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ODONATA (INSECTA)

ABSTRACT - Adamović Ž., Anđus LJ., and Mihajlović LJ.: THE FAUNA OF DURMITOR, 5: Odonata (Insecta). - Crnogorska akademija nauka i umjetnosti, Posebna izdanja knj. 32, Odjeljenje prirodnih nauka knj. 18, Podgorica, 1996.

A total of 27 Odonata species has been identified in the area of the mount Durmitor, 2523 m), Montenegro. Vertical and habitat distribution of species are described and discussed. Representative Spectra of Odonata species of the sphagnum peatbog Barno jezero and several other lakes and streams are specified and commented. Fauna of Odonata of the mount Durmitor are compared with those of some other European high mountains: Pyrenees, Alps, Carpathians, Balkans and Caucasus.

IZVOD - Na području planine Durmitora (2523 m) u Crnoj Gori, utvrđeno je 27 vrsta Odonata. Opisano je i prodiskutovano njihovo visinsko rasprostranjenje i distribucija po staništima. Utvrđeni su i komentarisani reprezentativni spektri Odonata za tresavu Barno jezero, i nekoliko drugih jezera i tokova. Fauna Odonata planine Durmitora upoređena je sa faunom ovih insekata nekih drugih evropskih visokih planina: Pirineja, Alpa, Karpata, Balkana i Kavkaza.

Odonata, Durmitor, Yugoslavia.

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1. INTRODUCTION

Durmitor is the most remarkable mountain in the whole Dinarids, Yugoslavia. "Durmitor National Park"- comprising the central massif of Durmitor, the high mountain plateau Jezera, and the river Tara canyon - was established by the Assembly of Montenegro in 1952, and included into the list of the World's Natural and Cultural Heritage by UNESCO in 1980. The main place and seat of the Park administrative authority is the small town of Žabljak (1450 m).

A systematic field research of the Durmitor National Park fauna, including Insects, started in 1980, and was conducted by the Organizing Committee (NONVEILLER, 1984). Four books of the series "The fauna of Durmitor" have been already published.

Only two males of *Somatochlora metallica* from the area of Durmitor were recorded before this examination (ADAMOVIĆ, 1948). Several colleagues took a total of 60 dragonfly specimens while collecting various Insects for their own field examinations in the Park from 1980 to 1985. A list of 15 species identified among these specimens has been formerly reported, namely: *Lestes dryas*, *L. sponsa*, *Pyrrhosoma nymphula*, *Enallagma cyathigerum*, *Coenagrion puella*, *Aeshna cyanea*, *A. grandis*, *A. juncea*, *Cordulia aenea*, *Somatochlora metallica*, *Platetrum depressum*, *Libellula quadrimaculata*, *Sympetrum flavolum*, *S. striolatum*, and *Leucorrhinia dubia* (ANĐUS & ADAMOVIĆ, 1985). Odonata were collected until 1991. The field examinations of the habitat distribution and behavior of the dragonfly species were carried out during the following four years: 1989, 1990, 1991 and 1992.

The present paper deals with the whole material of Odonata collected in the area of Durmitor and, particularly, with the habitat distribution and relative abundance of the dragonfly species identified and examined.

The authors are grateful to all the colleagues (named in the section 3.1.) for providing dragonflies for examination, and the botanists Dr Nikola DIKLIĆ and Marjan NIKETIĆ, Natural History Museum, Beograd, for identification plants collected in the area of Durmitor. The writers are particularly thankful to Professor Dr Bastiaan KIAUTA, S.I.O., for his friendly interest and valuable help.

2. AREA EXAMINED

The whole area of Durmitor (18° 50' - 19° 28'E; 42° 57' - 43° 22'N) "is bordered naturally" (BEŠIĆ, 1984), namely: on N and NE by the river Tara canyon, E by the mount Sinjavina (2203 m), S and SW by the deep gorge of the river Bukovica and the river Komarnica canyon, and W by the river Piva canyon (Fig. 1).

