

## WATER MITES (ACARI, ACTINEDIDA) OF THE STAGNANT WATERS FROM THE SKADAR LAKE DRAINAGE BASIN (CRNA GORA, YUGOSLAVIA)

VLADIMIR M. PEŠIĆ

Faculty of Sciences, Department of Biology, University of Montenegro, Cetinjski put bb., YU-81000 Podgorica

A faunistic catalogue of water mites of the stagnant waters from the Skadar lake drainage basin compiles our present knowledge on the distribution of 47 species, including a large number of new records. 15 species were found for the first time in the fauna of Yugoslavia, four species reported new for the fauna of Balkan and one species reported new for the Mediterranean region; first descriptions are given of the deutonymphs of *Neumania agilis*. The ecological significance of the new records is briefly discussed.

KEY WORDS: Acari; water mites; Crna Gora; Skadar lake drainage basin; stagnant waters.

### INTRODUCTION

The water mite fauna of Yugoslavia is still poorly known. Although there are few data on water mites of Skadar lake drain basin, they have been investigated for the whole last century. Czech zoologist THON (1903) is the first to give the list of 13 water mite species for Skadar lake basin. After him MUSSELIUS (1916) gives a list of 7 species of water mites from Crna Gora. K. VIETS (1936) published the presence of 9 water-mite species on Skadar lake basin. PEŠIĆ (*in press*) reported two species from the stagnant waters of the Skadar lake drainage basin.

47 Species are known from the investigated area, representing 18 genera: *Hydrachna*, *Eylais*, *Hydryphantes*, *Hydodroma*, *Lebertia*, *Oxus*, *Limnesia*, *Hygrobates*, *Neumania*, *Unionicola*, *Forelia*, *Hydrochoreutes*, *Piona*, *Pionopsis*, *Tiphys*, *Axonopsis*, *Brachypoda* and *Arrenurus*.

The paper compiles a catalogue of all records published so far of water mites of the stagnant waters from the Skadar lake drainage basin with new findings. For

each species the global pattern of distribution is given, followed by the new locality records. In addition, for each species may be given on habitat preference, taxonomic notes or discussion regarding the morphological features.

## STUDY AREA

Skadar Lake drainage basin is located between 18° 41' and 19° 47' of the East longitude and between 42° 58' and 40° 10' of the North latitude. Skadar lake, located in a karst terrain in the outer part of the southeastern Dinaric Alps, is the largest of the Balkan lakes and has surface area which fluctuates seasonally from approximately 370 to 600 km<sup>2</sup>. The lake's water level also varies seasonally from 4.7 to 9.8 m above sea level. The lake is extending in the NW-SE direction and it is approximately 44 km long. Through the Bojana River the lake is linked with the Adriatic Sea, and through the Drim River it has a link with Ohrid Lake. The exact origin of the lake is unknown but it probably originated through solution and tectonism during the Pleistocene.

Southern and southwestern sides of the lake are rocky, barren and steep having bays in which there usually are the sublacustrine springs, so called "okos". On the northern side is an enormous inundated area, where the boundary changes as water levels fluctuate.

The climate of Skadar lake drainage basin is typically Mediterranean, with a long, hot summer at lower and medium elevations and a short winter with heavy and abundant rainfall. For a more detailed description of the lake and its climate with special regard to hydrological aspects, see LASKA *et al.*, (1981).

The map of the study area is presented on Fig. 1.

## MATERIAL AND METHODS

Water mites were collected with a hand net and sorted on the spot in a white pan. Mites were conserved in Koenike's fluid and determined in the laboratory. A large part of them was dissected and slide-mounted in Hoyer's fluid for determination and measurements. The complete material is labelled and available in the collection, V. M. PEŠIĆ, Podgorica.

The following abbreviations are used: P-1: first palp segment; P-2: second palp segment; P-3: third palp segment; P-4: fourth palp segment; P-5: fifth palp segment;

The indications of number of specimens are given as follows: (males/females/deutonymphs).

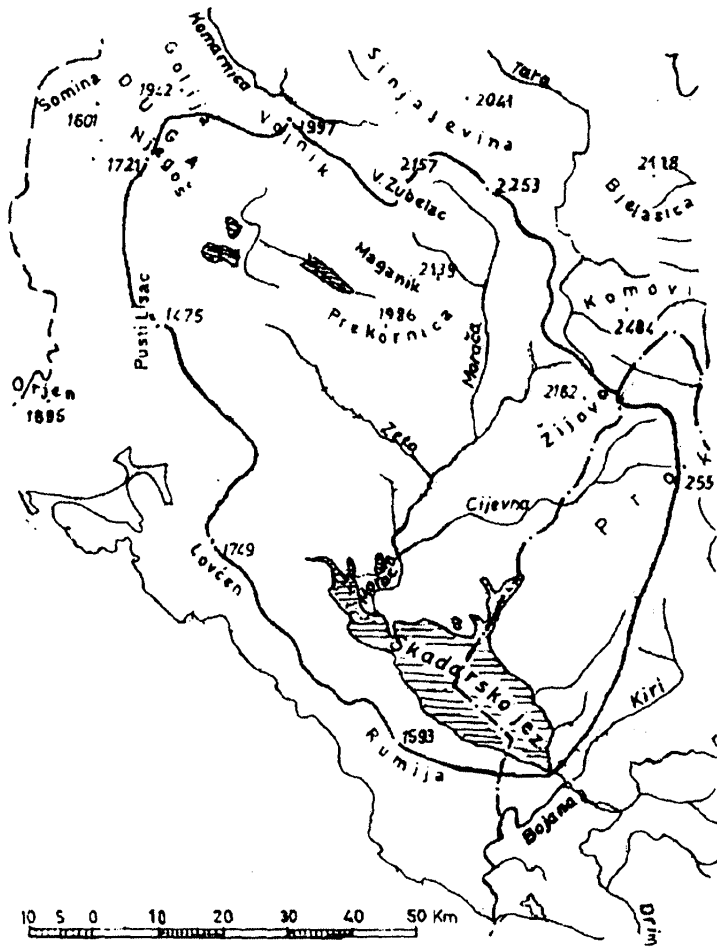


Fig. 1. A map of the study area.

