprostranjenja ove endemične vrste Chater i Walters (1964) navode Albaniju i zapadnu Jugoslaviju. Međutim, vrsta je prema Šiliću (1984) u Jugoslaviji zastupljena samo na teritoriji Hercegovine, dok je za Albaniju Demiri (1983) ne navodi. U ediciji Flora SR Srbije vrsta takođe nije navedena (Slavnić 1970).

Na teritoriji Srbije, biljka je otkrivena u klisuri Prizrenske Bistrice, a kako su primerci pokazivali razlike u odnosu na materijal iz Hercegovine, opisani su kao subsp. *nikolicii* (Selinger & Wraber 1987).

Biljku smo našli i na području izvan klisure, na padinama Ošljaka.

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FLORISTICAL INCREASE ON THE TERITORY OF KOSOVO AND METOHIJA (SERBIA)

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S u m m a r y

The total of seven plant species were found on the Teritory of Kosovo and Metohija (Serbia) for the first time. Those are: *Euphorbia exigua* L., *Tragus racemosus* (L.) All., *Rubia tinctorum* L., *Cnidium silaifolium* (Jacq.) Simk. subsp. *orientale* (Boiss.) Tutin, *Lactuca quercina* L. subsp. *chaixii* (Vill.) Čelak., *Valeriana tuberosa* L. and *Gagea pusilla* (F. W. Schmidt) Schultes & Schultes fil.

We quote the new localities on the Kosovo and Metohija for another four species. Those are: *Ptilostemon strictus* (Ten.) Greuter, *Lathyrus grandiflorus* Sibth. & Sm., *Hypericum annulatum* Moris and *Selene retzdorffiana* (K. Malý) Walters subsp. *nikolicii* Selinger & Wraber.

UDK: 582.669(497)
Originalni naučni članak

CERASTIUM SUBSECTION OF THE GENUS *CERASTIUM* L. (*CARYOPHYLLACEAE*) ON BALKAN PENINSULA

ANNOTATED CHECK - LIST

M. NIKETIĆ

Natural History Museum, Belgrade, Yugoslavia

Niketić, M. (1995-98): *Cerastium subsection of the genus Cerastium L. (Caryophyllaceae) on Balkan Peninsula. Annotated check-list.* - Bulletin of Natural History Museum, Belgrade, *B49-50*, 39-61.

On the basis of long-term floristic investigations and checking of herbarium material total of 4 series, 14 species and 103 infraspecial taxa have been stated for the flora of the Balkan peninsula. Fourteen of the infraspecial taxons have been described as new for science. Furthermore, 39 taxons gained a new status or entered a new combination.

INTRODUCTION

The long years of field research and the examination of the extensive herbarium materials (*BD* - Natural History Museum Budapest, *BEO* - Natural History Museum, Belgrade, *BEOU* - Faculty of Biology, Belgrade, *PVSI* - - Faculty of Agriculture, Plovdiv, *SO* - Faculty of Biology, Sofia, *SOA* - Faculty of Agriculture, Sofia (material in Plovdiv), *SOM* - Bulgarian Academy of Sciense, Sofia etc.) led to new and more complete insight into the taxonomy and classification of Subsect. *Cerastium* on the Balkan peninsula. The enclosed nomenclature represents a basis for further morphological, chorological, and phylogenetic speculations.

ABBREVIATIONS: *Cro* Croatia, *BH* Bosnia and Herzegovina, *Mtg* Montenegro, *Srb* Serbia, *A* Albania, *Ma* Former Yugoslav Republic of Macedonia, *Bu* Bulgaria, *Gr* Greece, *AE* Aegean Islands (*sensu lato*). The areas mentioned

in the protologue have been marked with bold letter-type. The new chorological data have been marked with italic letter-type.

The authors mentioning the missindentified taxa have mostly been marked and listed numerically; the first data has been marked in bold face.

CERASTIUM L.

Ser. **Alpina** Borza in Bot. Közl. 12: 50 (1913); 12, 13.
= Ser. *Lanigera* Borza, op. cit.: 57 (1913); 13.
= Sect. *Arvensia* Subsect. *Lanigera* (Borza) Georgiev in God. Sof. Univ. 13: 411 (1935).

alpinum aggr.

alpinum L. Sp. Pl.: 438 (1753); 4, 5, 6, 12, 13, 14, 18, 21, 22, 25.
Srb A Ma
= *C. alpinum* subsp. *kochii* Wettst. in Bibl. Bot. 26: 35 (1892); 13.

f. **alpinum**
Srb A Ma

f. **glanduliferum** (Koch) Hayek in Feddes Repert. (Beih.) 30(1): 208 (1924); 8.
Srb A Ma
= *C. alpinum* var. *glanduliferum* Koch, Syn. Fl. Germ. Helv.: 123 (1835) [basion.]; 6, 13, 23.
= *C. alpinum* var. *nudipes* Fenzl ex Griseb., Spicil. Fl. Rumel. 1: 210 (1843); 2, 5.
= *C. alpinum* var. *glanduliferum* f. *nudipes* (Fenzl ex Griseb.) Graebner & Corr. in Aschers. & Graebner, Syn. Mitteleur. Fl. 5(1): 618 (1917); 12.

eriophorum Kit. in Schultes, Österr. Fl. ed 2, 1: 694 (1814); Boşcaiu et al. in Willdenowia 27: 40 (1997).
BH Mtg Srb A Ma Bu
= *C. villosum* Baumg., Enum. Stirp. Transs. 1: 424 (1816).
"*C. alpinum*" sensu 1, **2**, 9, 18 [p. p.], 21, 28, 34, 38 [p. p.], 39 [p. p.], 40, 41.
"*C. alpinum* subsp. *lanatum*" sensu 14, 22, **38**.
"*C. alpinum* var. *lanatum*" sensu **3**, 34.
"*C. decalvans* subsp. *dollineri* f. *bosniacum*" sensu **9**.
"*C. lanatum*" sensu **6**, 9, 11, 12, 18, 19, 25, 35, 39.
"*C. latifolium*" sensu 1, **28**.
"*C. moesiacum*" sensu **35** [p. p.], 39 [p. p.].
"*C. uniflorum*" sensu 9, **18** [p. p.].

f. **eriophorum**
BH Mtg Srb Ma Bu

f. **glutinosum** (Koch) Niketić, **comb. nova**
BH Mtg Srb A Ma Bu
= *C. alpinum* var. *glutinosum* Koch, Syn. Fl. Germ. Helv.: 124 (1835) [basion.].
= *C. alpinum* var. *lanatum* f. *glanduloso-villosum* G. Beck in Glasn. Muz. Bosni Herceg. 18: 484 (1906).
= *C. lanatum* f. *litigiosum* Borza in Bot. Közl. 12: 53 (1913); 19.

= *C. alpinum* subsp. *lanatum* var. *glutinosum* (Koch) Graebner & Corr. in Aschers. & Graebner, Syn. Mitteleur. Fl. 5(1): 621 (1917).
= *C. alpinum* subsp. *lanatum* var. *glutinosum* f. *glanduloso-villosum* (G. Beck) Graebner & Corr., loc. cit. (1917).
= *C. lanatum* f. *glutinosum* (Koch) Hayek in Feddes Repert. (Beih.) 30(1): 208 (1924); 9, 25, 31, 39.
= *C. lanatum* subsp. *glutinosum* (Koch) Georgiev in God. Sof. Univ. 13: 408 (1935).
"*C. alpinum* var. *glanduliferum*" sensu **34**, 39.
"*C. alpinum* var. *soleirolii*" sensu 34, **41**.
"*C. gnaphalodes*" sensu Pantocsek in Verh. Natur. Heilk. Presb. 2 (1871-72): 104 (1874); 2.

f. **macranthum** (Stoj. & Georgiev) Niketić, **comb. nova**
Bu
= *C. lanatum* subsp. *glutinosum* f. *macranthum* Stoj. & Georgiev in God. Sof. Univ. 13: 409 (1935) [basion.].

f. **rotundifolium** (Schur) Niketić, **comb. nova**
Mtg Srb
= *C. lanatum* f. *rotundifolium* Schur, Enum. Pl. Transs.: 123 (1866) [basion.].
= *C. alpinum* subsp. *lanatum* var. *glutinosum* f. *rotundifolium* (Schur) Graebner & Corr. in Aschers. & Graebner, Syn. Mitteleur. Fl. 5(1): 622 (1917).

neoscardicum Niketić in Glasn. Inst. Bot. Bašte Univ. Beograd 26-27: 64 (1994).
"*C. alpinum*" sensu Lakušić D. & Niketić in BID "Josif Pančić", Zbor. Rad. - Prvih deset godina BID: 45 (1988).
Srb

f. **adenotrichum** Niketić in Glasn. Inst. Bot. Bašte Univ. Beograd 26-27: 68 (1994).
Srb

f. **glandulosum** Niketić in Glasn. Inst. Bot. Bašte Univ. Beograd 26-27: 68 (1994).
Srb

f. **neoscardicum**
Srb

decalvans Schlosser & Vuk., Fl. Croat.: 360 (1869); 7, 9, 14, 21, 25, 35, 36, 37, 38, 39, 40.
Cro BH Mtg Srb A Ma Bu Gr AE
= *C. lanigerum* G. Clementi in Atti Riunione Sci. Ital. 3: 520 (1841) [non Desv. in Jour. Bot. Agric. 3: 228 (1816)]; 3, 6, 11, 12, 13, 17, 18, 19, 20, 23, 24, 31.
= *C. arvense* var. *lanigerum* Vis., Fl. Dalm. 3: 184 (1850).
= *C. tomentosum* var. *elongatum* Pantocsek in Verh. Natur. Heilk. Presb. 2 (1871-72): 104 (1874); 2, 3.
= *C. tomentosum* subsp. *lanigerum* Stoj. & Stefanov, Fl. Bălg. 1: 412 (1924).
"*C. arvense*" sensu **4** [balc.].
"*C. grandiflorum*" sensu **4** [p. p.], 7 [p. p.], 9 [p. p.], 18 [p. p.], 22 [p. p.], 40 [p. p.].
"*C. tomentosum*" sensu **2**, 3.

subsp. **decalvans**
Cro BH Mtg Srb A Ma Bu Gr AE

var. **albanicum** (Bald.) Niketić **comb. nova**
Mtg Srb **A** Ma
= *C. grandiflorum* var. *albanicum* Bald. in Bull. Herb. Boiss. 4: 618 (1896) [basion.].
= *C. albanicum* (Bald.) Corr. in Österr. Bot. Zeitschr. 59: 182 (1909); 13.
= *C. lanigerum* var. *albanicum* (Bald.) K. Malý in Glasn. Muz. Bosni Herceg. 35: 129 (1923); 19.
= *C. lanigerum* var. *dollineri* f. *albanicum* (Bald.) Hayek in Feddes Repert. (Beih.) 30(1): 205 (1924).
= *C. lanigerum* subsp. *albanicum* (Bald.) Georgiev in God. Sof. Univ. 13: 421 (1935) [p. p.].
= *C. cernjavskii* Georgiev, op. cit.: 422 (1935); 24.
"*C. decalvans* var. *leontopodium*" sensu **7** [p. p.].
"*C. grandiflorum*" sensu **6** [p. p.], 7 ["*C. nodosum*"] [p. p.].
"*C. grandiflorum* var. *rosmarinifolium*" sensu **15**.

f. **albanicum**
Mtg Srb **A** Ma

f. **scardicum** Georgiev ex Niketić, f. **nova** - T y p u s: Macedonia: Mt. Scardus (Ljuboten) prope pag. Rogačevo, in solo serpentinico ["solo silicolo"], leg. T. Soška 5.6.1921., det. Georgiev sub nom. *C. scardicum* (H o l o t y p u s: *BEOU*). - Dense caespitosa, caulibus ad 20 *cm* altis; folia magis conferta.
Ma
= *C. scardicum* Georgiev ex Soška in Glasn. Skopsk. Naučn. Društva 18: 233 (1938) [nom. inval.].

f. **isophyllum** (Bornm.) Niketić, **comb. nova**
Srb **Ma**
= *C. lanigerum* var. *isophyllum* Bornm., Beitrg. Fl. Mazedon. 1: 426 (1925) [basion.].
= *C. cernjavskii* f. *isophyllum* (Bornm.) Georgiev in God. Sof. Univ. 13:: 422 (1935).

var. **anisophyllum** (Bornm.) Niketić, **comb. nova**
Srb **Ma**
= *C. balcanicum* var. *anisophyllum* Bornm., Beitrg. Fl. Mazedon. 1: 425 (1925) [basion.].
= *C. cernjavskii* f. *major* Georgiev in God. Sof. Univ. 13: 423 (1935).
"*C. banaticum* var. *balcanicum*" sensu **25**.
"*C. decalvans* var. *leontopodium*" sensu **7** [p. p.].

var. **bosniacum** (G. Beck) Niketić, **comb.** in **stat. nov.**
BH Mtg Srb Ma
= *C. tomentosum* f. *bosniacum* G. Beck in Ann. Naturh. Mus. (Wien) 2: 63 (1887) [basion.]; 3.
= *C. lanigerum* var. *bosniacum* (G. Beck) Corr. in Österr. Bot. Zeitschr. 59: 170 (1909); 6.
= *C. lanigerum* f. *bosniacum* (G. Beck) Graebner & Corr. in Aschers. & Graebner, Syn. Mitteleur. Fl. 5(1): 591 (1917).
= *C. lanigerum* var. *dollineri* f. *bosniacum* (G. Beck) Hayek in Feddes Repert. (Beih.) 30(1): 205 (1924); 19, 23.
= *C. lanigerum* subsp. *bosniacum* (G. Beck) Georgiev in God. Sof. Univ. 13: 419 (1935).

= *C. decalvans* subsp. *dollineri* f. *bosniacum* (G. Beck) Gajić in Josifović et al., Flora SR Srbije 2: 163 (1970) [comb. inval.]; 25.
= *C. decalvans* f. *bosniacum* Trinajstić, Fl. Anal. Jugosl., Suppl. 5: 7 (1978).

var. **decalvans**
Cro BH Mtg Srb A Ma Bu Gr AE
= *C. lanigerum* var. *decalvans* (Schlosser & Vuk.) Halászcy, Consp. Fl. Graec. 1: 221 (1900); 5, 18, 19, 31.
"*C. moesiacum* f. *dimonii*" sensu **6** [p. p.].
"*C. moesiacum* f. *thasium*" sensu **10**.

f. **decalvans**
Cro BH Mtg Srb A Ma Bu Gr AE
= *C. lanigerum* subsp. *bosniacum* var. *rupicolum* Georgiev in God. Sof. Univ. 13: 420 (1935).

f. **dollineri** (G. Beck) Trinajstić, Fl. Anal. Jugosl., Suppl. 5: 7 (1978).
Cro **BH** Mtg Srb A Ma *Bu Gr*
= *C. lanigerum* f. *dollineri* G. Beck in Ann. Naturh. Mus. (Wien) 2: 62 (1887) [basion.]; 40.
= *C. lanigerum* var. *dollineri* (G. Beck) G. Beck in Ann. Naturh. Mus. (Wien) 6: 329 (1891); 3, 6, 13, 18, 23, 31.
= *C. tomentosum* var. *pilosoviscidum* Bald. in Mem. Accad. Sci. (Bologna) Ser. 5, 9(1): 10 (1900).
= *C. lanigerum* var. *dollineri* (G. Beck) Hayek in Feddes Repert. (Beih.) 30(1): 205 (1924).
= *C. lanigerum* var. *dollineri* f. *pilosoviscidum* (Bald.) Hayek loc. cit. (1924); 31.
= *C. lanigerum* var. *dollineri* f. *heterophyllum* K. Malý in Glasn. Muz. Bosni Herceg. 40: 122 (1928).
= *C. lanigerum* subsp. *bosniacum* var. *dollineri* (G. Beck) Georgiev in God. Sof. Univ. 13: 420 (1935).
= *C. decalvans* subsp. *dollineri* (G. Beck) Gajić in Josifović et al., Flora SR Srbije 2: 163 (1970); 14.
"*C. albanicum*" sensu 12 [p. p.].

f. **minutum** (Georgiev) Niketić, **comb.** et **stat. nov.**
Mtg *Srb Ma Bu Gr*
= *C. lanigerum* subsp. *minutum* Georgiev in God. Sof. Univ. 13: 421 (1935) [basion.].

f. **alpicolum** (Hausskn.) Niketić, **comb.** et **stat. nov.**
BH *Mtg Srb* Ma *Bu* **Gr**
= *C. lanigerum* var. *alpicolum* Hausskn. in Mitt. Thür. Bot. Ver. 5: 55 (1893) [basion.].
= *C. lanigerum* var. *pindicolum* Halácsy, Consp. Fl. Graec. 1: 220 (1900) [nom. illeg.]; 5, 6, 13.
= *C. lanigerum* var. *dollineri* f. *alpicolum* (Hausskn.) Hayek in Feddes Repert. (Beih.) 30(1): 205 (1924).
= *C. decalvans* f. *pindicolum* (Halácsy) Trinajstić, Fl. Anal. Jugosl., Suppl. 5: 7 (1978) [comb. illeg.].
"*C. arvense* var. *alpicolum*" sensu 2, **15** [p. p.].

f. **robustrum** (G. Beck) Niketić, **comb. nova**
BH Mtg *Srb* A
= *C. lanigerum* f. *robustrum* G. Beck in Ann. Naturh. Mus. (Wien) 6: 329 (1891) [basion.]; 3, 13.

= *C. lanigerum* var. *decalvans* f. *robustrum* (G. Beck) Hayek in Feddes Repert. (Beih.) 30(1): 206 (1924).
= *C. lanigerum* subsp. *bosniacum* var. *robustrum* (G. Beck) Georgiev in God. Sof. Univ. 13: 420 (1935).

var. **durmitoreum** (Rohlena) Niketić, **stat.** in **comb. nov.**
BH **Mtg** Srb *A* Ma
= *C. lanigerum* var. *durmitoreum* Rohlena in Sitz.-Ber. Böhm. Ges. Wiss. 1904(38): 31 (1905) [basion.]; 5, 13, 31.
= *C. lanigerum* var. *decalvans* f. *durmitoreum* (Rohlena) Hayek in Feddes Repert. (Beih.) 30(1): 206 (1924).
= *C. decalvans* subsp. *durmitoreum* (Rohlena) Gajić in Josifović et al., Flora SR Srbije 2: 164 (1970); 14.
= *C. decalvans* f. *durmitoreum* (Rohlena) Trinajstić, Fl. Anal. Jugosl., Suppl. 5: 7 (1978).

f. **durmitoreum**
BH **Mtg** Srb *A* Ma

f. **glabrum** (Georgiev) Niketić, **comb. nova**
Mtg *Srb A Ma*
= *C. lanigerum* subsp. *minutum* f. *glabrum* Georgiev in God. Sof. Univ. 13: 421 (1935) [basion.].

f. **semiglabrum** (G. Beck) Niketić, **comb. nova**
BH Mt *Sb Gr*
= *C. lanigerum* var. *dollineri* f. *semiglabrum* G. Beck in Glasn. Muz. Bosni Herceg. 18: 483 (1906) [basion.]; 5, 13, 18, 19, 31.
= *C. lanigerum* f. *semiglabrum* (G. Beck) Borza in Bot. Közl. 12: 59 (1913).
= *C. lanigerum* subsp. *bosniacum* f. *semiglabrum* (G. Beck) Georgiev in God. Sof. Univ. 13: 420 (1935).
= *C. decalvans* f. *semiglabrum* (G. Beck) Trinajstić, Fl. Anal. Jugosl., Suppl. 5: 7 (1978).

var. **halacsyi** (Borza) Niketić, **comb. nova**
AE
= *C. moesiacum* f. *halacsyi* Borza in Bot. Közl. 12: 57 (1913) [basion.]; 18.
= *C. moesiacum* var. *halacsyi* (Borza) Graebner & Corr. in Aschers. & Graebner, Syn. Mitteleur. Fl. 5(1): 588 (1917).
= *C. moesiacum* f. *thasium* Hayek in Feddes Repert. (Beih.) 30(1): 207 (1924) [nom. illeg.].
= *C. arvense* var. *bornmuellerianum* Stoj. & Kitanov in God. Sof. Univ. 41(3): 358 (1945-1946).
= *C. moesiacum* subsp. *glutinosum* (Halácsy) Strid in Strid & Tan, Fl. Hellen. 1: 202 (1997) [comb. illeg.].
"*C. alpinum* var. *glutinosum*" sensu Halácsy in Österr. Bot. Zeitschr. 42: 414 (1892).

var. **histrio** (Corr. ex Prain) Niketić, **comb.** in **stat. nov.**
Ma **Bu** Gr
= *C. histrio* Corr. in Österr. Bot. Zeitschr. 59: 182 (1909) [nom. illeg.]; Corr. ex Prain in Index Kew. Suppl. 4: 44 (1913) [basion.]; 13.
= *C. decalvans* subsp. *adamovicii* var. *histrio* Stoj. & Stefanov, Fl. Bălg. ed. 3: 416 (1948); 39.

= *C. decalvans* subsp. *histrio* (Corr. ex Prain) Stoj. & al. in Stoj. & Stefanov, Fl. Bălg. ed. 4, 1: 380 (1966) [comb. inval.]; Greuter & Burdet in Willdenowia 12: 37 (1982), 14.

"*C. balcanicum*" sensu **41.**

"*C. banaticum* var. *leontopodium*" sensu **18.**

var. **leontopodium** (Stoj. & Stefanov) Buschm. in Feddes Repert. 43: 135 (1938) [p. p.].

A Ma **Bu** Gr

= *C. banaticum* var. *leontopodium* Stoj. & Stefanov in Österr. Bot. Zeitschr. 72: 86 (1923) [basion.]; 18.

= *C. grandiflorum* subsp. *banaticum* var. *leontopodium* (Stoj. & Stefanov) Stoj. & Stefanov, Fl. Bălg. 1: 411 (1924).

= *C. leontopodium* (Stoj. & Stefanov) Georgiev in Stoj. & Stefanov, Fl. Bălg. ed. 2: 380 (1933); 12.

= *C. leontopodium* subsp. *soskianum* Georgiev in God. Sof. Univ. 13: 416 (1935).

f. **doerflerianum** (Georgiev) Niketić, **comb. nova**

A **Ma** *Bu*

= *C. lanigerum* subsp. *nikolovii* f. *doerflerianum* Georgiev in God. Sof. Univ. 13: 422 (1935) [basion.].

f. **leontopodium**

A Ma **Bu** Gr

f. **macedonicum** (Georgiev) Niketić, **comb.** et **stat. nov.**

Bu Gr

= *C. macedonicum* Georgiev in Stoj. & Stefanov, Fl. Bălg. ed. 2: 378 (1933) [nom. inval.]; Georgiev in God. Sof. Univ. 13: 416 (1935) [basion.].

= *C. decalvans* subsp. *macedonicum.* (Georgiev) Stoj. & Stefanov, Fl. Bălg. ed. 3: 416 (1948); 14, 39.

f. **nikolovii** (Georgiev) Niketić, **comb.** et **stat. nov.**

Ma *Bu*

= *C. lanigerum* subsp. *nikolovii* Georgiev in God. Sof. Univ. 13: 421 (1935) [basion.].

f. **prilepanum** (Georgiev) Niketić, **comb. nova**

Ma *Bu*

= *C. lanigerum* subsp. *nikolovii* f. *prilepanum* Georgiev in God. Sof. Univ. 13: 421 (1935) [basion.].

var. **oehmii** Niketić var. **nov.** - T y p u s: Flora macedonica: Kapina (Poreč), leg. ing. H. Oehm 7.1934., det. T. Soška sub nom. *C. lanigerum* subsp. *decalvans*, rev. O. Grebenščikov sub nom. *C. lanigerum* subsp. *dollineri* (H o l o t y p u s: *BEO*). - Planta eglandulosa. Indumento instar *C. malyi*, caulibus cum foliis sporadice adpresse albosericeo-tomentosis, pili sporadice agglutinato-agglomerati; folia caulina lineari-lanceolata, basalia saepe in rosulas conferta, etiam saepe unilateralia et falcata. Fasciculi foliorum steriles in axillis foliorum saepe nullis. Sepala cum bracteis margine latissime argenteo-scariosa.

Ma

"*C. orbelicum* subsp. *malyi*" sensu **12.**

var. **orbelicum** (Velen.) Niketić, **comb.** in **stat. nov.**

Ma **Bu** Gr

= *C. orbelicum* Velen. in Sitz.-Ber. Böhm. Ges. Wiss. 1890: 42 (1890) [basion.]; 12 [p. p.], 18, 41.

= *C. moesiacum* f. *dimonii* Borza in Bot. Közl. 12: 57 (1913).
= *C. tomentosum* subsp. *moesiacum* var. *orbelicum* (Velen.) Stoj. & Stefanov, Fl. Bălg. 1: 413 (1924).
= *C. moesiacum* var. *orbelicum* (Velen.) Georgiev in Stoj. & Stefanov, Fl. Bălg. ed. 2: 379 (1933); 13.
= *C. decalvans* subsp. *orbelicum* (Velen.) Stoj. & Stefanov, Fl. Bălg. ed. 3: 416 (1948); 14, 21, 39.
"*C. moesiacum*" sensu **35** [p. p.], 39 [p. p.].

f. **adamovicii** (Velen.) Niketić, **comb. nova**
Bu
= *C. moesiacum* var. *adamovicii* Velen. in Allgem. Bot. Zeitschr. 11: 43 (1905) [basion.]; 6, 11, 13.
= *C. moesiacum* f. *adamovicii* (Velen.) Hayek in Feddes Repert. (Beih.) 30(1): 207 (1924).
= *C. tomentosum* subsp. *moesiacum* var. *adamovicii* (Velen.) Stoj. & Stefanov, Fl. Bălg. 1: 413 (1924).
= *C. adamovicii* (Velen.) Georgiev in God. Sof. Univ. 13: 423 (1935).
= *C. decalvans* subsp. *adamovicii* (Velen.) Stoj. & Stefanov, Fl. Bălg. ed. 3: 416 (1948); 14, 39.
= *C. decalvans* f. *adamovicii* (Velen.) Trinajstić, Fl. Anal. Jugosl., Suppl. 5: 7 (1978).

f. **belassicum** (Georgiev) Niketić, **comb. et stat. nov.**
Ma **Bu** Gr
= *C. adamovicii* var. *belassicum* Georgiev in God. Sof. Univ. 13: 423 (1935) [basion.].
= *C. adamovicii* var. *belassicum* f. *pilosum* Georgiev, loc. cit. (1935).

f. **orbelicum**
Bu

f. **stribrnyi** Niketić, f. **nova** - T y p u s: Flora bulgarica: Rhodopes centr. (Čaušovo), leg. V. Stribrny 6.1895. sub nom. *C. banaticum*, rev. *C. moesiacum* (H o l o t y p u s: *BEOU*). - Planta 10-20 *cm* alta. Inflorescentia eglandulosa.
Bu

var. **pauciflorum** (G. Beck) Niketić, **comb. et stat. nov.**
BH Mtg ***Srb*** *A Ma* Bu
= *C. lanigerum* f. *pauciflorum* G. Beck in Glasn. Muz. Bosni Herceg. 18: 483 (1906) [basion.]; 13.
= *C. lanigerum* var. *decalvans* f. *pauciflorum* (G. Beck) Hayek in Feddes Repert. (Beih.) 30(1): 206 (1924); 31.

f. **pauciflorum**
BH Mtg ***Srb*** *A Ma*

f. **stojanovii** (Georgiev) Niketić, **comb. et stat. nov.**
Bu
= *C. lanigerum* subsp. *stojanovii* Georgiev in God. Sof. Univ. 13: 422 (1935) [basion.].

var. **pseudolanatum** (K. Malý) Niketić, **comb.** in **stat. nov.**
BH *Mtg A Ma* Bu
= *C. lanigerum* var. *pseudolanatum* K. Malý in Glasn. Muz. Bosni Herceg. 35: 129 (1923) [basion.].
= *C. lanigerum* var. *dollineri* f. *bosniacum* subf. *pseudolanatum* (K. Malý) Hayek in Feddes Repert. (Beih.) 30(1): 205 (1924).

= *C. moesiacum* var. *orbelicum* f. *rhodopeum* Georgiev in Stoj. & Stefanov, Fl. Bălg. ed. 2: 379 (1933).
= *C. rhodopeum* (Georgiev) Georgiev in God. Sof. Univ. 13: 418 (1935).
= *C. decalvans* subsp. *orbelicum* f. *rhodopeum* (Georgiev) Stoj. & Stefanov, Fl. Bălg. ed. 3: 416 (1948); 39.
= *C. decalvans* f. *pseudolanatum* (K. Malý) Trinajstić, Fl. Anal. Jugosl., Suppl. 5: 7 (1978).
"*C. hekuravense*" sensu **12.**

f. **lindtneri** Niketić f. **nova** - T y p u s: Flora macedonica: Rudoka: Turčin plan. supra Tetovo, leg. V. Lindtner 3.8.1936. sub nom. *C. lanatum* (H o l o t y p u s: *BEO*). - Sepala cum pedunculis glanduloso-pilosa.
Ma

f. **pseudolanatum**
BH *Mtg A* Bu

subsp. **sylvaticum** (K. Malý) Niketić **stat. nov.**
BH
= *C. lanigerum* var. *sylvaticum* K. Malý in Glasn. Muz. Bosni Herceg. 32: 135 (1920) [basion.].
= *C. lanigerum* var. *dollineri* f. *semiglabrum* subf. *sylvaticum* (K. Malý) Hayek in Feddes Repert. (Beih.) 30(1): 205 (1924).
= *C. orbelicum* subsp. *malyi* var. *sylvaticum* (K. Malý) Georgiev in God. Sof. Univ. 13: 418 (1935).
= *C. decalvans* f. *sylvaticum* (K. Malý) Trinajstić, Fl. Anal. Jugosl., Suppl. 5: 7 (1978).

f. **glandulosum** (K. Malý) Niketić **comb. nova**
BH
= *C. lanigerum* var. *sylvaticum* f. *glandulosum* K. Malý in Glasn. Muz. Bosni Herceg. 35: 128 (1923) [basion.].
= *C. orbelicum* subsp. *malyi* var. *sylvaticum* f. *glandulosum* (K. Malý) Georgiev in God. Sof. Univ. 13: 418 (1935).

f. **sylvaticum**
BH

moesiacum aggr.

moesiacum Friv. in Flora (Regensb.) 19: 435 (1836); 6 [p. p.], 7 [p. p.], 11, 12, 13 [p. p.], 14 [p. p.], 18 [p. p.], 21 [p. p.], 22 [p. p.], 35 [p. p.], 39 [p. p.], 41 [p. p.].
Bu
= *C. tomentosum* var. *moesiacum* (Friv.) Griseb., Spicil. Fl. Rumel. 1: 211 (1843) [p. p.]; 4
= *C. arvense* var. *latifrons* Urum. in Österr. Bot. Zeitschr. 49: 201 (1899).
= *C. arvense* f. *latifrons* (Urum.) Hayek in Feddes Repert. (Beih.) 30(1): 206 (1924).
= *C. tomentosum* subsp. *moesiacum* (Friv.) Stoj. & Stefanov, Fl. Bălg. 1: 412 (1924).
= *C. arvense* var. *polytrichum* f. *latifrons* (Urum.) Vălev in Jordanov, Fl. Nar. Rep. Bălg. 3: 376 (1966).

malyi (Georgiev) Niketić, **comb.** et **stat. nov.**
BH Mtg Srb A Bu
= *C. orbelicum* subsp. *malyi* Georgiev in God. Sof. Univ. 13: 417 (1935) [basion.] [p. p.].

"*C. hekuravense*" sensu Lakušić in God. Biol. Univ. Sarajevo 19: Tab. 11, 11a (1966).
"*C. moesiacum*" sensu 1, 3 [balc.], 6 [p. p.], 7 [p. p.], 9, 13 [p. p.], 14 [p. p.], 17, 18 [p. p.], 19, 21 [p. p.], 22 [p. p.], 23, 25, **28**, 30, 31, 35 [p. p.], 38, 39 [p. p.], 40, 41 [p. p.].
"*C. tomentosum*" sensu **26**, 29.
"*C. tomentosum* var. *moesiacum*" sensu 2, **15** [p. p.], 27.

subsp. **malyi**
BH Mtg Srb A Bu

var. **malyi**
BH Mtg Srb A

f. **neolindtneri** Niketić, f. **nova** - T y p u s: Flora montenegrina: Mt Greben prope Gusinje, in rupestribus calcareis cacuminis, leg. V. Lindtner 24.7.1933 sub nom. *C. malyi* (H o l o t y p u s: *BEO*). - Folia caulina late ovata vel late eliptica.
***Mtg** Srb A*

f. **malyi**
BH Mtg Srb A

var. **orientale** Niketić, var. **nov.** - T y p u s: Flora serbica: Mt Pleš supra pagum Beloinje, prope Svrljig, in pratis supra zonam fagetis, ca. 780-800 *m* leg. V. Lindtner 28.6.1955, det. N. Diklić sub nom. *C. moesiacum* (H o l o t y p u s: *BEO*). - Folia juvenilia adpresse cano vel albo-tomentosa, non dense albosericeo-tomentosa. Sepala obtusiuscula, non obtusa, 6-8 *mm* longa, cum bracteis modice argenteo-scarioso-marginata. Petala calyce circiter duplo longiora, non 2-2,5-plo longiora.
***Srb** Bu*
"*C. moesiacum* f. *dimonii*" sensu **6** [p. p.].

f. **midzorense** Niketić, f. **nova** - T y p u s: Flora serbica: Mt Stara planina (Midžor), in pascuis, ca. 2000 *m*, leg. O. Grebenščikov 6.7.1946. sub nom. *C. moesiacum* f. *adamovicii* (H o l o t y p u s: *BEO*). - Sepala et bracteae, saepe pedunculi et rami inflorescentiae glanduloso-pilosi.
***Srb** Bu*
"*C. decalvans* subsp. *adamovicii*" sensu **9**.

f. **orientale**
***Srb** Bu*

subsp. **serpentini** (Novák) Niketić, **comb.** et **stat. nov.**
Srb
= *C. moesiacum* f. *serpentini* Novák in Preslia 5: 83 (1927) [basion.]; 10.
= *C. orbelicum* subsp. *malyi* f. *zlatiborense* Georgiev in God. Sof. Univ. 13: 418 (1935) ["*zlatibrrense*"].
"*C. moesiacum* f. *halacsyi*" sensu **10**.
"*C. orbelicum* subsp. *malyi* f. *malyi*" sensu **12** [p. p.].

Ser. **Cerastium**
= Subsect. *Arvensia* Hayek, Fl. Steierm. 1: 301 (1908) [nom. illeg.]; 12, 13.
= Ser. *Arvensia* Borza in Bot. Közl. 12: 62 (1913) [nom. illeg.].

arvense L. Sp. Pl.: 438 (1753); 1, 2, 3, 9, 11, 12, 13, 14, 18, 20, 21, 22, 26, 27, 28, 30, 31, 32, 34, 38, 39, 41, 42.
Cro BH Mtg Srb A Ma Bu

subsp. **arvense**
Cro Srb *Ma* Bu
= *C. arvense* var. *nemorum* Georgiev in Stoj. & Stefanov, Fl. Bălg. ed. 2: 378 (1933); 11, 39.
= *C. arvense* subsp. *strictum* f. *nemorum* (Georgiev) Georgiev in God. Sof. Univ. 13: 412 (1935).
= *C. banaticum* subsp. *alpinum* var. *nemorum* (Georgiev) Stoj. & Stefanov, Fl. Bălg. ed. 3: 418 (1948).

f. **adenophorum** Hayek, Fl. Steierm. 1: 303 (1908); 13.
Srb Ma

f. **arvense**
Cro Srb Bu

f. **glabrescens** G. F. W. Meyer, Chloris Hannov.: 200 (1856); 13, 18.
Srb

subsp. **molle** (Vill.) Arcangeli Compt. Fl. Ital.: 99 (1882); 14, 21, 22.
Cro BH Mtg Srb A Ma Bu
= *Centunculus rigidus* Scop., Fl. Carn. ed. 2, 1: 322 (1772).
= *Cerastium rigidum* (Scop.) Vitm., Summa Plant. 3: 137 (1789); 6.
= *C. molle* Vill., Hist. Pl. Dauphine. 3: 644 (1789) [basion.].
= *C. ciliatum* Waldst. & Kit., Icon. Descr. Pl. Rar. Hung. 3: 250 (1812); 32, 40, 41.
= *C. strictum* var. *molle* (Vill.) Ser. in DC. Prodr. 1: 419 (1824).
= *C. strictum* var. *rigidum* (Scop.) Ten., Syll. Fl. Neap.: 221 (1831).
= *C. arvense* var. *ciliatum* (Waldst. & Kit.) Aschers. & Kanitz, Cat. Corm. Serb. etc.: 84 (1877); 20, 34.
= *C. arvense* var. *polytrichum* Urum. in Österr. Bot. Zeitschr. 49: 201 (1899); 11, 12, 34, 39.
= *C. arvense* var. *rigidum* (Scop.) G. Beck in Glasn. Muz. Bosni Herceg. 18: 484 (1906); 13.
= *C. arvense* subsp. *rigidum* (Scop.) Hegi, Ill. Fl. Mitt.-Eur. 3: 376 (1911); 18, 38.
= *C. arvense* var. *strictum* f. *molle* (Vill.) Graebner & Corr. in Aschers. & Graebner, Syn. Mitteleur. Fl. 5(1): 607 (1917).
= *C. arvense* f. *polytrichum* (Urum.) Hayek in Feddes Repert. (Beih.) 30(1): 206 (1924).
= *C. arvense* subsp. *ciliatum* (Waldst. & Kit.) Hayek, loc. cit. (1924); 9, 31, 38, 39.
= *C. banaticum* subsp. *alpinum* var. *polytrichum* (Urum.) Stoj. & Stefanov, Fl. Bălg. ed. 3: 417 (1948).
"*C. arvense* var. *alpicolum*" sensu **40**.
"*C. arvense* var. *laricifolium*" sensu 3, 20, **42**.
"*C. arvense* subsp. *lerchenfeldianum*" sensu 9, 14 [balc.], **18**, 21 [balc.], 38.
"*C. árvense* var. *lerchenfeldianum*" sensu **34**.
"*C. arvense* subsp. *strictum*" sensu **12**.
"*C. arvense* var. *thomasii*" sensu **2**, 31.
"*C. laricifolium*" sensu **32**.

f. **calcicolum** (Schur) Niketić, **comb. nova**
BH Mtg *Srb* Ma Bu
= *C. arvense* var. *calcicolum* Schur, Phytogr.: 152 (1877) [basion.]; 6.
= *C. beckianum* Hand.-Mazz. & Stadim. in Österr. Bot. Zeitschr. 55: 433 (1905).

= *C. arvense* var. *beckianum* (Hand.-Mazz. & Stadim.) Rohlena in Sitz.-Ber. Böhm. Ges. Wiss. 1911: 19 (1912).
= *C. rigidum* var. *beckianum* (Hand.-Mazz. & Stadim.) Borza in Bot. Közl. 12: 70 (1913).
= *C. rigidum* var. *ciliatum* (Waldst. & Kit.) Borza, loc. cit.: 72 (1913).
= *C. arvense* var. *strictum* f. *beckianum* (Hand.-Mazz. & Stadim.) Graebner & Corr. in Aschers. & Graebner, Syn. Mitteleur. Fl. 5(1): 606 (1917).
= *C. arvense* var. *rigidum* f. *calcicolum* (Schur) Graebner & Corr., op. cit.: 610 (1917).
= *C. arvense* subsp. *rigidum* f. *beckianum* (Hand.-Mazz. & Stadim.) Hayek in Feddes Repert. (Beih.) 30(1): 206 (1924); 31.
= *C. arvense* var. *glanduliferum* Davidov ex Georgiev in God. Sof. Univ. 13: 412 (1935); 11, 39.
= *C. arvense* subsp. *calcicolum* (Schur) Borza, Consp. Fl. Rom. 1: 89 (1947).
= *C. banaticum* subsp. *alpinum* var. *glanduliferum* (Georgiev) Stoj. & Stefanov, Fl. Bălg. ed. 3: 418 (1948).
= *C. arvense* subsp. *rigidum* var. *beckianum* (Hand.-Mazz. & Stadim.) Prodan in Săvulescu, Fl. Rep. Pop. Române 2: 63 (1953).

f. **capitatum** (Georgiev) Niketić, **comb.** et **stat. nov.**
Srb **Bu**
= *C. arvense* var. *capitatum* Georgiev in God. Sof. Univ. 13: 411 (1935) [basion.].

f. **molle**
Cro BH Mtg Srb A Ma Bu

f. **petrovicii** Niketić, f. **nova** - T y p u s: Flora serbica: Mt Suva planina, leg. Dr. S. Petrović 1879. sub nom. *C. arvense* var. *?* (H o l o t y p u s: *BEOU*). - Dense caespitosa caulibus floriferis humilibus, 5-15 *cm* longis. Folia caulina ovato-lanceolata. Inflorescentia eglandulosa.
Srb

subsp. **strictum** (Koch) Gaudin, Fl. Helv. 3: 245 (1828); 14, 21, 22.
Cro BH Mtg *Srb*
= *C. strictum* Haenke in Jacq., Collectanea 2: 65 (1789) [non L., Sp. Pl.: 439 (1753)].
= *C. arvense* var. *strictum* Koch, Syn. Fl. Germ. Helv.: 124 (1835) [basion.]; 3 [p. p.], 13.
= *C. arvense* var. *alpicolum* Fenzl in Ledeb., Fl. Ross. 1: 413 (1842).
= *C. arvense* var. *strictum* f. *alpicolum* (Fenzl) Graebner & Corr. in Aschers. & Graebner, Syn. Mitteleur. Fl. 5(1): 607 (1917).
= *C. arvense* subsp. *ciliatum* f. *alpicolum* (Fenzl) Hayek, in Feddes Repert. (Beih.) 30(1): 207 (1924); 31.

f. **minus** (G. Beck) Niketić, **comb. nova**
BH *Srb*
= *C. arvense* var. *strictum* f. *minus* G. Beck in Glasn. Muz. Bosni Herceg. 18: 483 (1906) [basion.].

f. **strictum**
Cro BH Mtg *Srb*

banaticum (Rochel) Heuffel in Verh. Zool.-Bot. Ges. Wien 8: 77 (1858); 1, 5, 6, 7, 9, 11, 12, 13, 14, 18, 21, 22, 25, 35, 36, 37, 38, 39, 40, 41.
Srb A Ma Bu Gr AE
= *C. grandiflorum* var. *banaticum* Rochel, Pl. Banat. Rar.: Tab. 2, fig. 6 (1828) [basion.].
= *C. grandiflorum* var. *glabrescens* Reichenb., Fl. Germ Excurs.: 799 (1832).
= *C. grandiflorum* var. *glabrum* Koch, Syn. Fl. Germ. Helv.: 125 (1835).
= *C. grandiflorum* subsp. *banaticum* (Rochel) Stoj. & Stefanov, Fl. Bălg. 1: 411 (1924).
= *C. arvense* subsp. *banaticum* (Rochel) Stoj. & al. in Stoj. & Stefanov, Fl. Bălg. ed. 4, 1: 380 (1966) [comb. inval.].
"*C. grandiflorum*" sensu **4** [p. p.], 9 [p. p.], 18 [p. p.], 25, 26, 28, 29, 30, 38 [p. p.], 41.
"*C. grandiflorum* var. *rosmarinifolium*" sensu **2** [p. p.].

subsp. **banaticum**
Srb ?A Ma Bu Gr AE
"*C. banaticum* subsp. *alpinum*" sensu **35** [p. p.], 39 [p. p.].
"*C. banaticum* subsp. *speciosum*" sensu **22** [p. p.].

var. **adenotrichum** (Čelak.) Borza in Bot. Közl. 12: 63 (1913); 11, 12, 13, 18, 35, 39.
Ma **Bu** Gr *AE*
= *C. adenotrichum* Čelak. in Österr. Bot. Zeitschr. 37: 338 (1887) [basion.].
= *C. grandiflorum* subsp. *banaticum* var. *adenotrichum* (Čelak.) Stoj. & Stefanov, Fl. Bălg. 1: 412 (1924).
= *C. banaticum* var. *adenotrichum* f. *thracicum* Georgiev in God. Sof. Univ. 13: 414 (1935).
"*C. grandiflorum* subsp. *speciosum*" sensu **34**.

f. **abbreviatum** Georgiev in Stoj. & Stefanov, Fl. Bălg. ed. 2: 380 (1933); 35, 39.
Bu
"*C. banaticum* var. *adenotrichum* f. *balcanicum*" sensu **11**, 35.

f. **adenotrichum**
Ma **Bu** Gr

f. **velessanum** Georgiev in God. Sof. Univ. 13: 414 (1935).
Ma

var. **banaticum**
Srb ?A Ma Bu Gr AE
= *C. banaticum* var. *latifolium* Georgiev in Stoj. & Stefanov, Fl. Bălg. ed. 2: 380 (1933); 11, 35, 39.
= *C. banaticum* var. *robustrum* Georgiev in God. Sof. Univ. 13: 414 (1935); 11, 35, 39.

f. **banaticum**
Srb ?A Ma Bu Gr AE

f. **diklicii** Niketić, f. **nova** - T y p u s: Flora serbica: Mt Rtanj: In rupestribus calcareis et in pratis ad dorso jugi, 1200-1500 *m*, leg. N. Diklić & S. Mladenović 19.7.1988. (H o l o t y p u s: *BEO*). - Sepala et bracteae, saepe pedunculi et rami inflorescentiae, interdum etiam folia extimia glanduloso-pilosi.
***Srb** Ma Bu*
"*C. banaticum* var. *balcanicum*" sensu **9**, 38.

f. **kellereri** (Georgiev) Niketić, **stat. nov.**
Srb Ma **Bu**
= *C. banaticum* var. *kellereri* Georgiev in Stoj. & Stefanov, Fl. Bălg. ed. 2: 380 (1933) [nom. inval.]; Georgiev in God. Sof. Univ. 13: 413 (1935) [basion.]; 35, 39.

f. **minus** (Velen.) Borza in Bot. Közl. 12: 63 (1913); 18.
Srb **Bu**
= *C. banaticum* var. *minus* Velen. in Allgem. Bot. Zeitschr. 11(2): 43 (1905) [basion.]; 13.
= *C. grandiflorum* subsp. *banaticum* var. *minus* (Velen.) Stoj. & Stefanov, Fl. Bălg. 1: 412 (1924).
= *C. banaticum* f. *urumovii* Georgiev in God. Sof. Univ. 13: 413 (1935).

f. **nikolicii** Niketić, **f. nova** - T y p u s: Flora serbica: Mt Stol prope urbem Bor, in saxeto, exp. W, leg. V. Nikolić 25.6.1955. (H o l o t y p u s: *BEO*). - Dense caespitosa caulibus floriferis humilibus, 10-15 *cm* longis. Sepala et bracteae, saepe pedunculi et rami inflorescentiae glanduloso-pilosi.
Srb

var. **ilicii** Niketić, **var. nov.** - T y p u s: Flora serbica: Pljačkovica, leg. Đ. Ilić 5.1910. (H o l o t y p u s: *BEO*). - Folia 3-4 *cm* longa, 2-4 *mm* lata. Bracteae margine ad medio ciliatae.
Srb

var. **madarense** Georgiev in God. Sof. Univ. 13: 413 (1935); 35, 39.
Srb Ma **Bu**
= *C. banaticum* var. *madarense* Georgiev in Stoj. & Stefanov, Fl. Bălg. ed. 2: 380 (1933) [nom. inval.].

f. **madarense**
Srb **Bu**

f. **pancicii** Niketić, **f. nova** - T y p u s: Flora serbica: Mt Rtanj, leg. J. Pančić 8.1872. sub nom. *C. grandiflorum* (H o l o t y p u s: *BEOU*). - Dense caespitosa caulibus floriferis humilibus, 10-15 *cm* longis. Sepala et bracteae, saepe pedunculi et rami inflorescentiae glanduloso-pilosi.
Srb

f. **stenophyllum** (Georgiev) Niketić, **comb.** et **stat. nov.**
Srb Ma **Bu**
= *C. banaticum* f. *stenophyllum* Georgiev in Stoj. & Stefanov, Fl. Bălg. ed. 2: 380 (1933) [nom. inval.].
= *C. banaticum* var. *stenophyllum* (Georgiev) Georgiev in God. Sof. Univ. 13: 413 (1935) [basion.]; 35, 39.

subsp. **hirsutum** (Fenzl ex Griseb.) Niketić, **comb.** et **stat. nov.**
Srb Ma Gr ?Bu
= *C. grandiflorum* var. *hirsutum* Fenzl ex Griseb., Spicil. Fl. Rumel. 1: 211 (1843) [basion.]; 2 [p. p.], 20 [p. p.].
= *C. grandiflorum* f. *hirsutum* (Fenzl ex Griseb.) Graebner & Corr. in Aschers. & Graebner, Syn. Mitteleur. Fl. 5(1): 581 (1917); 18.
= *C. banaticum* subsp. *kosaninii* Georgiev in God. Sof. Univ. 13: 414 (1935).
= *C. banaticum* var. *kosaninii* (Georgiev) Micevski, Flora na Republika Makedonija 1(2): 262 (1993).

var. **grebenscikovii** Niketić, **var. nov.** - T y p u s: Flora macedonica: Mt Bistra, supra pag. Sence (ca. urbem Gostivar), in pratis, ca. 1800 *m*, leg. O. Grebenščikov 22.6.1933. sub nom. *C.*

grandiflorum, rev. O. Grebenščikov sub nom. *C. banaticum* subsp. *kosaninii* (H o l o t y p u s: *BEO*). - Folia glabrata, tantum basi ciliata.

Srb Ma

var. **hirsutum**

Srb Ma Gr ?Bu

subsp. **speciosum** (Boiss.) Jalas in Ann. Bot. Fenn. 20: 109 (1983); 14, 21, 22, 36, 37.

A *Ma* Bu **Gr** AE

= *C. grandiflorum* var. *speciosum* Boiss., Fl. Orient. 1: 727 (1867) [basion.].

= *C. speciosum* (Boiss.) Hauskn. in Mitt. Thür. Bot. Ver. 5: 55 (1893); 6, 13, 16, 18.

= *C. grandiflorum* subsp. *speciosum* (Boiss.) Stoj. & Stefanov, Fl. Bălg. 1: 412 (1924).

"*C. lanigerum*" sensu **16** [p. p.].

"*C. tomentosum*" sensu **15**.

var. **alpinum** (Boiss) Niketić, **comb. nova**

A *Ma* **Gr** *AE*

= *C. grandiflorum* var. *alpinum* Boiss., Fl. Orient. 1: 728 (1867) [basion.].

= *C. speciosum* f. *subspeciosum* Borza in Bot. Közl. 12: 73 (1913).

= *C. speciosum* var. *subspeciosum* (Borza) Graebner & Corr. in Aschers. & Graebner, Syn. Mitteleur. Fl. 5(1): 596 (1917).

= *C. speciosum* f. *alpinum* (Boiss.) Hayek, in Feddes Repert. (Beih.) 30(1): 206 (1924).

= *C. banaticum* subsp. *alpinum* (Boiss.) Buschm. in Feddes Repert. 43: 140 (1938); 9, 35, 39.

"*C. arvense* var. *alpicolum*" sensu **15** [p. p.].

f. **adenophorum** Haláscy ex Niketić, **f. nova** - T y p u s: Flora Graeca: Mt Olympi, leg. Heldreich 7.1851. sub nom. *C. grandiflorum* var. *glabrescens*, rev. Borza 27.6.1911., sub nom. *C. speciosum* var. *adenophorum* (H o l o t y p u s: *BD*). - Dense caespitosa caulibus floriferis humilibus. Sepala et bracteae, saepe pedunculi et rami inflorescentiae glanduloso-pilosi.

Ma **Gr** *AE*

= *C. speciosum* var. *adenophorum* Haláscy, Consp. Fl. Graec. 1: 221 (1900) [nom illeg.]; 6, 13.

f. **alpinum**

Gr

var. **balcanicum** (Vandas) Niketić, **comb. nova**

Ma **Bu** Gr

= *C. balcanicum* Vandas in Sitz.-Ber. Böhm. Ges. Wiss. 1888: 436 (1888) [basion.]; 40.

= *C. grandiflorum* var. *balcanicum* (Vandas) Williams in Jour. Bot. (London) 37: 118 (1902).

= *C. banaticum* f. *balcanicum* (Vandas) Borza in Bot. Közl. 12: 64 (1913).

= *C. banaticum* var. *balcanicum* (Vandas) Graebner & Corr. in Aschers. & Graebner, Syn. Mitteleur. Fl. 5(1): 595 (1917); 18.

= *C. grandiflorum* subsp. *banaticum* var. *balcanicum* (Vandas) Stoj. & Stefanov, Fl. Bălg. 1: 412 (1924).

= *C. banaticum* var. *adenotrichum* f. *balcanicum* (Vandas) Georgiev in Stoj. & Stefanov, Fl. Bălg. ed. 2: 378 (1933); 35.

var. **speciosum**
Gr AE

Ser. **Grandiflora** Borza in Bot. Közl. 12: 61 (1913); 13.
= Ser. *Candidissima* Borza, op. cit.: 60 (1913).

candidissimum Corr. in Österr. Bot. Zeitschr. 59: 171 (1909); 6, 7, 13, 14, 18, 21, 22, 36, 37.
Gr AE
"*C. tomentosum*" sensu **4**, 16, 40.

f. **alpinum** (Boiss. & Heldr. ex Corr.) Hayek in Feddes Repert. (Beih.) 30(1): 203 (1924).
Gr
= *C. tomentosum* var. *alpinum* Boiss. & Heldr. ex Corr. in Österr. Bot. Zeitschr. 59: 171 (1909) [basion.].
= *C. candidissimum* f. *brevifolium* Borza in Bot. Közl. 12: 60 (1913); 7.
= *C. candidissimum* var. *alpinum* (Boiss. & Heldr. ex Corr.) Graebner & Corr. in Aschers. & Graebner, Syn. Mitteleur. Fl. 5(1): 583 (1917); 7.

f. **candidissimum**
Gr

f. **cuneifolium** Corr. in Österr. Bot. Zeitschr. 59: 176 (1909); 7, 18.
Gr
= *C. candidissimum* var. *cuneifolium* (Corr.) Graebner & Corr. in Aschers. & Graebner, Syn. Mitteleur. Fl. 5(1): 583 (1917).

grandiflorum Waldst. & Kit., Descr. Icon. Pl. Hung.: 183 (1804); 2, 3, 6, 13, 14, 18 [p. p.], 20, 21, 22 [p. p.], 27, 31, 32, 38 [p. p.], 40 [p. p.], 42.
Cro BH Mtg A
= *C. biebersteinii* var. *tenuifolium* Gren. in Mém. Soc. Émul. Doubs 1: 192 (1841).
= *C. tomentosum* var. *grandiflorum* (Waldst. & Kit.) Fiori & Paol., Fl. Anal. Ital. 1: 358 (1898).
= *C. grandiflorum* f. *leiogynum* Corr. in Österr. Bot. Zeitschr. 59: 180 (1909); 6, 7.
= *C. grandiflorum* f. *lasiostemon* Corr., op. cit.: 181 (1909); 7, 18, 31.
= *C. grandiflorum* var. *leiogynum* (Corr.) Graebner & Corr. in Aschers. & Graebner, Syn. Mitteleur. Fl. 5(1): 580 (1917).
= *C. grandiflorum* var. *lasiostemon* (Corr.) Graebner & Corr., op. cit.: 581 (1917).
= *C. nodosum* Kit. ex Buschm. in Feddes Repert. 127 (1938) [nom. illeg.] [p. p.].
"*C. grandiflorum* var. *hirsutum*" sensu **2** [p. p.], 20 [p. p.].

f. **grandiflorum**
Cro BH *Mtg* A
= *C. grandiflorum* f. *rosmarinifolium* G. Beck in Glasn. Muz. Bosni Herceg. 18: 481 (1906) [non *C. grandiflorum* var. *rosmarinifolium* Fenzl in Ledeb., Fl. Ross. 1: 414 (1842)] [nom. illeg.]; 7, 38.
= *C. grandiflorum* f. *leiostemon* Corr. in Österr. Bot. Zeitschr. 59: 181 (1909); 6.

= *C. grandiflorum* var. *leiostemon* (Corr.) Graebner & Corr. in Aschers. & Graebner, Syn. Mitteleur. Fl. 5(1): 580 (1917).

"*C. grandiflorum* var. *rosmarinifolium*" sensu **2** [p. p.].

f. **setifolium** G. Beck in Glasn. Muz. Bosni Herceg. 18: 481 (1906); 7, 13, 18, 38.

Cro **BH** *Mtg*

f. **virescens** G. Beck in Glasn. Muz. Bosni Herceg. 18: 481 (1906); 7, 13, 18, 38.

BH

= *C. grandiflorum* f. *glabrescens* Corr. in Österr. Bot. Zeitschr. 59: 181 (1909) [non *C. grandiflorum* var. *glabrescens* Reichenb., Fl. Germ. Excurs.: 799 (1832)] [nom. illeg.]; 7, 13.

= "*C. grandiflorum* var. *glabrescens*" sensu **42**.

Ser. **Latifolia** Borza in Bot. Közl. 12: 47 (1913); 13.

latifolium aggr.

dinaricum G. Beck & Szysz. in Rozpr. Akad. Um. (Mat.-Przyr.) 19: 62 (1889); 3, 6, 10, 13, 14, 18, 20, 21, 22, 31, 38.

Cro **BH** Mtg Srb A

"*C. alpinum*" sensu **27**, 20.

"*C. latifolium*" sensu Vis. in Real. Inst. Venet. 16 :163 (1871); Vis., Fl. Dalm., Suppl. 1: 131 (1872).

var. **dinaricum**

Cro **BH** Mtg Srb A

f. **dinaricum**

Cro **BH** Mtg Srb A

f. **velebiticum** Degen & Lengyel in Magyar Bot. Lapok 6: 126 (1907); 6, 18, 38.

Cro BH Mtg A

= *C. dinaricum* var. *velebiticum* (Degen & Lengyel) Graebner & Corr. in Aschers. & Graebner, Syn. Mitteleur. Fl. 5(1): 628 (1918); 19.

var. **hekuravense** (Jáv.) Niketić, **comb.** et **stat. nov.**

Mtg ?Srb **A**

= *C. hekuravense* Jáv. in Növ. Közl. 19: 18 (1921) [basion.]; 14, 18, 23.

"*C. alpinum*" sensu **21**.

uniflorum Clairv., Man. Herbor. Suisse: 147 (1811); 3, 6, 13, 14, 18 [p. p.], 21, 38.

BH

runemarkii Möschl & Rech. fil. in Anzeig. Akad. Wiss. (Wien) 1962: 231 (1962); 14, 21, 22, 37.

AE

= *C. coronense* Runemark in Bot. Not. 114: 455 (1961) [non Schur in Verh. Naturf. Ver. Brünn 15(2): 154 (1877)].

theophrasti Merxm. & Strid in Bot. Not. 130: 469 (1977); 14, 21, 22, 36, 37.

Gr

= *C. uniflorum* var. *mitkaënse* Wagner in Feddes. Repert. 39: 282 (1935).

"*C. alpinum* var. *glanduliferum*" sensu **33**.

CONCLUSIONS

The total of 4 series, 14 species and 103 infraspecial taxa have been stated for the flora of the Balkan peninsula. Fifteen of the infraspecial taxa have been described as new for science: *C. arvense* subsp. *molle* f. *petrovicii*, *C. banaticum* f. *diklicii*, *C. banaticum* f. *nikolicii*, *C. banaticum* var. *ilicii*, *C. banaticum* var. *madarense* f. *pancicii*, *C. banaticum* subsp. *hirsutum* var. *grebenscikovii*, *C. banaticum* subsp. *speciosum* var. *alpinum* f. *adenophorum*, *C. decalvans* var. *albanicum* f. *scardicum*, *C. decalvans* var. *oehmii*, *C. decalvans* var. *orbelicum* f. *stribrnyi*, *C. decalvans* var. *pseudolanatum* f. *lindtneri*, *C. malyi* f. *neolindtneri*, *C. malyi* var. *orientale* and *C. malyi* var. *orientale* f. *midzorense*. Furthermore, 39 taxa gained a new status or entered a new combination.

Ser. *Alpina* Borza and Ser. *Lanigera* Borza have been brought together into one section due to the existence of the transitory species of *C. neoscardicum* Niketić, and to the occurrence of a succession of similar forms clearly indicating their phylogenetic relatedness.

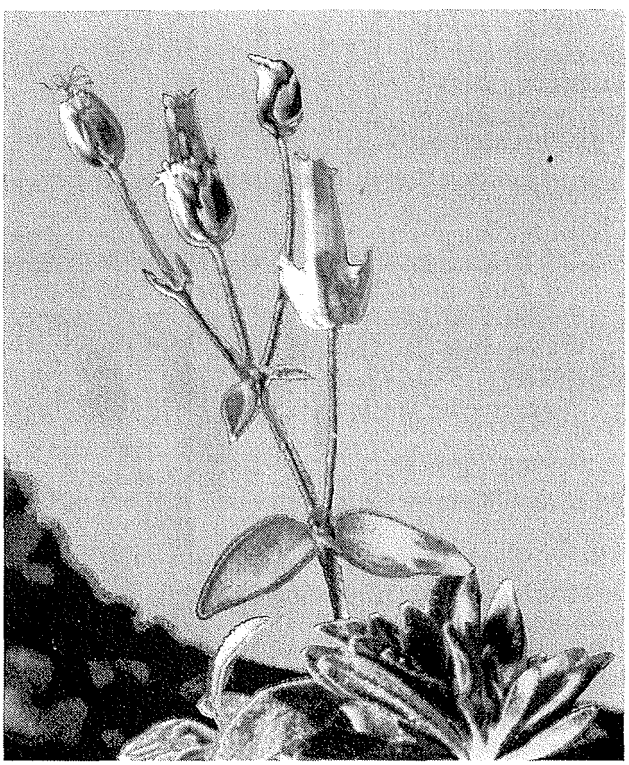

Fig. 1. - *Cerastium dinaricum* var. *hekuravense*
Mt Durmitor (Škrka, Ćuskija)
(photo M. Niketić)

C. malyi (Georgiev) Niketić has been extract in the *moesiacum* group, as a species of the West and Central part of the group's range. *C. decalvans* subsp. *sylvaticum* (K. Malý) Niketić and *C. malyi* subsp. *serpentini* (Novák) Niketić. have been isolated as subspecies convergent with the representatives of the *alpinum* group, according to the type of hairiness.

On basis of the phyletic comparisons of its original description and the herbarium materials collected on the Durmitor mountain (Montenegro), the *C. hekuravense* Jáv. taxon has been returned from Ser. *Alpina* to Ser. *Latifoliae* Borza. Since its glandular-pubescent leaves are its only difference from *C. dinaricum* G. Beck & Szysz., (also growing on the Durmitor mountain), it has been given the status of variety, *C. dinaricum* var. *hekuravense* (Jáv.) Niketić (Fig. 1).

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SUBSECT. *CERASTIUM* RODA *CERASTIUM* L. (*CARYOPHYLLACEAE*) NA BALKANSKOM POLUOSTRVU

REVIDIRANI I DOPUNJENI POPIS TAKSONA

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I z v o d

Nakon višegodišnjih terenskih istraživanja i pregleda obimnog herbarskog materjala (*BD* - Prirodnjački muzej, Budimpešta, *BEO* - Prirodnjački muzej, Beograd, *BEOU* - Biološki fakultet, Beograd, *PVSI* - Poljoprivredni fakultet, Plovdiv, *SO* - Biološki fakultet, Sofija, *SOA* - Poljoprivredni fakultet, Sofija, materijal u Plovdivu, *SOM* - Bugarska Akademija nauka, Sofija i dr.) došlo se do novih i potpunijih saznanja o taksonomiji i klasifikaciji podsekcije *Cerastium* roda *Cerastium* L. na Balkanskom poluostrvu. Priloženi nomenklator predstavlja osnovu za dalja morfološka, horološka i filogenetska razmatranja.

