

**FAUNA OF MOSQUITOES (DIPTERA: CULICIDAE)
OF STARA PLANINA, SERBIA**

B. BOŽIČIĆ-LOTHROP¹ AND A. VUJIĆ²

¹ Department of Entomology, University of California, Riverside, U.S.A.

² Institute of Biology, PMF, University of Novi Sad, Trg Dositeja Obradovića 2,
YU-21000 Novi Sad

This paper presents the faunistic data of mosquitoes from the mountain Stara Planina, which is located centrally in the Balkan Peninsula. Material was collected during the period April - July in the years 1987/88, from the southwestern area of the mountain. Twelve species are found in 10 different localities. Results are compared with the data from the Bulgarian part of Stara Planina.

KEY WORDS: Diptera, Culicidae, Mt. Stara Planina, Serbia.

INTRODUCTION

The mountain Stara Planina (eastern Serbia) is located in the central part of the Balkan Peninsula. This mountain is the last, western branch of Balkan mountain range. The type of its ground makes it rich in waters and therefore a suitable habitat for development of mountain mosquito species. A two-year investigation of this region resulted in recording of 12 mosquito species. The paper presents a zoogeographical analysis of recorded species, as well as their comparison with the species found on the Bulgarian part of Stara Planina.

AREA EXAMINED

Stara Planina extends along the border between FR Yugoslavia and Bulgaria. From the biggest mountain branch, located in Bulgaria, several minor ridges enter the territory of Yugoslavia. It belongs to the group of Carpathian-Balkan mountains. The highest peaks are on main branch - Midžor (2169 m), Čungulj

(2081 m), Martinova Čuka (1961 m), Vražija Glava (1938 m) and Tri Čuke (1937 m). The highest peaks on minor ridges are Babin Zub (1758 m), Bratkova Strana (1943 m), Kopren (1936 m) and Tupanar (1602 m).

The central part of Stara Planina consists mainly of silicate rocks. At the foothills there is a narrow limestone belt which enters the mountain massif on southwest part reaching up to the altitude of 1900 m and forming deep depressions. The Serbian part of the massif belongs to the basin of the river Timok which springs out on Stara Planina and flows into the Danube on the north. The central position of the mountain on the Balkan Peninsula defines its climate as a continental one with average annual temperature of +10° C, minimal from -15° to -20° C, and maximal between 35-37° C. The coldest months are January and February, the springs are cool and damp, summers are dry and hot, without frosts, while autumns are long and warm (GREBENŠČIKOV, 1950).

According to MATVEJEV (1973), piedmont area of Stara Planina is covered with Submediterranean-Balkan deciduous forests. Smaller areas of Mediterranean mountain rocky pastures and forests on rocky grounds are located at the altitude of about 900 m. The mountain region is covered with European spruce forests of boreal type, well preserved on Stara Planina. European high mountain rocky grounds and pastures are on the northern slopes of the mountain, at the altitudes of 1700 to 1900 m and between the peaks Midžor and Tri Kladenca.

MATERIAL AND METHODS

The investigations were carried out on the southwestern part of Stara Planina during the period April-July in the years 1987/88. The material was collected on the following localities designated with UTM signs (Fig. 1):

- (1) Surroundings of the town Pirot, along the river Nišava (FN-28) at the altitude of 400 m; the breeding sites of mosquitoes were in swamps overgrown with reeds and located along the roads.
- (2) Locality Temska (FN-29) at the altitude of about 500 m; the ponds overgrown with rush (*Juncus*) and other marshy plants were placed close to the river. In expanded part of the river bed mosquito breeding sites were found in dug trenches.
- (3) Locality Rsovci (FN-48), at the altitude around 700 m; because of increased water inflow a part of stream turned into a peat bog which was a favourable place for larval development.
- (4) Locality of the resting house "1 maj" Pirot (FN-48); mosquito breeding sites were found along the Dojkinačka river in small water pools, at the altitude of 850 m.