## RESULTS AND DISCUSSION

### 1. SYSTEMATIC CATALOGUE

Family Hydrachnidae

1. *Hydrachna (Diplohydrachna) uniscutata* Thor, 1897

Distribution: Palearctic.

Material examined: Martinići near Spuž, Moromiš, in a pool, 36 m asl., 09.06.1999, leg. Pešić (1/0/0).

Remarks: New for the fauna of Yugoslavia.

Family E y l a i d a e

2. *Eylais degenerata* (Koenike, 1897)

Distribution: Africa, Asia, Australia, Europe (Spain, France, Hungary, Italy, Yugoslavia).

Remarks: It is only known from two records in 1903, when THON (1903) collected this species (under name *E. mrazeki*) from a pool near Podgorje (N from Žabljak) and from a pool near Podgorica. K.O.VIETS (1950) placed *E. mrazeki* in synonymy with *E. degenerata*.

Family H y d r y p h a n t i d a e

3. *Hydryphantes (Hydryphantes) placationis* Thon, 1899

Distribution: W Palearctic.

Material examined: Martinići near Spuž, Moromiš, in a pool, 36 m asl., 06.05.2001, leg. Pešić (2/0/0).

Remarks: In the Balkan *Hydryphantes placationis* has only been recorded very rarely, from Serbia, Macedonia and Bulgaria. The species has been collected from the end of April until July, with a peak in May.

Family H y d r o d r o m i d a e

4. *Hydrodroma despiciens* (Müller, 1776)

Distribution: All continents except Antarctic.

Material examined: Martinići near Spuž, Moromiš, in a pool, 36 m asl., 27.06.1999, leg. Pešić (5/4/0); ibid., 24.06.2001, leg. Pešić (0/0/1).

Remarks: *Hydrodroma despiciens* is a common species, which can be found throughout the country.

5. *Hydrodroma pilosa* Besseling, 1940

Distribution: central Europe, England, Italy, Turkey, Yugoslavia (Crna Gora).

Remarks: PEŠIĆ (*in press*) reported this species from a drinking basin for cattle, fed by a spring (Markov Do near Cetinje, Markova bara).

Family *Lebertiidae*

6. *Lebertia (Pilolebertia) inaequalis* (Koch, 1837)

Distribution: Palearctic.

Material examined: Skadar lake, Malo Blato, Bobija, 5 m asl., 14.08.2000, leg. Pešić (2/0/0); *ibid.*, 14.09.2000, leg. Pešić (3/0/0); Skadar lake, Raduš, 5 m asl., 11.07.2000, leg. Pešić (1/0/0); Skadar lake, Murići, 5 m asl., 12.07.2000, leg. Pešić, 7 exp.

Remarks: New for the fauna of Yugoslavia. *Lebertia inaequalis* has been collected in rivers as well as in stagnant waters, e.g. large lakes. In stagnant waters it occupies the zone with wash of waves. In streams the species is tolerant of all kinds of human influence, but in stagnant waters it occurs only when the water quality is good (SMIT & VAN DER HAMMEN, 2000).

Family *Oxidae*

7. *Oxus (Oxus) angustipositus* K.Viets, 1908

Distribution: Europe.

Material examined: Skadar lake, Malo Blato, Bobija, 5 m asl., 06.05.2000, leg. Pešić (0/0/3); *ibid.*, 14.08.2000, leg. Pešić (3/0/0); *ibid.*, 14.09.2000, leg. Pešić (2/1/0); *ibid.*, 16.02.2001, leg. Pešić (0/3/0); *ibid.*, 01.07.2001, leg. Pešić (9/2/0); Skadar lake, Murići, 5 m asl., 12.07.2000, leg. Pešić (0/1/0); Skadar lake, East, 06.10.1960, ex coll. Georgiev & Petkovski (11/4/0); Skadar lake near station (Vranjina), 5 m asl., 07.10.1960, ex coll. Georgiev & Petkovski (1/0/0).

Remarks: *Oxus angustipositus* is a common species, reported here for the first time for Balkan Peninsula (K.O.VIETS, 1978).

8. *Oxus (Oxus) longisetus* (Berlese, 1885)

Distribution: Palearctic.

Material examined: Skadar lake, Malo Blato, Bobija, 5 m asl., 14.09.2000,

leg. Pešić (0/1/0); *ibid.*, 01.07.2001, leg. Pešić (1/5/0), Skadar lake near station (Vranjina), 5 m asl., 07.10.1960, ex coll. Georgiev & Petkovski (0/1/0).

Remarks: *Oxus longisetus* is widespread in Europe, and occurs in the surrounding countries, so its occurrence in Yugoslavia is not a real surprise.

#### 9. *Oxus (Oxus) strigatus* (Müller, 1776)

Distribution: Palearctic.

Material examined: Pool near Skadar lake, 06.10.1960, ex coll. Georgiev & Petkovski (0/2/0); Skadar lake near station (Vranjina), 5 m asl., 07.10.1960, ex coll. Georgiev & Petkovski (0/1/0).

Remarks: The taxonomic status of the species is not clear, LUNDBLAD (1962) synonymized the species with *Oxus ovalis* (Müller).

Family *Limnesiidae*

#### 10. *Limnesia (Limnesia) undulata* (Müller, 1776)

Distribution: Holarctic.

Material examined: Skadar lake, Malo Blato, Bobija, 5 m asl., 06.05.2000, leg. Pešić, 9 exp., 35 deutonymphs; *ibid.*, 01.07.2001, leg. Pešić, (0/0/1); an pool near Skadar lake, 06.10.1960, ex coll. Georgiev & Petkovski (9/3/0); Skadar lake, East, 06.10.1960, ex coll. Georgiev & Petkovski (10/10/0); Skadar lake near station (Vranjina), 5 m asl., 07.10.1960, ex coll. Georgiev & Petkovski (10/5/1); mouth of River Morača, 5 m asl., 05.10.1960, ex coll. Georgiev & Petkovski (26/37/0).