Za floru Balkanskog poluostrva (uključujući i egejska ostrva) konstatovane su 4 serije i 14 vrsta, kao i 103 infraspecijska taksona, od kojih su 15 novi za nauku: *C. arvense* subsp. *molle* f. *petrovicii*, *C. banaticum* f. *diklicii*, *C. banaticum* f. *nikolicii*, *C. banaticum* var. *ilicii*, *C. banaticum* var. *madarense* f. *pancicii*, *C. banaticum* subsp. *hirsutum* var. *grebenscikovii*, *C. banaticum* subsp. *speciosum* var. *alpinum* f. *adenophorum*, *C. decalvans* var. *albanicum* f. *scardicum*, *C. decalvans* var. *oehmii*, *C. decalvans* var. *orbelicum* f. *stribrnyi*, *C. decalvans* var. *pseudolanatum* f. *neolindtneri*, *C. malyi* f. *lindtneri*, *C. malyi* var. *orientale* i *C. malyi* var. *orientale* f. *midzorense*. Osim toga 39 taksona je dobilo novi status ili je ušlo u novu kombinaciju.

Ser. *Alpina* Borza i ser. *Lanigera* Borza su ujedinjene u jednu sekciju zbog postojanja prelazne vrste *C. neoscardicum* Niketić, kao i zbog pojave 'sukscesivnog' niza sličnih taksona, koji upućuje na njihovu filogenetsku povezanost.

U okviru kompleksa *moesiacum* izdvojen je *C. malyi* (Georgiev) Niketić kao vrsta zapadnog i centralnog dela areala grupe. Kao podvrste koje su po tipu dlakavosti konvergentne sa predstavnicima agregata *alpinum*, izdvojene su *C. decalvans* subsp. *sylvaticum* (K. Malý) Niketić i *C. malyi* subsp. *serpentini* (Novák) Niketić.

Na osnovu upoređenja podataka koji se nalaze u izvornom opisu i rezultata analize herbarskog materjala sakupljenog u Crnoj Gori (Durmitor), takson *C. hekuravense* Jáv. vraćen je iz ser. *Alpina* u ser. *Latifoliae* Borza, a kako se od *C. dinaricum* G. Beck & Szysz., koji takođe raste na Durmitoru, razlikuje samo po žlezdasto dlakavim listovima, dodeljen mu je taksonomski status varijeteta: *C. dinaricum* var. *hekuravense* (Jáv.) Niketić (Fig. 1).

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UDK: 582.736 (497.11)
Originalni naučni članak

DA LI JE VRSTA *ASTRAGALUS SULCATUS* L. NESTALA IZ FLORE SRBIJE ?

OLGA VASIĆ

Prirodnjački muzej, Beograd, Jugoslavija

Vasić Olga (1995-98): *Has the species Astragalus sulcatus L. disappeared from the flora of Serbia?.* - Bulletin of the Natural History Museum, Belgrade, *B49-50*, 63-72.

The specimens collected on Fruška Gora (Yugoslavia: Serbia) and erroneously identified as *Astragalus sulcatus* L. belong to the species *Astragalus onobrychis* L. These specimens were long thought to be the only evidence of the presence of *A. sulcatus* in the flora of Serbia. As that evidence is not valid, and no other exists, there are no grounds for the claim that the species was ever present in the flora of Serbia. Since it never occurred in these parts, it cannot have disappeared.

UVOD

Vrsta *Astragalus sulcatus* L. našla se svojevremeno na spisku taksona koji su bili predviđeni da se obrade u okviru projekta Crvena knjiga flore Srbije. Sudeći po podacima koji se mogu naći u literaturi (O b r a d o v i ć 1966, D i k l i ć 1972, B o ž a *et al.* 1997), vrsta je u potpunosti zasluživala svoje mesto u ovoj knjizi. Jedino njeno do sada navođeno nalazište je Fruška gora, gde ju je na tri lokaliteta 1950. pronašla NADA BABIĆ. Tokom sledećih skoro 50 godina nije bilo vesti da je ponovo nađena u prirodi, mada je Fruška gora bila kontinuirano predmet pažnje botaničara, a nije gajena ni u veštačkim uslovima. Shodno tome, zaključak da pripada grupi biljaka koje su na teritoriji Srbije izumrle (B o ž a *et al.* 1997) činio bi se logičnim. Prilikom početne prospekcije kritičkih taksona i lokaliteta tokom priprema za izradu Crvene knjige flore Srbije, pojavile su se indicije da primerci koje je NADA BABIĆ odredila kao *As-*

tragalus sulcatus L., možda pripadaju vrsti *Astragalus onobrychis* L. U slučaju da je početna greška prilikom determinacije zaista načinjena, prouzrokovala je lančanu reakciju pojavljivanja netačnih podataka u literaturi, što je tu vrstu sasvim neopravdano dovelo i na listu biljaka za Crvenu knjigu.

METODE

Da bi se utvrdilo da li postoje dokazi o ranijem i eventualno sadašnjem prisustvu vrte *Astragalus sulcatus* u flori Srbije, primenjene su dve metode:

revizija izvornog herbarskog materijala uz korišćenje literature (G u ş u l e a c 1957, C h a t e r 1968, D i k l i ć 1972) i odgovarajućeg uporednog herbarskog materijala,

pretraživanje onih terena na Fruškoj gori na koje se odnose informacije o prisustvu vrste *Astragalus sulcatus* L.

MATERIJAL

Herbarski materijal iz zbirke Odeljenja u Novom Sadu Zavoda za zaštitu prirode Republike Srbije (*HZPNS*):

Astragalus sulcatus L., Testera 24.05.1950, *leg.* Nada Babić, *det.* Nada Babić, inv. br. 1156 (Sl. 1).

Astragalus sulcatus L., Venac - Vučji do 01.06.1950, *leg.* Nada Babić, *det.* Nada Babić, inv. br. 1157.

Astragalus sulcatus L., Slankamen 04.06.1950, *leg.* Nada Babić, *det.* Nada Babić, inv. br. 1158.

Uporedni herbarski materijal iz zbirke Mađarskog prirodnjačkog muzeja u Budimpešti (*BP*):

Astragalus sulcatus L., Hungaria oocident. Com. Mosony. Ad lacum Fertö, prope pagum Neszider 10.06.1914, inv. br. 438584 (Sl. 2).

Astragalus sulcatus L., Flora Hungarica [ime lokaliteta nečitko] 24.06.94, *leg.* E. Khek, inv. br. 101462.

Astragalus sulcatus L., Flora Hungarica [ime lokaliteta nečitko] 94, *leg.* E. Khek, inv. br. 101458.

Ovaj materijal ljubazno su mi pozajmili kolege iz Muzeja u Budimpešti, DEZSÖ KOVÁTS i LAJOS SOMLYAY, na čemu im se najlepše zahvaljujem.

Tokom terenskih istraživanja, koja su sprovedena 07.07.1998. na Fruškoj gori, na lokalitetima (Venac - Vučji do, Testera, Slankamen) za koje je u literaturi navedeno da je biljka nađena 1950. godine, nisam pronašla ni jedan primerak koji na osnovu morfoloških osobina može odgovarati opisu vrste *Astragalus sulcatus*, ili karakteristikama koje su izražene na uporedom herbarskom materialu.

REZULTATI

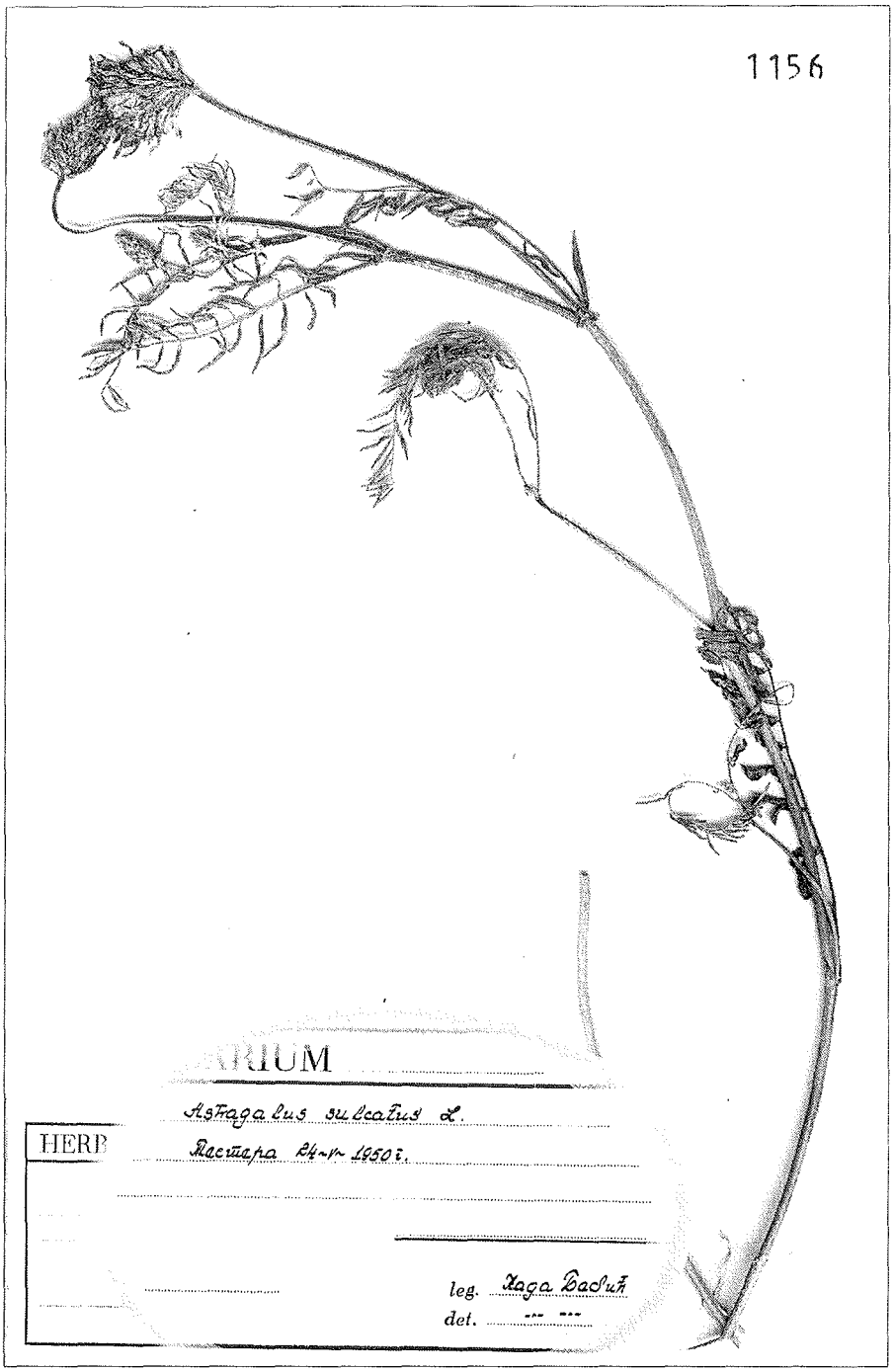
Herbarski primerci (*HZPNS:* inv. br. 1156, 1157, 1158) određeni kao *Astragalus sulcatus* L. po svim dijagnostičkim karakteristikama se u potpunosti uklapaju u opis vrste *Astragalus onobryshis* L. Na osnovu opisa u literaturi značajni diferencijalni karakteri su tip dlaka na stabljici i listovima, građa čašice, oblik i dlakavost ploda. Kod *A. onobrychis* dlake su dvokrake i čunaste, čašica je opnasta i obrasla gustim dvokrakim čunastim dlakama, plod je izdužen, trostran, naduven, gusto dlakav. Dlake kod *A. sulcatus* su većinom jednostavne, čašica je zelena (zeljasta), pokrivena nerazgranatim dlakama, plod je izduženo linearan, neznatno naduven, gladak, go ili sa vrlo proređenim dlakama (G u ş u l e a c 1957, C h a t e r 1968, D i k l i ć 1972). Sve navedene karakteristike za *A. onobrychis* jasno su vidljive na herbarskim primercima. Međutim i razlike u habitusu u odnosu na uporedni materijal (Sl. 1, 2) jasno pokazuju da ne može biti sumnje da primerci sa Fruške gore nemaju ni malo sličnosti sa vrstom *A. sulcatus.*

DISKUSIJA

Mada je primerke za koje je verovala da predstavljaju vrstu *Astragalus sulcatus* L. sakupila NADA BABIĆ, prva je nalaz objavila O b r a d o v i ć (1966). Pored navođenja lokaliteta (Slankamen, Venac, Vučji do, Testera), dala je i sledeći komentar: "U Fruškoj gori na vlažnim travnim mestima; raštrkano". Kako se na herbarskim etiketama *(HZPNS:* inv. br. 1156, 1157, 1158) ne nalaze podaci o osobinama staništa niti o broju primeraka na lokalitetu, moglo bi se zaključiti da je O b r a d o v i ć navela sopstvene podatke, odnosno da je biljku videla na navedenim lokalitetima. Međutim oznaka *HPM* (Herbar Poljoprivrednog muzeja [Prirodnjačkog muzeja po B o ž a *et al.* 1997] u Novom Sadu) koju je O b r a d o v i ć (1966) dala uz lokalitete, jasno ukazuje da su podaci o rasprostranjenju biljke preuzeti sa etiketa. Karakteristike staništa su pak doslovno preuzeti podaci koje za ovu vrstu navodi J á v o r k a (1924) za Mađarsku. Prema tome jasno je da je O b r a d o v i ć (1966) navela podatke o ovoj vrsti na osnovu materijala koji je sakupila NADA BABIĆ i podataka u pomenutoj literaturi.

Verujući u pouzdanost prethodnih podataka, D i k l i ć (1972) je vrstu *Astragalus sulcatus* uključio u Floru SR Srbije, uz komentar da je u Jugoslaviji zabeležena samo u Srbiji i to u Vojvodini na Fruškoj gori.

Na osnovu podataka u Flori SR Srbije, u kritičkom popisu vaskularnih biljaka cirkummediteranskih zemalja (Med-Checklist), Jugoslavija se navodi kao jedino područje za koje je ova vrsta poznata (G r e u t e r *et al.* 1989). Inače, prema Flora Europaea, areal vrste *A. sulcatus* prostire se u Austriji, Čehoslovačkoj, Mađarskoj, Rumuniji i centralnim, zapadnim i istočnim delovima Rusije (C h a t e r 1968), što bi značilo da se na Fruškoj gori nalazile najjužnije tačke njenog areala.



Sl. 1. - Primerak sa Fruške gore pogrešno određen kao *Astragalus sulcatus* L. (*HZPNS*).
The specimen from Fruška Gora erroneously identificated as *Astragalus sulcatus* L.

Sl. 2. - Primerak vrste *Astragalus sulcatus* L. (*BP*).
The specimen of the species *Astragalus sulcatus* L. (*BP*).

Rukovodeći se kriterijumima za određivanje kategorija ugroženosti taksona (IUCN 1994), a uz činjenicu da *A. sulcatus* posle 1950. nije ponovo nađen, niti je poznato da je negde gajen, B o ž a *et al.* (1997) su došli do zaključka da se na teritoriji Jugoslavije vrsta može smatrati izumrlom. I bili bi sasvim u pravu da se nije dogodila ona inicijalna greška i da u literaturu nije uvedena vrsta čije prisustvo u flori ovog područja do sada nije dokazano.

Još pre nego što sam imala mogućnost da vidim materijal u zbirci u Novom Sadu, zbunjivala me je činjenica da vrsta posle prvih nalaza nikada kasnije nije nađena na Fruškoj gori. Kako je reč o krupnoj busenastoj biljci, koja ima dobro razvijen rizom, teško je poverovati da njeno prisustvo u nekom području može biti efemernog karaktera. Imajući u vidu da je flora Fruške gore bila objekat doktorskih i magistarskih teza (O b r a d o v i ć 1966, S t e v a n o v i ć 1984, B u t o r a c 1986, 1987), brojnih naučnih članaka (A t a n a c k o v i ć 1953, Š a j i n o v i ć 1976, D j u r d j e v i ć 1982, 1985, B u t o r a c 1986*a*, I g i ć 1986), monografija (O b r a d o v i ć 1973, B u t o r a c 1992), još je neobičnije da je ova biljka mogla da ostane nezapažena. I sama sam, prikupljajući materijal za magistarski rad o varijabilnosti vrste *A. onobrychis* u Vojvodini, detaljno pretražila Frušku goru (I v k o v i ć 1982) ali nisam naišla na *A. sulcatus*. Uspeh je izostao i 1998, kada sam ovu biljku pokušala da nađem na Fruškoj gori na lokalitetima za koje je navedeno da je rasla 1950.

Analiza materijala u zbirci u Novom Sadu razrešila je sve nedoumice veoma jednostavno. Utvrdila sam naime da se radi o pogrešnoj determinaciji, odnosno da primerci koje je N. BABIĆ odredila kao *A. sulcatus* L., pripadaju vrsti *A. onobrychis* L.

Danas je veoma teško rekonstruisati kako je došlo do pogrešne determinacije. Istina, ako se čitaju samo tekstovi opisa za ove dve vrste, (J á v o r k a 1924, G u ş u l e a c 1957, C h a t e r 1968, D i k l i ć 1972) stiče se utisak da su po opštem habitusu dosta slične, dok su razlike samo u detaljima. Međutim, crteži ovih dveju vrsta koje je uradila VERA CSAPODY (J á v o r k a & C s a p o d y 1934) jasno pokazuju razlike u habitusu, a naročito u obliku ploda. Ustvari veoma je teško, naročito ako se dobro poznaje *Astragalus onobrychis* koji je u Vojvodini česta biljka, zameniti čak i primerke koji nisu u stadijumu potpunog razvića sa vrstom *A. sulcatus*.

Pregled herbarskog materijala vrste *Astragalus sulcatus* u zbirci Mađarskog prirodnjačkog muzeja u Budimpešti samo je potvrdio da primerci sa Fruške gore nemaju nikakve sličnosti sa ovom vrstom.

Sigurno je da ovo nije jedini slučaj pogrešno identifikovanog materijala i po tome možda i ne bi zasluživao više od informacije o obavljenoj reviziji. Međutim, izvanredan je kao primer kakve dalekosežne i neželjene posledice može da ima jednostavno preuzimanje objavljenih podataka, bez provere herbarskog materijala ili terenskih istraživanja. To je naročito opasno kada se radi o biljkama koje bi mogle da imaju poseban taksonomski ili floristički značaj. U ovom slučaju u domaćoj naučnoj javnosi stvorena je pogrešna predstava o značaju

primeraka sa Fruške gore u odnosu na posledice ugroženosti i osiromašenja flore Srbije. Pored toga, neopravdano se navodi da vrsta *Astragalus sulcatus* pripada flori prostora cirkummediteranskih zemalja.

Srećna okolnost je što postoji herbarski materijal, na osnovu čije revizije je moglo da se ustanovi da čitava konstrukcija stvorena u literaturi pada, jer je početni podatak bio pogrešan. To je ujedno još jedan dokaz koliko su herbarske zbirke dragocene, naročito u primeni rezultata taksonomskih, florističkih i horoloških istraživanja.

Uzimajući u obzir da se deo areala nalazi na prostoru nama susednih zemalja Mađarske i Rumunije, a da vrsta raste na staništima kakvih ima i kod nas, ne bi bilo iznenađujuće da *Astragalus sulcatus* proširi svoj areal i na područje Srbije. Međutim za sada dokazi o tome ne postoje.

ZAKLJUČAK

Primerci sakupljeni na Fruškoj gori (*HZPNS:* inv. br. 1156, 1157, 1158) ne pripadaju vrsti *Astragalus sulcatus* L., kako se to do sada smatralo, već vrsti *A. onobrychis* L.

Shodno tome, ne postoje dokazi da je vrsta *Astragalus sulcatus* L., ikad bila član flore Srbije. Zato vrsta *A. sulcatus* nije mogla nestati (izumreti) iz flore Srbije, jer na ovim prostorima do sada nije ni rasla.

Takođe nije opravdano da se smatra da ova vrsta raste na prostoru cirkummediteranskih zemalja.

Blagovremeno utvrđivanje tačnog identiteta primeraka vrste *A. onobrychis* L. sa Fruške gore, doprinelo je otklanjanju jedne naučne zablude, koja je mogla da zaluta i u osnovna dokumenta prilikom planiranja mera u procesu upravljanja zaštićenim prostorima Nacionalnog parka.

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HAS THE SPECIES ASTRAGALUS SULCATUS L. DISAPPEARED FROM THE FLORA OF SERBIA ?

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S u m m a r y

The list of critical taxa made while preparing the Red Data Book of Flora of Serbia included the species *Astragalus sulcatus* L. According to literature data (O b r a d o v i ć 1966, D i k l i ć 1972, B o ž a *et al.* 1997) the species seemed to claim a place in this book. Its only cited habitat was Fruška Gora (Testera, Venac: Vučji Do, Slankamen), where it was found in 1950 (*HZPNS:* Inv. No. 1156, 1157, 1158, *leg.* and *det.* N. Babić). For almost 50 years since then it has never been recorded in the wild, nor was it cultivated in controlled environment. It seemed therefore appropriate to conclude (B o ž a *et al.* 1997) that the species had become extinct on the territory of Yugoslavia (Serbia). However, it was suggested that the specimens identified as *Astragalus sulcatus* L. by N. BABIĆ may belong to the species *Astragalus onobrychis* L. If the original determination is indeed erroneous, it would prove accountable for the chain reaction of publishing erroneous data in literature, and for the unjustified appearance of this species in the list of plants for the Red Data Book.

A record of *A. sulcatus* was first published by O b r a d o v i ć (1966), who cited the data on distribution from the herbarium labels (*HZPNS:* Inv. No. 1156, 1157, 1158), while for the habitat features she literally took over the data cited by J á v o r k a (1924) for Hungary. Assuming the aforementioned data to be reliable, D i k l i ć (1972) included the species into the Flora of SR Serbia, noting that in Yugoslavia it thrived only in Serbia (Vojvodina: Fruška Gora). On the basis of these data, Med-Checklist cites Yugoslavia as the only area among circum-Mediterranean countries from which this species is known (G r e u t e r *et al.* 1989). According to Flora Europaea, the species' range comprises Austria, Czechoslovakia, Hungary, Romania, and Russia (C, W, E) (C h a t e r 1968), which would suggest that Fruška Gora is the southernmost point of its range. On the basis of IUCN (1994) criteria, considering that *A. sulcatus* has not been found since 1950, nor was there any evidence of its cultivation, B o ž a *et al.* (1997) came to the conclusion that the species had disappeared (extinct) from the territory of Yugoslavia.

Two methods were employed to ascertain whether or not there was evidence of the presence of *A. sulcatus* in the flora of Serbia: (1) a revision of the original herbarium material (*HZPNS*: Inv. No. 1156, 1157, 1158) using relevant literature (G u ş u l e a c 1957, C h a t e r 1968, D i k l i ć 1972) and referential herbarium material (*BP*: Inv. No. 438584, 101462, 101458), (2)

field investigation on the sites on Fruška Gora from which the species was cited in 1950, which was carried out on 07.07.1998. No specimens with the distinguishing features of *A. sulcatus* were found on that occasion.

Herbarium specimens (*HZPNS:* Inv. No. 1156, 1157, 1158), determined as *Astragalus sulcatus* L., in all their distinguishing features accord with the description of the species *Astragalus onobryshis* L. (Guşuleac 1957, Chater 1968, Diklić 1972). Differences in habitus with regard to the referential material (Fig. 1, 2) further confirm that the specimens from Fruška Gora can have nothing in common with the species *A. sulcatus.*

Therefore the species *Astragalus sulcatus* L. cannot have disappeared from the territory of Yugoslavia (Serbia), for it never occurred there in the first place.

This is certainly not the only case of erroneously identified material and in itself would not demand more than information on revision. However, it serves to illustrate how the initial mistake in identification may trigger off a chain of erroneous data in literature if the published data are taken over without examining herbarium material or field investigations. This is particularly dangerous in cases of taxa which may be of great taxonomic or floristic importance. In this case, a wrong picture was formed of the importance of the record from Fruška Gora with regard to the consequences of threats to and impoverishment of Serbian flora. Furthermore, it was inappropriately cited that the species *A. sulcatus* belonged to the flora of circum-Mediterranean countries.

Considering that its range comprises the neighbouring Hungary and Romania, and that the species inhabits the sites similar to those in our parts, it would not be surprising to find *Astragalus sulcatus* extending its range to the area of Serbia. There is, however, no evidence to indicate this.

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Originalni naučni članak

IMPATIENS GLANDULIFERA ROYLE - NOVA ADVENTIVNA VRSTA U FLORI SRBIJE

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Pavlović Dragana, Panjković Biljana, Stojšić Vida (1995-98): *Impatiens glandulifera Royle - a new adventive species in the flora of Serbia.* - Bulletin of Natural History Museum, Belgrade, *B49-50*, 73-76.

The first record of the adventive plant *Impatiens glandulifera* in Serbia: Ivanjica (UTM: DP23) 1996. The small colony was checked in 1997 and 1998.

UVOD

Adventivna biljka *Impatiens glandulifera* (Sl. 1), otkrivena je u Ivanjici 1996. godine, što je prvi podatak o prisustvu vrste u flori Srbije.

Autohtoni areal vrste *Impatiens glandulifera* prostire se u Aziji, u zapadnim delovima Himalaja i istočnoj Indiji. U Evropu je doneta početkom prošlog veka kao ukrasna vrtna biljka. Na prirodnom staništu je prvi put zabeležena 1897. kod Hamburga (H e g i 1924). Danas je dobro aklimatizovana i široko rasprostranjena, naročito u severnoj, srednjoj i istočnoj Evropi (M o o r e 1968, M a r k o v i ć 1970). Naseljava uglavnom prostore na obalama reka, a raste u poplavnim šumama na vlažnom i hranljivim materijama bogatom zemljištu (M a r k o v i ć 1970).

Najraniji nalazi sa jugoslovenskih prostora potiču iz Slovenije, gde je nađena na obalama reka Save, Drave i Mure (M a y e r 1952, P e t k o v š e k 1953, 1966). Na obalama istih reka otkrivena je kasnije nizvodno i na teritoriji Hrvatske, kao i u Gorskom Kotaru (M a r k o v i ć 1970, 1979, 1984, T r i n a j s t i ć 1974). Pored novih lokaliteta grupisanih uz ranije nalaze u područ

Sl. 1. - *Impatiens glandulifera*: Ivanjica (Foto: N. Kovačević, 04.09.1997)
Impatiens glandulifera: Ivanjica (Photo: N. Kovačević, 04.09.1997)

Sl. 2. - *Impatiens glandulifera*: Ivanjica, obala Gliječkog potoka (Foto: I. Panić, 05.09.1996)
Impatiens glandulifera: Ivanjica, bank of the Gliječki Potok creek (Photo: I Panić, 05.09.1996)

ju reka Drave i Mure, L u k a č (1989) je otkrio da se vrsta pojavila u Kutini i Osijeku, što ukazuje na njeno širenje prema istoku.

O prisustvu vrste *Impatiens glandulifera* na teritoriji Srbije do sada nije bilo podataka (V u k i ć e v i ć 1973, G a j i ć 1977, S a r i ć 1986).

REZULTATI I DISKUSIJA

Vrsta *Impatiens glandulifera*, otkrivena je u Ivanjici (UTM: DP23) 5. septembra 1996. na obali Gliječkog potoka (Sl. 2), a njeno ponašanje je praćeno i tokom sledeće dve godine.

Po brojnosti sa kojom se javlja, već prve godine je zapaženo da joj odgovara vlažna šljunkovita nitratna podloga. Tokom 1996-1998, biljka se lokalno proširila, pa je pronađena i na rubu obližnje šume. Kako se najmasovnije javlja u blizini deponije otpada iznad puta pored potoka, može se pretpostaviti da je dovoženje otpada jedan od mogućih načina njenog useljavanja.

S obzirom da je područje Ivanjice brdskog karaktera (oko 500 *m* n. v.), a prema iskustvu o ponašanju u Gorskom Kotaru, može se pretpostavati da se biljka lokalno dalje neće znatnije širiti. Međutim, budući da se adventivne vrste često rasprostiru 'skokovito', može se očekivati da se i *Ipmatiens glandulifera* sledećih godina pojavi na novim lokalitetima u bližoj ili daljoj okolini Ivanjice.

ZAKLJUČAK

Otkriće *Impatiens glandulifera* u Ivanjici prvi je dokaz o prisustvu ove adventivne vrste u flori Srbije. Mada je veći deo populacije subspontanog karaktera, pokazuje tendenciju širenja i prema prirodnim staništima.

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IMPATIENS GLANDULIFERA ROYLE - A NEW ADVENTIVE SPECIES IN THE FLORA OF SERBIA

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S u m m a r y

The adventive plant, *Impatiens glandulifera* Royle (Fig. 1), originating from Asia, was first introduced to Europe as an ornamental plant. Later on it was spread from gardens to natural habitats (H e g i 1924). The plant was recorded for the first time in Slovenia on the river banks of Sava, Drava and Mura rivers (M a y e r 1952, P e t k o v š e k 1953, 1966), and subsequently in Croatia (M a r k o v i ć 1970, 1979, 1984, T r i n a j s t i ć 1974). L u k a č (1989) has reported the easternmost finding in Croatia. The species has not been recorded in flora of Serbia up to now (V u k i ć e v i ć 1973, G a j i ć 1977, S a r i ć 1986).

The plant *Impatiens glandulifera* was recorded for the first time on the territory of Serbia in Ivanjica (UTM: DP23) on the bank of the Gliječki Potok creek (Fig. 2). The majority of the plants was found on the pebbly nitrate habitat, as well as a few on forest edge. The population was spread locally in the period of 1996-1998.

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Originalni naučni članak

RASPROSTRANJENJE ADVENTIVNE VRSTE *CHAMOMILLA SUAVEOLENS* (PURSH) RYDB. 1916 (*ASTERALES, ASTERACEAE*) NA PROSTORU JUGOSLOVENSKIH ZEMALJA

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Vasić Olga (1995-98): *Distribution of the adventive plant Chamomilla suaveolens (Pursh) Rydb. 1916 (Asterales, Asteraceae) on the territory of Yugoslav countries.* - Bulletin of Natural History Museum, Belgrade, *B49-50*, 77-86.

The distribution data on the adventive plant, *Chamomilla suaveolens*, for the territory of eastern part of Yugoslav countries, Serbia, Bosnia and Herzegovina, Macedonia and Montenegro, are given.

UVOD

Vrsta *Chamomilla suaveolens* (Pursh) Rydb. slično većini adventivnih biljaka u Evropi, uglavnom zauzima staništa antropogenog porekla. Na jugoslovenskim prostorima to su pretežno staništa ruderalnog karaktera. Verovatno da je to osnovni razlog što iz aspekta zaštite gajenih biljaka ova vrsta nije smatrana dovoljno atraktivnom. Tako sa izuzetkom teritorije Vojvodine, u literaturi koja se odnosi na prethodnu Jugoslaviju, nema mnogo podataka o njenom rasprostranjenju.

Međutim, *Chamomilla suaveolens*, mada ne tako masovno pojavljuje se naročito poslednjih godina sve češće i na površinama sa gajenim biljkama, što je svrstava u kategoriju potencijalnih korova. Uz činjenicu da adventivne biljke treba stalno držati na oku bez obzira kako se trenutno ponašaju u novoj sredini, rasprostiranje i ponašanje vrste *Chamomilla suaveolens* treba pratiti sa daleko više pažnje.

Utisak o količini podataka za vrstu *Chamomilla suaveolens*, može da bude nerealan ukoliko se nema u vidu da se vrsta, naročito u starijoj literaturi,

pojavljuje pod nekoliko imena. Ukoliko se ime *Chamomilla suaveolens* (Pursh) Rydb. 1916, (K a y 1976) prihvati kao validno i aktuelno, ime *Santolina suaveolens* Pursh 1814 je bazionim. U literaturi se pojavljuje još desetak sinonoma, a najčešći su *Artemisia matricarioides* Less. 1831, *Matricaria discoidea* DC. 1837, *M. matricarioides* (Less.) Portér. 1894 i *M. suaveolens* (Pursh) Buchenau 1894. non L. Ovakva šarolokost imena ne samo u starijoj, već i u novijoj literaturi, nalaže krajnju opreznost i preciznost prilikom određivanja i objavljivanja novih podataka o rasprostranjenju vrste.

Chamomilla suaveolens je u Evropi nesumnjivo adventivna biljka. Opšte je prihvaćeno da potiče sa prostora severne Azije i zapadne Severne Amerike, ali njena postojbina u odnosu na ova dva kontinenta ipak nije precizno određena. Kao područje autohtonog areala H e g i (1928) navodi pomenute teritorije, ali napominje da spontano raste možda samo u istočnoj Aziji. Prema H a y e k u (1931) vrsta potiče iz Severne Amerike i severoistočne Azije. N y á r á d y (1964) smatra da *Chamomilla suaveolens* potiče iz Severne Amerike, ali kao područje autohtonog rasprostranjenja navodi i Kamčatku. K a y (1976) ne dovodi u pitanje autohtonost dela areala u severoistočnoj Aziji, ali znakom pitanja izražava sumnju u pogledu zapadne Severne Amerike.

Slično mnogim vanevropskim vrstama koje su se kasnije u Evropi raširile adventivno i *Chamomilla suaveolens* je u XIX veku gajena u Botaničkoj bašti u Berlinu (H e g i 1928). Verovatno da je to bilo inicijalno žarište iz koga se proširila u srednjoj Evropi, a zatim i dalje. Mada najraniji zabeleženi nalaz (1850) potiče iz Švedske, u prilog tome govori činjenica da je 1852. zapažena u okolini Berlina, a sledećih godina i u mnogim gradovima Nemačke, Austrije i severne Italije (H e g i 1928).

Sasvim je moguće da je vrsta šireći se prema jugoistoku već u to vreme dospela u istočnu Evropu i na Balkan, jer je u Rumuniji prvi put konstatovana 1889. godine (N y á r á d y 1964). Međutim, najraniji podatak o njenom prisustvu na Balkanskom poluostrvu objavljen je tek početkom ovog veka (H a y e k 1931). Mada je H a y e k (1931) naveo Bosnu i Hercegovinu kao područje na kome je vrsta nađena na Balkanu, prvi podatak za istočne jugoslovenske prostore je stariji i potiče iz panonskog dela današnje Srbije (P r o d á n 1916).

Danas je *Chamomilla suaveolens* poznata u većini zemalja severne i srednje Evrope, ali sudeći prema literaturi još nije zapažena u Albaniji, Grčkoj i Turskoj (K a y 1976). Međutim, to ne mora da znači da svoj areal nije već proširila i na ta područja.

Bez obzira na to što ne može da se utvrdi da li su područja prvih nalaza bila i inicijalna žarišta, ili se iz srednje Evrope višekratno useljavala iz raznih pravaca i u različito vreme, *Chamomilla suaveolens* je danas prisutna na teritoriji svih republika prethodne Jugoslavije.

Mada sam ovu vrstu nalazila svojevremeno i u Hrvatskoj i Sloveniji, ograničiću se na iznošenje podataka sa teritorija Bosne i Hercegovine, Jugoslavije (Srbija i Crna Gora) i Makedonije. Prema razgovoru sa LJERKOM MARKO-

VIĆ (*pers. comm.* 1988, 1990), trebalo bi da je već objavljen njen rad o rasprostranjenju vrste *Chamomilla suaveolens* na području Hrvatske i Slovenije.

Cilj ovog rada je da se što realnije prikaže dosadašnje poznavanje rasprostranjenja vrste *Chamomilla suaveolens* na prostoru istočnih jugoslovenskih zemalja. Iz tog razloga pored sopstvenih, iznosim i podatke koje sam dobila ljubaznošću kolega, na čemu im se najlepše zahvaljujem:

Č. ŠILIĆ (Herbarijum Zemaljskog muzeja B i H u Sarajevu, SARA)

V. STEVANOVIĆ, D. LAKUŠIĆ i S. JOVANOVIĆ (Herbarijum Univerziteta u Beogradu, BEOU)

P. BOŽA (P. B.), VERA BUDAK (V. B.) i RUŽICA IGIĆ (R. I.), Institut za biologiju Novi Sad.

RASPROSTRANJENJE U ISTOČNOM DELU JUGOSLOVENSKIH ZEMALJA

Rasprostranjenje vrste *Chamomilla suaveolens* (Pursh) Rydb. u istočnom delu jugoslovenskih zemalja prikazano je na slici 1.

Najstariji dokaz o prisustvu adventivne vrste *Chamomilla suaveolens* na Balkanskom poluostrvu, potiče upravo sa teritorije Bosne. Biljku je u Sarajevu u tadašnjoj Aleksandrovoj ulici, 1931. godine pronašao KARLO MALÝ (SARA). Verovatno da je na osnovu tog podatka, iako se na njega ne poziva, H a y e k (1931) kao područje rasprostranjenja biljke na Balkanu naveo Bosnu i Hercegovinu.

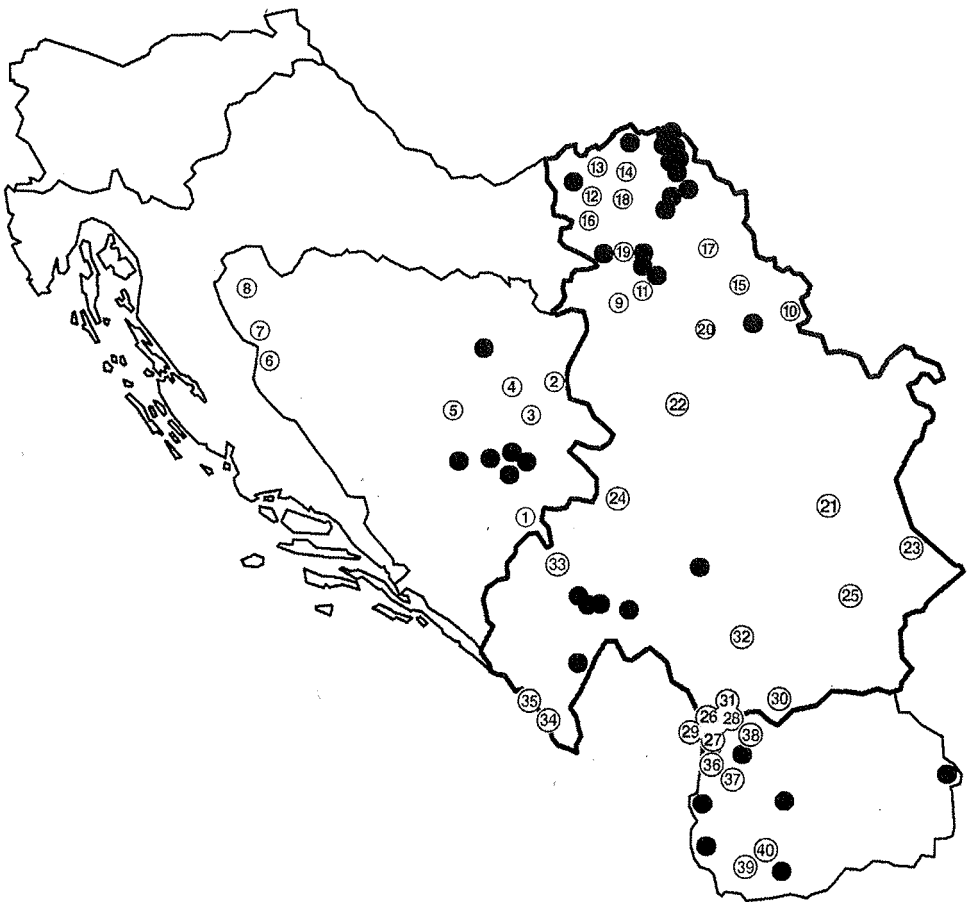
Sledećih godina biljka je ponovo konstatovana u Sarajevu (trg ispred Zemaljskog Muzeja) i okolini (na pruzi pored Sarajeva), ali i u mestima Pale, Koran, Stambulčić i Sjetlina, duž uskotračne pruge istočno od Sarajeva (M a l ý 1933). U Herbarijumu Zemaljskog muzeja (SARA) postoje i primerci sa Pala koje je K. MALÝ sakupio 1936. godine.

M a l ý (1940) je konstatovao vrstu *Chamomilla suaveolens* i zapadno od Sarajeva, pored Bradine, takođe uz uskotračnu prugu. Prema B j e l č i ć (1964/65) MALÝ je vrstu našao i na Jahorini kod Poljaca 1948. na 1560 *m* n. v. Na lokalitetu u Sprečkom polju kod železničke stanice Puračić biljku je otkrila R i t t e r - S t u d n i č k a (1952).

Očigledno je da su o prisustvu vrste *Chamomilla suaveolens* za područje Bosne i Hercegovine postojali konkretni dokazi. Međutim B j e l č i ć (1983), u Flori Bosne i Hercegovine, bez navođenja lokaliteta daje samo opšte podatke o poreklu vrste i karakteru staništa koja naseljava.

Pored Sarajeva, gde se vrsta zadržala i 1981. i 1988. godine, našla sam je na još 8, do tada nepoznatih lokaliteta: Foča, Zvornik, Vlasenica (1980), Kovačić (Kladanj), Kakanj, Martin Brod, Kulen Vakuf i Ostrožac (1981).

Rasprostranjenje *Chamomilla suaveolens* prikazano je u Flori SR Srbije jednom nepreciznom konstatacijom: "Odomaćena vrsta u SR Srbiji. Zasad usta



Sl. 1. - Rasprostranjenje adventivne vrste *Chamomilla suaveolens* u istočnom delu jugoslovenskih zemalja: crne tačke - podaci iz literature, bele tačke - novi nalazi.

Distribution of the adventive plant, *Chamomilla suaveolens*, for the territory of eastern part of Yugoslav countries: black dots - literature data, white dots - new localities.

(1) Foča, (2) Zvornik, (3) Vlasenica, (4) Kovačić (Kladanj), (5) Kakanj, (6) Martin Brod, (7) Kulen Vakuf, (8) Ostrožac, (9) Sremska Mitrovica, (10) Kaluđerovo, (11) Dobrinci, (12) Srpski Miletići, (13) Čonoplja, (14) Crvenka, (15) Bavanište, (16) Odžaci, (17) Mošorin, (18) Bački Gračac, (19) Begeč, (20) Beograd, (21) Aleksinac (Žitkovac), (22) Rudnik (Rudnik), (23) Stara Planina, (24) Zlatibor, (25) Leskovac, (26) Dragaš, (27) Globočica, (28) Brod, (29) Restelica, (30) Jažince, (31) Prizren, (32) Priština, (33) Durmitor (Žabljak), (34) Bar, (35) Sutomore, (36) Strezimir, (37) Mavrovo, (38) Tetovo, (39) Oteševo, (40) Resen.

novljena samo u Vojvodini." (G a j i ć 1975). Međutim, ekološki zahtevi vrste nisu takvi da bi se očekivalo da se u širenju ograniči samo na područje Vojvodine. Stoga se u odnosu na celokupnu teritoriju Srbije, konstatacija 'odomaćena' može prihvatiti jedino kao potencijalni obim i karakter rasprostranjenja, do koga prema dosadašnjim podacima još uvek nije došlo.

Najstariji podatak o prisustvu *Chamomilla suaveolens* u Srbiji, a ujedno i prvi podatak za jugoslovenske zemlje potiče sa početka veka iz Sombora (P r o d á n 1916). Ovakvo tumačenje istorijata useljavanja i širenja vrste, iz aspekta današnje administrativno političke podele Evrope može se smatrati tačnim, mada je u to vreme Sombor još uvek bio u okviru Austrougarske monarhije.

Za sledećih četrdesetak godina bio je to jedini podatak o prisustvu vrste na teritoriji današnje Srbije. Mada ne postoje egzaktni dokazi, sudeći po kasnijim podacima, vrlo je verovatno da je *Chamomilla suaveolens* kroz svo to vreme bila prisutna na teritoriji Vojvodine.

Od šezdesetih godina, kada je A t a n a c k o v i ć (1958) vrstu pronašla u Subotici, Senti, Bečeju, Novom Sadu i Bačkoj Palanci, otkriveno je njeno prisustvo na još 11 lokaliteta u Vojvodini (I v k o v i ć *et al.* 1980, I v k o v i ć & Č a p a k o v i ć 1981). Podaci do kojih se došlo tokom poslednjih petnaestak godina ukazuju da *Chamomilla suaveolens* na području Vojvodine i dalje ima tendenciju širenja. U prilog tome govore podaci za lokalitete Sremska Mitrovica, Kaluđerovo i Dobrinci, na kojima sam je našla tokom 1981. godine, kao i Srpski Miletić 1986. (V. B.), Čonoplja i Crvenka 1990. (R. I.), Bavanište i Odžaci 1995. (P. B.), Mošorin i Bački Gračac 1996. i Begeč 1997. (R. I.).

Sobzirom na veoma izraženo delovanje antropogenog faktora u svim delovima Vojvodine, dalje širenje vrste je sasvim očekivano. Ruderalna staništa koja primarno naseljava, pravi su "rasadnici" iz kojih *Chamomilla suaveolens* zauzima i prostore sa gajenim biljkama. Uzimajući u obzir agrikulturni karakter Vojvodine i veliku brojnost jedinki sa kojom se vrsta javlja na mestima koja naseljava, ovu vrstu koja je potencijalni korov treba držati pod kontrolom.

Južno od Save i Dunava vrsta *Chamomilla suaveolens* je još uvek retka. Na osnovu nalaza u turističkom naselju (25. IX 1993, 1700 *m* n. v. BEOU), L a k u š i ć (1996) je vrstu uključio u listu flore Kopaonika.

Međutim *Chamomilla suaveolens* je već ranije rasla u ovom delu Srbije. Našla sam je 1980. godine u okolini Aleksinca (Žitkovac) i na planini Rudnik (Rudnik), a 1984. u Beogradu.

Sudeći prema nalazima tokom poslednje dve godine, vrsta se lagano i dalje širi. V. STEVANOVIĆ i D. LAKUŠIĆ (14. V 1996, BEOU) pronašli su je na Staroj Planini. Na području Zlatibora biljka raste kod hotela "Čigota" (1997. P. B.), kao i u selu Sirogojno i na Čolovića brdu, gde sam je pronašla jula 1998. U septembru 1997. konstatovala sam da se vrsta pojavila i u Leskovcu.

Usled nedostatka ranijih pisanih podataka (K o j i ć & P e j č i n o v i ć 1982), može se prihvatiti da prvi dokazi o prisustvu vrste *Chamomilla suaveolens* u flori Kosova potiču iz 1987. godine. Tada sam je u području Šar-planine, na 1000-1700 *m* n. v., našla u selima Dragaš, Restelica i Jažince, a 1988. u Prizrenu i Prištini. Tokom 1997. imala sam priliku da se uverim da se vrsta na lokalitetima na području Šar-planine zadržala i nakon 10 godina od prvih nalaza, kao i da se pojavila u Globočici i Brodu.

U Crnoj Gori prisustvo vrste *Chamomilla suaveolens* otkriveno je 1985. godine, u Podgorici [Titograd], Beranu [Ivangrad] i Kolašinu, kao i na planini Sinjavini (selo Lipovo i katun Ječmen do) (V a s i ć 1986). Očigledno je da se vrsta na ovim prostorima širi veoma sporo, jer je od vremena prvih nalaza konstatovana na samo još tri lokaliteta. U planinskom području vrstu je pronašao S. JOVANOVIĆ (22. V 1992, BEOU) na Durmitoru (Žabljak i okolina), dok je iz mediteranskog regiona poznata za sada samo u Sutomoru, gde sam je našla 1996. i Baru (1997. P. B.).

U florističkoj literaturi koja se odnosi na Makedoniju [FYR Macedonia] nisam našla podatke koji bi ukazivali na prisustvo vrste *Chamomilla suaveolens* na ovom području. Prema rečima K. MICEVSKOG (*in litt.* 11. IV 1987.), nisu postojali ni herbarski primerci ove vrste u Herbarijumu makedonske flore Skopskog Univerziteta.

Ispostavilo se međutim da se prve informacije o prisustvu vrste *Chamomilla suaveolens* u flori Makedonije nalaze u fitocenološkoj literaturi. Prema fitocenološkim snimcima sa lokaliteta Bitolj, Debar i okolina, Struga, Gostivar, Berovo, okolina Kičeva i planina Jakupica, biljka je već 1970. i 1973. godine imala značajan udeo u ruderalnoj vegetaciji Makedonije. U snimcima za *Hordetum murini* Libbert 1932, navedena je kao vrsta klase *Plantaginetea*, pod imenom *Matricaria matricarioides* (Less.) Portér, a za *Lolio - Plantaginetum majoris* Bg. 1930 kao karakteristična vrsta asocijacije pod imenom *Matricaria discoidea* (M a t v e j e v a 1982). Prema ovim podacima, mogao bi da se izvede zaključak da je reč o dva nezavisna taksona. Međutim, u pitanju je jedna ista vrsta, *Chamomilla suaveolens*, ali navedena pod sinonimima koji se u savremenoj literaturi uglavnom više ne koriste (K a y 1976, G a j i ć 1975).

Osim u Gostivaru, odakle je *Chamomilla suaveolens* već poznata (M a t v e j e v a 1982), našla sam je 1986. u selima Strezimir i Mavrovo, zatim u Tetovu, kao i u mestima Oteševo i Resen kod Prespanskog jezera.

DISKUSIJA I ZAKLJUČCI

Adventivna vrsta *Chamomilla suaveolens* u pogledu ekoloških zahteva izrazito je ruderalna biljka. To joj omogućava naseljavanje čitavog niza staništa koja su nastala posrednim ili nepostednim delovanjem antropogenog faktora, pa čak i onih koja pružaju minimum uslova u pogledu kvaliteta zemljišta. U urbanim sredinama zauzima tipična ruderalna staništa kao što su ugaženi obodi travnjaka, napuštene i zapuštene zelene površine, uski prostori uz kuće ili rubove trotoara. Javlja se i na železničkim stanicama i to najčešće uz šine. Izvan naselja raste pored puteva i na obodu njiva.

Prema dosadašnjim iskustvima, uobičajeno je da se pojava i rasprostiranje adventivnih biljaka vezuje za agrikulturna, urbana i uopšte područja izrazite ljudske aktivnosti. Iz tog aspekta, podaci koji govore o prisustvu vrste *Chamomilla suaveolens* u planinskom regionu mogu da izgledaju nelogični i iznenađujući. Međutim, ako se analizira tip staništa na kojima vrsta raste, uprkos tome

što je reč o nadmorskim visinama i preko 1000 *m*, postaje jasno da se i tu radi o ruderalnim staništima. Na Sinjavini biljka raste na ugaženom zemljištu oko koliba u katunu, a na Kopaoniku i Durmitoru u turističkim naseljima. Prema tome opet je u pitanju rezultat ljudskoh aktivnosti, a *Chamomilla suaveolens* se i tu nalazi na svom tipičnom staništu, pri čemu nadmorska visina za nju nije ograničavajući faktor. Da za vrstu *Chamomilla suaveolens* to nije ništa neobično, govore i slični podaci sa lokaliteta u Rumuniji, gde je nalažena na nadmorskim visinama od 1400 do 1600 *m* (N y á r á d y 1964).

Dosada poznati podaci sa prostora istočnih jugoslovenskih zemalja pokazuju sliku najvećeg stepena rasprostranjenosti vrste *Chamomilla suaveolens* u Vojvodini (Sl. 1). Međutim, nije nemoguće da je i u ostalim delovima znatno češća nego što to izgleda prema raspoloživim podacima. Na to ukazuju i najnoviji podaci o njenom širenju i na teritorijama izvan izrazito agrikulturnog područja Vojvodine. Razlog nedovoljne istraženosti nalazi se u činjenici da je reč o prvenstveno ruderalnoj biljci, za koju se verovalo da kao korovska vrsta nema veći značaj. Ipak kao potencijalno korovskoj biljci, koja naročito može da ugrozi tzv. okopavinske kulture, treba joj posvetiti daleko više pažnje, pa se tim pre ne smeju zanemariti ni pravci i načini njenog dosadašnjeg širenja.

Većina adventivnih biljaka, naročito one američkog porekla, ulaze na jugoslovenske prostore uglavnom iz pravca srednje Evrope, šireći se prema istoku i jugu, a naročito kroz Panonsku niziju. Sudeći po dinamici areala u ovom delu Evrope, kao i na jugoslovenskim prostorima, taj princip rasprostiranja može da se prepozna i kod ove vrste.

Chamomilla suaveolens je na severnim, nama geografski bliskim teritorijama, bila konstatovana još u prošlom veku (H e g i 1928). Međutim, podaci za područje Bugarske su po svoj prilici novijeg datuma (K a y 1976), jer je S t o j a n o v i S t e f a n o v (1948) ne spominju.

Uzimajući u obzir hronologiju otkrivanja, geografski položaj i gustinu lokaliteta, koji su uglavnom koncentrisani u zapadnim delovima analiziranog područja, može se zaključiti da se vrsta širila iz pravca severozapada ka jugoistoku. To može da se prihvati kao opšti plan formiranja areala na ovim prostorima, pri čemu su pojedini lokaliteti istureni dalje na istok (Stara planina, Leskovac, Berovo) možda rezultat ponovnog useljenja iz susednih krajeva. Interesantno je pratiti da li će ti lokaliteti sledećih godina postati centri daljeg lokalnog širenja vrste. Brže rasprostiranje prema istoku u Vojvodini, uslovljeno je agrikulturnim karakterom ovog područja, kao i gustinom mreže saobraćajnica.

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DISTRIBUTION OF THE ADVENTIVE PLANT *CHAMOMILLA SUAVEOLENS* (PURSH) RYDB. 1916 (*ASTERALES, ASTERACEAE*) ON THE TERRITORY OF YUGOSLAV COUNTRIES

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S u m m a r y

The species *Chamomilla suaveolens* (Pursh) Rydb., like most adventive plants in Europe, occurs chiefly in anthropogenic habitats. In Yugoslav countries its habitats are mostly ruderal in character, although in recent years the spe-

cies has been increasingly found in areas with cultivated plants as well. Since that classes the species *Chamomilla suaveolens* among the potential weeds, its distribution and behaviour ought to be more closely observed. The current knowledge on the distribution of the species *Chamomilla suaveolens* in the eastern part of Yugoslav countries is given in Fig. 1.

The first evidence for the presence of the adventive species *Chamomilla suaveolens* on the Balkan Peninsula originated from Bosnia (Hayek 1931), while the first data for the eastern part of Yugoslav countries came from Vojvodina (Sombor) (Prodán 1916).

Although the occurrence of *Chamomilla suaveolens* in the area of Bosnia and Herzegovina had been fully confirmed (Malý 1933, 1940, Ritter-Studnička 1952, Bjelčić 1964/65) Bjelčić (1983) in the Flora of Bosnia and Herzegovina offers only general information on its habitats, without citing the already established sites. During the investigations of 1980 and 1981, I discovered the species on eight more, until then unknown sites: Foča, Zvornik, Vlasenica, Kovačić (Kladanj), Kakanj, Martin Brod, Kulen Vakuf, and Ostrožac.

The Flora of Serbia describes the distribution of *Chamomilla suaveolens* rather imprecisely: "Naturalized species in SR Serbia. So far established only in Vojvodina." (Gajić 1975). However, the ecological requirements of the species are not expected to limit its dispersion to the area of Vojvodina. Therefore, in respect of the total territory of Serbia, the term "naturalized" is acceptable only as indicating a potential range and character of distribution, which the current data had not confirmed.

The discovery of the species *Chamomilla suaveolens* in Sombor (Prodán 1916) was for 40 years the only evidence of its existence on the territory of Serbia. Since the fifties, when Atanacković (1958) found the species on several more sites, it was discovered on 11 sites more in Vojvodina (Ivković *et al.* 1980, Ivković & Čapaković 1981). The data from the last 15 years indicate that in Vojvodina *Chamomilla suaveolens* still shows the trend of expanding. This is confirmed by the sites of Sremska Mitrovica, Kaluđerovo, and Dobrinci where I found it during 1981, as well as the following finds: Srpski Miletić 1986 (V. B.), Čonoplja and Crvenka 1990 (R. I.), Bavanište and Odžaci 1995 (P. B.), Mošorin and Bački Gračac 1996, Begeč 1997 (R. I.).

As relevant literature gives only data for Kopaonik (Lakušić 1996), the species may be considered extremely rare south of the Sava and the Danube. However, *Chamomilla suaveolens* appeared in the central part of Serbia at least as late as 1980, when I found it in the neighbourhood of Aleksinac and on Mt. Rudnik, and in 1984 in Belgrade. The sites discovered on Stara Planina Mt. 1996 (BEOU), on three localities on Zlatibor Mt.: near the "Čigota" hotel (1997 P. B.), Sirogojno village and Čolovića Brdo hill in June 1998, as well as in Leskovac 1997 are witness to a slow spreading of the species' range in this part of Serbia.

The first records of the species *Chamomilla suaveolens* for Kosovo date from 1987, when I found it in the area of Mt. Šar-Planina, and in Prizren and Priština in 1988. During 1997, I established that the species still occurs on the sites on Mt. Šar-Planina ten years after the first records had been made. I also ascertained its presence in Globočica and Brod.

In Montenegro, *Chamomilla suaveolens* was first discovered in 1985 (V a s i ć 1986). The species appears to be spreading very slowly in that area, as, since the first records, it was found on three more sites only: Durmitor (Žabljak) 1992 (BEOU), Bar 1997 (P. B.), and Sutomore, where I discovered it in 1996.

The first data on the presence of *Chamomilla suaveolens* in the flora of Macedonia may be found in phytocenological records (M a t v e j e v a 1982), where it is cited as *Matricaria matricarioides* and *Matricaria discoidea*, the synonyms largely out of use in modern literature. During 1986, I discovered the species in the villages of Strezimir and Mavrovo, also in Tetovo, and at Oteševo and Resen on the Lake of Prespa.

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OROMEDITERANSKI ELEMENTI NA ALPIMA I ALPSKO-VISOKONORDIJSKI NA BALKANSKIM PLANINAMA

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Matvejev, S. D. (1995-98): *Oro-mediterranean elements in the Alps and alpine-high nordic elements in the Balkan mountains.* - Bulletin of Natural History Museum, Belgrade, *B49-50*, 87-95.

Origin of oro-Mediterranean living species found in Alps and vice versa the presence of Alpine-high-Nordic species in Balkan mountains is explained using the concept of living forms and colonisation types. Dinaric mountain system is considered the center of speciation and colonisation of Central Europe.

U postglacijalu na Alpima i planinama Balkanskog poluostrva bila je ista, ili veoma slična flora i fauna (T e r m i e r 1952, F l i n t 1957, V u l j f 1944, P o p o v 1949, i dr.). Krajem glacijacija (Würm III) moćni ledeni štit zvani "Inlandeiss" prekrivao je Alpe, Fenoskandiju i veći deo Evrope. Na severoistoku se to hladno područje preko prostrane tundre vezivalo za arktičku, tada znatno pomaknutu ledenu kalotu (G r i g o r i e v 1956). Malobrojni preglacijalni alpski elementi (grupa I.2.1, prema S e m j o n o v - T j a n j - - Š a n s k o m 1937 - videti dodatak na kraju) ipak su ostali da žive na kamenitim gromadama koje su štrčale iz leda, jer su i tu našli zadovoljavajuće uslove u pojedinim mikrostaništima. Neke vrste su se zimi selile u podgorje.

Južni obod evroazijskog ledenog štita i tundre, u Würmu i u početku holocena, bio je ekološki most preko koga su se pojedine vrste cirkumarktičke faune i flore, kao i planinski istočno-azijski elementi, doselili do Alpa (P o - p o v 1927), a neke alpske vrste su obodom olednjavanja i tundre stigli daleko na sever Evroazije (grupa II.2.4.). Preko dovoljno hladnog podnožja Alpa u te biocenze su došli i malobrojni zapadnobalkanski oromediteranski elementi (II.2.3), koji su hladno razdoblje Würma preživljavali u susednim balkanskim

refugijumima (kanjonima, topljacima i sličnim "zbegovima"). Prema tome, današnji živi svet visokih Alpa i sredogorja, sastoji se od alpskih i balkanskih oromediteranaca i od arkto-nordijskih došljaka (grupe: I.1, I.2, II.2.2.2.1, II.2.2.1, II.2.2.2, II.22.3, II.2.2.4, II.2.2.5). U florističkom i faunističkom pogledu, mnogi planinski masivi su dobro proučeni, ali biogeografske analize ipak nedostaju. Tako je tokom dugogodišnjih proučavanja ptica (*Aves*) i skakavaca (*Acridoidea, Tettigonioidae*) na Alpima i planinama Balkanskog poluostrva, autor prikupio dragocene i vrlo obimne biogeografske, taksonomske i ekološke podatke. Međutim, rezultati objavljeni u većem broju radova (Matvejev 1950, 1973, 1976, 1981, 1983, 1990, Us & Matvejev 1967, Matvejev & Vasić 1973 i dr.) obrađeni su usko tematski, bez uzimanja u obzir kompleksa istorijsko-ekoloških zbivanja, kao ni biogeografskih posledica u sastavu faune. Biogeografska analiza tih konkretnih podataka namerno je izostavljena i ovde. Naime, cilj ovoga rada je da navede čitaoca na usvajanje primene "programskog mišljenja" u biogeografsko-ekološkoj analizi ma koje grupe živih bića. Ipak treba napomenuti da, iako nedostaje obrada materijala po "programskom mišljenju", ipak se načelno može reći, da je među pticama i skakavcima na Alpima mnogo više arkto-nordijskih došljaka nego na drugim južno-evropskim planinama. "Programsko mišljenje" kao postupak u biogeografskoj analizi južnoevropskih, tj. oromediteranskih planina, nalaže da se sagledaju sva preglacijalna, glacijalna i postglacijalna zbivanja na tom prostoru.

Prema klasifikaciji životnih formi (Matvejev & Dimovski 1964) zapadne oromediteranske planine (Pirineji i Alpi) danas imaju živi svet ekološkog tipa *humidopetricola*, a istočne (planine Balkanskog poluostrva, Krima i Kavkaza) tipa *xeropetricola*. Danas su to rukovodeće životne forme sa mnogim podtipovima. Ali ne samo na vrhovima, već i u šumskom pojasu sredogorja obrazovale su se u toku dugog pliocena nove vrste i podvrste, koje su danas usko rasprostranjene. One su i za vreme glacijacija naseljavale jedno ili dva susedna "biogeografska ostrva", jer su svi ti planinski masivi bili među sobom izolovani prostorno morem, ili ekološki nizinskim biocenozama.