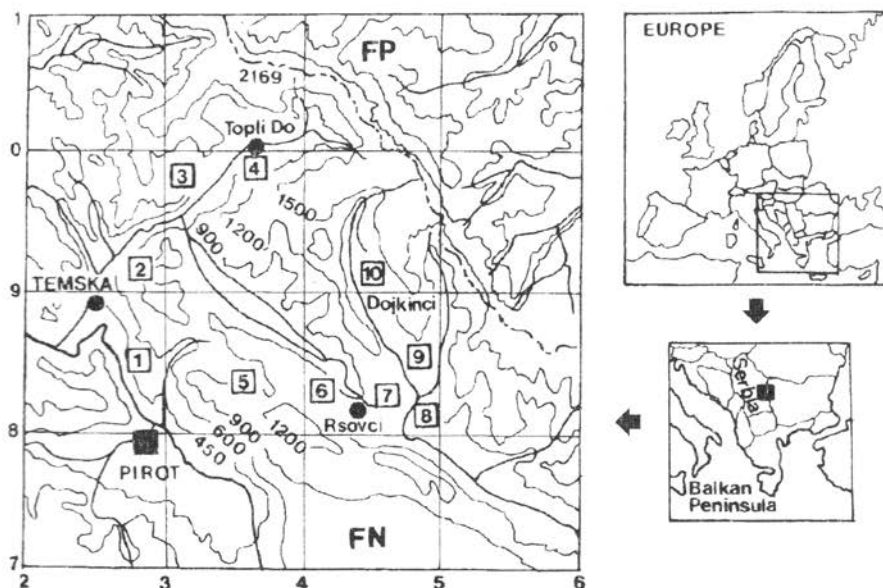


Fig. 1. UTM Map of mountain Stara Planina with localities.

- (5) Locality Planinica (FN-38) at the altitude of 900 m; the breeding places were found in beech forests, usually in small depressions near the road.
- (6) Locality Topli Do (FP-30), along the Toplodolska river in oak forest at 800 m altitude; the mosquito larvae were found in temporary ponds.
- (7) Locality Dojkinci, at the altitude of 950 to 1200 m (FN-48); the larvae were found near the spring, in water overflowed into the channel, in the vicinity of village church. The larvae were also found in temporary pools formed along the Dojkinačka river in spring time, due to the increased water inflow.
- (8) The locality Okolište (FN-48), in area between Visočka Ržana and the locality 4; the larvae were found in temporary pools along the river Visočica.
- (9) Locality Temštica (FN-39), 700 m altitude; mosquito larvae were observed in meanders along the river.
- (10) Locality Rsovc/Visočka Ržana (FN-48); the larvae were found in temporary pools formed in spring time, usually after heavy rain falls.

Larvae and pupae were caught in a standard way, by larval net, while adults were collected by entomological net and collecting sucking tubes. During the field work, basic microclimatic factors were measured - water temperature, air temperature, air humidity, water pH, water depth; plant species present in breed-

ing places were also collected. The larvae are preserved in Canada balsam. The adult samples are deposited in the collection of the Institute of Biology, Faculty of Natural Sciences, Novi Sad.

RESULTS AND DISCUSSION

Fauna of Stara Planina

A two-year period of investigations of the southwestern part of Stara Planina resulted in findings of 12 species belonging to two subfamilies (Culicinae and Anophelinae).

Following species from genus *Culex* were recorded - *C. hortensis* Ficalbi, 1926, having its range in Mediterranean and central Europe, cosmopolitan species *C. pipiens* typ. Linnaeus, 1758 and species *C. torrentium* Martini, 1925, distributed in central and north Europe.

Species *Culiseta setivalva* Maslov, 1937 has been recorded in Turkey and former USSR so far (GUTSEVICH *et al.*, 1971).

Seven species were collected from genus *Aedes*: *Ae. excrucians* Walker, 1856, *Ae. cinereus* Meigen, 1818, *Ae. cataphylla* Dyar, 1916, *Ae. pullatus* Coquillett, 1904, having a north Holarctic range; *Ae. cantans* Meigen, 1818 is of European distribution, while *Ae. refiki* Medschid, 1928 has its range in Asia Minor and central Europe; *Ae. rusticus* Rossi, 1790 is distributed in Europe, Algeria and Morocco.

One *Anopheles* species, namely, *An. hyrcanus* Pallas, 1771 was found, distributed in north Mediterranean, central and north Asia and central Europe.