Remarks: *Limnesia undulata* is a common species in Crna Gora, and occurs throughout the country.

#### 11. *Limnesia (Limnesia) maculata* (Müller, 1776)

Distribution: Holarctic.

Material examined: Skadar lake, Malo Blato, Bobija, 5 m asl., 06.05.2000, leg. Pešić, 7 exp., 9 deutonymphs; Skadar lake, East, 06.10.1960, ex coll. Georgiev & Petkovski (11/20/10).

Remarks: *Limnesia maculata* is a common species in Crna Gora, and occurs

throughout the country.

Family *H y g r o b a t i d a e*

12. *Hygrobates (Hygrobates) longipalpis (Hermann, 1804)*

Distribution: Holarctic

Material examined: Tološi (Podgorica), Mareza, in a canals, 40 m asl., 15.09.1999, leg. Pešić (4/3/0); Skadar lake near station (Vranjina), 5 m asl., 07.10.1960, ex coll. Georgiev & Petkovski (2/14/0); Malo Blato, Bobija, 5 m asl., 01.07.2001, leg. Pešić (0/1/0); Skadar lake, Malo Blato, mouth of river Biševina, 5 m asl., 03.11.2000, leg. Pešić (13/3/2); Martinići near Spuž, Moromiš, in a pool, 36 m asl., 29.04.2001, leg. Pešić (1/1/0); *ibid.*, 06.05.2001, leg. Pešić (0/3/0).

Remarks: *Hygrobates longipalpis* is a common species in Yugoslavia. The species has been collected in a large number of water types, e.g. ditches, canals, lakes and ponds.

13. *Hygrobates (Hygrobates) fluviatilis (Ström, 1768)*

Distribution: Europe, N-America (?).

Material examined: Tološi (Podgorica), Mareza, in canals, 40 m asl., 15.09.1999, leg. Pešić (5/12/0).

Remarks: *Hygrobates fluviatilis* is a common species in Yugoslavia. *Hygrobates fluviatilis*, a species in naturally conserved running waters mostly present in low numbers, but capable to build up large populations in organically polluted streams (GERECKE & SCHWOERBEL, 1991).

14. *Hygrobates (Hygrobates) longiporus Thor, 1898*

Distribution: Palearctic.

Material examined: Tološi (Podgorica), Mareza, in canals, 40 m asl., 15.09.1999, leg. Pešić (0/1/0).

Remarks: *Hygrobates longiporus* is a rare species in Yugoslavia. New for the fauna of Yugoslavia.

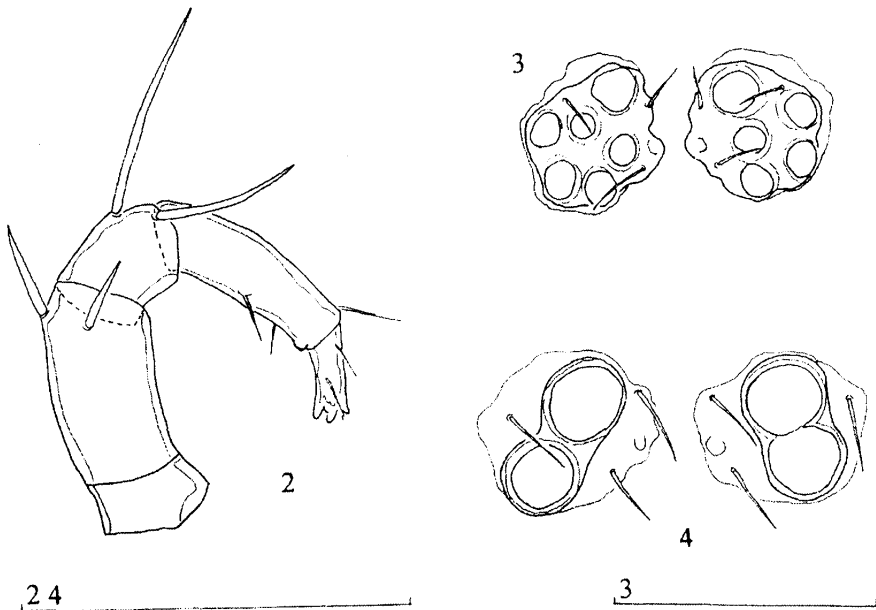
Family *U n i o n i c o l i d a e*

15. *Neumania (Neumania) agilis* Koenike, 1916  
(Fig. 2 -4)

Distribution: Germany, France, Poland, Latvia, Yugoslavia (Crna Gora).

Material examined: Skadar lake, Malo Blato, Bobija, 5 m asl., 06. 05.2000, leg. Pešić (10/5/3); Skadar lake, East, 06.10.1960, ex coll. Georgiev & Petkovski (1/0/0); Skadar lake, mouth of river Plavnica, 07.10.1960, ex coll. Georgiev & Petkovski (0/2/0).

Remarks: No descriptions have been published so far of deutonymphs of *N. agilis*. The deutonymph of *N. agilis* is in most regards similar to the adult. Total length of idiosoma is 427-521  $\mu\text{m}$ , width is 350-428  $\mu\text{m}$ . Distal papilla with chitinous tip on P-4 close to most distal setal papilla (Fig. 2). Dorsal length (in  $\mu\text{m}$ ) and relative length [% total length] (in parentheses) of single segments: P-1, 17.0 (9.3); P-2, 55.1-57.7 (30.1-31.5); P-3, 31.5-32.7 (17.2-17.9); P-4, 50.0-52.5 (27.3-28.7); P-5, 25.5-27.0 (13.9-14.7). Provisional genital plates each with 2 - 6 acetabula (Figs. 3, 4).



**Figs. 2-4.** *Neumania (Neumania) agilis* Koenike, 1916, Malo Blato, Bobija, deutonymph: 2 - palp; 3 - genital field (prep. 296); 4 - genital field (prep. 297). Bars = 0.1 mm.

16. *Neumania (Neumania) vernalis* (Müller, 1776)

Distribution: Palearctic; Europe except the Iberian peninsula.

