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Savo BRELIH:
Ectoparasitical Entomofauna of Yugoslav Mammals. II. Siphonaptera from *Dinaromys bogdanovi* and *Chionomys nivalis* (Rodentia: Cricetidae)

Ektoparazitska entomofavna sesalcev (Mammalia) Jugoslavije. II. Sifonapteri z reliktne in snežne voluharice (*Dinaromys bogdanovi* in *Chionomys nivalis*, Rodentia: Cricetidae)

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ECTOPARASITICAL ENTOMOFAUNA OF YUGOSLAV MAMMALS.

II. SIPHONAPTERA FROM *DINAROMYS BOGDANOVI* AND *CHIONOMYS NIVALIS* (RODENTIA: CRICETIDAE).

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IZVLEČEK – EKTOPARAZITSKA ENTOMOFAVNA SESALCEV (MAMMALIA) JUGOSLAVIJE. II. SIFONAPTERI Z RELIKTNE IN SNEŽNE VOLUHARICE (*DINAROMYS BOGDANOVI* in *CHIONOMYS NIVALIS*, RODENTIA: CRICETIDAE) – Avtor navaja 23 vrst in 13 podvrst bolh, ugotovljenih na reliktni voluharici (*Dinaromys bogdanovi*) in snežni voluharici (*Chionomys nivalis*) v Jugoslaviji. Popisane so 4 nove podvrste: *Ctenophthalmus nifetodes tvrtkovici* ssp. n., *Ct. n. petrovi* ssp. n., *Ct. n. krystufeki* ssp. n. in *Ct. n. dzukici* ssp. n. Poleg teh je za favno Jugoslavije nova tudi *Callopsylla caspia*. Razširjenost 6 vrst in 8 podvrst bolh, značilnih za zgoraj navedeni voluharici, je prikazana na 4 geografskih kartah. Izdelan je nov ključ za določevanje podvrst vrste *Ctenophthalmus nifetodes*.

SYNOPSIS – The author states 23 species and 13 subspecies of fleas as found on Martino's vole (*Dinaromys bogdanovi*) and the snow vole (*Chionomys nivalis*) in Yugoslavia. Described are 4 new subspecies: *Ctenophthalmus nifetodes tvrtkovici* ssp. n., *Ct. n. petrovi* ssp. n., *Ct. n. krystufeki* ssp. n. and *Ct. n. dzukici* ssp. n.. In addition thereto one species is new for the fauna of Yugoslavia, namely: *Callopsylla caspia*. The distribution of 6 species and 8 subspecies of fleas characteristic of the above-mentioned voles is shown in 4 maps. Presented is also a new key for determining the subspecies of *Ctenophthalmus nifetodes*.

Introduction

Dealt with in the first part of the Ectoparasitical Entomofauna of Yugoslav Mammals (BRELIH & PETROV 1978) were fleas as found on insectivores. With respect to the mammalian system we should proceed with the order of bats (Chiroptera), however, the relating collected material being quite insufficient, we passed over to rodents (Rodentia) already in the second part. From this order about 10,000 specimens were examined, which enabled us to collect therefrom an ample material the data on which will be published in several sequels. Foreseen are four sequels which are to form a whole, therefore, some chapters and tables will be published in the last part only.

Studied in the first of the four sequels are Siphonaptera with Martino's vole – *Dinaromys bogdanovi* (V. & E. MARTINO 1922) and the snow vole – *Chionomys nivalis* (MARTINS 1842). These two species live in rocky regions and are ecologically rather isolated from most of other micromammalia. They have a large number of parasites specifically feeding on them

but as they live in the same habitat, the parasites often pass from one species to the other. In the older literature Martino's vole is referred to by a generic name of *Dolomys* NEHRING 1989 but has recently been included in the genus *Dinaromys* KRETZOI 1955 (GROMOV & POLJAKOV 1977: 125, PETROV & TODOROVIĆ 1982: 193). The classification of the snow vole into the genus *Chionomys* follows GROMOV & POLJAKOV 1977:327, PETROV 1979:15 and KRATOCHVIL 1981: 4. In Europe this species is often referred to by a generic name of *Microtus* SCHRANK 1978.

The fleas from the Yugoslav voles *Dinaromys bogdanovi* and *Chionomys nivalis* have been treated in a number of papers and contributions. New taxa were described by WAGNER (1933, 1938), SMIT (1957) and ROSICKÝ & CARNELUTTI (1959). Taxonomically important are also the works by SMIT (1963), SMIT & WRIGHT (1965), and HOPKINS & ROTHSCHILD (1962, 1966), while the zoogeographic data are presented also in the works by WAGNER (1930), ROSICKÝ & TODOROVIĆ (1964), and SKURATOWICZ & BARTKOWSKA (1977).

In the works from which the data were taken various errors and deficiencies could be noted, especially so with regard to the correct spelling of finding places and the altitude – they were corrected without being specifically pointed out in the text.

Cited in connection with those species of fleas whose true hosts are *Dinaromys bogdanovi* and *Chionomys nivalis* are also other hosts in order to render the presentation of a parasite more complete.

Acknowledgements

In preparing this work I enjoyed every assistance of my colleagues terriologists, Dr. Boris PETROV from Belgrade, Nikola TVRTKOVIĆ, MSc, from Zagreb, Boris KRYŠTUFEK, curator, from Ljubljana, Dr. Anka RUŽIĆ, Georg DŽUKIĆ, MSc, and Miroljub MILENKOVIĆ, assistant from Belgrade, Dr. Danica TOVORNIK and Janez GREGORI, curator, from Ljubljana, Dr. Sonja MIKŠIĆ from Sarajevo, Branimir GJETVAJ, curator and Branko JALZIĆ from Zagreb, so I profit by this opportunity to sincerely thank them for their kind help. I also thank my colleague Dr. Alexander DUDICH from Zvolen, Czechoslovakia, for his collaboration in solving certain taxonomic problems.

Material and Methods

Most of the material was collected in the last 18 years parallelly with the field research on mammals. Examined were the majority of the localities known in connection with *D. bogdanovi* and *Ch. nivalis* in Yugoslavia. We collected above all in the summer time since during the winter those regions are not easily accessible. In the faunistic research of micromammalia from 100 to 200 snap-traps were set per night. Dead animals were removed from the traps in early morning hours because numerous parasites later leave them. Each single species of hosts was stored into a separate linen bag till the examination which was attended to immediately after collecting. The parasites as caught were conserved on the spot in a 70 % alcohol i.e. separately with respect to the host, the locality, the altitude and the date. In most cases the ecological examinations were not performed. All of our material was taken from the fur of the hosts since the nests of these two voles are to be found deep in rocky cracks and caves and are practically inaccessible. The infestation percentage was not calculated for it was virtually impossible to always collect the prey from the trap and examine in detail all animals caught; unfortunately we do not possess information on the number of specimens examined by Wagner, Martino and other collectors.

The specimens as collected were used to prepare microscopic slides in Canada balsam. Examined were also the slides from the Zemaljski muzej Bosne i Hercegovine in Sarajevo, which is specifically indicated for all data in the systematic survey. All of the material for which the text does not provide the mention of literature or the collection makes part of the collection of the Natural History Museum of Slovenia in Ljubljana (coll. S. Brelih).

The fleas were collected in 71 localities (49 squares according to the 10 km UTM system) in the entire distribution area of *D. bogdanovi* and *Ch. nivalis* in Yugoslavia.

The material is determined according to HOPKINS & ROTHSCHILD (1956, 1962, 1966 and 1971) and ROSICKÝ (1957); taken into account were also some of the more recent contributions of different authors (SKURATOWICZ 1972, SMIT & WRIGHT 1978, BEAUCOURNU & LAUNAY 1979, BEAUCOURNU, LAUNAY & VALLE 1982).

Survey of the finding places

SLOVENIJA (SLOVENIA):

1. UM94 Julijske Alpe: Mangrt
2. VM04 Julijske Alpe: Trenta: Pri cerkvi
   VM04 Julijske Alpe: Dom v Planici
   VM04 Julijske Alpe: Tamar
3. VM14 Julijske Alpe: Krma
4. VM13 Julijske Alpe: Zgornja Krma
   VM13 Julijske Alpe: Vernar
   VM13 Julijske Alpe: Vodnikova koča
5. VM12 Julijske Alpe: Rodica
6. VM63 Kamniške Alpe: Kamniško sedlo
7. VL08 Trnovski gozd: Čaven
8. VL28 Hrušica: Javornik
9. VL38 Logatec, Hotedršica, Novi svet
10. VL56 Cerknica, Otok
11. VL54 Snežnik

HRVATSKA (CROATIA):

12. VL31 Istra: Učka
13. VL73 Gorski Kotar: Risnjak
14. VK96 Velebit: Zavižan, Vučjak
    VK96 Velebit: Zavižan, Modrića dolac
    VK96 Velebit: Zavižan, Vukusić snježnica
    VK96 Velebit: Veliki Zavižan
    VK96 Velebit: Babrovača
    VK96 Velebit: Šarinac
    VK96 Velebit: Gornja Klada
15. VK95 Velebit: Mirevo
16. WK05 Velebit: Bilenski Padež
17. WK03 Velebit: Bačić Kuk
18. WK31 Velebit: Čorina Prosina
    WK31 Velebit: Buljma
19. WK60 Velebit: Predzid
20. WK70 Velebit: Malovan
21. XJ02 Kozjak: Malačka, Opor
22. XH69 Biokovo: Vošac, Stara snježnica
23. XH78 Biokovo: Sošići
24. XH97 Sr. Dalmacija: Kardeljevo (=Ploče), Bačinska jezera

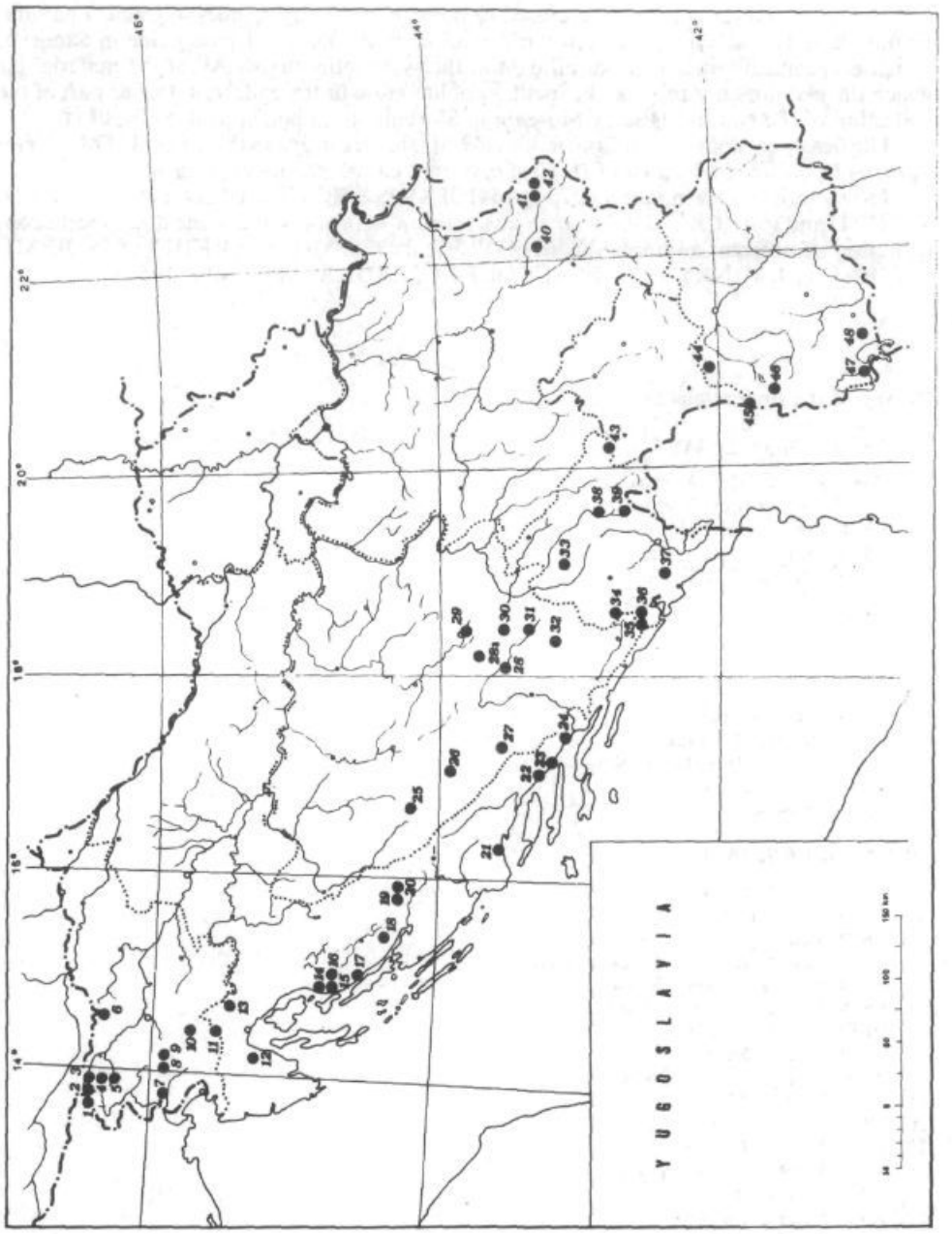

Fig. 1. Map of Yugoslavia with indicated finding places.

BOSNA I HERCEGOVINA (BOSNA AND HERZEGOVINA):

25. XJ39 Bosna: Šator: Babina greda
    XJ39 Bosna: Šator: Šatorsko jezero
26. XJ66 Bosna: Cincar (=Cincer)
    XJ66 Bosna: Cincar: Ravnine
27. XJ92 Hercegovina: Poklečani, Pizdino vrelo
28. BP62 Hercegovina: Prenj: Crno polje
28.aBP74 Bosna: Sarajevo, Bjelašnica
29. BP95 Bosna: Sarajevo, Trebević
30. BP92 Hercegovina: Treskavica: Kutski Grad
31. BP90 Hercegovina: Zelengora: Orlovačko jezero
    BP90 Hercegovina: Zelengora: Orlovac
32. BN88 Hercegovina: Gacko, Bjelašnica

CRNA GORA (MONTENEGRO):

33. CN47 Durmitor: Crepuljna poljana
    CN47 Durmitor: Dobri do, Sedlo
    CN47 Durmitor: Valovito jezero
    CN47 Durmitor: Žabljak
34. CN03 Vilusi, Obodina
35. BN91 Orjen: Štirovnik
36. CN01 Orjen (top surroundings)
37.?CM39 Cetinje (environs)
38. CN94 Ivangrad: Bjelasica
    CN94 Ivangrad: Bjelasica: Zekova glava
    CN94 Ivangrad: Bjelasica: Jelovica
39. CN92 Komovi: Štavna

SRBIJA (SERBIA):

40. EN98 Suva planina: Trem
41. FN38 Basara: Planinica
42. FN48 Stara planina: Tri čuke
    FN48 Stara planina: Ponor

SRBIJA: KOSOVO (SERBIA: KOSOVO):

43. DN33 Žljeb: Kula

MAKEDONIJA (MACEDONIA):

44. DM95 Šar planina: Popova Šapka
45. DM62 Korab: Velika Korabska vrata
    ?DM62 Korab: Ćos Alija
46. DM70 Bistra
47. DM83 Galičica
48. EL13 Pelister: Golemo jezero
    EL13 Pelister: Jorgov Kamen

Following the successive number is the corresponding square according to the 10 km. UTM system. The province, the mountains, the major localities etc. are given in the first, the narrow exact locality in the second place. If separated by a comma (,), it means that a smaller locality is situated close to a larger one (e. g. Logatec, Hotedršica); if separated by a colon (:), however, the finding place in the strictest sense is situated in the territory of the first mentioned region or represents its component (e. g. Julijske Alpe: Mangrt).

Geographic distribution of the hosts

According to PETROV & TODOROVIĆ (1982) the distribution area of the species *Dinaromys bogdanovi* extends from the northern Velebit and Mala Kapela in Croatia over Dalmatia, Herzegovina, southern Bosnia (Trebević), Montenegro and Kosovo to Galičica in southwestern Macedonia. No recent finding places are known for Slovenia, though Pleistocene fragments were found near Ilirska Bistrica (BARTOLOMEI 1970 – *Dinaromys* cf. *bogdanovi*). Known in northern Italy are several Pleistocene finding places of the same species and also the finding of *Dinaromys dalmatinus* from the older Pleistocene in the vicinity of Trieste (KORMOS 1933). The distribution of the former mentioned species is shown in Fig. 2.

Recent populations of *D. bogdanovi* have been stated in Yugoslavia only, thought they undoubtedly live also in Albania and perhaps in Greece as well. Described are 7 geographic races which, however, are not stated since it is indispensable to critically examine all taxa of this species.

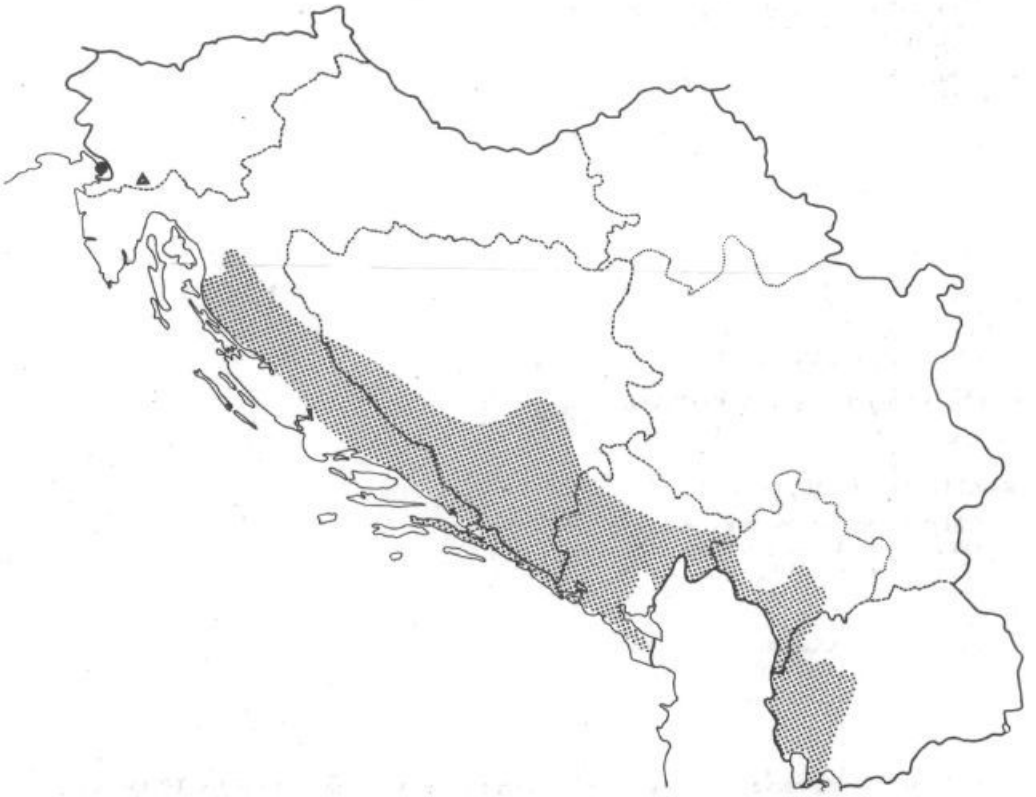

Fig. 2. Map showing the distribution of *Dinaromys bogdanovi* (V. & E. MARTINO) in Yugoslavia. Adapted according to PETROV & TODOROVIĆ 1982. Fossil findings: *Dinaromys* cf. *bogdanovi* (triangle), *Dinaromys dalmatinus* (full circle).