The well known Serbian geographer CVJIĆ (1899) noticed that three principal geomorphological units composed the area of Durmitor, namely: the massif of Durmitor, the plateau of Pivska Planina and the plateau of Jezera.

The lowest point of the whole area is found at the confluence of the rivers Piva and Tara (433 m). The Piva started formerly on the altitude of 574 m. However, a long part of the Piva stream has been turned into an artificial Piva Lake by a dam, 220 m high, to supply electric power. Another main stream, the Tara is the longest river in Montenegro. It originates on 1095 m, flows from S to N till the town Mojkovac, and then turns to NW. The Tara enters the canyon at the mouth of the left bank tributary stream Bistrica (750 m), and flows through the canyon, 78 km long, till the joint with the Piva (RADOJIČIĆ, 1984).

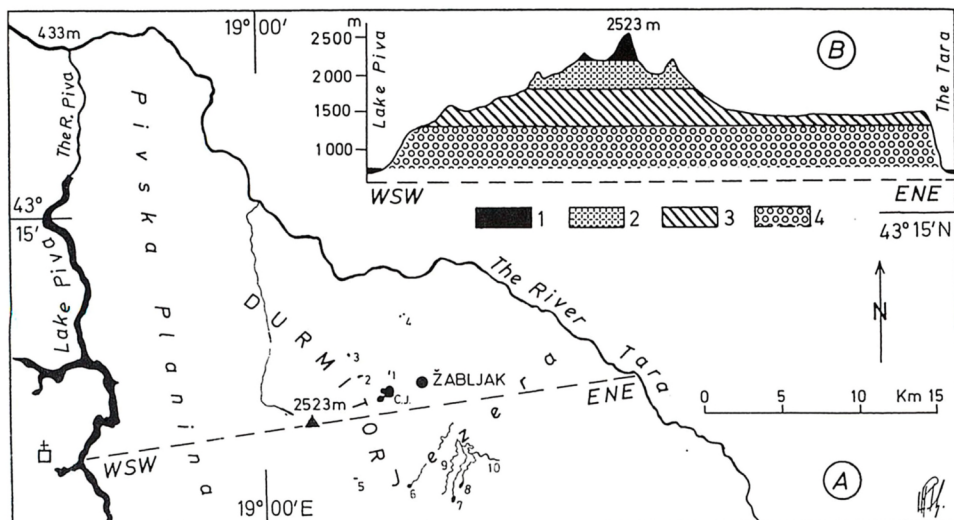


Fig. 1 - A, a sketch map showing the area of Durmitor, with some of the sites examined, namely: C.J. - Crno Jezero, 1 - Barno Jezero, 2 - Zminje Jezero, 3 - Malo Jezero, 4 - Goveđa Jezera, 5 - Valovito Jezero, 6 - Pošćensko Jezero, 7 - Vražje Jezero, 8 - Riblje Jezero, 9 - Bijeli Potok, 10 - Žugića Bare, - B, the altitudinal zonation of vegetation from WSW (Pivski Manastir) over the highest peak, called Bobotov Kuk (2523 m) to ENE (Đurđevića Tara), namely: 1 - Alpine turf vegetation and High mountain heathland vegetation, 2 - Alpine low pine forest of *Pinus mughus*, 3 - Boreal coniferous forests, and 4 - Various deciduous forests (after LAKUŠIĆ, 1984, but very simplified).

Steep slopes of the both river canyons rise sharply to the vast, already mentioned, plateaux at an average altitude of 1450 m. The both plateaux are made of the Mesozoic limestones, and were originated by fluvial action, denudation, karst erosion and marginal corrosion in the Miocene epoch. Deep canyons of the rivers Piva and Tara were cut through the limestone plateaux, latter in the Pliocene epoch and Quaternary period (MILOJEVIĆ, 1951; RADOJIČIĆ, 1984).