Remarks: *Neumania vernalis* is a common species in Yugoslavia (ĐORĐEVIĆ, 1903; MUSSELIUS, 1912).

17. *Neumania (Neumania) deltoides* (Piersig, 1894)

Distribution: Palearctic; all Europe.

Remarks: K. VIETS (1936) reported this species from a pool near Skadar lake. Common in lakes, ditches and ponds.

18. *Neumania (Neumania) limosa* (Koch, 1836)

Distribution: Palearctic, all Europe.

Material examined: Skadar lake, mouth of river Plavnica, 07.10.1960, ex coll. Georgiev & Petkovski (20/0/0).

Remarks: Found usually in oligotrophic and eutrophic lakes, ditches and ponds.

19. *Neumania (Soarella) papillosa* (Soar, 1902)

Distribution: Europe.

Material examined: Skadar lake, East, 06.10.1960, ex coll. Georgiev & Petkovski, (0/4/0).

Remarks: *Neumania papillosa* is a rare species, reported here for the first time for Balkan peninsula (K.O. VIETS, 1978).

20. *Unionicola (Unionicola) minor* (Soar, 1900)

Distribution: Europe except Scandinavia.

Material examined: Skadar lake, Malo Blato, Bobija, 5 m asl., 06. 05. 2000, leg. Pešić (0/22/5); ibid., 14. 08. 2000, leg. Pešić (0/12/6); ibid., 14.09.2000, leg. Pešić (9/30/4); ibid., 16.02.2001, leg. Pešić (0/17/0); ibid., 01.07.2001, leg. Pešić (21/35/20); Skadar lake, Grmožur, 5 m asl., 11.07.2000, leg. Pešić (0/2/0); Skadar lake, Raduš, 5 m asl., 11.07.2000, leg. Pešić (0/2/0); Skadar lake, East,

06.10.1960, ex coll. Georgiev & Petkovski (2/2/0); a pool near Skadar lake, 06.10.1960, ex coll. Georgiev & Petkovski (0/4/0); Skadar lake, mouth of river Plavnica, 07.10.1960, ex coll. Georgiev & Petkovski, (0/19/0); Ulcinj, Šasko jezero-lake, 25.06.2001, leg. Pešić (0/1/0).

Remarks: *Unionicola minor* is the most abundant species in the Skadar lake. It can be considered as an indicator for good water quality (SMIT & VAN DER HAMMEN, 2000). New for the fauna of Yugoslavia.

21. *Unionicola (Unionicola) crassipes* (Müller, 1776)

Distribution: Holarctic.

Material examined: Skadar lake, Malo Blato, Bobija, 5 m asl., 06. 05. 2000, leg. Pešić (0/12/5); ibid., 14. 08. 2000, leg. Pešić (0/1/0); ibid., 01.07.2001, leg. Pešić (0/0/1); ibid., 14.09.2000, leg. Pešić (1/0/0).

Remarks: *Unionicola crassipes* is a common species in the Skadar lake. The species has a preference for larger water bodies, like canals and lakes.

22. *Unionicola (Hexatax) gracilipalpis* (K.Viets, 1908)

Distribution: Holarctic.

Material examined: Skadar lake near station (Vranjina), 5 m asl., 07.10.1960 ex coll. Georgiev & Petkovski (0/1/0).

Remarks: The species is an indicator for clean and clear waters, rich in macrophytes (SMIT & VAN DER HAMMEN, 2000). New for the fauna of Yugoslavia.

23. *Unionicola (Pentatax) aculeata* (Koenike, 1890)

Distribution: Holarctic.

Material examined: Skadar lake, Raduš, 5 m asl, 29.06.1966, leg. G. Karaman (0/1/0); Skadar lake, East, 06.10.1960, ex coll. Georgiev & Petkovski (3/8/0).

Remarks: New for the fauna of Yugoslavia.

Family P i o n i d a e

24. *Forelia (Forelia) liliacea* (Müller, 1776)

Distribution: Holarctic.

Material examined: Skadar lake, Malo Blato, Bobija, 5 m asl., 01.07.2001, leg. Pešić (0/1/0).

Remarks: New for the fauna of Yugoslavia.

**25. *Forelia (Forelia) cetrata* (Koenike, 1895)**

Distribution: Spain, France, Germany, Switzerland, Austria, Italy, Yugoslavia (Crna Gora).

Material examined: Skadar lake, Malo Blato, mouth of river Biševina, 5 m asl., 03.11.2000, leg. Pešić (0/1/0).

Remarks: *Forelia cetrata* is a rare species, reported here for the first time for Balkan Peninsula (K.O.VIETS, 1978).

**26. *Forelia (Forelia) variegator* (Koch, 1837)**

Distribution: Palearctic.

Material examined: pool near Skadar lake, 06.10.1960, ex coll. Georgiev & Petkovski (0/1/0); Skadar lake, East, 06.10.1960, ex coll. Georgiev & Petkovski (1/3/0).

Remarks: New for the fauna of Yugoslavia.

**27. *Hydrochoreutes krameri* Piersig, 1896**

Distribution: Europe, Northern Africa, Northern Asia, N-America.

Material examined: Skadar lake, Malo Blato, Bobija, 5 m asl., 06.05.2000, leg. Pešić (3/2/1).

Remarks: *Hydrochoreutes krameri* is a common species, which can be found throughout the country.

**28. *Piona (Piona) carnea* (Koch, 1836)**

Distribution: Holarctic.

Material examined: Martinići near Spuž, Moromiš, in a pool, 36 m asl.,

24.09.2000, leg. Pešić (1/0/0).

Remarks: THON (1903) reported this species from a pool near Njeguše (near Cetinje).