In Yugoslavia *Chionomys nivalis* is spread, according to PETROV (1979), from the Julian Alps and the Kamniške Alps to the Karavanken Mountains over western Slovenia and Učka in northeastern Istria, the Gorski Kotar, Kapela, the Velebit, western Bosnia, Herzegovina, northern Montenegro, Prokletije and Šar planina to Galičica and Pelister in southwestern Macedonia. Besides, it also lives in eastern Serbia (Suva and Stara planina, Basara). It has recently been stated also in other places of Istria (Rovinj and Istarske Toplice, KOVAČIĆ 1981: 180–181, Osp, leg. J. GREGORI and S. BRELIH). The distribution of this species is shown in Fig. 3.

The snow vole is much more spread than Martino's vole. Cited in the last revision of the species (KRATOCHVIL 1981) with respect to its area as a whole are 17 subspecies living from northern Spain and southern Germany in the west to Poland in the north and Bulgaria in the east, whereas outside Europe in Asia Minor, Palestine, Iran, the Caucasus and Turkmenia.

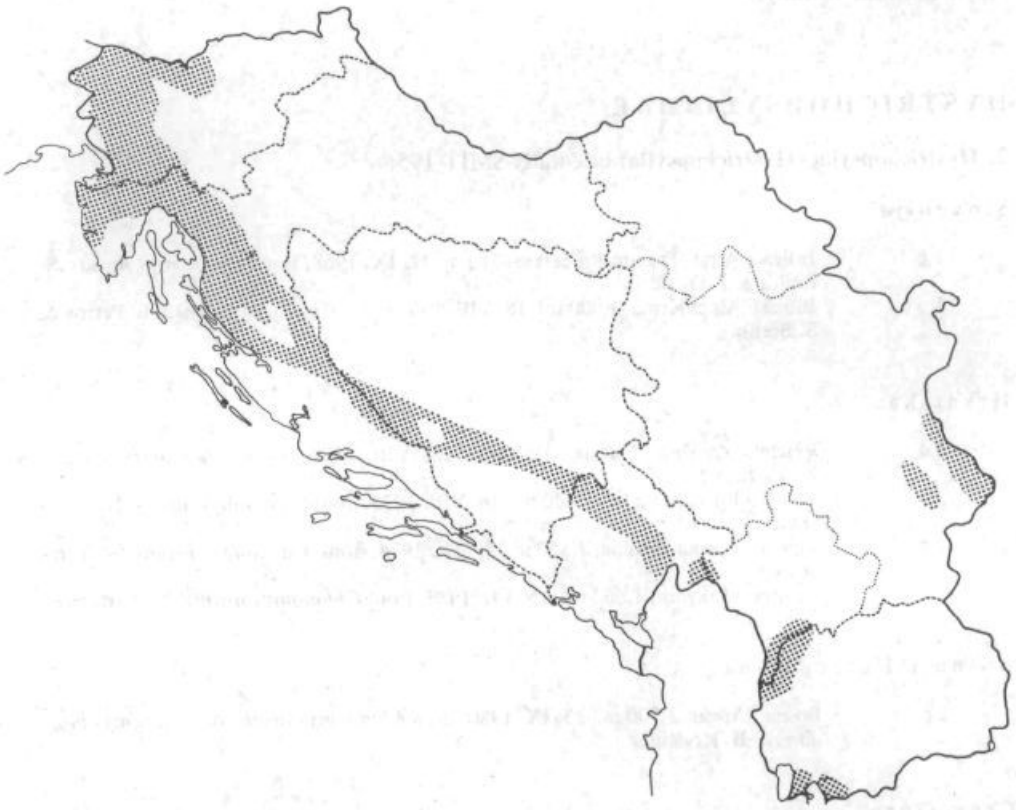

Fig. 3. Map showing the distribution of *Chionomys nivalis* (MARTINS) in Yugoslavia. Adapted according to PETROV 1979, supplemented according to KOVAČIĆ 1981 and new findings of BRELIH & GREGORI.

Survey of the Stated Species and Subspecies

ISCHNOPSYLLIDAE

1. Rhinolophopsylla unipectinata unipectinata (TASCHENBERG 1880)

Bosna i Hercegovina:

1♂ Bosna: Trebević, 1. IV. 1947, from *Dinaromys bogdanovi*, E. Martino, coll. Zemaljski muzej Bosne i Hercegovine, Sarajevo.

The species *Rh. unipectinata* parasitizes on bats, above all those bat species staying in underground caves during the day-time. In Europe these species most frequently belong to the genus *Rhinolophus* though *Rh. unipectinata* has been found also on *Miniopterus schreibersi* and some other bats. Its true host is the greater horseshoe bat (*Rhinolophus ferrumequinum*). From bats fleas rerely pass over to other mammals as they hardly ever come into contact with them, so this finding is most interesting. It could be explained by the fact that relict vole (*D. bogdanovi*) and bats all live in rocky cracks and openings through which parasites make their way from time to time.

HYSTRICHOPSYLLIDAE

2. Hystrichopsylla (Hystrichopsylla) orientalis SMIT 1956

Slovenija:

1 ♀ Julijske Alpe: Trenta: Pri cerkvi, 710 m, 12. IX. 1968, from *Chionomys nivalis*, S. Brelih & J. Dovič;
1 ♀ Julijske Alpe: Krma, 1,000 m., 18. VIII. 1967, from *Chionomys nivalis*, B. Petrov & S. Brelih.

Hrvatska:

1 ♂ 2 ♀ Velebit: Zavižan, Vučjak, 1,550 m., 18. VIII. 1976, from *Chionomys nivalis*, N. Tvrtković;
1 ♀ Velebit: Bilenski Padež, 1,240 m., 16. VIII. 1976, from *Chionomys nivalis*, N. Tvrtković;
2 ♂ 1 ♀ Velebit: Čorina Prosina, 1,350 m., 29. IX. 1974, from *Chionomys nivalis*, N. Tvrtković;
1 ♀ Velebit: Malovan, 1,600 m., 15. VII. 1983, from *Chionomys nivalis*, N. Tvrtković.

Bosna i Hercegovina:

1 ♀ Bosna: Cincar, 1,700 m., 13. IX. 1980, from *Chionomys nivalis* or *Dinaromys bogdanovi*, B. Kryštufek.

Crna Gora:

2 ♀ Vilusi, Obodina, 950 m., 15. IX. 1970, from *Dinaromys bogdanovi*, B. Petrov & G. Džukić.

In the last years numerous authors (SKURATOWICZ 1972, BEAUCOURNU & LAUNAY 1979, BEAUCOURNU, LAUNAY & VALLE 1982) treated the subspecies *Hystrichopsylla talpae talpae* and *H.t. orientalis* as independent species with a number of subspecies. The taxonomic problems of these two species will be dealt with in detail in one of our future works because *Dinaromys bogdanovi* and *Chionomys nivalis* are not its true hosts.

3. Atyphloceras nuperus palinus (JORDAN 1931)

Hrvatska:

2 ♀ Velebit: Modrića dolac, 1,460 m., 13. X. 1977, from *Chionomys nivalis,* N. Tvrtković.

A. nuperus is a relatively rare winter species living in the mountains of eastern and central Europe. WAGNER (1939) cited its eastern race *A.n. palinus* for Serbia (Kopaonik) whereas it was later stated also in Slovenia i.e. at Kamniška Bistrica (ROSICKÝ & CARNELUTTI 1958). Our collection includes more than 40 specimens from various places in Slovenia, Croatia, Montenegro and Serbia. Most of our specimens were caught in mountains, whereas six males and five females in the lowlands of Prekmurje (Lendava, Črni log, leg. B. KRYŠTUFEK), at less than 160 m. of altitude. It most frequently lives on voles and much less so on mice. The ma most probably results from the fact that we rarely collected in mountains during the winter.

4. Rhadinopsylla (Actenophthalmus) sp. (Žljeb)
(Figs. 4, 5, 8)

Srbija: Kosovo:

1 ♀ Žljeb: Kula, 1,750 m., 14. VI. 1977, from *Dinaromys bogdanovi,* B. Petrov;
1 ♀ ibidem, 28. V. 1979, M. Milenković.

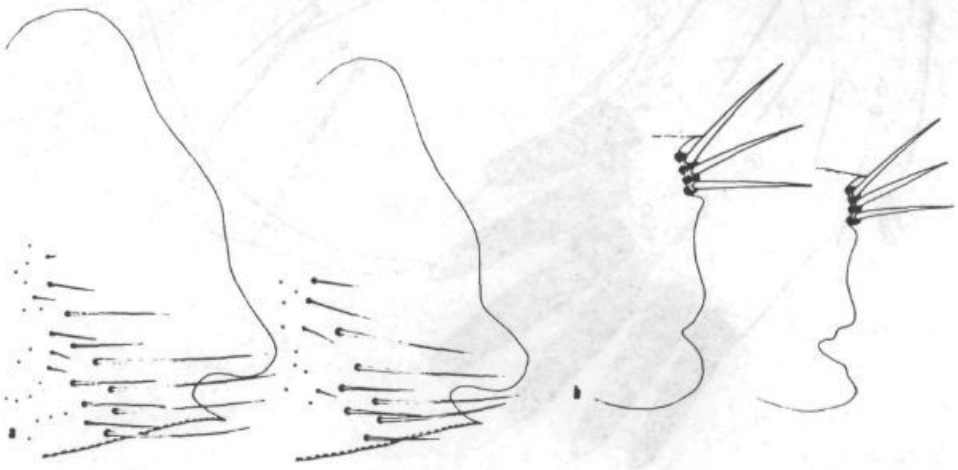

Fig. 4. *Rhadinopsylla* sp., sternum VII and outline of tergum VII of two females: Kula, Žljeb Mts., Kosovo.

In the shape of the genal comb and the metathorax the two females caught on *D. bogdanovi* from Žljeb closely resemble *Rh. mesa* JORDAN & ROTHSCHILD but differ therefrom as well as from *Rh. mesoides* SMIT in a shorter distance between the frontal tubercle and the oral angle (Fig. 5), three antepygidial bristles and a deep sinus on the apical margin of the VIIth tergite (Fig. 4b), a double irregular row of bristles on the VIIth sternite and also in the apical margin of the VIIth sternite (Fig. 4a) which is similar to that in *Rh. pitymydis* (ZAVATTARI). In this case we most likely have to do with a new species, however, the description of the species would require also a male. Both females were caught in an area that is not easily accessible, especially so in the winter time, which applies also to the nids of *D. bogdanovi* to be found deep in rocky cracks.

5. Rhadinopsylla (Actenophthalmus) dolomydis SMIT 1957
(Fig. 7)

Hrvatska:

	1 ♀	Velebit: Predzid, 800 m., 26. VII. 1975, from *Dinaromys bogdanovi,* N. Tvrtković;
2 ♂	1 ♀	Kozjak: Malačka, Opor, 500 m., 28. IV. 1974, from *Dinaromys bogdanovi,* S. Brelih & J. Gregori;
1 ♂	1 ♀	ibidem, 6. X. 1975, from *Dinaromys bogdanovi,* N. Tvrtković.

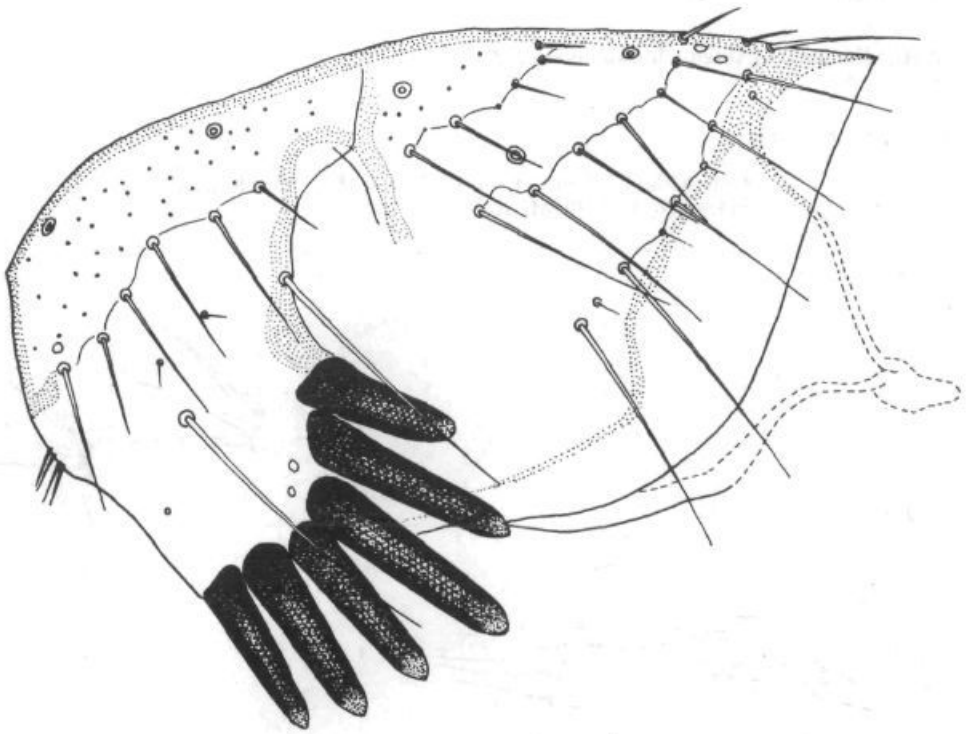

Fig. 5. *Rhadinopsylla* sp., head of female: Kula, Žljeb Mts., Kosovo.

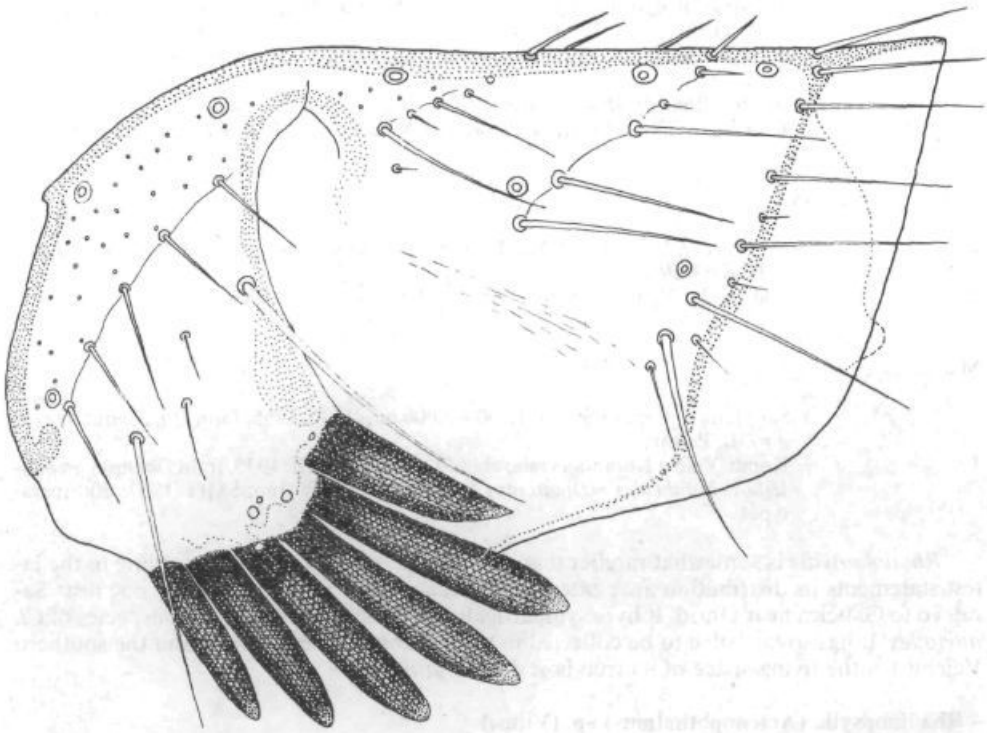

Fig. 6. *Rhadinopsylla* sp., head of male: Obodina, Vilusi, Montenegro.

Bosna i Hercegovina:

Hercegovina: Prenj, from *Dolomys* sp. *(=Dinaromys bogdanovi),* WAGNER 1939: 157 (*Rectofrontia isacanthus* Rothsch. = *Rhadinopsylla dolomydis*);

1 ♀ Bosna: Sarajevo, Bjelašnica, 2,000 m., E. Martino, from *Dolomys bogdanovi marakovici (=Dinaromys bogdanovi),* E. Martino, WAGNER 1930: 26 (*Rhadinopsylla isacanthus* ROTHSCH. = *Rh. dolomydis*);

Bosna: Sarajevo, Trebević, from *Dolomys bogdanovi marakovici (=Dinaromys bogdanovi);* WAGNER 1930: 34, 43 *(Rhadinopsylla isacanthus = Rh. dolomydis);*

1 ♀ ibidem, 10. XI. 1946, from *Dolomys bogdanovi (=Dinaromys bogdanovi),* K. Martino, coll. Zemaljski muzej Bosne i Hercegovine, Sarajevo;

4 ♂ 4 ♀ ibidem, 15. VII. 1955, from *Dolomys (=Dinaromys) bogdanovi,* F. Schmid; SMIT 1957: 73, 75 (holotype, allotype and paratypes);

1 ♀ Hercegovina: Zelengora: Orlovac, 1,650 m., 12. VI. 1986, from *Dinaromys bogdanovi,* B. Kryštufek.

Crna Gora:

1♂ Orjen (surrouding top), 1,750 m., 2. VI. 1979, from *Dinaromys bogdanovi,* M. Milenković:

1 ♂		Ivangrad, Bjelasica, 2,100 m., 17. IX. 1970, from *Dinaromys bogdanovi,* B. Petrov & G. Džukić;
1 ♂		Ivangrad, Bjelasica: Jelovica, 1,400 m., 18. VII. 1976, from *Dinaromys bogdanovi,* B. Kryštufek;
1 ♂		ibidem, from *Apodemus flavicollis;*
1 ♂	1 ♀	ibidem, 18. IX. 1981, from *Dinaromys bogdanovi,* B. Petrov & M. Milenković.

Srbija: Kosovo:

2 ♂	1 ♀	Žljeb: Kula, 1,750 m., 13. VII. 1978, from *Dinaromys bogdanovi,* B. Petrov, S. Brelih & B. Kryštufek;
2 ♂	1 ♀	ibidem, 28. V. 1979, from *Dinaromys bogdanovi,* M. Milenković.