The central massif of Durmitor rises between the two plateaux. It is a huge group of high and dense limestone ridges with steep slopes, divided by deep and often spacious hollows and dales, which were glacial cirques and troughs, respectively, during the Pleistocene glaciations (CVIJIĆ, 1899). The Durmitor massif breaks up into 48 peaks higher than 2000 m, 7 of them are higher than 2400 m. The highest peak is Bobotov Kuk (2523 m). The orogenesis of Durmitor has been repeatedly described and discussed by CVIJIĆ (1921), MILOJEVIĆ (1951), and particularly BEŠIĆ (1953, 1983). The mountain is made mostly of the Mesozoic limestone, and flysch from the late Cretaceous and early Tertiary periods. There are also some other clastic and eruptive rocks.

The plateau Pivska Planina, lying W of the Mount Durmitor, is cut off from the central massif by the glacial cirque of Škrka and the Sušica canyon. The latter is about 700 m deep. Accordingly, the plateau has not been covered with moraines by the Pleistocene glaciers, except at the village of Nedajno. The plateau has mostly a karst topography with numerous hollows and dales, and without surface streams and lakes. Springs are rare, and shallow

temporary ponds are found here and there in some hollows with *terra rossa*. Farmers used to cover mass of snow in karst hollows with straw to get snow-water for livestock in summer (MILOJEVIĆ, 1951).

The plateau Jezera lies E of the mount Durmitor and slopes gently from N (1500 m) to S (1300 m). It is much more interesting for the distribution of Odonata than the plateau Pivska Planina. The plateau Jezera extends continuously from the central massif slopes. Consequently, the Pleistocene glaciers covered the plateau with moraines and had essential effects on relief forms and waters of this plateau (CVIJIC, 1921; MILOJEVIĆ, 1951). CVIJIC (1899) pointed out that "in all the Serbian countries, the area of Durmitor is the richest in lakes." On the other hand, Durmitor is mostly a limestone area of "the typical karst topography, including crevices, hollows, dales, caves, swallow-holes, underground channels" (BEŠIĆ, 1969). To solve an obvious discrepancy between the two facts, BEŠIĆ (1969, 1984) pointed to the following evidences: existence of impermeable layers of clastic and igneous rocks, orogenic movements, and glaciation. The latter event produced the most important changes on preglacial karst scenery of the plateau Jezera. Morains of boulders, pebbles, sand and clay filled karst hollows and dales. A rugged karst landscape of the preglacial plateau has been followed by the drift-covered plateau Jezera of a level or slight undulating surface with limestone outcrops. According to BEŠIĆ (1969, 1984), the Pleistocene glaciers eroded, among other rocks, the early Triassic strata of the Werfenian yellowish sandstones, sandshists, shales, and covered the plateau with overlying moraines of these rocks. Layers of fine, yellowish white clay made an impermeable foundation of lakes, ponds, marshes and surface streams on the plateau Jezera. The eminent geologist gave an important note of warning, namely: "the thickness of the Quaternary deposits on the plateau is relatively small, therefore very deep earthworks on the plateau Jezera must be forbidden, otherwise surface waters could be lost" (BEŠIĆ, 1969). BEŠIĆ's warning remark is obviously useful for the protection of the dragonfly breeding sites on the plateau Jezera. - Until the middle of the 19th century, the plateau Jezera was covered with forests of *Picea abies*, *Pinus silvestris* and *Abies alba*, which were then burned down (BRAJOVIĆ, 1987).