Prema tome, bogatstvo i raznovrsnost te visokoplaninske južno-evropske flore i faune potiče danas, ne samo od davne (pliocenske) "ostrvske" izolovanosti njenih pojedinih teritorija, već i od izolovanosti koja je bila uslovljena glacijalnim i postglacijalnim zbivanjima. Za Alpe ta zbivanja su već opisana u početku ove rasprave. Ona su se dosta razlikovala od zbivanja na Balkanskim planinama, gde je poslednja glacijacija (Würm III) zahvatala samo severoistočne, a u manjoj meri i severne, padine. Na mnogim južnim planinama uopšte nije bilo lednika, već samo snežanika. U ta hladnija razdoblja, balkanski visokoplaninski živi svet svake planine preživeo je u sredogorju na obodu njene ledene ili snežne kalote, koja se tada spuštala znatno niže. Šumski živi svet je preživeo u podgorju, po klisurama ili drugim "zbegovima" (Matvejev 1975). Važna je i činjenica da je visokoplaninski živi svet pojedinih balkanskih planina bio za vreme te glacijacije šumskim pojasom ili podgorjem, prostorno izolovan od živog sveta susednih balkanskih visokih planina. Ovo je kod nekih grupa omogućilo očuvanje preglacijalne, lokalne polimorfnosti. Tako su na primer

skakavci iz podporodice *Tettigoniidae*, zastupljeni danas na vrhu skoro svake srednjebalkanske planine posebnom vrstom iz roda *Metrioptera* (M i k š i ć 1960, 1971, 1978). Rezultate tih istraživanja su potvrdili H a r t z (1969) kao i U s & M a t v e j e v (1967). Kod leptira (*Lepidoptera*) takođe postoji jak polimorfizam na balkanskim planinama, ali zbog aktivnog preletanja, pojedine vrste su rasprostranjene ne na jednoj, već na više susednih visokih planina. U rodu *Erebia* na primer, u Jugoslaviji je nađena 21 vrsta (J a k š i ć 1988).

Flora i fauna Balkanskih visokih planina ne odlikuje se samo uskoendemičnim vrstama, već i njihovim združivanjem u reliktne "polidominantne" zajednice (prema M i š i ć u 1982). Ovo je nastalo uglavnom za vreme glacijacija kada je sastav tih visokoplaninskih zajednica obogaćen sredogorskim endemičnim vrstama koje su se prilagodile za opstanak u visokoplaninskim staništima. Prema S e m j o n o v - T j a n j - Š a n s k o m (1937) to su "dobrovoljni visokoplaninci" (*hecontorites*). Zbog aktivne seobe mnogi alpski oromediteranci (*"oreogenetes"* - insekti, ptice, po istom autoru) još za vreme glacijacija i u postglacijalu su naselile Alpima susedne (a i udaljenije) Balkanske planine. Pošto su ti "alpijci" uglavnom "vlagoljubivi" (*humidopetricola*) oni danas naseljavaju severne padine, klisure, pa i vlažnija staništa šuma na kamenjarima. Ta ista oromediteranska staništa naseljavaju i alpsko-visokonordijske vrste, jer na južnobalkanskim planinama nema alpijskih i visokonordijskih staništa.

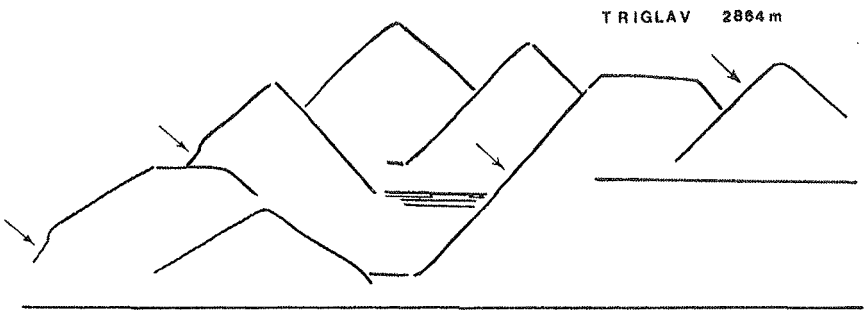
U flori i fauni Alpa, naprotiv, balkanski oromediteranci su "došljaci" (*hecontorites* II.2.2., videti dodatak). Oni su ušli u sastav alpskih biocenoza koje naseljavaju izuzetno suva i sunčana alpska staništa, jer su "suholjubivi", a na Alpima nema ekološki suvih (*xeropetricola*) oromediteranskih staništa.

Visoke planine severnog dela Balkanskog poluostrva (Rila, Stara planina, Kopaonik, pa i Pohorje) silikatni su masivi, zbog čega su vlažnije. Pošto se nalaze severnije i istočnije od drugih balkanskih planina, klima je na njima oštrija. Njihov živi svet je tipa *"humidopetricola"* sa dosta arktičkih i borealnih elemenata, ali ima i alpskih, koji su došli za vreme poslednje glacijacije preko Dinarida, a severni preko Karpata. Taj "karpatski put" objašnjava nalaženje severoistočnih podvrsta ptica i skakavaca (a i podvrsta drugih bića) u srednjem i istočnom delu Balkanskog poluostrva. Na tim silikatnim planinama, balkanski oromediteranci se nalaze samo na prisojnim staništima tipa *"xeropetricola"*. Tu postoje i neka staništa visoko-nordijskog tipa sa karakterističnim živim svetom. U njemu se nalaze i "vlagoljubivi" alpski elementi.

U slučaju Alpa kao oromediteranskog masiva, može se zaključiti da se (1) živi svet visokih Alpa danas sastoji od alpskih i balkanskih oromediteranaca i od arkto-visokonordijskih došljaka, (2) prema do sada prikupljenim podacima, analiza se može uraditi za ptice i skakavce, (3) načelno se može reći, da je na Alpima mnogo više arkto-visokonordijskih došljaka nego na drugim oromediteranskim planinama.

Pri analizi porekla živog sveta ostalih zapadnih oromediteranskih balkanskih planina, treba da se uzme u obzir najpre humidnost, koja se smanjuje

ka Istoku i Jugu. Za sve te planine ipak je zajedničko veliko bogatstvo endemičnim vrstama i zajednicama. Endemiti u visokoplaninskom svetu čine većinu (M a t v e j e v 1963, 1975, 1983, 1983*a*). Na severnim balkanskim planinama je više alpsko-visokonordijskih elemenata, ali najviše ih je na Durmitoru. Na inicijativu i uz pomoć Crnogorske akademije nauka i umjetnosti taj živi svet je

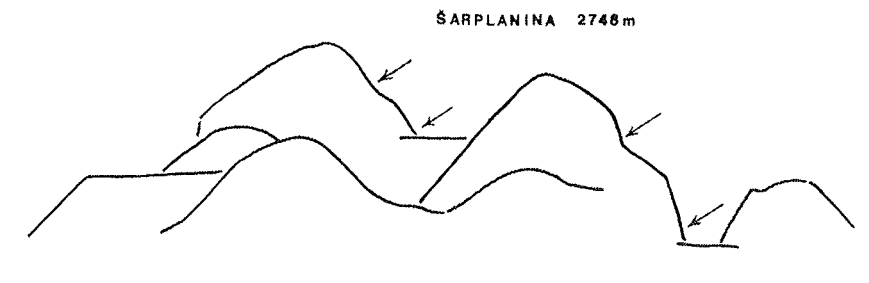


Sl. 1. - Triglav: alpsko-visokonordijska staništa na kojima se mestimično nalaze oromediteranski elementi.

Triglav: Alpine-High Nordic habitats where oro-Mediterranean elements occur at random.

dobro proučen. U Srbiji, od severnih humidnih oromediteranskih planina najbolje je proučen živi svet Kopaonika gde su desetak godina radile ekipe Instituta za ekologiju i biogeografiju Srpske akademije nauka.

Danas je već dosta dobro poznat živi svet i drugih planina istočnog i juž-



Sl. 2. - Šar-planina: oromediteranska staništa; alpsko-visokonordijski elementi na severnim ekspozicijama, ili severnoj strani klisura (original).

Šar-planina: oro-Mediterranean habitats; Alpine-High Nordic elements in northerly expositions, or in the North of the gorges (original).

nog dela Balkanskog poluostrva. Objavljene su monografije o nekim grupama životinja, na primer o skakavcima Grčke (W i l l e m s e 1984), o osolikim muvama Crne Gore (Š i m i ć 1987), leptirima Makedonije (S c h a i d e r & J a k š i ć 1988), pticama Balkanskog poluostrva (M a t v e j e v 1976). Prema tome, danas već postoji dovoljno podataka za jednu dokumentovanu bio-

geografsku analizu celokupne balkanske teritorije, a i susednih Alpa. Međutim, prema savremenim istraživanjima, centralni delovi Jugoslavije su "biogeografski čvor" za specijaciju i naseljavanje Srednje Evrope (M a t v e j e v 1976, V a s i ć *et al.* 1990, V a s i ć 1993).

Kako na osnovu ličnog dugogodišnjeg proučavanja ptica i skakavaca, autor naročito dobro poznaje teritoriju Jugoslavije, smatra da takav "čvor" zaista postoji, te da se mogu predočiti sledeće biogeografske pravilnosti. Alpske vrste su na Istok prodrle do Kopaonika i Prokletija. Međutim, alpsko-visokonordijske vrste su za prodiranje imale dva puta, preko Dinarida i preko Karpata. Neke vrste su stigle iz oba pravca do središnih balkanskih Dinarskih planina, ali većina je dospela samo do zapadnih ili istočnih planina Jugoslavije. Oromediteranci tipa *"humidopetricola"* su manje prisutni prema Istoku i Jugu. Naprotiv, prema Zapadu i Severu, broj oromediteranaca tipa *"xeropetricola"* opada.

Iako su za sada ova zapažanja preliminarna, ipak ukazuju na puteve "programskog mišljenja" o biogeografiji Balkanskog poluostrva. Ovo je naročito važno zbog činjenice da balkanski živi svet u odnosu na živi svet Srednje Evrope, u nedavnoj geološkoj prošlosti nije bio "periferni" već "ishodni", koji je u postglacijalu sa Balkanskog poluostrva naselio Srednju Evropu (M a t v e j e v 1961, 1973, 1976).

U ovoj raspravi autor namerno upotrebljava neke zaboravljene biogeografske i ekološke pojmove, 'osavremenjujući' one koji imaju ne samo naučno-istorijsku vrednost, već i danas sasvim precizno određuju hronološke i druge biogeografske osobenosti današnjih bića. Na taj način podaci postaju određeniji i pristupačniji za savremenu kompjutersku obradu.

OBJAŠNJENJE POJMOVA

A. S. S e m j o n o v - T j a n j - Š a n s k i j (1910, 1937), prvi je kompleksno sagledao proces nastajanja visokoplaninske faune Evroazije. U sastavu faune jedne visoke planine on izdvaja sledeće grupe i podgrupe elemenata:

I *ACONTORITES* su one vrste koje su bile prinuđene da postanu planinci u toku uzdizanja tla i nabiranja planina (pasivni elementi).

I 1 - KRIPTOBIONTNE vrste su one koje danas (i u prošlosti) skriveno žive u pećinama, duboko u pukotinama stena, ili duboko u zemlji. Većina tih bića danas ima uglavnom preglacijalnu rasprostranjenost (M a t v e j e v 1961, 1973, 1975). Kriptobiontne grupe su na pr. *Lumbricidae, Formicidae, Myriapoda, Pseudoscorpiones,* neke *Mollusca,* neke *Carabidae* (videti Zoogeografsku katu H a d ž i 1931).

I 2 - FANEROBIONTNE vrste su one koje veći deo života provode van stalnih zaklona. Njihova savremena rasprostranjenost je uglavnom nastala u toku glacijacija i u postglacijalu (M a t v e j e v 1961, 1973, 1975).

II *HECONTORITES* su one vrste koje su uglavnom došljaci. One su aktivno u planine došle geološki nedavno.

II 2 - u grupi *"hecontorites"* većinu čine "fanerobiontne" vrste. One su predmet većine savremenih geografskih i biogeografskih razmatranja. Postale su planinci na dva načina:

II 2.*1* - pasivno tokom uzdizanja i nabiranja tla - manjina vrsta.

II 2.*2* - aktivno su došle u planine - većina vrsta.

U grupi II.2.2 S e m j o n o v - T j a n j - Š a n s k i j izdvaja: II.2.2.1 - autohtone planinske i visokoplaninske vrste prilagođene posebnim planinskim uslovima *"oreogenetes* i *hypsogenetes"*. One su rođene u planinama. Dalje autor izdvaja: II.2.2.2 - *"philori* i *phillipsi"*. Njih su planine i visoke planine privukle novim, za njih pogodnijim, ekološkim uslovima; II.2.2.3 - *"oreopoeci* i *hypsopoeci"* su vrste koje su u planinama, ili visokim planinama našle utočište, one su "useljenici"; II.2.2.4 - vrste koje su se iz planina raselile u ravnice su *"emigranti"*; II.2.2.5 - *"oreoxeni* i *hypsoxeni"* su vrste koje samo povremeno borave u planinama, ili visokim planinama, one su naviknute da budu planinski gosti.

U dosta zaboravljene biološke pojmove, koji se sada opet primenjuju (M i c e v s k i 1990) spada i klasifikacija ekoloških karakteristika životnih formi koju su predložili M a t v e j e v & D i m o v s k i (1963). Ona uzima u obzir ne samo specifične ekološke prilagođenosti, već i sredinu - stanište u kome biće danas živi. Time se izražavaju njegove ekološko-geografske osobenosti, što je naročito važno za biogeografsku analizu.

I Grupa - *petricola*, sa 3 podgrupe

II Grupa - *planicola*, sa 11 podgrupa

III Grupa - *arenikola* sa više za pustinje specifičnih podgrupa

IV Grupa - *nivicola* sa više podgrupa u odnosu na podlogu

V Grupa - *aquaticola* sa 7 podgrupa

VI Grupa *drymicola* sa 6 podgrupa

VII Grupa - *silvicola* sa 10 podgrupa

Svaki tip predela - biom (M a t v e j e v & P u n c e r 1989) u svom živom svetu sadrži određeni 'set' navedenih životnih formi - grupa i odgovarajućih podgrupa.

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ORO-MEDITERRANEAN ELEMENTS IN THE ALPS AND ALPINE-HIGH NORDIC ELEMENTS IN THE BALKAN MOUNTAINS

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S u m m a r y

The aim of this paper is to explain the origin of oro-Mediterraneans in the Alps and the presence of High Nordics in their flora and fauna. Special attention is given to the routes by which Alpine-High Nordics penetrated the Balkan Mountains and Balkan oro-Mediterraneans penetrated the Alps and Carpathians. The Alpine and northern elements reached the central Dinaric ranges not only by way of the rim of Englandeiss and middle European tundra, but also across the Carpathians. Further to the east and south, their numbers diminish. To the east, the Alpine species reached Kopaonik via the Dinaric ranges. They are of the ecological type *"humidopetricola"* (M a t v e j e v & D i m o v s k i 1964). The number of the oro-Mediterranean species of the "xeropetricola" type declines westwards and northwards. These species are fewest in the Alps and Carpathians.

The foregoing observations were reached on the basis of the data we personally collected during the 40-year-long study of the birds (*Aves*) and grasshoppers (*Tettigoniidea, Acridoidea*) of the Balkan Peninsula. Further investigation indicated a presence in the central Dinaric mountain system of a "biogeographic knot" of speciation and colonization of central Europe (M a t v e j e v 1976, V a s i ć *et al.* 1990, V a s i ć 1993), as the Balkan living world was not "peripheral" to the living world of central Europe, but "original", having colonized central Europe from the Balkans during the postglacial period (M a t v e j e v 1961, 1973, 1976).

The present study employed the long forgotten "programme thinking" methods in the analysis of fauna formation in the Eurasian mountains (S e m j o n o v - T j a n j - Š a n s k i j 1910, 1937).

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Technical paper

TYPE MATERIAL OF *GASTROPODA* (*MOLLUSCA*) IN NATURAL HISTORY MUSEUM IN BELGRADE

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Jovanović Božana (1995-98): *Type material of Gastropoda (Mollusca) in Natural Hystory Museum in Belgrade.* - Bulletin of Natural History Museum, Belgrade, *B49-50*, 97-128.

The paper lists the type material from the snail collections of Petar S. Pavlović and Pavle Radoman, kept in the Natural History Museum in Belgrade (BEO) within the general mollusk collection. The collections contain the material originates from Yugoslavia and adjacent countries, including the total of 198 types.

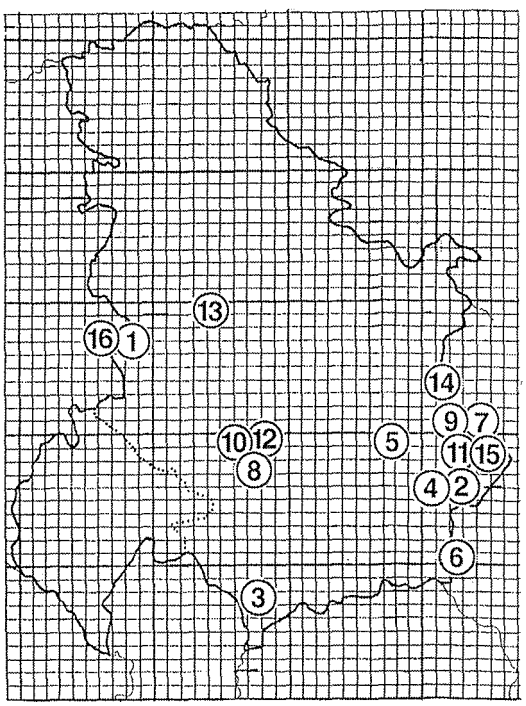
INTRODUCTION

The collection of recent mollusks kept in the Natural History Museum in Belgrade (BEO), consists of several separate collections. They include, among other, two large snail collections of PETAR S. PAVLOVIĆ and PAVLE RADOMAN. The last two collections of the total of 198 types belonging to the families of *Clausiliidae*, *Hydrobiidae*, *Orientalinidae*, *Pyrgulidae* and *Bithinellidae*. This paper offers a short history of both collections and the list of its type material.

TYPE MATERIAL FROM THE COLLECTION OF PETAR S. PAVLOVIĆ

PETAR S. PAVLOVIĆ brought together a collection of snails in the period of time between 1905 and 1911. In the course of material gathering, he covered large tracts of the then Serbia and Old Serbia [now part of Macedonia]. He visited more than 450 localities in order to form as complete picture of the snail

fauna as possible. The small staff of the then Natural History Museum was not sufficient for such an extensive undertaking, so it was then greatly helped by outside collaborators. They did a very good job, closely observing the instructions for collecting received from PAVLOVIĆ himself. It was also he who classified the abundant material into a great collection of both fresh and seawater snails. The collection has kept in the Natural History Museum in Belgrade (BEO), and is in good condition. It consists of 183 species, *i. e.* 4792 inventory numbers. P a v l o v i ć (1911, 1912) published two large papers based on the study of the collections: CONTRIBUTIONS TO THE STUDY OF MOLLUSKS OF OLD SERBIA AND MACEDONIA and MOLLUSKS OF SERBIA I. MAINLAND MOLLUSKS. PAVLOVIĆ described as new to science 10 species, 5 varieties, and 1 form. The



Map. 1. - Type localities of the taxa originally described and named by Pavlović (1911, 1912, 1913) and Urbanski (1973): (1) *Herilla ziegleri tarensis*, (2) *Macedonica pirotana*, (3) *Macedonica frauenfeldi elongata*, (4) *Macedonica frauenfeldi moellendorffii*, (5) *Macedonica frauenfeldi pavloviciana*, (6) *Balea biplicata vlasinensis*, (7) *Balea biplicata balcanica*, (8) *Balea biplicata pancici*, (9) *Balea wagneri stojicevici*, (10) *Balea urosevici*, (11) *Balea pancici*, (12) *Vestia roschitzi minima*, (13) *Vestia roschitzi intermedia*, (14) *Vestia roschitzi trigonostoma*, (15) *Vestia ranojevici*, (16) *Paladilhiopsis serbica*.

Tipični lokaliteti sa kojih su Pavlović (1911, 1912, 1913) i Urbanski (1973) izvorno opisali i imenovali taksone.

description of new species did not include the marking of the types. A revision of PAVLOVIĆ species from the family *Clausiliidae*, was done by U r b a n s k i (1973). He isolated one holotype and 14 lectotypes. This paper gives their list. Every type is listed with its name, the name of locality and the inventory number provided by URBANSKI. The paper also lists the rest of the mentioned species, each with its inventory number, locality, date of collection and the nuber of specimens in the PAVLOVIĆ collection, as well as with maps of their distribution in Serbia (Map. 1).

In 1913. PAVLOVIĆ established a new genus for science. It was *Paladilhiopsis*, with a new species *Paladilhiopsis serbica* (Pavlović, 1913).

FAMILY *CLAUSILIIDAE* SCHMIDT, 1857

Genus *HERILLA* H. et A. Adams, 1855

Herilla ziegleri tarensis (Pavlović, 1912)

Herilla dacica f. *tarensis* Pavlović, 1912: 96; *Herilla ziegleri tarensis* Nordsieck, 1971: 54, pl. 1, fig. 11, 12, pl. 2, fig. 13; Urbanski, 1973: 164, pl. 3, fig. 3, 4.

Locus typicus restrictus: Derventa, Bajina Bašta (Serbia) CP86

Lectotypus: BEO 08, *ibidem*

Other (non-type) specimens: 3157 Derventa, Bajina Bašta 1908, leg. N. Arsović, 9 exp, 3158-3159 *ibidem*, leg. Novak Arsović, 248 exp; 3161 Perućac, leg. P. Pavlović, 14 exp; 3162 Manastir Rača, Brdo Krstača Mt. 1906.08.14., 1909.08., 23 exp, leg. P. Pavlović; 3163 Gradac, Valjevo, 1906.07., leg. P. Pavlović, 18 exp; 3164 Derventa, 1909, leg. P. Pavlović, 22 exp; 3165 *ibidem*, leg. P. Pavlović, 1 exp; 3166 *ibidem*, 1909, leg. P. Pavlović, 7 exp; 3167 *ibidem*, 1906, leg. P. Pavlović, 10 exp.

Genus *MACEDONICA* O. Boettger, 1877

Macedonica pirotana (Pavlović, 1912)

Clausiliastra pirotana Pavlović, 1912: 82, pl. 1, fig. 24-29; Tomić, 1959: 39, *Macedonica pirotana* Nordsieck, 1972: 26, pl. 3, fig. 31; *Serbica marginata pirotana* Urbanski, 1973: 163, pl. 3, fig. 1, *Macedonica pirotana* Nordsieck, 1979: 258; Maassen, 1988: 35.

Locus typicus restrictus: Čelteš, Pirot (Serbia) FN27

Lectotypus: BEO 07, *ibidem*

Other (non-type) specimens: 2725 Sarlak, Pirot, 1908.05.11., leg. P. Pavlović, N. Rakić, 191 exp.; 2726 *ibidem*, (Staro Jevrejsko Groblje) 1907.07.20., leg. P. Pavlović, D. Stojićević 455 exp; 2727 Grlište, 1905, leg. V. Petković, 41 exp.; 2728 Gradišnička klisura, 1907.07.21., leg. P. Pavlović, D. Stojićević, 2 exp; 2729 Ćelteš, Pirot, 1908.05., leg. P. Pavlović, 339 exp; 2730 *ibidem*, 1911.08.28., leg. P. Pavlović, 15 exp; 2731-2733 *ibidem*, 1907.07. leg. P. Pavlović, D. Stojićević, 6 exp.

Macedonica frauenfeldi elongata (Pavlović, 1911)

Herilla frauenfeldi var. *elongata* Pavlović, 1911: *Macedonica* (*Serbica*) *frauenfeldi occidentali* S. Jaeckel, 1954: fig. 11. Locus typicus: " Prizren"; *Serbica frauenfeldi occidentalis* Urbanski, 1969: 256; *Macedonica frauenfeldi occidentalis* Nordsieck, 1972: pl. 3, fig. 27; *Macedonica frauenfeldi elongata* Urbanski, 1973: pl. 4, fig. 3, 4.

Locus typicus: Sv. Marko, Prizren (Serbia) DM77

Lectotypus: BEO 09, *ibidem*

Other (non-type) specimens: 4123 Sv. Marko (Prizren), 1908.06.25., leg. N. Ranojević, 1910.06. 2 exp. leg. Stanković, 33 exp; 4124 village Lokvice, Prizren, leg. S. Nikolić, 1908, 3 exp; 4123, Svinjište, Sredska, Prizren, leg. N. Ranojević, 1910.12.,1 exp.

Macedonica frauenfeldi moellendorffii (Pavlović, 1912)

Herilla möllendorffii Pavlović, 1912: 91, pl. 2, fig. 1-6; *Clausilia möllendorffii* Tomić, 1959: 44; *Serbica frauenfeldi moellendorffi* Urbanski, 1973: 166, pl. 4, fig. 3, 4.

Locus typicus: Rsavci, Pirot (Serbia) FN27

Lectotypus: BEO 10, *ibidem*

Paralectotypus: 3154, *ibidem*, 1911.08., 9 exp.

Other (non-type) specimens: 3155 2 exp.

Macedonica frauenfeldi pavloviciana Urbanski, 1973

Clausilia ranojevici Tomić, 1959: 43 (*nomen nudum*), *Serbica frauenfeldi pavloviciana* Urbanski, 1973: 173, pl. 6, fig. 3-5;

Locus typicus: Niš, Suva Planina Mt.. EN79 (Serbia)

Holotypus: BEO 15, *ibidem*

Other (non-type) specimens: 3084 Suva Planina Mt., 1908.09.13., 558 exp; 3085 *ibidem*, 1907.09.07., leg. N. Ranojević, 16 exp; 3086 Trem (Golemi Kamen), 1909.05.19., leg. N. Ranojević, 36 exp.

Genus *BALEA* Gray, 1824

Balea* (*Alinda*) *biplicata vlasinensis (Pavlović, 1912)

Alinda biplicata var. *vlasinensis* Pavlović, 1912: 87, pl. 1, fig. 30-32; *Laciniaria* (*Alinda*) *biplicata vlasinensis* Urbanski, 1973: 153, pl. 1, fig. 1, 2.

Locus typicus: Vlasina (Serbia) FN02

Lectotypus: BEO 01, *ibidem*

Paralectotypus: 3072, *ibidem*, 1908.04.11., leg. U. Zdravković, 25 exp.

Other (non-type) specimens: 3073 Topli Do, Midžor, Stara Planina Mt., 1907, 11 exp.

Balea* (*Alinda*) *biplicata balcanica (Pavlović, 1912)

Alopia balcanica Pavlović, 1912: 80, pl. 1, fig. 9-14; Tomić, 1959: 39; *Alinda balcanica* Sturany & Wagner, 1914: 106; *Pseudalinda balcanica* Nordsieck, 1972: 55; *Laciniaria* (*Alinda*) *biplicata balcanica* Urbanski, 1973: 154, pl. 1, fig. 6-8.

Locus typicus: Babin Zub, Stara Planina Mt. (Serbia) FP30

Lectotypus: BEO 02, *ibidem*

Paralectotypus: 2712-2714 *ibidem*, 1907.07.25., leg. P. Pavlović, D. Stojićević. 49 exp.

Balea* (*Alinda*) *biplicata pancici (Pavlović, 1912)

Alopia pančići Pavlović, 1912: 80, pl. 1, fig. 4-8; Tomić, 1959: 39; *Alinda pančići* Sturany & Wagner, 1914: 106; *Laciniaria* (*Alinda*) *biplicata pancici* Urbanski, 1973: 156, pl. 1, fig. 3, 5.

Locus typicus: Jelak, Kopaonik Mt. (Serbia) DN89

Lectotypus: BEO 03, *ibidem*

Other (non-type) specimens: 2715 Jelak, Kopaonik Mt., 1911.07.21., D. Stojićević, D. Stojadinović, 30 exp; 2716 *ibidem*, 1910.07.27., 26 exp; 2717 *ibidem*, 6 exp.

Balea* (*Alinda*) *wagneri stojicevici (Pavlović, 1912)

Alopia stojićevići Pavlović, 1912: 28, pl. 1, fig. 15-18; *Alinda stojicevici* Sturany & Wagner, 1914: 106; *Pseudalinda* (*Pseudalinda*) *wagneri stojicevici* Urbanski, 1969: 247, pl. 5, fig. 2; Urbanski, 1973: 157, pl. 2, fig. 1, 2; Damjanov, Liharv, 1975: 407.

Locus typicus: Jabučko Ravnište, Babin Zub, Stara Planina Mt. (Serbia) FP30

Lectotypus: BEO 04, *ibidem*

Other (non-type) specimens: 2720 Babin Zub, Jabučko Ravnište, Stara Planina Mt., 1907.07.25., leg. P. Pavlović, D. Stojićević, 10 exp; 2721 *ibidem*, 1908.07., leg. P. Pavlović, D. Stojićević, 8 exp.

Balea* (*Alinda*) *urosevici (Pavlović, 1912)

Alopia uroševići Pavlović, 1912: 81, pl. 1, fig. 19-23; Tomić, 1959: 39; *Alinda urosevici* Sturany & Wagner, 1914: 106; *Laciniaria* (*Alinda*) *biplicata urosevici* Urbanski, 1973: 159, pl. 2, fig. 4, 5.

Locus typicus: Srebrnac, Kopaonik Mt. (Serbia) DN89

Lectotypus: BEO 05, *ibidem*

Other (non-type) specimens: 2722 Srebrnac, Kopaonik Mt., 1910.07.25., 11 exp; 2723 *ibidem*, 1908., 15 exp.

Balea* (*Alinda*) *pancici Pavlović, 1912

Balea perversa var. *pančići* Pavlović, 1912: 79, pl. 1, fig. 1-3; *Balea perversa* (2719 sa Midžora) Tomić, 1959: 39; *Balea pancici* Urbanski, 1973: 161, pl. 2, fig. 3a-c; Nordsieck, 1979:249.

Locus typicus: Midžor, Stara Planina Mt. (Serbia) FP30

Lectotypus: BEO 06, *ibidem*

Paralectotypus: 2718 *ibidem*, 1907.07.27., leg. P. Pavlović, D. Stojićević 21 exp.

Genus *VESTIA* Hesse, 1916

Vestia roschitzi minima (Pavlović, 1912)

Uncinaria minima Pavlović, 1912: 102, pl. 2, fig. 11-15; Tomić, 1959: 44; *Clausilia* (*Uncinaria*) *roschitzi* var. *serbica* Frankenberger, 1916: 235 "Kopaonik ad Brus Serbiae meridionalis"; *Pseudalinda* (*Vestia*) *roschitzi minima* Urbanski, 1973: 167, pl. 5, fig. 6-8; *Vestia roschitzi minima* Nordsieck, 1973: 201.

Locus typicus restrictus: Jelak, Kopaonik Mt. (Serbia) DN89

Lectotypus: BEO 11, *ibidem*

Other (non-type) specimens: 3214 Jelak, Kopaonik Mt., 1911., leg. P. Pavlović, D. Stojićević, D. Stojadinović, Schulz, 3 exp; 3215 *ibidem*, 1908.08., 5 exp,

1910.07.28., 5 exp, 1911.07.21., 3 exp; 3216 Srebrnac, Kopaonik Mt. 1908.08., 1 exp.

Vestia roschitzi intermedia (Pavlović, 1912).

Uncinaria minima intermedia Pavlović, 1912: 103, pl. 2, fig. 16-18; *Uncinaria intermedia* Tomić, 1959: 44; *Pseudalinda* (*Vestia*) *roschitzi minima* Urbanski, 1973: 168, pl. 5, fig. 6-8; Nordsieck, 1973: 201.

Locus typicus: Golija DN49 (Serbia)

Lectotypus: BEO 12, *ibidem*

Paralectotypus: 3224 Golija Mt., 25.06.-1911.07.05., leg. P. Pavlović, D. Stojićević, 1 exp.

Other (non. type) specimens: 3225 Javor, 1911., leg. P. Pavlović, 7l exp.

Remarks: Probably the synonym of the *P. r. minima* (fide Urbanski 1973).

Vestia roschitzi trigonostoma (Pavlović, 1912)

Uncinaria trigonomostoma Pavlović, 1912: 103, pl. 2, fig. 19-21; Tomić, 1959: 27; *Pseudalinda* (*Vestia*) *roschitzi trigonomostoma* Urbanski, 1973: 170, pl. 5, fig. 9-11; *Vestia roschitzi trigonostoma* Nordsieck, 1973: 201.

Locus typicus restrictus: Babušnica (= Ljuberađa), Suva Planina Mt. (Serbia) FP16.

Lectotypus: BEO 13, *ibidem*

Other (non-type) specimens: 3217 Periš (Milenkov Kamen), Svrljiške Planine Mts., 1908.10., leg. V. Živković, 7 exp; 3218 Periš (Modra stena), 1908.10.21., leg. V. Živković, 1 exp; 3219 Široke Luke, Stara Planina Mt., 1911.08.25., leg. P. Pavlović, 15 exp; 3220 Babušnica (=Ljuberađa), 1907.07.18., leg. P. Pavlović, D. Stojićević, 35 exp; 3221 Suva Planina Mt., 1908.09.13., leg. P. Pavlović, D. Stojićević, 1 exp.; 3222 Mosurovac, Suva Planina Mt., 1908.09.13., leg. P. Pavlović, D. Stojićević, 2 exp; 3223 Tara Mt. (ispod Biljega) 1909.08., leg. P. Pavlović, D. Stojićević, 11 exp; 3226 Periš (Sirinjava Dufka), 1909.06.10., leg. V. Živković, 1 exp.; 3227 Periš (Ulnac), 1909.06.10., leg. P. Pavlović, V. Živković, 9 exp.; 3228 Pernat, 1908.10., leg. V. Živković, 6 exp.; 3229 Manastir Suvodol, 1907.07.30., leg. P. Pavlović, 2 exp.; 3230 Rtanj Mt., 1908.09.04., leg. N. Ranojević, 1 exp.

Vestia ranojevici (Pavlović, 1912)

Uncinaria turgida var. *ranojevići* Pavlović, 1912: 105; *Pirostoma* (*Pirostoma*) *riloënsis* Sturany, Wagner, 1914: 64, pl. 16, fig. 94 a-b, Locus typicus: "Rilski manastir im Rila-Gebirge (1150 *m*) in Bulgarien"; *Uncinaria turgida* Tomić, 1959: 44; *Pseudalinda* (*Vestia*) *riloënsis riloënsis* Urbanski, 1960: 131; fig. 9, 10; *Pseudalinda* (*Vestia*) *ranojevici* Urbanski, 1969: 254; Urbanski, 1973: *ibidem*, 173, pl. 6, fig. 1a, b; *Vestia* (*Brabenecia*) *ranojevici* Nordsieck, 1979: 266.

Locus typicus: stražara Krvave Bare, Toplodolska Reka river, Stara Planina Mt. FP30 (Serbia)

Lectotypus: BEO 14, *ibidem*

Family ***ORIENTALINIDAE*** Radoman, 1978

Genus *PALADILHIOPSIS* Pavlović, 1913

Paladilhiopsis serbica (Pavlović, 1913)

Lartetia serbica Pavlović, 1913: 71, fig. 16-20; *Paladilhia serbica* Jaeckel, S. G., Klemm, W., Meise, W., 1958: 173; *Lartetia serbica* Tomić, 1959: 54; *Paladilhia* (*Paladilhiopsis*) *serbica* Schutt, 1970: 307, pl. 15, fig. 17; *Paladilhiopsis serbica* Radoman, 1973: 9.

Locus typicus: Čočića vrelo, Tara Mt. CP86 (Serbia)

Syntypus 4232, 1912.06., 4 exp.

Topotypus 4233, *ibidem*, 1925.06.20., 1 exp.

TYPE MATERIAL FROM PAVLE RADOMAN COLLECTION

In 1988. PAVLE RADOMAN presented the Belgrade Natural Hystory Museum with collection of *Hydrobioidea* snails. The collection is the result of his thirty-year work in the field of malacology. The materials originate from Austria, Slovenia, Croatia, Bosnia and Herzegovina Yugoslavia (Serbia and Montenegro) Albania, Macedonia and Turkey. A large part of the materials comes from the lake Ohrid in Macedonia. RADOMAN devoted a great part of his to study of the lake Ohrid snails, confirm in their high-degree endemity. The collection of RADOMAN consists of 208 species and subspecies, over 7500 specimens, 177 of which are types. This paper offers data the type materials kept in the Natural History Museum in Belgrade. There is also another part of the collection (type material) that is kept in the malacological collections of the Senckenberg Museum, Frankfurt. In 1989. the collection was museologically classified and named " Pavle Radoman Memorial Hydrobioidea Collection". It was numbered and photographed, and in 1991 cataloggud. Every species is listed with its name, its inventory number, locality (Map. 2, 3, 4, 5), UTM grid coordinates (the species found in Slovenia, Croatia, Bosnia and Herzegovina, Macedonia and Yugoslavia only) and the date of collection (not for all species).

Family ***HYDROBIIDAE*** Troschel, 1857

Genus *HYDROBIA* Hartmann, 1821

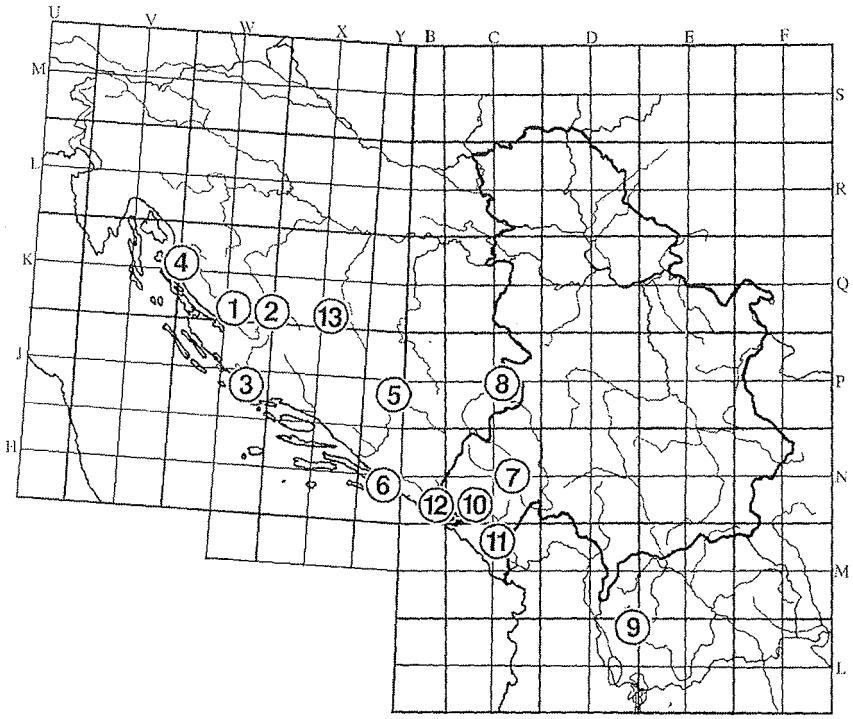
Hydrobia salaria (Radoman, 1973)

Obrovia salaria Radoman, 1973: 286, fig. 2 (A),5; *Hydrobia salaria* Radoman, 1977: 207, pl. 21, fig. 5-8; Radoman, 1983: 29, pl. 1, fig. 4, 5; 47; Jovanović, 1991: 212, pl. 1, fig. 1.

Locus typicus: brackish part of the Zrmanja river, Obrovac (Croatia) WJ59

Holotypus: BEO 002 *ibidem*, 1973.07.

Paratypus: BEO 003 *ibidem*, 1 exp.



Map. 2.- Type localities of the taxa originally described and named by Radoman (1973, 1983): (1) *Hydrobia salaria*, (2) *Hydrobia testadura*, (3) *Ventrosia spalatiana*, (4) *Ventrosia cissana*, (5) *Orientalina curta narentana*, (6) *Orientalina curta mostarensis*, (7) *Orientalina curta anagastica*, (8) *Orientalina curta pivensis*, (9) *Orientalina curta kicavica*, (10) *Orientalina elongata*, (11) *Orientalina lacustris*, (12) *Orientalina montana*, (13) *Orientalina bosniaca*.

Tipični lokaliteti taksona koje je opisao i imenovao Radoman (1973, 1983).

Hydrobia testadura (Radoman, 1973)

Obrovia testadura Radoman, 1973: 286, fig. 2 (B); *Hydrobia testadura* Radoman, 1977: 207, pl. 21, fig. 9-10; Radoman, 1983: 29, pl. 1, fig. 6; Radoman, 1985: 47; Jovanović, 1991: 212, pl. 1, fig. 2.

Locus typicus: brackish part of the Zrmanja river, Obrovac (Croatia) WJ59

Holotypus: BEO 005, *ibidem*, 1972.07

Paratypus: BEO 006 *ibidem*, 2 exp.

Genus *VENTROSIA* Radoman, 1977

Ventrosia spalatiana (Radoman, 1973)

Hydrobia spalatiana Radoman, 1973: 15; *Ventrosia spalatiana* Radoman, 1977: 209, pl. 21, fig. 14-16; Radoman, 1983: 31, pl. 1, fig. 8; Jovanović, 1991: 213, pl. 1, fig. 3.

Locus typicus: branckish spring Pontana, Trogir-Divulje (Croatia) WJ91

Lectotypus: BEO 009, *ibidem*, 1972.07.12.

Paralectotypus: BEO 010, *ibidem*, 2 exp.

Ventrosia cissana (Radoman, 1973)

Hydrobia cissana Radoman, 1973: 15; *Ventrosia cissana* Radoman, 1977: 209, pl. 21, fig. 17-18; Radoman, 1983: 31, pl. 1, fig. 9; Jovanović, 1991: 213, pl. 1, fig. 4.

Locus typicus: brackish water, Zrće, Pag island (Croatia) VK93

Lectotypus: BEO 012, *ibidem*

Paralectotypus: BEO 013, *ibidem*, 1 exp.

Ventrosia pontieuxini (Radoman, 1973)

Hydrobia ventrosia Radoman, 1973: 15; *Hydrobia pontieuxine* Radoman, 1973: 15; Radoman, 1977: 210, pl. 21, fig. 19-20; *Ventrosia pontieuxini* Radoman, 1983: 31, pl. 1, fig. 10; Radoman, 1985: 155; Jovanović, 1991, 213, pl. 1, fig. 5.

Locus typicus: coastal zone of the Black See, Mangalia (Romania)

Lectotypus: BEO 015, *ibidem*

Paralectotypus: BEO 016 *ibidem*, 1 exp.

Genus *KIRELIA* Radoman, 1973

Kirelia carinata Radoman, 1973

Kirelia carinata Radoman, 1973: 16; Radoman, 1983: 38, pl. 2, fig. 17; Radoman, 1985: 142; Jovanović, 1991: 215, pl. 1, fig. 6.

Locus typicus: Lake Beysehir (Turkey)

Lectotypus: BEO 024, *ibidem*, 1969.06.06.

Paralectotypus: BEO 025 *ibidem*, 1 exp.

Kirelia murtici Radoman, 1973

Kirelia murtici Radoman, 1973: 16; Radoman, 1983: 38, pl. 2, fig. 18; Radoman, 1985: 142; Jovanović, 1991: 215, pl. 1, fig. 7.

Locus typicus: Manavgat-Konyia: springMurtici (Turkey)

Lectotypus: BEO 027, *ibidem*, 1960.06.05.

Paralectotypus: BEO 028 *ibidem*, 1 exp.

Family ***ORIENTALINIDAE*** Radoman, 1978

Genus *ORIENTALINA* Radoman, 1978

Orientalina curta narentana Radoman, 1973

Orientalia narentana Radoman, 1973: 16; *Orientalina curta narentana* Radoman, 1983: 42, pl. 2, fig. 22; Jovanović, 1991: 215, pl. 2, fig. 1.

Locus typicus: the lower cours of the river Buna (near Neretva) (Bosnia and Hezegovina) YH39

Lectotypus: BEO 032, *ibidem*

Paralectotypus: BEO 033, *ibidem*, 1 exp.

Orientalina curta mostarensis Radoman, 1973

Orientalia mostarensis Radoman, 1973: 16; *Orientalina curta mostarensis* Radoman, 1983: 43, pl. 2, fig. 23; Jovanović, 1991: 216, pl. 2, fig. 2.

Locus typicus: spring Aleksin Han, in the middle course of Neretva river, north of Mostar (Bosna and Herzegovina) YH23

Lectotypus: BEO 035, *ibidem*

Paralectotypus: BEO 036, *ibidem*, 1 exp.

Orientalina curta anagastica Radoman, 1973

Orientalia anagastica Radoman, 1973: 17; *Orientalina curta anagastica* Radoman, 1983: 43, pl. t. 2, fig. 24; Jovanović, 1991: 216, pl. 2, fig. 3.

Locus typicus: Titograd [Podgorica]: spring by monstery Morača (Montenegro) CN63

Lectotypus: BEO 038, *ibidem*

Paralectotypus:BEO 039 *ibidem*, 1 exp.

Orientalina curta pivensis Radoman, 1973

Pseudamnicola consociella miliaria Wagner, 1927: 6 (Rudo); *Orientalia pivensis* Radoman, 1973: 18; *Orientalia limica* Radoman, *ibid.*, 6; *Orientalina curta pivensis* Radoman, 1983: 43, pl. 2, fig. 25; Jovanović, 1991: 216, pl. 2, fig. 4.

Locus typicus: Rudo: big spring Jezero, near Rudo, west from the town Priboj (Bosnia and Hezegovina) CP63

Lectotypus: BEO 041, *ibidem*

Paralectotypus: BEO 04 *ibidem*, 1 exp.

Orientalina curta kicavica Radoman, 1973

Pseudamnicola consociella Stanković and Radoman, 1955: 5; Radoman, 1962: 88, fig. 1, 9, 17; Radoman, 1964: fig. 1; 88, fig. 1, 9, 17; *Orientalia kicavica* Radoman, 1973: 18; *Orientalia janinensis* Radoman, *ibidem.*, 6; *Orientalina curta kicavica* Radoman, 1983: 44, pl. 2, fig. 26; Radoman, 1985: 49; Jovanović, 1991: 216, pl. 2, fig. 5.

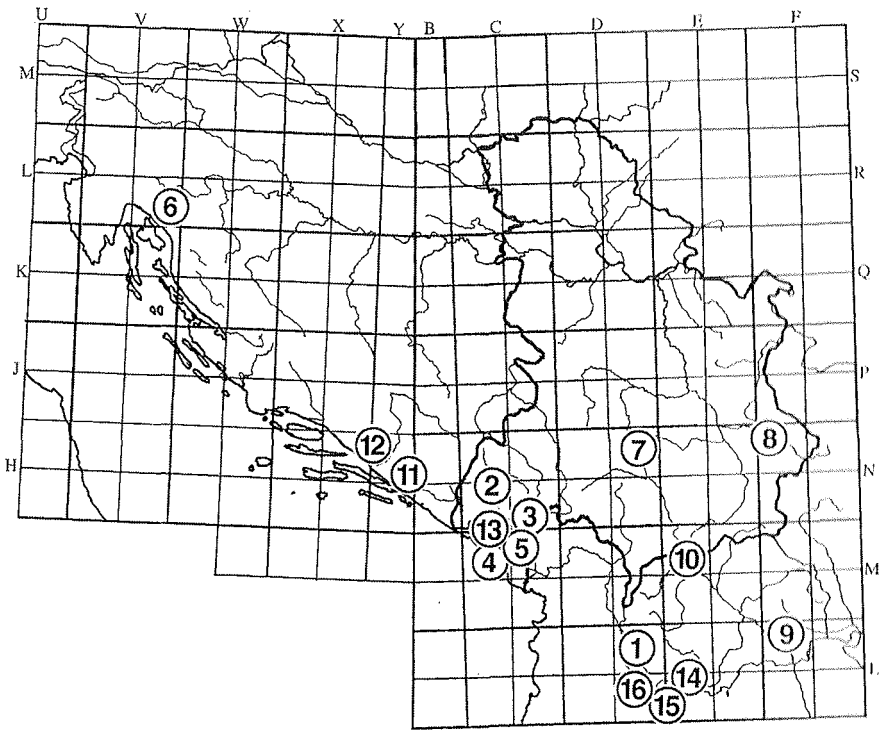
Locus typicus: big spring Izvor, about 16 *km* from Kičevo (Macedonia) DL99

Lectotypus: BEO 044, *ibidem*

Paralectotypus: BEO 045 *ibidem*, 1 exp.

Orientalina curta albanica Radoman, 1973

Lartetia sp.? Radoman, 1957: 62; *Pseudamnicola* sp.? Radoman, 1957: *ibidem*, 63; *Orientalia albanica* Radoman, 1973: 18; *Orientalina curta albanica* Radoman, 1983: 44, pl. 2, fig. 27; Jovanović, 1991: 217, pl. 2, fig. 7.



Map. 3.- Type localities of the taxa originally described and named by Radoman (1956, 1960, 1966, 1973): (1) *Horatia novoselensis*, (2) *Anagastina vidrovani*, (3) *Anagastina zetaevalis*, (4) *Anagastina scutarica*, (5) *Anagastina gluhodolica*, (6) *Vinodolia fiumana*, (7) *Grossuana serbica serbica*, (8) *Grossuana serbica remesiana*, (9) *Grossuana serbica macedonica*, (10) *Grossuana serbica scupica*, (11) *Zavalia vjetrenice*, (12) *Narentiana albida*, (13) *Bracenica spiridoni*, (14) *Prespiana lacustris*, (15) *Ohridohoratia carinata*, (16) *Polinskiola polinskii*.

Tipični lokaliteti taksona koje je opisao i imenovao Radoman (1956, 1960, 1966, 1973).

Locus typicus: spring Golobarda, near Korča (Albania)

Lectotypus: BEO 047, *ibidem*

Paralectotypus: BEO 048 *ibidem*, 4 exp.

Orientalina elongata Radoman, 1973

Orientalia elongata Radoman, 1973: 17; Radoman, 1983: 45, pl. 2, fig. 28; Jovanović, 1991: 217, pl. 2, fig. 7.

Locus typicus: spring near monastery Vranjina, near Virpazar (Montenegro) CM48

Lectotypus: BEO 050, *ibidem*

Orientalina lacustris Radoman, 1983

Orientalina lacustris Radoman, 1983: 45, fig. 16; Radoman, 1985: 58; Jovanović, 1991: 217.

Locus typicus: Lake Skutari [Skadar l.], along the sandy beach on the south lake bank, below Murići village (Montenegro) CM56

Holotypus: BEO 052, *ibidem*

Orientalina montana Radoman, 1973

Orientalia montana Radoman, 1973: 17; *Orientalina montana* Radoman, 1983: 45, pl. 2, fig. 29; Radoman, 1985: 40; Jovanović, 1991: 217, pl. 2, fig. 8.

Locus typicus: spring near stream Lukavaca, about 15 *km* nort-west from Budva (Montenegro) CM28

Lectotypus: Beo 054, *ibidem*

Paralectotypus: BEO 055 *ibidem*, 1 exp.

Orientalina bosniaca Radoman, 1973

Orientalia bosniaca Radoman, 1973: 46; *Orientalina bosniaca* Radoman, 1983: 46, pl. 2, fig. 30; Jovanović, 1991: 217, pl. 2, fig. 9.

Locus typicus: spring in the village Miljevci, between Bosanska Krupa and Sanski Most (Bosnia and Hezegovina) XK15

Lectotypus: BEO 057, *ibidem*

Paralectotypus: BEO 058 *ibidem*, 1 exp.

Orientalina delphica Radoman, 1973

Orientalia delphica Radoman, 1973: 18; *Orientalina delphica* Radoman, 1983: 46, pl. 2, fig. 31; Jovanović, 1991: 217,pl. 3, fig. 10.

Locus typicus: the spring in the place Delfi (Greece)

Lectotypus: BEO 060, *ibidem*, 1964.09.

Paralectotypus: BEO 061, *ibidem*, 1 exp.

Genus *HORATIA* Bourguignat, 1887

Horatia novoselensis Radoman, 1966

Horatia novoselensis Radoman, 1966: 250, fig. 9; Radoman, 1983: 52, pl. 3, fig. 39; Jovanović, 1991: 219, pl. 3, fig. 12.

Locus typicus: Sini virovi, nord-east of village Novo Selo (Macedonia) DL76

Lectotypus: BEO 070, *ibidem*

Paralectotypus: BEO 071 *ibidem*, 1 exp.

Genus *ANAGASTINA* Radoman, 1978

Anagastina vidrovani (Radoman, 1973)

Anagasta vidrovani Radoman, 1973: 18; Radoman, 1973: 421, fig. 1A, 3; *Anagasta urbana* Radoman, *ibidem*; *Anagasta vidrovani* Radoman, 1983: 53, fig. 21, pl. 3, fig. 41; Radoman, 1985: 162; Jovanović, 1991: 219, pl. 3, fig. 13.

Locus typicus: Vidrovan, the big spring cca 9 *km* north of the Nikšić (Montenegro) CN33

Lectotypus: BEO 074, *ibidem*

Paralectotypus: BEO 075 *ibidem*, 2 exp.

Anagastina zetaevalis (Radoman, 1973)

Anagasta zetaevallis Radoman, 1973: 422, pl. 1, fig. 1c; Radoman, 1973: 19; *Anagastina zetaevalis* Radoman, 1983: 54, pl. 3, fig. 42; Jovanović, 1991: 219, pl. 3, fig. 14.

Locus typicus: a spring on the right bank of the Zeta river, near Vranjicke njive, Titograd [Podgorics] (Montenegro) CM59

Lectotypus: BEO 077, *ibidem*

Paralectotypus: BEO 078 *ibidem*, 2 exp.

Anagastina scutarica (Radoman, 1973)

Anagasta scutarica Radoman, 1973: 422, fig. 2a; Radoman, 1973:19; *Anagastina scutarica* Radoman, 1983: 54, pl. 3, fig. 43; Radoman, 1985: 58; Jovanović, 1991: 219, pl. 3, fig. 15.

Locus typicus: Lake Skutari [Skadar l.], along the bank, near the place Luka Krnjička (Montenegro) CM47

Lectotypus: BEO 080, *ibidem*

Paralectotypus: BEO 081, *ibidem*, 3 exp.

Anagastina gluhodolica (Radoman, 1973)

Anagasta gluhodolica Radoman, 1973: 422, fig. 2b; Radoman, 1973: 9; *Anagastina gluhodolica* Radoman, 1983: 54, pl. 3, fig. 44; Jovanović, 1991: 220, pl. 3, fig. 16.

Locus typicus: Velje Oko spring, below the Gluhi Do, Virpazar (Montenegro) CM47

Lectotypus: BEO 083, *ibidem*

Paralectotypus: BEO 084 *ibidem*, 1 exp.

Genus *DALMATINELLA* Radoman, 1973

Dalmatinella fluviatilis Radoman, 1973

Dalmatinella fluviatilis Radoman, 1973: 20; Radoman, 1983: 55, fig. 22, pl. 3, fig. 46; Radoman, 1985: 46; Jovanović, 1991: 220, pl. 3, fig. 17.

Locus typicus: Zrmanja river (Croatia)

Holotypus: BEO 086, *ibidem*

Paratypus: BEO 087 *ibidem*, 1 exp.

Genus *VINODOLIA* Radoman, 1973

Vinodolia fiumana Radoman, 1973

Vinodolia fiumana Radoman, 1973: 20; Radoman, 1983: 57, fig. 23, pl. 3, fig. 47; Jovanović, 1991: 220, pl. 3, fig. 18.

Locus typicus: Glogi, a small spring in the place Bribir (Croatia) VL80

Lectotypus: BEO 089, *ibidem*

Paralectotypus: BEO 090 *ibidem*, 1 exp.

Genus *GROSSUANA* Radoman, 1973

Grossuana serbica serbica Radoman, 1973

Grossuana serbica Radoman, 1973: 19; *Grossuana serbica serbica* Radoman, 1983: 58, fig. 24, pl. 4, fig. 48; Jovanović, 1991: 220, pl. 3, fig. 19.

Locus typicus: the source of the Raške river by the monastery of Sopoćani (Srbija) DN77

Lectotypus: BEO 092, *ibidem*

Paralectotypus: BEO 093 *ibidem*, 1 exp.

Grossuana serbica remesiana Radoman, 1973

Grossuana remesiana Radoman, 1973: 20; *Grossuana serbica remesiana* Radoman, 1983: 59, pl.4, fig. 50; Jovanović, 1991: 221, pl. 3, fig. 20.

Locus typicus: the big spring in the Bela Palanka (Srbija) FN08

Lectotypus: BEO 096, *ibidem*

Paralectotypus: BEO 097 *ibidem*, 1 exp.

Grossuana serbica macedonica Radoman, 1973

Grossuana macedonica Radoman, 1973: 19; *Grossuana serbica macedonica* Radoman, 1983: 59, pl. 4, fig. 51; Jovanović, 1991: 221, pl. 4, fig. 21.

Locus typicus: the spring above the Valandovo (Macedonia) FL37

Lectotypus: BEO 099, *ibidem*

Paralectotypus: BEO 100, *ibidem*, 1 exp.

Grossuana serbica scupica Radoman, 1973

Grossuana scupica Radoman, 1973: 19; *Grossuana serbica scupica* Radoman, 1983: 59, pl.4, fig. 52; Jovanović, 1991: 221, pl. 4, fig. 22.

Locus typicus: the big spring Rašče, Skopje (Macedonia) EM25

Lectotypus:BEO 102, *ibidem*

Paralectotypus: BEO 103 *ibidem*, 1 exp.

Grossuana serbica vurliana Radoman, 1966

Pseudamnicola vurliana Radoman, 1966: 160, fig. 2, fig. 4, fig. 6; *Grossuana vurliana* Radoman, 1973: 7; *Grossuana serbica vurliana* Radoman, 1983: 60, pl.4, fig. 53; Jovanović, 1991: 221, pl. 4, fig. 23.

Locus typicus: the springKamena Vurla (Greece)

Lectotypus: BEO 105, *ibidem*, 1964.09.

Paralectotypus: BEO 106 *ibidem*, exp.

Genus *ZAVALIA* Radoman, 1973

Zavalia vjetrenice Radoman, 1973

Zavalia vjetrenice Radoman, 1973: 235, fig. 6, 7, 8; Radoman, 1973: 20; Radoman, 1983: 61, fig. 25(a-d), pl. 4, fig. 54; Jovanović, 1991: 222, pl. 6, fig. 24.

Locus typicus: spring below the cave Vjetrenica, near Zavala, Popovo polje (Bosnia and Hezegovina) YH44.

Lectotypus: BEO 108, *ibidem*

Paralectotypus: BEO 109 *ibidem*, 3 exp.

Genus *NARENTIANA* Radoman, 1973

Narentiana albida Radoman, 1973

Narentana albida Radoman, 1973: 20; *Narentiana albida* Radoman, 1983: 61, fig. 26 (a-c), pl. 4, fig. 55; Jovanović, 1991: 222, pl. 4, fig. 25.

Locus typicus: the spring by the north bank of Baćinsko Jezero (Lake of Baćina) (Croatia) XH97

Lectotypus: BEO 111, *ibidem*, 1973.07.

Paralectotypus: BEO 112 *ibidem*, 1 exp.

Genus *BRACENICA* Radoman, 1973

Bracenica spiridoni Radoman, 1973

Bracenica spiridoni Radoman, 1973: 20; Radoman, 1983: 6, fig. 29, pl. 4, fig. 59; Jovanović, 1991: 223, pl. 4, fig. 26.

Locus typicus: Špirov izvor, a small spring above the Studenac spring, Podmeret, Baćena (Montenegro) CM48.

Lectotypus: BEO 116, *ibidem*

Paralectotypus: BEO 117 *ibidem*, 1 exp.

Genus *PRESPOLITOREA* Radoman, 1973

Prespolitorea valvataeformis Radoman, 1973

Prespolitorea valvataeformis Radoman, 1973: 20; Radoman, 1983: 68, fig. 31, pl. 4, fig. 61; Radoman, 1985: 138; Jovanović, 1991: 223, pl. 4, fig. 28.

Locus typicus: rocky south-west bank of Lake Presa, on the stones in the narrow bank zone (Macedonia)

Lectotypus: BEO 120, *ibidem*

Paralectotypus: BEO 121 *ibidem*, 1 exp.

Prespolitorea malaprespaensis Radoman, 1973

Prespolitorea malaprespensis Radoman, 1973: 21; *Prespolitorea malaprespaensis* Radoman, 1983: 68, pl. 4, fig. 61; Radoman, 1985: 138; Jovanović, 1991: 223, pl. 4, fig. 29.

Locus typicus: Malo Prespansko Jezero (Small Prespa Lake) (Albania).

Lectotypus: BEO 123, *ibidem*

Paralectotypus: BEO 124 *ibidem*, 2 exp.

Genus *PRESPIANA* Radoman, 1973

Prespiana lacustris Radoman, 1973

Prespiana lacustris Radoman, 1973: 21; Radoman, 1983: 69, fig. 32, pl. 4, fig. 62; Radoman, 1985: 138; Jovanović, 1991: 224, pl. 4, fig. 30.

Locus typicus: Stenje, stony south-west coast of Prespa Lake (Macedonia) DL93.

Lectotypus: BEO 126, *ibidem*

Paralectotypus: BEO 127 *ibidem*, 1 exp.

Genus *MALAPRESPIA* Radoman, 1973

Malaprespia albanica Radoman, 1973

Malaprespia albanica Radoman, 1973: 21; Radoman, 1983: 70, fig. 33, pl. 4, fig. 63; Radoman, 1985: 138; Jovanović, 1991: 224, pl. 5, fig. 31.

Locus typicus: Malo Prespansko Jezero (Small Prespa Lake) (Albania)

Lectotypus: BEO 129, *ibidem*

Paralectotypus: BEO 130 *ibidem*, 1 exp.

Genus *ALBANIANA* Radoman, 1973

Albaniana albanica Radoman, 1973

Lartetia sp. Radoman, 1957:62; *Albaniana albanica* Radoman, 1973: 21; Radoman, 1983: 72, fig. 34, pl. 4, fig. 64; Jovanović, 1991: 224, pl. 5, fig. 31.

Locus typicus: Ventroko spring, Small Prespa Lake (Albania)

Lectotypus: BEO 132, *ibidem*

Genus *OHRIDOHORATIA* Hadžišće, 1956

Ohridohoratia carinata (Radoman, 1956)

Pseudamnicola carinata Radoman, 1956: 87, fig.1, 4, 7a, e; Radoman, 1962: 107; Radoman, 1964: pl. 1; Jaeckel, 1967:96; *Ohridohoratia carinata* Radoman, 1973: 7; Radoman, 1983: 73, pl. 4, fig. 66; Radoman, 1985: 119, 130; Jovanović, 1991: 224, pl. 5, fig. 33.

Locus typicus: on the bank stonesby the place Veli Dab, Lake Ohrid (Macedonia) DL83.

Lectotypus: BEO 135, *ibidem*

Paralectotypus: BEO 136 *ibidem*, 1 exp.

Genus *POLINSKIOLA* Radoman, 1973

Polinskiola polinskii (Radoman, 1960)

Pseudamicola sp. Staković et Radoman, 1955: 6; *Pseudamnicola polinskii* Radoman, 1960: 6, fig. 2, 3; Radoman, 1962: 90, fig. 2, 10; Radoman, 1964: pl. 1; *Polinskiola polinskii* Radoman, 1973: 7; Radoman, 1983: 74, pl. 5, fig. 68; Radoman, 1985: 38, 92, 119, 130, 131; Jovanović, 1991: 225, pl. 5, fig. 34.

Locus typicus: on the stones close to the bank by Sv. Naum, Ohrid Lake DL72

Lectotypus: BEO 139, *ibidem*, 1958.

Paralectotypus: BEO 140 *ibideme*, 1 exp.

Genus *OHRIDOHAUFFENIA* Hadžišče, 1956

Ohridohauffenia depressa (Radoman, 1965)

Pseudamnicola depressa Radoman, 1956: 88 fig. 2, 5, 7 *b*, *c*; Radoman, 1962:107, fig. 12 *a*; Radoman, 1964: pl. 1; Jaeckel, 1967: 96; *Ohridohoratia* (*Ohridohauffenia*) *gjorgjevici* Hadžišče, 1956: 57; *Ohridohauffenia depressa* Radoman, 1973: 7; Radoman, 1983: 75, fig. 37, pl. 5, fig. 69; Radoman, 1985: 120, 125, 131; Jovanović, 1991: 225, pl. 5, fig. 35.