Makedonija:

	2 ♀	Šar planina: Popova Šapka, 1,800 – 2,000 m., 10. X. 1965, from *Dinaromys bogdanovi,* B. Petrov;
1 ♂		Korab: Velika Korabska vrata, about 1,900 m., 7. VIII. 1935, from *Dolomys grebenščikovi korabensis (=Dinaromys bogdanovi),* V. Martino; SMIT 1957: 306 (paratype).

Rh. dolomydis is somewhat rarelier than *Ctenophthalmus nifetodes.* According to the latest statements its distribution area extends from the southern Velebit to Trebević near Sarajevo to Galičica near Ohrid. It lives sympatrically with the majority of the subspecies of *Ct. nifetodes.* It has so far failed to be collected in the territory of the northern and the southern Velebit i.e. the living-space of its true host *D. bogdanovi.*

– Rhadinopsylla (Actenophthalmus) sp. (Vilusi)
(Figs. 6, 7)

Crna Gora:

1 ♂	Vilusi, Obodina, 950 m., 15. IX. 1970, from *Dinaromys bogdanovi,* B. Petrov & G. Džukić.

In most of its determination characteristics the male caught at Obodina near Vilusi coincides with *Rh. dolomydis,* however, it clearly differs from therefrom in its genal comb (Fig. 6) comprising 6 teeth (which exceptionally appears also in *Rh. dolomydis)* which are much more pointed, the dorsal side of the upper spine being flat and the two lower spines thinner. In spite of the considerable difference to be noticed in the genal comb this specimen most probably belongs to *Rh. dolomydis.* A reliable identification would require more material from this locality.

6. Rhadinopsylla (Actenophthalmus) integella integella JORDAN & ROTHSCHILD 1921

Srbija:

1 ♀	Stara planina: Tri čuke, 1,900 m., 10. X. 1947, from *Chionomys nivalis,* A Ružić & B. Petrov; ROSICKY & TODOROVIĆ 1964: 212.

Rh. integella is a late autumnal and winter mountain species living on numerous small mammals, primarily voles, most frequently feeding on *Clethrionomys glareolus.* The parasites

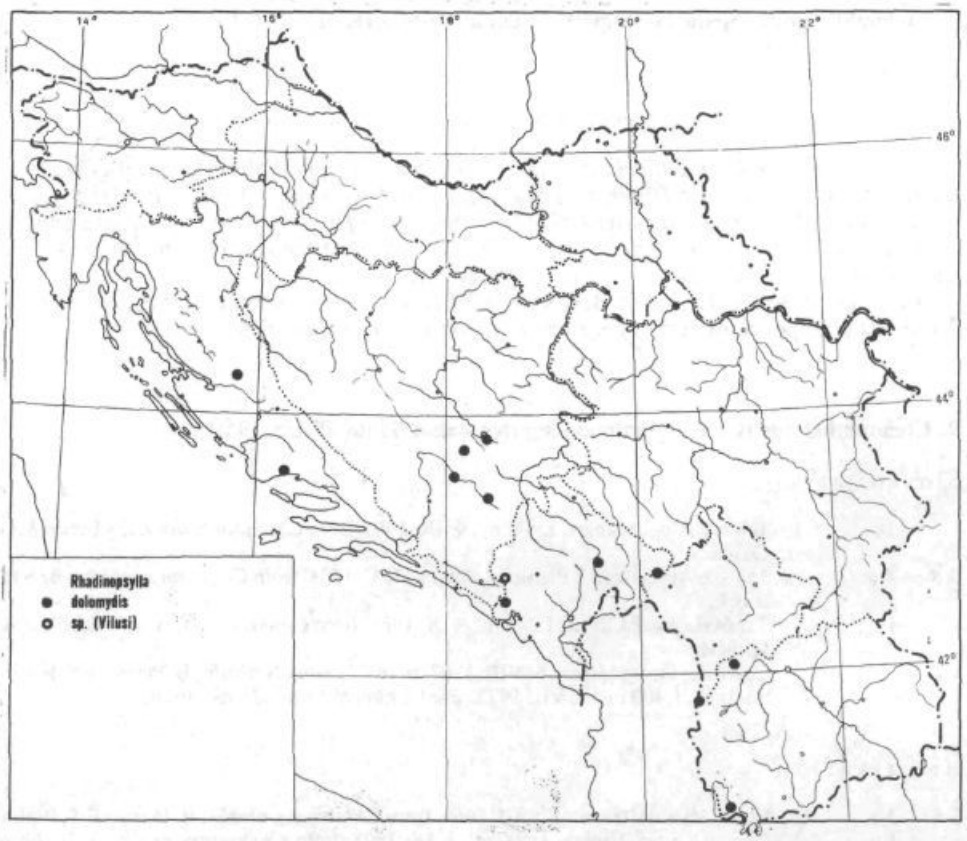

Fig. 7. Map of the distribution of *Rhadinopsylla dolomydis* SMIT and *Rh.* sp. (Vilusi, Montenegro) in Yugoslavia.

often pass over from *Cl. glareolus* to *Chionomys nivalis* and vice-versa for these two voles live sympatrically. *Rh. integella* was found on *Chionomys nivalis* but once, which is probably due to the fact that we rarely hunted the snow vole during the winter.

7. **Doratopsylla dasycnema dasycnema** (ROTHSCHILD 1897)

Bosna i Hercegovina:

1 ♀ Bosna: Šator: Babina greda, 1,620 m., 13. IX. 1983, from *Dinaromys bogdanovi*, N. Tvrtković.

With us the transitions from insectivores to voles and mice are not rare. Nevertheless, we could state only the above-mentioned example of transition of *D. dasycnema*, whose true hosts are the shrews from the genera *Sorex* and *Neomys*, to *Dinaromys bogdanovi*. No flea from insectivores was found on *Chionomys nivalis*, however, on *Sorex araneus* a female of *Ctenophthalmus orphilus* was found, its true host being *Chionomys nivalis* (BRELIH and PETROV 1978: 42).

8. Ctenophthalmus (Spalacoctenophthalmus) monticola (KOHAUT 1901)

Makedonija:

1 ♂		Šar planina: Popova Šapka, 1,800 m., VIII. 1948, from *Chionomys nivalis*, B. Petrov.

The true host of *Ct. monticola* is *Spalax leucodon* permanently living in deeper layers of the soil, so its contact with *Dinaromys bogdanovi* and *Chionomys nivalis* can only occur by chance. So the fleas most likely pass over from *Spalax* to *Dinaromys* via intermediate hosts such as *Apodemus sylvaticus* and *Pitymys subterraneus*. That are spread everywhere, having passages in underground layers as well as rocky cracks.

From Durmitor (Žabljak, leg. B. KRYŠTUFEK) we also possess an example of flea transition in the opposite direction i.e. from *Dinaromys (Ct. nifetodes)* to *Spalax*.

9. Ctenophthalmus (Ctenophthalmus) agyrtes wagnerianus PEUS 1950

Slovenija:

	1♀	Julijske Alpe: Mangrt, 1,900 m., 9. IX, 1981, from *Chionomys nivalis*, S Brelih & G. Džukić.
3 ♂	4 ♀	Julijske Alpe: Dom v Planici, 1,000 m., 3. V. 1983, from *Chionomys nivalis*, B. Krystufek;
	1 ♀	Trnovski gozd: Čaven, 1,240 m., 3. X. 1968, from *Chionomys nivalis*, S. Brelih & R. Jelinčič.
1 ♂		Cerknica, Otok, 550 m., 6. VIII. 1967, from *Chionomys nivalis*, B. Petrov & S. Brelih;
1 ♂		Snežnik, 1,400 m., 7. VII. 1972, from *Chionomys nivalis*, S. Brelih.

Hrvatska:

3 ♂	3 ♀	Istra: Učka, 1,100 m., 12. VII. 1969, from *Chionomys nivalis*, B. Petrov & S. Brelih;
	1 ♀	Gorski Kotar: Risnjak, 1,400 m., 1. IX. 1978, from *Chionomys nivalis*, S. Brelih & J. Gregori.

10. Ctenophthalmus (Ctenophthalmus) agyrtes dinarus ROSTIGAYEV 1959

Hrvatska:

2 ♂	1 ♀	Velebit: Zavižan, Vučjak, 1,550 m., 5. VI. 1977, from *Chionomys nivalis*, N. Tvrtković;
	1 ♀	idem, 12. X. 1977;
3 ♂	2 ♀	idem, 23. VI. 1981;
	2 ♀	ibidem, 26. VI. 1981, from *Chionomys nivalis*, S. Brelih;
	1 ♀	Velebit: Zavižan, Modrića dolac, 1,460 m., 13. X. 1977, from *Chionomys nivalis*, N. Tvrtković;
1 ♂		Velebit: Zavižan, Vukušić sniježnica, 1,420 m., 28. IX. 1975, from *Chionomys nivalis*, N. Tvrtković;
3 ♂	3 ♀	Velebit: Babrovača, 920 m., 22. IV. 1983, from *Chionomys nivalis*, N. Tvrtković;
	2 ♀	ibidem, 21. V. 1984, from *Chionomys nivalis*, B. Gjetvaj;
	1 ♀	Velebit: Šarinac, 1,220 m., 20. VIII. 1976, from *Chionomys nivalis*, N. Tvrtković;
1 ♂	2 ♀	Velebit: Čorina Prosina, 1,350 m., 29. IX. 1974, from *Chionomys nivalis*, N. Tvrtković;

1 ♂ Velebit: Buljma, 1,400 m., 1. X. 1974, from *Chionomys nivalis*, N. Tvrtković;
1 ♀ Velebit: Predzid, 750 m., 21. III. 1976, from *Chionomys nivalis*, N. Tvrtković;
1 ♀ Velebit: Malovan, 1,600 m., 15. VII. 1983, from *Chionomys nivalis*, N. Tvrtković;
2 ♂ Kozjak: Malačka, Opor, 500 m., 6. X. 1975, from *Dinaromys bogdanovi*, N. Tvrtković (intermediate between sspp. *dinarus* and *ohridanus*).

11. Ctenophthalmus (Ctenophthalmus) agyrtes ohridanus WAGNER 1939

Makedonija:

2 ♂ Galičica, 1,600 m., 9. VII. 1978, from *Dinaromys bogdanovi*, B. Petrov, S. Brelih & B. Kryštufek;
2 ♂ ibidem, 11. X. 1983, from *Chionomys nivalis*, B. Kryštufek & M. Belanović.

12. Ctenophthalmus (Ctenophthalmus) agyrtes serbicus WAGNER 1930

Crna Gora:

3 ♀ Durmitor: Valovito jezero, 1,715 m., 23. IX. 1981, from *Dinaromys bogdanovi*, B. Petrov & M. Milenković;
1 ♂ Ivangrad, Bjelasica: Jelovica, 1,400 m., 18. IX. 1981, from *Dinaromys bogdanovi*, B. Petrov & M. Milenković;
1 ♀ Komovi: Štavna, 1,750 ., 17. VII. 1978, from *Chionomys nivalis*, B. Petrov, S. Brelih & B. Kryštufek.

Srbija:

1 ♂ 3 ♀ Stara planina: Ponor, 1,400 ., 25. VI. 1947, from *Chionomys nivalis*, A. Ružić & B. Petrov.

Srbija: Kosovo:

1 ♂ 1 ♀ Žljeb: Kula, 1,750 m., 13. VII. 1978, from *Dinaromys bogdanovi*, B. Petrov, S. Brelih & B. Kryštufek.

13. Ctenophthalmus (Ctenophthalmus) agyrtes graecus JORDAN 1926

Makedonija:

1 ♂ 1 ♀ Šar planina: Popova Šapka, 1,900 m., 10. X. 1965, from *Chionomys nivalis*, B. Petrov.

– Ctenophthalmus (Ctenophthalmus) agyrtes ssp.

Bosna i Hercegovina:

1 ♀ Bosna: Šator: Babina greda, 1,620 m., 13. IX. 1983, from *Dinaromys bogdanovi*, N. Tvrtković.

Crna Gora:
1 ♀ Vilusi, Obodina, 950 m., 29. VIII. 1982, from *Dinaromys bogdanovi*, G. Džukić.

Available from these two finding places are only females so we are not in position to determine subspecies.

Ct. agyrtes is a species which with us parasitizes on almost all species of small mammals with the exception of bats. Living in Yugoslavia are seven subspecies of *Ct. agyrtes,* five whereof were stated on *Chionomys nivalis* and three on *Dinaromys bogdanovi.*

An ample material has been collected on this species which is to be presented in detail in one of our future works.

14. *Ctenophthalmus (Medioctenophthalmus) orphilus dolomiticus* *JORDAN 1928*
(Figs. 8, 9)

Slovenija:

1 ♀ Julijske Alpe: Mangrt, 2,000 m., 28. VII. 1973, from *Chionomys nivalis*, B. Petrov & B. Kryštufek;

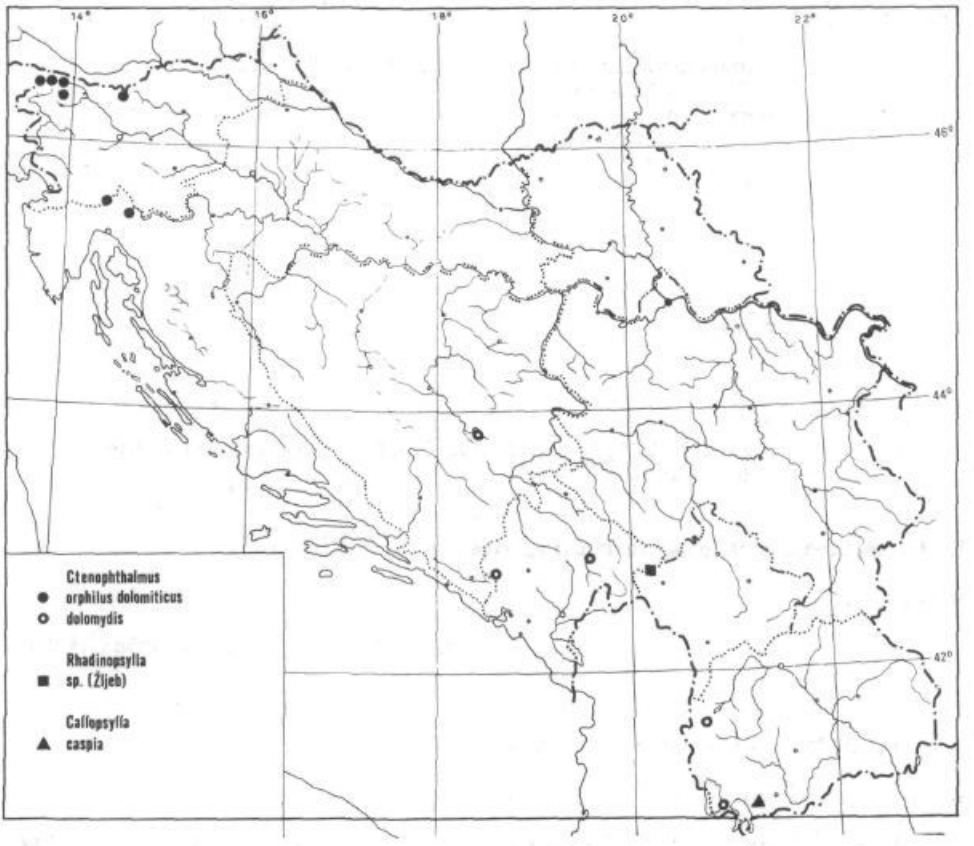

Fig. 8. Map of the distribution of *Ctenophthalmus orphilus dolomiticus* JORDAN, *Ct. dolomydis* SMIT, *Callopsylla caspia* (TIFLOV) and *Rhadinopsylla* sp. (Žljeb Mts., Kosovo) in Yugoslavia.

	2 ♀	ibidem, 29. VII. 1973, from *Chionomys nivalis*, S. Brelih & J. Gregori;
	1 ♀	ibidem, 1,900 m., 9. IX. 1981, from *Chionomys nivalis*, S. Brelih & G. Džukić;
	1 ♀	Julijske Alpe: Krma, 1,000 m., 18. VIII. 1968, from *Chionomys nivalis*, B. Petrov & S. Brelih;
	1 ♀	ibidem, 18. VIII. 1968, from *Sorex araneus*, B. Petrov & S. Brelih; BRELIH & PETROV 1978: 42;
3 ♂	2 ♀	Julijske Alpe: Vernar (Vodnikova koča), ca. 2,000 m., from *Chionomys nivalis*; WAGNER 1938: 253 (holotype and paratypes of *Ctenophthalmus sclavinus* WAGNER 1933 = *Ctenophthalmus orphilus dolomiticus* JORDAN 1928);
1 ♂	1 ♀	Julijske Alpe: Zgornja Krma, 15. VII. 1963, from *Chionomys nivalis wagneri*, J. Wagner; HOPKINS & ROTHSCHILD 1966: 430;
	3 ♀	Julijske Alpe: Dom v Planici, 1,000 m., 3. V. 1983, from *Chionomys nivalis*, B. Kryštufek;
	2 ♀	Kamniške Alpe: Kamniško sedlo, 1,880 m., 23. VI. 1957, from *Chionomys nivalis*, J. Nosek, S. Brelih & M. Trpiš; ROSICKÝ & CARNELUTTI 1959: 140.
1 ♂	4 ♀	Snežnik, 1,600 m., 20. VII. 1967, from *Chionomys nivalis*, B. Petrov & S. Brelih.

Hrvatska:

1 ♂	2 ♀	Gorski Kotar: Risnjak, 1,400 m., 1. IX. 1978, from *Chionomys nivalis*, S. Brelih & J. Gregori;
1 ♂		ibidem, from *Clethrionomys glareolus*.

The true host of this relatively rare flea is *Chionomys nivalis*. It but exceptionally passes over to other small mammals. In Yugoslavia one specimen was also found on *Clethrionomys glareolus* and *Sorex araneus*.

Ct. orphilus is spread above all in the Alps, reaching in the northeast over Lower Austria as far the High Tatra Mountains in Czechoslovakia. In Yugoslavia it was found in the Julian and the Kamnik Alps, as well as in the northwestern part of the Dinaric Alps (Snežnik, Risnjak).