Species of faunistic importance

The presence of *Culiseta setivalva* is of special faunistic interest. The species originates from southeastern Europe and Asia Minor. In Serbia, previous to this record, it was found on Kopaonik (VUJIĆ & BOŽIČIĆ, 1987). The breeding places of the species are usually ponds and lakes overgrown with vegetation, such as in case of locality 1 (Fig. 1). It has one generation per year. During the winter it is in the stage of larvae which in May turn into pupae. The adults appear at the end of May and beginning of June. During the summer time they lay the eggs on the edge or bottom of dried up ponds which are refilled with water in the autumn when eclosion begins. In December larvae are in 2nd and 3rd stage and they spend the winter in this form. Finding of larvae in this period is very difficult as they remain at the bottom almost all the time and rarely appear at

the surface. If larvae are tried to be caught only from the water surface, then it will be very difficult to confirm their presence. The record of *C. setivalva* on Kopaonik was on the locality of Radošiće (490-700 m) in similar habitat conditions and time period.

Species *Culex torrentium* was, previous to the record on Stara Planina, found in Serbia only on the mountain Kopaonik (VUJIĆ & BOŽIČIĆ, 1987). The range of this species includes central Europe and Asia Minor. The findings from Kopaonik were recorded at the localities of Radošiće and Brus, in temporary ponds formed in small depressions along the roads. The records from Stara Planina were registered in similar habitats on locality 10 (Fig. 1). All habitats of this species have been outside inhabited places. Morphologically, it is similar to species *C. pipiens* and the only significant difference between these two species is in the structure of male genitalia.

A special attention should be given to the record of *Aedes pullatus*. It is a mountain species of north Holarctic distribution (KNIGHT & STON, 1977), sometimes reaching the altitudes up to 3000 - 4000 m. Other findings in Yugoslavia were recorded on the mountain Durmitor, localities of Lokvice - 1693 m and Sušičko Jezero - 1140 m (BOŽIČIĆ & MOROVIĆ, 1987), and a number of localities on Kopaonik (VUJIĆ & BOŽIČIĆ, 1987). Records from Stara Planina were found on the locality Dojkinci at the altitude of 950-1200 m. The breeding sites of this early spring, univoltine species are of temporary character, having muddy bottoms and overgrown with vegetation.

Species *Aedes refiki* was recorded on the locality Rsovci, Planinica, Topli Do, Dojkinci and Okolište, at the altitude of 700 to 1200 m. Previous records on the Balkan Peninsula were registered in Serbia on Kopaonik at the altitude from 490 to 700 m (VUJIĆ & BOŽIČIĆ, 1987), in Slovenia (TRPIŠ & TOVORNIK, 1958), in the vicinity of Sarajevo (APFELBECK, 1929), in Macedonia, Strumica (VUJIĆ & BOŽIČIĆ, unpublished data). It belongs to a group of species with southeast and central European distribution.

Others *Aedes* species registered on Stara Planina are univoltine, mainly early spring species developing in forest zones. They were observed on a number of localities all over the Balkan Peninsula, with no connection to any specific altitude.

Species *Anopheles hyrcanus* and *Culex hortensis* are distributed in Mediterranean and central Europe. When found outside of Mediterranean area then, as a rule, it is in the parts of the continent with preserved sub Mediterranean type of ecosystems.

Mosquito fauna of Bulgarian and Serbian parts of Stara Planina

Fauna of mosquitoes in the part of Stara Planina located in Bulgaria was examined by BOŽKOV (1967, 1974). He recorded 14 species: *Anopheles plumbeus* Steph., *An. maculipennis* Mg., *An. claviger* Mg., *Culiseta annulata* Sch., *Aedes cataphylla* Dyar., *Ae. caspius* Pall., *Ae. pulchritarsis* Rond., *Ae. geniculatus* Oli., *Ae. echinus* Edw., *Ae. vexans* Mg., *Culex territans* Walker, *C. hortensis* Fic., *C. pipiens* L., and *C. theileri* Theob.