Locus typicus: on the bank stones by Veli Dab, Lake Ohrid (Macedonia) DL83

Lectotypus: BEO 142, *ibidem*

Ohridohauffenia sublitoralis (Radoman, 1962)

Pseudamnicola sublitoralis Radoman, 1962: 111, fig. 4b, 12b; Radoman, 1964:105; *Ohridohauffenia sublitoralis* Radoman, 1973: 7; Radoman, 1983:75, pl. 5, fig. 70; Radoman, 1985: 120, 124, 125, 131; Jovanović, 1991: 225, pl. 5, fig. 36.

Locus typicus: Ohridsko Jezero: Ohrid: Gorica (Macedonia) DL85

Lectotypus: BEO 144, *ibidem*

Paralectotypus: BEO 145 *ibidem*, 1 exp.

Ohridohauffenia rotonda (Radoman1964)

Pseudamnicola rotonda Radoman, 1965: 101, fig. 1, 6, 10, 11; *Rotondia rotonda* Radoman, 1973: 8; Willman & Pieper, 1978: 118; *Ohridohauffenia rotonda* Radoman, 1983: 76, pl. 5, fig. 71; Radoman, 1985: 120, 131; Jovanović, 1991: 226, pl. 5, fig. 37.

Locus typicus: on the bank stones along Gorica hill, Ohrid (Macedonia) DL85

Lectotypus: BEO 147, *ibidem*

Paralectotypus: BEO 148 *ibidem*, 1 exp.

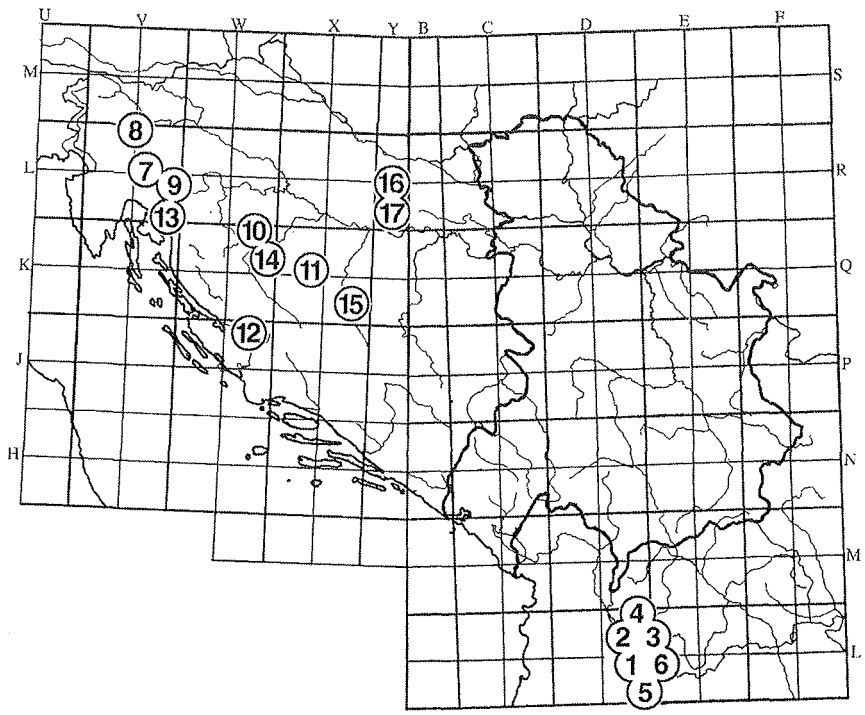
Ohridohauffenia minuta (Radoman, 1955)

Pseudamnicola minuta Radoman, 1955:106, fig. 1, 2, 3, 4; Radoman, 1964: 103, pl. 1; Stanković & Radoman, 1955: 5; *Rotondia minuta* Radoman, 1973: 8; Willman & Pieper, 1978: 118; *Ohridohauffenia minuta* Radoman, 1983: 76, pl. 5, fig. 72; Radoman, 1985: 120, 131; Jovanović, 1991: 226, pl. 5, fig. 38.

Locus typicus: the Studenčišta spring, Ohrid (Macedonia) DL85

Lectotypus: BEO 150, *ibidem*

Paralectotypus: BEO 151 *ibidem*, 1 exp.



Map. 4.- Type localities of the taxa originally described and named by Radoman (1955, 1956, 1962, 1964, 1965, 1973, 1975): (1) *Ohridohauffenia depressa*, (2) *Ohridohauffenia sublitoralis*, (3) *Ohridohauffenia rotonda*, (4) *Ohridohauffenia minuta*, (5) *Ohridohauffenia sanctinaumi*, (6) *Dolapia ornata*, (7) *Belgrandiella conica*, (8) *Belgrandiella robusta*, (9) *Belgrandiella novoselensis*, (10) *Belgrandiella koprivnensis*, (11) *Belgrandiella dabriana*, (12) *Belgrandiella krupensis*, (13) *Graziana lacheineri adrolitoralis*, (14) *Graziana lacheineri glinensis*, (15) *Graziana verbasensis*, (16) *Graziana slavonica*, (17) *Graziana papukensis*.

Tipični lokaliteti taksona koje je opisao i imenovao Radoman (1955, 1956, 1962, 1964, 1965, 1973, 1975)

Ohridohauffenia sanctinaumi (Radoman, 1964)

Pseudamnicola sp. Stanković et Radoman, 1955: 6; *Pseudamnicola st. naumi* Radoman, 1964: 105, fig. 4, 9; *Naumia sanctinaumi* Radoman, 1973: 8; Willmann and Pieper, 1978: 118; *Ohridohauffenia sanctinaumi* Radoman, 1983: 78, pl. 5, fig. 73; Radoman, 1985: 120, 126, 131; Jovanović, 1991: 226, pl. 5, fig. 39.

Locus typicus: small springs by Sveti Naum, Lake Ohrid DL72

Lectotypus: BEO 154, *ibidem*

Paralectotypus: BEO 155 *ibidem*, 1 exp.

Genus *DOLAPIA* Radoman, 1973

Dolapia ornata (Radoman, 1956)

Pseudamnicila ornata Radoman, 1956: 88, fig. 3, 6, 7c, f, 8; Radoman, 1962: 108, fig. 7, 15; Jaeckel, 1967: 89; *Ohrigocea prlitchevi* Hdžišče, 1956: 83, fig. 20, 21, 22; *Ohrigocea sandanskii* Hadžišče, 1956: 86, fig. 23, 24; *Dolapia ornata* Radoman, 1973: 8; Radoman, 1983: 80, fig. 41, pl. 5, fig. 77; Radoman, 1985: 101, 133; Jovanović, 1991: 227, pl. 5, fig. 40.

Locus typicus: Ohridsko Jezero: on the bank stones by Veli Dab, Lake Ohrid (Macedonia) DL83

Lectotypus: BEO 161, *ibidem*

Paralectotypus: BEO 162 *ibidem*, 1 exp.

Genus *TRICHONIA* Radoman, 1973

Trichonia kephalovrissonia Radoman, 1973

Trichonia kephalovrissonia Radoman, 1973: 21; Radoman, 1983: 2, pl. 5, fig. 81; Radoman, 1985: 140; Jovanović, 1991: 227, pl. 6, fig. 41.

Locus typicus: the Kephalovrisson spring, by the main (Greece)

Lectotypus: BEO 165, *ibidem*, 1964.09.

Paralectotypus: BEO 166 *ibidem*, 1 exp.

Trichonia trichonica Radoman, 1973

Trichonia trichonica Radoman, 1973: 22; Radoman, 1983: 82, pl. 5, fig. 82-83; Radoman, 1985: 140; Jovaović, 1991: 227, pl. 6, fig. 42.

Locus typicus: by the north-east rocky bank, near place Mirtia, Lake Trichonic, (Greece).

Lectotypus: BEO 168, *ibidem*, 1964.09.

Paralectotypus: BEO 169 *ibidem*, 1 exp.

Genus *PSEUDOISLAMIA* Radoman, 1978

Pseudoislamia balcanica Radoman, 1978

Pseudoislamia balcanica Radoman, 1978: 23, pl. 1, fig. 1, 2; Radoman, 1983: 83, fig. 44, pl. 5, fig. 84-86; Jovanović, 1991: 228, pl. 6, fig. 43.

Locus typicus: by the north-east rocky bank, near the place Mirtia, Lake Trichonic (Greece).

Lectotypus: BEO 171, *ibidem*, 1978.07.

Paralectotypus: BEO 172 *ibidem*, 1 exp.

Genus *DAPHNIOLA* Radoman, 1973

Daphniola graeca Radoman, 1973

Daphniola graeca Radoman, 1973: 22; Radoman, 1983: 84, fig. 45, pl. 5, fig. 87; Radoman, 1985: 49; Jovanović, 1991: 228, pl. 6, fig. 44.

Locus typicus: Larisa: the Daphne spring, about 30 *km* from Larisa (Greece)

Lectotypus: BEO 174, *ibidem*, 1964.09.

Paralectotypus: BEO 175 *ibidem*, 1 exp.

Genus *GRAECORIENTALIA* Radoman, 1973

Graecorientalia vrissiana Radoman, 1966

Pseudamnicola vrissiana Radoman, 1966: 159, fig. 1, 3, 5, 7; *Graecorientalia vrissiana* Radoman, 1973: 8; Radoman, 1983: 84, fig. 46, pl. 6, fig. 88; Jovanović, 1991: 228, pl. 6, fig. 45.

Locus typicus: Larisa a small spring by the place Vrissia, near the main road Larisa-Athens (Greece).

Lectotypus: BEO 177, *ibidem*, 1964.09.

Paralectotypus: BEO 178 *ibidem*, 1 exp.

Genus *FALSIBELGRANDIELLA* Radoman, 1973

Falsibelgrandiella bunarica Radoman, 1973

Falsibelgrandiella bunarica Radoman, 1973: 22; Radoman, 1983: 88, fig. 48, pl. 6, fig. 90; Jovanović, 1991: 229, pl. 6, fig. 46.

Locus typicus: great spring Pinar Basa, Gemlik (Yalova-Bursa) (Turkey)

Lectotypus: BEO 181, *ibidem*, 1969.05.26.

Paralectotypus: BEO 182, *ibidem*, 1 exp.

Genus *TURKORIENTALIA* Radoman, 1973

Turkorientalia anatolica Radoman, 1973

Turkorientalia anatolica Radoman, 1973: 22; Radoman, 1983: 88, fig. 49, pl. 6, fig. 91; Jovanović, 1991: 229, pl. 6, fig. 47.

Locus typicus: the small spring Yercey, near Lake Yercey (Yesilova-Burdur), (Turkey)

Lectotypus: BEO 184, *ibidem*, 1969.07.02.

Paralectotypus: BEO 185 *ibidem*, 1 exp.

Genus *BELGRANDIELLA* Wagner, 1927

Belgrandiella conica Radoman, 1975

Belgrandiella conica Radoman, 1975: 32, pl. 1, fig. 5; Radoman, 1983: 91, pl. 6, fig. 97; Jovanović, 1991: 230, pl. 6, fig. 48.

Locus typicus: Mrzlik izvor, Cerknica (Slovenia) VL56

Lectotypus: BEO 191, *ibidem*

Paralectotypus: BEO 192 *ibidem*, 2 exp.

Belgrandiella robusta Radoman, 1975

Belgrandiella robusta Radoman, 1975: 34, pl. 1, fig. 2; Radoman, 1983: 92, pl. 6, fig. 99; Jovanović, 1991: 230, pl. 6, fig. 49.

Locus typicus: Obrha, a big source by the Vrhnika village, in Loška Dolina (Slovenia) VL49

Lectotypus: BEO 195, *ibidem*, 1975

Belgrandiella novoselensis Radoman, 1975

Belgrandiella novoselensis Radoman, 1975: 36, pl. 2, fig. 11; Radoman, 1983: 95, pl. 6, fig. 103; Jovanović, 1991: 231, pl. 6, fig. 50.

Locus typicus: the small spring in Nova Sela, by the road Kočevje-Delnice (Croatia) VL84

Lectotypus: BEO 201, *ibidem*

Paralectotypus: BEO 202 *ibidem*, 1 exp.

Belgrandiella koprivnensis Radoman, 1975

Belgrandiella koprivnensis Radoman, 1975: 36, pl. 2, fig. 12; Radoman, 1983: 95, pl. 6, fig. 104; Jovanović, 1991: 231, pl. 7, fig. 51.

Locus typicus: the Krčana spring, about 2 *km* from the road Cazin-Bužim, near the Donja Koprivna village (Croatia) WK78

Lectotypus: BEO 204, *ibidem*, 1975.

Paralectotypus: BEO 205 *ibidem*, 1 exp.

Belgrandiella dabriana Radoman, 1975

Belgrandiella dabriana Radoman, 1975:38, pl. 2, fig. 13; Radoman, 1983: 96, pl.6, fig. 105; Jovanović, 1991: 231, pl.7, fig. 52.

Locus typicus: by Dabarska Pećina (cave), the source of the Dabar river, about 6-8 *km* south of Sanski Most (Bosnia-Herzegovina) XK35

Lectotypus: BEO 207, *ibidem*

Paralectotypus: BEO 208 *ibidem*, 1 exp.

Belgrandiella krupensis Radoman, 1973

Belgrandiella krupensis Radoman, 1973: 23; Radoman, 1975: 38, pl. 2, fig. 14; Radoman, 1983: 96, pl. 6, fig. 106; Jovanović 1991: 231, pl. 7, fig. 53.

Locus typicus: source of Krupa, the right tributary of the Zrmanja river (Croatia) WJ79.

Lectotypus: BEO 210 *ibidem*

Paralectotypus: BEO 211 *ibidem*, 1 exp.

Belgrandiella zermanica Radoman, 1973

Belgrandiella zermanica Radoman, 1973: 23; Radoman, 1975: 38, pl. 2, fig. 15; Radoman, 1983: 96, pl. 6, fig. 107; Radoman, 1985: 47; Jovanović, 1991: 231, pl. 7, fig. 54.

Locus typicus: the Zrmanja river, aboveJankovića Buk (Croatia)

Lectotypus: BEO 213, *ibidem*

Paralectotypus: BEO 214 *ibidem*, 1 exp.

Genus *GRAZIANA* Radoman, 1975

Graziana lacheineri adrolitoralis Radoman, 1975

Graziana adriolitoralis Radoman, 1975: 42, pl. 3, fig. 5; *Graziana lacheineri adrolitoralis* Radoman, 1983: 100 pl. 7, fig. 110; Radoman, 1985: 47; Jovanović, 1991: 232, pl. 7, fig. 55.

Locus typicus: a small spring in a grass declivitely above the Lokve village, south of Delnice (Croatia) VL82

Lectotypus: BEO 218, *ibidem*

Paralectotypus: BEO 219 *ibidem*, 1 exp.

Graziana lacheineri glinensis Radoman, 1975

Graziana glinensis Radoman, 1975: 42, pl. 3, fig. 3; *Graziana lacheineri glinensis* Radoman, 1983: 101, pl. 7, fig. 111; Jovanović, 1991: 232, pl. 7, fig. 56.

Locus typicus: Vrelo, a small spring below the road in Baštra, about 7 *km* from Otoka village (Bosnia and Herzegovina) WK97

Lectotypus: BEO 221, *ibidem* 1975.

Paralectotypus: BEO 222, *ibidem*, 1 exp.

Graziana austriana Radoman, 1975

Graziana austriana Radoman, 1975: 40, pl. 3, fig. 2; Radoman, 1983: 101 pl. 7, fig. 112; Jovanović, 1991: 232, pl. 7, fig. 57.

Locus typicus: Andritz-Ursprung, Graz (Austria)

Lectotypus: BEO 224, *ibidem*

Paralectotypus: BEO 225 *ibidem*, 1 exp.

Graziana verbasensis Radoman, 1975

Graziana verbasensis Radoman, 1975: 42, pl. 3, fig. 4; Radoman, 1983: 102, pl. 7, fig. 113; Jovanović, 1991: 233, pl. 7, fig. 58.

Locus typicus: a spring by the road Jajce-Mrkonjić Grad, about 8 *km* from Jajce (Bosnia and Herzegovina) XK81

Lectotypus: BEO 227 *ibidem*

Graziana papukensis Radoman, 1975

Graziana papukensis Radoman, 1975: 43, pl. 3, fig. 6; Radoman, 1983: 102, pl. 7, fig. 114; Radoman, 1985: 47; Jovanović, 1991: 233, pl. 7, fig. 59.

Locus typicus: Jankovac, a big spring on the north declivity of the Papuk mountain, Podravska Slatina (Croatia) YL04

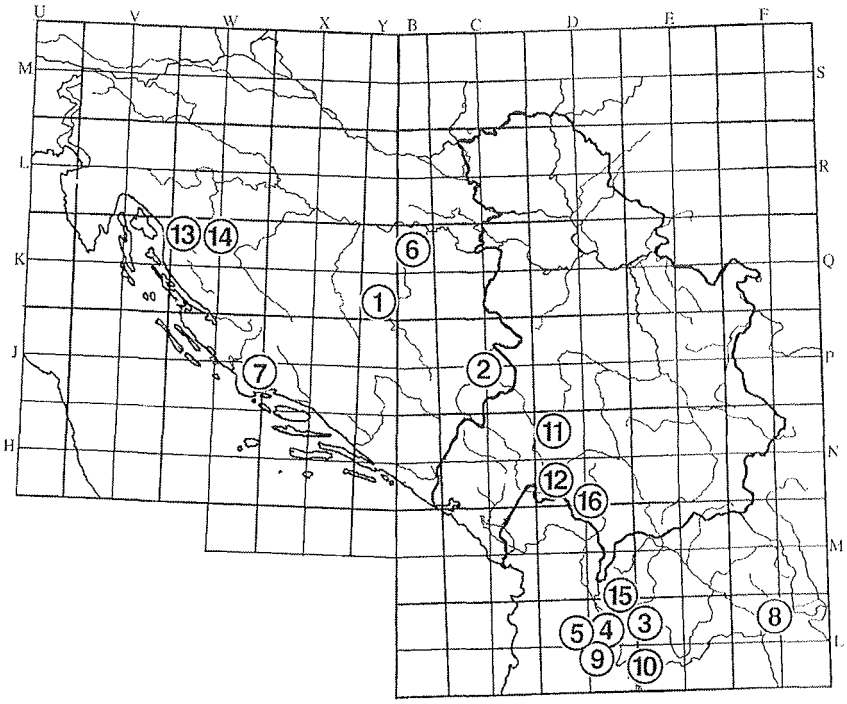
Lectotypus: BEO 229, *ibidem*

Paralectotypus: BEO 230 *ibidem*, 1 exp.

Graziana slavonica Radoman, 1975

Graziana slavonica Radoman, 1975: 43, pl. 3, fig. 7; Radoman, 1983: 103, pl. 7, fig. 115; Radoman, 1985: 47; Jovanović, 1991: 233, pl. 7, fig. 60.

Locus typicus: Jankovac spring, Papuk Mt.. (Croatia) YL04



Map. 5.- Type localities of the taxa originally described and named by Radoman (1953, 1955, 1964, 1973, 1975, 1976) and Radoman et Stanković (1978): (1) *Sarajana apfelbecki travnicensis*, (2) *Sarajana apfelbecki driniana*, (3) *Pseudohoratia brusinae*, (4) *Pseudohoratia lacustris*, (5) *Strugia ohridana*, (6) *Islamia bosniaca*, (7) *Islamia latina*, (8) *Graecoanatolica macedonica*, (9) *Pyrgohydrobia jablanicensis*, (10) *Pyrgohydrobia sanctinaumi*, (11) *Bythinella schmidti dispersa*, (12) *Bythinella schmidti luteola*, (13) *Bythinella magna*, (14) *Bythinella kapelana*, (15) *Bythinella drimica drimica*, (16) *Bythinella drimica alba*.

Tipični lokaliteti taksona koje su opisali i imenovali Radoman (1953, 1955, 1964, 1973, 1975, 1976) i Radoman et Stanković (1978).

Lectotypus: BEO 232, *ibidem*

Paralectotypus: BEO 233 *ibidem*, 2 exp.

Genus *SARAJANA* Radoman, 1975

Sarajana apfelbecki travnicensis Radoman, 1975

Sarajana travnicensis Radoman, 1975: 47, pl. 4, fig. 3; *Sarajana apfelbecki travnicensis* Radoman, 1983: 105, pl. 7, fig. 118; Radoman, 1985: 53; Jovanović, 1991: 233, pl. 8, fig. 61.

Locus typicus: Plava Voda, a brook in the Travnik town (Bosnia and Herzegovina) YK01

Lectotypus: BEO 237, *ibidem*

Paralectotypus: BEO 238 *ibidem*, 1 exp.

Sarajana apfelbecki driniana Radoman, 1975

Sarajana driniana Radoman, 1975: 48, pl. 4, fig. 4; *Sarajana apfelbecki driniana* Radoman, 1983: 105, pl. 7, fig. 119; Jovanović, 1991: 234, pl. 8, fig. 62.

Locus typicus: a spring in the Kaoštica village, about 2 *km* above the right bank of the Drina river, (Bosnia and Herzegovina) CP54

Lectotypus: BEO 240, *ibidem*

Paralectotypus: BEO 241 *ibidem*, 1 exp.

Genus *PSEUDOHORATIA* Radoman, 1967

Pseudohoratia brusinae (Radoman, 1953)

Horatia brusinae Radoman, 1953: 67, fig. 5-7; Radoman, 1955: pl. 4, fig. 17--20; Radoman, 1962: 111; Stanković S., Radoman, 1955: 6; Jaeckel, Klemm, Meise, 1957: 176; Schutt, 1961: 69-77; *Pseudohoratia brusine* Radoman, 1967: 153; Radoman, 1983: 115, pl. 8, fig. 132; Radoman, 1985: 120, 124, 125; Jovanović, 1991: 236, pl. 8, fig. 63.

Locus typicus: Ohrid Lake, in the profound zone (over 50 *m* depth), opposite to the Gorica hill near the Ohrid town (Macedonia) DL85

Lectotypus: BEO 253, *ibidem*

Paralectotypus: BEO 254 *ibidem*, 1 exp.

Pseudohoratia lacustris Radoman, 1964

Pseudamnicila lacustris Radoman, 1964: 103, fig. 3,8; *Pseudohoratia lacustris* Radoman, 1967: 152; Radoman, 1983: 115, pl. 8, fig. 133; Radoman, 1985: 120, 124, 125; Jovanović 1991: 236, pl. 8, fig. 64.

Locus typicus: Ohrid Lake, in the *Chara* zone, about 10 *m* depth, opposite to the Podmolje village (Macedonia) DL75

Lectotypus: BEO 256, *ibidem*

Genus *STRUGIA* Radoman, 1973

Strugia ohridana Radoman, 1973

Strugia ohridana Radoman, 1973: 25; Radoman, 1983: 119, pl. 8, fig. 139; Radoman, 1985: 82, 92, 111, 123, 132, 134; Jovanović, 1991: 237, pl. 8, fig. 65.

Locus typicus: the cave from which Šum takes rise, a big spring about 4 *km* from Struga town (Macedonia) DL75

Lectotypus: BEO 262, *ibidem*

Paralectotypus: BEO 263 *ibidem*, 1 exp.

Genus *ISLAMIA* Radoman, 1973

Islamia bosniaca Radoman, 1973

Islamia bosniaca Radoman, 1973: 229, fig. 1b, 3; Radoman, 1973: 23; Radoman, 1983: 126, pl. 9, fig. 149; Radoman, 1985: 142; Jovanović, 1991: 238, pl. 8, fig. 68.

Locus typicus: small spring Podgaj, about 11 *km* from Doboj (Bosnia and Herzegovina) BQ65

Lectotypus: BEO 272, *ibidem*

Paralectotypus: BEO 273 *ibidem*, 1 exp.

Islamia zermanica Radoman, 1973

Islamia zermanica Radoman, 1973: 231, fig. 1d, 4; Radoman, 1983: 126, fig. 70 a, pl. 9, fig. 150; Radoman, 1985: 142; Jovanović, 1991: 238, pl. 8, fig. 69.

Locus typicus: the Zrmanja river (Croatia)

Lectotypus: BEO 275, *ibidem*

Paralectotypus: BEO 276, *ibidem*, 1 exp.

Islamia latina Radoman, 1973

Islamia latina Radoman, 1973: 229, fig. 1c, 4; Radoman, 1983: 127, fig. 70 b, pl. 9, fig. 151; Radoman, 1985: 142; Jovanović, 1991: 239, pl. 8, fig. 70.

Locus typicus: the Mirača spring, near the Islam Latinski village (Croatia) WJ39

Lectotypus: BEO 278, *ibidem*

Paralectotypus: BEO 279 *ibidem*, 3 exp.

Islamia graeca Radoman, 1973

Islamia graeca Radoman, 1973,: 23; Radoman, 1983: 127, pl. 9, fig. 152; Radoman, 1985: 142; Jovanović, 1991: 239, pl. 9, fig. 71.

Locus typicus: Lake Amvrakia, on the along the west lake bank (Greece)

Lectotypus: BEO 281, *ibidem*, 1964.09.

Islamia trichoniana Radoman, 1978

Islamia trichoniana Radoman, 1978: 23, pl. 1, fig. 3; Radoman, 1983: 127, pl. 9, fig. 153; Radoman, 1985: 142; Jovanović, 1991: 239, pl. 9, fig. 72.

Locus typicus: the Trichonic Lake, along the stony north-east bank, near Mirtia (Greece)

Lectotypus: BEO 282, *ibidem*, 1978.07.

Paralectotypus: BEO 283 *ibidem*, 2 exp.

Islamia pseudorientalica Radoman, 1973

Islamia pseudorientalica Radoman, 1973: 23; Radoman, 1983: 127, fig. 70 d, pl. 9, fig. 154; Radoman, 1985: 142; Jovanović, 1991: 239, pl. 9, fig. 73.

Locus typicus: small Lake Kirkgoz, about 40 *km* nort of Antalia (Turkey)

Lectotypus: BEO 285, *ibidem*, 1969.06.

Islamia anatolica Radoman, 1973

Islamia anatolica Radoman, 1973: 24; Radoman, 1983: 128, fig. 70 e, pl. 9, fig. 155; Jovanović, 1991: 239, pl. 9, fig. 74.

Locus typicus: Kirkgoz (Turkey)

Lectotypus: BEO 287, *ibidem*, 1969.06.

Paralectotypus: BEO 288 *ibidem*, 1 exp.

Genus *GRAECOANATOLICA* Radoman, 1973

Graecoanatolica macedonica Radoman et Stanković, 1978

Graecoanatolica macedonica Radoman et Stanković, 1978: 5, fig. 1; Radoman, 1983: 130, pl. 9, fig. 158; Jovanović, 1991: 240, pl. 9, fig. 75.

Locus typicus: Lake Dojran, on the bank stones by a small beach Kaldrma, near the Dojran town (Macedonia) FL46

Lectotypus: BEO 292, *ibidem*

Paralectotypus: BEO 293 *ibidem*, 1 exp.

Graecoanatolica lacustristurca Radoman, 1973

Graecoanatolica lacustristurca Radoman, 1973: 24; Radoman, 1983: 130, pl. 9, fig. 160; Radoman, 1985: 138; Jovanović, 1991: 240, pl. 9, fig. 76.

Locus typicus: Lake Egridir (Turkey)

Lectotypus: BEO 296, *ibidem*, 1969.06.

Paralectotypus: BEO 297, *ibidem*, 1 exp.

Graecoanatolica tenuis Radoman, 1973

Graecoanatolica tenuis Radoman, 1973: 24; Radoman, 1983: 130, pl. 9, fig. 161; Radoman, 1985: 141; Jovanović, 1991: 240, pl. 9, fig. 77.

Locus typicus: a big spring in the Gemich village, about 13 *km* from Çardak (Turkey)

Lectotypus: BEO 299, *ibidem*, 1969.06.

Paralectotypus: BEO 300 *ibidem*, 1 exp.

Graecoanatolica kocapinarica Radoman, 1973

Graecoanatolica kocapinarica Radoman, 1973: 24; Radoman, 1983: 131, pl. 9, fig. 162; Radoman, 1985: 141; Jovanović, 1991: 240, pl. 9, fig. 78.

Locus typicus: big spring Koca Pinar, Yukari Gökdere, about 25 *km* south of the Egridir (Turkey)

Lectotypus: BEO 302, *ibidem*, 1969.06.

Paralectotypus: BEO 303 *ibidem*, 1 exp.

Graecoanatolica conica Radoman, 1973

Graecoanatolica conica Radoman, 1973: 25; Radoman, 1983: 131, pl. 9, fig. 163; Radoman, 1985: 141; Jovanović, 1991: 241, pl. 9, fig. 79.

Locus typicus: a spring below the railway between village Dazkiri and Çardak, near the north bank of Lake Acy Gölü (Turkey)

Lectotypus: BEO 305, *ibidem*, 1969.06.

Paralectotypus: BEO 306 *ibidem*, 1 exp.

Graecoanatolica brevis Radoman, 1973

Graecoanatolica brevis Radoman, 1973: 25; Radoman, 1983: 131, pl. 9, fig. 163; Radoman, 1985: 141; Jovanović, 1991: 241, pl. 9, fig. 80.

Locus typicus: the big spring Pinar Güzü, by the Dular village, near the road Yesilova-Burdur, not far from the south-west bank of Lake Burdur (Turkey)

Lectotypus: BEO 308, *ibidem*, 1969.06.

Paralectotypus: BEO 309 *ibidem*, 1 exp.

Family ***PYRGULIDAE*** Brusina, 1881

Genus *PYRGOHYDROBIA* Radoman, 1955

Pyrgohydrobia jablanicensis Radoman, 1955

Pyrgohydrobia sp. Stanković et Radoman, 1955: 6; Radoman, 1973: 11; Radoman, 1983: 137, pl. 10, fig. 169; Radoman, 1985: 116, 121, 126, 131; Jovanović, 1991: 242, pl. 10, fig. 1.

Locus typicus: small artificial lake by the Šum spring, about 4 *km* west of the Struga town, in the Ohrid Basin (Macedonia) DL75

Lectotypus: BEO 315, *ibidem*

Pyrgohydrobia sanctinaumi Radoman, 1955

Pyrgohydrobia sp. Stanković et Radoman, 1955: 6; Radoman, 1973: 11; Radoman, 1983: 138, pl. 10, fig. 170; Radoman, 1985: 121, 126, 131; Jovanović, 1991: 242, pl. 10, fig. 2.

Locus typicus: small lake by Sv. Naum, near the south shore of Lake Ohrid (Macednia) DL72

Lectotypus: BEO 317, *ibidem*, 1954.07.

Paralectotypus: BEO 318 *ibidem*, 1 exp.

Family *BYTHINELLIDAE* Germain, 1931

Genus *BYTHINELLA* Moquin Tandon, 1855

Bythinella schmidti dispersa Radoman, 1976

Bythinella dispersa Radoman, 1976: 144, pl. 1, fig. 7; *Bythinella schmidti dispersa* Radoman, 1983: 176, pl. 12, fig. 205; Jovanović, 1991: 248, pl. 11, fig. 1.

Locus typicus: spring in the village of Dubnica, about 3 *km* south of the town Sjenica (Serbia) DN19

Lectotypus: BEO 352, *ibidem*

Paralectotypus: BEO 353 *ibidem*, 4 exp.

Bythinella schmidti luteola Radoman, 1976

Bythinella luteola Radoman, 1976: 144, pl. 1, fig. 8; *Bythinella schmidti luteola* Radoman, 1983: 177, pl. 12, fig. 206; Jovanović, 1991: 248, pl. 11, fig. 2.

Locus typicus: fountain near the village of Bučje, by the road Andrijevica--Ivangrad (Montenegro) DN13

Lectotypus: BEO 355, *ibidem*

Paralectotypus: BEO 356 *ibidem*, 4 exp.

Bythinella magna Radoman, 1976

Bythinella magna Radoman, 1976: 141, pl. 1, fig. 4; Radoman, 1983: 178, pl. 12, fig. 208; Radoman, 1985: 41; Jovanović, 1991: 249, pl. 11, fig. 3.

Locus typicus: the large spring Klanac in the Žagrevići village, near the main spring the Gacka river, in the Gacko polje (Croatia)

Lectotypus: BEO 359, *ibidem*

Paralectotypus: BEO 360 *ibidem*, 3 exp.

Bythinella kapelana Radoman, 1976

Bythinella kapelana Radoman, 1976: 143, pl. 1, fig. 5; Radoman, 1983: 178, pl. 12, fig. 209; Radoman, 1985: 41; Jovanović, 1991: 249, pl. 11, fig. 4.

Locus typicus: Majerovo Vrelo a large spring in the Gacko polje, about 3 *km* far from the spring Klanac, and about 4-5 *km* to the left of the road Plitvice--Gospić (Croatia) WK26

Lectotypus: BEO 362, *ibidem*

Paralectotypus: BEO 363, *ibidem*, 3 exp.

Bythinella drimica drimica Radoman, 1976

Bythinella drimica drimica Radoman, 1976: 146, pl. 2, fig. 9; Radoman, 1983: 179, pl. 12, fig. 212; Jovanović, 1991: 249, pl. 11, fig. 6.

Locus typicus: a small spring in the valley of the Radika river, by the road Debar-Mavrovo, 10-12 *km* from Mavrovo (Macedonia) DM71

Lectotypus: BEO 367, *ibidem*

Paralectotypus: BEO 368, *ibidem*, 1 exp.

Bythinella drimica alba Radoman, 1976

Bythinella drimica alba Radoman, 1976: 146, pl. 2, fig. 10; Radoman, 1983: 179, pl. 12, fig. 213; Jovanović, 1991: 250, pl. 11, fig. 7.

Locus typicus: fountain nord-west of the Dečani monastery, by the road to the water power-station of "Kožnjar," the Beli Drim drainage area (Serbia) DN41

Lectotypus: BEO 370, *ibidem*

Paralectotypus: BEO 371 *ibidem*, 1 exp.

Bythinella turca Radoman, 1976

Bythinella turca Radoman, 1976: 147, pl. 2, fig. 12; Radoman, 1983: 180, pl. 12, fig. 214; Jovanović, 1991: 250, pl. 11, fig. 8.

Locus typicus: the powerful spring of Ciri (Balkiri) about 10 *km* south of the town Egridir, by the road to the Kavada Lake (Turkey)

Lectotypus: BEO 374, *ibidem*, 1969.

Paralectotypus: BEO 375 *ibidem*, 1 exp.

Genus *PARABYTHINELLA* Radoman, 1973

Parabythinella malaprespaensis Radoman, 1973

Parabythinella malaprespaensis Radoman, 1973: 25; Radoman, 1983: 182, pl. 12, fig. 217; Radoman, 1985: 145; Jovanović, 1991: 250, pl. 11, fig. 9.

Locus typicus: Malo Prespansko Jezero, on the stones in the shore zone of the small gulf situated (Albania)

Lectotypus: BEO 378, *ibidem*

Paralectotypus: BEO 379 *ibidem*, 5 exp.

Parabythinella graeca Radoman, 1978

Parabythinella graeca Radoman, 1978: 25, pl. 1, fig. 4; Radoman, 1983: 182, pl. 12, fig. 218; Radoman, 1985: 145; Jovanović, 1991: 251, pl. 11, fig. 10.

Locus typicus: Lake Vegerritis (=Ostrovsko), on the stones by the east shore, a little north of the village of Fagari (Greece)

Lectotypus: BEO 381, *ibidem*

Paralectotypus: BEO 382 *ibidem*, 1 exp.

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TIPSKI MATERIJAL *GASTROPODA* (*MOLLUSCA*) U PRIRODNJAČKOM MUZEJU U BEOGRADU

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I z v o d

U Prirodnjačkom muzeju u Beogradu (BEO) postoji dosta velika zbirka *Gastropoda* (*Mollusca*). U okviru nje nalaze se i zbirke puževa (kopnenih i slatkovodnih) PETRA S. PAVLOVIĆA i PAVLA RADOMANA. U ovome radu dat je spisak tipskog materijala iz tih zbirki. Tipski materijal je iz familija: *Clausilidae*, *Hydrobiidae*, *Orientalinidae*, *Pyrgulidae* i *Bythinellidae*, a potiče iz Austrije, Slovenije, Hrvatske, Bosne i Hercegovine, Jugoslavije, Rumunije, Bugarske, Albanije, Makedonije, Grčke i Turske. Tipski materijal sadrži 202 tipa, od toga, 6 holotipova, 3 paratipa, 105 lektotipova, 87 paralektotipa i 2 sintipa. Uz svaku vrstu pored imena dat je inventarski broj pod kojim se vrsta vodi u zbirci, lokalitet sa UTM oznakom i datum sakupljanja (za vrste za koje postoji datum), a za vrste koje su nađene u Sloveniji, Hrvatskoj, Bosni i Hercgovini, Makedoniji i Jugoslaviji (Srbija i Crna Gora) date su i karte na kojima su ubeleženi njihovi tipični lokaliteti.

UDK: 595.3(497.11)
Original scientific paper

TAXONOMICAL STUDY OF THE GENUS *LEPTESTHERIA* (*CONCHOSTRACA, CRUSTACEA*) II

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Marinček Magdalena, Petrov Brigita (1995-98): *Taxonomical study of the genus Leptestheria (Conchostraca, Crustacea) II.* - Bulletin of Natural History Museum, Belgrade, *B49-50*, 129-143.

The systematics of *Conchostraca* is still insufficiently elaborated and the data on their distribution are scarce. The major problems concerning the systematic relationships are within the genus *Leptestheria* G. O. Sars, 1896. Because of a considerable variability of the structural characters used in the taxonomy of this genus, the validity of certain criteria and the justification of distinction of several European species have been challenged. This paper presents the results of the morphological analysis of a population of *Leptestheria* found near the road Velika Plana - Žabari in 1975.

It has been established that this population displays a number of structural similarities to the populations of *Leptestheria* found near Terezino Polje (Croatia) and to *L. saetosa* Marinček et Petrov, 1992 described from Yugoslavia. Furthermore, it exhibits certain similarities to *L. intermedia* Botnariuc 1947 and, to a certain degree, to *L. dives* Daday, 1923 and *L. rotundirostris* Daday, 1923, which suggests phylogenetic relationships of these forms. However, the population studied displays peculiarities in which it differs from the populations from Terezino Polje and from *L. saetosa*, as well as from other European species. This study demonstrates that an intensive speciation is still taking place within the genus *Leptestheria*.

INTRODUCTION

The systematics of *Conchostraca* is still insufficiently elaborated and the data on their distribution are scarce, in some cases dubious as well. The major problems concerning the systematic relationships are within the genus *Leptestheria* G. O. Sars, 1896. Because of a considerable variability of the structural characters used in the taxonomy of this genus, the validity of certain criteria and the justification of distinction of several European species have been challenged.

So far, a total of 5 species of this genus has been established in Europe. *L. dahalacensis* Rüppel, 1837 has been found in Austria, Czech Republic, Slovakia, Hungary, Roumania, Croatia, in the Near East, in the southern regions of the Commonwealth of Independent States, on Sicily, and on the isle of Dahal in the Red Sea (D a d a y 1923). Its ally, the species *L. rotundirostris* Daday, 1923, has been discovered in Hungary and in the southern regions of Russia (Saratov) (D a d a y 1923). *L. dives* Daday, 1923 has been found in Roumania (Jassy, Comina), in the region of the Caucas and Saratov, in Asia Minor, and in the region of the Vardar River (D a d a y 1923). *L. tenuis* G. O. Sars, 1901 has been discovered in the south of the Balkan Peninsula, in the region of the Vardar River (Greece), in the Transcaspian region, and in Mongolia (D a d a y 1923). The species *L. intermedia* Botnariuc, 1947 has been discovered in Roumania and has so far been found in that country only (B o t n a r i u c 1947).

Comparing the numerical values of a few morphological characters, S t r a š k r a b a (1966) proposed that all European and two African species should be considered as *L. dahalacensis*.

The solving of the problem of the distinction of species is of particular interest in Yugoslavia, where the ranges of European species meet or even overlap. Thus, in order to check the taxonomical significance of certain characteristics as well as to establish phylogenetic relationships, extensive studies of the populations of *Leptestheria* have been carried out in Yugoslavia. In our previous work (M a r i n č e k & P e t r o v 1985) we studied two populations discovered in the vicinity of Terezino Polje (Croatia). We also described a new species *L. saetosa* from the vicinity of Progar in Srem (Serbia) (M a r i n č e k & P e t r o v 1992). This paper presents the results of a morphological analysis of the population of *Leptestheria* found between Velika Plana and Žabari (Serbia).

MATERIAL AND METHODS

On June 25th, 1975, a population of *Leptestheria* was found between Velika Plana and Žabari, about 80 *km* southeast of Belgrade. This population was discovered in a rain pool in a maize field near the road Velika Plana - - Žabari.

Specimens were collected by means of a standard hand-net and preserved in 70% ethanol.

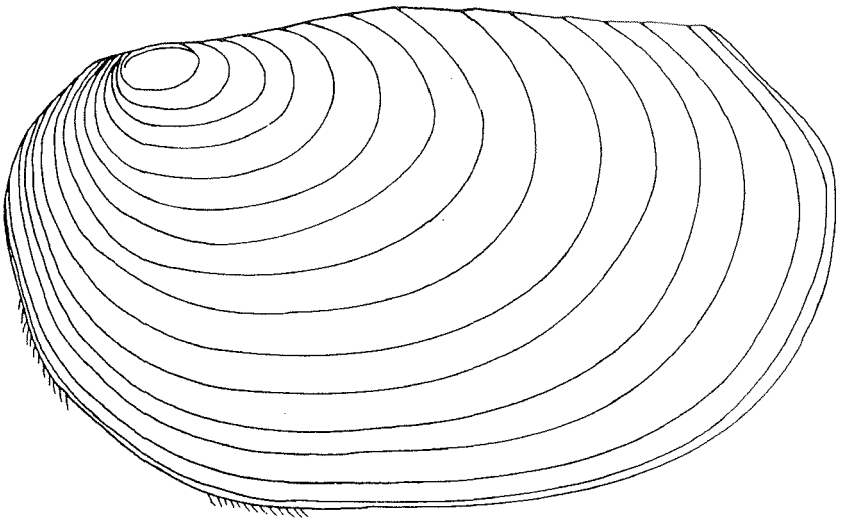

Fig. 1. - Shell of the male.
Ljušturica mužjaka.

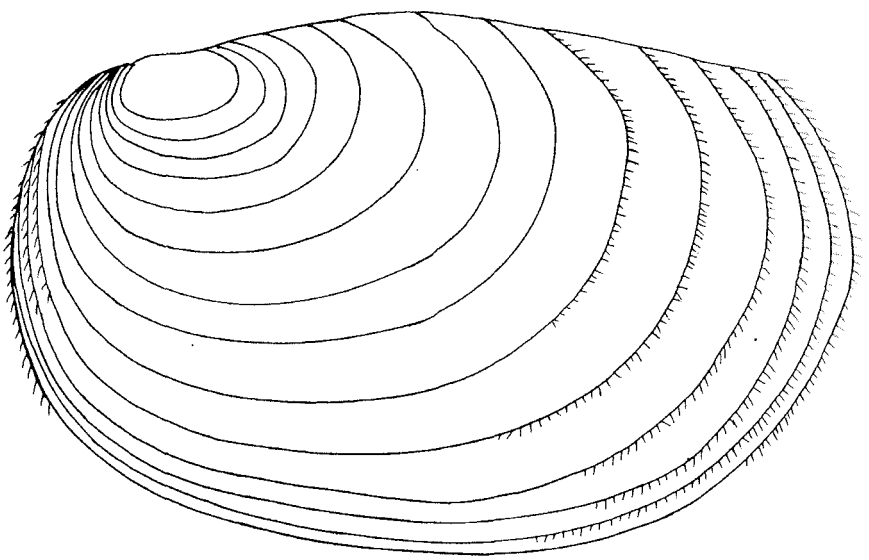

Fig. 2. - Shell of the female
Ljušturica ženke

RESULTS

On the basis of comparative - morphological studies of structural characteristics, we have observed that this population displays certain similarities to the species *L. intermedia* and, to a certain degree, also to *L. dives*, *L. rotundirostris*, and *L. dahalacensis*, but it differs from them in a number of peculiarities. It also differs in certain characteristics from the populations of *Leptestheria* found near Terezino Polje and from *L. saetosa*.

The specimens of the population found between Velika Plana and Žabari have the shell margin, as well as the growth lines, covered by setae, but less than in *L. intermedia*. Namely, whereas in *L. intermedia* setae are present along the entire length of the shell margin and growth lines, both in males and females, in our populations they are arranged only on certain parts of the margin and on certain growth lines (Figs. 1, 2). They are more abundant in females than in males. It has been observed that setae are more abundant in younger specimens than in the older ones of both sexes. It should be noted that in addition to *L. intermedia*, another two European species, *L. rotundirostris* and *L. dives*, have setae on the shell. In *L. rotundirostris*, setae occur only on the posterior margin of the male shell, whereas in females they are present only on the ventral margin. According to D a d a y (1923) *L. dives* frequently has setae, but only on the ventral margin of the female shell. However, the presently studied population is characterized by a distribution of setae differing from that in these two species. In males, setae are present on the anterior and partly on the ventral margin, and in females on both the anterior and posterior margins, as well as on the growth lines of the posterior and sometimes also of the anterior part of the shell. In younger females setae are also distributed on the anterior part of the ventral margin. Such an arrangement of setae certainly indicates that this population is closely related to the species *L. intermedia*.

However, the frequency of setae and their arrangement are similar to those observed in the populations we discovered near Terezino Polje and in *L. saetosa* from Progar. As distinct from the populations from Terezino Polje, the setae on the growth lines in males of the presently studied population have not observed. This population is distinguished from *L. saetosa* by a smaller number of setae on the shell margin and their absence on the growth lines in males, and by the absence of setae on the ventral margin and their smaller number on the growth lines in females. Hence, on the basis of the shell appearance, it may be concluded that northern populations from Terezino Polje and Progar are more closely related to the species *L. intermedia* than the population from Velika Plana - Žabari.

The length of the shell varies from 9 to 11 *mm* in males, and from 8.5 to 10 *mm* in females.

Microscopic structure of the shell of the population studied is similar to that in *L. intermedia*, as is the case with the populations from Terezino Polje.

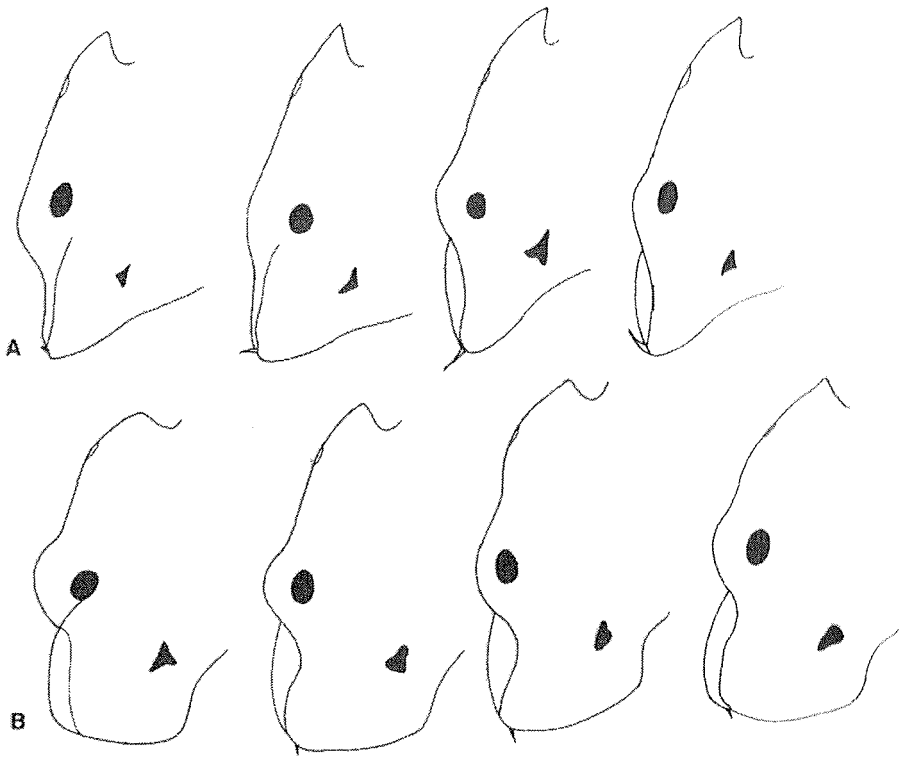

Fig. 3. - The head: A - female, B - male.
Glava: A - ženka, B - mužjak.

As regards the morphological characteristics of the head, we have established that the general shape of the male rostrum differs from that in *L. intermedia*. It is almost square, with prominent anterior and posterior angles (Fig. 3*B*), whereas in *L. intermedia* it has the shape of a domed spatula void of prominent angles. The male rostrum also differs from that in *L. dives* and *L. rotundirostris*. In *L. dives*, it has less sharp angles and a convex ventral edge, while in *L. rotundirostris*, it has the appearance of a completely domed spatula. The general shape of the rostrum is similar to that in *L. dahalacensis*. The male rostrum also differs from the populations from Terezino Polje and from *L. saetosa* in having more pronounced anterior and posterior angles and a more flattened ventral edge.

Female rostrum is of a triangular shape (Fig. 3*A*) as in females from Terezino Polje and those of *L. saetosa*.

Nauplius eye resembles that in *L. intermedia*. It is of a triangular shape both in males and females. In males, its most prominent angle is directed toward the rostrum tip, similar to *L. intermedia*. Triangle-shaped nauplius eye is also observed in *L. dives* but is differently directed, especially in males. In the populations from Terezino Polje and in *L. saetosa*, the appearance of the naup-

lius eye markedly differs frPom that in the population discovered between Velika Plana and Žabari. It is considerably more developed and shaped like a pipe with a narrowed projection directed almost horizontally toward the compound eye.

Male antennules are indistinctly segmented into 17-19 articles. There are 17-19 sensory papillae covered with sensory organs. No data are available on the occurrence of segmentation or on the number of sensory papillae in *L. intermedia*. When describing other European species, D a d a y (1923) does not report on the number of articles of antennules, which leads us to the conclusion that they are unsegmented. Compared to the populations from Terezino Polje and to *L. saetosa*, the population studied has a greater number of articles. However, as regards the number of sensory papillae in the males of the presently studied population, it is similar to that in the populations from Terezino Polje and *L. saetosa* as well as to that in other European species (Tab. 1).

Female antennules are indistinctly segmented into 7-9 articles and have 12-13 sensory papillae. In the number of articles and sensory papillae, they are similar to the antennules of the populations from Terezino Polje and *L. saetosa*, but have somewhat smaller number of papillae with respect to other European species (Tab. 2).

Male antennae have 10-14 articles in both branches. In view of the number of articles, they do not differ either from the populations from Terezino Polje and to *L. saetosa*, or to other European species.

Female antennae have 11-12 articles in both branches. The number of articles is similar to that in the populations from Terezino Polje and *L. saetosa*, as well as to that in most other European species; it is somewhat lower only compared to *L. dives* and *L. dahalacensis*.

The trunk consists of 24 segments, both in males and females. This number is similar in all the species.

In males, 12-17 posterior segments carry spines in their middorsal part. The number of spiny segments is somewhat lower compared to *L. intermedia* and *L. dahalacensis*, as well as relative to the population I from the neighbourhood of Terezino Polje and to *L. saetosa*. The number of segments is closest to that in *L. dives* var. *securiformis* and to that in the population II from Terezino Polje. The last segment usually carries spines but is sometimes without them. In *L. intermedia* 1-5 posterior segments do not bear spines, while in the populations from Terezino Polje 1-2, and in *L. saetosa* 1-3 last segments always lack spines. In the species *L. rotundirostris* 2-3 segments and in *L. tenuis* 2-4 segments are also without spines. According to D a d a y (1923) *L. dahalacensis* carries spines on all posterior segments but S t r a š k r a b a (1996) reports that in the populations of this speciesin Czech Republic and Slovakia 6 posterior segments may be void of spines. As for the arrangement of middorsal spines in males, our population is most closely related to *L. dives* and to its variety *L. dives* var. *securiformis* in which 1-2 posterior segments may likewise be sometimes without spines.

Tab. 1.- *Variability of some characters of males of our populations and of European species*
Varijabilnost nekih karaktera mužjaka naših populacija i evropskih vrsta

	VEL. PLANA-ŽABARI	TEREZINO POLJE I	TEREZINO POLJE II	*L. saetosa*	*L. inter-media*	*L. dives*	*L. dives* var. *securi-formis*	*L. dahala-censis*	*L. rotun-dirostris*	*L. tenuis*
HEAD GLAVA										
A1										
No.of segm. Br.segm.	17-19	11-12	6-10	6-11	-	-	-	-	-	-
No.of papillae Br.papila	17-19	15-17	16-21	16-21	-	14-16	-	16-18	18-20 11-12 (sometimes)	12-20
A2										
No of segments Broj segmenata	10-14	5-15 (12-14 most freq.)	7-14	11-14	-	12-13	-	12-16	11-14	13-14
TRUNK TRUP										
No of segments Broj segmenata	24	24	23-24	23-25	23	24	-	24	24	24
No of spiny segm. Br. segm. sa bodlj.	12-17	12-21	13-15	10-21	15-20	17-18	11-17	16-20	17-18	18
Max. No of spines Maks. broj bodlji	8-23	7- 9	7-10	2- 8	3- 9	7-17 (6 Rom. pop.)	21	9	7-11	3-15
TELSON TELZON										
No. of dorsal spines Broj dorz. bodlji	51-63	29-47	37-52	38-56	47-53	36-48	-	-	40-60	26-30

Table 2. - *Variability of some characters of females of our populations and of European species*
Varijabilnost nekih karaktera ženki naših populacija i evropskih vrsta

	VEL. PLANA-ŽABARI	TEREZINO POLJE I	TEREZINO POLJE II	*L. saetosa*	*L. inter-media*	*L. dives*	*L. dives* var. *securi-formis*	*L. dahala-censis*	*L. rotundirostris*	*L. tenuis*
HEAD GLAVA										
A1										
No.of segm. Br.segm.	7-9	8	4- 5	unsegm. or 5-6 indist.	-	-	-	-	-	-
No.of papillae Br.papila	12-13	13	11-17	-	-	16-18	-	16-18	18-20 11-12 (sometimes)	12-20
A2										
No of segments Broj segmenata	11-12	7-14	9-14	10-14	-	15-16	-	12-16	11-14	13-14
TRUNK TRUP										
No of segments Broj segmenata	24	24	24	22-26	23	22-24	-	24	24	24
No of spiny segm. Br. segm. sa bodlj.	12	12-21	13-15	12-20	11-14	14-18	13	4 (20 Straškaba)	14-18 (14 most freq.)	20
Max. No of spines Maks. broj bodlji	30-35	7- 9	7-10	8-25	31	11-15 (62 Rom. pop.)	31	17-25 (25 Rom.pop.)	7-11	29
TELSON TELZON										
No. of dorsal spines Broj dorz. bodlji	71-96	79	76-85	50-89	62-96	36-48	-	-	40-65	26-30

In females, 12 posterior segments always carry middorsal spines. Our population is very closely related in this character to *L. intermedia* and especially to *L. dives* var. *securiformis*. However, the number of spiny segments is lower compared to the populations from Terezino Polje and to *L. saetosa*, as well as compared to other European species. In our population middorsal spines are present on all posterior segments, which is also the case in the populations from Terezino Polje and in the majority of European species. The only exception is *L. saetosa* and *L. rotundirostris* in which 1-2 last segments may lack spines. It should be pointed out that the number of spines increases toward the posterior part of the body, so that the maximal number of spines occurs on the last 2-4 segments. In the presence of the highest number of spines precisely on the last segments, this population is closely related to the Roumanian population of *L. dives* and to its variety *L. dives* var. *securiformis* as well as to the populations from Terezino Polje and *L. saetosa*, but it differs from other European species in which the greatest number of spines is present on the segments preceding the last ones.

In the males of the presently studied population the maximal number of spines per segment is 8-23, which is markedly higher in comparison to *L. intermedia* as well as to the populations from Terezino Polje, *L. saetosa* and to the majority of other species in Europe. This is the most peculiar characteristic of the form studied. This number is most similar to that observed in *L. dives* and particularly in *L. dives* var. *securiformis,* though it is higher than in these two forms as well.

In females the maximal number of spines per segment amounts to 30-35 and is considerably higher than in the populations from Terezino Polje and *L. saetosa* and also higher than in the species *L. dives*, *L. rotundirostris*, *L. dahalacensis*, and *L. tenuis*. Our population is most similar in this character to *L. intermedia* and *L. dives* var. *securiformis*.

Regarding the structure of the first, second and the third pair of appendages in males, we have established a great similarity between the form studied and the populations from Terezino Polje and *L. saetosa*, especially in the number of setae and their distribution. With respect to *L. saetosa* our population differs in lacking transversal row of setae on endites 4 and 5 on the third pair of appendages. Compared with *L. intermedia*, to the extent the available data from literature allow, the form studied differs in having two-segmented palpus endopoditalis on the first, second and third pair of appendages, in a greater length of the endite 5 (twice the length of the corresponding endite 5), and in the absence of a transversal row of setae at the level of endite 4 on the third pair of appendages. A closer comparison of the structure of appendages in our population to that in other species was not possible due to obscure literature data. Still, we have established that the appearance of palpus endopoditalis in our form is very similar to that in *L. dahalacensis* and *L. rotundirostris*.

In females we have observed that the first pair of appendages is remarkably similar to that in the populations from Terezino Polje, *L. saetosa* and *L.*

intermedia. However, unlike *L. saetosa* our females lack a transversal row of setae on endite 4, while palpus endopoditalis is indistinctly two-segmented. Compared to *L. intermedia*, our form differs in having palpus endopoditalis indistinctly divided into two segments. The number of appendages modified for egg-bearing is particularly interesting. This character is used as one of the criteria for species distinction. We observed that the majority of specimens (7 out of 11) had the 10th to 14th pair of appendages modified for egg-bearing on both sides (as in *L. dahalacensis*, *L. rotundirostris* and *L. saetosa*). In two specimens the 10th to 15th pair were modified on both sides (as in *L. dives*) and in two specimens the 10th to 14th pair on one side of the body and the 10th to 15th on the other side were egg-bearing (as in *L. intermedia*). With respect to this character, our population differs from the species *L. intermedia* as well as from the populations inhabiting the surroundings of Terezino Polje and from other European species. In *L. intermedia* appendages from the 10th to 14th pair are modified on one side of the body and from the 10th to 15th pair on the other; only exceptionally the appendages from the 10th to 14th pair are modified on both sides (B o t n a r i u c 1947). In the populations from Terezino Polje, the number of females with the 10th to 14th pair modified for egg bearing on both sides and that of the females with the 10th to 14th pair modified on one side of the body and the 10th to 15th pair on the other side is approximately the same. The *L. saetosa* populations are characterized by having the 10th to 14th pair of appendages egg-bearing on both sides of the body in most females; rare are the females with the modified 10th to 13th pair of appendages on both or on one side, whereas in certain specimens the 10th to 15th pair of appendages are modified for egg bearing. The species *L. dahalacensis* and *L. rotundirostris* have the 10th to 14th pair of appendages modified on both sides. In *L. dives* the appendages from the 10th to 15th pair, and in *L. tenuis* from the 10th to 13th pair on both sides are egg-bearing. However, D a d a y (1923) reports that in Roumania, in the vicinity of Jassy, he found a specimen of *L. dahalacensis* in which appendages were modified from the 10th to 14th pair on one side and from the 10th to 13th on the other, so that this specimen represents a transition form between *L. dahalacensis* and *L. tenuis*. B o t n a r i u c (1947) reports that he discovered one specimen of *L. dives* in which appendages were modified from the 10th to 16th pair on both sides.

Male telson bears 51-63 dorsal spines. On the proximal part of the telson they are shorter, with domed, blunt tips and almost smooth edges. At about the middle of the telson, spines become weakly indented and increasingly so toward the distal part of the telson. The appearance of the spine apical parts also changes, so that spines are markedly indented and sharp on the distal part of the telson. In comparison to the populations from Terezino Polje, the number of spines is greater and less variable. In comparison to *L. saetosa* the spine number is also greater. It is also higher relative to *L. intermedia*, *L. dives* and *L. tenuis* and is similar to that in *L. rotundirostris*. This population differs in the appearance of spines from the populations from Terezino Polje, where spines are mainly smooth or poorly indented. As distinguished from *L. saetosa*

this population is characterized by having blunt and nearly smooth spines on the anterior part of the telson, while in *L. saetosa* they are sharp and slightly jagged. Regarding the appearance of telson spines, our population represents a transition between *L. intermedia,* characterized by indented spines and *L. dives,* whose spines are smooth. The species *L. rotundirostris* and *L. tenuis* also display transient characters: their spines are rough or indented.

On the female telson there are 71-91 sharp spines. In the proximal part of the telson they are almost smooth but toward the distal part they become indented. In respect of the populations from Terezino Polje, this population has a higher number of spines, which lack indentation on the proximal part of the telson. In comparison to *L. saetosa,* this population has a higher number of spines, likewise in comparison to *L. dives, L. rotundirostris* and *L. tenuis.* They differ in their appearance too: in *L. dives* they are smooth and blunt on the proximal part or sharp on the distal part of the telson, while in *L. rotundirostris* and *L. tenuis* they are either rough or indented. However, the number of spines in this population is closest to that in the species *L. intermedia*; there is also a similarity in their appearance.

DISCUSSION

The presence of setae on the margin and growth lines of the shell is the character which closely relates the population studied to the species *L. intermedia* and *L. saetosa,* except that setae in both sexes, especially in males, are less abundant. A greater abundance of setae in younger specimens, both on the margin and on the growth lines, may be said to be the character, reminiscent of that in their ancestors. It may be also concluded that this form is phylogeneticaly related to *L. intermedia,* which was discovered in 1947 in Roumania, and has since been found in that country only, as well as to the species *L. saetosa,* which has been discovered in our country. This is supported by the fact that microscopic structure of the shell is also similar to that described by Botnariuc (1947) for *L. intermedia.* On the other hand, in the frequency and arrangement of setae and the shell structure, this population is very closely related to the populations of *Leptestheria* we discovered in the vicinity of Terezino Polje. The population found on Velika Plana - Žabari route, the populations from Terezino Polje, and *L. saetosa,* as well as the species *L. intermedia* certainly are very closely related and form one group.

As evident from our previous and present findings, among the characteristics of the head, the general shape of the nauplius eye is a relatively stable character. In its triangular shape, as well as in its orientation, the population studied is most closely related to the species *L. intermedia,* but it greatly differs from the populations from Terezino Polje and from *L. saetosa.* The rostrum varies but its general shape is almost uniform. This population noticeably diverges in the shape of the rostrum from *L. intermedia,* but resembles the species *L. dahalacensis.* The structure of antennae and antennules does not dif-

fer much among European species. Still, it should be emphasized that a comparison of the number of segments and sensory papillae on the antennules is not sufficient. In order to draw more reliable conclusion careful study of the shape of sensory papillae and the structure of sensory organs is needed.

The number of trunk segments is very similar in all European species. In males the number of segments which carry middorsal spines does not vary much among the species. As for the arrangement of these spines, the majority of European species, as well as the populations from Terezino Polje and *L. saetosa*, lack spines on a few posterior segments, unlike *L. dahalacensis*. In this respect, the population studied, together with the species *L. dives*, forms the transition between *L. dahalacensis* and other European species by having the spines on the posterior segments or sometimes missing them. In females of the European species, the number of spiny segments is more variable than in males, but their arrangement is similar. In the majority of species, likewise in our population, they are present on all posterior segments, unlike in *L. rotundirostris*. In *L. saetosa* 1-2 terminal segments may lack spines. However, the presently studied population displays certain peculiarities still. Namely, it has the greatest number of spines on the posterior segments, unlike the majority of European species where the spines are the most numerous on the segments preceding the posterior ones. Such a pattern of spine distribution is also observed in Roumanian populations of *L. dives*, *L. dives* var. *securiformis* (B o t n a r i u c 1947), as well as in the populations from Terezino Polje and in *L. saetosa*.