In Yugoslavia *Chionomys nivalis* is spread (Fig. 3) from the Julian and the Kamnik Alps in Slovenia over the entire Dinaric chain of mountains and Šar planina to Pelister in Macedonia, as well as in eastern Serbia (Stara and Suva planina, Basara). With us two flea species

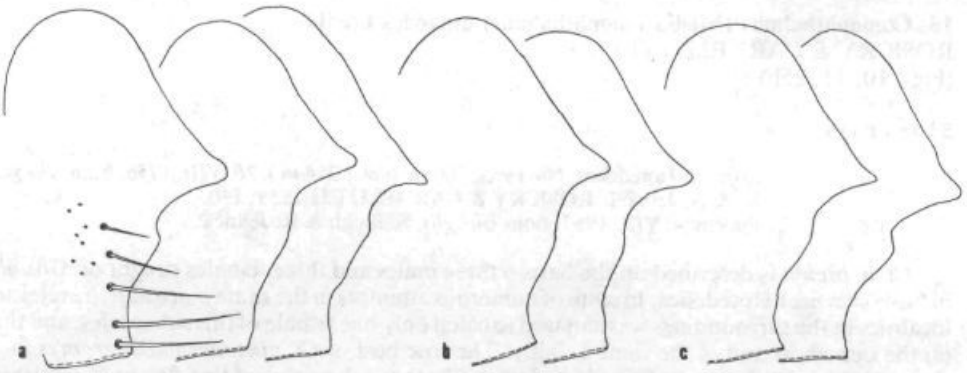

Fig. 9. *Ctenophthalmus orphilus dolomiticus* JORDAN, sternum VII of female and outline of sternum VII: a. Mangrt Mt., Julian Alps, Slovenia; b. Snežnik Mts., Slovenia; c. Risnjak Mt., Gorski Kotar, Croatia.

are characteristic of it, namely, *Ct. orphilus* as mentioned before and *Callopsylla caspia* which according to the present findings is restricted exclusively to Pelister. On the remaining part of its distribution area it is infested only with species whose true hosts are other small mammals. It is interesting to note that in the entire territory where *Dinaromys bogdanovi* is spread (as well as *Ct. nifetodes*), *Chionomys nivalis* does not have fleas otherwise characteristic of it.

(– Ctenophthalmus (Medioctenophthalmus) nivalis nivalis ROTSCHILD 1909)

Slovenija:

1 ♀ Julijske Alpe: Rodica, from *Chionomys nivalis;* WAGNER 1939: 157.

WAGNER's statement (1939: 157) that *Ct. nivalis nivalis* is stated in the Julian Alps (Rodica) is not correct. It has been established that the nominate subspecies of *Ct. nivalis* lives in the French Alps only whereas the subspecies *cervinus* JORDAN & ROTHSCHILD 1920, and *helveticus* SMIT 1963, in the Swiss Alps. In the time when Wagner published this information the taxonomy of *Ct. nivalis* was still rather unclear, so he classified to this species also sspp. *nifetodes* and *eugeniae*. SMIT (1957, 1963) solved these problems and determined *Ct. nifetodes* as an independent species. *Ct. nivalis* has been proven to be an expressedly Alpine species, whose true host is *Chionomys nivalis*, and *Ct. nifetodes* a Dinaric – Šar-Pindic species, whose true host is *Dinaromys bogdanovi*. Nevertheless it has not been decided to which species belongs the sole female from Rodica. The females of *Ct. nivalis helveticus* and *Ct. nifetodes brelihi* so closely resemble one another that it is virtually impossible to distinguish them with any degree of reliability. Taking into account the fact that Rodica is more than ten times closer to Hotedršica (the only known finding place od *Ct. n. brelihi*) than to Simplon Pass (loc. typ of *Ct. n. helveticus*) and as the Julian Alps make part of the same tectonic whole as the Dinaric and the Šar-Pindic mountains, it is likely for the said female to belong to *Ct. nifetodes*, even though the host (*Chionomys nivalis*) and the highland ecological conditions speak in the favour of *Ct. nivalis*. The solution of this problem urgently requires a male that we failed to find in spite of repeated efforts to do so.

15. Ctenophthalmus (Medioctenophthalmus) nifetodes brelihi
ROSICKÝ & CARNELUTTI 1959
(Figs. 10, 11, 25b)

Slovenija:

3 ♂ 3 ♀ Logatec, Hotedršica, Novi svet, 700 m. (not 1,264 m.), 26. VIII. 1956, from *Glis glis*, R. & N. Jelinčič; ROSICKÝ & CARNELUTTI 1959: 140.
1 ♀ ibidem, 4. VIII. 1967, from *Glis glis*, S. Brelih & R. Jelinčič.

Ct. n. brelihi is described on the basis o three males and three females caught on *Glis glis* in Novi svet near Hotedršica. In spite of numerous attempts in the same place and the relevant localities in the surroundings we managed to catch only one female of this subspecies, and that on the same host and in the same locality. The true host of *Ct. nifetodes* is *Dinaromys bogdanovi*, which has been confirmed in almost all other subspecies of this flea in Yugoslavia. *Ct. nifetodes* quite frequently passes over to other hosts with which *Dinaromys* shares its living-space in rocks. These are above all *Chionomys nivalis, Glis glis* and *Apodemus mystacinus*. Of the afore-mentioned species only a fat dormouse was caught in the vicinity of Ho-

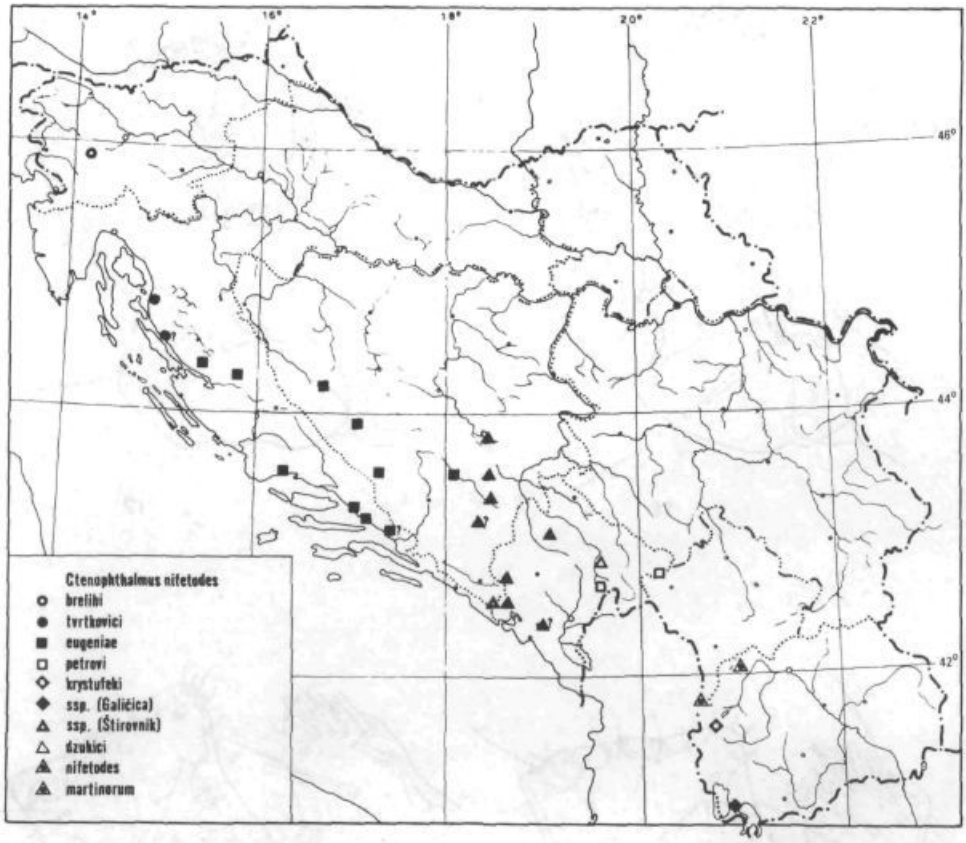

Fig. 10. Map of the distribution of *Ctenophthalmus nifetodes* (WAGNER) in Yugoslavia.

tedršica, whereas in the nearby Javornik (Hrušica) as well as some other somewhat more remote localities (Trnovski gozd, Snežnik) also *Chionomys nivalis* which, however, was never infested wich *Ct. nifetodes*. Thus, there still remains an open question of the true host of *Ct. n. brelihi*. In spite of a yearlong search we failed to catch living specimens of *D. bogdanovi* in Slovenia, while Pleistocene fragments of *D.* cf. *bogdanovi* where found near Ilirska Bistrica and those of *D. dalmatinus* in the vicinity of Trieste in Italy. Both finding places are about 40 km away from Hotedršica. With respect to the present state of investigations it could be concluded that in the territory of Slovenia the species of the genus *Dinaromys* have become extinct, while their specific flea *Ct. nifetodes* has survived and has found new hosts.

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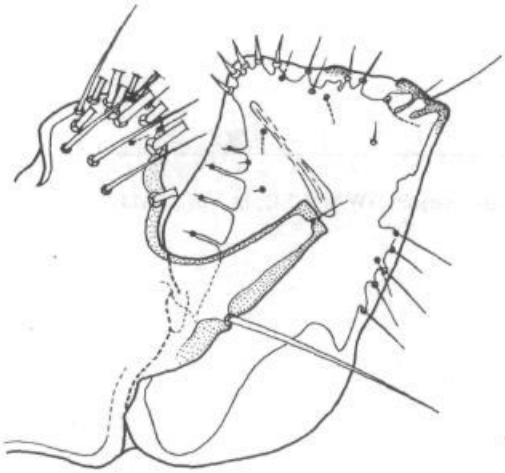

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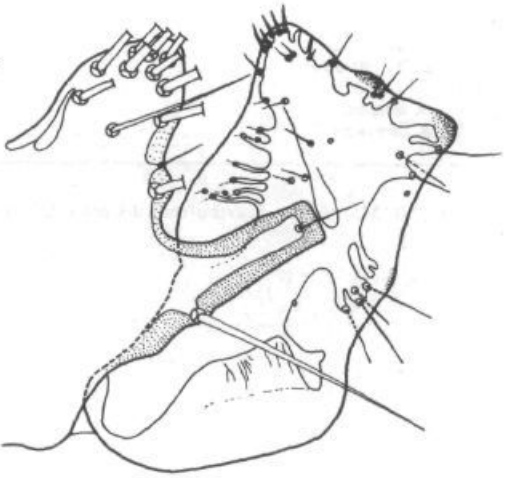

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Figs. 11–14. *Ctenophthalmus nifetodes* sspp., processes of clasper: (11) *C. n. brelihi* ROSICKY & CARNELUTTI 1959; (12) *C. n. tvrtkovici* ssp. n., holotype; (13) *C. n. eugeniae* WAGNER, lectotype, adapted according to SMIT & WRIGHT 1965; (14); *C. n. petrovi* ssp. n., holotype.

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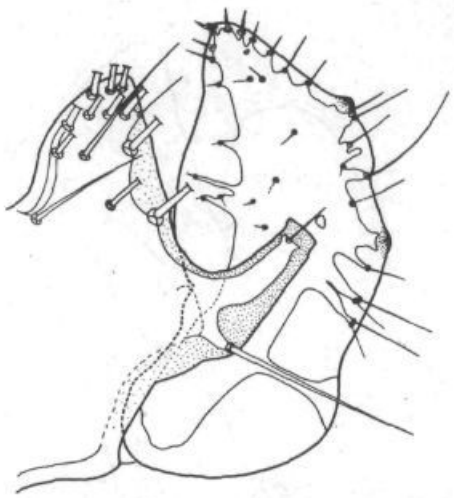

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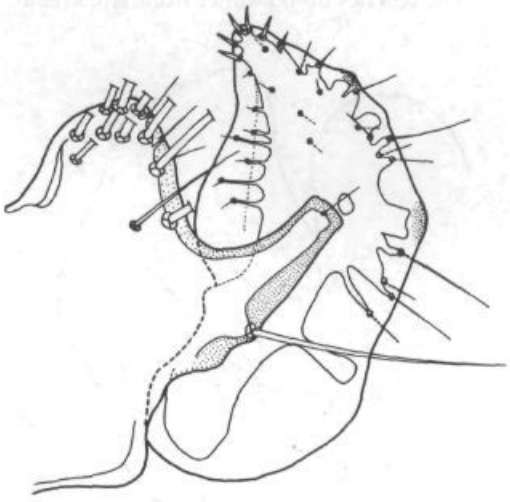

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Figs. 15–18. *Ctenophthalmus nifetodes* sspp., processes of clasper: (15) *C. n. krystufeki* ssp. n., holotype; (16) *C. n. dzukici* ssp. n., holotype; (17) *C. n. nifetodes* WAGNER, Trebević Mt., Bosnia, adapted according to SMIT 1957; (18) *C. n. martinorum* SMIT, holotype, adapted according to SMIT 1957.

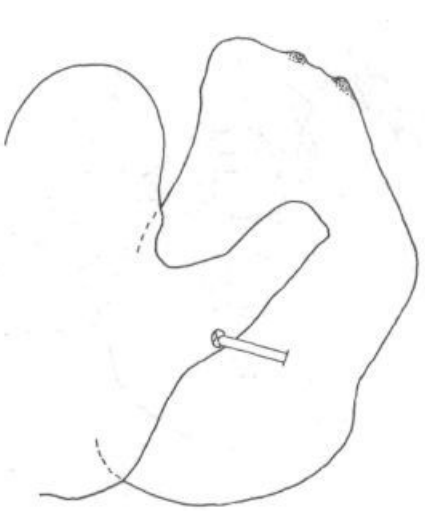
16. Ctenophthalmus (Medioctenophthalmus) nifetodes tvrtkovici ssp. n.
(Figs. 10, 12, 21a, 25a)

Hrvatska:

1 ♂	2 ♀	Velebit: Zavižan, Vučjak, 1,550 m., 18. VIII. 1976, from *Chionomys nivalis*, N. Tvrtković;
2 ♂	4 ♀	idem, 1,600 m., 23. VI. 1981;
	2 ♀	Velebit: Zavižan, Modrića dolac, 1,460 m., 8. IX. 1979, from *Chionomys nivalis*, N. Tvrtković;
	1 ♀	Velebit: Zavižan, Modrića dolac (Botanički vrt), 1,460 m., 8. IX. 1979, from *Glis glis*, N. Tvrtković;
1 ♂		Velebit: Gornja Klada, 350 m., 26. VI. 1981, from *Dinaromys bogdanovi*, N. Tvrtković & B. Jalžić;
	1 ♀	Velebit: Bačić Kuk, 900 m., 25. VII. 1976, from *Dinaromys bogdanovi*, N. Tvrtković.

Holotype male (No.: IA–P–6542) from Vučjak near Zavižan, North Velebit, Croatia, 1,600 m., 23. VI. 1981, from *Chionomys nivalis*, leg. N. TVRTKOVIĆ and allotype female (No.: IA–P–4439), 1,550 m., 18. VIII. 1976, all other data the same as with the holotype. Paratypes: 2 males and 8 females from Vučjak and Modrića dolac (other data stated above). The typical material is kept at the Natural History Museum of Slovenia in Ljubljana (coll. S. BRELIH) and the British Museum (Nat. Hist.).

Diagnosis: Ssp. *tvrtkovici* closely resembles ssp. *brelihi*, differing therefrom primarily in that on the apical margin of the movable process the first »wart« is not developed and that it has no short marginal seta on the posterior margin immediately behind the second »wart«. The females do not differ from ssp. *brelihi*.



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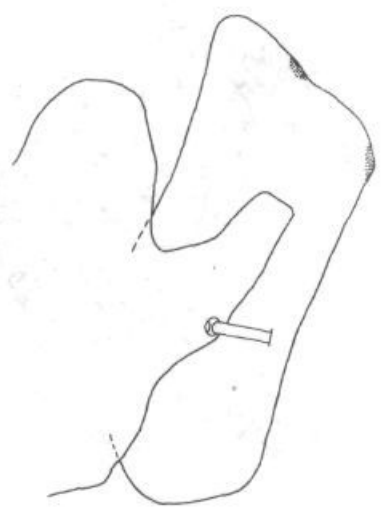

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Figs. 19–20. *Ctenophthalmus nifetodes* sspp., outline of processes of clasper: (19) ssp. from Štirovnik Mt., Orjen Mts., Montenegro; (20) ssp. from Galičica Mts., Macedonia.

Description: Male (Fig. 12). Dorsal lobe (L^1) of the fixed process slightly higher than broad, pyramidal or subpyramidal; ventral lobe (L^2) of the fixed process short. Supra foveal portion of the movable process quadrangular, posterior apical angle rectangular. Anterior apical angle of the movable process sounded, broadened and elevated above the level of the second half of the apical margin. The first »wart« of the apical margin is not developed. No short marginal seta on the posterior margin immediately behind the second »wart«. There are 4–5 tetrad bristles. In the lower part of the posterior margin there is a deep sinus as in the case of ssp. *brelihi*. The apical margin of st. VIII as in Fig. 21a. Phallosome as in the other subspecies.

Female (Fig. 25a). Lobe of the apical margin of st. VII broad and short as in ssp. *brelihi*.

The only specimen available is from Gornja Klada, caught on *D. bogdanovi*, having L^1 of the fixed process more rounded in the apical part and L^2 slightly longer (nevertheless distinctly shorter than in ssp.*eugeniae*) than the specimens from Zavižan, which represents a transition to ssp. *eugeniae* and was therefore not considered as a paratype. Similarly, also the females from Bačić Kuk were not taken into account as paratypes since no males are available from that place. In three speciemens the apical margin of the fixed process passes over to the posterior margin under the right angle and in the fourth specimen under a blunt angle (approx. 110°). In the specimens from Zavižan the number of tetrad bristles amounth to 5 + 5, 5 + 4, 4 + 4, and in the specimen from Gornja Klada to 5 + 5.

Morphologically ssp. *tvrtkovici* comes closest to ssp. *brelihi* though by the shape of its movable process it already slightly approaches ssp. *eugeniae*. A step forward in this direction is the population from Gornja Klada.

All specimens of ssp. *tvrtkovici* from Zavižan (Vučjak, Modrića dolac) were caught on *Chionomys nivalis*. Their original host is no doubt *D. bogdanovi* which in the northern Velebit has so far been caught up to 990 m. of altitude. Thus the population from Zavižan seems to have lastingly changed its host and this probably explains the reason why lesser morphological differences exist between this population and the specimen from Gornja Klada.

I named the new species after my friend and colleague, the theriologist Nikola TVRTKOVIĆ, MSc., principal of the National Zoological Museum of Croatia in Zagreb, in thanks for his yearlong help in my research of siphonaptera of Yugoslavia.

17. Ctenophthalmus (Medioctenophthalmus) nifetodes eugeniae WAGNER 1938
(Figs. 10, 13, 21 b-e, 26)

Hrvatska:

1 ♂		Velebit: Buljma, 1,400 m., 2. X. 1974, from *Chionomys nivalis*, N. Tvrtković;
	1 ♀	Velebit: Predzid, 750 m., 5. VII. 1975, from *Apodemus sylvaticus*, N. Tvrtković:
	3 ♀	ibidem, 800 m., 26. VII. 1975, from *Dinaromys bogdanovi*, N. Tvrtković;
4 ♂	1 ♀	Kozjak: Malačka, Opor, 500 m., 28. IV. 1974, from *Dinaromys bogdanovi*, S. Brelih & J. Gregori;
	1 ♀	idem, from *Apodemus mystacinus;*
1 ♂		ibidem, 6. X. 1975, from *Dinaromys bogdanovi*, N. Tvrtković;
2 ♂	1 ♀	Biokovo: Vošac, Stara sniježnica, 27. VIII. 1976, from *Dinaromys bogdanovi*, N. Tvrtković;
	2 ♀	idem, from *Apodemus mystacinus;*
	1 ♀	Kardeljevo (=Ploče), Bačinska jezera, 40 m., 2. V. 1974, from *Dinaromys bogdanovi*, S. Brelih & J. Gregori.