The most frequent species in Bulgarian part of Stara Planina are *Culex hortensis*, *C. pipiens*, *Anopheles maculipennis* and *Aedes geniculatus*. Zoogeographical analysis of registered mosquito species on this part of Stara Planina confirmed that most numerous are Holarctic (*An. maculipennis*, *Ae. caspius*, *Ae. cataphylla* and *C. territans*) and Mediterranean species (*Ae. pulchritarsis*, *Ae. echinus*, *C. hortensis* and *C. theileri*). They are followed by Palaearctic species (*An. claviger*, *Culiseta annulata* and *Ae. geniculatus*), cosmopolitan species *Ae. vexans* and *Culex pipiens* and one European-Siberian species *An. plumbeus* (BOŽKOV, 1967, 1974). Larvae of species *C. hortensis* have been recorded at the altitude of 1880 m, being the highest place of mosquito finding on Stara Planina.

The comparison of the results obtained by faunistic investigation of Bulgarian and Serbian parts of Stara Planina has clearly shown that Serbian part is predominant with univoltine, early spring, forest species of genus *Aedes*. The findings of these species are related to the time of field work and the type of habitats examined. Although the material collection on Bulgarian part was carried out also in April and May, the field activities were connected with open areas, while in forest zones only species *Aedes geniculatus*, *Ae. pulchritarsis*, *Ae. echinus*, *Anopheles plumbeus*, *An. claviger* and *Culex hortensis* were recorded. We are of the opinion that examinations, especially in case of genus *Aedes*, should be continued in Bulgarian part of Stara Planina.

CONCLUSION

Faunistic researches of southwest part of Stara Planina during the period 1987/88 resulted in recording the presence of 12 mosquito species. The location of Stara Planina in the central part of the Balkan Peninsula makes this mountain important as a connection between the Carpathians and Balkan mountain. Stara Planina is rich in waters, especially in spring time, and this is a favourable condition for the development of early spring, univoltine, mountain mosquito species. During a two year investigation of 10 localities in period April-July the following species were recorded: *Aedes refiki*, *Ae. excrucians*, *Ae. cantans*, *Ae. cinereus*, *Ae. cataphylla*, *Ae. rusticus*, *Ae. pullatus*, *Culiseta setivalva*, *Culex hortensis*, *C. pipiens*, *C. torrentium* and *Anopheles hyrcanus*.

Species *Culiseta seuvalva* and *Culex torrentium* have been recorded in Yugoslavia so far only on the localities of Kopaonik.

The records of species *Aedes refiki* and *Ae. pullatus* on the Balkan Peninsula have been found only on few high mountain localities.

The comparison of our records with mosquito fauna in Bulgarian part of Stara Planina resulted in the conclusion that in Serbian part are predominant the early spring, univoltine species, more or less developing in forest zones.

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ФАУНА КОМАРАЦА (DIPTERA: CULICIDAE)
СТАРЕ ПЛАНИНЕ, СРБИЈА

Б. БОЖИЧИЋ-ЛОТРОП И А. ВУЈИЋ

И з в о д

Током двогодишњих истраживања (1987/88) у југозападном делу Старе планине, Србија забележено је 12 врста комараца. Стара планина је богата водом, посебно током пролећа што пружа изузетно повољне услове за развој униволтних, ранопролећних, планинских врста комараца. Регистроване су следеће врсте: *Aedes refiki* Medschid, *Ae. excrucians* Walker, *Ae. cantans* Meigen, *Ae. cinereus* Meigen, *Ae. cataphylla* Dyar, *Ae. rusticus* Rossi, *Ae. pullatus* Coquillett, *Culiseta setivalva* Maslov, *Culex hortensis* Ficalbi, *C. pipiens* Linnaeus, *C. torrentium* Martini и *Anopheles hyrcanus* Pallas.

Врсте *Culiseta setivalva* и *Culex torrentium* су до сада у СР Југославији регистроване само на Копаонику.

Врста *Aedes refiki* је поред Старе планине забележена само на неколико локалитета на Балканском полуострву. Врста *Ae. pullatus* је поред Старе планине регистрована још само на планинама Копаонику и Дурмитору у СР Југославији.

Поредећи резултате овог рада са истраживањима фауне комараца у бугарском делу Старе планине може се закључити да у југословенском делу доминирају, ранопролећне шумске врсте рода *Aedes* са једном генерацијом годишње, које у бугарском делу пишу забележене.

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