With regard to the maximal number of spines per segment in males the population studied differs from the populations from Terezino Polje and to *L. saetosa*, as well as to the majority of other European species. As regards this character in females, our population differs from the populations from Terezino Polje and from *L. saetosa*, while it is closest to the species *L. intermedia*. It should be emphasized that the findings of various authors referring to the maximal number of spines per segment in *L. dahalacensis* differ. According to D a d a y (1923) it is 17-25, according to B o t n a r i u c (1947) concerning Roumanian populations it also amounts to 25, while S t r a š k r a b a (1966) reports Czech and Slovakian populations to bear up to 40 spines per segment. Different maximal numbers of spines per segment are recorded for *L. dives* too. Thus, D a d a y (1923) reports that the maximal number of spines per segment in females is 11-15 and B o t n a r i u c (1947) reports the occurrence of as many as 62 for Roumanian population, which is an exceptionally high number for European species.

Careful study of the structure of appendages both in males and females also suggests a close relation of this population to populations from Terezino Polje and to *L. saetosa*. As for the egg-bearing appendages, it is obvious that their number is not completely stabilized. In this respect the group including *L. intermedia*, populations from Terezino Polje, *L. saetosa* and the population presently studied is of a particular interest.

As regards the characteristics of the telson, both in males and females, the population studied differs from the populations from Terezino Polje and from *L. saetosa*, as well as from other species.

A great number of structural characteristics suggests a close relationship between the population studied, populations from Terezino Polje and *L. saetosa* with the species *L. intermedia*. On the other hand, in certain characteristics of the shell as well as in the number of egg-bearing appendages *L. intermedia* is related to species *L. dives* and *L. rotundirostris*. It is obvious that intensive speciation is in progress within the genus *Leptestheria*, especially in our country.

CONCLUSION

In the course of the study of morphological characteristics of the population of *Leptestheria* discovered on Velika Plana - Žabari route, it has been established that it displays a number of structural similarities to the populations of this genus we found in the vicinity of Terezino Polje and to the species *L. saetosa*. Furthermore, it is similar to the species *L. intermedia*, and to a certain degree to the species *L. dives* and *L. rotundirostris*, which suggests phylogenetic relationships of these forms. However, the population studied displays peculiarities in which it differs from the populations from Terezino Polje and *L. saetosa* as well as from other European species of this genus.

In comparison to the populations from the vicinity of Terezino Polje, this population differs in: the shape of the nauplius eye, the shape of male rostrum, a greater number of articles in male antennules, the distribution of middorsal spines on trunk segments of males, a smaller number of spiny segments in females, a considerably greater maximal number of spines per segment, the number of appendages modified for egg bearing, a greater number of spines on telson and their appearance.

In comparison to *L. saetosa*, this population is characterized by: a smaller number of setae on the shell, the appearance of the nauplius eye, the shape of the male rostrum, a considerably higher maximal number of spines per segment, the presence of these spines on posterior segments, a greater number of spines on telson both in males and females and their appearance on the anterior part of male telson.

With respect to the species *L. intermedia* the population studied differs in: less abundant setae of the shell margin in both sexes and their absence on growth lines of the male shell, the general shape of the male rostrum, a smaller number of spiny segments and the arrangement of spines in males, the presence of the maximal number of spines on 2-4 posterior segments and their considerably higher number in males, the number of egg-bearing appendages, a greater number of spines on the male telson, and in their appearance.

With regard to the species *L. dives,* the population studied is characterized by: the arrangement of setae on the shell margin and their presence on growth lines in females, the presence of setae on the margin of the male shell, the microscopic structure of the shell, the general shape of the male rostrum, a smaller number of sensory papillae on antennules and a smaller number of articles in female antennae, a greater maximal number of spines per segment in males, the number of egg-bearing appendages, a greater number of spines on the telson and their appearance.

With respect to *L. dives* var. *securiformis* our population differs in: the presence of setae on the margin of the male shell, the arrangement of setae along the margin and their presence on growth lines on the female shell, the shape of the male rostrum, the number of egg-bearing appendages.

Compared to the species *L. dahalacensis,* our population differs in: the presence of setae on the shell, the microscopic structure of the shell, the appearance of the nauplius eye, a smaller number of sensory papillae on antennules and a smaller number of articles on antennae in females, a smaller number of spiny segments in males, a greater maximal number of spines per segment, the arrangement of spines on female trunk segments, the number of egg--bearing appendages.

The form studied differs from *L. rotundirostris* in: the arrangement of setae on the shell margin in males, the presence of setae on the margin and growth lines on female shell, the shell structure, the shape of the male rostrum, the appearance of the nauplius eye, a smaller number of sensory papillae on female antennules, a smaller number of spiny segments and the arrangement of spines in females, a greater maximal number of spines per segment, the number of egg-bearing appendages, the appearance of spines on the male telson, a greater number of spines on the female telson.

In comparison to *L. tenuis,* this population differs in: the presence of setae on the shell, the shape of the male rostrum, a smaller number of sensory papillae in females, a smaller number of spiny segments in females, the arrangement of spines on the trunk segments of males, a greater maximal number of spines per segment, the number of egg-bearing appendages, a greater number of spines on the telson.

These observations demonstrate that an intensive speciation is still taking place within the genus *Leptestheria.* Further extensive studies on the territory of our country and bordering regions are required to elucidate taxonomic and phylogenetic relationships within this genus.

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TAKSONOMSKA ISPITIVANJA RODA *LEPTESTHERIA* (*CONCHOSTRACA, CRUSTACEA*) II

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I z v o d

Usled znatnog varijabiliteta u okviru pojedinih vrsta, taksonomija roda *Leptestheria* predstavlja jedan od najvećih problema u okviru čitave grupe *Conchostraca*. S obzirom da se na području naše zemlje sustiču, a verovatno i preklapaju, areali rasprostranjenja evropskih vrsta ovoga roda, naša fauna je utoliko interesantnija a problem distinkcija vrsta teži.

U ovom radu ispitivana je populacija *Leptestheria* nađena 25. jula 1975. godine u jednoj bari zaostaloj posle kiše, na njivi kukuruza, blizu puta Velika Plana - Žabari. Analizirajući morfološke karakteristike ove populacije ustanovili smo da je ona vrlo bliska populacijama *Leptestheria* koje smo našli u okolini Terezinog Polja, kao i vrsti *L. saetosa* otkrivene u okolini Progara. Po svojim osobinama, populacije sa lokaliteta Velika Plana - Žabari i Terezino Polje, kao i populacije *L. saetosa*, su i u bliskim odnosima sa vrstom *L. intermedia*, tako da sve zajedno čine jednu srodnu grupu. Osim toga, prisutna je određena sličnost i sa vrstama *L. dives* i *L. rotundirostris*. Međutim, ustanovljene su i strukturalne specifičnosti ove populacije u odnosu na prethodno ispitivane populacije ovoga roda u Hrvatskoj i kod nas, kao i u odnosu na sve ostle evropske vrste.

Na osnovu naših istraživanja zaključujemo da se u okviru roda *Leptestheria* odvijaju još uvek intenzivni tokovi specijacije, posebno na našem tlu. Potrebna su dalja opsežna istraživanja na teritoriji naše zemlje i okolnih oblasti u cilju rasvetljavanja taksonomskog značaja konstatovanih strukturalnih specifičnosti kao i filogenetskih odnosa u okviru ovog roda.

UDK: 595.34(45)
Original scientific paper

DEVELOPMENTAL STAGES OF *TISBE HOLOTHURIAE* HUMES, 1957 (*COPEPODA, HARPACTICOIDA*)

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Vidmanić Lidija (1995-98*): Developmental stages of Tisbe holothuriae Humes, 1957, (Copepoda, Harpacticoida).* - Bulletin of Natural History Museum, Belgrade, *B49-50,* 145-155.

Tisbe holothuriae, from the Lagoon of Venice (Italy), was cultivated in a laboratory conditions during some years. A morphological description and some measurements of five nauplius and five copepodit stages are given.

INTRODUCTION

The marine benthic copepod *Tisbe* is very often used in laboratory studies, since it can easily be reared under standard conditions. Its life span is usually rather short (10-12 days), but it can range from 8 to 15 days in relation to environmental conditions such as temperature and salinity (Battaglia 1970, Battaglia & Lazzaretto 1967, Betouhim-El & Kahan 1972), and its fertility is high (means number of eggs is 20-30 per female). Several authors have used this genus for toxicity tests at individual and population levels (Dalla-Venezia *et al.* 1980, 1980*a*, Fava & Dalla-Venezia 1976, Moraitou-Apostolopoulou *et al.* 1983, Verriopoulos & Moraitou-Apostolopoulou 1982, 1989, Hoppenheit & Sperling 1977) and other for population genetics (Battaglia & Finco 1969, Battaglia 1970, Betouhim-El & Kahan 1972, Fava & Volkmann-Rocco 1975, Volkmann-Rocco 1969, 1972, 1973, Hoppenheit 1975, 1976). In spite of this, in literature a detailed study of developmental stages of the genus *Tisbe*, except description of species *Tisbe reticulata* presented by

Battaglia & Talamini (1957) we could not find, although the knowledge of it can be very useful in studying demographic characteristics of laboratory and field populations.

The present work aims to give a description of every developmental stage of species *Tisbe holothuriae*, as well as some measurements important for their identification.

MATERIAL AND METHODS

Populations of *Tisbe holothuriae* Humes, 1957, were used in our study. They were collected from the Lagoon of Venice in the 1990 and reared for about three years under laboratory conditions. The populations were kept in five glass vessels of 2/l, filled with double filtered water from the Lagoon of Venice, in a thermostatic room under constant temperature (20.5±0.1 °*C*), and light cycle: 12*h* fluorescent light, 12*h* dark, according to the method reported by Battaglia (1970) and other authors (Betouhim-El & Kahan 1972, Battaglia & Finco 1969, Dalla-Venezia *et al.* 1980*a*). Salinity of the water was 34±2 %, and the food, weakly renewed, consisted of ten small pieces of boiled wheat, 15 *ml* of GUILLARDS medium-GUI with *Chlamydomonas plethora*, and a small piece of the green macroalga *Ulva*. The vessels were cleaned when necessary, and the water was completely renewed approximately every two months.

From these populations ten egg-bearing females were taken and each of them placed in a glass vessel (25 *ml*). The female was removed from the vessel after release of nautili. During the metamorphosis the individuals were fed with a small piece of boiled wheat and *Chlamydomonas plethora* in 1 *ml* of liquid medium. When necessary glycerin has been used as temporary anesthetic (Fava & Volkmann-Rocco 1975), but usually to prevent their movement, we kept animals under a covering glass. Dimensions of setae, antennae and body segments were measured with an ocular micrometer.

RESULTS AND DISCUSSION

In the life cycle of *Tisbe holothuriae* Humes we have found five naupliar, five copepodite stages, and adults with marked sexual dimorphism, while Battaglia & Talamini (1957) reported for the species *Tisbe reticulata* six nauplius stages and six copepodit (the sixth copepodite stage corresponding to the adult). In the report of Uhlig & Noodt (1966) the *Tisbe helgolandica* development consists of five nauplius and four copepodit stages.

In Tables 1 and 2, the salient differences between the successive stages (number of abdominal segments, first antenna segments and caudal setae, as well as body and seta lengths) have been presented.

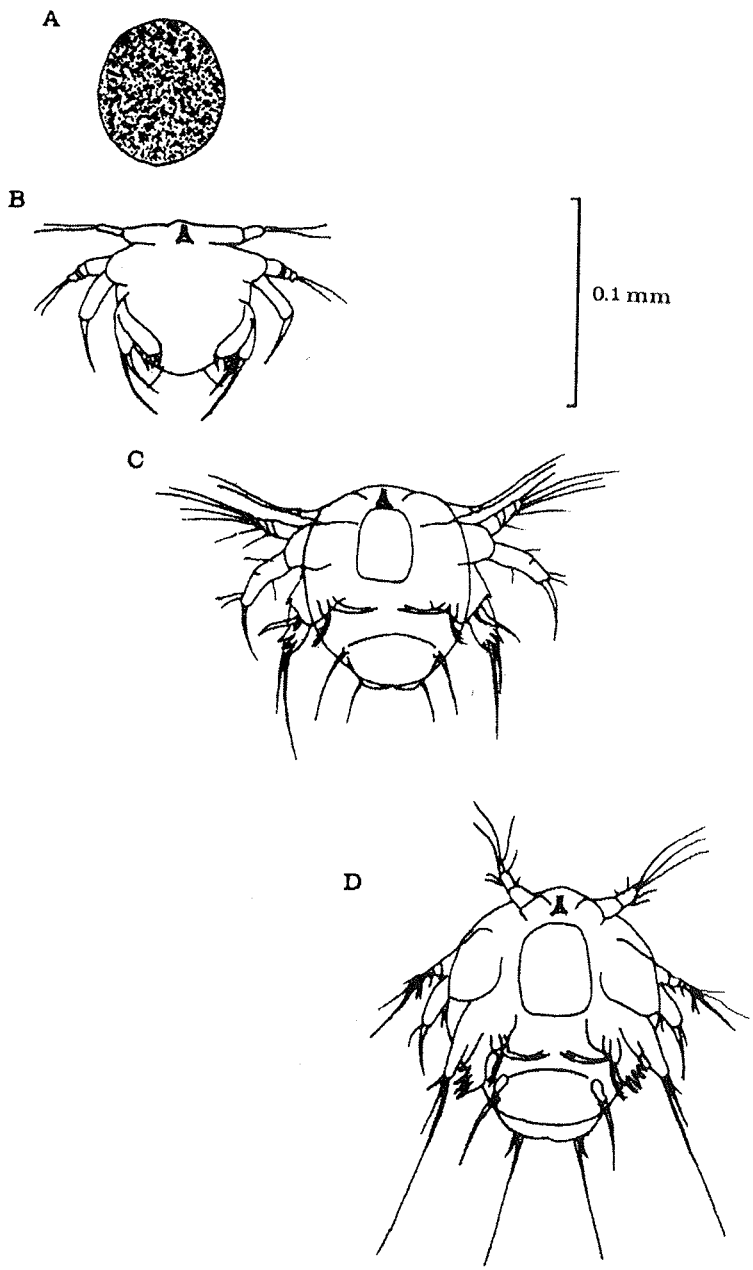

Fig. 1. - *Tisbe holothuriae*: *A* - egg, *B* - nauplius I, *C* - nauplius II, *D* - nauplius III
Tisbe holothuriae: *A* - jaje, *B* - nauplius I, *C* - nauplius II, *D* - nauplius III

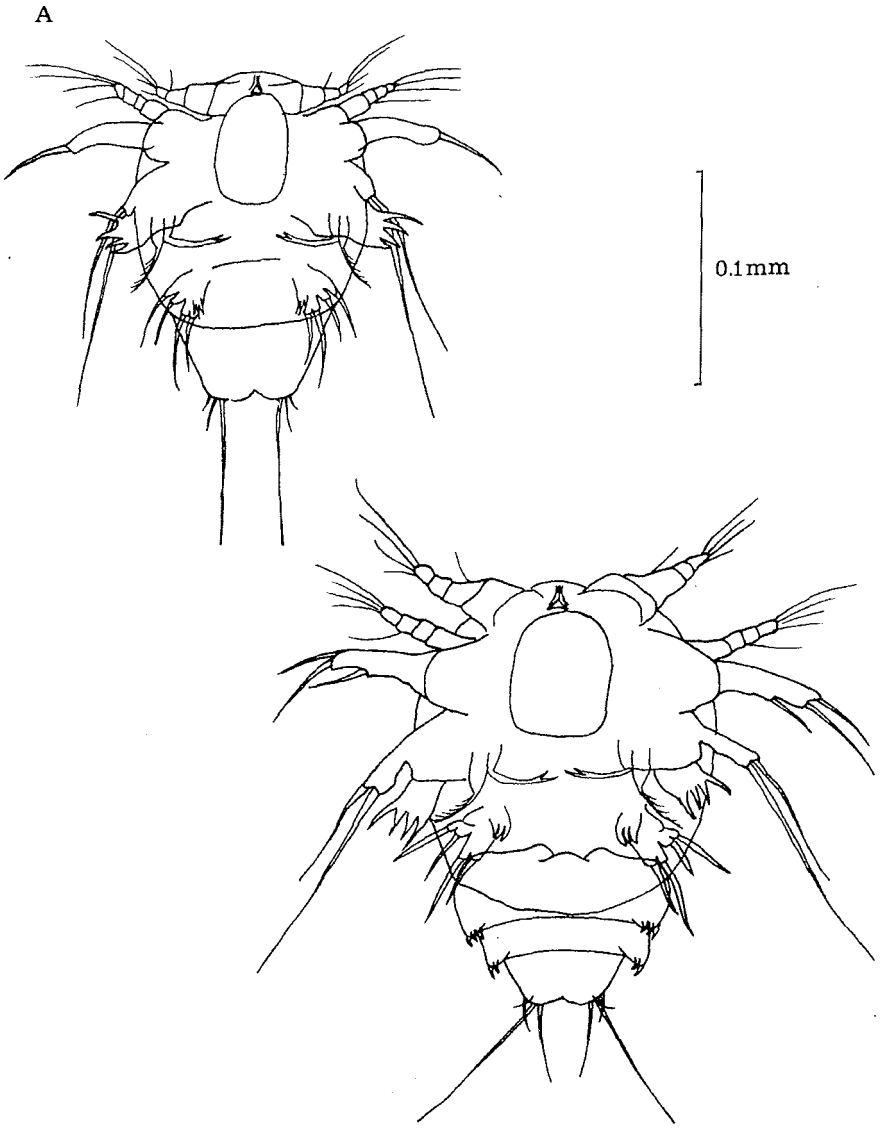

Fig. 2. - *Tisbe holothuriae*: *A* - nauplius IV, *B* - nauplius V

Nauplius I (Fig. 1*B*) (just hatched) is about 69±2μm long, without body segmentation. His body is longer than its width. First antenna (27±2μm) consists of two segments, and at the caudal part it has two short caudal setae (18±μm).

After 3-5 hours it is possible to see one more small but clearly visible body segment (4±μm) with two caudal setae only a little longer than in the

Tab. 1. - *Number of 1st antenna segments, body segments and caudal setae in different developmental stages of Tisbe holothuriae*
Broj segmenata prve antene, telesnih segmenata i kaudalnih nastavaka kod različitih razvojnih stadijuma *Tisbe holothuriae*

NUMBER OF:	1 st ANTENNA SEGMENTS	BODY SEGMENTS	CAUDAL SETAE
NAUPLIUS			
I	2	1	2
II	3	2	2
III	4	2	4
IV	4	2	6
V	4	4	8
COPEPODITE			
I	4	5	8
II	5	6	8
III	6	7	8
IV	7	8	8
V	7	9	8
ADULT	8	10	8

Tab. 2. - *Body and seta lengths in different developmental stages of Tisbe holothuriae*
Dužina tela i kaudalnih nastavaka kod različitih razvojnih stadijuma *Tisbe holothuriae*

	BODY LENGTH (μm)	SETA LENGTH (μm)
EGG	70±5	
NAUPLIUS		
I	67± 2	18± 1
II	98± 6	19± 1
III	108± 7	55± 3
IV	137± 5	86± 5
V	190± 7	87± 8
COPEPODITE		
I	289±20	224± 8
II	275±43	283±16
III	418±37	361±16
IV	481±17	385± 3
V	615±59	518±42
ADULT		
female	832±13	582±34
male	567±48	589±36

previous stage (19±1μm). Body length is 98±6μm and still longer than wide. First antenna (34±μm) has three segments. This stage is nauplius II (Fig. 1*C*).

Nauplius III (Fig. 1*D*) is one day old with no changes in number of body segments and caudal setae, but here are four segments in the first antenna, and dimensions of body and other parts important for their identification are remarkably different. Second body segment is 6±2μm long, longer caudal seta 55±3μm, and body length is 108±7μm. Cephalotorax is still longer (102±6μm) than wide (88±6μm).

Nauplius IV (Fig. 2*A*) is about two days old. There are still only two body segments, but second is considerably longer (23±7μm), with six caudal setae (the longest is 86±5μm). The first antenna (45±3μm) is with four segments. In this stage cephalotorax becomes a little wider (115±6μm) than long (113±6μm).

In the last developmental stage of nauplius (V) (Fig. 2*B*), which is three days old, there are some very significant changes. It has four body segments (abdominal part is 64±3μm long), with eight caudal setae (87±8μm the longest). Body length is 190±7μm and the first antenna (45±4μm) has four segments.

After 4-5 days of hatching, nauplius become copepodite (Fig. 3*A*), with characteristically prolonged abdomen. body consists of five segments, two caudal rami and four caudal setae on each rami. Body length (from rostrum to caudal rami) is 289±20μm, the longest caudal seta 224±8μm, and first antenna 69±7μm with four segments. Cephalotorax is wider (128±8μm) than long (117±9μm).

The 5-6 days old individuals are copepodite II (Fig. 3*B*) with six body segments and five segments in the first antenna. Dimensions are greater than in previous stage. Body length is 375±43μm, the longest caudal seta 283±16μm and the first antenna 85±3μm, cephalotorax is 151±9μm wide and 125±5μm long.

Copepodite III (Fig. 3*C*), 6-7 days old, has one body and antenna segment more than in previous stage. Body dimensions are: length 418±37μm, caudal seta 361±16μm, first antenna 114±18μm. Cephalotorax is 167±19μm wide and 141±8μm long.

Stage copepodite IV (8-9 days old) (Fig. 4*A*) is very similar to adults according to shape. For the first time during the development, there is possible to see genital segment. Body is 481±17μm long with eight segments, the longest caudal seta is 385±3μm, the first antenna has seven segments and it is longer than in previous stage (134±3μm).

The last development stage copepodite V (Fig. 4*B*), old 9-10 days, has nine body segments (one less than adults), and still seven segments in the first antenna. Body length is 615±59μm and caudal seta 518±42μm.

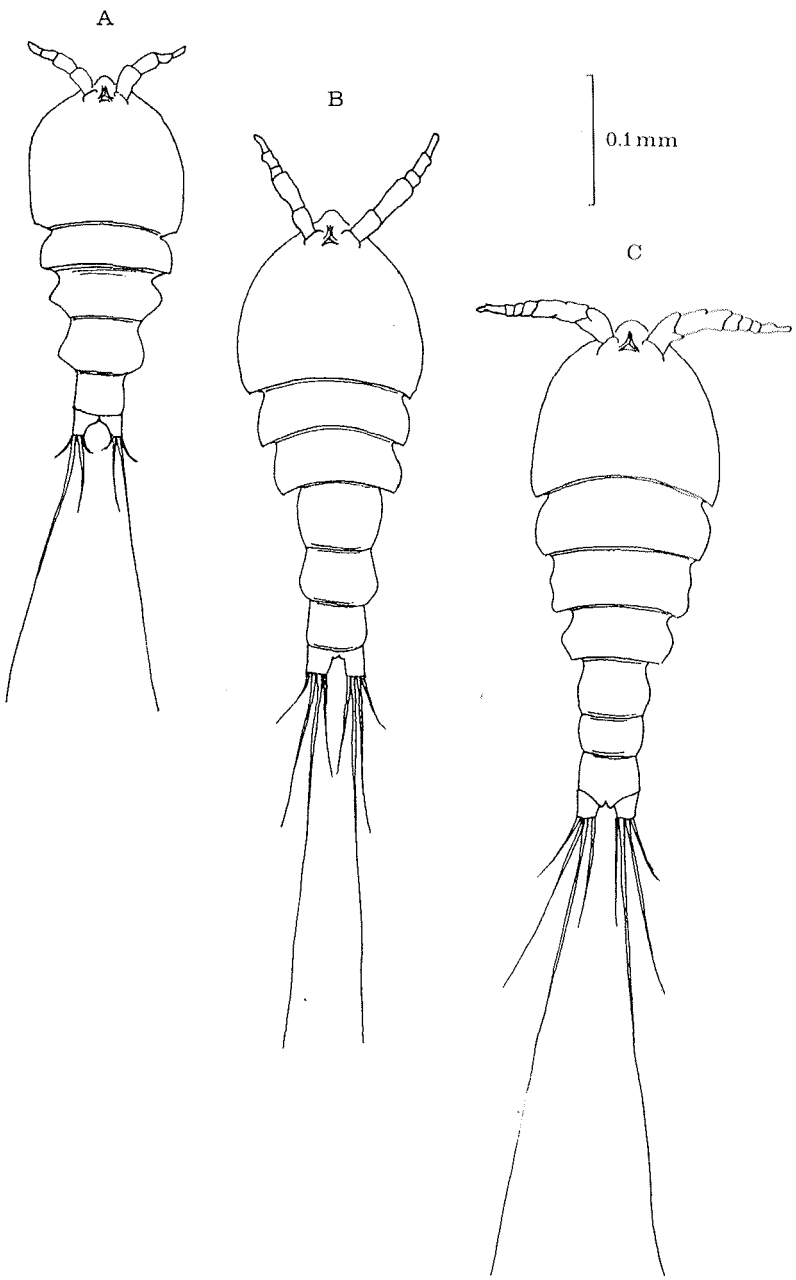

Fig. 3. - *Tisbe holothuriae*: *A* - copepodite I, *B* - copepodite II, *C* - copepodite III

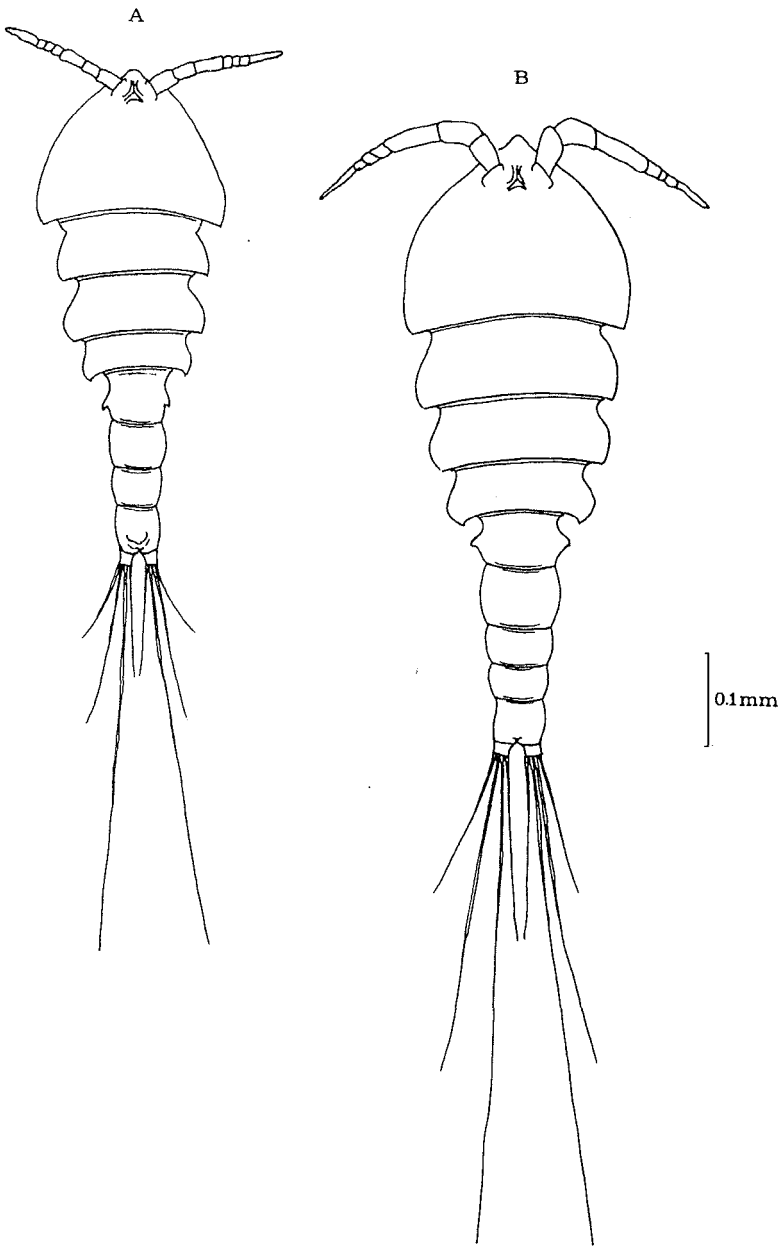

Fig. 4. - *Tisbe holothuriae*: *A* - copepodite IV, *B* - copepodite V

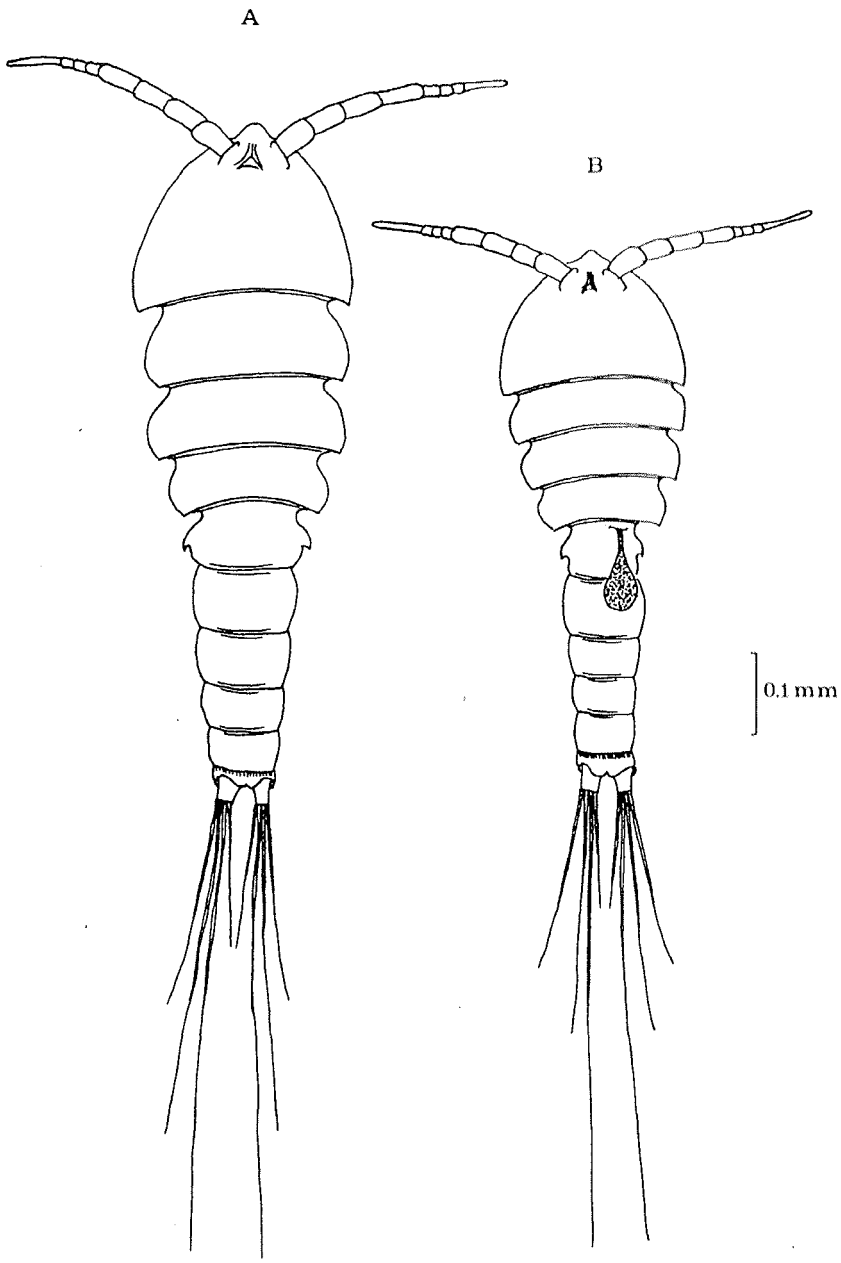

Fig. 5. - *Tisbe holothuriae*: *A* - female, *B* - male
Tisbe holothuriae: *A* - ženka, *B* - mužjak

In this stage, beginning of sexual differentiation comprising endopodit P2, with characteristic spine, and maxilopedae is possible to be seen.

In spite of the very similar size, the difference between the copepodite V and the male adult is evident (Fig. 5*B*). Indeed, the adult male is light brown colored, while copepodite V is colorless, or pale yellow. In addition in copepodite V, the genital area is not completely formed.

In this paper we are not giving description of adults since both males and females are well known. Their detailed description is given in the paper by the other author (Volkman-Rocco 1972).

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RAZVOJNI STADIJUMI *TISBE HOLOTHURIAE* HUMES, 1957 (*COPEPODA, HARPACTICOIDA*)

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Izvod

Marinska vrsta *Tisbe holothuriae*, iz venecijanske lagune, gajena je tokom nekoliko godina u laboratorijskim uslovima. U radu je dat opis morfoloških karakteristika i dimenzija deset razvojnih stadijuma ove vrste (pet naupliusi pet copepodit stadijuma).

UDK: 595.733(497.113)
Original scientific paper

THE FIRST SURVEY OF THE FAUNA OF *ODONATA* IN SPECIAL NATURE RESERVE "STARI BEGEJ - CARSKA BARA"

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Santovac, B. S., Andjus Ljiljana (1995-98*): The first survey of the fauna of Odonata in the Special Nature Reserve "Stari Begej - Carska Bara".* - Bulletin of Natural History Museum, Belgrade, *B49-50*, 157-165.

In this investigation twenty three species of *Odonata* were recorded on the territory of special nature reserve "Stari Begej - Carska Bara". Twelve of them are new for the researched area, namely: *Calopteryx splendens* (Harr.), *C. virgo* (L.), *Lestes viridis* (Van der Linden), *Coenagrion puella* (L.), *Erythromma najas, Aeschna isosceles* (Mull.), *A. mixta* (Latrei.), *Anax imperator* (Leach), *Orhetrum cancellatum* (L.), *Sympetrum fonscolombei* (Selys), *S. striolatum* (Charp.), and *S. vulgatum* (L.). Today, the total number of the species of *Odonata* listed on the researched sites is 27.

INTRODUCTION

There are 34 species of dragonflies and dragondamsels (*Insecta, Odonata*) registered on the territory of Vojvodina, representing 60.7% of the total of 56 species known on the territory of Serbia (A n d j u s 1992).

The dragonflies and dragondamsels on the territory of Vojvodina have been studied by the following authors, K o h a u t (1896), P o n g r a c z (1944), A d a m o v i ć (1949, 1956), P e t r i k (1958), Č u b r i l o v i ć (1960), G r a d o j e v i ć (1963), A d a m o v i ć & A n d j u s (1983) and A n d j u s (1985, 1992).

The study of the insects of the order *Odonata* had been conducted in both wide and narrow area of Carska Bara. The number of the recorded species of *Odonata* in Carska bara had totalled 15 (A d a m o v i ć 1949, A n d j u s 1985). A d a m o v i ć (1949) states to have caught a number of specimens of dragonflies and dragondamsels in Titel, Belo Blato, and Zrenjanin, the total number of the species of the caught specimens being 11. Of these, 2 species were caught in Zrenjanin: *Platycnemis pennipes* (Pall.) and *Ischnura elegans* (Vander.); 7 species were caught in Belo Blato (this site lies in the wider area of the Special Nature Reserve "Stari Begej - Carska Bara" protected area): *Lestes barbarus*, *Lestes virens*, *Lestes sponsa*, *Agrion pulchellum*, *Aeschna affinis*, *Sympetrum meridionale*, and *Sympetrum sanquinem*; and the following 3 species were caught in Titel: *Sympecma fusca*, *Ischnura elegans*, and *I. pumilio*. A n d j u s (1985) lists 7 species caught on the terrain of Ečka, which lies in the immediate neighbourhood of the protected area. These species are as follows: *Lestes sponsa*, *Platycnemis pennipes*, *Ischnura elegans*, *I. pumilio*, *Enallagma cyathigerum*, *Erythromma viridulum*, *Orthetrum albystilum*, and *Crocothemis erytraea*. Of these, the following species were novel for the wider area of Carska Bara: *Erythromma viridulum*, *Enallagma cyathigerum*, *Orthetrum albystilum*, and *Crocothemis erytraea*.

AREA RESEARCHED

The Special Nature Reserve "Stari Begej - Carska Bara" represents a small remainder of the floodland of the Begej and the Tisa. Its appearance today is the result of the digging of the Begej Canal from Timisoara to Titel, and the raising of levees and bank revetments. The old Carska Bara was charted as early as XVI century. A map dating from 1896 shows embankments encircling the whole area of Carska Bara.

The regulation relating to the conservation of the Special Nature Reserve "Stari Begej - Carska Bara" meticulously specifies its boundaries and the extent of the area of complex ecosystems, the features of plant and animal world, as well as the protective measures and development strategies.

The appearance and character of the described aquatic ecosystems, which were earlier dependent on the changes in water level and spring floods, are today regulated by draining water pumps and dams. This is extremely important in view of the significance of permanent water basins for the larval stadium of the *Odonata*. The pools in the area of the Special Reserve are nowadays much reduced in size, owing to the growth of aquatic vegetation. The annual spreading of the aquatic vegetation from shore towards open water is estimated at 1-2 *m*, on account of the overgrowing of observation platforms.

The confirmation of the status of the complex area " Stari Begej - Carska Bara" as a Special Nature Reserve had necessitated a more detailed study and analysis of the diversity of its living world, including the *Odonata* fauna.

The authors have assumed that the fauna of these insects in the Reserve area is far more diverse than the previous studies implied.

In 1994 and 1995, the collection of the material was conducted on the following sites: Carska Bara, Traktor Bara, Perleska Bara, the banks of the Tisa, Stari Begej, the canal towards Lukino Selo, the banks of the navigable Begej, Tiganjica, Botoški Rit, and the lakes in Zrenjanin. During that time, various habitats were studied. The habitats have been grouped by the process of codification and classification based largely on the internationally standardised classification of habitat types - CORINEHC (Coordination of Information Environment Habitat Codes), which was created under the auspices of the Land Use Programme and was shortened, modified, and adapted for the territory of Yugoslavia (V a s i ć 1995).

1-2. AQUATIC HABITATS

15. Salt (and saline) marshes, salt pastures, salt steppes

1503. emersed halophytic communities and reedbeds of continental salinous pools (Perleska Bara)

22. Standing water (fresh), natural and man-made shallow lakes, pools, ponds, and man-made canals

2211. the zone of floating vegetation of large eutrophic lowland pools and oxbow lakes (Carska Bara, Stari Begej, the canal towards Lukino Selo, the lakes in Zrenjanin)

2212. small eutrophic pools with or without open water (Perleska Bara)

2220. navigable canals of standing and, at intervals, slow-running water (the navigable Begej)

2221. drainage canals of standing and, at intervals, slow-running water (the canal towards Lukino Selo)

24. Running water

2401. open courses of large lowland navigable rivers (Tisa)

2403. open courses of larger, mostly lowland rivers (the navigable Begej)

3. SCRUB AND GRASSLANDS

37. Unimproved or lightly improved wet meadows

3702. floodland and marshy meadows in forelands behind levees of lowland rivers, around pools and canals (Traktor Bara, Tiganjica).

38. Mesophile grasslands

3801. humid continental saline soils (Perleska Bara)

3802. valley and lowland mesophile meadows (Botoški Rit)

4. WOODLAND

44. Alluvial and very wet forests and brush

4401. willow and poplar forests along lowland rivers, in floodland forelands between rivers and levees, or flooded by underground waters (Tiganjica, Traktor Bara)

5. MARSHES

53. Reed-beds on the fringes of rivers and pools

5312. the zone of water-fringe vegetation of small continental eutrophic pools, shallow lakes (Traktor Bara, Perleska Bara, Carska Bara),

5321. water-fringe vegetation of navigable canals (the navigable Begej)

5322. water-fringe vegetation of drainage canals (canal towards Lukino Selo)

MATERIAL AND METHODS

The dragonflies and dragondamsels were captured with the entomological net by the standard method, and were killed with benzene in a killing bottle. Several species were seen only during the observation, e.g., *Calopteryx splendens* and *C. virgo*, and were, owing to their characteristic appearance, listed on the basis of observation alone.

The research on the insects of the order *Odonata* in the Special Nature Reserve "Stari Begej - Carska Bara" had been planned for the duration of 3 years. The preliminary research began towards the middle of 1994. In 1994 and 1995, the areas under the III degree protection were studied. In the ensuing period, the sites under the II and I degree protection are to be studied, and the whole area is to be visited periodically.

Along with the research on Carska Bara, some experimental research was conducted in Zrenjanin on the lakes which lie in the very centre of the town and were formed by obstructing the old water-course of the Begej.

The dragonflies and dragondamsels were collected in the area of Carska Bara and on the lakes in Zrenjanin during the season of 1994 and 1995.

RESULTS

In the course of identification of the material the total of 23 species of *Odonata* was determined.

Subord. *ZYGOPTERA* Selys, 1840.

Fam. *CALOPTERYGIDAE* Buchecker, 1876.

1. ***Calopteryx splendens*** (Harris, 1782.) - 1 male seen flying over Lake 2 in Zrenjanin and pausing on the leaf of a dried reed, 19.07.1995.

2. ***Calopteryx virgo*** (Linnaeus, 1758) - 1 female seen flying in the crown of a willow on the shore of Lake 2 in Zrenjanin, 20.06.1995.

Fam. *LESTIDAE* Selys, 1840.

3. ***Sympecma fusca*** (Van der Linden, 1823.) - 1 female captured on the levee on the site the Stari Begej - Traktor Bara, 21.04.1995; 3 males caught on Lake 2 in Zrenjanin, 08.05.1995.
4. ***Lestes sponsa*** (Hansenmann, 1823.) - 1 male captured in the dense growth of *Carex sp.* right along the bank of the Stari Begej on Traktor Bara, 19.07.1995.
5. ***Lestes viridis*** (Van der Linden, 1825) - 2 males; one caught on the slope of the levee on the Stari Begej on Traktor Bara, 09.06.1994; the other caught in the long grass under the crown of a willow, 20.07.1994.

Fam. *PLATYCNEMIDAE* Tillyard, 1938.

6. ***Platycnemis pennipes*** (Pallas, 1771.) - 1 female caught in *Carex sp.* on Carska Bara, 29.06.1994.; and 1 male caught flying above water on the Tisa, 24.07.1994.
7. ***Ischnura elegans*** (Van der Linden, 1840.) - this is the most numerous species, both in the area of Carska Bara and on the lakes in Zrenjanin. It was found in large numbers on nearly every fieldtrip - on calamus right along the banks, along the levee, and in the long grass behind the levee. During 1994, the following specimens were captured on the Stari Begej - Traktor Bara: 1 male and 3 females, 29.06.; 3 males and 9 females, 06.07.; 16 males and 8 females, 13.07.; 30 males and 6 females, 20.07.; 8 males and 3 females, 27.07.; 17 males and 2 females, 03.08.; 4 males and 1 female, 10.08.; 5 males and 1 female, of which one pair *in copula*, 31.08.; 4 males and 3 females, 07.09.; 5 males and 1 female, 14.09.; 1 male, 28.09. During 1995, the collected material was as follows: 1 male and 1 female *in copula*, 28.05.; 2 males, 1 female and 1 pair *in copula*, 15.06.; 2 males, 1 female and 1 pair *in copula*, 19.07.

   Only one female was caught on Lake 2 in Zrenjanin in 1994. During 1995, however, the following specimens were captured: 1 juvenile male and 4 females, 08.05.; 8 males and 5 females, of which 2 pairs *in copula* 09.05.; 1 male and 1 female, 12.05.; 1 male and 1 female *in copula* 28.05.; 3 males and 2 females, 13.06.; 1 juvenile male, 17.07. The specimens were captured for the most part in the grass right along the shore, and on windy days in the long grass on the levee.
8. ***Ischnura pumilio*** (Charpentier, 1840) - a very rare species; 1 male caught on *Carex sp.* along the bank of the Stari Begej on Traktor Bara, 02.08.1995. The specimen has an orange body with a black line on the dorsal side of the thorax, and a black pattern on the 9th and the 10th abdominal appendage.

9. ***Enallagma cyathigerum*** (Charpentier, 1840) - likewise a very rare species; a single specimen, male, captured in the reeds on Lake 2 in Zrenjanin, 08.05.1995.

10. ***Coenagrion puella*** (Linnaeus, 1758.) - the species was noted only on Lake 2 in Zrenjanin, where the following specimens were captured; 1 male - in the reeds along the shore, 05.06.1995.; 3 males (1 juvenile), 12.06.1995.; 1 female, 24.07.1995.

11. ***Erythromma najas*** (Hansenmann, 1823.) - 1 pair captured while laying eggs on *Myriophyllum sp.* along the shore in Zrenjanin, 17.07.1995.

12. ***Erythromma viridulum*** (Charpentier, 1840.) - the most numerous species on the submersed plants in Zrenjanin, and likewise on the Stari Begej and Carska Bara; 1 female caught on *Carex sp.*, 27.07.1994.; 1 pair captured while laying eggs on *Myriophyllum sp.* on the canal towards the mill, 31.08.1994.; 1 male caught on the canal towards Lukino Selo, 07.09.1994.; The following specimens were captured in Zrenjanin: 2 males and 1 female, 1 pair *in copula*, in the reeds along the shore, 05.06.1995.; 2 males, 12.06.1995.; 1 male 13.06.1995.

Subord. *ANISOPTERA* Selys, 1840.

Fam. *AESCHNIDAE* Selys, 1850.

13. ***Aeschna isosceles*** (O.F. Muller) - 2 males caught right on the path between the reeds on the second shooting stand on Carska Bara, 28.05.1995.; another male caught in the reeds on the Stari Begej - Traktor Bara on the same day; 1 male captured in Zrenjanin while flying above the water, 05.06.1995.

14. ***Aeschna mixta*** (Latreille, 1805.) - 3 males captured in the reeds in Botoški Rit on Carska Bara, 03.08.1994.; 1 male caught in the reeds on the farm along the navigable Begej, 31.08.1994.; 2 males caught in the crown of an oak on the Stari Begej - Traktor Bara, 14.09.1994.; 1 male captured above the water on the same site, 28.09.1994.

15. ***Anax imperator*** (Leach, 1815.) - 1 male captured flying above Lake 2 in Zrenjanin, 12.06.1995.; 1 female captured while laying eggs on the rotten part of a reed in the water, 14.06.1995.

Fam. *LIBELLULIDAE* Selys, 1850.

16. ***Orthetrum albystilum*** (Selys, 1848.) - in the period from July to August this is the dominant species on the Stari Begej on Traktor Bara. The following specimens were caught on the same site during 1994; 4 males and 3 females, 06.07.; 2 males and 3 females, 20.07.; 1 male 27.07.; 1 male and 1 female *in copula*, 10.08. The males were captured flying above the water, whereas the females were captured in the long grass, 10-odd metres above water. During 1995, 1 female was caught

on the same site, 28.05.; and 1 male was caught flying above water in the dock area on the Stari Begej.

17. ***Orthetrum cancellatum*** (Linnaeus, 1758.) - a frequently found species; both sexes were found on almost every fieldtrip to the Stari Begej - Traktor Bara and the lakes in Zrenjanin. The following material was collected on the Stari Begej - Traktor Bara: 1 female caught on the levee, 10.08.1994.; 1 male caught in the grass on the levee, 28.05.1995.; 2 males and 4 females captured in the blackberry bushes, 15.06.1995; 1 female, 19.07.1995. In 1995, the specimens collected on Lake 2 in Zrenjanin were as follows: 2 females (in the grass on the levee), 12.05.; 1 female, 18.05.; 3 males, 05.06.; 1 male, 12.06.; 1 male, 13.06.; 2 males (flying above water), 17.07.

18. ***Crocothemys erytreae*** (Brulle, 1832.) - this is a rare species on the terrain of Carska Bara; however, it is frequently found on the lakes in Zrenjanin, where it contends for the hunting area with the specimens of the order *Orthetrum*. The following specimens were captured on the Stari Begej - Traktor Bara in the blackberry bushes along the levee: 1 female, 29.06.1994.; 1 male, 27.07.1994., and 1 female, 03.08.1994. Furthermore, 1 male was caught on Lake 2 in Zrenjanin, 05.06.1995., and another male was caught on the same site on a dry reed in the water, 12.06.1995.

19. ***Sympetrum fonscolombei*** (Selys, 1840.) - an extremely rare species; 1 female captured in the grass on the bank of the Stari Begej - Traktor Bara, 19.07.1995.

20. ***Sympetrum meridionale*** (Selys, 1841.) - this species is most numerous on Carska Bara, Perleska Bara, and Traktor Bara. Several males and females, including pairs *in copula*, were captured on almost every fieldtrip in the period from June to the end of September. In 1994, the following specimens were captured: 1 male on the levee of Traktor Bara, 29.06.; 4 males and 2 females on the same site, 03.08.; 24 males and 2 females on the levee and on dried willow, 10.08.; 1 male and 2 females, 31.08.; 14 males and 9 females, 3 pairs *in copula*, on the farm at Tiganjica, 4 males and 14 females, 2 pairs *in copula*, on the meadow by the canal towards Lukino Selo, 07.09.; 8 males and 14 females, 2 pairs *in copula*, 14.09.; 1 male and 4 females 28.09., on which occasion a large number of pairs *in copula* was noted flying. On 19.07.1995 a female was found in the dried reeds along the shore.

21. ***Sympetrum sanquineum*** (O. F. Muler, 1764.) - this is the second most numerous species in the area of Carska Bara and Traktor Bara. In 1994, the collected material was as follows: 2 males and 1 female on the levee, 20.07.;6 males and 4 females, 27.07.; 13 males, 03.08.; 10 males and 1 female, 10.08. On the farm at Tiganjica along the shore of the Stari Begej - Traktor Bara the following specimens were caught: 1

male, 31.08.1994.; 2 males, 14.09.1994.; 2 males in the grass along the shore, 19.07.1995.

22. ***Sympetrum striolatum*** (Charpentier, 1840.) - 1 male caught on the meadow along the levee of Traktor Bara, 27.07.1994; 4 males and 1 female caught in Botoški Rit, 10.08.1994.; 2 males captured on the meadow by the canal towards Lukino Selo, 07.09.1994.; 1 male and 1 female caught along the bank of the Stari Begej - Traktor Bara, 14.09.1994.; 1 female was caught on the same site, 28.09.1994.; and so was, on a dried branch of a willow, 1 juvenile male, 19.07.1995.

23. ***Sympetrum vulgatum*** (Linnaeus, 1758.) - a rare species; a single specimen, male, captured on the meadow by the canal towards Lukino Selo, 07.09.1994.

CONCLUSIONS

In the course of identification of the collected material 23 species of *Odonata* were determined, of which 12 species belonged to the suborder *Zygoptera*; and 11 species belonged to the suborder *Anisoptera*.

We have found 12 species new for the researched area. Those were: *Calopteryx splendens* (Harr.), *C. virgo* (L.), *Lestes viridis* (Van der Linden), *Coenagrion puella* (L.), *Erythromma najas*, *Aeschna isosceles* (Mull.), *A. mixta* (Latrei.), *Anax imperator* (Leach), *Orhetrum cancellatum* (L.), *Sympetrum fonscolombei* (Selys), *S. striolatum* (Charp.), and *S. vulgatum* (L.).

Today, the total number of the species of *Odonata* listed on the researched sites is 27, which represents 48.2 % of the total of 56 species registered in Serbia so far. At the same time, this number represents 79.4 % of the total of 34 species registered in Vojvodina.

The most numerous species in the course of our research were: *Erythromma viridulum*, *Ischnura elegans*, *Sympetrum meridionale*, and *Sympetrum sanguineum*.

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PRVI PREGLED FAUNE *ODONATA* U SPECIJALNOM REZERVATU PRIRODE "STARI BEGEJ - CARSKA BARA"

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I z v o d

U radu su izneti podaci o nalazu 23 vrste *Odonata* u specijalnom rezervatu prirode "Stari Begej - Carska bara". Od toga 12 vrsta su iz podreda *Zygoptera*, a 11 iz podreda *Anisoptera*. 12 vrsta su nove za ispitivano područje: *Calopteryx splendens* (Harr.), *C. virgo* (L.), *Lestes viridis* (Van der Linden), *Coenagrion puella* (L.), *Erythromma najas* (Hansenmann), *Aeschna isosceles* (Mull.), *A. mixta* (Latrei.), *Anax imperator* (Leach), *Orhetrum cancellatum* (L.), *Sympetrum fonscolombei* (Selys), *S. striolatum* (Charp.) i *S. vulgatum* (L.). Ukupan broj nađenih vrsta vilinskih konjica na Carskoj bari je 27. Autori navode da se na ispitivanom području može očekivati još veći diverzitet ove grupe insekata.

UDK: 595: 76(497.11)
Originalni naučni članak

PRILOG POZNAVANJU *COLEOPTERA* U VODAMA KRAGUJEVAČKOG OKRUGA
JUNSKI ASPEKT

SNEŽANA PEŠIĆ

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Pešić Snežana (1995-98): *Contribution to the knouledge of the Coleoptera in the fresh waters in Kragujevac district, june aspect.* - Bulletin of Natural History Museum, Belgrade, *B49-50*, 167-171.

In this paper the part of hydrobiological investigations of fresh waters in Kragujevac district are given. The list of 12 species (7 families) of fresh-water *Coleoptera* is represented.

UVOD

Mada po broju vrsta najbrojniji u klasi, redu *Coleoptera* se ne poklanja adekvatna pažnja u istraživanjima na prostorima Srbije. Ovo se naročito odnosi na predstavnike koji žive u slatkim vodama. Hidrobiološka istraživanja su poslednjih decenija intenzivirana usled povećanog zanimanja za stanje životne sredine i kvalitet voda. To ipak nije bitno promenilo odnos prema pripadnicima reda *Coleoptera*, tako da nema značajnijih rezultata od vremena kada je Maksimović (1958) objavio rezultate istraživanja u okolini Beograda. Naveo je nalaz 28 vrsta *Dytiscidae*, a svoje podatke je uporedio sa rezultatima Košanina (1904) i Matića (1922), koji su i sami prikupljali *Coleoptera* u okolini Beograda. Od 15 vrsta insekata nađenih na području Srbije i jednog dela Hrvatske na biljnoj vrsti *Myriophyllum spicatum*, 6 je tvrdokrilaca iz porodice *Curculionidae* (Lekić & Mihajlović 1970).

U Šumadiji su višekratno vršena hidrološka i hidrobiološka istraživanja, (Stepanović 1972, Karaman & Karaman 1989, Simić *et al.* 1994, 1994*a*, Ostojić *et al.* 1995) ali ni tada nije posvećena posebna

pažnja predstavnicima *Coleoptera*. Verovatno da je jedan od razloga to što one nisu uključene u tablice vrsta bioindikatora, a glavni cilj svih tih istraživanja je bio da se nekom od standardnih metoda odredi kvalitet voda na izabranim punktovima.

Očigledno da je dosadašnje poznavanje sastava i stanja faune *Coleoptera* vodenih staništa u Srbiji sasvim oskudno. Kako je za sagledavanje mesta i uloge ove grupe životinja u prirodi Srbije, neophodno njihovo što bolje poznavanje, ovaj rad je najava detaljnih istraživanja na području centralne Srbije.

Zahvaljujem se kolegama A. OSTOJIĆU i V. SIMIĆU na pomoći prilikom sakupljanja i obrade materijala.

MATERIJAL I METODE RADA

U okviru projekta "Istraživanje voda Kragujevačkog okruga", tokom leta 1993. godine obrađena su 23 punkta na tekućim i stajaćim vodama u srcu Šumadije: reka Lepenica (izvorište, ispod postrojenja za prečišćavanje voda u Cvetojevcu, ušće), reka Uglješnica (područje obraslo drezgom, kod mosta u Petrovcu, ušće), Grošničko jezero, ušće reke Grošnice, Bresnička reka, ušće Kozujevskog potoka (Korman), jezero u Šumaricama (početak, preliv jezera), ušće Jabučke reke (Korman), reka Srebrenica (pre Stragara, ušće), Banjski potok (Banja Voljavča), reka Gruža (preliv, ušće Ribeša), ušće Lipnice u Ribeš, Velika Morava (Batočina), Rača (ispod naselja), reka Ždraljica (Donja Sabanta, ušće).

Izvršeno je jednokratno uzorkovanje i analiza hemijskih parametara i radijacije, kao i hidrobiološka analiza. Uzimanje hidrobioloških uzoraka je podrazumevalo mikrobiološki, makrovegetacijski, ihtiološki, planktonski, bentosni i perifitonski deo.

Coleoptera su, zajedno sa ostalim perifitonskim i bentosnim organizmima, sakupljene 21. i 22. juna. Korišćena je bentosna mrežica i ispiranje bilja i kamenja u kadicama pomoću mekih četkica. Uzorci su odmah fiksirani formaldehidom.

Nakon izdvajanja iz uzoraka, adultne *Coleoptera* su preparirane, a zatim identifikovane do vrsta. Redosled vrsta je dat po I l l i e s u (1967), ali je za određivanje pripadnosti vrsta familijama prihvaćen sistem F r e u d e *et al.* (1965, 1971, 1979).

REZULTATI, DISKUSIJA I ZAKLJUČAK

Laboratorijskom analizom fiksiranog bentosnog i perifitonskog materijala prisustvo adultnih *Coleoptera* je ustanovljeno u uzorcima sa osam punktova. U tabeli 1. dati su osnovni parametri koji ukazuju na neke ekološke karakteristike staništa pogodnih za život *Coleoptera*.

Tab. 1. - *Neki parametri staništa na punktovima gde su pronađeni adulti Coleoptera*
Some habitat parametres on the localities where the *Coleoptera* adults were founded

PUNKT LOCALITY	*t °C*	*pH*	DUBINA DEPTH *cm*	BRZINA SPEED *m/s*	KARAKTER DNA BOTTOM CHARACT.
1. Uglješnica područje drezge	27,0	7,5-8	5 - 10	0,2	kamen, mulj, alge stones, mud, algae
2. Grošnica ušće	24,2	7,0	5 - 10	0,8	mulj, kam.(malo) mud, stones (little)
3. Kozujevski potok, ušće	23,0	7,0	3 - 5	0,4	mulj, sitan kamen mud, dinky stones
4. Banjski potok Banja Voljavča	18,4	7,0	5	0,2	šljunak, kamenje gravel, stones
5. Lipovica ušće	23,5	7,0	2 - 5	mirna	mulj /mud
6. Velika Morava kod Batočine	25,6	7,5	50	brza	šljunak, pesak gravel, sand
7. Rača ispod naselja	27,0	8,5-9	5 - 15	0,2	glina, debeli mulj
8. Ždraljica Donja Sabanta	18,0	7,5	5 - 10	0,2	kamen, mulj(malo) stones, mud (little)

Identifikacijom 16 sakupljenih jedinki ustanovljeno je 12 vrsta iz 12 rodova i 7 familija *Coleoptera.*

Subordo *ADEPHAGA*

Fam. *GYRINIDAE*

1. ***Gyrinus substriatus*** Stephens - 1 jedinka, Ždraljica (D. Sabanta);

Fam. *DYTISCIDAE*

1. ***Scarodytes halensis*** (F.) - 1 jed., Lipovica ušće;
2. ***Platambus maculatus*** v. ***inornatus*** Schillsky - 1 jed., Uglješnica (drezga);
3. ***Agabus bipustulatus*** (L.) - 1 jed., Lipovica ušće;

Fam. *HYDRAENIDAE*

1. ***Hydraena gracilis*** Germ. - 1 jed., Uglješnica (drezga);
2. ***Ochthebius foveolatus*** Germ. - 1. jed., V. Morava;
3. ***Helophorus guttulus*** ssp. ***brevipalpis*** Bedel - 1 jed., Lipovica ušće; 2 jed., Kozujevski potok;

Fam. *SPERCHEIDAE*

1. ***Spercheus emarginatus*** (Schall.) - 1. jed., Rača;

Fam. *HYDROPHILIDAE*

1. ***Laccobius minutus*** (L.) - 1 jed., Kozujevski potok;

Fam. *DRYOPIDAE*

1. ***Helichus substriatus*** (Müller) - 3 jed., Banja Voljavča;
2. ***Elmis reitscheli*** Steffan - 1 jed., Grošnica ušće;

Fam. *CHRYSOMELIDAE*

1. ***Ochrosis ventralis*** (Ill.) - 1 jed., Ždraljica (D. Sabanta).

Činjenica da je u uzorku od svega 16 primeraka (sakupljenih na samo 8 punktova) ustanovljeno 12 vrsta, ukazuje da se u ovom području može očekivati veoma raznovrsna fauna *Coleoptera*. Sve vrste, izuzev *Ochrosis ventralis* koja se vezuje za biljku *Solanum dulcamara*, a koja raste i na obalama reka, su pravi vodeni insekti.

Kvalitet voda (određen na osnovu drugih bioindikatorskih grupa) u kojima su vrste pronađene pripada II i III klasi, odnosno po rednim brojevima u tabeli 1, punktovi 3, 4, 6, 8 - II, 1, 2, 7 - III, dok je 5 na prelazu između ovih dveju kategorija vode (S i m i ć *et al.* 1994).

Buduća istraživanja treba da pokažu ne samo faunistički sastav, već i brojnost i rasprostranjenje pojedinih vrsta *Coleoptera*. Na osnovu tih podataka moglo bi se pristupiti ekološkim i zoogeografskim istraživanjima. Na osnovu poznavanja sastava, osobina i ponašanja pripadnika faune, možda će se pokazati opravdanim da se vodene *Coleoptera* uključe u liste bioindikatora stanja voda, čime bi rezultati istraživanja dobili i praktičan značaj.

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CONTRIBUTION TO THE KNOWLEDGE OF *COLEOPTERA* IN THE FRESH WATERS IN KRAGUJEVAC DISTRICT

JUNE ASPECT

SNEŽANA PEŠIĆ

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Summary

The fresh-water *Coleoptera* fauna in Serbia is known ansufficiently.

This is the first step of such investigations in Šumadija. In the June 21 and 22, 1993, the bental and perifitonal material on 23 places was collected. The adult-*Coleoptera* (16 specimens) in the 8 samples were founded. The short list of habitat parametres for the each "positive" locality is given (Tab. 1).

The founded *Coleoptera* from 12 species (7 families) are: *Gyrinidae*: *Gyrinus substriatus* Steph.; *Dytiscidae*: *Scarodytes halensis* (F.), *Platambus maculatus v. inornatus* Schillsky, *Agabus bipustulatus* (L.): *Hydraenidae*: *Hydraena gracilis* Germ., *Ochthebius foveolatus* Germ., *Helophorus guttulus ssp. brevipalpis* Bedel; *Spercheidae*: *Spercheus emarginatus* (Schall.); *Hydrophilidae*: *Loccobius minutus* (L.); *Dryopidae*: *Helichus substriatus* (Müller), *Elmis reitscheli* Steffan; *Chrysomelidae*: *Ochrosis ventralis* (Ill.). Only the last species is not real aquatic *Coleoptera*, but lives on the plant of *Solanum dulcamara* near streams.

After the serious ecological investigations the fresh-water *Coleoptera* possibly could be includedin the list of bioindicators.

UDK: 595.773(497.1)
Original scientific paper

GENUS *EUMERUS* MEIGEN 1822 (*DIPTERA: SYRPHIDAE*) IN AREA OF FORMER YUGOSLAVIA

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Vujić, A., Šimić Smiljka (1995-98): *Genus Eumerus Meigen 1822 (Diptera: Syrphidae) in area of former Yugoslavia.*- Bulletin of Natural History Museum, Belgrade, *B49-50*, 173-190.

The paper presents data for 21 species of genus *Eumerus* recorded in area of former Yugoslavia - records, distribution, male genitalia illustrations, redeterminations and incorrect identifications. Six species, *E. clavatus* Beck. (Croatia, Serbia), *E. elaverensis* Seguy (Macedonia), *E. richteri* Stack. (Serbia), *E. sulcitibius* Rond. (Montenegro), *E. tarsalis* Loew (Croatia, Montenegro) and *E. tauricus* Stack. (Serbia), are recorded for the first time on the Balkan Peninsula.