Bosna i Hercegovina:

1 ♂		Bosna: Šator: Babina greda, 1,620 m., 13. IX. 1983, from *Dinaromys bogdanovi*, N. Tvrtković;
4 ♂	1 ♀	Bosna: Šator: Šatorsko jezero, 1,488 m., 13. IX. 1983, from *Dinaromys bogdanovi*, B. Kryštufek;
	2 ♀	Bosna: Cincar, 1,700 m., 13. IX. 1980, from *Dinaromys bogdanovi*, B. Kryštufek;
	1 ♀	idem, from *Clethrionomys glareolus;*
	4 ♀	Bosna: Cincar: Ravnine, 1,456 m., 14. IX. 1980, from *Dinaromys bogdanovi*, N. Tvrtković;
1 ♂		Hercegovina: Poklečani, Pizdino vrelo, 1,000 m., 12. V. 1971, from *Dinaromys bogdanovi*, B. Petrov;
1 ♂	7 ♀	Hercegovina: Prenj: Crno polje, 1,400 m., 14. VIII. 1936, from *Dolomys (≈Dinaromys bogdanovi)*, E. Martino; WAGNER 1938: 253 (holotype, allotype and paratypes).

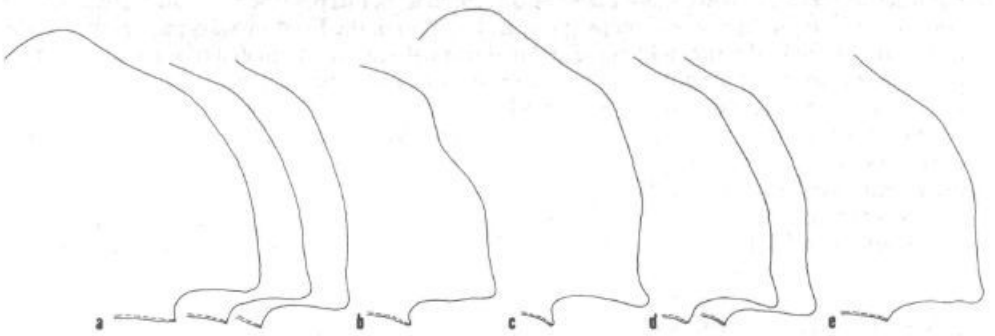

Fig. 21. *Ctenophthalmus nifetodes* sspp., outline of sternum VIII of males: (a) *C. n. tvrtkovici* ssp. n., holotype and paratypes; b – e. *C. n. eugeniae* WAGNER: (b) Buljma, Velebit Mts., Croatia; (c) Poklečani, Herzegovina; (d) Biokovo Mts., Dalmatia, Croatia; (e) Malačka, Kozjak Mts., Croatia.

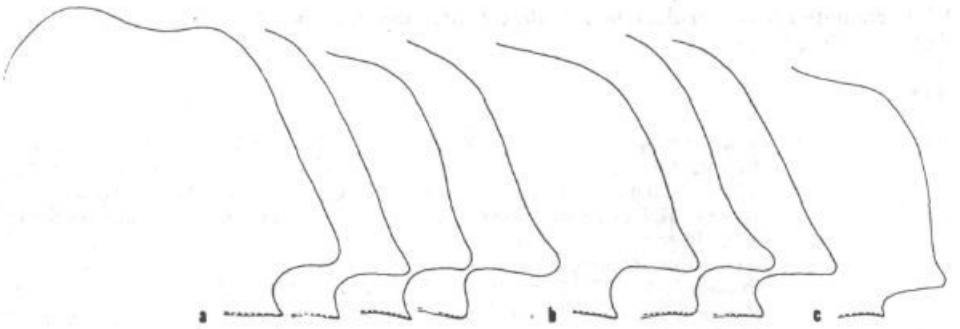

Fig. 22. *Ctenophthalmus nifetodes nifetodes* WAGNER, outline of sternum VIII of males: a. Orjen Mts.. Montenegro; b. Durmitor Mts., Montenegro; c. Vilusi, Montenegro.

Ct. n. eugeniae is spread from the southern Velebit and Šator highlands in the northwest to Prenj and the mouth of the Neretva in the southeast. It has so far been stated in ten squares according to the 10 km. UTM system. The differences among single populations are small and unimportant though they become more obvious in single specimens. In the population from Šator highlands L^2 of the fixed process is shorter than it is characteristic of ssp. *eugeniae*, showing a link with ssp. *tvrtkovici*.

Supplement to the Description: In most of the specimens the supra foveal portion of the movable process is more rhomboidal than rectangular so that the posterior apical angle forms an acute angle (75° – 85°, exceptionally 90°). On the apical margin of the movable process, directly behind the sensilla and before the first »wart« there sometimes appears another unpronounced »wart«, whereas in certain populations the first »wart« is developed but weakly. In all populations there are five tetrad bristles on either side, with the exception of the population from Biokovo in which one specimen had 4 bristles on the right and another 6 bristles on the left side.

18. Ctenophthalmus (Medioctenophthalmus) nifetodes petrovi ssp. n.
(Figs. 10, 14, 24 a, b, 27)

Crna Gora:

1 ♂	1 ♀	Komovi: Štavna, 1,800 m., 17. IX. 1967, from *Chionomys nivalis*, B. Petrov;
2 ♂		ibidem, 1,900 m., 21. IX. 1981, from *Dinaromys bogdanovi*, B. Petrov & M. Milenković.

Srbija: Kosovo

19 ♂	13 ♀	Žljeb: Kula, 1,750 m., 13. VII. 1978, from *Dinaromys bogdanovi*, B. Petrov, S. Brelih & B. Kryštufek;
6 ♂	7 ♀	ibidem, 28. V. 1979, from *Dinaromys bogdanovi*, M. Milenković.

Holotype male (No.: IA-P-4881) and allotype female (IA-P-4907) from Slovenia in Ljubljana (coll. S. BRELIH) and the British Museum (Nat. Hist.).

Diagnosis: By the shape of the movable process ssp. *petrovi* resembles ssp. *eugeniae*, however, in the new subspecies this process is slightly narrower, its foveo-apical portion having the shape of a square. On the posterior margin, directly behind the posterior apical angle there are one short marginal and one submarginal seta.

Description: Male (Fig. 14). L^1 of the fixed process equally broad as high, subpyramidal or rounded, L^2 long. The foveo-apical portion of the movable process rectangular, the anterior, the apical and the posterior margin relatively flat; the first »wart« is situated approximately in the middle of the apical margin. The apical margin forms a right angle with the posterior one. The second »wart« forms a posterior apical angle, immediately behind it there are a short marginal and a submarginal seta on the posterior margin. Growing on either side are four tetrad bristles, their alveoli lying very closely to one another. The lobe of the margin of st. VIII immediately above the sinus broadly rounded (Fig. 24 a). Phallosome as in the other subspecies.

Female (Fig. 27). By the shape of the apical margin of st. VII they do not differ from the nominate subspecies.

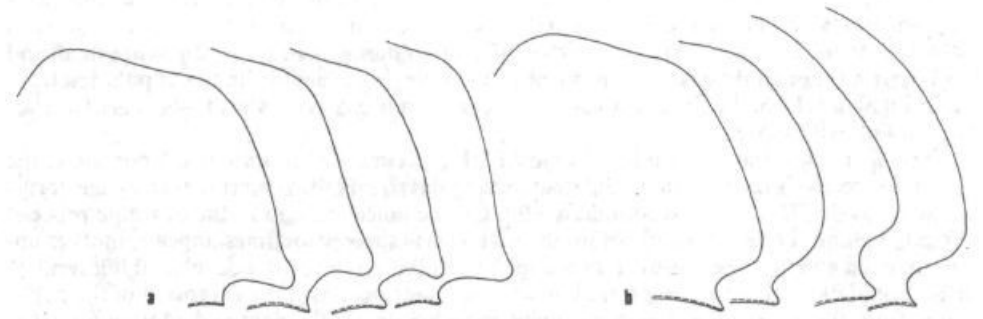

Fig. 23. *Ctenophthalmus nifetodes* sspp., outline of sternum VIII of males: a. *C. n. dzukici* ssp. n., paratypes, Jelovica Mt., Bjelasica Mts., Montenegro, b. *C. n. martinorum* SMIT, Popova Šapka, Šar planina. Macedonia.

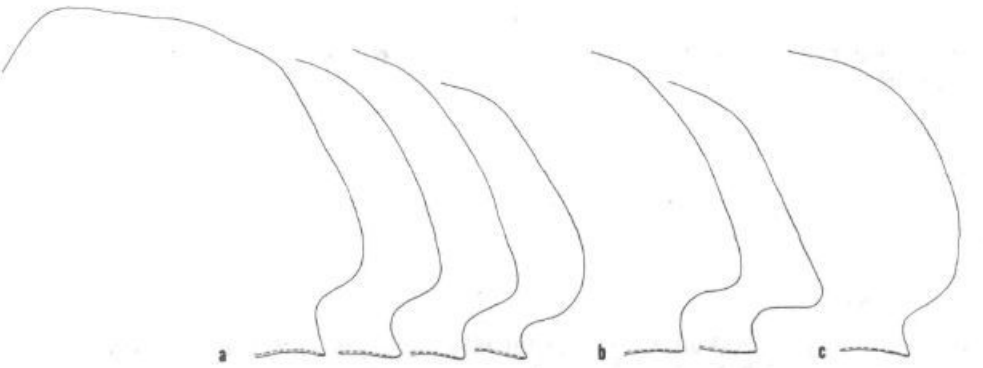

Fig. 24. *Ctenophthalmus nifetodes* sspp., outline of sternum VIII of males: a, b. *C. n. petrovi* ssp. n., (a) holotype and paratypes, (b) Komovi Mts., Montenegro; c. *C. n. krystufeki* ssp. n., holotype.

The population from Žljeb is very homogeneous, little differences are to be observed only in the dorsal lobe of the fixed process which in some cases is sharper and in others more rounded. In certain specimens another unpronounced sclerotized prominence appears on the posterior margin, immediately above the tetrad bristles.

In all of its essential characteristics the population from the Komovi Mts. coincides with ssp. *petrovi* though in single specimens divergencies can be observed towards the surrounding species. Thus, one male only has the same apical margin of st. VIII as ssp. *petrovi* (or *martinorum*), and two males an apical margin more similar to that of ssp. *nifetodes* (Fig. 24 b). In one specimen the apical margin of the movable process descends obliquely from the anterior to the posterior angle (similarly as in ssp. *krystufeki*), and in two of them in the same way as in ssp. *petrovi*.

I named the new subspecies after my friend and colleague, the leading Yugoslav theriologist Dr. Boris PETROV from Belgrade, in thanks for his yearlong collaboration and help in my research of siphonaptera of Yugoslavia.

19. Ctenophthalmus (Medioctenophthalmus) nifetodes krystufeki ssp. n.
(Figs. 10, 15, 24 c)

Makedonija:

1 ♂ Bistra, 1,750 m., 16. VIII. 1980, from *Dinaromys bogdanovi,* B. Kryštufek.

Holotype male (No. IA-P-6056) from Bistra Mts., West Macedonia, (other data given above); kept at the Natural History Museum of Slovenia in Ljubljana (coll. S. BRELIH).

Diagnosis: By the below stated differences in the shape of the movable process ssp. *krystufeki* distinctly differs from all other subspecies of *Ct. nifetodes* and is closely related only to the undescribed subspecies from Galičica.

Description: Male (Fig. 15). The dorsal lobe of the fixed process slightly broader than high and rounded; the ventral lobe long; the movable process is narrower and higher than in other subspecies, the anterior and the posterior margin running more or less parallelly, the apical margin descending obliquely towards the posterior margin and forming an obtuse posterior apical angle (approximately 115°). The anterior apical angle of the movable process is sharply rounded and slightly sclerotized. The first »wart« is situated just before one half and the second »wart« at the end of an almost straight apical margin. The posterior margin of the movable process is almost straight and no short marginal seta can be found on its upper portion immediately under the second »wart«. The holotype has 4 tetrad bristles on either side. The apical margin of st. VIII is broadly rounded (Fig. 24 c). The phallosome as in the other subspecies.

Female uncnown.

The only presently known finding place of this subspecies is the highlands of Bistra. The distribution area of ssp. *krystufeki* seems to be quite restricted, for 20 km towards Korab Mts. lying towards the nordeast there lives ssp. *martinorum* and about 60 km towards the south-oriented Galičica an as yet unnamed subspecies.

I named the new subspecies after my friend and colleague, the theriologist Boris KRYŠTUFEK, a curator of the Natural History Museum of Slovenia in Ljubljana, in thanks for his yearlong help in my research of siphonaptera of Yugoslavia.

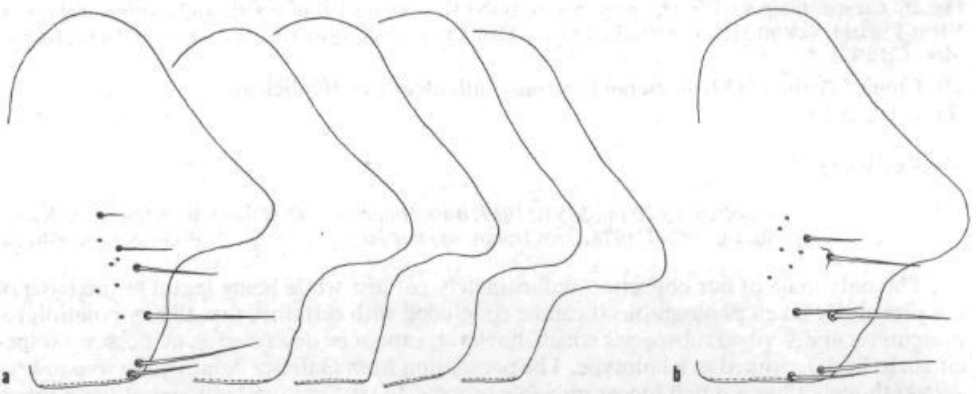

Fig. 25. *Ctenophthalmus nifetodes* sspp.: a. *C. n. tvrtkovici* ssp. n., sternum VII of female allotype and outline of sternum VII of female paratypes; b. *C. n. brelihi* ROSICKÝ & CARNELUTTI, sternum VII of female.

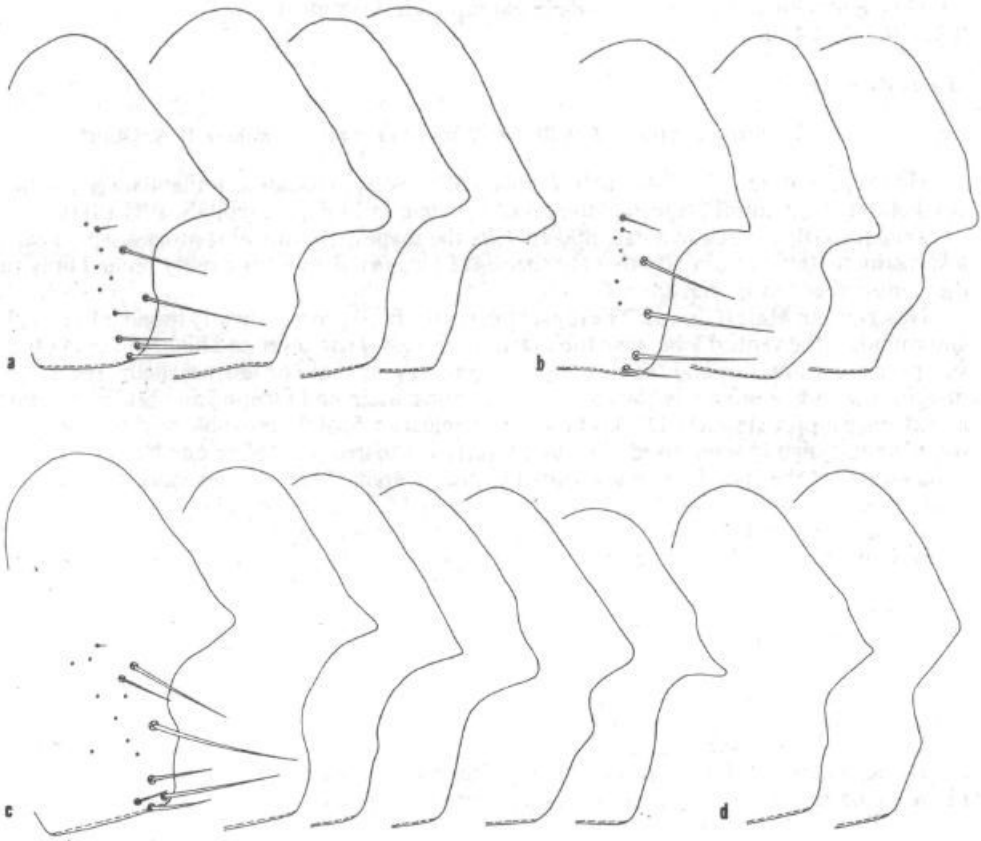

Fig. 26. *Ctenophthalmus nifetodes eugeniae* WAGNER, sternum VII of female and outline of sternum VII: a. Predzid, Velebit Mts., Croatia; b. Biokovo Mts., Croatia; c. Cincar Mts., Bosnia; d. Malačka, Kozjak Mts., Croatia.

20. Ctenophthalmus (Medioctenophthalmus) nifetodes ssp. (Galičica)
(Figs. 10, 20)

Makedonija:

1 ♂ Galičica, 1,600 m., 3. VII. 1967, from *Dinaromys bogdanovi*, B. Petrov & A. Ružić;
6 ♀ ibidem, 9. VII. 1978, from *Dinaromys bogdanovi*, B. Petrov, S. Brelih & B. Kryštufek.

The only male of our collection unfortunately got lost while being lent. On the basis of the previously taken photographs it can be concluded with certainty that this population represents an undescribed subspecies which, however, cannot be described as we possess no specimen to be determined as a holotype. The population from Galičica comes quite to ssp. *krystufeki* though it has a much longer movable process. In ssp. *krystufeki* though it has a much longer movable process. In ssp. *krystufeki* the posterior margin of the movable process is only slightly longer than the apical margin, while it is approximately about twice as long in the population from Galičica.

In spite of repeated attempts we failed to catch a new male on Galičica.

21. Ctenophthalmus (Medioctenophthalmus) nifetodes dzukici ssp. n.
(Figs. 10, 16, 23 a, 28)

Crna Gora:

	1 ♀	Ivangrad, Bjelasica, 2,100 m., 17. IX. 1970, from *Dinaromys bogdanovi,* B. Petrov & G. Džukić;
3 ♂	3 ♀	Ivangrad, Bjelasica: Zekova glava, 2,050 m., 20. VII. 1976, from *Dinaromys bogdanovi,* B. Kryštufek;
	2 ♀	ibidem, 19. IX. 1981, from *Dinaromys bogdanovi,* B. Petrov & M. Milenković;
1 ♂	6 ♀	Ivangrad, Bjelasica: Jelovica, 1,400 m., 18. VII. 1976, from *Dinaromys bogdanovi,* B. Kryštufek;
	1 ♀	idem, 24. VII. 1976;
4 ♂	9 ♀	ibidem, 18. IX. 1981, from *Dinaromys bogdanovi,* B. Petrov & M. Milenković;
	1 ♀	ibidem, 20. IX. 1981, from *Clethrionomys glareolus*, B. Petrov & M. Milenković.