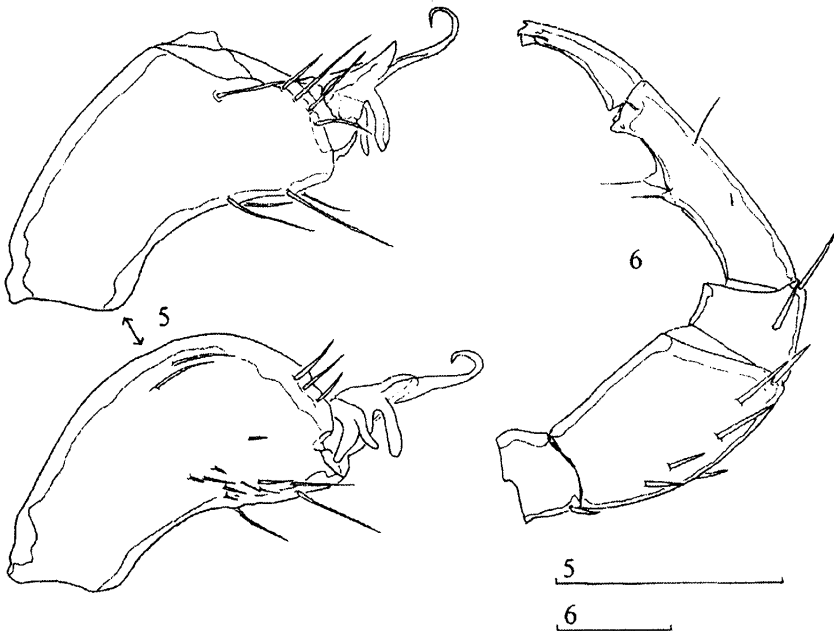
29. *Piona (Piona) coccinea gracilipalpis* Lundblad, 1924

(Figs. 5-6)

Distribution: Spain, Hungary, Sweden, Yugoslavia (Crna Gora).

Material examined: Skadar lake, East, 06.10.1960, ex coll. Georgiev & Petkovski (1/0/0).

Remarks: BIESADKA (1980) raised the subspecies to the rank of a species *Piona gracilipalpis* Lundblad, 1924. Drawings of SZALAY (1964) is quite conformable to my findings concerning shape of the palps (Fig. 6) and 3-Leg-6 (Fig. 5). *Piona coccinea gracilipalpis* is a rare species, reported here for the first time for Balkan Peninsula (K.O.VIETS, 1978).



**Figs. 5-6.** *Piona (Piona) coccinea gracilipalpis* Lundblad, 1924, Skadar lake, East, male: 5 - palp; 6 - 3-Leg-6. Bars = 0.1 mm.

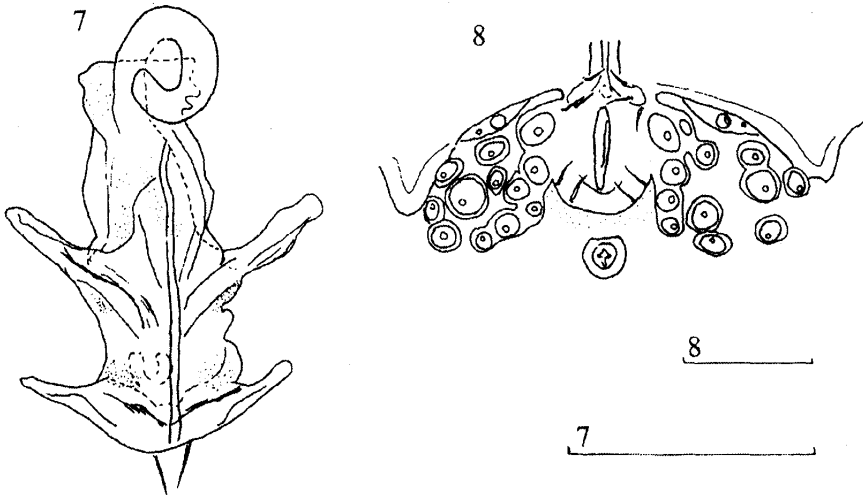
30. *Piona damkoehleri* K. Viets, 1930

(Figs. 7-8)

Distribution: Spain, Greece (Cyclades), Yugoslavia (Crna Gora).

Material examined: Martinići near Spuž, Moromiš, in a pool, 36 m asl., 14.04.2001, leg. Pešić (1/0/0); *ibid.*, 06.05.2001, leg. Pešić (1/0/0)

Remarks: New for the fauna of Yugoslavia. Compared with Viets drawings, in the Montenegrin specimens, the genital aperture is a little longer and the genital acetabula are lying in the integument as K.VIETS (1930) described (Fig. 6). DAVIDS (1977) found that the genital acetabula in a male of the Greek material are lying in a sclerosed plate, but there are little unsclerosed patches between the acetabula. *Piona damkoehleri* is a very rare species and probably is characteristic for temporary waters. The species has been collected only from the beginning of April until mid-May.



Figs. 7-8. *Piona damkoehleri* Viets, 1930, Martinići near Spuž, Moromiš, male: 7- ejaculatory complex; 8 - genital field. Bars = 0.1 mm.

31. *Piona (Piona) nodata* (Müller, 1776)

Distribution: Holarctic.

Material examined: Martinići near Spuž, Moromiš, in a pool, 36 m asl., 24.09.2000, leg. Pešić (36/20/0); ibid., 14.04.2001, leg. Pešić (0/ 3/4); ibid., 29.04.2001, leg. Pešić (1/3/0).

Remarks: *Piona nodata* is common species in Yugoslavia. The species has been collected from the beginning of April until October, with a peak in spring and in autumn.

32. *Piona (Piona) pusilla* (Neuman, 1875)

Distribution: Holarctic.

Material examined: Skadar lake, Malo Blato, Bobija, 5 m asl., 06.05.2000, leg. Pešić (6/0/2).

Remarks: New for the fauna of Yugoslavia.

33. *Piona (Piona) disparilis* (Koenike, 1895)

(Fig. 9)

Distribution: Europe.

Material examined: Skadar lake near station (Vranjina), 5 m asl., 07.10.1960, ex coll. Georgiev & Petkovski (0/1/0).