INTRODUCTION

A complex faunistic and zoogeographical investigations of hoverflies fauna on the territory of former Yugoslavia was resulted in a great number of collected specimens of the genus *Eumerus*. A significant number of taxa, not known for this area before, have been determined. Published and unpublished collections of Institute of Biology, Novi Sad and Museums of Natural History (Beograd, Sarajevo, Zagreb, Ljubljana) which contain the samples from investigated area have been examined. Redetermination of museum material has made possible the verification of literature data of the species investigated. After finishing the study of material, data have been systematized including a survey of recorded species, incorrect determinations have been mentioned and the records of established species have been presented. On the basis of museum material one new species has been described (Šimić & Vujić 1996).

GENUS *EUMERUS*

Genus *Eumerus* presents a well defined taxon, exceptionally rich in species. This is one of the largest hoverflies genera in the Plaearctic region, with 140 species listed by P e c k (1988). In other biogeographical areas a number of species is significantly smaller, about 40 species in Oriental region, about 10 in Australian and more than 30 in Paleotropical region. On the American continent there are only few introductory species (S t a c k e l b e r g 1961).

Species of the genus *Eumerus* are developed in tissues of bulbaceous plants (*Liliaceae*, *Orobanchaceae*). It has been assumed that this type of phytophagia originates from Mediterranean within the group of coprophagous ancestral form (V u j i ć & G l u m a c 1993). This is also proved by the similarity in morphology of species of tribe *Eumerini* (genera *Eumerus* and *Merodon*) with the recent Mediterranean coprophagae, genera *Tropidia* and *Syritta*, as well as by the possibility that larvae of these genera develop in bulbaceous plants. Phenomenon of monophagia and oligophagia probably explains an extremely high speciation within the genus *Eumerus*.

According to literature data 18 species have been recorded for the territory of former Yugoslavia (G l u m a c 1972, Š i m i ć 1987, V u j i ć & Š i m i ć 1994, V u j i ć & G l u m a c 1994). *Eumerus* is the third-largest genus in this region. More numerous are genera *Cheilosia* and *Merodon*.

MATERIAL AND METHODS

A total of 312 samples (190 males and 122 females) from the collections of Institute of Biology, Novi Sad (NS), Land Museum of Bosnia and Herzegovina, Sarajevo (SAR), Natural History Museums from Belgrade (BEO), Skopje (SKO), Zagreb (ZAG) and Ljubljana (LJU) was examined. The following published collections: S t r o b l (1898), L a n g h o f f e r (1917-1923), G l u m a c (1955, 1956, 1956a, 1959, 1968), Š i m i ć (1987), V u j i ć & Š i m i ć (1994), V u j i ć & G l u m a c (1994) were checked. A large unpublished material kept within these Museums has also been analyzed. In this way, a great part of the material collected in investigated area during the past 100 years has been included.

Determination have been carried out in accordance with the keys, S a c k (1932) and S t a c k e l b e r g (1961), while the names of species and ranges have been presented after the catalogue of Palaearctic hoverflies (P e c k 1988). Male genitalia drawings for 20 species have been presented. Hypopygium preparations have been made by use of standard procedure.

Within the species survey there are data about its findings recorded on the territory of former Yugoslavia with UTM designation for localities and with the abbreviations of the administrative regions according H o l l i s & B r u m m i t t (1992): Slovenia (YUG-SL), Croatia (YUG-CR), Bosnia and Herzegovina (YUG-BH), Montenegro (YUG-MO), Serbia (YUG-SR) and

Macedonia (YUG-MA). There is also the name abbreviations of the institute collection (NS) or museum (BEO, SAR, ZAG, LJU, SKO), where each sample (male: m, female: f) is kept, date, legator (leg.) and determiner (det.). In case of incorrect determination, a name written on a label under the sample, is given. Unpublished material is included into the part named "New records". Published material is cited together with the paper data (name of authors and date). The type of range is defined according to the catalogue of Palaearctic hoverflies (P e c k 1988). The distribution on the Balkan Peninsula was supplemented by a data from Palaearctic catalogue for Bulgaria (BG) and Greece (GR). In case when in the Yugoslav catalogue (G l u m a c 1972) there is a republic for which the records could not have been checked and confirmed, the name is within the parentheses.

RESULTS AND DISCUSSION

Twenty one species of the genus have been registered for the investigated area. Male and female samples have been stated for 19 species. With two species, *E. ovatus* Loew (one female in LANGHOFFER's collection, ZAG) and *E. tauricus* Stack. (one female in collection of GLUMAC, BEO) there have been only female specimens. The structure of male genitalia has proved to be a valuable character for species separation and determination. However, mostly thanks to the structure of male genitalia *E. consimilis* has been recognized as a new species (Š i m i ć & V u j i ć 1996).

This paper does not analyzed the species *E. claripennis*, described by C o e (1957), from Macedonia. Type material is in London, and additional investigations have not resulted in recording of new samples from the type locality. The validity of this taxon should be examined by the checking of holotype (this one has been the only one registered sample of this species so far).

SPECIES OF GENUS *EUMERUS* IN THE INVESTIGATED AREA

1. ***Eumerus amoenus*** Loew, 1848 (Fig. 2d, Fig. 5f)

Distribution: Mediterranean, Central Asia; Balkan Peninsula: YUG-CR, YUG-MO, YUG-SR, (YUG-MA); GR.

Published records: NS: Š i m i ć (1987): YUG-MO (Skadarsko Jezero: Gornja Gorica CN50 4.07.1983. 1m 1f leg. and det. Šimić; Virpazar CM47 13.07.1983. 1m leg. and det. Šimić); V u j i ć & Š i m i ć (1994): YUG-SR (Vršačke Planine: Gudurica ER30 8.06.1983. 1f leg. and det. Vujić; Misa EQ29 12.05.1985. 5m 4f leg. and det. Vujić; 19.05.1985. 1m leg. and det. Vujić; Prevala EQ29 31.05.1985. 1f leg. and det. Vujić). ZAG: L a n g h o f f e r (1917--1923): YUG-CR (Sušak 12.04.1887. 2m leg. and det. Langhoffer; 25.04.1888. 1m leg. and det. Langhoffer; 29.06.1987. 1m leg. and det. Langoffer: *E. ruficornis*; Senj 11.05.1889. 1m leg. and det. Langhoffer: *E. lunulatus*; Vinodol 14.04.1897. 1f leg. and det. Langhoffer: *E. lunulatus*; Zagreb 2/3.09.1895. 2f *E. lunulatus*).

New records: NS: YUG-CR (Trogir XJ01 07/08.1978. 9m 1f leg. Nonveiller; Hvar 1-20.08.1981. 1f leg. Šimić; Slano YH34 1f leg. Šimić; Benkovac WJ47 19.05.1991. 1f leg. Stolić); YUG-MO (Boka Kotorska CN00 5.05.1991. 12m 6f leg. Radnović, Stolić, Šimić and Vujić; 12.05.1991. 7m 2f leg. Šimić and Vujić; 15.06.1991. 1m leg. Vujić); YUG-SR (Obedska Bara: Debela Gora DQ25 2.07.1988. 1f leg. Vujić; 15.04.1990. 1m 2f leg. Milankov and Vujić; Deliblatska Peščara EQ06 21.04.1989. 1m leg. Vujić; Bagremara 13.07.1981. 1f leg. Šimić; Srbobran 1.09.1981. 1f leg. Šimić; Juhor EP15 8/14.07.1984. 2f leg. Radnović). BEO: YUG-CR (Umag UL83 5.06.1955. 1m leg. Glumac). SAR: YUG-CR (Krapina WM61 2m 4f leg. Hensch).

The widest distributed species of genus on the Balkan Peninsula. *E. amoenus* is characteristic species of Mediterranean, Pannonian and sub-Pannonian areas.

2. ***Eumerus argyropus*** Loew, 1848 (Fig. 1b)

Distribution: South Europe; Balkan Peninsula: YUG-CR, YUG-MO, YUG-SR; BG, GR.

Published records: BEO: G l u m a c (1956): YUG-CR (Umag UL83 5.06.1955 1m 31.07.1955. leg. and det. Glumac); G l u m a c (1956a): YUG--MO (Dobrota CN10 13.06.1956. 1m leg. and det. Glumac).

New records: NS: YUG-SR (Vršačke Planine: Mesić EQ29 8.06.1994. 2m leg. Vujić); SAR: YUG-CR (Krapina WM61 2m leg. Hensch).

First record for: YUG-SR.

The samples of this species were found in the previous museum material, mostly collected in Mediterranean, and in Pannonian plain.

3. ***Eumerus basalis*** Loew, 1848 (Fig. 4d)

Distribution: Mediterranean; Balkan Peninsula: YUG-CR, YUG-MO, YUG-SR; BG, GR.

Published records: NS: V u j i ć & G l u m a c (1994): YUG-SR (Fruška Gora: Petrovaradinski Rit DR10 2.05.1986. 1f leg. Radišić, det. Vujić). BEO: G l u m a c (1956a): YUG-CR (Dubrovnik BN62: Ombla 3.08.1956. 1m leg. and det. Glumac). ZAG: L a n g h o f f e r (1917-1923): YUG-CR (Senj 2.06.1889. 1m leg. and det. Langhoffer: *E. ruficornis*).

New records: NS: YUG-MO (Boka Kotorska CN00 5.05.1991. 1m leg. Vujić). BEO: YUG-CR (Umag UL83 8.7.1955 1m leg. Glumac; 1.10.1956. 1m leg. and det. Glumac; Ragusa 3.08.1956. 1m leg. Glumac).

First records for: YUG-MO.

E. basalis was recorded beside the Adriatic coast, also on localities in Pannonian basin (Obedska Bara, Petrovaradinski Rit).

4. ***Eumerus clavatus*** Becker, 1921 (Fig. 2c)

Distribution: East Europe, Mediterranean; Balkan Peninsula: YUG-CR, YUG-SR.

Published records: BEO: G l u m a c (1955): YUG-SR (Avala 24.07.1954. 1m leg. and det. Glumac: *E. ornatus*). ZAG: L a n g h o f f e r

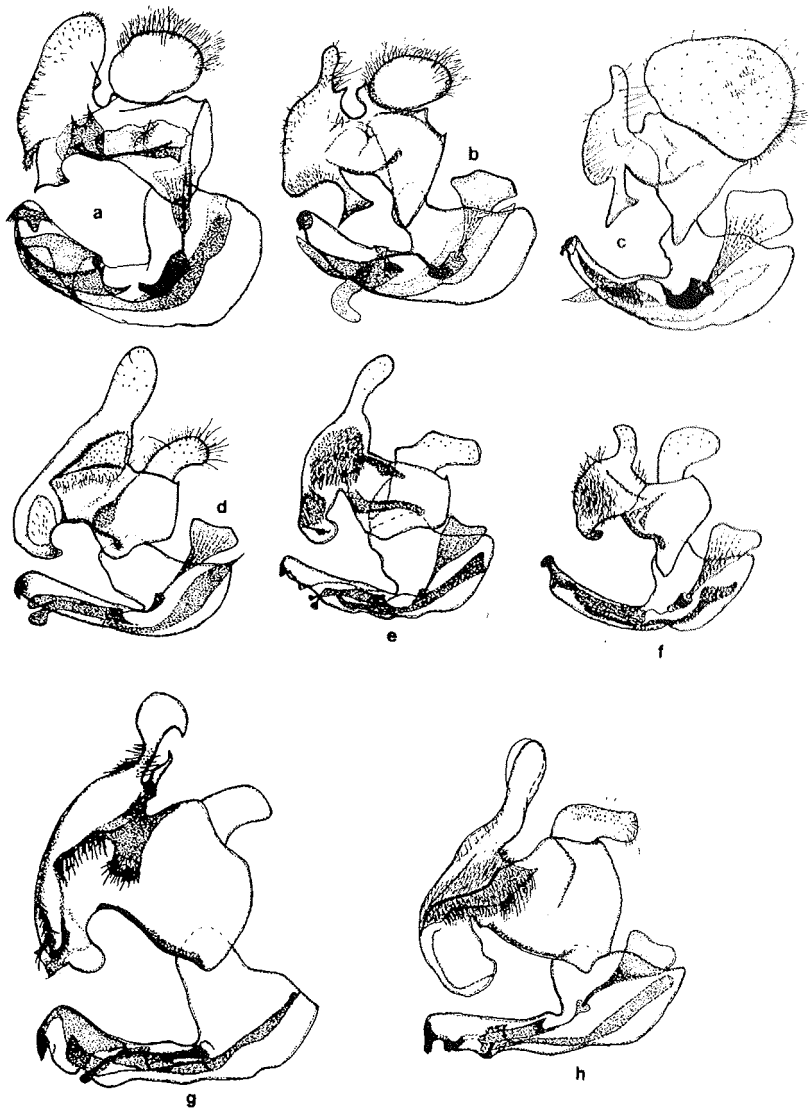

Fig. 1.- Male genitalia (lateral view): a) *Eumerus flavitarsis*; b) *E. argyropus*; c) *E. ornatus*; d) *E. tuberculatus*; e) *E. sogdianus*; f) *E. pulchellus*; g) *E. strigatus*; h) *E. consimilis*.
Građa genitalnog aparata mužjaka (bočno).

(1917-1923): YUG-CR (Draga 2.07.1887. 1f leg. and det. Langhoffer: *E. amoenus*; Bakar 16.05.1888. 1f leg. and det. Langhoffer: *E. amoenus*; Bakar 23.08.1898. 1f leg. and det. Langhoffer: *E. lunulatus*).

New records: NS: YUG-SR (Malinik: Klisura Lazareve reke EP77 8.07.1989. 2m 1f leg. Radnović and Vujić; Svrljiške Planine: Beloinje EP90 12.07.1989. 1m leg. Milankov, Radnović and Radović). BEO: YUG-CR (Dubrovnik BN62: Ombla 1f leg. Glumac).

First records for: Balkan Peninsula, YUG-CR, YUG-SR.

Species with narrow range, which extends from Central and East Russia, over the Romania and Balkan Peninsula to the Tunisia.

5. ***Eumerus consimilis*** Šimić et Vujić, 1996 (Fig. 1h, Fig. 5d)

Distribution: Balkan Peninsula: YUG-CR.

Published records: BEO: Glumac (1956): YUG-CR (Kopar 11.5.1955. 1m leg. and det. Glumac: *E. strigatus*). ZAG: Langhoffer (1917-1923): YUG-CR (Orehovica 10.05.1887. 1m leg. and det. Langhoffer: *E. lunulatus*; ŠKorinje 6.08.1887. 1m leg. and det. Langhoffer: *E. lunulatus*).

E. consimilis has been described on the basis of old museum material. The known records are connected with the north-west part of Adriatic coast.

6. ***Eumerus elaverensis*** Seguy, 1961 (Fig. 4e, Fig. 6)

Distribution: South Europe; Balkan Peninsula: YUG-MA.

New records: SKO: YUG-MA (Oteševo 29.08.1959. 1m leg. and det. Glumac: *E. pulchellus*).

First record for: Balkan Peninsula, YUG-MA.

The species has been found in the collection of Natural History Museum, Skopje. *E. elaverensis* was described from the France and Pyrenees (Seguy 1961). The record from Macedonia is the first one after the description.

7. ***Eumerus flavitarsis*** Zetterstedt, 1843 (Fig. 1a)

Distribution: Europe, Siberia; Balkan Peninsula: YUG-SL, YUG-SR, (YUG-MA?).

New records: NS: YUG-SR (Begej DR51 23.05.1990. 1m leg. Šimić; Grmija 11.07.1984. 1f leg. Jakšić). LJU: YUG-SL (Travnik hillside 5.08.1974. 1f leg. Sivec).

First records for: YUG-SL, YUG-SR.

Rare species on the Balkan Peninsula registered in the continental parts. Record from Macedonia (Glumac 1968) is under the question because GLUMAC quoted the morphological deviations of collected samples from the original description.

8. ***Eumerus grandis*** Meigen, 1822 (Fig. 4b)

syn. *E. annulatus* (Panzer, 1798)/

Distribution: Palaearctic; Balkan Peninsula: YUG-MO.

Published records: NS: Šimić (1987): YUG-MO (Durmitor: Kanjon Sušice CN38 24.08.1984. 1m 1f leg. Vujić, det. Šimić: *E. annulatus*).

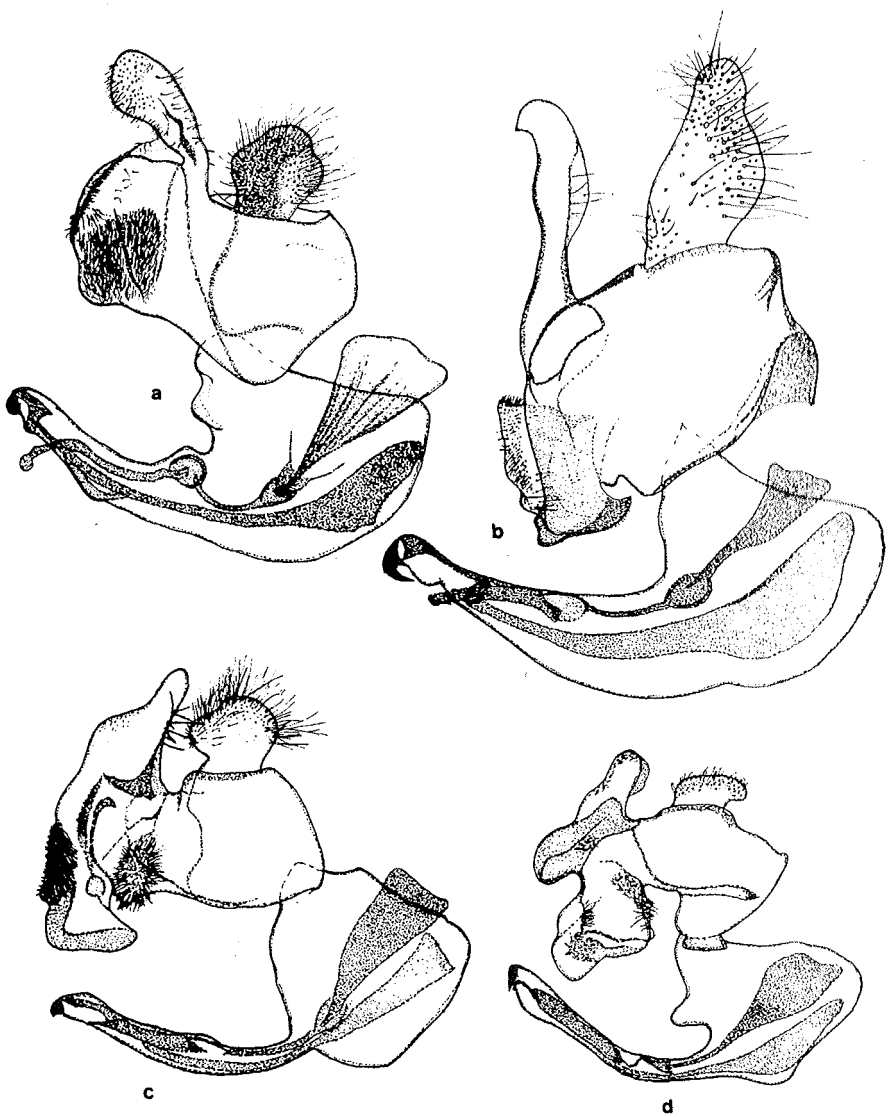

Fig. 2.- Male genitalia (lateral view): a) *Eumerus richteri*; b) *E. olivaceus*; c) *E. clavatus*; d) *E. amoenus*.

Građa genitalnog aparata mužjaka (bočno).

New records: NS: YUG-MO (Durmitor: Skakala CN38 7.07.1992. 1m leg. Vujić).

Within the large range, from Finland to Spain and from France to Chine, only few records of this species are known. On the Balkan Peninsula *E. grandis* was found only on Durmitor mountain (Kanjon Sušice: 1300 *m*).

9. ***Eumerus olivaceus*** Loew, 1848 (Fig. 2b)

Distribution: South Europe; Balkan Peninsula: YUG-MO, YUG-SR, YUG-MA; BG.

Published records: NS: Šimić (1987): YUG-MO (Durmitor: Aluge CN58 26.06.1985. 2m leg. Vujić, det. Šimić; Kanjon Tare CN58 25.06.1983. 1m leg. Aleksić and Vujić, det. Šimić).

New records: NS: YUG-MO (Kanjon Morače CN62 4.04.1990. 1m leg. Vujić); YUG-SR (Šar-Planina: Ošljak DM97 29.06.1988. 2m leg. Vujić); YUG--MA (Mavrovo 27.08.1966. 1m leg. Glumac).

First records for: YUG-SR.

The species is registered in few South European countries (Spain, France, Italy, Bulgaria), at the high altitudes.

10. ***Eumerus ornatus*** Meigen, 1822 (Fig. 1c, Fig. 5a)

Distribution: West Palaearctic; Balkan Peninsula: YUG-CR, YUG-BH, YUG-MO, YUG-SR, (YUG-MA).

Published records: NS: Šimić (1987): YUG-MO (Durmitor: Kanjon Tare CN58 25.06.1983. 3m 6f leg. Aleksić and Vujić, det. Šimić); Vujić & Šimić (1994): YUG-SR (Vršačke Planine: Široko Bilo EQ29 9.06.1983. 1f leg. and det. Vujić: *E. lucidus*, 26.05.1985. 1m leg. and det. Vujić; Prevala EQ29 22.06.1984. 1m leg. Šimić, det. Vujić; Vršački Rit EQ29 22.07.1983. 1f leg. and det. Vujić; Mesić EQ39 3.06.1984. 1f leg. Šimić, det. Vujić; Fiseš EQ39 21.06.1984. 1f leg. Šimić, det. Vujić; Markovac ER30 26.05.1986. 1f leg. and det. Vujić); Vujić & Glumac (1994): YUG-SR (Fruška Gora: Ležimir CQ89 27.05.1981. 1f leg. Šimić det. Vujić; Andrevlje CR90 30.05.1988. 1m leg. Radnović and Vujić det. Vujić). ZAG: Langhoffer (1917-1923): YUG--CR (Zagreb 29.08.1886. 1f leg. and det. Langhoffer).

New records: NS: YUG-CR (Hvar 1/20.08.1981. 1f leg. Šimić). YUG-BH (Konjuh CQ00 30.07.1989. 1m leg. Radović and Vujić) YUG-SR (Obedska Bara: Debela Gora DQ25 21/27.06.1987. 1m leg. Radnović and Vujić; Potisje: Bačko Gradište DR24 13.08.1985. 1f leg. Šimić and Vujić; Kučajske Planine EP46 24/26.07.1986. 2m leg. Radnović; Malinik: Klisura Lazareve Reke EP77 07.1985. 2m 2f leg. Radišić; Tara: Rača CP86 22.07.1985. 1m leg. Radnović; Šar-Planina: Beli Drim DM67 22.07.1986. 1f leg. Vujić).

First records for: YUG-BH.

E. ornatus is one of the widest distributed species in investigated area, at the altitudes to the 1000 m.

11. ***Eumerus ovatus*** Loew, 1848 (Fig. 4f)

Distribution: Central and South Europe; Balkan Peninsula: YUG-BH.

Published records: SAR: S t r o b l (1898): YUG-BH (Derventa YK28 1f leg. Hilf det. Strobl).

The record from S t r o b l (1898) has been confirmed on the basis of museum material from Sarajevo.

12. ***Eumerus pulchellus*** Loew, 1848 (Fig. 1f)

Distribution: Mediterranean; Balkan Peninsula: (YUG-CR), YUG--MO; GR.

Published records: NS: Š i m i ć (1987): YUG-MO (Skadarsko Jezero: Vranjina CM48 2m leg. and det. Šimić).

New records: NS: YUG-MO (Skadarsko Jezero: Vranjina CM48 3m 2f leg. Šimić).

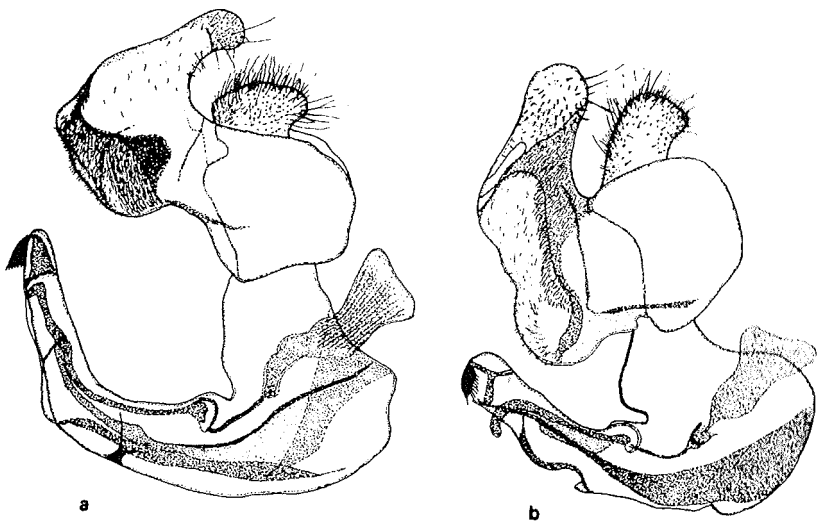

Fig. 3.- Male genitalia (lateral view): a) *Eumerus tarsalis*; b) *E. tricolor*.
Građa genitalnog aparata mužjaka (bočno).

E. pulchellus has the range in narrow belt of Mediterranean. The species was cited (G l u m a c 1972) for several localities from investigated area, but only the findings from Skadar Lake have been confirmed.

13. ***Eumerus richteri*** Stackelberg, 1960 (Fig. 2a)

Distribution: Caucasus, Carpathians; Balkan Peninsula: YUG-SR.

New records: NS: YUG-SR (Malinik: Klisura Lazareve Reke 13.07.1985. 2m 11f leg. Radišić, 8.07.1989. 3m 5f leg. Radnović and Vujić; Svrljiški Timok EP91 13.07.1989. 1f leg. Radnović).

First records for: Balkan Peninsula, YUG-SR.

S t a c k e l b e r g (1960) described this species from the Transcaucasus, and records from East Serbia are the first besides primary distribution. *E. richteri* has been found in the gorges of low Karpathians mountains (Malinik and Dubašnica) and Moesian foothills (Svrljiške Planine).

14. ***Eumerus sinuatus*** Loew, 1855 (Fig. 4a)

Distribution: Central Europe, Siberia; Balkan Peninsula YUG-SR.

Published records: NS: V u j i ć & Š i m i ć (1994): YUG-SR (Vršačke Planine: Prevala EQ29 24.05.1985. 1m 1f leg. and det. Vujić); V u j i ć & G l u m a c (1994): YUG-SR (Fruška Gora: Glavica DR00 18.05.1988. 1m leg. and det. Vujić, 20.05.1989. 1m leg. and det. Vujić).

E. sinuatus is known from two Central European countries (Switzerland and Austria), Kazakhstan and West Siberia. In investigated area this species has been recorded only on two Pannonian mountains (Vršačke Planine and Fruška Gora).

15. ***Eumerus sogdianus*** Stackelberg, 1952 (Fig. 1e, Fig. 5e)

Distribution: Central Europe, Central Asia; Balkan Peninsula: YUG--CR, YUG-BH, YUG-SR, YUG-MA.

Published records: NS: V u j i ć & G l u m a c (1994): YUG-SR (Fruška Gora: Mutalj CQ99 7.08.1982. 1f leg. and det. Vujić, Sremska Kamenica DR00 25.06.1982. 1f leg. Ercegovac, det. Vujić). BEO: G l u m a c (1956): YUG-CR (Kopar 20.06.1955. 12m leg. and det. Glumac: *E. strigatus*);

New records: NS: YUG-BH (Hutovo blato 1.06.1990. 1f leg. Šimić); YUG-SR (Koviljski Rit DR20 19.04.1989. 1m leg. Vujić; Potisje: Ada DR37 13.08.1985. 1f leg. Šimić, Fruška Gora: 1987. 1m 1f leg. Grbić; Carska Bara DR51 9.07.1985. 1m 1f leg. Šimić and Vujić, Padej DR37 29.05.1985. 2f leg. Šimić and Vujić, Titelski Breg DR40 28.05.1985. 1f leg. Šimić and Vujić; Svetozar Miletić 23.07.1984. 1m leg. Radišić; Deliblatska Peščara EQ06 21.04.1989. 1m leg. Vujić; Bački Monoštor 23.07.1984. 1f leg. Šimić; Malinik: Klisura Lazareve Reke EP77 31.04.1989. 1m leg. Vujić; Stara Planina: Dojkinačka Reka FN48 30.05.1988. 1m leg. Ercegovac and Vujić); YUG-MA (Baba EL14 17.06.1990. 1f leg. Radnović and Vujić).

First records for: YUG-CR, YUG-BH, YUG-MA.

The species is frequent in Pannonian lowlands, besides the rivers and marshes. On the Balkan mountains *E. sogdianus* has been found near the rivers and in the gorges.

16. ***Eumerus strigatus*** (Fallen, 1817) (Fig. 1g, Fig. 5c)

Distribution: Palaearctic; Balkan Peninsula: YUG-CR, YUG-BH, YUG--MO, YUG-SR, (YUG-MA); BG.

Published records: NS: V u j i ć & Š i m i ć (1994): YUG-SR (Vršačke Planine: Gudurica ER30 21.07.1983. 1m 1f leg. and det. Vujić; Misa EQ29 19.05.1985. 1f leg. and det. Vujić). ZAG: L a n g h o f f e r (1917-1923): YUG-CR (Zagreb 12.10.1886. 1f leg. and det. Langhoffer: *E. lunulatus*; 5.04.1896. 1m leg. and det. Langhoffer: *E. lunulatus*; Božjakovina 6.05.1897. 3m 3f leg. and det. Langhoffer: *E. lunulatus*; Bakar 27.07.1887. 1f leg. and det. Langhoffer: *E. lunulatus*).

New records: NS: YUG-MO (Bar-Kotor CM19 22.02.1990. 1f leg. Vujić; Rumija CM56 5.04.1990. 1f leg. Vujić); YUG-SR (Deliblatska Peščara: Alibu

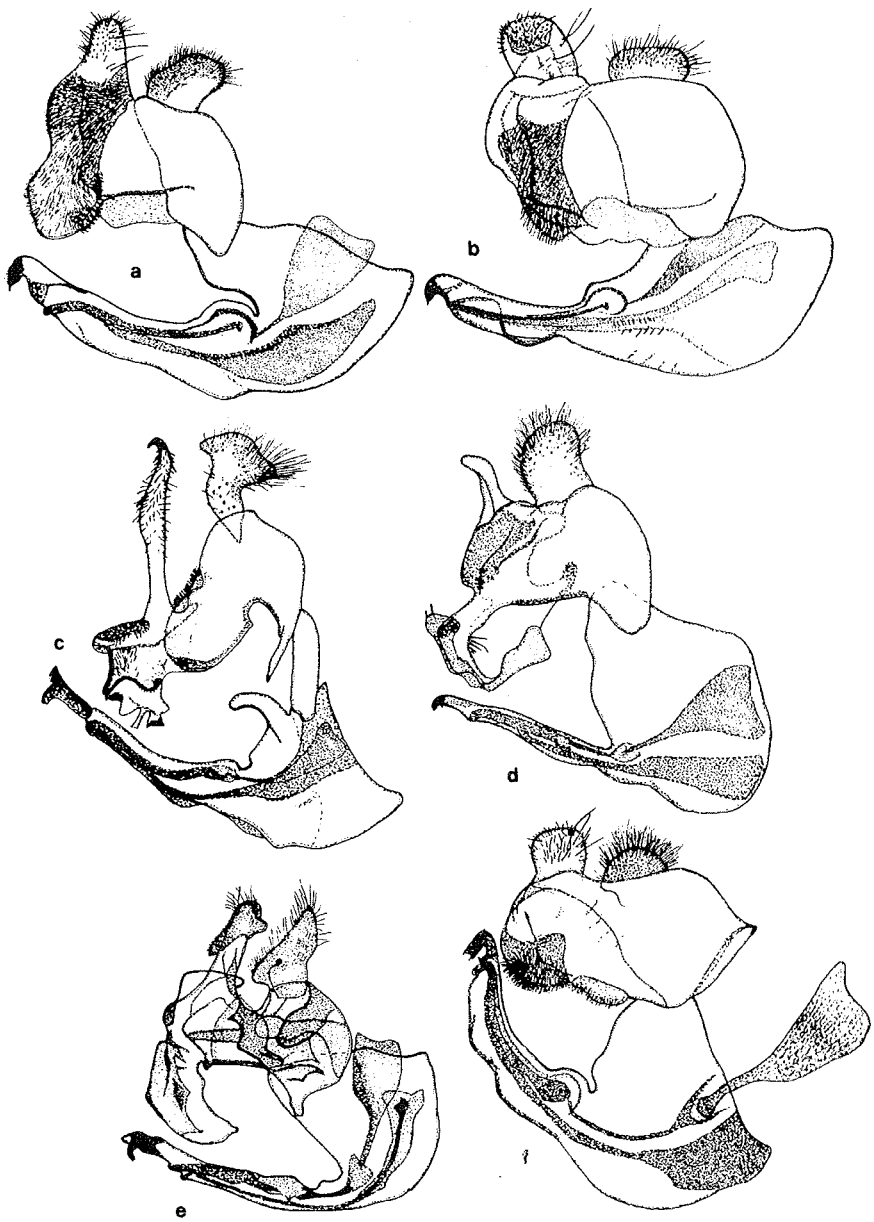

Fig. 4 - Male genitalia (lateral view): a) *Eumerus sinuatus*; b) *E. grandis* c) *E. sulcitibius*; d) *E. basalis*; e) *E. elaverensis*; f) *E. ovatus*.

Građa genitalnog aparata mužjaka (bočno).

nar DQ99 2.06.1987. 1m 1f leg. Šimić and Vujić, Lovište EQ16 26.08.1982. 1m leg. Vujić; Batajnica 6.07.1980. 1m; Kučajske Planine EP46 29.07.1986. 3f leg. Radnović; Zaječar FP06 10/20.07.1978. 1m leg. Nonveiller; Kokin Brod DP01 11.08.1982. 1m leg. Božičić; Kopaonik: Samokovska Reka 21.06.1991. 1f leg. Vujić). SAR: YUG-BH (Vrelo Bosne BP95 1914. 1m leg. Apfelbeck; Mojmilo 1912. 1m leg. Winneguth).

First records for: YUG-BH.

E. strigatus is widely distributed species in investigated area, especially in Mediterranean, Pannonian lowlands and foothills.

17. ***Eumerus sulcitibius*** Rondani,1868 (Fig. 4c)

Distribution: Pontic-Adriatic; Balkan Peninsula: YUG-MO.

New records: NS: YUG-MO (Boka Kotorska CN00 12.05.1991. 1m leg. Vujić).

First records for: Balkan Peninsula, YUG-MO.

E. sulcitibius has been registered on few localities along the Adriatic and Black Sea.

18. ***Eumerus tarsalis*** Loew,1848 (Fig. 3a)

Distribution: South Palaearctic; Balkan Peninsula: YUG-CR, YUG-MO.

Published records: ZAG: L a n g h o f f e r (1917-1923): YUG-CR (Zakalj 23.05.1888. 1m leg. and det. Langhoffer: *E. sabulonum*).

New records: NS: YUG-MO (Durmitor: Kanjon Sušice CN38 9.07.1991. 2m leg. Radnović; Boka Kotorska CN00 15.06.1991. 1m leg. Vujić).

First records for: Balkan Peninsula, YUG-CR, YUG-MO.

E. tarsalis is very rare in the investigated area. The species has been recorded at the different altitudes (0-1200 *m*).

19. ***Eumerus tauricus*** (Stackelberg, 1952)

Distribution: Pontic-Dacian; Balkan Peninsula: YUG-SR.

Published records: BEO: G l u m a c (1955): YUG-SR (Deliblatska Peščara: Rasadnik 13.06.1954. 1f leg. and det. Glumac: *E. sabulonum*).

First records for: Balkan Peninsula, YUG-SR.

The species is described from Crimea (S t a c k e l b e r g 1952). The finding from Serbia (Deliblatska Peščara) is the first one besides the type locality.

20. ***Eumerus tricolor*** (Fabricius,1798) (Fig. 3b)

Distribution: Central Europe, Central Asia; Balkan peninsula: YUG--CR, YUG-MO, YUG-SR, (YUG-MA); BG.

Published records: NS: Š i m i ć (1987): YUG-MO (Durmitor: Kanjon Tare CN48 21.06.1983. 8m leg. Aleksić and Vujić, det. Šimić, CN58 25.06.1983. 3m leg. Aleksić and Vujić, det. Šimić, Mala Crna Gora CN38 8m 2f 8.07.1983. leg. Aleksić, Šimić and Vujić, det. Šimić, Aluge CN58 26.06.1985. 1m leg. Vujić, det. Šimić, Vrela CN58 26.06.1983. 1f leg. Vujić, det. Šimić, Kanjon Sušice CN38 8.07.1983. 1f leg. Vujić, det. Šimić); V u j i ć & Š i m i ć (1994): YUG--SR (Vršačke Planine: Markovac ER30 13.05.1983. 1m leg. and det. Vujić; 22.06.1984. 1f leg. Šimić, det. Vujić); V u j i ć & G l u m a c (1994): YUG-SR

(Fruška Gora: Petrovaradinski Rit DR10 30.06.1985. 1m leg. Radišić, det. Vujić). BEO: Glumac (1959): YUG-SR (Fruška Gora: Paragovo DR00 25.08.1957. 1f leg. and det. Glumac); ZAG: Langhoffer (1917-1923): YUG-CR (Lapača 1.05.1887. 1f leg. and det. Langhoffer; Stonetić 28.06.1897. 1m leg. and det. Langhoffer).

New records: NS: YUG-SR (Deliblatska Peščara: Alibunar DQ99 2.06.1987. 1m 2f leg. Šimić and Vujić, 8.06.1988. 1m).

In investigated area *E. tricolor* is distributed in Pannonian and sub-Pannonian area, as well as on Durmitor.

21. ***Eumerus tuberculatus*** Rondani,1857 (Fig. 1d, Fig. 5b)

Distribution: Europe, Siberia; Balkan Peninsula: YUG-CR, YUG-BH, YUG-MO, YUG-SR, YUG-MA.

Published records: NS: Šimić (1987): YUG-MO (Skadarsko Jezero: Plavnica CM58 11.05.1982. 5m leg. and det. Šimić); Vujić & Glumac (1994): YUG-SR (Fruška Gora: Petrovaradinski Rit DR10 23.05.1985. 1m leg. Radišić, det. Vujić; 1.05.1986. 1m leg. Radišić, det. Vujić). ZAG: Langhoffer (1917-1923): YUG-CR (Zagreb 5.09.1896. 1m leg. and det. Langhoffer: *E. lunulatus*; Božjakovina 6.05.1897. 1m leg. and det. Langhoffer: *E. lunulatus*).

New records: NS: YUG-MO (Tivat 1.09.1983. 1m; Skadarsko Jezero: Plavnica CM58 11.05.1982. 4m 1f leg. Šimić; Durmitor: Mlinski Potok CN48 29.08.1983. 1m leg. Vuković) YUG-SR (Deliblatska Peščara: Alibunar DQ99 2.06.1987. 1m leg. Šimić and Vujić; Potisje: Rusanda DR44 9.07.1985. 1m leg. Šimić and Vujić, Senta DR28 5.08.1989. 1m leg. Vujić; Koviljski Rit DR20 19.04.1989. 7m 3f leg. Vujić) YUG-MA (Baba EL14 17.06.1990. 6m leg.. Rad-

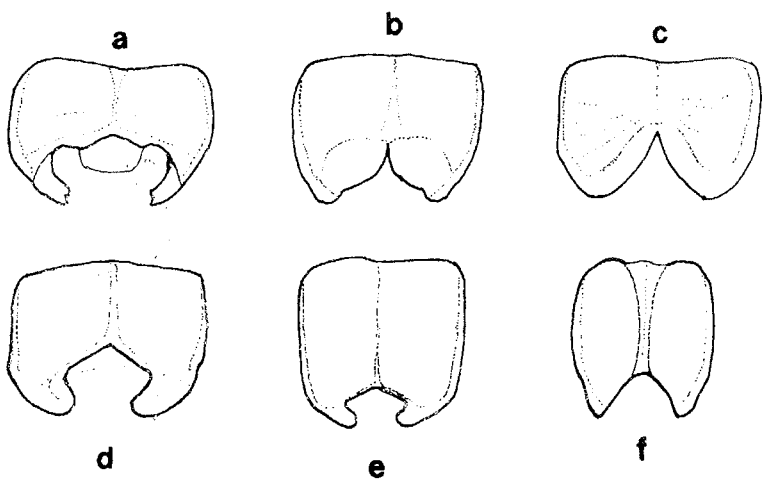

Fig. 5. - Shape of sternit 4: a) *Eumerus ornatus*; b) *E. tuberculatus*; c) *E. strigatus*; d) *E. consimilis*; e) *E. sogdianus*; f) *E. amoenus*.

Građa sternita 4.

nović and Vujić; Mavrovo 27.08.1966. 1m leg. Glumac). SAR: YUG-BH (Mojmilo 1912. 1m leg. Winneguth).

First records for: YUG-BH, YUG-MA.

This is one of the widest distributed species in investigated area, especially in Mediterranean and Pannonian lowlands.

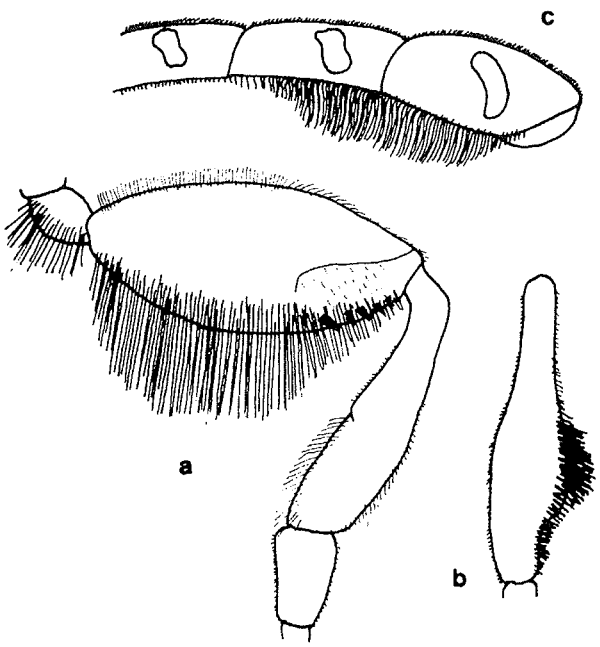

Fig. 6. - *Eumerus elaverensis*: a) posterior leg (without tarsi 2-5) (lateral view); b) posterior tibia (ventral view); c) tergites 2-4 (lateral view).

Eumerus elaverensis: a) zadnja noga (bez tarzalnih članaka 2-5) (bočno); b) zadnja tibija (ventralno); c) tergiti 2-4 (bočno).

CONFIRMED MUSEUM MATERIAL

Within the museum material that has been checked there are some collections or parts of them that have been published in the following papers: S t r o b l (1898, 1900, 1902) (only two samples of genus *Eumerus* within the collection of Sarajevo); L a n g h o f f e r (1917-1923) (almost all specimens of genus *Eumerus* have been preserved in Croatian Natural History Museum in Zagreb); G l u m a c (1955, 1956, 1956*a*, 1959) (the collections have been kept in the Natural History Museum, Belgrade and have been almost completely except for few missing samples); G l u m a c (1968) (only one sample of the genus has been checked within the collection belonging to the museum in

Skopje); Šimić (1987), Vujić & Glumac (1994), Vujić & Šimić (1994) (all samples published in these three papers are kept at the working collection of the Institute of Biology, Novi Sad).

The material examination has proved a number of incorrect determinations but helped the discovery of samples belonging to several species that have not been registered on the territory of former Yugoslavia until now, while one species has been described on the basis of museum material.

INCORRECT IDENTIFICATIONS

Redetermination has proved that findings of some species cited in literature for the investigated area have been incorrectly determined samples. Three species can be certainly confirmed as not to be registered on cited localities:

1. ***Eumerus lucidus*** Loew, 1848 - The finding of this species has been reported by Šimić & Vujić (1984). Redetermination has proved that the specimen belongs to species *E. ornatus.*

2. ***Eumerus ruficornis*** Meigen,1822 - The species has been cited in the paper about *Diptera* in Croatia (Langhoffer 1917-1923). After checking the material from the collection kept in Croatian Natural History Museum it has been found out that the samples belong to species *E. basalis.*

3. ***Eumerus sabulonum*** (Fallen,1817) - Again another species that has been reported by Langhoffer (1917-1923). However, the sample from the collection has been redetermined as *E. tarsalis.* The second record of the species has been cited in the paper about hoverflies in Serbia (Glumac 1955), but the specimen named in the collection as *E. sabulonum* belongs to species *E. tauricus.*

UNCONFIRMED RECORDS

Material collections belonging to museums outside the territory of former Yugoslavia have not been checked and consequently the findings of several species are to be inspected in future time (although a parts of some collections have been destroyed or lost). This is the case with the collections of Strobl (1902), Coe (1956, 1957, 1960), Glumac (1968) with the species that have not been confirmed by this investigation:

1. ***Eumerus claripennis*** Coe, 1957 - The single sample of this species is kept at the collection of British Museum in London.

2. ***Eumerus lunatus*** (Fabricius, 1794) - The species has been reported in the catalogue of the *Syrphidae* in Yugoslavia (Glumac 1972). The examination of museum material has not confirmed the existence of this species over the investigated area.

CONCLUSIONS

The paper analyses the species of genus *Eumerus* recorded on the territory of former Yugoslavia deposited at the collections of the Institute of Biology, Novi Sad, and the Natural History Museums in Belgrade, Ljubljana, Zagreb, Sarajevo and Skopje.

A total of 312 samples were examined and 21 species were registered:

- Six species, *E. clavatus* (Croatia, Serbia), *E. elaverensis* (Macedonia), *E. richteri* (Serbia), *E. sulcitibius* (Montenegro), *E. tarsalis* (Croatia, Montenegro) and *E. tauricus* (Serbia), are discovered for the first time on the Balkan Peninsula.

- This is the first record of *E. flavitarsis* for Slovenia.

- *E. sogdianus* is found for the first time in Croatia.

- These are the first findings of *E. ornatus*, *E. sogdianus*, *E. strigatus* and *E. tuberculatus* for Bosnia and Herzegovina.

- *E. basalis* is registered for the first time in Montenegro.

- These are the first findings of *E. argiropus*, *E. flavitarsis* and *E. olivaceus* from Serbia.

- *E. sogdianus* and *E. tuberculatus* haven't been discovered in Macedonia until now.

Redetermination has proved that findings of three species, *E. lucidus*, *E. ruficornis* and *E. sabulonum*, cited in literature for the investigated area have been incorrectly determined samples.

The samples of two species, *E. claripennis* and *E. lunatus*, reported in the literature for the investigated area have not been checked.

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ROD *EUMERUS* MEIGEN, 1822 (*DIPTERA: SYRPHIDAE*) NA PODRUČJU JUGOSLOVENSKIH ZEMALJA

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I z v o d

U ovom radu su analizirani primerci vrsta roda *Eumerus* koji se čuvaju u radnoj zbirci Instituta za biologiju u Novom Sadu (NS), zbirci Zemaljskog muzeja u Sarajevu (SAR) i zbirkama Prirodnjačkih muzeja, iz Beograda (BEO), Ljubljane (LJU), Zagreba (ZAG) i Skoplja (SKO). Time je obuhvaćen najveći deo materijala prikupljenog na istraživanom području tokom poslednjih 100 godina. Utvrđena je 21 vrsta roda *Eumerus*. Kod dve vrste, *E. ovatus* Loew i *E. tauricus* Stack., pronađeni su samo primerci ženki. Kod ostalih 19 zabeleženi su primeci oba pola. Pokazalo se da je građa genitalnog aparata mužjaka najpouzdaniji karakter za determinaciju, pa su stoga u radu dati i njihovi crteži.

- Šest vrsta, *E. clavatus* Beck. (Hrvatska, Srbija), *E. elaverensis* Seguy (Makedonija), *E. richteri* Stack. (Srbija), *E. sulcitibius* Rond. (Crna Gora), *E. tarsalis* Loew (Hrvatska, Crna Gora) i *E. tauricus* Stack. (Srbija), su prvi put registrovane na Balkanskom poluostrvu.

- *E. flavitarsis* Zett. je prvi put zabeležen za Sloveniju.

- *E. sogdianus* Stack. je prvi put nađen u Hrvatskoj.

- U radu su dati prvi nalazi vrsta *E. ornatus* Meig., *E. sogdianus* Stack., *E. strigatus* Fall. i *E. tuberculatus* Rond. za Bosnu i Hercegovinu.

- *E. basalis* Loew je prvi put registrovan u Crnoj Gori.

- Navedeni su prvi nalazi vrsta *E. flavitarsis* Zett. i *E. olivaceus* Loew za Srbiju.

- Vrste *E. sogdianus* Stack. i *E. tuberculatus* Rond. do sada nisu bile poznate za Makedoniju.

Redeterminacija je pokazala da su primerci vrsta *E. lucidus* Loew, *E. ruficornis* Meig. i *E. sabulonum* Fall., koje se navode u literaturi za jugoslovenske zemlje, pogrešno determinisani i da pripadaju drugim vrstama.

Primerci dveju vrsta, *E. claripennis* Coe i *E. lunatus* Fabr., koji se u literaturi navode za istraživano područje, nisu analizirani, jer se nalaze u zbirkama koje su bile nedostupne.

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STUDIES OF *DROSOPHILIDAE* (*DIPTERA*) IN YUGOSLAVIA X. COLLECTION FROM VINCI AT DANUBE COAST

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More than 6.000 individuals of *Drosophilidae* flies have been collected in June and September 1989 at the locality near an old village Vinci, *cca.* 12 *km* from the entrance to the Iron Gate (Đerdap), at Danube coast. In two sublocalities, near very coast of the river, and in a pine wood about 300 *m* apart from this coast, a total of 20 different species was found (16 in each environment), twelve of which were common for both habitats. The differences in species composition were significant between two habitats, as well as within each of these habitats when collections from June and September had been compared.

INTRODUCTION

Family *Drosophilidae*, compared to other families of order *Diptera*, is not especially rich in the number of described species. In spite of this, according to W h e e l e r (1986), so far are described 2.822 species, out of which only the genus *Drosophila* contains 1.595 species. In palearctic region are so far described 304, and in Europe 93 species of *Drosophilidae* (B ä c h l i & R o c h a P i t é 1984).

Yugoslavia, former and present, is biogeographically and ecologically especially versatile (M a t v e j e v & P u n c e r 1989), although it's *Drosophilidae* fauna is not enough investigated. Due to this, we started about fifteen

years ago a series of studies to describe properly the spatial and temporal distribution, as well as the ecology of these species (K e k i ć & M a r i n k o v i ć 1979, K e k i ć & B ä c h l i 1981). During passed period of our investigation we collected *Drosophilidae* in ecologically variable habitats of cca. 50 geographically different localities of former Yugoslavia, from Poreč at the North to Ohrid lake at the South, and from Adriatic Island Mljet at the West to Fruška Gora Mountain at the East. The result of these studies, faunistically, is a discovery of 23 new species so far not described in this area, so that a list of Yugoslavian *Drosophilidae* now amounts 56 different species, grouped in 10 genera (K e k i ć & B ä c h l i 1991).

In this paper we are presenting the results of our investigation of *Drosophilidae* fauna at a specific locality, a habitat at the coast of a big river, which has not been studied so far. This is a start of a broaden analysis of Danube coast in Yugoslavia (558 *km*), one of two largest rivers in Europe, which is connecting geographically and climatically different environments and habitats, and which also presents the routes of active migrations of studied flies, as well as of their passive transfer, *e. g.* by means of winds and humans.

MATERIAL AND METHODS

In this paper, as in all our previous studies of *Drosophilidae* fauna, the flies have been collected by means of a special substrate for the attraction of drosophilids (B ä c h l i 1972, C a r s o n & H e e d 1983). The method is based on an empirical knowledge that fermented fruits attract practically all species of *Drosophilidae* in their habitats, in spite of the fact whether they use this substrate as their ordinary or alternative source of food, as a place where they lay their eggs, or a site where they proceed their copulation. This substrate is prepared a few days in advance from a mixture of various fruits (basically apples, bananas and seasonal fruit, with a small amount of sugar and baker's yeast). The portions of this already fermented mixture (*cca.* 300 *gr* each) have been poured out to plastic plates and distributed in different places of a habitat. Next few days, in morning and evening hours when flies are most active, we were catching them by entomological nets arround these baits.

The locality Vinci is a village between Veliko Gradište and Golubac, designated by old Romans as the beginning of Iron Gate, in fact some 12 *km* from the entrance to Đerdap Canyon, and 1.000 *km* from the mouth of river Danube to Black See. At this locality, we have collected drosophilid flies at two spots, about 1 *km* downstream from the village: (1) in a section of a few hundred meters along the very coast of Danube river, and (2) *cca.* 300 *m* appart from this coast, inside a sandy but green area with rare second houses, in a wood of pine (*Pinus nigra*) trees.

Collecting site along the coast of the river, 5-20 *m* wide, has a typical coast vegetation (grasses, weads, bushes, acacia trees). A relatively frequent local road goes just above this site, and some of organic and plastic drop-outs

can be found. In the second, our "continental" site, flies were collected in a clean area of a young pine wood, where in a vicinity, in a sandy ground, only some garden trees and bushes can be found, sporadically with some fruit trees and vegetables.

The flies were collected from 6-9th June and from 4-6th September, 1989.

RESULTS AND DISCUSSION

The results of our findings of *Drosophilidae* fauna at the very coast of Danube river, *cca.* 1 *km* down-stream from village Vinci are presented in Table 1. Among a total of 4.110 collected and determined individuals, 16 species have been discovered. *D. melanogaster* is a dominant species (with 64% of collected individuals), *D. subobscura* is present with *cca.* 20%, *D. phalerata* with 9%, etc..

The differences between June and September collections of

Tab. 1. - *Drosophilidae flies caught at Danube coast near village Vinci*
Drosophilidae ulovljene na obali Dunava u blizini sela Vinci

SPECIES VRSTE	JUNE 1989	SEPTEMB. 1989	TOTAL UKUPNO
DROSOPHILA			
1. *D. ambigua*	9	3	12
2. *D. bifasciata*	1	-	1
3. *D. confusa*	-	1	1
4. *D. funebris*	5	-	5
5. *D. helvetica*	-	20	20
6. *D. hydei*	1	1	2
7. *D. immigrans*	4	54	58
8. *D. kuntzei*	1	3	4
9. *D. limbata*	1	-	1
10. *D. melanogaster*	489	2132	2621
11. *D. phalerata*	145	245	390
12. *D. subobscura*	522	292	814
13. *D. testacea*	4	31	35
14. *D. transversa*	79	3	82
SCAPTOMYZA			
15. *S. graminum*	2	-	2
16. *S. pallida*	62	-	62
TOTAL UKUPNO	1325	2785	4110

Drosophilidae at this specific locality are obvious, with described 14 and 11 species, respectively. In spring collection two species are dominant, *D. subobscura* (39%) and *D. melanogaster* (37%), whereas in fall collection *D. melanogaster* is by far most frequent (77%). Out of 16 species, only 9 are caught both in June and in September. Statistical comparison by KOLMOGOROV-SMIRNOV test (S o k a l & R o h l f 1981) gives a significant difference between two comparisons ($D = 0.409 » D_{0.001} = 0.054$). Another specificity of our coast sublocality is an extremely large presence of *Scaptomyza pallida*, in spite of an identical methodology used in comparisons to our previous collections.

Tab. 2. presents the list of species found in our collection of flies in the vicinity of a second house in a pine wood, 300-400 *m* apart from the coast of Danube. Among 16 species out of 1.948 inspected individuals, the dominant species here are *D. subobscura* (53%), *D. phalerata* (29%) and *D. melanogaster* (10%). The differences between June and September collections are evident, with 11 and 13 found species, respectively, and 9 species common in both

Tab. 2. - *Drosophilidae flies caught cca. 300 m apart from Danube coast in a second house settlement 1 km from village Vinci.*
Drosophilidae ulovljene oko 300 *m* od obale Dunava u vikend naselju udaljenom oko 1 *km* od sela Vinci.

SPECIES VRSTE	JUNE 1989	SEPTEMB. 1989	TOTAL UKUPNO
DROSOPHILA			
1. *D. ambigua*	2	1	3
2. *D. busckii*	1	-	1
3. *D. funebris*	16	3	19
4. *D. helvetica*	-	3	3
5. *D. hydei*	1	-	1
6. *D. immigrans*	2	15	17
7. *D. kuntzei*	-	7	7
8. *D. melanogaster*	31	174	205
9. *D. obscura*	-	1	1
10. *D. phalerata*	95	466	561
11. *D. simulans*	-	3	3
12. *D. subobscura*	496	530	1026
13. *D. testacea*	6	37	43
14. *D. transversa*	22	33	55
15. *D. tristis*	-	1	1
SCAPTOMYZA			
16. *S. pallida*	2	-	2
TOTAL UKUPNO	674	1274	1948

collections. In spring collection dominant species is *D. subobscura* (74%), and in fall collection *D. subobscura* (42%) with *D. phalerata* (37%). Of course, these differences should be explained by a reaction of species to the seasonal climatic and biological changes in two different periods of the year. Statistical analysis (KOLMOGOROV-SMIRNOV test) gives a significant difference between these two collections ($D = 0.309 » D_{0.01} = 0.049$).

Tab. 3. gives summarized results of our *Drosophilidae* collections in two different habitats in locality near village Vinci. In both habitats a total of 20 species are found, 12 of which being common for both sublocalities. According to the Kolmogorov-Smirnov test, the composition and quantitative presentation of the species are significantly different in two described habitats, $D = 0.533 » D_{0.01} = 0.045$). It is evident that *D. melanogaster* is a dominant

Tab. 3. - *A comparison of Drosophilidae flies caught at Danube coast and in a second house settlement surrounded by a pine wood (cca. 300 m apart from the coast), in Vinci locality.*

Poređenje *Drosophilidae* ulovljenih na obali Dunava i vikend naselju okruženom borovom šumom (oko 300 *m* od obale), na lokalitetu Vinci.

SPECIES VRSTE	SETTLEMET NASELJE	DANUBE C. OBALA	TOTAL UKUPNO
DROSOPHILA			
1. *D. ambigua*	3	12	15
2. *D. bifasciata*	-	1	1
3. *D. busckii*	1	-	1
4. *D. confusa*	-	1	1
5. *D. funebris*	19	5	24
6. *D. helvetica*	3	20	23
7. *D. hydei*	1	2	3
8. *D. immigrans*	17	58	75
9. *D. kuntzei*	7	4	11
10. *D. limbata*	-	1	1
11. *D. melanogaster*	205	2621	2826
12. *D. obscura*	1	-	1
13. *D. phalerata*	561	390	951
14. *D. simulans*	3	-	3
15. *D. subobscura*	1026	814	1840
16. *D. testacea*	43	35	78
17. *D. transversa*	55	82	137
18. *D. tristis*	1	-	1
SCAPTOMYZA			
19. *S. graminum*	-	2	2
20. *S. pallida*	2	62	64
TOTAL UKUPNO	1948	4110	6058

species in Danube-coast habitat, and that *D. subobscura* is dominant a few hundred meters apart from this coast, in a weekend-house area in a pine tree wood.

Due to the fact that flies are vagile individuals that can travel daily a few hundred meters (B ä c h l i, *pers. comm.*), although it is usually less (T a y l o r *et al.* 1984), the differences in species composition in two studied habitats could be only explained by ecological conditions which are contributing to a differential presence (*i. e.* frequency) of observed species in two different environments.

It is well known that *D. melanogaster* is a cosmopolitan and synantropic species, and that an other synantropic species is its sibling *D. simulans*, as well as *D. busckii*, *D. funebris*, *D. hydei* and *D. immigrans* (P a t t e r s o n & S t o n e 1952, D o b z h a n s k y 1965, P a r s o n s & S t a n l e y 1981), although some authors consider *D. funebris* and *D. immigrans* as subcosmopolitan species (D a v i d & T s a c a s 1981). *D. melanogaster* is by far the most synantropic species, entering the human houses, cellars and magazines, and using his ex-products (litters; *etc.*) to lay their eggs, the larvae of which develop on fermented fruits, vegetables, mushrooms and other materials. Differently from some other synantropic species (such as *D. immigrans*), *D. melanogaster* does not inhabit wild areas, being the best indicator of a "contamination" of human environments by his products and activities.

D. subobscura is, together with *D. melanogaster*, the best studied species of *Drosophilidae* in Europe (K r i m b a s 1993). It is a polyphagous species and its breeding sites are numerous and versatile: fruits, mushrooms, rotten leaves and vegetables, etc. Due to the places where it lives (woods, semi wild areas, green parks of urban areas), this species has a wide potential of adaptation to local conditions. Basically, however, *D. subobscura* is a forest species which dominates in a majority of wild habitats in former and present Yugoslavia (K e k i ć & B ä c h l i *in press*).

From *Obscura* group, we also found at Vinci locality: *D. ambigua*, *D. bifasciata*, *D. helvetica*, *D. obscura* and *D. tristis*. About the ecology of these species is not very much known, so that our findings could be of some interest in this respect.

The species *D. cameraria*, *D. confusa*, *D. kuntzei*, *D. phalerata*, *D. testacea* and *transversa*, found in both of here described habitats, are laying their eggs exclusively, or prevalently, in different species of mushrooms (B a s d e n 1954, S h o r r o c k s 1982).

Consequently, we can judge about the constitution of an environment according to a composition of the species which are inhabiting this environment, and, *vice versa*, the species composition is definitely a result of ecological and historical properties of a particular habitat.

If the proportion of "domestic" and "wild" species of *Drosophila* is taken as a criterion for an estimation of the wildedness of a habitat (or, on the con-

trary, of a synantropic "contamination" by human products and activities), we may definitely say that here studied habitat at very coast of the Danube (downstream from village Vinci, in a vicinity of a local road), has been more exposed to such human influences, than the habitat in a pine wood, in the surrounding of rarely inhabited second houses, a few hundred meters apart from the river (Tab. 4.).

Tab. 4. - *The proportion of domestic individuals of Drosophila in two ecologically different habitats in Vinci locality, in June and September 1989.*
Proporcija domestičnih jedinki *Drosophila* u dva ekološki različita staništa na lokalitetu Vinci, u junu i septembru 1989. godine.

HABITAT STANIŠTE	JUNE	SEPTEMBER	TOTAL UKUPNO
Danube coast Obala Dunava	37.7%	78.5%	63.8%
Settlement near Danube Naselje u blizini Dunava	7.6%	15.3%	12.6%

Our future studies of *Drosophilidae* fauna along the Danube river in Yugoslavia, should give us further information about the richeness and specificities of this fauna in studied habitats, due to their ecological, geographic and historical properties, with the aim to answer the question how much antropogenic influences can be demonstrated by using as a model population dynamics of different *Drosophila* species.

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PROUČAVANJE FAUNE *DROSOPHILIDAE* (*DIPTERA*) U JUGOSLAVIJI X KOLEKCIJA SA LOKALITETA VINCI (OBALA DUNAVA)

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I z v o d

Od 6. do 9. juna, kao i 4. i 5. septembra 1989. godine lovili smo mušice iz familije *Drosophilidae* na lokalitetu Vinci u dva ekološki različita staništa.

Vinci su seoce na desnoj obali Dunava između Velikog Gradišt i Golubca, udaljeno oko 1000 *km* od ušća Dunava u Crno more, odnosno oko 12 *km* uzvodno od ulaza u Đerdapsku klisuru.