Holotype male (No.: IA-P-4430) and allotype female (No.: IA-P-4431) from Zekova Glava, Bjelasica Mts., Ivangrad, Montenegro, 2,050 m., 20. VII. 1976, from *Dinaromys bogdanovi,* leg. B. KRYŠTUFEK; paratypes 7 males and 22 females from Bjelasica, all other data given above. The typical material is kept at the Natural History Museum of Slovenia in Ljubljana (coll. S. BRELIH) and the British Museum (Nat. Hist.).

Diagnosis: Ssp. *dzukici* resembles the nominate subspecies; it differs therefrom above all in the supra-acetubular portion of the movable process representing a preceding stage between sspp. *nifetodes* and *petrovi.* The second »wart« is situated immediately after the posterior margin and is rather remote from the tetrad bristles.

Description: Male (Fig. 16). The fixed process of the clasper is the same as in ssp. *nifetodes*, but the dorsal lobe is subpyramidal and equally high as broad. The anterior and the posterior margin of the movable process run parallelly to each other whereas the apical margin descends obliquely from the anterior to the posterior angle. The anterior angle is sharp and sclerotized as in ssp. *nifetodes.* The first and the second »wart« are well developed and protruding; in between there is an unsclerotized prominence forming a posterior angle. The second »wart« is situated very closely to the posterior angle and immediately underneath a short submarginal seta. The tetrad bristles are much more remote from this seta than in ssp. *nifetodes.* There are four tetrad bristles. The apical margin of st. VIII and the phallosome are the same as in the nominate subspecies.

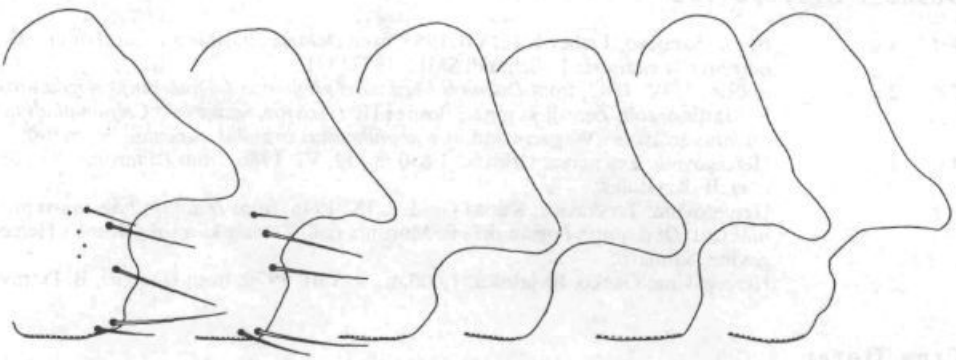

Fig. 27. *Ctenophthalmus nifetodes petrovi* ssp. n., sternum VII of female and outline of sternum VII of female paratypes.

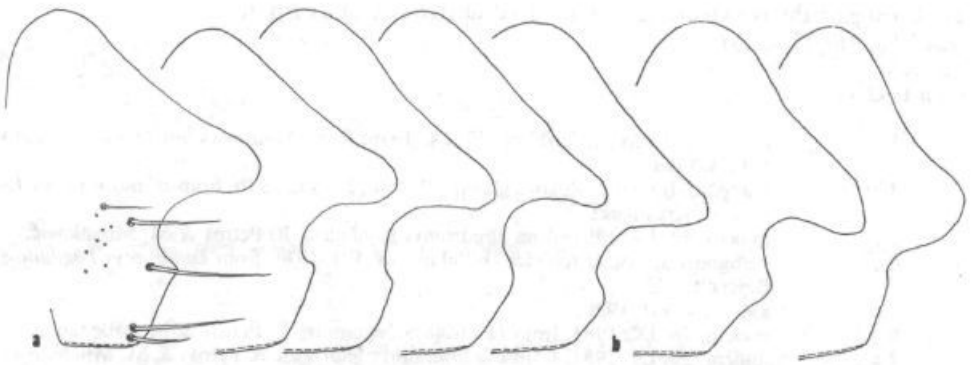

Fig. 28. *Ctenophthalmus nifetodes dzukici* ssp. n., sternum VII of female allotype and outline of sternum VII of female paratypes: a. Zekova glava, Bjelasica Mts., b. Jelovica, Bjelasica Mts., Montenegro.

Female (Fig. 28). The apical margin of st. VII is the same as in ssp. *nifetodes*.

Noticeable differences exist among single specimens in the shape of the movable process of the clasper, however, they do not diverge essentially from the description. In one paratype the second »wart« is merged with the posterior apical angle; in some specimens the prominence forming a posterior angle is unpronounced and in one case sclerotized.

I named the new subspecies after my friend and colleague Georg DŽUKIĆ, MSc., a herpetologist of the Institute for Biological Research »Siniša Stanković« in Belgrade, in thanks for his yearlong help in my research of siphonaptera of Yugoslavia.

22. Ctenophthalmus (Medioctenophthalmus) nifetodes nifetodes WAGNER 1933
(Figs. 10, 17, 22, 29)

Bosna i Hercegovina:

4 ♂	4 ♀	Bosna: Sarajevo, Trebević, 15. VII. 1955, from *Dolomys bogdanovi marakovici (=Dinaromys bogdanovi)*, F. Schmid; SMIT 1957: 311.
2 ♂	2 ♀	ibidem, 1. IV. 1947, from *Dolomys bogdanovi preniensis (=Dinaromys bogdanovi)*, E. Martino, coll. Zemaljski muzej Bosne i Hercegovine, Sarajevo (»*Ctenophthalmus orphilus sclavinus* Wagner« and »*Ctenophthalmus orphilus eugeniae* Wagner«);
4 ♂	1 ♀	Hercegovina: Zelengora: Orlovac, 1,650 m., 12. VI. 1986, from *Dinaromys bogdanovi*, B. Kryštufek;
1 ♂		Hercegovina: Treskavica: Kutski Grad, 5. IX. 1946, from *Dolomys bogdanovi preniensis* (=*Dinaromys bogdanovi*), E. Martino, coll. Zemaljski muzej Bosne i Hercegovine, Sarajevo;
	2 ♀	Hercegovina: Gacko, Bjelašnica, 1,600 m., 4. VIII. 1970, from *Glis glis*, B. Petrov.

Crna Gora:

2 ♂	1 ♀	Durmitor: Valovito jezero, 1,715 m., 23. IX. 1981, from *Dinaromys bogdanovi*, B. Petrov & M. Milenković;

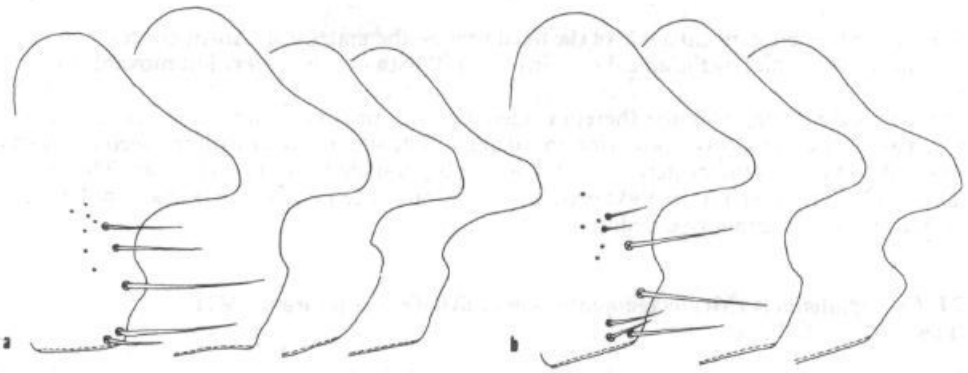

Fig. 29. *Ctenophthalmus nifetodes nifetodes* WAGNER, sternum VII of female and outline of sternum VII: a. Orjen Mts., Montenegro; b. Durmitor Mts., Montenegro.

1 ♂	1 ♀	Durmitor: Dobri do, Sedlo, 2,000 m., 23. IX. 1981, from *Dinaromys bogdanovi*, B. Petrov & M. Milenković;
	1 ♀	idem, 1,900 m., 25. IX. 1981;
1 ♂		Durmitor: Žabljak, 1,520 m., 15. IX. 1984, from *Spalax leucodon*, B. Kryštufek;
8 ♂	4 ♀	Vilusi, Obodina, 950 m., 15. IX. 1970, from *Dinaromys bogdanovi*, B. Petrov & G. Džukić;
1 ♂	1 ♀	ibidem, 29. VIII. 1982, from *Dinaromys bogdanovi*, G. Džukić;
7 ♂	5 ♀	Orjen (surrouding top), 1,750 m., 2. VI. 1979, from *Dinaromys bogdanovi*, M. Milenković;
	1 ♀	Cetinje, environs, from *Glis glis;* WAGNER 1933: 279 (*»Ctenophthalmus nivalis nifetodes«* – holotype).

The nominate subspecies of *Ct. nifetodes* is spread in the eastern part of Bosnia and Herzegovina and the western part of Montenegro. No morphological differences exist among single populations from Trebević, Treskavica, Durmitor, Vilusi and the peak of Orjen. From the environs of Cetinje (loc. typ. of *Ct. nifetodes*) no new material is available so it cannot be confirmed whether this population of which only one female is known in fact belongs to the same subspecies; taking into account the newly discovered finding places (Vilusi, the peak of Orjen) the probability thereof is quite strong. The population from Bjelašnica near Gacko, too, most probably belongs to this typical subspecies, which can be inferred from the geographic position of the finding place and the apical margin of st. VII of both females which are at our disposal. A male will have to be provided for a more reliable identification.

23. Ctenophthalmus (Medioctenophthalmus) nifetodes ssp. (Orjen: Štirovnik)
(Figs. 10, 19)

Crna Gora:

3 ♂	1 ♀	Orjen: Štirovnik, 1,500 m., 1968, from *Dinaromys bogdanovi*, B. Petrov

While being lent, the slides of this population got lost, and all there has been left of it are photographs of two males. Even though Štirovnik is but 5 km away from the peak of Orjen, the living-space of ssp. *nifetodes,* the photographs let us affirm with a great deal of certainty that the two populations differ from each other. By the dorsal lobe of the fixed process and

the rounded anterior apical angle of the fixed process the males from Štirovnik coincide with ssp. *martinorum*, and by the apical margin of st. VIII with ssp. *nifetodes*. The movable process resembles the nominate subspecies though two sclerotized prominences lie in the last third of the apical margin. The first thereof is identical with the first »wart« in other subspecies, whereas the second forms a posterior apical angle. The site identical with the second »wart« lies in the middle of the posterior margin, is broadly rounded and unsclerotized. This population differs quite well from all known subspecies but since no male serving as a holotype is at our disposal, it cannot be denominated.

24. Ctenophthalmus (Medioctenophthalmus) nifetodes martinorum SMIT 1957
(Figs. 10, 18, 23 b, 30)

Makedonija:

4 ♂	9 ♀	Šar planina: Popova Šapka, 1,800 – 2,000 m., VIII. 1948, from *Dinaromys bogdanovi*, B. Petrov;
1 ♂	1 ♀	idem, 10. X. 1965;
3 ♂	3 ♀	Korab: Velika Korabska vrata, 7. VIII. 1935, from *Dolomys grebenščikovi korabensis (=Dinaromys bogdanovi)*, V. Martino; SMIT 1957: 314 (holotype, allotype and paratypes);
3 ♂		Korab: Čos-Alija, 1,500 m., VII–VIII. 1935, from *Dolomys grebenščikovi korabensis (=Dinaromys bogdanovi)*, V. Martino; SMIT 1957: 314 (paratypes).

In the area of Korab no theriological investigations haver been made since the World War II, so no new siphonapteric material is available therefrom. Classified to this subspecies can be also the population from Šar planina which by its essential characteristics coincides with the population from Korab, however, in one male there can already be noticed a transition towards the nominate subspecies.

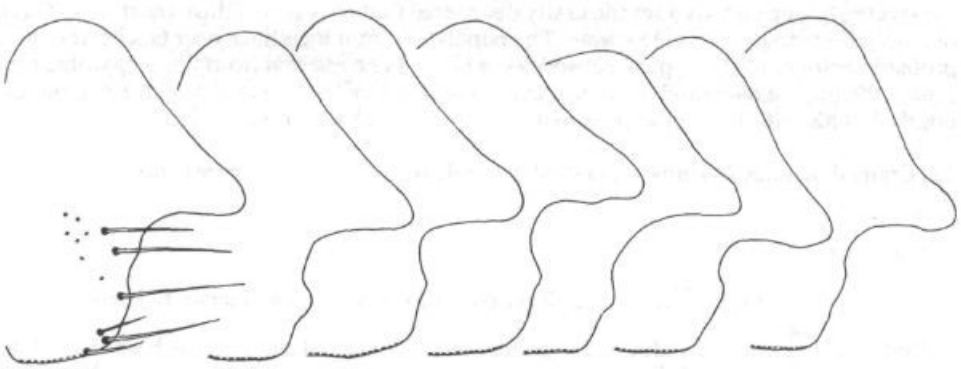

Fig. 30. *Ctenophthalmus nifetodes martinorum* SMIT, sternum VII of female and outline of sternum VII: Popova Šapka, Šar planina, Macedonia.

25. Ctenophthalmus (Medioctenophthalmus) dolomydis SMIT 1957
(Figs. 8, 31)

Bosna i Hercegovina:

3 ♂ 3 ♀ Bosna: Sarajevo, Trebević, 1,630 m., 15. VII. 1955, from *Dolomys bogdanovi marakovići (=Dinaromys bogdanovi)*, F. Schmid; SMIT 1957: 317 (holotype, allotype and paratypes).

Crna Gora:

1 ♂ 4 ♀ Vilusi, Obodina, 950 m., 15. IX, 1970, from *Dinaromys bogdanovi*, B. Petrov & G. Džukuć;
1 ♀ Ivangrad, Bjelasica, 2,100 m., 17. IX, 1970, from *Dinaromys bogdanovi*, B. Petrov & G. Džukić.

Makedonija:

2 ♀ Bistra, 1,800 m., 30. X. 1971, from *Dinaromys bogdanovi*, B. Petrov;
1 ♀ Galičica, 1,600 m., 3. VI. 1971, from *Dinaromys bogdanovi*, B. Petrov.

Of the known three species of fleas characteristic of *Dinaromys bogdanovi Ct. dolomydis* is the least frequent; the smallest of all is also its distribution area. It was described on the basis of 3 males and 3 females from Trebević in Bosnia. According to the data as published Trebević has been the only known finding place of this species. In 1970 it was found also in two finding places in Montenegro and a year later also in two others in Macedonia.

The only male at our disposal (from Obodina) coincides in all essential characteristics with the description of the holotype. The same applies to two males which, undocumented, make part of the collection of the Zemaljski muzej Bosne i Hercegovine in Sarajevo (leg. MARTINO). In eight of the above-mentioned females from our collection lesser differences can be noticed in the apical margin of st. VII (Fig. 31) which, however, seem to be individual rather than populational by character.

The data collected so far indicate that this species is spread in the eastern part of the area of *D. bogdanovi* i.e. to the east of the line Sarajevo – Trebinje, however, it there lives sympatrically only with sspp. *nifetodes, dzukici, krystufeki* and the subspecies from Galičica. In no locality could it be found together with sspp. *petrovi* and *martinorum* even though an ample material was collected in this very area.

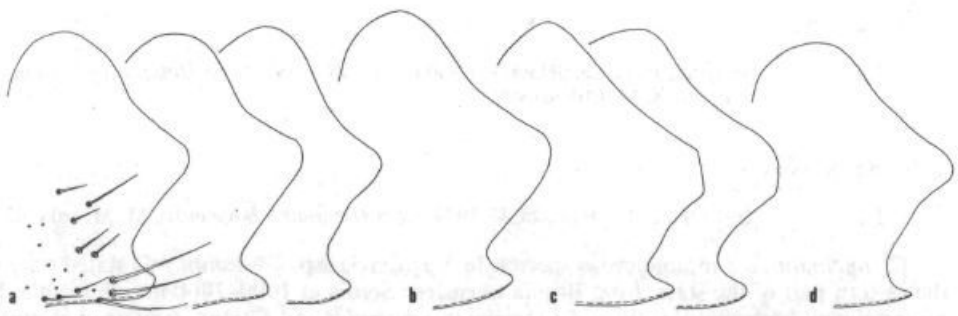

Fig. 31. *Ctenophthalmus dolomydis* SMIT, sternum VII of female and outline of sternum VII: a. Vilusi. Montenegro; b. Bjelasica Mts., Montenegro; c. Bistra Mts., Macedonia; d. Galičica Mts., Macedonia.

26. Ctenophthalmus (Euctenophthalmus) congener congener ROTHSCHILD 1907

Slovenija:

1 ♂ Julijske Alpe: Dom v Planici, 1,000 m., 3. V. 1983, from *Chionomys nivalis*, B. Kryštufek;
1 ♀ Cerknica, Otok, 550 m., 6. VIII. 1967, from *Chionomys nivalis*, B. Petrov & S. Brelih.

Hrvatska:

1 ♂ Gorski Kotar: Risnjak, 1,400 m., 1. IX. 1978, from *Chionomys nivalis*, S. Brelih & J. Gregori;
1 ♀ Velebit: Zavižan, Vučjak, 1,550 m., 5. VI. 1977, from *Chionomys nivalis*, N. Tvrtković;
2 ♀ idem, 23. VI. 1981;
1 ♂ *ibidem, 26. VI. 1981, from Chionomys nivalis, S. Brelih;*
1 ♀ Velebit: Bilenski Padež, 1,240 m., 16. VIII. 1976, from *Chionomys nivalis*, N. Tvrtković.

Ct. c. congener is a sylvan species living in lowlands as well as mountains. In Yugoslavia it is spread in the western part of the country, from Slovenia to Bosnia. It is frequent on all voles but it also passes over to other rodents and insectivores. The findings thereof on *Chionomys nivalis* are quite unexpected whereas the chances of its passing over to *D. bogdanovi* are much lesser both in the geographical as well as ecological respect.

27. Ctenophthalmus (Euctenophthalmus) uncinatus koshanini ROSICKY & TODOROVIĆ 1964

Bosna in Hercegovina:

1 ♂ Bosna: Cincar: Ravnine, 1,456 m., 14. IX. 1980, from *Dinaromys bogdanovi*, N. Tvrtković.

Crna Gora:

1 ♀ Ivangrad, Bjelasica: Jelovica, 1,400 m., 18. IX. 1981, from *Dinaromys bogdanovi*, B. Petrov & M. Milenković.