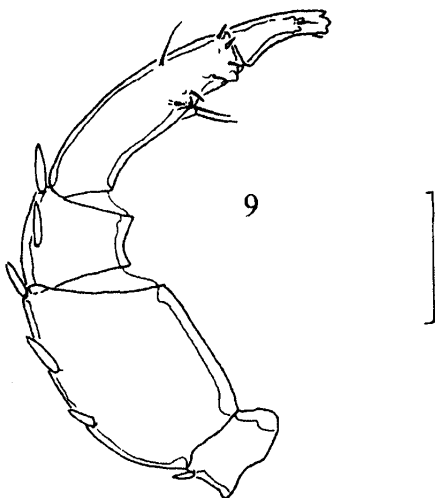


Fig. 9. *Piona (Piona) disparilis* Koenike, 1895, Skadar lake near station (Vranjina), female: 9 - palp. Bars = 0.1 mm.

Remarks: New for the fauna of Yugoslavia. Dorsal lengths (in  $\mu\text{m}$ ) of palp segments of the illustrated female (Fig. 9): P-1, 40.4; P-2, 184.6; P-3, 80.7; P-4, 179; P-5, 77.

34. *Tiphys (Tiphys) torris* (Müller, 1776)

Distribution: Palearctic.

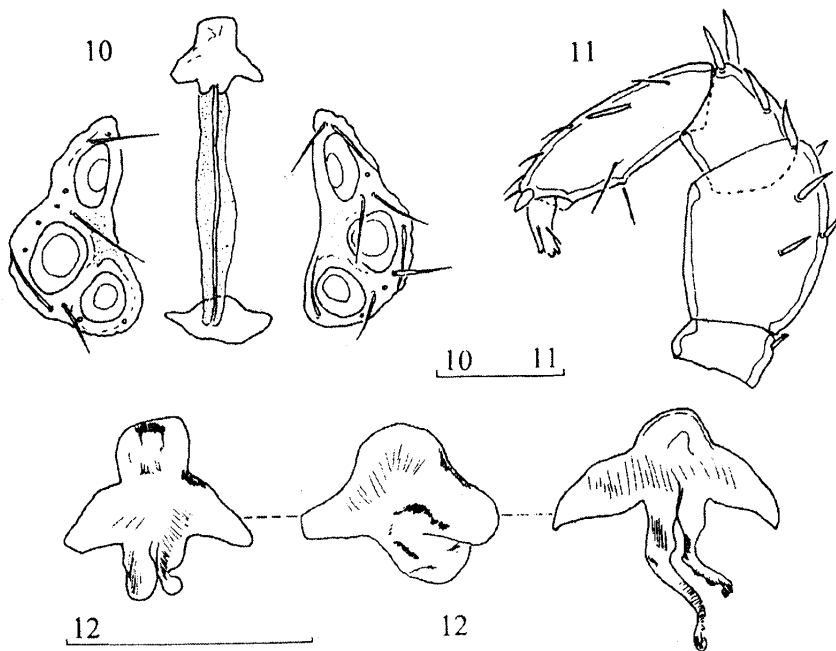
Material examined: Skadar lake, Malo Blato, Bobija, 5 m asl., 16.02.2001, leg. Pešić (0/2/0).

Remarks: New for the fauna of Yugoslavia

35. *Tiphys (Tiphys) convexipalpis* L. Ponyi, 1956

(Figs. 10-12)

Distribution: Hungary, Yugoslavia (Crna Gora), Macedonia (unpublished data).



**Figs. 10-12.** *Tiphys (Tiphys) convexipalpis* L. Ponyi, 1956, Martinići near Spuž, Moromiš, female: **10** - genital field; **11** - palp; **12** - variability of the praegenital sclerites. Bars = 0.1 mm.

Material examined: Martinići near Spuž, Moromiš, in a pool, 36 m asl., 29.04.2001, leg. Pešić (0/2/0); ibid., 13.05.2001, leg. Pešić (0/1/0).

Remarks: New for the fauna of Mediterranean. The original description of *T. convexipalpis* was based on a female specimen from Hungary (L. PONYI, 1956) after that occasion no more records of this species are given. Description of PONYI is quite conformable to my findings concerning shape of the palps (Fig. 8), epimeres and genital field (Fig. 7). The shape of the praegenital sclerites of this species is characteristic. Nevertheless I was surprised by the variability of this characteristic in the females found on Moromiš as shown in Fig. 9. Extensive sampling on the locality Moromiš did not result in finding of the male of *T. convexipalpis*. The species has been collected from the beginning of April until mid-May.

36. *Pionopsis lutescens* (Hermann, 1804)

Distribution: Palearctic.

Material examined: Kuči, Kržanja, in a drinking basin for cattle, fed by a spring, 12.05.2001, leg. Pešić (1/6/0).

Remarks: New for the fauna of Crna Gora.

Family A t u r i d a e

37. *Brachypoda (Brachypoda) versicolor* (Müller, 1776)

Distribution: Palearctic.

Material examined: Skadar lake, Malo Blato, Bobija, 5 m asl., 06.05.2000., leg. Pešić (1/40/3); ibid., 14.09.2000, leg. Pešić (0/1/0); ibid., 16.02.2001, leg. Pešić, (0/1/0); Skadar lake, Murići, 5 m asl., 12.07.2000, leg. Pešić (3/1/1); Skadar lake near station (Vranjina), 5 m asl., 07.10.1960, ex coll. Georgiev & Petkovski (3/9/1).

Remarks: *Brachypoda versicolor*, the secondmost abundant species in the Malo Blato in spring, is almost completely absent from summer samples. Our data show an extremely female-biased population in May. Individual numbers increase from May to June, but adults disappear nearly completely in August.

38. *Axonopsis (Hexaxonopsis) serrata* Walter, 1928

Distribution: Tunisia, Algeria, Portugal, Germany, Czech Republic, Poland, Italy, Bulgaria, Croatia, Yugoslavia (Crna Gora).