Prvo stanište se nalazi neposredno uz Dunav, a čini ga uzan pojas vegetacije (širine 5 do 20 *m*) koji prati reku, dok se drugo nalazi u obližnjem vikend naselju u mladoj borovoj šumici i udaljeno je od prvog manje od pola kilometra. Prvo stanište je međutim pod izrazitijim antropogenim uticajem jer u neposrednoj blizini prolazi dosta prometni lokalni put. U vikend naselju kuće su malobrojne, a aktivni antropogeni uticaj samo povremen.

U ovom, kao i u svim našim dosadašnjim radovima posvećenim izučavanju faune *Drosophilidae*, mušice smo lovili uz pomoć supstrata za primamljivanje (mešavina različitog voća u procesu vrenja: banana, jabuka, manje količine sezonskog voća, pekarski kvasac, šećer). Porcije od oko 300 *g* mešavine (na plastičnim tacnama, obično 20) raspoređuju se po staništu na rastojanju od oko 10 *m*. Mušice koje privuku mamci, love se u jutarnjim i večernjim časovima (u vreme maksimalne aktivnosti) uz pomoć entomološke mrežice.

Na tabelama 1, 2. i 3. prikazani su rezultati istraživanja faune *Drosophilidae* u oba posmatrana staništa.

Među više od 6000 ulovljenih jedinki identifikovano je ukupno 20 vrsta, po 16 u svakom staništu od kojih 12 zajedničkih za oba. Poređenje kompozicija vrsta (prolećnih i kasnoletnjih u svakom staništu, kao i između staništa) korišćenjem KOLMOGOROV-SMIRNOV testa otkriva u svim slučajevima značajne razlike. Naravno, konstatovane razlike posledica su promena u staništu tokom godišnjih doba, kao i ekoloških razlika između staništa.

Kompozicija vrsta u određenom staništu odraz je ekoloških uslova koji tu vladaju, a zadovoljavaju njihove potrebe. Prema tome, na osnovu poznate ekologije nekih prisutnih *Drosophila* vrsta moguće je izvršiti procenu ekološkog stanja staništa. Tako se u posmatranim staništima, vrednost proporcije konstatovanih domestičnih *Drosophila* vrsta (*D. busckii*, *D. funebris*, *D. hydei*, *D. melanogaster*, *D. simulans* i *D. immigrans*) i ukupne kolekcije, može uzeti

kao kriterijum za procenu stepena sinantropnosti ("kontaminiranost" čovekom i njegovim aktivnostima). Na osnovu tog kriterijuma, stanište pored Dunava sa oko 6[illegible]% domestičnih vrsta, nasuprot vikend-naselju sa samo 13%, u ekološkom smislu je sinantropnije (Tab. 4).

Naša je namera da ovakva istraživanja sprovedemo i na drugim lokalitetima duž toka Dunava. Kao jedna od najdužih reka Evrope (oko 2857 *km*), Dunav povezuje geografski i klimatski različite predele i staništa, a istovremeno predstavlja i prirodni put kako aktivne, tako i pasivne migracije mušica iz familije *Drosophilidae*. Cilj ovih istraživanja nije samo proširivanje poznavanja ekologije *Drosophilidae* koje žive uz reku i u zaleđu, već i određivanje ekološkog stanja različitih staništa duž toka Dunava.

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THE BUTTERFLIES OF THE KOSOVO AND METOHIJA IN SOUTH SERBIA (*Lepidoptera: Hesperioidea and Papilionoidea*)

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Jakšić, P., Živić, N. (1995-98): *The butterflies of the Kosovo and Metohija in south Serbia* (*Lepidoptera: Hesperioidea and Papilionoidea*).- Bulletin of Natural History Museum, Belgrade, *B49-50*, 201-218.

The paper offers a concise history of the research on the butterfly fauna of Kosovo and Metohija. The results of twenty years long faunistic research on butterflies in this region are presented. A total of 171 species are listed, 43 of which are now recorded for the first time for Kosovo and Metohija. The drawings of genitalia of some newly recorded species are shown, and a zoogeographical classification of all species is given. In the butterfly fauna of Kosovo and Metohija, central European elements are dominant. The specific alpine elements of Kosovo's mountains are analysed from the zoogeographical aspect.

INTRODUCTION

On the basis of the previously published data we reached the conclusion that the butterfly fauna (*Hesperioidea* and *Papilionoidea)* of Kosovo and Metohija is insufficiently and incompletely known. The conclusion refers both to the number of established species and the area investigated. In the last century, owing to the specific historical conditions, social and economic circumstances, etc., there had been no faunistic research on this group of insects in Kosovo and Metohija. The data of the butterflies of the region were first published early in the 20th century. Naturally, the authors were foreign entomologists. The absence of a systematic approach to investigations was the main characteristic of these works.

The earliest written records, made by Hans REBEL, a lepidopterist from Vienna, date back to the 1914-17 period (R e b e l 1914, 1914*a*, 1917). When the Natural History Museum of Bosnia and Herzegovina in Sarajevo (Zemaljski Muzej BiH u Sarajevu) was founded, Rebel co-operated intensively with this institution through Victor APFELBECK, a former curator. Three papers of his surveyed the material collected at the following sites in Kosovo and Metohija: Dečani, Dobri Do, Goranica (Đakovica), Paštrik, Novo Selo, and Žljeb. The material was shown to Rebel by a zoologist, Arnold PENTHER, who worked in those areas for the Academy of Vienna (Kaiserl. Akademie der Wissenschaften). A total of 73 butterfly species was recorded, among which the first subspecies new to science to be described from the territory of Kosovo and Metohija: *Parnassius apollo dardanus* Rebel, 1917, whose type locality is Žljeb (R e b e l 1914, 1917*a*).

Ivan BURESCH, a lepidopterologist, visited the area in the period 1912--19, accompanying the Bulgarian troops occupying Kosovo and Metohija during the Balkan Wars and the First World War. He collected butterflies and published 25 butterfly species from Kačanik (B u r e s c h & I l t s c h e w 1921).

There followed the publication of Mihajlo GRADOJEVIĆ's renowned paper entitled "Prilog lepidopterskoj fauni Jugoslavije. Leptirovi Srbije - *Diurna* [The contribution to the lepidopteral fauna of Yugosklavia. Butterflies of Serbia - Diurna]". In addition to the territory of present Serbia, the paper covered the area of Macedonia. Three sites in Kosovo and Metohija were cited: Kačanik, Kobilica, and Priština (G r a d o j e v i ć 1931). It is interesting that G r a d o j e v i ć employed neither R e b e l's (1914, 1917) nor B u r e s c h & I l t s c h e w's (1921) published data for his work. Neither did he use the data from the rich collection of Miloš ROGULJA, an industrialist from Novi Sad.

The year of 1931 also saw the publication of the widely acclaimed paper "Die Lepidopterenfauna Albaniens mit Berucksichtigung der Nachbargebiete" (R e b e l & Z e r n y 1931), which contained some faunistical data for Kosovo and Metohija including those not previously published, the most important of which were the data referring to the newly described subspecies from the region: *Boloria pales contempta* Zerny (TL: Žljeb), *Lassiommata petropolitana arnauta* Rebel und Zerny (TL: Prizren, Paštrik), and *Maculinea alcon sevastos* Rebel und Zerny (TL: Paštrik, Žljeb).

The post-war studies of the Macedonian butterflies undertaken by German and Austrian lepidopterists for the National Museum in Skoplje (Prirodonaučen Muzej, Skoplje) included reports on the Kosovo and Metohija's bordering regions such as Kačanik and Šar Planina. The most important data in these works are those referring to Šar Planina, which was on that occasion first cited in lepidopterology, in as late as the letter half of this century (D a n i e l *et al.* 1951, T h u r n e r 1964).

The faunistical papers also encompass few travel records from Kosovo and Metohija. Owing to the rising standard of living and better communicati-

ons, travel literature became very popular among amateur entomologists. Travel writing as a rule lacks a methodical approach to investigations and systematic, but it can help to fill in the gaps in the faunistical picture of a region. Such are the writings of A s s e l b e r g s (1975) who gave some data for Kosovo and Metohija (Leposavić) and W e i s s (1975) who collected butterflies on Čakor and Šar Planina (Globočica).

Other papers containing data on the butterflies of Kosovo and Metohija include those monographic in character, which consider a genus or a species. Papers covering specific biological problems may also be placed in this group. While working on a monograph of the genus *Parnassius*, B r y k and E i s n e r (1930) described a new subspecies of *Parnassius mnemosyne* L., *P. mnemosyne balcanica* Bryk et Eisner, type locality: Šar Planina and Kačanik (B r y k & E i s n e r 1930). Important data on species of *Hipparchia fagi* Scopoli and *H. statilinus* Hufn. were given in two papers by Zdravko LORKOVIĆ (L o r k o v i ć 1974, 1976). In 1900, Mary NICHOLL, an English woman described the first butterfly species from Kosovo and Metohija new to science: *Erebia rhodopensis* Nicholl, an endemic Balkan species (N i c h o l l 1900). Interestingly, Ms Nicholl explored mainly Bosnia and Herzegovina, Montenegro, and Bulgaria, and the description of the aforesaid species was the only data referring to Kosovo and Metohija. The second and the last description of a new species from Kosovo and Metohija territory was given by Otakar KUDRNA, who distinguished and described a new species from the species *Hipparchia semele*: *H. delattini* Kudrna (K u d r n a 1975). Finally in our first work monographic in character, Rizo SIJARIĆ treated the species of the genus *Coenonympha* from the Kosovo and Metohija region (S i j a r i ć 1984).

The papers thematic in character include those on migratory species of butterflies. Stanko RADOVANOVIĆ, the founder and chairman of the Department for Insect Migration established within the Yugoslav Entomological Society (JED), published several papers (R a d o v a n o v i ć 1973, 1974, 1975*a*, 1975*b*, 1976) presenting the data on migratory butterfly species which move across Kosovo and Metohija from south to north and from the Mediterranean regions toward continental Europe. A paper by the author (J a k š i ć 1986) reporting on butterfly species of some Kosovo's gorges may also be placed in this group of papers. It records new and rare butterfly species and explains their presence in those regions on the basis of historical and ecological factors.

MATERIAL AND METHODS

The material on which the data in the present paper are based has been collected systematically during the last 20 years. The whole territory of Kosovo and Metohija was carefully covered, geographically, zoogeographically, also ecologically, and with regard to seasons. The collected material was prepared, determined, and conserved in the collection of the first author. The classical method of collecting was employed: that of catching by net and, in certain ca-

ses, that of hatching from larvae. The collection comprises around 20000 specimens; whenever possible, we collected population to allow further biological analyses of subspecific interrelations, etc.

The identification was performed on the basis of drawings of wings and the analyses of genitalia and other anatomical features. To this end, about 2000 microscope slides were mounted by standard methods. Naturally, the publication of determination keys by Higgins (1975) and Kudrna (1986) played a decisive role in our work on this group.

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A detailed review of the collected material surpasses the scope of the present paper. For reasons of brevity we offer a concise review that nevertheless contains all important data. The explored sites are classified into three groups: A) Ravines, B) Central region of Kosovo and Metohija pastures and hills where sites were best explored and boast unique biological features, and C) Alpine regions of Kosovo and Metohija. Considering that butterflies are very movable insects, both horizontally and vertically, this kind of generalization is acceptable. Also for reasons of brevity, we did not cite the already published data, but only those from original research. The References contain bibliographical data for the already published works, so that interested readers can find them.

THE LIST OF EXAMINED SITES (COMPLETE WITH UTM CODE)

A) Ravines:

1. Rugovska Klisura. Miliševac and Čakor DN32-DN12
2. Prizrenska Bistrica (from Prizren to Rečane) DM87
3. Kačanička klisura (General Janković)EM26
4. Ibarska Klisura (Košutovački Potok) DN59

B) Central region of pastures and hills:

5. Priština (Grmija, Gazimestan, Gračaničko JezeroEN12, Novo Brdo (Bostane) EN32, GnjilaneEN30, Uroševac EM19, Dečani DN41, Kosovska Mitrovica DN98, Istok (Mokra Gora) DN53, Brezovica (Piljevački Potok) DM98, Zrze (Švanski Most) DM68.

C) Alpine regions of Kosovo and Metohija:

6. Streoce (uphills Dečane) DN41
7. Kopaonik (Suvo Rudište, Pančićev Vrh) DN89
8. Koprivnik (uphill Peć) DN32
9. Šar-Planina (Durlov Potok, Piribeg, Ošljak) EM06
10. Paštrik DM67

RESULTS

The results are shown on the table and the picture as follow:

Tab. 1. - *Survey of Lepidoptera recorded (Systematics and nomenclature follow H i g g i n s 1975 and K u d r n a 1996); asterisk - the new species for the fauna of Kosovo and Metohija.*

Plegled nalaza Lepidoptera (sistematika i nomemklatura po H i g g i n s 1975 i K u d r n a 1996); zvezdica - nove vrste za faunu Kosova i Metohije.

LOCALITIES	1	2	3	4	5	6	7	8	9	10
Superfam. *HESPERIOIDEA*										
Fam. *Hesperiidae*										
1. *Pyrgus malvae* (Linnaeus, 1758)	+	+		+	+	+	+		+	
2. *Pyrgus alveus* Hübner, 1803					+				+	+
*3. *Pyrgus armoricanus* Oberthur, 1910					+					
*4. *Pyrgus serratulae* (Rambur, 1840)					+				+	+
5. *Pyrgus carthami* (Hübner, 1813)				+	+					
*6. *Pyrgus sidae* (Esper, 1782)			+			+				
*7. *Pyrgus andromedae* (Wallengren, 1853)									+	
8. *Spialia orbifer* (Hübner, 1823)	+	+	+	+	+	+	+		+	
*9. *Carcharodus alceae* (Esper, 1870)					+					
*10. *Carcharodus lavatherae* (Esper, 1783)	+				+	+				
*11. *Carcharodus flocciferus* (Zeller, 1847)					+					+
12. *Erynnis tages* (Linnaeus, 1758)	+	+	+	+	+	+	+	+	+	+
13. *Carterocephalus palaemon* (Pallas, 1771)	+									
*14. *Thymelicus acteon* (Rottemburg, 1775)					+					
15. *Thymelicus lineola* (Ochsenheimer,1806)	+				+			+	+	+
16. *Thymelicus sylvestris* (Poda, 1761)								+	+	
17. *Hesperia comma* (Linnaeus, 1758)		+			+	+			+	
18. *Ochlodes venatus* (Bremer & Grey,1853)	+	+			+				+	+
Superfam. *PAPILIONOIDEA*										
Fam. *Papilionidae*										
19. *Papilio machaon* Linnaeus, 1758	+	+			+	+			+	+
20. *Iphiclides podalirius* (Linnaeus, 1758)	+	+	+	+	+	+	+	+	+	+
*21. *Zerynthia polyxena* (Denis & Schiffermüller, 1775)		+			+				+	

LOCALITIES	1	2	3	4	5	6	7	8	9	10
22. *Zerynthia cerisyi* (Godart, 1822)		+	+							
23. *Parnassius apollo* (Linnaeus, 1758)						+		+	+	
24. *Parnassius mnemosyne* (Linnaeus, 1758)	+		+		+				+	+
Fam. *Pieridae*										
25. *Aporia crataegi* (Linnaeus, 1758)	+	+		+	+		+	+	+	
26. *Pieris brassicae* (Linnaeus, 1758)	+				+	+			+	+
27. *Pieris napi* (Linnaeus, 1758)	+	+	+	+	+	+	+	+	+	+
28. *Pieris balcana* Lorkovic, 1970	+		+		+				+	
29. *Pieris ergane* (Geyer, 1828)	+	+			+	+			+	
30. *Pieris rapae* (Linnaeus, 1758)	+	+	+	+	+	+	+	+	+	+
31. *Pieris mannii* Mayer, 1851	+	+			+				+	+
32. *Pontia edusa* (Fabricius, 1777)		+		+	+		+		+	
33. *Euchloe ausonia* (Hübner, 1806)		+	+							
* 34. *Anthocharis cardamines* (Linnaeus, 1758)	+	+		+	+		+		+	
35. *Colias hyale* (Linnaeus, 1758)			+		+				+	
36. *Colias alfacariensis* Ribbe, 1905		+	+		+				+	
* 37. *Colias balcanica* Rebel, 1903							+			
38. *Colias crocea* (Geoffroy, 1785)	+	+	+	+	+	+	+	+	+	+
39. *Gonepteryx rhamni* (Linnaeus, 1758)	+	+	+		+				+	
40. *Leptidea sinapis* (Linnaeus, 1758)	+	+	+	+	+	+	+	+	+	+
*41. *Leptidea duponcheli* (Staudinger, 1871)	+	+	+	+	+					
Fam. *Lycaenidae*										
42. *Lycaena phlaeas* (Linnaeus, 1761)	+	+	+	+	+		+	+	+	
*43. *Lycaena dispar* (Haworth, 1803)				+		+				
44. *Lycaena virgaureae* (Linnaeus, 1758)	+							+	+	+
45. *Lycaena tityrus* (Poda, 1761)		+		+	+	+	+		+	
46. *Lycaena alciphron* (Rottemburg, 1775)	+				+				+	
47. *Lycaena thersamon* (Esper, 1784)					+				+	
48. *Lycaena candens* (Herrich-Schäffer, 1844)							+	+	+	+
* 49. *Thecla betulae* (Linnaeus, 1758)					+				+	
50. *Neozephirus quercus* (Linnaeus, 1758)	+				+				+	
51. *Satyrium ilicis* (Esper, 1779)	+				+				+	

LOCALITIES	1	2	3	4	5	6	7	8	9	10
*52. *Satyrium acaciae* (Fabricius, 1787)										+
53. *Satyrium pruni* (Linnaeus, 1758)					+	+			+	
54. *Satyrium w-album* (Knoch, 1782)									+	
55. *Satyrium spini* (Fabricius, 1787)	+	+	+		+				+	+
56. *Callophrys rubi* (Linnaeus, 1758)				+	+				+	
57. *Leptotes pirithous* (Linnaeus, 1767)				+	+					
*58. *Lampides boeticus* (Linnaeus, 1767)					+					
*59. *Cupido minimus* (Fuessly, 1775)	+				+				+	+
60. *Cupido osiris* (Meigen, 1829)				+	+				+	
61. *Cupido decoloratus* Staudinger, 1886)					+					
62. *Celastrina argiolus* (Linnaeus, 1758)		+			+				+	
*63. *Scolitantides schiffermuelleri* (Hemming, 1929)				+	+					
*64. *Scolitantides bavius* (Eversmann. 1832)	+	+			+					
65. *Scolitantides orion* (Pallas, 1771)	+	+		+	+					
*66. *Glaucopsyche alexis* (Poda, 1761)	+	+	+		+	+	+			+
67. *Glaucopsyche alcon* (Denis & Schiffermüller, 1775)					+					
*68. *Glaucopsyche arion* (Linnaeus, 1758)	+				+				+	
69. *Glaucopsyche iolas* (Ochsenheimer, 1816)		+								
*70. *Plebeius argus* (Linnaeus, 1758)	+	+	+	+	+	+	+	+	+	+
71. *Plebeius sephirus* (Frivaldszky, 1835)				+	+					
* 72. *Plebeius idas* (Linnaeus, 1761)	+	+		+	+	+			+	
* 73. *Plebeius argyrognomon* (Bergsträsser, 1779)					+				+	+
74. *Plebeius agestis* (Denis & Schiffermüller, 1775)	+			+	+				+	+
*75. *Plebeius artaxerxes* (Fabricius, 1793)					+				+	
76. *Plebeius eumedon* (Esper, 1780)					+					+
77. *Plebeius anteros* (Freyer, 1838)					+				+	
78. *Plebeius optilete* (Knoch, 1781)									+	
*79. *Polyommatus semiargus* (Rottemburg, 1775)				+	+				+	+
80. *Polyommatus damon* (Denis & Schiffermüller, 1775)	+								+	+
*81. *Polyommatus ripartii* (Freyer, 1830)					+					
82. *Polyommatus admetus* (Esper, 1783)		+			+					+
83. *Polyommatus amandus* (Schneider, 1792)					+				+	+

LOCALITIES	1	2	3	4	5	6	7	8	9	10
*84. *Polyommatus thersites* (Cantener, 1835)					+					
85. *Polyommatus escheri* (Hübner, 1823)		+								
86. *Polyommatus dorylas* (Denis & Schiffermüller, 1775)		+							+	
87. *Polyommatus coridon* (Poda, 1761)	+	+		+	+				+	+
88. *Polyommatus bellargus* (Rottemburg, 1775)	+			+	+		+	+	+	+
89. *Polyommatus daphnis* (Denis & Schiffermüller, 1775)	+	+	+		+	+	+		+	+
90. *Polyommatus icarus* (Rottemburg, 1775)	+	+	+	+	+	+	+	+	+	+
91. *Polyommatus eroides* (Frivaldszky, 1835)							+		+	+
Fam. ***Riodinidae***										
*92. *Hamearis lucina* (Linnaeus, 1758)					+	+			+	+
Fam. ***Libytheidae***										
93. *Libythea celtis* (Laicharting, 1782)		+	+		+					
Fam. ***Nymphalidae***										
94. *Nymphalis polychloros* (Linnaeus, 1758)	+			+	+	+			+	+
95. *Nymphalis antiopa* (Linnaeus, 1758)			+		+				+	
96. *Nymphalis io* (Linnaeus, 1758)			+		+		+	+	+	
97. *Vanessa atalanta* (Linnaeus, 1758)	+		+	+	+	+	+		+	+
98. *Vanessa cardui* (Linnaeus, 1758)	+	+	+	+	+	+	+	+	+	+
99. *Nymphalis urticae* (Linnaeus, 1758)	+		+	+	+	+	+		+	+
100. *Nymphalis c-album* (Linnaeus,1758)					+	+	+		+	+
101. *Argynnis paphia* (Linnaeus, 1758)	+	+	+	+	+	+	+	+	+	+
102. *Argynnis pandora* (Denis & Schiffermüller, 1775)			+	+	+	+	+		+	
103. *Argynnis aglaja* (Linnaeus, 1758)	+				+	+	+		+	
104. *Argynnis niobe* (Linnaeus, 1758)	+		+						+	
105. *Argynnis adippe* (Denis & Schiffermüller, 1775)	+				+	+		+	+	+
106. *Issoria lathonia* (Linnaeus, 1758)	+	+	+	+	+	+	+	+	+	+
*107. *Brenthis hecate* (Denis & Schiffermüller, 1775)					+	+			+	
108. *Brenthis daphne* (Bergsträsser, 1780)		+	+		+					
109. *Boloria pales* (Denis & Schiffermüller, 1775)	+								+	
110. *Boloria graeca* (Staudinger, 1870)	+								+	
111. *Boloria dia* (Linnaeus, 1767)	+	+	+	+	+	+	+	+	+	+

LOCALITIES	1	2	3	4	5	6	7	8	9	10
*112. *Boloria titania* (Esper, 1793)								+	+	
113. *Boloria euphrosyne* (Linnaeus, 1758)	+			+	+	+			+	
114. *Melitaea didyma* (Esper, 1799)	+	+	+	+	+	+	+	+	+	
115. *Melitaea trivia* (Denis & Schiffermüller, 1775)	+		+		+	+	+		+	
116. *Melitaea phoebe* (Denis & Schiffermüller, 1775)	+		+		+				+	
117. *Melitaea cinxia* (Linnaeus, 1758)			+	+	+				+	+
118. *Melitaea diamina* (Lang, 1789)	+									
119. *Melitaea athalia* (Rottemburg, 1775)	+				+		+		+	
*120. *Melitaea aurelia* Nickerl, 1850					+					
*121. *Euphydryas maturna* (Linnaeus, 1758)	+									
122. *Euphydryas aurinia* (Rottemburg, 1775)				+						+
123. *Apatura ilia* (Denis & Schiffermüller, 1775)	+			+	+				+	
124. *Apatura iris* (Linnaeus, 1758)	+		+		+				+	
125. *Limenitis populi* (Linnaeus, 1758)			+							
126. *Limenitis reducta* (Staudinger,1901)	+	+	+	+	+					
127. *Limenitis camilla* (Linnaeus, 1764)	+	+	+		+					
*128. *Neptis sappho* (Pallas, 1771)	+									
*129. *Neptis rivularis* (Scopoli, 1763)		+			+					
Fam. ***Satyridae***										
130. *Hipparchia ferula* (Fabricius, 1793)	+				+				+	+
131. *Hipparchia dryas* (Scopoli, 1763)					+		+			
*132. *Hipparchia circe* (Fabricius, 1775)				+	+		+	+		
*133. *Hipparchia arethusa* (Denis & Schiffermüller, 1775)			+		+		+			
134. *Hipparchia fagi* (Scopoli, 1763)			+							+
135. *Hipparchia syriaca* (Staudinger, 1871)			+	+	+		+			
136. *Hipparchia semele* (Linnaeus, 1758)				+					+	+
137. *Hipparchia volgensis* (Mazochin-Porshnjakov, 1952)					+	+	+			
138. *Hipparchia statilinus* (Hufnagel, 1766)	+		+	+	+				+	
139. *Hipparchia briseis* (Linnaeus, 1764)			+		+		+		+	+
140. *Erebia ligea* (Linnaeus, 1758)	+						+		+	
141. *Erebia euryale* (Esper, 1805)	+						+		+	

LOCALITIES	1	2	3	4	5	6	7	8	9	10
*142. *Erebiamanto* (Denis & Schiffermüller, 1775)								+		
143. *Erebia epiphron* (Knoch, 1783)									+	
144. *Erebiaaethiops* (Esper, 1777)	+									
145. *Erebia medusa* (Denis & Schiffermüller, 1775)					+		+		+	+
146. *Erebia gorge* (Esper, 1805)									+	+
147. *Erebia rhodopensis sharsta* Higgins, 1965									+	
*148. *Erebia cassioides* (Reiner & Hohenwarth, 1792)	+								+	
149. *Erebia ottomana* Herrich-Schäffer, 1847	+					+	+		+	+
150. *Erebia pronoe* (Esper, 178o)	+							+	+	
*151. *Erebia melas* (Herbst, 1796)	+					+		+	+	+
152. *Erebia oeme* (Esper, 1805)									+	+
153. *Erebia pandrose* (Borkhausen, 1788)									+	
154. *Melanargia galathea* (Linnaeus, 1758)	+	+	+	+	+	+	+	+	+	+
155. *Melanargia larissa* (Esper, 1784)				+						
156. *Maniola jurtina* (Linnaeus, 1758)	+	+	+	+	+	+	+	+	+	+
157. *Maniola lycaon* (KÜhn, 1774)	+			+	+		+		+	+
158. *Maniola lupina* (Costa, 1836)			+		+				+	
159. *Aphantopus hyperantus* (Linnaeus, 1758)			+		+				+	+
160. *Maniola tithonus* (Linnaeus, 1771)	+		+		+					+
161. *Coenonympha pamphilus* (Linnaeus, 1758)	+	+	+	+	+	+	+	+	+	+
162. *Coenonympha rhodopensis* Elwes, 1900	+						+		+	+
163. *Coenonympha leander* (Esper, 1784)					+				+	
*164. *Coenonympha gardetta* (Prunner, 1798)	+						+			
165. *Coenonympha arcania* (Linnaeus, 1761)	+		+	+	+		+		+	+
*166. *Coenonympha glycerion* (Borkhausen, 1788)							+			
167. *Pararge aegeria* (Linnaeus, 1758)	+	+	+	+	+		+	+	+	+
168. *Pararge megera* (Linnaeus, 1767)	+	+	+	+	+				+	
169. *Pararge maera* (Linnaeus, 1758)	+	+	+	+	+	+	+	+	+	+
170. *Pararge petropolitana* (Fabricius, 1787)									+	+
171. *Pararge roxelana* (Cramer, 1777)					+					

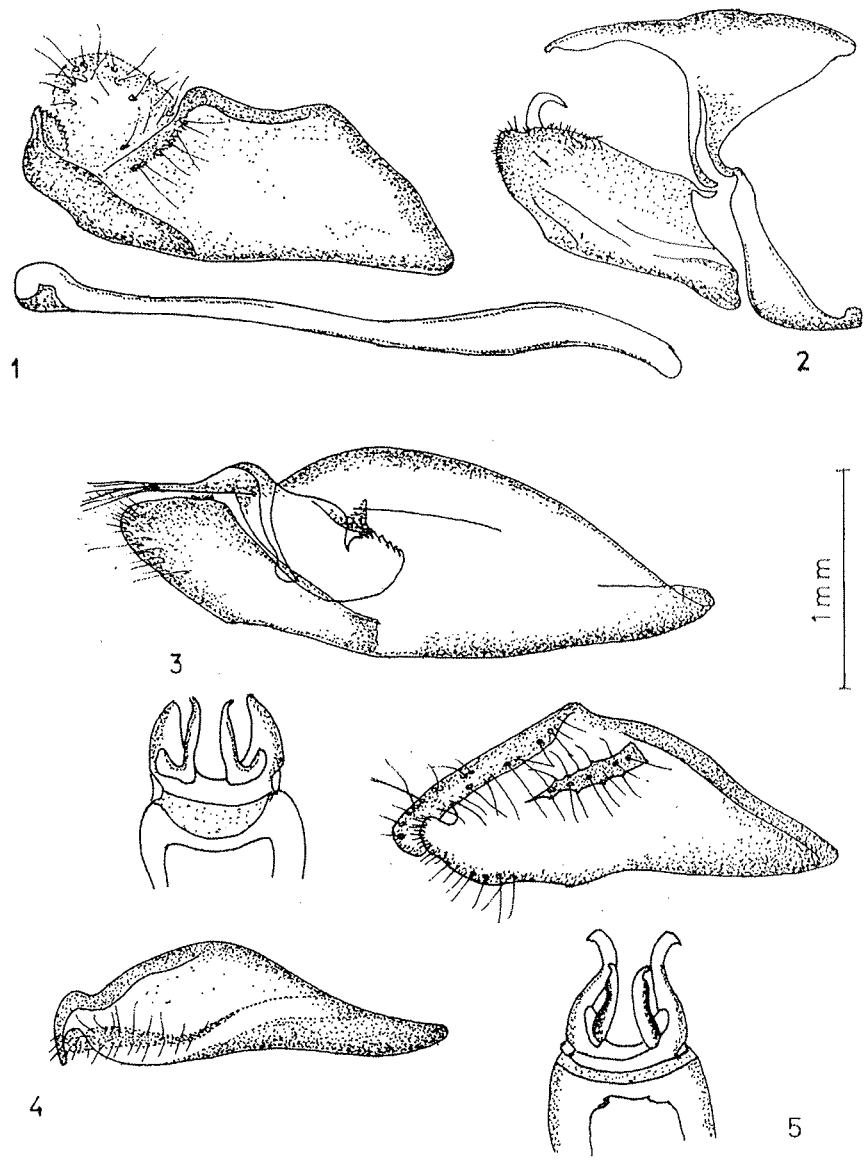

Fig. 1. - Male genitalia of certain ixamined species: 1) *Carterocephalus palaemon* Pallas, 1771 - Peć: Rugovska Klisura, 650 *m*, 07.04.1979; 2) *Neptis sappho* Pallas, 1771 - Peć: Miliševac, 600 *m*, 15.08.1985; 3) *Pyrgus andromedae* Wallengren, 1853 - Šar-Planina: Meanče, 2317 *m*, 13.07.1988; 4) *Vaccinina optilete* Knoch, 1781 - Šar-Planina: Durlov Potok, 1850 m, 12.07. 1988; 5) *Plebejus sephirus* Frivaldsky, 1835 - Priština: Grmija, 700 m, 10.05.1991.

Genitalije mužjaka istraženih vrsta.

DISCUSION

An analysis of the investigation results presented in Table 1 offers a more precise picture of the diversity and composition of butterfly fauna on Kosovo and Metohija. A total of 244 butterfly species has been recorded from former Yugoslavia. Thus the 171 species established on Kosovo and Metohija comprise 70% of all former Yugoslavia butterfly species. This is a high percentage, considering the size of Kosovo and Metohija territory. A comparison with the number of species from surrounding areas confirms this claim. For example: 205 species have been found in Macedonia, 160 in Montenegro (still an insufficiently investigated region) and 130 on Mt. Durmitor (S i j a r i ć *et al.* 1984). In the wider area of Timočka Krajina 138 species have been recorded (Z e č e v i ć 1983), and 181 species for the whole Croatia (L o r k o v i ć 1985). Therefore the butterfly fauna of Kosovo and Metohija may be considered to be well investigated. Theoretically, we may expect to find several more species in the region, but that would not significantly affect the picture. It would be interesting to compare proportional representation of other groups of insects, animals, and plants in Kosovo and Metohija and other parts of former Yugoslavia. Particularly as the occurrence of some butterfly species indicates the presence of certain plants used as food by their caterpillars, although these plants have not yet been found in Kosovo and Metohija (J a k š i ć 1986).

It can be seen from the presented results that we established 43 new butterfly species for the area. The newly discovered species included some unexpected records, which was already discussed in the aforementioned work of the first author. Plate I shows the genitalia of five of the most important species new for the fauna of Kosovo and Metohija.

Tab. 2. - *The faunistic grouping of butterflies of Kosovo and Metohija (according to V a r g a 1977, modified): total of species 171 (100%); numbers correspond to the species numbers in Tab. 1.*

Faunistička podela leptira Kosova i Metohije: ukupan broj vrsta 171 (100%); brojevi odgovara brojuevima vrsta u tabeli 1.

I PALAEARCTIC SPECIES

1. Arboreal faunistic elements:

a) Holarctic species, 51(29,8%):
1, 2, 12, 13, 15, 17, 18, 19, 25, 26, 27, 30, 33, 34, 39, 42, 45, 53, 54, 56, 59, 62, 66, 68, 70, 72, 79, 90, 95, 96, 99, 100, 101, 103, 104, 105, 106, 108, 111, 113, 114, 116, 117, 119, 120, 122, 123, 124, 127, 161, 169.

b) West palaearctic species, 28(16,3%):
3, 9, 10, 11, 14, 20, 46, 47, 52, 55, 69, 74, 82, 84, 88, 94, 97, 102, 107, 115, 130, 136, 139, 156, 157, 158, 167, 168.

c) Atlanto-Mediterranean species, 1(0,5%):
63.

d) Atlanto-Pontomediterranean-Caspian species, 6(3,5%):
6, 60, 64, 71, 81, 133.

e) North and Pontomediterranean species, 33(19,2%):
8, 16, 21, 22, 28, 29, 31, 32, 36, 40, 41, 50, 51, 57, 61, 77, 85, 86, 87, 89, 92, 126, 132, 134, 135, 137, 138, 154, 155, 160, 163, 165, 171.

f) Pontocaspian-Turkestano-southern-Siberian species, 14(8,1%):
4, 5, 24, 43, 65, 67, 73, 80, 91, 93, 121, 128, 129, 131.

g) Siberian species, 17(9,9%):
23, 35, 44, 49, 75, 76, 78, 83, 112, 118, 125, 140, 144, 145, 159, 166, 170.

2. Oreal faunistic elements:

a) Oreotundral species, 2(1,1%):
7, 153.

b) Euroalpine species, 9(5,2%):
109, 141, 142, 143, 146, 148, 150, 152, 164.

c) Pontomediterranean oreal species, 7(4%):
37, 48, 110, 147, 149, 141, 162

II PALAEOTROPIC SPECIES, 2 (1,1%):
38, 58.

III NEARCTIC SPECIES, 1 (0,5%):
98.

The composition of the butterfly fauna can be shown by an analysis of zoogeographical features (Tab. 2). Table 2 shows that all species, except three, belong to Palaearctic centers of distribution where arboreal faunistic elements predominate, with almost one third being Holarctic species. The dominant species among Kosovo and Metohija butterflies (1, 8, 12, 20, 25, 27, 30, 34, 40, 42, 45, 70, 90, 99, 101, 102, 106, 111, 114, 154, 156, 161, 167, 169) are typical representatives of Central European faunistic elements. The three non Holarctic migratory species (38, 58, 98) have no diapause in Kosovo and Metohija at any stage of their development, but are immigrants from the Mediterranean basin.

Even a superficial analysis of fauna composition from certain smaller sites shows remarkable complexity, which is seen first of all in mutual presence of different faunistical elements. These communities thus assume a polydominant character, as already described for some canyons and gorges in Kosovo and Metohija (J a k š i ć 1986). This polydominance is characteristic of alpine fauna. A sound knowledge of fauna allows us to follow two elements of alpine fauna in northern-southerly direction over the whole territory of former Yugoslavia: euroalpine and pontomediterranian oreal faunistic elements (Tab. 3). The survey clearly shows specific features in the succession of pontomediterranian oreal faunistic elements, in contrast to euroalpine elements as nonspecific components of alpine fauna. The survey also points to Velebit as the transitional area for the distribution of these elements, which has already been discussed, in relation to butterflies (M l a d i n o v & L o r k o v i ć 1985).

Tab. 3. - *Two components of alpine faunistic elements.*
Dve komponente alpskih faunističkih elemenata

SPECIES	TRIGLAV	VELEBIT	DURMITOR	ŠAR-PL.	PELISTER
Euroalpine faunistical elements					
Boloria pales Schiff.	+		+	+	+
Erebia epiphron Kn.		+	+	+	+
Erebia gorge Hbn.	+	+	+	+	+
Erebia cassioides Hoh.			+	+	+
Erebia pronoe Esper	+	+	+	+	+
Erebia stirius Godart	+				
Erebia oeme Hbn.	+	+	+	+	
Coen. gardetta Prunn.	+		+		
Pontomediterranean - - oreal faunistic elements					
Colias balcanica Rebel				?	+
Lycaena candens H.-S.		+	+	+	+
Boloria graeca Stgr.			+	+	+
Erebia ottomana H.-S.		+	+	+	+
Erebia melas Herbst		+	+	+	+
Coen. rhodopensis El.		+	+	+	+

Apart from the alpine butterflies cited in Table 3, there are other species of particular importance for Kosovo and Metohija fauna, such as specific Balkan endemite, *Erebia rhodopensis sharsta* Higgins, which has not been found anywhere else in former Yugoslavia except on Šar-Planina Mt. Also important is the record of an alpine species *Plebeius optilete* (Knoch, 1781), whose population, stable and dense, has been found on Šar-Planina (the site of Durlov Potok, 1650-1800 m a.s.l.). Interestingly, this species can also be found in Pohorje and Karavanke near Jesenice in Slovenia.

From an analysis of the alpine region of Kosovo and Metohija it can be inferred that this is the center of geomorphologic units: Prokletije Mts. are the extreme south-eastern ridge of Dinaric karst; Šar-Planina is a clearly defined entity within the Šara-Pindic mountain system; and Kopaonik is a specific transitional area with the elements of Dinaric karst and Rodopi massif. Furthermore, the direction of these mountain systems had a decisive influence on the development of the present butterfly fauna during the glaciation and interglaciation.

Tab. 4: *Distribution of some representatives of Kosovo and Metohija high mountain fauna.* Rasprostranjenje nekih predstavnika visokoplaninske faune Kosova i Metohije.

SPECIES	KOPAONIK	PROKLETIJE	ŠAR-PL.
Lycaena candens H.-S.	+	+	+
Plebeius optilete (Knoch)			+
Boloria titania (Esper)	+	+	+
Erebia epiphron Knoch			+
Erebia rhodopensis Nicholl			+
Erebia cassioides Hohenw.		+	+
Erebia pandrose Borkhausen		+	+
Coenon. rhodopensis Elwes	+	+	+
Coenon. gardetta Prunner	+	+	
Coenon. glycerion Borkh.	+		

Table 4 offers a survey of certain specific alpine butterflies in these areas of Kosovo and Metohija. The Table shows that there are no specific features in the distribution neither of pontomediterranian oreal (totally "covering" this area) nor euroalpine faunistic elements. To the contrary, their distribution accords with the local ecological conditions on each of these three mountains.

Finally, the butterfly fauna of Kosovo and Metohija comprises pontomediterranean elements of Anatolia present in the south-eastern part of the Balkans. Those are species of steppe xerothermal type: *L. duponcheli* Stgr., *H. syriaca* Stgr., *H. volgensis* M.-P., *P. roxelana* Cramer, *M. larissa* Geyer etc. Kosovo and Metohija is the boundary area of their ranges. Their population number is small and largely depends on a variety of ecological conditions during certain seasons.

With regard to the west European frigophile, mesophile elements and anatolian xerothermal elements, it should be noted that the range boundary for the greatest number of species of these two groups lies exactly in Kosovo and Metohija, with Šar-Planina as a strong border barrier. South of Šar-Planina, in Macedonia, there occur many refugia of preglacial fauna (Treska, Topolka, Babuna, Lukovo, etc.) with numerous butterfly species that cannot be found north of this mountain.

As regards the vertical distribution of butterflies, in spite of clear zone division in Kosovo and Metohija, a systematic review cannot be given due to the size of territory and high mobility of these insects. However, we may note that only 10 species (5%) are limited to the alluvial lowlands not exceeding 700 *m* above sea level, 18 species (10.2%) are restricted to alpine regions in the 1300-2500 *m* above sea level; other species can be found in various zones, the majority of them in the belt 700-1800 *m* above sea level, where optimal ecological conditions exist. As we have said before, the number of Kosovo and Metohija butterfly species is very high. The explanation for this lies primarily in the central location of Kosovo and Metohija in the Balkans and in the history

of colonization of its fauna, which allowed the arrival of faunistic elements from adjoining regions. The present remarkable diversity of ecological factors renders possible the existence of different faunistic elements.

CONCLUSIONS

From an analysis of the research results the following conclusions can be inferred:

The investigation of butterfly fauna in Kosovo and Metohija dates from the beginning of this century, and was most intensive in the period between two World Wars and after the World War II.

According to the literature data about 130 butterfly species were known from the territory of Kosovo and Metohija until our investigations undertaken 20 years ago.

The field investigations of Kosovo and Metohija region yielded 43 new butterfly species. Thus, 171 species of butterflies are established for this region (Table 1).

Quantitative investigations seem to be satisfying, but further field research could add to the quality, particularly with regard to subspecific differentiation and detailed zoogeographical divisions.

Zoogeographical classification indicates the complexity of butterfly fauna composition (Tab. 2) which further suggest a complex history of colonisation of this area.

Faunistic analyses of alpine elements show an absence specific elements in distribution of both pontomediterranian oreal and euroalpine elements.

The most important representatives of butterfly fauna of Kosovo and Metohija can be found among steppe xerothermal species originating from Anatolia, as well as among alpine species that are the members of different faunistic groups.

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DNEVNI LEPTIRI KOSOVA I METOHIJE (JUŽNA SRBIJA) (*Lepidoptera*: *Hesperioidea* i *Papilionoidea*)

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I z v o d

U radu je dat sintetski prikaz višegodišnjeg istraživanja faune dnevnih leptira Kosova i Metohije. Ukupno je utvrdjena 171 vrsta, što je prikazano u tabeli 1. To je vrlo visoka cifra, koja u procentima iznosi 70% od faune dnevnih leptira prethodne Jugoslavije. Iz tabele 1 može se takodje videti da su otkrivene 43 nove vrste (označene zvezdicama) za faunu Kosova i Metohije. Na slici 1 dati su crteži genitalija nekih od novootkrivenih vrsta. U tabeli 2 data je zoogeografska analiza faune dnevnih leptira Kosova i Metohije. U fauni dominiraju vrste sa srednjeevropskim centrima rasprostranjenja. Pored toga javljaju se tri nepalearktičke vrste, koje ni u jednom razvojnom stadijumu nemaju dijapauzu na prostoru Kosova i Metohije. Analiziramo li učešće pojedinih faunističkih elemenata na pojedinačnim lokalitetima uočićemo polidominantni sastav faune. Iz tabele 3 se vidi specifičnost u smeni pontomediteransko orealnih sa euroalpskim elementima faune na prostoru Kosova i Metohije. Kao endemične vrste u fauni Srbije na prostoru Kosova i Metohije prisutne su *Colias balcanica* Rebel, *Plebeius optilete* Knoch i *Erebia rhodopensis* Nicholl (prva sa Kopaonika, a druge dve sa Šar-planine).

Kao posebno bogato i još uvek nedovoljno istraženo ovo područje zaslužuje i dalje intenzivno istraživanje.

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Original scientific paper

SOME EVOLUTIONARY ASPECTS OF LABIAL PALPS IN *BRACONIDAE* (*HYMENOPTERA*)

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Labial palps of 334 species from 132 genera of the family *Braconidae* were investigated, while 156 of them were illustrated. Also some evolutionary trends of labial palps were discussed and the importance of palpal characteristics in taxonomy was emphasized.

INTRODUCTION

The Braconid mouthparts are adapted to take liquid food (*nectar*) and in ectoparasiting species also to heamolymph of the host during egg laying (T o b i a s 1959).

The family of *Braconidae* has a unique structure of mouth apparatus. The exception is subfamily species *Alysiinae* which have mandibules turned out whose tips never touch. Most frequently is the labrum triangular in shape and mandibles are short with double teeth (except in *Alysiinae*). All *Braconidae* have short maxillae with palps consisting of 5-6 segments; few species have less segments.

The labium of all *Braconidae* is built of shuttle-like prementum, fan - - shaped glossae, cylindrical hypopharynx and palps with segments of various length and number.

In taxonomy of *Braconidae* many characteristics of mouth structure have not been used until now except clipeus, *i. e.* labrum relationship towards

mandible. Sporadically, numbers of segments in maxillar palps were taken in keys for determination of certain species.

The results of the study of the mouthparts in some *Hymenoptera* groups, *Formicidae* (G o t w a l d 1969), *Sphecidae* (R a d o v i ć 1980), *Braconidae* (B r a j k o v i ć 1980), served for important corrections in phylogenetic system of the researched taxa.

In this paper special attention was paid to the reduction of the segment number in labial palps which differ significantly in their structure in the family *Braconidae*.

MATERIAL AND METHODS

The investigated material has originated from the collection of the Systematic Entomology Laboratory, USDA, Washington, D. C. The mouthparts structure was dissected in 10% KOH solution, macerated and then put trough a series of alcohol solutions with increasing concentration of alcohol up to the absolute. From there they were transferred to toluol and from toluol mounted on slides in Canada-balsam. The labial palps were shown sideways, with scale--line 1 *mm*. The list of the species studied is given in the legend with the illustrations.

RESULTS AND DISCUSION

The results of these investigations have shown that within the family of *Braconidae* there exists a great variation in length of labial palps, in number and shape of segments and in relative length of some segments. The species of subfamily *Doryctinae* (Fig. 1, *1-22*) have 4 segments and usually have a long labial palp which shows plesiomorphological condition of this character. Only species of genera *Aivalicus* (Fig. 1, *2*) and *Ecphylus* (Fig. 1, *5*) have 3-segmented palps, the third segment being considerably longer than the others.

The investigated genera of the subfamily *Doryctinae* differ in length of some segments in labial palps and therefore this feature can be used with certainty in genera diagnosis. Species of the subfamily *Braconinae* (Fig. 1, *23-38*) have 3-segmented labial palps. The relative length of their segments varies considerably and is specific for every genus. Only the species of *Spinaria flavipennis* (Fig. 1, *35*) has 4-segmented and very long labial palps. This species also has the 3rd and the 4th segments considerably shorter than the 1st and the 2nd ones which is not the case with the other *Braconinae* species.

The species of the subfamily *Exotecinae* (Fig. 1, *39-51*) (M a r s h 1979) are much closer to *Doryctinae* by number of segments in labial palps as they all have four segments and long palps except for the species of the genus *Oncophanes* (Fig. 1, *40*). The species *Hormius vulgaris* Ashm. (Fig. 1, *45*), and

Hormisca tatiane Tel. (Fig. 1, 47) have considerably shorter third segments in labial palps which is not the case in other ectoparasiting *Braconidae*.

The diversity in the structure of labial palps is considerably larger within enodparasiting *Braconidae*. The number of segments ranges from four in majority of species to one in the species of genera *Elasmosoma* (Fig. 3, *146*), *Neoneurus* and *Cosmophorus* (Fig. 3, *156*). This undoubtedly points to two things: a) tendency of reduction in number of segments and b) shortening of labial palps in whole. Reduction of the third segments in labial palps appears distinctly in most primitive endoparasiting *Braconidae*. Therefore genera *Helconidea* (Fig. 1, *64*), *Helcon* (Fig. 1, *63*) and *Cenocoelius* (Fig. 1, *65*) belonging to the subfamily *Helconinae* are characterized by very long labial palps, usually longer than the whole labium. Their third segments are much shorter. Genera *Baeacis* (Fig. 1, *66*) and *Diospilus* (Fig. 2, *67*) have 3-segmented labial palps.

The subfamilies of *Rogadinae* (Fig. 1, *52-62*), *Macrocentrinae* (Fig. 2, *69*), *Opiinae* (Fig. 2, *81-88*), *Cheloninae* (Fig. 2, *106-110*) and majority of species belonging the subfamily *Alysiinae* (Fig. 2, *89-104*) have very long 4-segmented labial palps. The length of segments in the mentioned subfamilies varies remarkably between the subfamilies and within genera, so that this feature may be used with great certainty in genera revision.

The species of *Zele melleus* (*Zelinae*, Fig. 2, *68*) is characterized by very short, almost ring-shaped third segments in labial palps, although palps themselves are quite long. The tendency of palps shortening and partial or complete reduction of third segments is most clearly expressed within the genus *Agathis* of the subfamily *Agathidinae* (Fig. 2, *70-80*). The species of *Agathis perforator* Prov. (Fig. 2, *74*), *A. simillima* Cress., *A. erythrogaster* Vier., *A. pumilla* (Ratz.), *A. diversa* (Mues.) and *A. stigmatera* (Cress.) have narrow and prolonged 4-segmented labial palps. The species of *Agathis festiva* Mues. (Fig. 2, *73*) and *A. texana* (Cress.) have considerably shorter third segments on their palps while the species *Agathis calcarata* (Cress.), (Fig. 2, *75*) is lacking these segments and therefore its palps are 3-segmented. The reduction of the third segments in labial palps is shown in the small subfamily *Ichneutinae* (Fig. 2, *121--122*), whose species are the parasites of the *Symphita* larvae. The labial palps of *Ichneutes piconematis* Mason species (Fig. 2, *121*) are 4-segmented with very short third segments, while in *Ichneutidea proteroptoides* Vier. (Fig. 2, *122*), they are 3-segmented. Ring-shaped and almost completely reduced third segments of labial palps were established in the majority of species in the subfamily *Blacinae* (Fig. 2, *124-132*). The species of the genera *Blacus* (Fig. 2, *124*) and *Pygostolus* (Fig. 2, *127*) the parasites of the *Coleoptera* larvae, have very similar palps with almost reduced third segments. The species of the genera *Orgilus* (Fig. 3, *142-143*), *Microtypus* (Fig. 3, *141*), *Stantonia* (Fig. 3, *144*) and *Eubadizon* (Fig. 2, *128, 130, 131, 132*, Fig. 3, *140*), the parasites of the larvae of *Lepidoptera* have also 4-segmented labial palps with very short, ring-shaped third segments. The labial palps of the mentioned genera are generally short.

Fig. 1. - ***DORYCTINAE***: 1) *Acrophasmus immigrans* (Beard.), 2) *Aivalycus eclectes* Nix., 3) *Dendrosoter sulcatus* Mues., 4) *Doryctes fartus* Prov., 5) *Ecphylus hicoriae* Roh., 6) *E. pacificus* Marsh., 7) *Glyptocolastes caryae* (Ashm.), 8) *Euscelinus sarawacus* Westv., 9) *Heterospilus prosopidis* Vier., 10) *Histeromerus canadensis* Ashm., 11) *Leluthia mexicana* Cam., 12) *Liobracon aquilonius* Marsh., 13) *Megaloproctus platyantennus* Marsh., 14) *Monolexis fuscicornis* Foerst., 15) *Ontsira mellipes* Ashm., 16) *Odontobracon nigriceps* Cam., 17) *Rhaconotus cressoni* Mues. and Wal., 18) *Pambolidea barberi* Marsh., 19) *Rhaconotus fasciatus* (Ashm.), 20) *Rhoptocentrus piceus* Marsh., 21) *Spathius apicalis* (Westw.), 22) *Stenocorse bruchivorus* (Craw.); ***BRACONINAE***: 23) *Atanycolus comosifrons* Shenef., 24) *Habrobracon gelechiae* Ashm., 25) *Bracon mellitor* Say, 26) *Habrobracon hebetor* (Say), 27) *Bracon nuperus* Cress., 28) *Glabrobracon piger* Wesm., 29) *Coeloides scolytivorus* (Cress.), 30) *C. melanotus* Wesm., 31) *Phylomacroploea pleuralis* (Ashm.), 32) *Habrobracon xanthonotus* (Ashm.), 33) *Iphiaulax manteri* Nettl., 34) *Ipobracon rimac* Woll., 35) *Spinaria flavipennis* Roman., 36) *Stenobracon deesae* (Cam.), 37) *Tropobracon schoenobii* Vier., 38) *Vipio rugator* (Say); ***EXOTECINAE***: 39) *Colastes braconius* Hal., 40) *Oncophanes minutus* (Wesm.), 41) *Phanomeris metalli* Mues., 42) *Rhysipolis hariolator* (Hal.), 43) *Xenarcha lustrator* (Hal.), *Xenosternum ornigis* Mues., 45) *Hormius vulgaris* Ashm., 46) *Parachormius pallidipes* (Ashm.), 47) *Hormisca tatianae* Tel., 48) *Monitoriella elongata* Hedqv., 49) *Leurinion primum* Mues., 50) *Chremylus elaphus* Hal., 51) *Pambolus americana* (Ashm.); ***ROGADINAE***: 52) *Aleiodes parasiticus* Nort., 53) *Bucculatriplex bucculatricis* (Ashm.), 54) *Clinocentrus exsertor* (Nees), 55) *Cystomastax theretrae* Vier., 56) *Pelecystoma harrisinae* (Ashm.), 57) *Petalodes gossypiellae* Mues., 58) *Polystenidea parksi* Vier., 59) *Rogas molestus* Cress., 60) *R. terminalis* (Cress.), 61) *Tetrasphaeropyx pilosus* (Cress.), 62) *Yelicones delicatus* Cress.; ***HELCONINAE***: 63) *Helcon pedalis* Cress., 64) *Helconidea castaneae* Vier., 65) *Cenocoelius saperdae* (Ashm.), 66) *Baeacis abietis* (Ratz.) (scale-Line = 1 *mm*).

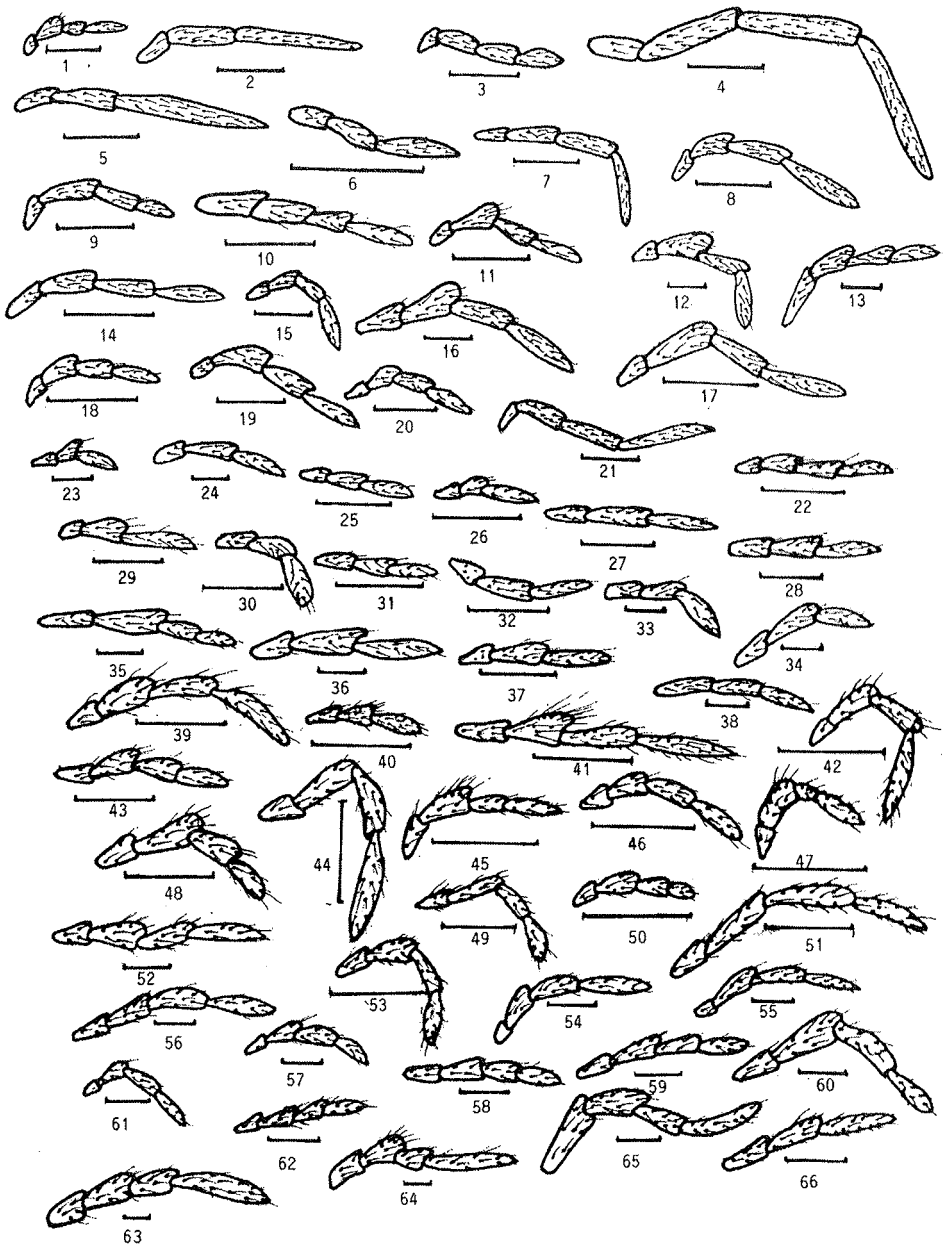
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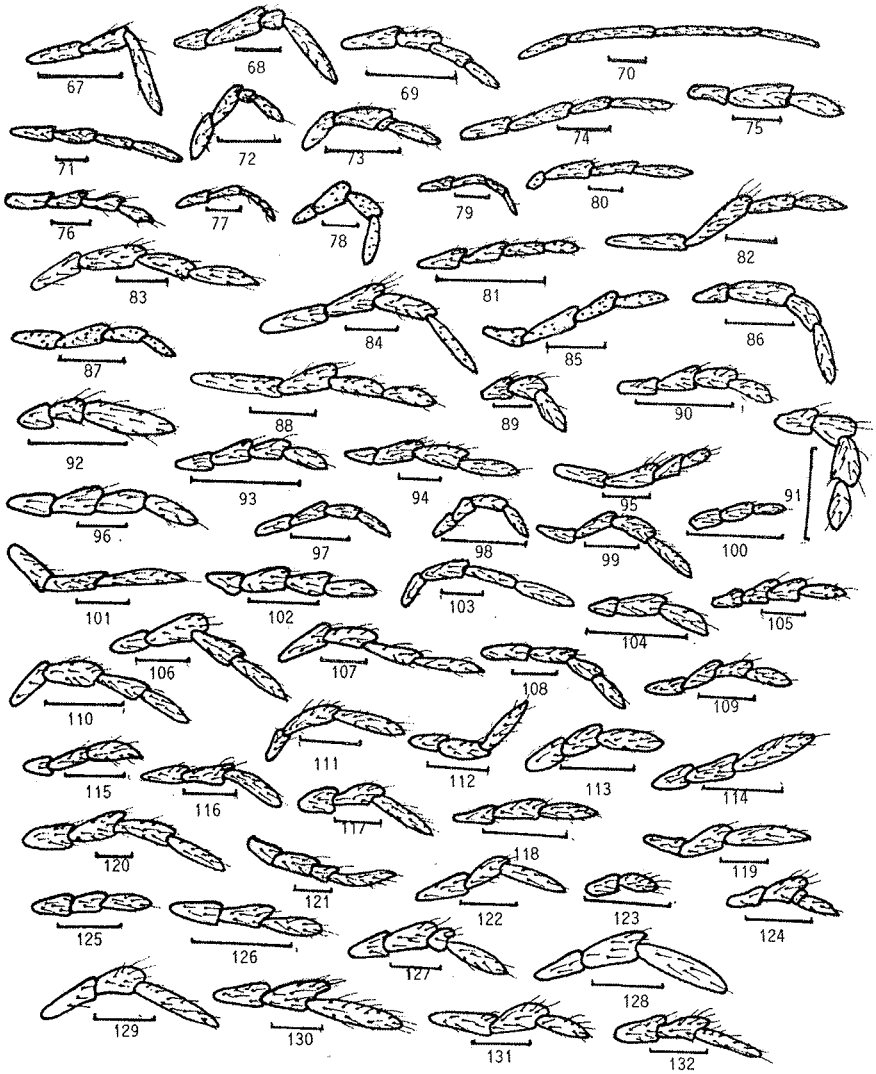
Fig. 2. - ***HELCONINAE***: 67) *Diospilus oleraceus* Hal.; ***ZELINAE***: 68) *Zelle melleus* (Cress.); ***MACROCENTRINAE***: 69) *Macrocentrus crambi* (Ashm.); ***AGATHIDINAE***: 70) *Aenigmostomus longipalpus* (Cress.), 71) *Agathirsia testacea* Mues., 72) *Agathis gibbosus* Say, 73) *A. festiva* Mues., 74) *A. perforator* Prov., 75) *A. calcaratus* (Cress.), 76) *Crassomicrodus divisus* (Cress.), 77) *Cremnops haematodes* Brulle, 78) *Earinus limitaris* (Say), 79) *Megagatis albitarsis* (Cress.), 80) *Zelomorpha arizonensis* Ashm; ***OPIINAE***: 81) *Ademon niger* (Ashm.), 82) *Doryctobracon zeteki* Mues., 83) *D. crawfordi* (Vier.), 84) *Biosteres sanguineus* (Ashm.), 85) *Diachasma muliebre* Mues., 86) *Opius nitidulator* (Nees), 87) *O. africanus* Siev., 88) *Biosteres vandenboschi* Full.; ***ALYSIINAE***: 89) *Chaenusa bergi* (Rieg.), 90) *Chorebus senilis* (Nees), 91) *Coelinidea meromyzae* (Forb.), 92) *C. ferruginea* Gah., 93) *Dacnusa laevipectus* (Thom.), 94) *Polemochartus lipariae* (Gir.), 95) *Alysia analis* Cress., 96) *A. manducator* (Panz.), 97) *Aphaereta pallipes (Say), 98) Aspilota nervosa* (Hal.), 99) *Phaenocarpa rubriceps* Prov., 100) *Asobara* sp., 101) *Phaenocarpa anastrephae* Mues., 102) *Chorebus minutus* (Tel.), 103) *Coelalysia lusoriae* (Bridw.), 104) *Pseudopezomachus masii* Nix.; ***SIGALPHINAE***: 105) *Sigalphus bicolor* (Cress.); ***CHELONINAE***: 106) *Ascogaster rufa* Mues. and Walk., 107) *Leptoderepana flavipes* Ashm., 108) *Chelonus narayani* Suba Rao, 109) *Microchelonus blacburni* (Gah.), 110) *Phanerotoma longicauda* Wall.; ***ACAELINAE***: 111) *Acaelius fasciipennis* (Rohw.); ***MICROGASTERINAE***: 112) *Apanteles xanthopus* Ashm., 113) *A. alexanderi* Breth., 114) *A. solitarius* (Ratz.), 115) *Hypomicrogaster tiro* (Reinh.), 116) *Microgaster subcompletus* Nees, 117) *M. tibialis* Nees, 118) *Mirax coptodiscae* Wall., 119) *Protomicroplitis auripes* (Prov.): ***CARDIOCHILINAE***: 120) *Cardiochiles nigriceps* Vier.; ***ICHNEUTINAE***: 121) *Ichneutes piconematis* Mason, 122) *Ichneutidea proteroptoides* Vier.; ***YPSISTOCERINAE***: 123) *Termitobracon emersoni* Brues; ***BLACINAE***: 124) *Blacus ruficornis* (Nees), 125) *Centistes leavis* (Cress.), 126) *Syrrhizus agilis* (Cress.), 127) *Pygostolus sticticus* (Fabr.), 128) *Eubadizon ernobii* Mues., 129) *Aliolus tomoxiae* (Roh.), 130) *Eubadizon strigitergum* Cush., 131) *E. definitum* (Mues.), 132) *E. phymatodis* Ashm. (scale-Line = 1 *mm*).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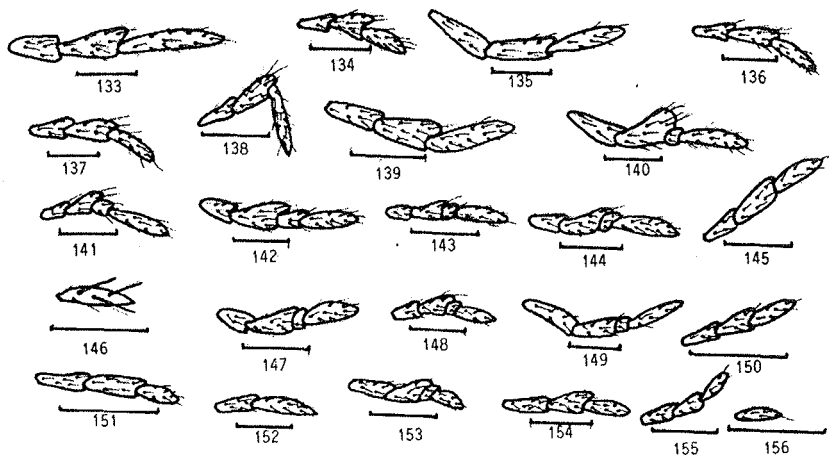

Fig. 3. - ***BLACINAE***: 133) *Eubazus rotundiceps* (Cress.), 134) *Schizoprymnus phllipsi* Vier., 135) *Aliolus rufus* Ril., 136) *Triapsis thoracicus* (Curt.), 137) *T. floricola* Wesm., 138) *Urosigalophus neobruchi* Gib., 139) *Ancylocentrus edentatus* (Hal.), 140) *Eubadizon exttensor* (L.), 141) *Microtypus fullawayi* (Beard.), 142) *Orgilus medicaginis* Mues., 143) *O. obscurator* (Nees), 144) *Stantonia lamprosemae* Mues., 145) *Allurus lituratus* (Hal.); ***NEONEURINAE***: 146) *Elasmosoma pergandei* Ashm.; ***EUPHORINAE***: 147) *Meteorus hyphantriae* Ril., 148) *M. hypophloei* Cush., 149) *Aridelus fischeri* (Vier.), 150) *Euphoriana uniformis* (Gah.), 151) *Microctonus eleodis* (Vier.), 152) *Dinocampus coccinellae* (Schr.), 153) *Perilitus rutilus* Nees, 154) *Leiophron pallipes* (Curt.), 155) *Wesmaelia pendula* Foerst.; ***COSMOPHORINAE***: 156) *Cosmophorus* sp. (scale-Line 1 = *mm*).