Srbija: Kosovo:

1 ♀ Žljeb: Kula, 1,750 m., 28. V. 1979, from *Dinaromys bogdanovi*, M. Milenković.

Ct. uncinatus is a mountainous species. In Yugoslavia ssp. *koshanini* was stated only in the eastern part of the state, from Bosnia to eastern Serbia at 1000–2000 m. of altitude. Its most frequent hosts in our country *Clethrionomys glareolus* and *Pitymys subterraneus* but it frequently passes over to other rodents. In three localities it was found on *D. bogdanovi*, but never on *Chionomys nivalis*, for the distribution areas of this flea and the snow vole overlap on a very small territory.

LEPTOPSYLLIDAE

28. Peromyscopsylla bidentata (KOLENATI 1863)

Hrvatska:

1 ♀ Velebit: Modrića dolac, 1,460 m., 13. VII. 1977, from *Chionomys nivalis*, N. Tvrtković.

Crna Gora:

1 ♀ Ivangrad, Bjelasica: Jelovica, 1,400 m., 18. IX. 1981, from *Dinaromys bogdanovi*, B. Petrov & M. Milenković.

Makedonija:

2 ♀ Šar planina: Popova Šapka, 1,900 m., 10. X. 1965, from *Chionomys nivalis*, B. Petrov;

4 ♂ 6 ♀ Galičica, 1,600 m., 11. X. 1983, from *Chionomys nivalis*, B. Kryštufek & M. Belanović.

P. bidentata is one of our most frequent winter sylvan species of fleas whose true host is *Clethrinomys glareolus* but it quite often passes over to other voles, mice and shrews. It lives primarily in the mountainous regions and is rare in lowlands. The findings thereof on *Chionomys nivalis* and *Dinaromys bogdanovi* would undoubtedly be much more numerous if winter hunting were more intensive in places populated by these two voles.

29. Peromyscopsylla silvatica (MEINERT 1896)

Srbija:

1 ♀ Suva planina: Trem, 1,700 m., IX. 1947, from *Chionomys nivalis*, A. Ružić & Petrov; ROSICKÝ & TODOROVIĆ 1964: 212;

1 ♂ 2 ♀ Basara: Planinica, 1,150 m., 18. VIII. 1981, from *Chionomys nivalis*, B. Petrov.

In Yugoslavia *P. silvatica* was found in few localities in the eastern part of the country so it was impossible to get a clear idea of its distribution or its true hosts. In Central Europe it is much more frequent, *Clethrionomys glareolus* probably being its true host. In our country it was stated exclusively in mountains, therefore, *Chionomys nivalis* seems likely to be one of its more important hosts.

30. Peromyscopsylla fallax (ROTHSCHILD 1909)

Slovenija:

1 ♀ Julijske Alpe: Trenta: Pri cerkvi, 710 m., 12. I X. 1986, from *Chionomys nivalis*, S. Brelih & J. Dovič;

1 ♂ Julijske Alpe: Dom v Planici, 1,000 m., 27. VIII. 1983, from *Chionomys nivalis*, B. Kryštufek;

1 ♂	1 ♀	Julijske Alpe: Tamar, 1,100 m., 27. VIII. 1983, from *Chionomys nivalis*, N. Tvrtković;
	5 ♀	Julijske Alpe: Krma, 1,000 m., 18. VIII. 1968, from *Chionomys nivalis*, B. Petrov & S. Brelih;
1 ♂	1 ♀	Trnovski gozd: Čaven, 1,240 m., 3. X. 1968, from *Chionomys nivalis*, S. Brelih;
	1 ♀	idem, 1,200 m., 23. IX. 1971;
	2 ♀	Hrušica: Javornik, 1,100 m., 3. IX. 1971, from Chionomys nivalis, S. Brelih & R. Jelinčič.

Hrvatska:

	1 ♀	Velebit: Zavižan, Modrića dolac, 1,460 m., 13. X. 1977, from *Chionomys nivalis*, N. Tvrtković;
	2 ♀	idem, 8. IX. 1979;
	1 ♀	Velebit: Zavižan, Vukušić sniježnica, 1,420 m., 28. IX. 1975, from *Chionomys nivalis*, N. Tvrtković;
4 ♂	2 ♀	Velebit: Veliki Zavižan, 1,670 m., 17. IX. 1974, from *Chionomys nivalis*, N. Tvrtković;
6 ♂	7 ♀	idem, 28. IX. 1975;
	1 ♀	Velebit: Šarinac, 1,200 m., 20. VIII. 1976, from *Chionomys nivalis*, N. Tvrtković;
	4 ♀	Velebit: Mirevo, 1,400 m., 15–16. VIII. 1976, from *Chionomys nivalis*, N. Tvrtković;
	1 ♀	idem, 7. VIII. 1977;
1 ♂	1 ♀	Velebit: Bilenski padež, 1,240 m., 16. VIII. 1976, from *Chionomys nivalis*, N. Tvrtković;
2 ♂		Velebit: Čorina Prosina, 1,350 m., 29. IX. 1974, from *Chionomys nivalis*, N. Tvrtković.

Bosna i Hercegovina:

	1 ♀	Bosna: Šator: Babina greda, 1,620 m., 13. IX. 1983, from *Dinaromys bogdanovi*, N. Tvrtković;
4 ♂	3 ♀	Bosna: Cincar, 1,700 m., 13. IX. 1980, from *Chionomys nivalis*, B. Kryštufek;
1 ♂	4 ♀	Bosna: Cincar: Ravnine, 1,456 m., 14. IX. 1980, from *Chionomys nivalis*, N. Tvrtković.

Crna Gora:

	1♀	Ivangrad, Bjelasica: Jelovica, 1,400 m., 18. IX. 1981, from *Dinaromys bogdanovi*, B. Petrov & M. Milenković.

In Yugoslavia *P. fallax* is much more spread and frequent than *P. silvatica*. With the exception of Macedonia it has been found in all of our republics and autonomous provinces. Most of the specimens were collection at sites lying at more than 1000 m. of altitude, in the forest or above the forest limit. With us the most frequent true host of *P. fallax* is *Clethrionomys glareolus*, followed by *Chionomys nivalis*. On other small mammals it was stated only in single cases.

31. Leptopsylla (Leptopsylla) taschenbergi taschenbergi (WAGNER 1898)

Srbija:

1 ♂	Suva planina: Trem, 1,700 m., IX. 1947, from *Chionomys nivalis*, A. Ružić & B. Petrov; ROSICKÝ & TODOROVIĆ 1964: 212.

In Yugoslavia *L. taschenbergi* lives above all at higher places (900 to 2,200 m. of altitude) but is quite rare in lowlands. Its true hosts are mice of the genus *Apodemus*; with us it is most frequently found on *A. sylvaticus* and *A. mystacinus*. On *Mus hortulanus* and *Chionomys nivalis* it was caught but once. The latter finding is not as surprising as it might seem at the first sight since this vole comes into contact with mice of the genus *Apodemus*.

32. **Leptopsylla (Leptopsylla) segnis** (SCHÖNHERR 1811)

Hrvatska:

1 ♀ Kozjak: Malačka, Opor, 500 m., 6. X. 1975, from *Dinaromys bogdanovi*, N. Tvrtković.

L. segnis is a cosmopolitan species living on numerous species of mice and rats, specially of the genera *Mus, Apodemus* and *Rattus*. Its true host is the house mouse (*Mus musculus* s. lat.), whereas it is more or less by accident if it goes astray on voles. Our finding thereof on *D. bogdanovi* is not surprising as this vole lives in the same surroundings as *Apodemus mystacinus* which in the same locality (Malačka) was badly infested with this flea species.

33. **Amphipsylla rossica** WAGNER 1912

Makedonija:

1 ♂ Galičica, 1,600 m., 11. X. 1983, from *Chionomys nivalis*, B. Kryštufek & M. Belanović.

In Yugoslavia *A. rossica* is bound all to *Microtus arvalis* and *M. epiroticus*, passing over to other small mammals only by accident. It is more frequent at lower sites, with the exception of southwestern Macedonia where it was found at up to 1,800 m. of altitude, and on this very height it also passed over to *Chionomys nivalis*.

CERATOPHYLLIDAE

34. **Megabothris turbidus** (ROTHSCHILD 1909)

Slovenija:

1 ♀ Julijske Alpe: Dom v Planici, 1,000 m., 3. V. 1983, from *Chionomys nivalis*, B. Kryštufek;
1 ♂ Hrušica: Javornik, 1,100 m., 3. IX. 1971, from *Chionomys nivalis* S. Brelih & R. Jelinčič;
1 ♂ Cerknica, Otok, 550 m., 6. VIII. 1967, from *Chionomys nivalis*, B. Petrov & S. Brelih;
2 ♂ Snežnik, 1,600 m., 20. VII. 1967, from *Chionomys nivalis*, B. Petrov & S. Brelih.

Hrvatska:

1 ♂ 2 ♀ Gorski Kotar: Risnjak, 1,400 m., 9. VIII. 1967, from *Chionomys nivalis*, B. Petrov & S. Brelih;

1 ♂		ibidem, 1. IX. 1978, from *Chionomys nivalis,* S. Brelih & J. Gregori;
	4 ♀	Velebit: Zavižan, Vučjak, 1,550 m., 5. VI. 1977, from *Chionomys nivalis,* N. Tvrtković;
	1 ♀	idem, 12. X. 1977;
2 ♂	3 ♀	idem, 23. VI. 1981;
1 ♂	2 ♀	Velebit: Veliki Zavižan, 1,670 m., 28. IX. 1975, from *Chionomys nivalis,* N. Tvrtković;
	1 ♀	Velebit: Malovan, 1,600 m., 15. VII. 1983, *Chionomys nivalis,* N. Tvrtković.

Bosna i Hercegovina:

3 ♂	2 ♀	Bosna: Šator: Babina greda, 1,620 m., 13. IX. 1983, from *Chionomys nivalis,* N. Tvrtković;
2 ♂		idem, from *Dinaromys bogdanovi;*
	1 ♀	ibidem, 5. IX. 1984, from *Chionomys nivalis,* B. Kryštufek;
1 ♂		Bosna: Šator: Šatorsko jezero, 1,488 m., 13. IX. 1983, from *Chionomys nivalis,* B. Kryštufek;
	1 ♀	Hercegovina: Zelengora: Orlovačko jezero, 1,500 m., 9. IX. 1984, from *Dinaromys bogdanovi,* B. Kryštufek.

Crna Gora:

2 ♂		Durmitor: Crepuljna poljana, 1,700 m., 10. VI. 1983, from *Dinaromys bogdanovi,* B. Kryštufek;
	1 ♀	idem, from *Chionomys nivalis;*
1 ♂	1 ♀	Ivangrad, Bjelasica: Jelovica, 1,400 m., 18. VII. 1976, from *Dinaromys bogdanovi,* B. Kryštufek;
	1 ♀	ibidem, 18. IX, 1981, from *Dinaromys bogdanovi,* B. Petrov;
3 ♂	4 ♀	Komovi: Štavna, 1,800 m., 1967, from *Chionomys nivalis,* B. Petrov;
	11 ♀	ibidem, 17. VII. 1978, from *Chionomys nivalis,* B. Petrov, S. Brelih & B. Kryštufek.

Srbija:

1 ♂		Suva planina: Trem, 1,700 m., IX. 1947, from *Chionomys nivalis,* A. Ružić & B. Petrov; ROSICKÝ & TODOROVIĆ 1964: 213;
	11 ♀	idem, 10. VI. 1947;
2 ♂	2♀	Basara: Planinica, 1,150 m., 18. VIII. 1981, from *Chionomys nivalis,* B. Petrov.

Srbija: Kosovo:

1 ♂	1 ♀	Žljeb: Kula, 1,750 m., 13. VII. 1978, from *Dinaromys bogdanovi,* B. Petrov, S. Brelih & B. Kryštufek.

Makedonija:

1 ♂		Šar planina: Popova Šapka, 1,800–2,000 m., VIII. 1948, from *Chionomys nivalis,* B. Petrov;
	2 ♀	idem, from *Dinaromys bogdanovi;*
	2 ♀	ibidem, 10. X. 1965, from *Chionomys nivalis,* B. Petrov;
1 ♂	1 ♀	ibidem, 1,500 m., 27. IX. 1966 from *Microtus (=Chionomys) nivalis*; SKURATOWICZ & BARTKOWSKA 1977:62;
	1 ♀	idem, 26. VIII. 1978;

1 ♂ Bistra, 1,750 m., 30. X. 1971, from *Dinaromys bogdanovi*, B. Petrov;
1 ♀ Pelister: Jorgov Kamen, 1,750m., 10. X. 1983, from *Chionomys nivalis*, B. Petrov & B. Kryštufek.

M. turbidus follows *Ctenophthalmus agyrtes* as the second most frequent flea species in Yugoslavia, parasitizing on small terrestrial mammals. It was found on almost all species of voles, mice, and shrews, though on the latter these fleas are much less numerous. The most frequent hosts thereof are *Clethrionomys glareolus, Apodemus flavicollis* and *Chionomys nivalis*. It is spread in all of our republics and both autonomous provinces. It lives both in mountains and lowlands, being more frequent in forests than open fields.

35. Callopsylla caspia (TIFLOV 1937)

Makedonija:

1 ♂ 2 ♀ Pelister: Golemo jezero, 2,250 m., 19. VII. 1971, from *Chionomys nivalis*, B. Petrov.

This is the first and so far also the only finding of *C. caspia* in Yugoslovia. This species is spread from the Lebanon Mountains and the Caucasus to Pamir and Tien Shan. Its true hosts are voles of the genera *Chionomys* and *Alticola*. In connection with the Balcans it was first mentioned by ROSICKÝ (1959: 344–7) who described the subspecies *C. c. rhodopeia* from the Pirin Mountains (Vihren) in southwestern Bulgaria, while SMIT and WRIGHT (1975: 37) attribute it to the nominate species. The specimens from Pelister slightly differ from the nominate form, however, the material as at our disposal does not allow us to state whether a new infraspecific taxon is in question. The true host of the Balcan populations of this species is *Chionomys nivalis*.

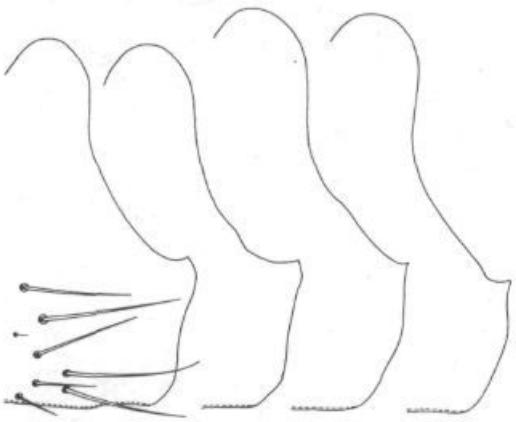

Fig. 32. *Callopsylla caspia* (TIFLOV), sternum VII and outline of sternum VII of two females: Pelister Mts., Macedonia.

36. Monopsyllus sciurorum sciurorum (SCHRANK 1781)

Crna Gora:

1 ♀ Ivangrad, Bjelasica: Zekova glava, 2,050 m., 19. IX. 1981, from *Dinaromys bogdanovi*, B. Petrov & M. Milenković.

M. sciurorum is a very frequent flea living above all on squirrels and dormice. As revealed in the course of our investigations, in Yugoslavia the squirrel (*Sciurus vulgaris*) and the fat dormouse (*Glis glis*) are by 100 % infested therewith. It was found also on *Dryomys nitedula, Eliomys quercinus, Apodemus flavicollis, A. sylvaticus, Clethrionomys glareolus, Microtus arvalis, Dinaromys bogdanovi, Parus major, Martes martes, M. foina* and *Felis silvestris. M. sciurorum* often passes over to the beasts feeding on squirrels and dormice; infested with this flea species are most often those birds as nest, like dormice, in hollows. Only one specimen of this flea was found on *Dinaromys bogdanovi* and none on *Chionomys nivalis.* The transitions of fleas in the opposite direction are more frequent, so a number of times *Ctenophthalmus nifetodes* was found at different localities on the fat dormouse, even though this flea is much less frequent than *M. sciurorum.* An explanation could probably be found in the fact that a stronger dormouse supersedes a relict vole and settles in its nest, thereat becoming infested with its parasites.

Key to the Subspecies of Ctenophthalmus nifetodes

Males:

1. Ventral lobe (L^2) of fixed process short, posterior margin of movable process with a deep sinus (Figs. 11, 12) 2
– L^2 of fixed process long, posterior margin of movable process without a deep sinus (Figs. 13–18) 3
2. Short marginal seta on posterior margin directly behind the second sclerotized marginal prominence (»wart«); the first »wart« developed (Fig. 11) (Slovenia) ..... **n.brelihi**
– No short marginal seta behind the second »wart«; the first »wart« is not developed (Fig. 12) (Velebit) ..... **n. tvrtkovici**
3. Supra foveal portion of movable process has the shape or a rhomboid of a rectangle (Figs. 13, 14) 4
– This portion has a different shape (Figs. 15–20) 5
4. Supra foveal portion of movable process more or less rhomboidal, on posterior apical angle on posterior margin there is no short marginal seta (Fig. 13) (Croatia, Bosnia, Herzegovina) ..... **n. eugeniae**
– Supra foveal portion of movable process more or less rectangular, short marginal seta directly behind posterior apical angle on posterior margin (Fig. 14) (Kosovo, eastern Montenegro) ..... **n. petrovi**
5. Apical margin of st. VIII forming a narrow lobe just above the sinus (Fig. 22) 6
– Lobe of st. VIII completely rounded (Figs. 24a, c) 8
6. Anterior apical angle of movable process rounded (Fig. 19) (southwestern Montenegro) ..... **nifetodes ssp.** (Štirovnik)
– Anterior apical angle of movable process sharp (Figs. 16, 17) 7
7. Second »wart« approximately in the middle betwen the first »wart« and tetrad bristles (Fig. 16) (eastern Montenegro) ..... **n. dzukici**
– Second »wart« farther off the first »wart« than tetrad bristles (Fig. 17) (Bosnia, Herzegovina, eastern and southern Montenegro) ..... **n. nifetodes**
8. Movable process pyriform, apical margin of this process passes into posterior margin (Fig. 18) (northwestern Macedonia) ..... **n. martinorum**
– Anterior and posterior margin of movable process more or less parallel, at one point only apical margin passes under an obtuse angle into posterior margin (Fig. 15) 9
9. Posterior margin of movable process only slightly longer than apical margin (Fig. 15) (western Macedonia) ..... **n. krystufeki**
– Posterior margin of movable process almost twice as long as apical margin (Fig. 20) (southwestern Macedonia) ..... **nifetodes ssp.** (Galičica)

SUMMARY

In Yugoslavia 22 species and 11 subspecies of fleas have been stated on *Dinaromys bogdanovi* and *Chionomys nivalis*, as well as 4 taxa which have not as yet been definitely identified.