Material examined: Skadar lake, Malo Blato, Bobija, 5 m asl., 06.05.2000, leg. Pešić (1/2/0); *ibid.*, 14.08.2000, leg. Pešić (11/11/0); *ibid.*, 14.09.2000, leg. Pešić (6/5/0); *ibid.*, 01.07.2001, leg. Pešić (2/3/0); Skadar lake, Grmožur, 5 m asl., 11.07.2000, leg. Pešić (2/1/0); Skadar lake, Raduš, 5 m asl., 11.07.2000, leg. Pešić (2/12/1); Skadar lake, Murići, 5 m asl., 12.07.2000, leg. Pešić (3/1/1); Skadar lake, East, 06.10.1960, ex coll. Georgiev & Petkovski (1/0/0).

Remarks: New for the fauna of Yugoslavia. For *Axonopsis serrata* no life cycle information was available. Our data show a strong summer peak in August. In view of their small size, the finding of a very low number of deutonymphs, is probably a collecting artifact. However, we cannot exclude that they are also short-lived and hidden in particular microhabitats, and therefore relatively rarely caught.

Family *Arrenuridae*

39. *Arrenurus (Arrenurus) claviger* Koenike, 1885

Distribution: W Palearctic.

Material examined: Skadar lake, Malo Blato, Bobija, 5 m asl., 14.08.2000, leg. Pešić (1/2/0).

Remarks: The colour of the male from Skadar lake is green, as in the male from Corsica (SMIT *et al.*, 2000), while specimens from N, W and Central Europe are almost always orange. New for the fauna of Yugoslavia.

40. *Arrenurus (Arrenurus) compactus* Piersig, 1894

Distribution: Palearctic.

Remarks: THON (1903) reported this species from a pool near Podgorje (N from Žabljak).

41. *Arrenurus (Arrenurus) cuspidifer* Piersig, 1894

Distribution: Palearctic.

Remarks: THON (1903) reported this species from a pool near Skadar lake.

42. *Arrenurus (Arrenurus) maculator* (Müller, 1776)

Distribution: Palearctic.

Material examined: Skadar lake, Malo Blato, Bobija, 5 m asl., 06.05.2000, leg. Pešić (1/0/0).

Remarks: THON (1903) reported this species from a pool near Podgorje (N from Žabljak). The colour of the idiosoma of the male from Malo Blato is red.

**43. *Arrenurus (Arrenurus) neumani* Piersig, 1895**

Distribution: W Palearctic.

Remarks: THON (1903) reported this species from a pool near Podgorje (N from Žabljak).

**44. *Arrenurus (Arrenurus) virens* Neuman, 1880**

Distribution: W Palearctic.

Remarks: THON (1903) reported this species from a pool near Podgorje (N from Žabljak).

**45. *Arrenurus (Megaluracarus) globator* (Müller, 1776)**

Distribution: Palearctic.

Material examined: Martinići near Spuž, Moromiš, in a pool, 36 m asl., 27.06.999, leg. Pešić (1/0/0); ibid., 24. 09. 2000, leg. Pešić (1/0/0); ibid., 06.05.2001, leg. Pešić (0/1/0); ibid., 24.06.2001, leg. Pešić, (1/1/0); Skadar lake, East, 06.10.1960, ex coll. Georgiev & Petkovski (1/1/0).

Remarks: *Arrenurus globator* is a common species in Crna Gora. It occurs in almost every type of stagnant water.

**46. *Arrenurus (Megaluracarus) cylindratus* Piersig, 1896**

Distribution: W Palearctic.

Material examined: Kuči, Kržanja, in a drinking basin for cattle, fed by a spring, 12.05.2001, leg. Pešić (1/6/0); Skadar lake near station (Vranjina), 5 m asl., 07.10.1960, ex coll. Georgiev & Petkovski (1/0/0).

Remarks: New for the fauna of Crna Gora. *Arrenurus cylindratus* occurs in mountain ponds, springs, pools of lower order streams (SMIT at al., 2000).

47. *Arrenurus (Micruracarus) sinuator* (Müller, 1776)

Distribution: Palearctic.

Material examined: Pool near Skadar lake, 06.10.1960, ex coll. Georgiev & Petkovski, (3/3/0); Skadar lake near station (Vranjina), 5 m asl., 07.10.1960, ex coll. Georgiev & Petkovski (3/1/0).

Remarks: THON (1903) reported this species from a pool near Skadar lake.

2. DIVERSITY OF WATER MITES IN THE SKADAR LAKE

Investigations on water mite communities in oligotrophic and mesotrophic lakes from Poland, The Netherlands and Germany demonstrate the presence of water mite species in rather similar numbers of 50-60 (DAVIDS *et al.*, 1994). In three eutrophic to hypertrophic lakes in the lowlands of Northern Germany, BÖTTGER & MIERWALD (1990) collected 24 to 34 species. According to NEDELJKOVIĆ (1959) - production of primary organic matter in Lake Skadar is in the limits of oligotrophy, which is characteristic of all shallow karst waters. Of the 47 species listed in this paper, 32 are species collected from Skadar lake. This is relatively small number for lake of such hydrological and geomorphological characteristics such as Lake Skadar, which is primarily result of insufficient knowledge about water mites fauna and most of other groups of Invertebrata in general.

If we compared water mite fauna of Lake Skadar with the lake of Ohrid fauna (which is also poorly known) we can see that the later is richer with number of species (PEŠIĆ, unpublished data). Despite its bigger size, Lake Skadar has 26 times less water than Lake Ohrid which is deeper and that gives Lake Ohrid greater number of ecological niches.

Especially characteristic for Lake Skadar is fauna on locations where sublacustrine springs occur. On those localities there are great temperature differences between surface and bottom. On Malo Blato-Bobija locality in 5 turns, 17 species have been collected in total, including *Stygohydracarus* n.sp., dweller of interstitial waters, the species which has also been collected in interstitial waters of the lake of Plav. On the same locality we have found numerous population of *N. agilis*, which is proved to have differences in smaller number of acetabula in both sexes compared to the Central European populations. DAVIDS (in personal communication) placed species *Neumania vietsi* in synonymy with *N. agilis*. *N. vietsi* was described from Carpathians by HUSIATINSCHI (1937), and also found in pools in drained brook on Corsica (whose temperature was 23°) by ANGELIER (1954). Number of acetabula in Corsica population is about 2 times bigger than the number of acetabula in the populations of *N. agilis* from Lake Skadar.