Finally, among the species of the subfamily *Euphorinae* (Fig. 3, *147--155*), which without doubt is the most progressive group, the species of the genera *Meteorus* (Fig. 3, *147-148*), *Aridelus* (Fig. 3, *149*) and *Perilitus* (Fig. 3, *153*) are characterized by 4-segmented labial palps in which the third segment is considerably reduced. The largest degree of reduction of the labial palps is in the species of *Termitobracon emersoni* Brues (Fig. 2, *123*) (*Ypsistocerinae*) in which labial palps are 2-segmented, and even more in the species *Elasmosoma pergandei* Ashm. (*Neoneurinae*) (Tab. 3, *146*) and *Cosmophorus* sp. (Fig. 3, *156*) (*Cosmophorinae*) where there is only one segment in labial palps.

The reduction in the number of segments in labial palps, is without doubt, achieved through the reduction of the third segments. This is already evident in ectoparasiting representatives of the *Braconidae* family which are more primitive than endoparasiting ones.

It is obvious from the obtained results that the tendency of shortening and reduction of number in segments of labial palps in the family *Braconidae* is expressed in various and unrelated subfamilies and it can be considered as parallelism although similar appearances are often marked as convergences which is incorrect. Parallelisms are frequent in the family of *Braconidae*, the most remarkable being the following: formation of premouth cavity, and of abdominal carapace, reduction of body size, etc. Parallelism appearances are the main reason of different macroclassifications within the family *Braconidae* (T o b i a s 1967, 1986, T e l e n g a 1952, Č a p e k 1970, A c h t e r b e r g 1984). The open question that remains to be answered is why in the evolution of labial palps the third segments are affected first, and there is also a question of further stages of reduction, since *Cosmophorus* and *Elasmosoma* have one segment.

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NEKI ASPEKTI EVOLUCIJE LABIJALNIH PALPUSA U FAMILIJI *BRACONIDAE* (*HYMENOPTERA*)

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I z v o d

U familiji *Braconidae* (*Hymenoptera*) vrlo je izražena tendencija skraćivanja i redukcije broja članaka labijalnih palpusa. Ova pojava je nezavisno tekla u različitim subfamilijama i ima karakter paralelizma. Smanjenje broja članaka u labijalnim palpusima počinje preko redukcije trećeg članka. Poznavanje pojave skraćivanja i redukcije broja članaka labijalnih palpusa je značajno i treba ga uzeti u obzir pri razmatranju filogenetskih odnosa i klasifikacije brakonida. Karakteristike građe labijalnih palpusa mogu se koristiti u sklopu drugih do sada korišćenih morfoloških karaktera što može doprineti izgrađivanju najprirodnijeg taksonomskog sistema brakonida.

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Original scientific paper

GOLDEN EAGLE (*AQUILA CHRYSAETOS* L.) POPULATION IN NATIONAL PARK "CENTRAL BALKAN" (BULGARIA)

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Nankinov, D. M., Nankinov, N., Lamburov, G. (1995-98): *Golden eagle (Aquila chrysaetos L.) in National Park "Central Balkan".*- Bulletin of Natural History Museum, Belgrade, *B49-50*, 229-236.

Central Balkan National Park supports the most numerous Golden Eagle population in Bulgaria. The updated studies confirmed about 20 breeding pairs, but expected number may be much higher. The National Park offers to Golden Eagle suitable habitats and abundant food. Main negative human effects are excluded. There are no serious bird competitors. Smugglers and collectors of young and eggs remain the only threats.

INTRODUCTION

The Bulgarian population of the Golden Eagle has been estimated by various authors to be about 200 pairs (Fischer *et al.* 1975), 150 pairs (Spiridonov 1985), 100-150 pairs (Krol 1987), or 130-140 pairs (Mitchev *et al.* 1989). It has been said that the greatest number of pairs broods in Stara Planina Mt. (50-70 pairs Spiridonov 1985, 28% Mitchev *et al.* 1989), and that its best habitats are in the Central Balkan National Park. However, there have been no special studies of the species in the region, and the available information has been episodic and obtained by chance. This made us summarize all available information (published or not) and carry out special research to find out its distribution in Central Balkan.

Our field studies were carried out from 1978 to 1996, covering the whole territory of the National Park. Special attention has been paid to the southern

slopes of the Stara Planina mountain, from the reserve Kozya Stena to the peak Botev, including reserves of Steneto, Stara Reka, and Dzhendema.

RESULTS AND DISCUSSION

The first information about Golden Eagle on the territory of Central Balkan comes from century ago. Since.then, it has been recorded by various observers (Fig. 1).

Between Etropole and Teteven: 31.05.1893 (R e i s e r 1894).

Troyanski Balkan: observed frequently, nesting on the rocks of the alpine zone (D r e n s k i 1934).

Near the Mirkovo village (Pirdop region): a young caught in the nest, 25.05.1946 (P a t e f f 1950).

Above Klissura: a pair nesting on the rocks, June 1961 (D o n t c h e v 1974).

Above Kalofer: 02.06.1962 (D o n t c h e v 1974).

Above V. Levski hut: 08.11.1963 (B a u m g a r t 1971).

Above the Karlovo town: 10.07.1973 (F i s c h e r *et al.* 1975).

Near the Pirdop town: 1973-1975 observed once (D o n t c h e v & I v a n o v 1978).

Near the peak Seveshtiplaz: recovered after a five-year absence (oral report of hunters).

The reserves of Steneto, Dzhendema, Stara Reka and Boatin: 1980s (P o p o v 1980, S t o i l o v 1984).

During 1980s, beside these reserves, nested above the Lopyan village and in the reserves of Tzaritchina, Peeshti Skali and Sokolna (S p i r i d o n o v 1985). Acording to M i l e v a (1982) inhabited the reserve Sokolna before 1980s.

Rocks along the Tcherna river right bank (near the Lopyan village) are the site known to R e i s e r (1894) as early as at the end of the previous century (S p i r i d o n o v 1983).

Golden Eagle has been observed in the reserve of Steneto also by M a z h d r a k o v a (1982), and one pair many times between 1975 and 1987 by S p i r i d o n o v and M i l e v a (1988). An adult bird with a newly fledged young (second half of July 1977), a pair with two first year birds (02--03.11.1986), two second year birds in the two opposite ends of the reserve (beginning of May 1987), one of which kept close to the peak Dobrila (end of September), one-year-old bird (July 1986).

A young and an adult bird was observed in the region of peak Tcherven of Vassiljovska mountain several times in 1983 and 1984, where on 27.01.1985

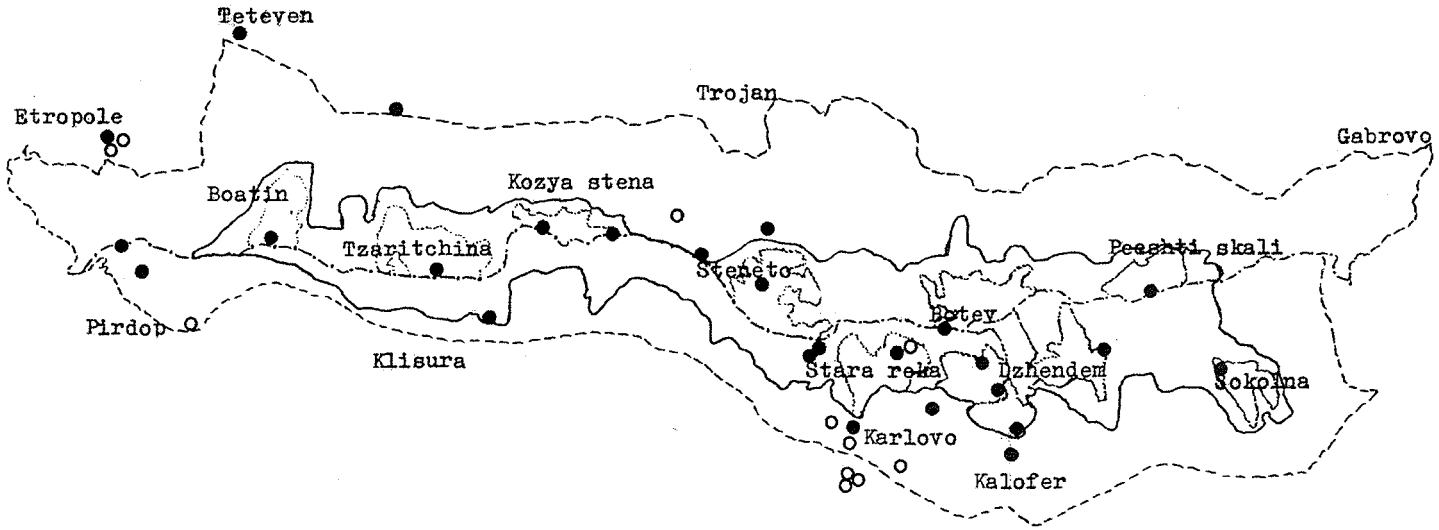

Fig. 1. - Golden Eagle (*Aquila chrysaetos*) on the National Park "Central Balkan": black dots - nesting period, white dots - non-nesting period.
Suri orao (*Aquila chrysaetos*) u Nacionalnom parku "Centralni Balkan": crne tačke - period gnežđenja, bele tačke - van perioda gnežđenja.

the building of a nest in rock niche (inhabited afterwards) was observed. A pair was observed also on 08.07.1986 above the peak Vassiljov (G u e o r g u i e v & A l e k s a n d r o v 1988).

In the reserve of Steneto: a nest with a young in a rock niche on 17--20.06.1981. The nest was vacant in 1982, a young was bred in 1983, a young bird in the nest on 15.07.1984, the nest was vacant again but the pair still occupied the valley in 1985 and 1986.

Above the residential complex of Soushitza (Karlovo town): a pair upon the rock in the autumn of 1978, and 4 during 1979.

Above the Karlovo town: a pair that afterwards flew towards the mountain, downstream Stara Reka river in spring of 1980.

On the meadows of Sokolitza village (Karlovo district): seen very often in 1978-1989.

The rock above Karlovo waterfalls (Sutchurum): a young squeaking on 14.07.1983, a young and an adult 14.07.1984, a pair 10.04.1985, a nest found 12.04.1985, a female incubating 17.04 1985 and 01.05.1985.

In the places of Panitzite, Bjala Reka, and the Raj hut from 19.03.1989 to the summer of 1989: 2 active nests found on high steep rocks, one of which above the Raj hut and the other in the eastern outskirts of Dzhendema 23.05 and 24.05.

The steep rock above the Navalijska river a pair observed often (probably nesting) in 1978-1989.

The rocks above Manastirska Reka river near the Nezabravka hut: regularly observed and probably nesting, an adult bird accompanied by 3 (!) young birds on 09.09.1983.

The rocks near the Orlovo Gnezdo cabin often observed during the same period.

Troyan Pass, above the Beklemeto recreation settlement: 4 birds soaring all day long 21.09.1984.

Kozya Stena peak: a pair on May 1982.

Reserve of Boatin, North from the Planinski Izvori hut: a pair 19.07.1996. On the peak Tetevenska Baba slopes: one specimen the same day.

Reserve Kozya Stena: one 21.07.1996.

The rock in the Kravarnika place near the Dobrila hut: one 23.07.1996.

Above the peak Mletchni Tchal ridge: 3 soaring 24.07.1996.

Below the Triglav top: 4 soaring 35.07.1996.

Between towns of Sopot and Karlovo, above the mountain slopes: one 01.08.1996.

The nests we have found had been situated in the zone between 600 and 1600 *m* above the sea level. A nest in the reserve of Steneto (June 1981) was in a deep triangular vertical niche 60 *m* from the bottom and 20 *m* from the top of the rock. The diameter of the nest was *c.* 1 *m*. Two Kestrel pairs (*Falco tinnunculus*), several Alpine Chough (*Pyrrhocorax graculus*), Crag Martin and Red-rumped Swallow pairs (*Hirundo rupestris, H. daurica*) nested very close by on the same rock. The nest above Stara Reka river was also among inaccessible rocks, on a narrow rock projection, about 40 *m* height and 15 *m* from the top of the rock. Otherwise, where attitude towards Golden Eagles tolerant, nests could be very close (up to 1 *km*) to the human settlements.

It is known that Golden Eagles lay as a rule 2 eggs, a young female 1, an adult one 2 or 3 eggs (Z a p f 1965). Probably it was an old female that had managed to rise three young we saw flying together with her on 09.09.1983 in the area of Nezabravka hut.

The hunting areas of the breeding pairs we observed were along the pastures in the alpine zone, above the upper tree-limit. The adult birds carried into their nests most often European Sousliks *(Citellus citellus)* - the basic prey in the studied region. A snake as a prey was recorded only once. Near Kozya Stena peak, in May 1982, eagles used to hunt on sousliks even during the bad weather and rain. Landed near burrow entrances they waited for sousliks to appear. According to S p i r i d o n o v and M i l e v a (1988) the hunting area of a Golden Eagle pair from reserve of Steneto extends over 5-6 thousand hectares, avoiding the dense forests along the valley of Tcherni Ossam river.

The fledged young Golden Eagles remain in the area for month and half or less and occasionally their parents continue to bring them prey. Later on, young start wandering over vaster area. It has been proved (W a l k e r 1987) that during the first month of these wanderings they are accompanied by the male, which afterwards returns to join the female. The young may disperse up to 350-500 *km* away the nest place (N i e d e r w o l f s g r u b e r 1970). We have observed them at the foots of Stara Planina and in the Prebalkan Fields, most often near the fish-ponds and on the meadows of Sokolitza village (Karlovo area), where the large numbers of waterfowl concentrate. Here eagles feed much on waterfowl wounded or killed by hunters. During this period Golden Eagles are often seen flying in circles for a long time even over the settlements.

The protection measures of the Central Balkan National Park are restrictive to a number of human activities. In spite of that the nest in the Steneto reserve was left by the birds in 1982, because a group of treasure-hunters had dug under it during the breeding period. The Golden Eagles are exceptionally sensitive to the human presence during building (cleaning) the nest, laying period and incubation, i.e. from February to March, and occasionally in April--May, if breeding delayed. This is the period when the high parts of Central Balkan are more seldom visited by people than in the June, July, August and September.

One of the major threats, which claims many victims among the eagles elsewhere, a dense network of electric transmission lines, is absent in Central Balkan. Toxicals (insecticides, rodenticides) are quite rarely applied on the territory of Central Balkan. The application of strychnine wolf and fox baits is prohibited, but illegal use of strychnine baits or traps are probably still occurring, as well as occasional shooting of eagles. However, the most serious threat comes from foreign and Bulgarian smugglers that collect young and eggs for their clients abroad.

The growth of the Golden Eagle population in Central Balkan is favored by the lack of competition with other large raptors, for example Vultures. The hunting areas of Long-legged Buzzard (*Buteo rufinus*) usually do not overlap with those of Eagles, at least during the breeding period. They are restricted to the lower mountain belt (below 1000 *m* a. s. l) and to the adjacent region of the Prebalkan Fields (S p i r i d o n o v & M i l e v a 1988). European Souslik is the basic food shared by in Central Balkan scarce Booted Eagles (*Hieraaetus pennatus*), Imperial Eagles (*Aquila helliaca*) and Sakers (*Falco cherrug*). Constantly increasing numbers of Golden Eagle in Middle Stara Planina during last two decades suppress the population of these three species, some pairs of which have already left their habitats. For example Imperial Eagle abandoned the region of Steneto reserve in 1981 (L a m b u r o v 1985). The studied area offers to Golden Eagle excellent habitats i.e. vast open habitats, high steep rocks, and abundance of food, mostly European Sousliks, but also Lesser Mole Rats (*Spalax leucodon*), European Hares (*Lepus europaeus*), foxes, possibly Beech Martens and Pine Martens (*Martes foina, M. martes*), Partridges (*Perdix perdix*), True Tortoises (*Testudo*), snakes, lizards, domestic animal corpses, etc.

CONCLUSION

Golden Eagle breeds successfully and its numbers are increasing in the Central Balkan National Park. Up to 20 nest territories are recently known. However total number of breeding pairs may be quite bigger.

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POPULACIJA SUROG ORLA (*AQUILA CHRYSAETOS* L.) U NACIONALNOM PARKU "CENTRALNI BALKAN" (BUGARSKA)

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I z v o d

Ukupnu bugarsku populaciju surog orla (*Aquila chrysaetos* L.) razni izvori procenjuju između 100 i 200 parova. Subpopulacija u nacionalnom parku "Centralni Balkan" (Stara planina, Bugarska) je najjača i u stalnom porastu već dvadesetak godina, ali su do ovih istraživanja, podaci uglavnom dobijani slučajno odnosno nesistematično. Tokom istraživanja od 1978. do 1996. na Staroj planini su utvrđene gnezdilišne teritorije 20 parova, ali se procenjuje da je stvarni broj znatno veći.

Neka od gnezda su praćena tokom niza godina. Tako na primer, gnezdo u rezervatu Steneto bilo je aktivno 1981., neaktivno 1982., aktivno 1983. i 1984., a neaktivno 1985. i 1986. iako je par i tada držao teritoriju u toj dolini.

Tri mlade ptice zajedno sa jednom odraslom, posmatrane 09.09.1983. kod planinske kuće Nezabravka, smatraju se primerom retkog slučaja tri uspešno odgajena mladunca iz istog gnezda.

Glavni plen koji roditelji nose mladuncima predstavljaju tekunice *(Citellus citellus)*. Posmatran je i zanimljiv slučaj lova po kiši, kada orao čeka pored jazbine da se tekunice pojave. Po S p i r i d o n o v u i M i l e v o j (1988) lovna teritorija para iz rezervata Steneto prostire se na 5-6 hiljada hektara pri čemu ne uključuje šumske komplekse duž reke Černi Osam. Mladi primerci se posle napuštanja zavičajne teritorije okupljaju u podnožju, naročito na ribnjacima gde se hrane ranjenom i mrtvom vodenom pernatom divljači.

Ocenjuje se da suri orao u NP Centralni Balkan ima gotovo idealne uslove: stenovita staništa za gnežđenje i visokoplaninske pašnjake sa obilnim plenom. Ne postoji kompeticija sa drugim krupnim pticama grabljivicama. Štaviše, malobrojnije vrste kao što su patuljasti orao (*Hieraaetus pennatus*), krstaš (*Aquila helliaca*) i stepski soko (*Falco cherrug*), teško izdržavaju u kompeticiji za tekunice, tako da im se populacija ne povećava, a krstaša se čak i smanjuje. Kompeticija sa riđim mišarem (*Buteo rufinus*) izbegnuta je time što se njegova lovna teritorija nalazi u visinskoj zoni ispod 1000 *m*.

Mere zaštite u NP Centralni Balkan, eliminisale su većinu negativnih ljudskih uticaja. Tamo nema ni dalekovoda koji drugde prouzrokuju gubitke na orlovima, ne upotrebljavaju se pesticidi, a zabranjeno je i postavljanje otrova za vukove i lisice. Najveća pretnja orlovima su krijumčari koji jaja i mladunace sakupljaju radi iznošenja na strano tržište.

UDK: 001.4=861:599.4(4)
Originalni naučni članak

PREDLOG STANDARDNE SRPSKE NOMENKLATURE SLEPIH MIŠEVA (*CHIROPTERA* BLUMENBACH, 1779, *MAMMALIA*) EVROPE

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The research of bats intensified in the Federal Republic of Yugoslavia over the recent years. However, a standardized Serbian nomenclature did not exist. These two facts initiated the publishing of this paper in which a taxonomically correct and linguistically apropriate Serbian and scientific nomenclature of European bats are given.

UVOD

Sisari iz reda *Chiroptera*, koji se u dosadašnjoj jugoslovenskoj naučnoj i popularnoj literaturi pojavljuju pod nazivima ljiljci, šišmiši, slepi miševi, topiri i netopiri, posebna su grupa čiji se predstavnici odlikuju nizom specifičnih karaktera. Za razliku od ostalih redova kopnenih sisara oni su se veoma rano, poput perajara i kitova, prilagodili na drugačiji način života. Dok su se predstavnici pomenuta dva reda prilagodili na delimičan ili potpuni život u vodenoj sredini, slepi miševi su se prilagodili na aktivno kretanje vazdušnom sredinom, slično pticama. Upravo je to umnogome doprinelo njihovoj specifičnoj morfoanatomskoj građi, koja povlači i niz drugih specifičnosti u domenu fiziologije i ekologije. Slično pticama, iza relativne morfoanatomske uniformnosti predstavnika različitih grupa ovog reda, krije se velika divergencija u odnosu na ishranu, odnosno na vrste hrane i načine konzumiranja. *Chiroptera* koriste veoma različitu hranu, od voća, cvetnog nektara, sitnih sisara, žaba, riba, krvi homeotermnih

životinja, do insekata, kojima se uglavnom hrane holarktičke vrste. Tako je u Evropi poznato oko 30 vrsta, koje se hrane isključivo insektima. Sličan, gotovo istovetan način ishrane kod evropskih vrsta praćen je malim razlikama u adaptacijama i neznatnim morfološkim razlikama, uz postojanje nekoliko parova sestrinskih vrsta. Njihovo razlikovanje je veoma teško, a moguće je samo upoređivanjem nekih morfoanatomskih detalja i uz pomoć biostatističke korelacije pojedinih dimenzija tela.

U poslednje vreme intenzivirana su istraživanja pojedinih predstavnika, ali i celokupne faune ovih sisara u SR Jugoslaviji. Iz tog razloga sve je više izražena potreba za jedinstvenom, standardnom nomenklaturom na srpskom jeziku, koja bi obuhvatila sve predstavnike reda *Chiroptera* u SR Jugoslaviji, ali i ostalih nekoliko evropskih vrsta, potencijalnih članova faune ovog područja.

SRPSKA NOMENKLATURA *CHIROPTERA* EVROPE

Srpska narodna imena, za svaku pojedinačnu vrstu *Chiroptera*, ili ne postoje ili su u najmanju ruku proizvoljna. To je uglavnom posledica nedovoljnog raspoznavanja vrsta i viših taksonomskih kategorija, što je uslovljeno uniformnošću izgleda (morfoanatomske sličnosti) i specifičnim načinom života. Razlike su toliko diskretne, za pojedine vrste minorne, da ljudi koji se njima ne bave posebno, čak i kada su biolozi, nisu u stanju da ih pravilno razlikuju. To je i osnovni razlog što ne postoji odgovarajuća, prihvatljiva nomenklatura na srpskom jeziku. Međutim, nije zanemarljiv ni uticaj sujeverja, straha i mistike koji su, ne samo kod nas već i u celoj zapadnoj civilizaciji, tradicionalno vezani za predstavnike ove grupe sisara.

Za vreme prethodnih Jugoslavija pokušavalo se sa standardizacijom i usaglašavanjem srpske, hrvatske i slovenačke nomenklature. Takav "kolaž", baziran uglavnom na imenima koja su konstruisana ili pretežno zasnivana na hrvatskom standardnom jezičkom izrazu, jer srpski nije ni postojao (Belić & Ivšić 1932, Mirić 1969, Stebbings 1988), nije odgovarao ovom govornom području. Iz tog razloga, postoji stalna potreba za standardnim srpskim imenima *Chiroptera*, pre svega u biotehničkim oblastima (poljoprivreda, šumarstvo, veterina, medicina i dr.), ali i u prosveti, zaštiti prirode, popularizaciji nauke, medijima i dr.

U nazivima za red na evropskim jezicima (engleski "bats", francuski "chauves souris", nemački "fledermäuse") gde je u osnovi imena '*miš*' upotrebljen u smislu bilo kog malog sisara, primenjen je sličan princip (Sokolov 1988). Ruski naziv "рукокрылые" donekle je prevod latinskog naziva *Chiroptera* (od latinizovanih grčkih reči χειρ - šaka, πτερον - krilo), dok bugarski "прилепи" objašnjava njihov način prihvatanja za podlogu.

Prvi domaći naziv objavio je Lazić (1836) u svom delu "Проста наравна историја или описаније наиважнии наравни телеса" nazivajući ih "животиньеногокрилате", dajući zatim u tekstu ime "слепи миш" vrsti *Vespertilio murinus* [= *Myotis myotis* (Borkhausen, 1797)], jedinom evropskom

predstavniku kojeg opisuje. P a n č i ć (1869) u svom opštem ključu za sisare uz latinsko ime ovog reda upotrebljava srpsko "prstokrilci", dok dalje u identifikacionom ključu za *Chiroptera* pored latinskog naziva stoji "ljiljci". Iako naziv "prstokrilci" predstavlja bukvalni prevod latinskog naziva reda, na srpskom jeziku u narodu je najraširenije i najuobičajenije ime "slepi miševi". Mada ne dočarava prave osobine ovih sisara (M i r i ć 1969), smatram da bi ime "slepi miševi" trebalo zadržati. Kao ime za ceo red prvi put se pominje u delu K a r a m a n a (1929) u kome je opisana celokupna fauna *Chiroptera* tadašnje Jugoslavije. Naziv "ljiljci" smatram neodgovarajućim zbog moguće zamene sa ljiljcima (familija *Sphingidae*) iz reda leptira (*Lepidoptera, Insecta*), ali bi ovaj naziv mogao biti korišćen za predstavnike pojedinih rodova slepih miševa.

Mada kao bukvalni prevod imena podreda *Microchiroptera*, kome pripadaju evropske vrste, može da se prihvati "mali slepi miševi", dimenzije njegovih pripadnika variraju u veoma širokom rasponu. Za srpski naziv je zato kao glavni atribut upotrebljena zajednička karakteristika, ishrana insektima i bubama, pa on glasi "bubojedi slepi miševi"[1]. Kriterijumi korišćeni za izradu predloga srpske nomenklature nižih taksona su različiti i razmatrani su sa stanovišta očiglednosti i najveće izraženosti karaktera. Pri tome se pošlo od konstatacije da bi imena prvenstveno trebalo da se zasnivaju na morfološkim i ekološkim karakterima *Chiroptera*, koji ih i razdvajaju u posebne taksone. Na to ukazuje postojanje 3 familije i 10 rodova evropskih predstavnika *Chiroptera*. Zbog toga je učinjen pokušaj da se imena navedenih grupa razlikuju, navodeći tako buduće korisnike ove nomenklature da već na prvi pogled uoče te neznatne razlike.

Prilikom izrade predloga ove nomenklature uočena je raznorodnost i znatna nepreciznost i u pisanju latinskih naziva taksona, imena autora i godina objavljivanja naziva. Ovo je stalno prisutno u naučnim delima i radovima, pre svega u onima novijeg datuma. Razlog za to bio je dobrim delom preokupiranost autora temama i problemima kojima su se bavili, te su verovatno malo pažnje posvećivali nomenklaturnim pravilima. Tako je u savremenoj stranoj i domaćoj literaturi došlo do velike konfuzije. Pregledom relevantne taksonomske literature, a pre svega dela M i l l e r a (1912), E l l e r m a n a & M o r r i s o n - S c o t a (1951), D j u l i ć & M i r i ć a (1969), M i r i ć a (1969), C o r b e t a (1978), S t e b b i n g s a (1988), C o r b e t a & H i l l a (1991), ustanovljene su velike razlike u nomenklaturnim detaljima, pre svega u nazivima vrsta slepih miševa. Poređenjem taksonomske nomenklature iz pomenute literature i striktnom primenom međunarodnih pravila zoološke nomenklature (IUBS 1985) nastala je ova naučna i srpska nomenklatura evropskih slepih miševa. Redosled taksona je prema D j u l i ć & M i r i ću (1969), a nastavci i detalji imena vrsta preuzeti su iz ishodnih referenci, u obliku kao kod C o r b e t a & H i l l a (1991). Jedine promene prihvaćene su za 7 evropskih vrsta slepih miševa, *Myotis mystacinus, M. nattereri, M. bechsteinii, M. dauben-*

[1] Neki predstavnici ovog podreda ne hrane se insektima, ali se smatra da su se njima primarno hranili.

tonii, Nyctalus leisleri, Pipistrellus kuhlii i *Miniopterus schreibersii*, čiji je autor bio nemački prirodnjak Kuhl (1817, 1818, 1819). On je pomenute vrste opisao u svom delu *Die deutschen Fledermäuse*, ali u svetskoj literaturi je postojala konfuzija u pogledu datuma publikovanja. Zbog toga su uz nazive pomenutih vrsta navođene različite godine opisa. Prema B o g d a n o w i c zu (1994) Međunarodna komisija za zoološku nomenklaturu (ICZN 1958) iznela je mišljenje da je godina publikovanja navedenog dela 1817. Prihvatajući tu činjenicu, promenjene su, u odnosu na C o r b e t a & H i l l a (1991), godine opisa pomenutih 7 vrsta, koje su ranije navođene uz ime HEINRICHA KUHLA.

Zvezdicom (*) su označene vrste koje još nisu zabeležene u fauni SR Jugoslavije, ali se na osnovu prisustva u širem biogeografskom području može smatrati korisnim njihovo uključivanje u sistem standardnih srpskih naziva.

NOMENKLATURA

Red ***CHIROPTERA*** Blumenbach, 1779 - **SLEPI MIŠEVI**

Podred ***MICROCHIROPTERA*** Dobson, 1875 - **BUBOJEDI SLEPI MIŠEVI**

Familija *RHINOLOPHIDAE* Gray, 1866 - **POTKOVIČARI**

Rod ***Rhinolophus*** Lacépède, 1799 - **Potkovičari**

Rhinolophus ferrumequinum (Schreber, 1774) - **Veliki potkovičar**
Rhinolophus hipposideros (Bechstein, 1800) - **Mali potkovičar**
Rhinolophus euryale Blasius, 1853 - **Južni potkovičar**
* *Rhinolophus mehelyi* Matschie, 1901 - **Tamnooki potkovičar**
Rhinolophus blasii Peters, 1866 - **Sredozemni potkovičar**

Familija *VESPERTILIONIDAE* Gray, 1821- **VEČERNJACI**

Rod ***Myotis*** Kaup, 1829 - **Mišouhi večernjaci**

Myotis mystacinus (Kuhl, 1817) - **Mali brkati večernjak**
* *Myotis brandtii* (Eversmann, 1845) - **Veliki brkati večernjak**
Myotis emarginatus (Geoffroy, 1806) - **Šiljouhi večernjak**
Myotis nattereri (Kuhl, 1817) - **Resasti večernjak**
Myotis bechsteinii (Kuhl, 1817) - **Dugouhi večernjak**
Myotis myotis (Borkhausen, 1797) - **Veliki mišouhi večernjak**
Myotis blythii (Tomes, 1857) - **Mali mišouhi večernjak**
Myotis daubentonii (Kuhl, 1817) - **Vodeni večernjak**
Myotis capaccinii (Bonaparte, 1837) - **Dugoprsti večernjak**
Myotis dasycneme (Boie, 1825) - **Barski večernjak**

Rod ***Vespertilio*** Linnaeus, 1758 - **Pravi večernjaci**

Vespertilio murinus Linnaeus, 1758 - **Dvobojni večernjak**

Rod ***Eptesicus*** Rafinesque, 1820 - **Ponoćnjaci**

* *Eptesicus nilssonii* (Keyserling and Blasius, 1839) - **Severni ponoćnjak**
Eptesicus serotinus (Schreber, 1774) - **Veliki ponoćnjak**

Rod ***Nyctalus*** Bowdich, 1825 - **Noćnici**
Nyctalus leisleri (Kuhl, 1817) - **Mali noćnik**
Nyctalus noctula (Schreber, 1774) - **Srednji noćnik**
* *Nyctalus lasiopterus* (Schreber, 1780) - **Veliki noćnik**

Rod ***Pipistrellus*** Kaup, 1829 - **Slepi mišići**
Pipistrellus pipistrellus (Schreber, 1774) - **Patuljasti slepi mišić**
Pipistrellus nathusii (Keyserling and Blasius, 1839) - **Šumski slepi mišić**
Pipistrellus kuhlii (Kuhl, 1817) - **Belorubi slepi mišić**
Pipistrellus savii (Bonaparte, 1837) - **Planinski slepi mišić**

Rod ***Barbastella*** Gray, 1821 - **Širokouhi ljiljci**
Barbastella barbastellus (Schreber, 1774) - **Širokouhi ljiljak**

Rod ***Plecotus*** Geoffroy, 1818 - **Dugouhi ljiljci**
Plecotus auritus (Linnaeus, 1758) - **Smeđi dugouhi ljiljak**
Plecotus austriacus (Fischer, 1829) - **Sivi dugouhi ljiljak**

Rod ***Miniopterus*** Bonaparte, 1837 - **Dugokrili ljiljci**
Miniopterus schreibersii (Kuhl, 1817) - **Dugokrili ljiljak**

Familija *MOLOSSIDAE* Gill, 1872- DUGOREPI MOLOSI
Rod ***Tadarida*** Rafinesque, 1814 - **Dugorepi molosi**
* *Tadarida teniotis* (Rafinesque, 1814) - **Južni dugorepi molos**

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A PROPOSAL FOR THE STANDARD SERBIAN NOMENCLATURE OF BATS, *CHIROPTERA* BLUMENBACH, 1779 (*MAMMALIA*) OF EUROPE

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S u m m a r y

Lately, the research of some of representatives of the bat fauna, as well as of the entire bat fauna, intensified in the FR Yugoslavia. Therefore the need is becoming more and more manifest for a uniform standardized Serbian nomenclature that would comprise all the representatives of these mammals in the FR Yugoslavia, but also a few other European species - potential representatives of the Yugoslav fauna.

During the two last Yugoslavias there were some attempts at standardization and unification of the Serbian, Croatian and Slovene nomenclatures. However, the result was a "collage", consisting primarily of names based on the standard Croatian nomenclature, as the Serbian did not exist. Nevertheless, standardized Serbian names for bats are essential for biotechnical fields (agri-

culture, forestry, veterinary, medicine, etc.), but also for education, environmental studies, media, popularizing of science, and so on.

For the making of the Serbian nomenclature various criteria were used, and they were based according to the degree of the presence and manifestness of the characteristics. The starting point in this purpose was the belief that the names should primarily be based on morphological and ecological characteristics according to which different species and upper taxons are identified in the first place. Nevertheless, that one distinguishes three families and 10 genera of European bats points to the existence of certain differences, ecological and philogenetic in the first place. That is why one of intentions of this paper is to emphasize the differences between the groups, and thus to induce the future users of this nomenclature to notice them instantly.

While making this nomenclature, the author noticed considerable inexactness and carelessness in the usage of the Latin names for taxons in literature. Likewise, the year of the first descriptions and the names of the first describers differ a lot. One encounters this in papers, mostly in more recent ones. A reason for such a situation is most probably the authors preoccupation with the subject and problems they are dealing with, so that little attention is paid to nomenclature. Because of all this, we are now faced with great confusion in foreign and Yugoslav literature. Reviewing the relevant taxonomic literature Miller (1912), Ellerman & Morrison-Scot (1951), Dulić & Mirić (1969), Mirić (1969), Corbet (1978), Stebbings (1988), Corbet & Hill (1991), in the first place, considerable differences were noticed, primarily in the bat nomenclature. The scientific and Serbian nomenclature of European bats offered here is a result of a comparision made between taxonomic nomenclatures from the mentioned literature and a strict adherence to the International code of zoological nomenclature (1985). The order of taxons is according to Djulić & Mirić (1969), while the endings and details concerning the names of the species are taken from first description references and in the form such as in Corbet & Hill (1991). The only changes that are introduced concern the 7 bat species first described by a German naturalist H. KUHL (1817; 1818, 1819). These species are described in his work "Die deutschen Fledermäuse", but in the world literature there was a confusion as to the year of its publishing. Thus, two years of description are mentioned. According to Bogdanowicz (1994) the International Commission on Zoological Nomenclature (ICZN 1958) decided on 1817 as the year of its publication. The year of the first description given with KUHL's name is accordingly changed throughout.

Asterisked species (*) are those that have not been registered in the fauna of the Federal Republic of Yugoslavia so far.

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Short communication

NOTES ON ORNITOFAUNA OF MACEDONIA, EPIROS AND THESSALIA (GREECE)

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During the period from 11 to 14 May 1990, short excursion to Greece was made, by car through Macedonia, Epiros and Thessalia, from Niki over Florina, Mikrolimni, Kastoria, Eptahori, Konitsa, Ioanina, Metsovo, Kalambaka, Trikala, Farkadona, Elassona, Katerini to Evzoni. During four days, in spite of relatively bad weather conditions, 61 bird species were observed. Believing that the area is poorly or not enough studied (B a u e r *et al.* 1969), we judged that every data is worth publishing. Faunistic list is made after sequence by V o o u s (1980).

Ciconia ciconia Linnaeus, 1758 - 11th: Niki - 7 individuals and 3 nests., 12th: near Asfaka - 1 ind. (individual), near Orthovouni - 1 ind. and 1 nest, 13th: Kalambaka - 1 ind. and 2 nests, 13th: Megalohori - 1 nest, 13th: between Farkadona and Mesohori - r ind. and 3 nests, 13th: Mesohori - e ind. and 2 nests, 14th: Evangelismos - 1 nest, 14th: Elassona - 3 ind. and 2 nests.

Cygnus olor (J. F. Gmelin, 1789) - 11th: Kastoria (Lake Kastoria) - 1 ind.

Anas platyrhynchos Linnaeus, 1758 - 12th: Ioanina (Lake Ioaninon) - 3 ind.

Accipiter nisus (Linnaeus, 1758) - 11th: near Vogatsiko - 1 ind., 11th: near Tsotili - 1 ind.

Buteo buteo (Linnaeus, 1758) - 11th: near Florina - 2 ind., 12th: near Pendalofos - 1 ind., 13th: Katara - 1 ind., 14th: Ag. Dimitrios (Olympos) - 2 ind.

Falco naumanni Fleischer, 1818 - 11th: Andartiko (Verno) - 1 ind., 12th: near Ioanina - 1 ind.

Falco tinnunculus - Linnaeus, 1758 - 12th: 10 km east of Ioanina - 2 ind., 13th: near Trikala - 1 ind., 13th: near Taxiarhes - 1 ind., 13th: near Farkadona - 1 ind., 14th: near Elassona - 1 ind., 14th: Kokkinopilos (Olympos) - 1 ind.

Falco eleonarae - Géné, 1839 - 12th: near Pendalofos - one adult in dark phase.

Fulica atra Linnaeus, 1758 - 11th: Mikrolimni (Lake Mikri Prespa) - 6 ind., 11th: Kastoria (Lake Kastoria) - 5 ind.

Glareola pratincola (Linnaeus, 1766) - 14th: near Pirgos (Axios-delta) - about 25 ind. Near this area, 15 *km* south-west of Thessaloniki, D i m i t r i j e v i ć (1980) noted flock of 30 individuals on July 13, 1976. Day later and 5 *km* to the east, at sea-coast, he found also a colony of about 1500-2000 birds.

Larus argentatus Pontoppidan, 1763-12th: Ioanina - 6 ind.

Chlidonias niger (Linnaeus, 1758) - 11th: Kastoria - (Lake Kastoria) - about 15 ind.

Streptopelia decaocto (E. Firvaldszky, 1838) - 11th: Florina - 1 ind., 11th: Kastoria - 2 ind., 11th: Neapoli - 7 ind., 12th: Ioanina - 4 ind.

Streptopelia turtur (Linnaeus, 1758) - 11th: Gavros - 4 ind., 11th: near Neapoli - 12 ind., 11th: near Tsotili - 3 ind., 14th: near Elassona - 7 ind., 14th: Ag. Dimitrios (Olympos) - 3 ind.

Cuculus canorus Linnaeus, 1758 - 11th: near Pissoderi - 2 ind., 11th: near Tsotili - 1 ind., 12th: near Pendalofos - 1 ind., 13th: Katara - 4 ind., 14th: Ag. Dimitrios (Olympos) - 3 ind.

Athene noctua (Scopoli, 1769) - 13th: near Farkadona - 1 ind., 13th: 20 *km* south-east of Mesohori - 1 ind.

Apus apus (Linnaeus, 1758) - 12th: Eptahori - 7 ind., 14th: Elassona - 23 ind., 14th: Katerini - 17 ind.

Apus melba (Linnaeus, 1758) - 11th: near Kotas - 4 ind., 12th: near Pendalofos - 10 pairs.

Merops apiaster Linnaeus, 1758 - 11th: near Tsotili - 4 ind., 12th: near Morfi - 3 ind., 12th: near Pendalofos - 1 ind.

Coracias garrulus Linnaeus, 1758 - 12th: 7 km north-west of Asfaka - 1 ind.

Upupa epops Linnaeus, 1758 - 11th: Gavros - 1 ind.

Picus virids Linnaeus, 1758 - 11th: Tsotili - 1 female, 14th: Ag. Dimitrios (Olympos) - 1 ind.

Galerida cristata (Linnaeus, 1758) - 11th: near Vogatsiko - 5 ind., 11th: Neapoli - 8 ind., 13th: Megalohori - 3 ind., 14th: near Kokkinopilos (Olympos) - 3 ind.

Ptyonoprogne rupestris (Scopoli, 1769) - 12th: near Eptahori - 1 pair, 12th: 5 km western of Drossopigi - 5 ind., 13th: near Votonosi - at several sites 2-3 ind.

Hirundo rustica Linnaeus, 1758 - singles, pairs or small flocs often seen in almost all towns and their surroundings.

Hirundo daurica Linnaeus, 1758 - singles or pairs often seen on the visited territory, nests near Trigono (May 11) near Drossopigi (May 12).

Delichon urbica Linnaeus, 1758 - in all towns, on rocks between Morfi and Pendalofos nesting approx. 200 pairs (May 12) and approx. 150 pairs between Pendalofos and Eptahori.

Motacilla flava Linnaeus, 1758:

Motacilla f. flava Linnaeus, 1758 - 13th: Votonosi - 3 ind.

Motacilla f. feldegg Michahelles, 1830 - 11th: near Neapoli - 1 ind.

Motacilla cinerea Tunstall, 1771 - 14th: Ag. Dimitrios (Olympos) - 3 ind.

Motacilla alba Linnaeus, 1758 - 11th: Pissoderi - 2 ind., 13th: Peristeri - 2 ind., 13th: Katara - 6 ind.

Erithacus rubecula (Linnaeus, 1758) - 11th: near Kotas - 2ind.

Luscinia megarhynchos C. L. Brehm, 1831 - 11th: near Kotas - 1 ind., 11th: Tsotili - 3 ind., 12th: near Asfaka - 1 ind., 13th: near Peristeri - 2 ind., 14th: Ag. Dimitrios (Olympos) - 3 ind.

Phoenicurus ochuros (S. G. Gmelin, 1774) - 11th: Pissoderi - 3 ind. and 2 nests, 12th: near Pendalofos - 5 ind.

Oenanthe oenanthe (Linnaeus, 1758) - 13th: Katara - 6 ind. and 1 nest, 14th: near Kokkinopilos (Olympos) - 2 ind.

Monticola saxatilis (Linnaeus, 1766) - 12th: near Pendalofos - 1 male.

Turdus merula Linnaeus, 1758 - 11th: Trigono - 2 ind, 11th: Tsotili - 3 ind., 13th: near Votonosi - 2ind., 13th: Katara - 5 ind., 14th: Ag. Dimitrios (Olympos) - 3 ind.

Turdus viscivorus Linnaeus, 1758 11th: Pissoderi - 3 ind., 13th: Katara - 2 ind.

Acrocephalus arundinaceus (Linnaeus, 1758) - 11th: Mikrolimni - 6 ind., 11th: Kastoria - 4 ind., 12th: Ioanina - 3 ind.

Phylloscopus collybita (Vieillot, 1817) - 12th: near Pendalofos - 3 ind.

Muscicapa striata (Pallas, 1764) - 13th: near Peristeri - 1 ind.

Aegithalos caudatus (Linnaeus, 1758) - 11th: Pissoderi - 1 ind, 13th: near Peristeri - 10 ind.

Parus caeruleus Linnaeus, 1758 - 13th: near Peristeri - 3 ind.

Parus major Linnaeus, 1758 - 11th: Pissoderi - 7 ind. and 2 nests, 11th: Trigono - 5 ind, 12th: near Pendalofos - 7 ind, 13th: near Peristeri - 3 ind, 13th: Katara - 9 ind, 14th: Ag. Dimitrios (Olympos) - 17 ind.

Oriolus oriolus (Linnaeus, 1758) - (Linnaeus, 1758) - 11th: Tsotili - 5 ind.

Lanius collurio Linnaeus, 1758 - 11th: Trigono - 2 ind., 11th: Kastoria - 2 ind., 13th: Katara - 3 ind., 14 th: Ag. Dimitrios (Olympos) - 5 ind.

Lanius minor J. F. Gmelin, 1788 - 13th: Mesohori - 2 ind.

Garrulus glandarius (Linnaeus, 1758) - 11th: Pissoderi - 3 ind., 11th: Tsotili - 1 ind., 12th: 7km north-west of Asfaka - 1 ind., 14th: Ag. Dimitrios (Olympos) - 4 ind.

Pica pica (Linnaeus, 1758) - singles, pairs or small flocs evidented almost everywhere.

Corvus monedula Linnaeus, 1758 - 11th: Florina - 5 ind., 12th: between Morfi and Pendalofos - approx. 100 pairs nest in rock crevices, 12th: near Asfaka - 7 ind, 12th: 10 *km* east of Ioanina - 5 ind.

Corvus corone cornix Linnaeus, 1758 - singles, pairs or small flocs almost everywhere.

Corvus corax Linnaeus, 1758 - 12th: near Pendalofos - 2 ind., 14th: near Elassona - 2 ind.

Sturnus vulgaris Linnaeus, 1758 - 11th: Florina - 15 ind., 11th: Andartiko - 1 ind., 11th: Mikrolimni - 7 ind., 11th: Trigono - 3 ind., 12th: near Morfi - 3 ind., 12th: Pendalofos - 5 ind., 14th: Elassona - 12 ind.

Passer domesticus (Linnaeus, 1758) - almost everywhere

Passer montanus (Linnaeus, 1758) - 13th: about 30 *km* east of Ioanina, near road to Petra - 2 ind.

Fringilla coelebs Linnaeus, 1758 - 11th: Pissoderi - 9 ind., 13th: Katara - 5 ind.

Serinus serinus (Linnaeus, 1766) - 13th: Katara - 3 ind.

Carduelis carduelis (Linnaeus, 1758) - 11th: near Florina - 6 ind., 11th: near Trigono - 2 ind., 12th: near Pendalofos - 5 ind., 12th: Ioanina - 5 ind., 13th: Katara - 3 ind., 14th: near Elassona - 7 ind.

Carduelis cannabina (Linnaeus, 1758) - 13th: Katara - 3 ind.

Emberiza citrinella Linnaeus, 1758 - 11th: Pissoderi - 2 ind.

Emberiza cirlus Linnaeus, 1758 - 11th: Gavros - 2 ind., 13th: Votonosi - 1 ind., 14th: Ag. Dimitrios (Olympos) - 1 ind.

Emberiza melanocephala Scopoli, 1769 - 11th: Tsotili - 2 ind., 14th: near Evzoni - 1 male.

Miliaria calandra (Linnaeus, 1758) - 11th: near Florina - 8 ind., 11th: Mikrolimni - 4 ind., 11th: Kastoria - 1 ind., 11th: Neapoli - 3 ind., 11th: Tsotili - 2 ind., 13th: Katara - 2 ind.

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UDK: 598.914 (497.113)

Short communication

AN UNUSUAL CASE OF CRIPPLING AND DYING OF TWO RED-FOOTED FALCON (*FALCO VESPERTINUS*) IN VOJVODINA (YUGOSLAVIA)

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During 1991 colonies of Red-footed Falcon (*Falco vespertinus*), were investigated at certain localities in Vojvodina. Each day a colony in black locust forest (DR44 after UTM 10 *x* 10 *km*) near Melenci was inspected.

The black locust forest is located on the left side of a road between Melenci and Bašaid along 3 *km* from Danube-Tisa-Danube canal towards Bašaid. This 15-25 *m* wide forest belt is bordered by the highway and village road running along fields of sunflower, corn, clover and wheat.

Red-footed Falcon use for breeding the abandoned nests of Rook (*Corvus frugilegus*), while their reproduction period coincides with corn maturation.

On 22 July of 1991 a male of Red-footed Falcon was observed crouching on a small pile of straw on stubble-field along the village road. He did not try to escape. After inspection it was observed that bones of the left wing were heavily crumbled while a leg was double broken. The bird weighted only 98 *g*. We fed it with locusts and took with us to the Institute of Biology (Novi Sad), where it died on 23 July. We gave it to the ornithological collection of the Natural History Museum, Belgrade (BEO).

Another, but dead Red-footed male, certain meters far from forest edge on a stubble-field along the village road, was found. That bird was decapitated and with no legs, while also a number of fractures of wing bones were observed. The crippled bird body weighted 99 *g.*

We are convinced that the injuries and death of Red-footed Falcon males are caused by a combine harvesting on 22 July. The combine certainly waved treetops disturbing the nests with 15 days (or more) old chicks. Adults were possibly reacted by attacking to combine. This may be confirmed by the similar adverse behavior of the adults when we checked nest content. Frequently, a group of four to five and sometimes seven to eight adults circled over trees. Some dived against intruder. Sometimes the birds even touched with their wings shoulders and head of a man climbing up the tree.

However, certain other circumstances might also cause death of Red-footed Falcon. Groups of three to five birds were observed catching insects rushed off the corn in front of the harvesting combines. Falcons were dangerously close to the machine on the move. In one or the other way, mortality of Red-footed Falcon is often connected with combine.

UDK: 595.371 (497)

Napomene urednika

O MATVEJEVLJEVIM PODVRSTAMA PTICA

U revijalnom članku dr S. D. MATVEJEVA, "Vrsta ili podvrsta, rezultati i problemi kod jugoslovenskih i balkanskih ptica" (Glasnik Prirodnjačkog muzeja u Beogradu *B48*: 63-71), autor je dao pregled svojih istraživanja geografske varijabilnosti ptica u periodu 1938-1976, a takođe i svoj pogled na upotrebu infraspecijskih kategorija u savremenim domaćim ornitološkim istraživanjima. Slažući se u načelu sa autorom, mislim da bi bile korisne dve napomene, od kojih prva može da dopuni pregled studija podvrsta ptica u jugoslovenskom delu Balkanskog poluostrva, a obe, naročito druga, mogu da obaveste čitaoce o valorizaciji velikog dela dr S. D. MATVEJEVA.

1. JESU LI PODVRSTE ZABORAVLJENE?

Uz potvrdu značaja i potrebe produbljenog rada u identifikaciji ornitofaune na infraspecijskom nivou, mora se naglasiti da je, suprotno utisku dr MATVEJEVA, domaća ornitološka literatura u periodu od sedamdesetih do devedesetih godina čak bogata radovima zasnovanim upravo na konceptu podvrsta koje je postavio sam dr MATVEJEV. Zapravo, radi se o nečemu što se već može nazvati 'Matvejevljevom školom'. Naročito se to odnosi na članke objavljene u Beogradu (npr. Biosistematika 1976: *2* pp. 137-142; 1977: *3* pp. 111-122; 1978: *4* pp. 193-202; 1979: *5* pp. 71-111, 187-200; 1980: *6* pp. 81-107; Glasnik Prirodnjačkog muzeja 1977: *B32* pp. 113-130; Zbornik radova o fauni SR Srbije SANU 1980: *1* pp. 85-100, 101-128; 1983: *2* pp. 197-245; 1985: *3* pp. 193-208; Arhiv bioloških nauka 1977: *27* pp. 47-60; 1979: *29* pp. 69-81; 1981: *33* 1P-2P i dr.), Podgorici (npr. Glasnik Republičkog zavoda za zaštitu prirode - Prirodnjačkog muzeja 1976: *9* pp. 31-38; 1990: *23* pp. 51-74 i dr.), Zagrebu (npr. Larus 1977: *29-30* pp. 355-357; 1980: *31-32* pp. 185-208; 1983: *33-35* p. 210 i dr.) i Sarajevu (npr. Glasnik Zemaljskog muzeja 1990: *NS29* pp. 109-179). U tim (i drugim) člancima, populacije ptica su identifikovane do nivoa podvrsta. Utisak da su balkanske podvrste ptica 'zaboravljene' posle 1976. mogao je doći samo usled toga što je pažnja dr MATVEJEVA (posle njegovog povlačenja u penziju i preseljenja u Ljubljanu) u tom periodu bila najviše usmerena na lokalnu ornito-

lošku aktivnost, dok mu je delatnost njegovih učenika u ostalim centrima izmicala pažnji.

Dakle, rad na podvrstama nije prestajao. Naprotiv, naročito tokom osamdesetih godina, balkanske zbirke ptica u Beogradu, Zagrebu, Sarajevu, Skoplju, Podgorici, Vršcu, Bečeju, Novom Sadu i dr. detaljno su i strpljivo analizirane u pogledu geografske varijabilnosti vrsta za potrebe dugoročnih programa izrade Faune ptica Srbije, Makedonije i Crne Gore (naime, opise te varijabilnosti trebalo je dopuniti, jer ih je MATVEJEV dosad dao samo u najneophodnijim naznakama). S posebnom odgovornošću je na tome rađeno u okviru saradnje na velikom međunarodnom projektu "Ptice zapadnog Palearktika" (Oxford University Press 1977-1994). Korespondent za Jugoslaviju u tom programu, i sam učenik 'Matvejevljeve škole', lično je proveravao svaku kritičnu balkansku podvrstu i, po ugledu na svog učitelja, uporedio 900 primeraka ptica iz Jugoslavije sa kompletnim serijama u ogromnoj zbirci Britanskog prirodnjačkog muzeja. Tako su obavljena istraživanja za koja se možda sme reći da su komplementarna radovima koje je između 1965. i 1972. lično obavio dr MATVEJEV u drugoj najvećoj svetskoj zbirci, u Zoološkom muzeju Akademije nauka u St. Petersburgu. Naročita pažnja je posvećena onim 'Matvejevljevim' podvrstama koje nisu bile u saglasnosti sa shvatanjima palearktičke geografske varijabilnosti u člancima i monografijama drugih autora, posebno u onim koji su objavljeni posle šezdesetih godina, ili ih iz drugih razloga dr MATVEJEV nije upoznao.

2. KOLIKO SU PRIHVAĆENE MATVEJEVLJEVE PODVRSTE?

Dominantno shvatanje geografske varijabilnosti ptica u Evropi sedamdesetih godina zasnivalo se na jednostavnom principu dveju ukrštenih klinalnih klimatskih linija: (1) postepenom smanjenju dimenzija od Severa ka Jugu (BERGMANOVO pravilo), i (2) postepenom opadanju količine melanina od Zapada ka Istoku (GLOGEROVO pravilo). Izuzev za neke ostrvske populacije, popularno je bilo 'lupersko' shvatanje o velikim podvrstama, odnosno oligotipskim vrstama, obično najviše sa po jednom podvrstom na svakom geografskom kraju kline. MATVEJEVLJEVA balkanska 'papazjanija' od podvrsta u tom svetlu izgledala je često suviše 'spliterski', gledana sa Zapada, ali i sa Istoka (vidi npr. L. S. S t e p a n j a n 1978: Sostav i raspredelenie ptic fauny SSSR 2. *Passeriformes,* Moskva).

Međutim, revizije opisane u prvoj napomeni, potvrdile su ispravnost Matvejevljevog složenog koncepta balkanskih podvrsta i omogućile da on najvećim delom bude ugrađen u danas najreferentniju ediciju o pticama u Evropi, u čuvenog 'Krampa' (S. C r a m p, *ed.* 1988, 1992: The Birds of the Western Palearctic *5, 6*; S. C r a m p & C. M. P e r r i n s, *eds* 1993, 1994: The Birds of the Western Palearctic *7, 8, 9*, Oxford University Press), gde se MATVEJEV citira nebrojeno puta. Potpisnik ovih redova imao je priliku da prisustvuje 'prelamanju' nekih kompleksnih pitanja geografske varijabilnosti balkanskih ptica.

To su bili pravi mali simpozijumi u, za evropske ornitologe, svakako najznačajnijem selu - engleskom Tringu, istom onom u kojem su godinama radili veliki E. HARTERT i Ch. VAURIE, i donedavno sedištu priređivača edicije koja je okupila najkritičkije raspoložena ornitološka imena današnjice. Dakle, poređenja još većih serija ptica i uvođenje novih taksonomskih i biogeografskih pristupa i metoda, pred strogom međunarodnom naučnom javnošću su potvrdila naučnu zasnovanost Matvejevljevih podvrsta balkanskih ptica u takvoj meri da svaki njegov učenik može i dalje da bude vrlo ponosan.

V. Vasić

UDK: 06.053:595.70

Vesti

XX MEĐUNARODNI KONGRES ENTOMOLOGA
(XX INTERNATIONAL CONGRESS OF ENTOMOLOGY)

Od 25. do 31. avgusta 1996. godine u Firenci je održan XX međunarodni entomološki kongres, u organizaciji *Accademia Nazionale Italiana di Entomologia* i *Societa Entomologica Italiana*. Predsednik Generalnog organizacionog odbora bio je uvaženi italijanski entomolog, profesor BACCIO BACCETTI.

Serija svetskih entomoloških kongresa počela je daleke 1910. godine u Briselu i nastavila se u nekoliko evropskih, američkih, azijskih i australiskih gradova. Ovo je bila prva prilika da italijanski entomolozi organizuju svetski kongres. Sa stanovišta bogate istorije, umetničke i naučne tradicije i turističkih mogućnosti izabrana je Firenca za mesto održavanja najvećeg svetskog okupljanja entomologa.

Mnogobrojne kongresne aktivnosti su se odvijale u prostorima Palazzo dei Congressi, Centro Affari i Fortezza da Basso, koje se nalaze u samom centru grada.

Ceremonija otvaranja je održana 25. augusta u velikoj sali Palazzo dei Congressi. U okviru programa otvaranja održana su dva plenarna referata, Prof BACCETTTI je govorio o istorijatu Italijanske entomologije, a prof WILSON (SAD) o biodiverzitetu insekata.

U narednim danima saopšteno je još 12 plenarnih referata, a završni o entomologiji na pragu trećeg milenijuma, podneo je prof. MOUD iz Velike Britanije. U toku rada Kongresa, preko 3500 entomologa iz 80 zemalja sa svih kontinenata, u velikom broju saopštenja i postera iznelo je svoje rezultate i zapažanja iz različitih oblasti entomoloških istraživanja. Za sedam radnih dana Kongres je radio u 24 sekcije, među kojima su bile: sistematika i filogenija insekata, biogeografija i biodiverzitet, morfologija i ultrastrukture, reprodukcija i razviće, entomološke neuro-nauke, imunitet, biologija ćelije, fiziologija i biohemija, genetika i evoluciona entomologija, molekularna biologija insekata i genetski inženjering, ekologija i populaciona dinamika, entomologija specijalnih staništa, etologija, entomologija socijalnih insekata, afidologija i serikultura, poljoprivredna i šumarska entomologija, tropska entomologija, entomologija u gradu i skladištima, entomofagni insekti i biološka borba, ekologija pesticida, rezistentnost i toksikologija, opšta i primenjena patologija insekata, integralna zaštita, medicinska i veterinarska entomologija, entomologija za treći mileni-

jum i dr. U okviru sekcija izneto je više od 1500 saopštenja. Pored toga, oko 1200 postera je bilo prikazano u dve prostrane sale zdanja Fortezza da Basso.

Iz Jugoslavije u radu Kongresa učestvovalo je devet entomologa (šest iz Beograda, i po jedan iz Novog Sada, Čačka i Kragujevca). Iz Prirodnjačkog muzeja ovom značajnom skupu prisustvovale su LJILJANA PROTIĆ i LJILJANA ANĐUS. Rezultate svojih istraživanja izložile su u formi postera. U radu, "The species *Adelphophilus* on the Balkan peninsula" PROTIĆ je objasnila da rod nije monotipski, jer postoje dve vrste, *Adelphophilus balcanicus* i *A. breviceps*, koje se međusobno razlikuju kako po građi genitalne aparature mužjaka, tako i po ekološim osobinama. U rada ANĐUS i MILENKOVIĆA, "The Fungiphagous thrips (*Thysanoptera, Phlaeothripidae*) nowel for the territory of former Yugoslavia", izneti su podaci o 4 vrste fungifagnih tripsa koji se hrane hifama i sporama gljiva. Vrste *Phlaeothrips bispinosus*, *P. pillichianus* i *Poecilothrips albopictus* do sada nisu bile poznate u fauni nekadašnje Jugoslavije, dok je vrsta *Phlaeothrips coriaceus* prvi put nađena u Srbiji.

Ljiljana Anđus