Living on *D. bogdanovi* are three specific species of siphonaptera which have so far been stated in the Yugoslav territory only: *Rhadinopsylla dolomydis, Ctenophthalmus nifetodes* and *Ct. dolomydis*. On Žljeb Mts., on the border between Kosovo and Montenegro, this vole fed two females from the genus *Rhadinopsylla* which by certain characteristics come very close to the Alpine species *Rh. mesa*. From the latter and the related species *Rh. mesoides* they differ in three antepygidial bristles, a differently shaped apical margin of the VIIth tergite and the VIIth sternite, a double row of bristles on the VIIth sternite and a shorter distance between the frontal tubercle and the oral angle. Involved in the present case is most probably a new, as yet unnamed species, however, a male would be indispensable to corroborate this presumption. *D. bogdanovi* is presumably also the true host of this population. From the same genus *(Rhadinopsylla)* a male from the vicinity of Vilusi, Montenegro, has remained unidentified. By most of its characteristics it coincides with *Rh. dolomydis* but it fundamentally differs from this species in its genal comb. A more ample material will let us determine whether an abnormal specimen or else a new taxon is in question.

Four sspp. have so far been known of *Ctenophthalmus nifetodes: nifetodes, eugeniae, martinorum*, and *brelihi*. Described in the present paper are four further sspp.: *tvrtkovici, petrovi, krystufeki* and *dzukici*. From Galičica Mts., Macedonia, and Štirovnik Mt. near Orjen Mts., Montenegro, two subspecies have remained undescribed; the slides got lost while being lent, so merely the photographs thereof are at our disposal. The true host of the majority of these subspecies is undoubtedly *D. bogdanovi*, which, however, most probably does not apply to both northwestern races (sspp. *tvrtkovici* and *brelihi*). On Zavižan, representing the locus typicus of ssp. *tvrtkovici*, all specimens were collected on *Ch. nivalis*. *D. bogdanovi* is not known in connection with this finding place but it was caught about 5 km away from there, at Gornja Klada lying from 1,100–1,200 m. lower. The only specimen of *Ct. nifetodes* from this finding place, though belonging to ssp. *tvrtkovici*, already approaches ssp. *eugeniae* by the shape of its fixed process, which points to the mutual isolation of the populations from Gornja Klada and Zavižan, simultaneously confirming the presumption that *Ch. nivalis* is the true host of ssp. *tvrtkovici*. A similar situation can be observed with regard to ssp. *brelihi* which has so far been stated only at Hotedršica in Slovenia, *Glis glis* being known as its true host. In Slovenia there are known no recent finding places of *D. bogdanovi*; its Pleistocene fragments were encountered in the environs of Ilirska Bistrica, whereas those of the fossil *Dinaromys dalmatinus* near Trieste in Ital. Both afore-mentioned finding places are about 40 km away from Hotedršica. As in spite of repeated efforts we have failed to find recent *D. bogdanovi*, we may presume that in Slovenia this species became extinct while its parasites survived and passed over to new hosts. At the moment we are not in position to answer the question whether in the case of *Ct. nifetodes* the new host is *Glis glis* or *Chionomys nivalis*.

Of the fleas characteristic of Martino's vole only *Ct. nifetodes* was stated throughout its distribution area. Most subspecies of this flea are geographically strictly localized and were stated only in one or two neighbouring finding places. Thus, ssp. *krystufeki* was stated exclusively on Bistra Mts., Macedonia, ssp. *dzukici* on Bjelasica Mts., Montenegro, ssp. *petrovi* in Kosovo and on Komovi Mts., Montenegro, ssp. *martinorum* on Korab Mts., and Šar planina, Macedonia, and the two as yet undescribed subspecies on Galičica Mts., Macedonia, and Štirovnik Mt. near Orjen Mts., Montenegro. Two subspecies alone cover a larger area, namely, the nominate subspecies living in southern Bosnia (Trebević Mts.), eastern Herzegovina and western and southern Montenegro, and ssp. *eugeniae* spread from the southeastern Velebit Mts. in Croatia and Šator Mts. in Bosnia, to the Neretva and Prenj Mts. Distributed

more or less similarly as *Ct. nifetodes* is also *Rhadinopsylla dolomydis* which, however, was not stated in the Northern and the Central Velebit Mts. Likewise we did not find it in some other localities known as the living place of its true host, which may be due to the fact that we collected in the summer time whereas the species from the *Rhadinpsylla* genus appear as images above all during the winter. Of the three species *Ctenophthalmus* covers the smallest area; it was only found in the localities lying to the east of the line Sarajevo – Orjen Mts.

In addition to the species of *D. bogdanovi* the following fleas were also found on this vole: *Rhinolophopsylla u. unipectinata, Hystrichopsylla orientalis, Doratopsylla d. dasycnema, Ctenophthalmus agyrtes dinarus, Ct. a. ohridanus, Ct. a. serbicus, Ct. uncinatus koshanini, Peromyscopsylla bidentata, P. fallax, Leptopsylla segnis, Megabothris turbidus,* and *Monopsyllus sc. sciurorum.*

In Yugoslavia *Chionomys nivalis* is infested with two specific flea species, namely: *Ctenophthalmus orphilus dolomiticus* living in the Julian and the Kamnik Alps and Snežnik Mts. in Slovenia and on Risnjak Mts. in the Gorski Kotar, Croatia, and *Callopsylla caspia* found only at higher positions of Pelister Mts. in Macedonia. In the territory betwen the Gorski Kotar, the Central Velebit Mts. and Pelister Mts. the snow vole feeds none of its specific siphonaptera. It is intersting to note that this territory coincides with the distribution area of *D. bogdanovi.* The populations of *Ch. nivalis* from eastern Serbia are likewise connected with no specific flea species. Beside the two specific species and the afore-mentioned *Ct. nifetodes tvrtkovici* the following species and subspecies of siphonaptera were also found on the snow vole: *Hystrichopsylla orientalis, Atyphloceras nuperus palinus, Rhadinopsylla i. integella, Ctenophthalus monticola, Ctenophthalmus agyrtes wagnerianus, Ct. a. dinarus, Ct. a. ohridanus, Ct. a. serbicus, Ct. a. greacus, Ct. nifetodes eugeniae, Ct. n. petrovi, Ct. c. congener, Peromyscopsylla bidentata, P. silvatica, P. fallax, Leptopsylla t. taschenbergi, Amphipsylla rossica* and *Megabothris turbidus.*

POVZETEK

Na reliktni voluharici *(Dinaromys bogdanovi)* in snežni voluharici *(Chionomys nivalis)* smo v Jugoslaviji ugotovili skupno 22 vrst in 11 podvrst bolh in štiri taksone, ki še niso dokončno identificirani.

Na reliktni voluharici žive tri, zanjo značilne in do sedaj samo na ozemlju Jugoslavije ugotovljene vrste bolh: *Rhadinopsylla dolomydis, Ctenophthalmus nifetodes* in *Ct. dolomydis.* Na Žljebu, na meji med Kosovim in Črno goro, smo na tej voluharici našli dve samici iz rodu *Rhadinopsylla*, ki sta po nekaterih znakih zelo podobni alpski vrsti *Rh. mesa.* Od te in od sorodne vrste *Rh. mesoides* pa se ločita po treh antepigidialnih ščetinah, drugače oblikovanem apikalnem robu VII. tergita in VII. sternita, dvojni vrsti ščetin na VII. sternitu in krajši razdalji med oralnim kotom in čelnim tuberklom. Verjetno gre v tem primeru za novo, še neimenovano vrsto, vendar bi za potrditev te domneve morali imeti tudi samca. Tudi od te vrste je glavni gostitelj skoraj zanesljivo reliktna voluharica. Iz rodu *Rhadinopsylla* je ostal neidentificiran tudi samec iz okolice Vilusov v Črni gori, ki se v večini znakov ujema z vrsto *Rh. dolomydis,* od nje pa se zelo razlikuje po ličnem glavniku. Na podlagi obsežnejšega materiala bo mogoče ugotoviti, ali gre za nenormalen osebek ali pa za nov takson.

Od vrste *Ctenophthalmus nifetodes* so bile do sedaj znane štiri podvrste: *nifetodes, eugeniae, martinorum* in *brelihi.* V tem prispevku so popisane še štiri nadaljnje podvrste: *tvrtkovici, petrovi, krystufeki* in *dzukici.* Nepopisani sta ostali še dve podvrsti z Galičice v Makedoniji in s Štirovnika pri Orjenu v Črni gori, od katerih so se pri izposojanju izgubili preparati, ohranile pa so se fotografije. Glavni gostitelj od večine teh podvrst je nedvomno reliktna voluharica, kar pa verjetno ne velja za obe severozahodni podvrsti *tvrtkovici* in *brelihi.* Na Zavižanu, ki je tipično nahajališče za podvrsto *tvrtkovici*, so bili vsi primerki ujeti na snežni voluharici. Reliktna voluharica s tega nahajališča ni znana, ujeta pa je bila pri približno 5 km oddaljeni Gornji Kladi, ki leži 1100 do 1200 m nižje. Edini primerek te vrste bolhe s tega nahajališča sicer pripada k podvrsti *tvrtkovici*, vendar se po obliki kopulacijskega organa že približuje podvrsti *eugeniae*, kar kaže na medsebojno izoliranost populacij z Gornje Klade in Zavižana, istočasno pa potrjuje domnevo, da je glavni gostitelj od podvrste *tvrtkovici* snežna voluharica. Podobno je tudi s podvrsto *brelihi,* ki je bila do sedaj ugotovljena samo pri Hotedršici v Sloveniji, njen edini do sedaj znani gostitelj pa je navadni polh *(Glis glis).* Iz Slovenije ni znanih recentnih nahajališč reliktne voluharice, njeni fragmenti iz pleistocena pa so bili odkriti v okolici Ilirske Bistrice, od izumrle vrste *Dinaromys dalmatinus* pa blizu Trsta v Italiji. Obe omenjeni nahajališči sta oddaljeni od Hotedršice okoli 40 km. Ker nam kljub vztrajnemu iskanju v Sloveniji ni uspelo najti recentnih populacij reliktne voluharice, domnevamo, da je ta vrsta pri nas izumrla, ostali pa so njeni paraziti, ki so prešli na nove gostitelje. Na vprašanje, ali je v primeru *Ctenophthalmus nifetodes brelihi* to navadni polh ali pa snežna voluharica, danes še ne moremo odgovoriti.

Od bolh, značilnih za reliktno voluharico, smo na celotnem arealu njene razširjenosti ugotovili samo vrsto *Ctenophthalmus nifetodes.* Večina podvrst te bolhe je geografsko ozko lokaliziranih in smo jih ugotovili le na enem ali dveh bližnjih nahajališčih. Tako je ssp. *krystufeki* ugotovljena samo na Bistri v Makedoniji, ssp. *dzukici* na Bjelasici v Črni gori, ssp. *petrovi* na Žljebu na Kosovem in Komovih v Črni gori, ssp. *martinorum* na Korabu in Šar planini v Makedoniji, še neimenovani podvrsti pa na Galičici v Makedoniji in na Štirovniku pri Orjenu v Črni gori. Samo dve podvrsti zavzemata širši areal in to nominatna podvrsta, ki živi v južni Bosni (Trebević), vzhodni Hercegovini ter zahodni in južni Črni gori in ssp. *eugeniae,* ki je razširjena od Jugozahodnega Velebita v Hrvatski in Šatora v Bosni do Neretve in Prenja v Hercegovini. Približno enako kot *Ct. nifetodes* je razprostranjena tudi *Rhadinopsylla dolomydis,* ki pa ni bila ugotovljena na Severnem in Srednjem Velebitu. Nismo je našli tudi na nekaterih drugih lokalitetah, kjer živi njen glavni gostitelj, razlog za to pa je verjetno v tem, da smo lovili predvsem v letnem času, vrste iz rodu *Rhadinopsylla* pa se kot imagi pojavljajo

najpogosteje v zimskem času. *Ctenophthalmus dolomydis* zavzema od vseh treh vrst najmanjši areal in smo ga našli samo v krajih, ki leže vzhodno od črte Sarajevo – Orjen.

Poleg specifičnih vrst za reliktno voluharico smo na njej našli še naslednje bolhe: *Rhinolophopsylla u. unipectinata, Hystrichopsylla orientalis, Doratopsylla d. dasycnema, Ctenophthalmus agyrtes dinarus, Ct. a. ohridanus, Ct. a. serbicus, Ct. uncinatus koshanini, Peromyscopsylla bidentata, P. fallax, Leptopsylla segnis, Megabothris turbidus* in *Monopsyllus sc. sciurorum.*

Snežna voluharica ima v Jugoslaviji dve specifični vrsti bolh, in sicer *Ctenophthalmus orphilus dolomiticus,* ki živi v Sloveniji v Julijskih in Kamniških Alpah ter na Snežniku, na Hrvatskem pa na Risnjaku v Gorskem Kotarju. Na vsem vmesnem ozemlju od Gorskega Kotarja in Sev. Velebita do Pelistra v Makedoniji je snežna voluharica brez zanjo specifičnih vrst bolh. Zanimivo je, da se to ozemlje prekriva z arealom razširjenosti reliktne voluharice. Tudi populacije snežne voluharice iz vzhodne Srbije nimajo svojih specifičnih vrst bolh. Poleg obeh specifičnih vrst in že prej omenjene podvrste *Ct. nifetodes tvrtkovici,* smo na snežni voluharici našli še naslednje bolhe: *Hystrichopsylla orientalis, Atyphloceras nuperus palinus, Rhadinopsylla i integella, Ctenophthalmus monticola, Ct. agyrtes wagnerianus, Ct. a. dinarus, Ct. a. ohridanus, Ct. a. serbicus, Ct. a. graecus, Ct. nifetodes eugeniae, Ct. n. petrovi, Ct. c. congener, Peromyscopsylla bidentata, P. silvatica, P. fallax, Leptopsylla t. taschenbergi, Amphipsylla rossica* in *Megabothris turbidus.*

References

BARTOLOMEI, G., 1970: Primi contributi alla conoscenza dei *Dolomys* pleistocenici del Veneto e del Carso. Mem. Mus. Civ. Stor. Nat. Verona **17**: 79–139.

BEAUCOURNU, J.-C. & H. LAUNAY, 1979: Le genre *Hystrichopsylla* TASCHENBERG (1880) dans l'ouest du bassin méditerranéen (Siphonaptera, Hystrichopsyllidae). Annls. Soc. ent. Fr. (N.S.) **15** (3): 489–504.

BEAUCOURNU, J. C., H. LAUNAY & M. VALLE, 1982. Le genre *Hystrichopsylla* TASCHENBERG, 1880 dans l'ouest du bassin méditerraneen (Siphonaptera, Hystrichopsyllidae). III. Nouveaux éléments pour la région alpine et les Apennins. Rev. suisse Zool. **89** (3): 673–689.

BRELIH, S. & B. PETROV, 1979. Ektoparazitska entomofavna sesalcev (Mammalia) Jugoslavije. I. Insektivori in na njih ugotovljeni sifonapteri. Scopolia **1**: 1–67.

GROMOV, I. M. & I. J. POLJAKOV, 1977: Fauna SSSR. Mlekopitajošie. T. III, 8. Polevki (Microtinae). Nauka, Leningrad.

HOPKINS, G. H. E. & Miriam ROTSCHILD, 1956. An ilustrated catalogue of the Rothschild collection of fleas (Siphonaptera) in the British Museum (Nat. Hist.) Vol. II. Coptopsyllidae, Vermipsyllidae, Stephanocircidae. Ischnopsyllidae, Hypsophthalmidae and Xiphiopsyllidae. Trust. Brit. Mus. (Nat. Hist.), London.

– – 1962. Idem. Vol. III. Hystrichopsyllidae. Ibidem.

– – 1966. Idem. Vol. IV. Hystrichopsyllidae. Ibidem.

– – 1971. Idem. Vol. V. Leptopsyllidae and Ancistropsyllidae. Ibidem.

KORMOS, T., 1933: Nuove trace di una »Forest bed« fauna nella regione Adriatica. Grotte Italia **7** (2): 1–4.

KOVAČIĆ, D., 1981: Novi podaci za faunu sisavaca (Mammalia) Istre. Zbornik sažetaka priopćenja. Prvi kongres biologa Hrvatske, Poreč, 21.–26. 9. '81. Zagreb 1981: 180–181.

KRATOCHVÍL, J., 1981: *Chionomys nivalis* (Arvicolidae, Rodentia). Acta Sc. Nat. Brno, **15** (11) 9: 1–62.

PETROV, B., 1979: Some questions of the zoogeografical division of the western palaearctic in the light of the distribution of mammals in Yugoslavia. Fol. zool. **28** (1): 13–24.

PETROV, B. & M. TODOROVIĆ, 1982. *Dinaromys bogdanovi* (V. & E. MARTINO, 1922) – Bergmaus. Handbuch der Säugetiere Europas **2**/1: 193–208.

ROSICKÝ, B., 1957: Blechy – Aphaniptera. Fauna ČSR 10. Českoslov. akad. věd., Praha.

– & J. CARNELUTTI, 1959. Přispevěk k poznáni fauni blech (Aphaniptera) Slovinska. Českoslov. parasitol. **6** (2): 135–148.

– & M. TODOROVIĆ, 1964. Some species of fleas southern regions of Yugoslavia. Českoslov. parasitol. **9**: 207–216.

SKURATOWICZ, W., 1972: Notes on *Hystrichopsylla talpae* (CURTIS) (Siphonaptera) in Poland. Bull. Acad. pol. Sci., Ser. Sci. biol. **20**: 321–324.

– & Klara BARTKOWSKA, 1977: Pchly (Siphonaptera) zebrane w Jugoslawii. Frag. faun. **23** (5): 51–65.

SMIT, F. G. A. M., 1957: Fleas fo *Dolomys*, the Yugoslavian montan vole. Ann. Mag. nat. Hist. (12) 10 (112): 305–319.

– 1963. Species-groups in *Ctenophthalmus* (Sinphonaptera: Hystrichopsylliadae). Bull. Brit. Mus. (Nat. Hist.), Entomol. **14** (3): 105–152.

– & A. M. WRIGHT, 1978. A list of code numbers of species and subspecies of Siphonaptera. Brit. Mus. (Nat. Hist.) ed., London, 48 pp.

– – 1965. Notes on the Wagner Collection of Siphonaptera in the Zoologisches Museum, Hamburg. Mitt. Hamburg. Zool. Mus. Inst. **62**: 1–54.

VAGNER, J., 1930. Afanipterska fauna Jugoslavije. Glas. Jugosl. Entomol. Druš. **3–4** (1–2) (1928–1929): 9–43.

WAGNER, J., 1933: Fünf neue palaearktische Flöhe. Konowia **11** (4): 273–280.
– 1938: Aphanipterologische Notizen. V. Über di Rassen von *Ctenophthalmus orphilus* J. & R. und *Ct. nivalis* R. und die Vergleichung des *Ceratophyllus garei* R. mit *C. borealis* R.. nebst einer Feststellung von *Ceratoph. garei islandicus* ssp. n. Konowia **16** (3–4): 252–257.
– 1940. Gattung *Ctenophthalmus* und ihre Einteilung (Aphaniptera. Z. Parasitenk. **11** (4): 593–606.

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