This catalogue demonstrates the presence of a very interesting fauna, but it is still poorly studied. Natural habitats of the large lakes have become very rare and are continuously threatened by human activities such as agriculture, transport and pollution which is the case with the Lake Skadar too (intensified process of eutrophication in the lake).

In future we can expect a considerable increase of knowledge from faunistic inventories of stagnant waters in the Skadar lake drainage basin about the diversity of water mites and their significance as ecological indicators of water quality.

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### REFERENCES

- ANGELIER, E., 1954. Contribution a l etude de la faune deaux douce de Corse. Acariens (Hydrachnellae et Porohalacaridae). *Vie et Milieu* 5: 74-148.
- BIESADKA, E., 1980. Water mites (Hydracarina) of the eutrophic Lake Zbechy (Leszno Voiv). *Pol. Ecol. Studies* 6(2): 247-262.
- BÖTTGER, K. & U. MIERWALD, 1990. Vergleichend faunistisch-ökologische Studien an der Wassermilben (Hydrachnellae, Acari) dreier norddeutscher Seen. *Faun. řkol. Mitt.*, 6: 107-126.
- DAVIDS, C., 1977. Some notes on water mites from Greek islands. *Biologia Gallo-Hellenica* 6(2): 239-244.
- DAVIDS, C., E. H. TEN WINKEL, & C. J. DE GROOT, 1994. Temporal and spatial patterns of water mites in lake Maarsseveen I. *Neth. J. Aquat. Ecol.*, 28(1): 11-17.
- GERECKE, R., & J. SCHWOERBEL, 1991. Water Quality and Water-Mites in the Upper Danube Region, 1959-1984. - In: Dusbabek, F. & Bukva, V. [eds.]: *Modern Acarology*, 1 (Academia) Prag u. (SPB Academic) The Hague, pp. 483-491.
- HUSIATINSCHI, A., 1937. Drei neue Hydracarinarten aus dm Hochmoorgebiet Mihodra in der Bukowina (Rumanien). *Arch. Hydrobiol.*, 31: 547 - 552.

- ĐORĐEVIĆ, Ž., 1903. Beitrag zur Kenntnis der Fauna Serbiens.II.: Hydrachnellae. *Glas. Srp. Kralj. Akad.*, Beograd, 67: 153-189. [in Serbian].
- LASCA, N., V. RADULOVIĆ, R. RISTIĆ, & D. CHERKAUER, 1981. Geology, Hydrology, Climate and Bathymetry of Lake Skadar. *In: Karaman, G.S. & A.M. Beeton (eds.): The biota and limnology of Lake Skadar*, pp. 117-125.
- LUNDBLAD, O., 1962. Die Hydracarina Schwedens.II. *Arkiv fr Zoology (2)* 21: 1-635.
- MUSSELIUS, A., 1912. Einige Hydracarina aus Montenegro. *Varšava Prot. Obsc. Jest.*, 23: 95-97.
- NEDELJKOVIĆ, R., 1959. *Skadar lake, a study of the organic production in one karst lake*. Biološki Institut N. R. Srbije, Posebna izdanja, 4: 156 pp. Šin SerbianC
- PEŠIĆ, V., (in press). On some very interesting water mite species (Acari, Actinedida) from Crna Gora (Montenegro), new for the Balkan peninsula and Mediterranean region. *Glas. Republ. Zavoda zašt. prirode -Prirod. muzeja* Podgorica.
- PONYI, L., 1956). Neue Hydrachnellen-Arten aus Ungarn. *Ann. Hist. Nat. Mus. Nation. Hung.*, (S.N.) 7: 443-450.
- SMIT, H., GERECKE, R. & A. DI SABATINO, 2000. A catalogue of water mites of the superfamily Arrenuroidea (Acari: Hydrachnidia) from the Mediterranean countries. *Arch. Hydrobiol. Suppl.*, 121 (3-4): 201 - 267.
- SMIT, H. & H. VAN DER HAMMEN, 2000. Atlas van de Nederlandse Watermijten (Acari: Hydrachnidia). *Nederlandse Faunistische Mededelingen* 13 : 1-272.
- SZALAY, L., 1964. *Viziatkak Hydracarina*. Akademia Kiado, Budapeste, 1-380.
- THON, K., 1903. Éber die in Montenegro von Dr. Mrazek gesammelten Hyrachniden. *S. B. böhm. Ges. Wiss. Prag*. II. Cl. 19: 7p.
- VIETS, K., 1930. Zur Kenntnis der Hydracarina-Fauna Spanien. *Arch. Hydrobiol.*, 21: 175-240 and 359-446.
- VIETS, K., 1936. Hydracarina aus Jugoslaviën. (Systematische, ökologische, faunistische und tiergeographische Untersuchungen ber die Hydrachnellae und Halacaridae des Sübwassers. *Arch. Hydrobiol.*, 29: 351-409.
- VIETS, K. O., 1950. Zur Kenntnis von *Eylais degenerata* Koenike 1897 (Hydrachnellae, Acari). *Arch. Hydrobiol.*, 43 (2): 258-294.
- VIETS, K. O., 1978. Hydracarina. - in: Illies, J. (ed.): *Limnofauna Europaea*, pp. 154-181.

**ВОДЕНЕ ГРИЊЕ (ACARI, ACTINEDIDA) СТАЈАЊИХ ВОДА У  
СЛИВУ СКАДАРСКОГ ЈЕЗЕРА (ЦРНА ГОРА, ЈУГОСЛАВИЈА)**

Владимир М. Пешић

**И з в о д**

Фаунистички каталог водених гриња (Acari, Actinedida) у стајаћим водама слива Скадарског језера (Црна Гора, Југославија) даје преглед дистрибуције 47 врста, укључујући и већи број нових налаза за истраживано подручје. Петнаест врста су по први пут регистроване за фауну СР Југославије, четири врсте су нове за фауну Балкана док је једна врста нова за Медитеран; по први пут је описана деутонимфа врсте *Neumania agilis*. За већи број врста дати су основни еколошки подаци на истраживаном подручју.

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