Three climatic types change rapidly over relatively short distance in the area of Durmitor due to effect of altitude. MILOJEVIĆ (1951) described the average weather conditions as *the temperate continental climate* in canyons of the Piva and the Tara (450-700 m), *the mountain climate* on the plateau of Pivska Planina and Jezera (1300-1500 m), and *the alpine climate* on the central massif of Durmitor (2200-2523 m). The mean annual temperature is 8° C in the canyons, 6° C on the plateaux, and about 0 °C on the central massif (PLEŠKO & ŠINIK, 1971). The lowest average temperatures have been recorded in January, - 1,8° C in the canyons, -5,4° C on the plateaux, and -8,0° C on the central massif. Four months have the average temperatures below 0° C, namely: December, January, February and March. The average number of "frost-days" (days with air temperature at or below 0° C) *per annum* is: 35 in the canyons, 60 on the plateaux, and 130 days on the central massif of Durmitor. The highest average temperatures occur in July, namely: about 18° C in the canyons, 14° C on the plateaux, and 9° C on the central massif. The average number of "summer-days" (days with air temperature at or above 25° C) *per annum* is: 60 in the canyons, 30 on the plateaux, and no one day on the central massif. The mean annual precipitation is 1250 mm in the canyons, 1500 mm on the plateaux, and 1900 mm on the central massif of Durmitor (RANKOVIĆ, 1971). The main maximum of precipitation is in November, and the main minimum in August. The first snow falls in the canyons about the

middle of November, on the plateaux at the end of October, and on the central massif of Durmitor about the middle of October. The last snow melts in the canyons at the end of March, on the plateaux about the middle of April, and on the central massif at the end of April. However, snow lasts the whole year in north-facing hollows and dales of the central massif. The average depth of snow is 55 cm in the canyons, 125 cm on the plateaux, and 200 cm on the central massif of Durmitor. The most frequent wind in the area of Durmitor is from S, but local air circulation is also very strong (IVEZIĆ, 1984).

The series of rendzina-soils, *terra rossa* and brown soils is a characteristic of the Mesozoic limestone area. Organogenic rendzina soils on limestone, dolomite, flysh and moraines are widely distributed in area of Durmitor, particularly above 1400 m. They show considerable differences, depending on parent material. Brown forest soil, brown leached soil, and brown podzolic soil occupy usually lower parts of the area (JOVIĆ, 1972). *Terra rossa* is widely distributed on the plateau Pivska Planina. Peat soils with a high content of organic matter are found around *Sphagnum* peat-bogs, in conditions of extreme wetness. Semi-peaty soils are widespread more than peat-soil in the area of Durmitor, and can be found in shallow swampy depressions with various *Carex* plant species.

Altitudinal zonation of vegetation with zonal subdivision and a mosaic of intrazonal, azonal and extrazonal plant communities in the whole area of Durmitor has been described by BLEČIĆ (1958), LAKUŠIĆ (1984), and JOVANOVIĆ et al. (1986). For the present purpose, three major zonal plant formations are of interest, namely: 1 - Alpine turf vegetation (*Crepidetalia dinaricae*) and High mountain heathland vegetation (*Daphno-Rhododendretalia hirsuti*), growing patchily on limestone rocky ground from 2200 m to 2523 m; 2 - Boreal coniferous forests, particularly, Alpine low pine forest (*Pinetum mugo*) growing on rendzina soil from 1700 m to 2200 m; Subalpine spruce forest (*Piceetum abietis subalpinus*); and Mountain spruce forest (*Piceetum abietis montanum*) growing on brown soil from 1400 m to 1700 m; 3 - Deciduous forest consisting of various plant communities which are distributed in a broad altitudinal zone from 440 m to 1400 m or 1800 m due to diversity of physical conditions. Several types of zonal deciduous forests are recognized in the latter major plant formation, for example: Subalpine beech forest (*Fagetum subalpinum*) on brown soil from 1600 m to 1800 m, Beech and fir forest (*Fagetum sylvaticae abietosum*) on rendzina soil and brown lessive or podzolized soils from 1100 m to 1600 m, Mountain beech forest (*Fagetum moesiaca montanum*) on brown soil from 440 m to 1100 m. Thermophilous oak forests are found predominantly in canyons, for example: *Quercus-Ostryetum carpinifoliae* and *Quercus-Carpinetum orientalis*. Owing to the human activity forest have been replaced to a great extent by grasslands with various plant-communities.

BEŠIĆ (1969) mentioned by name 19 lakes in the area of Durmitor, and classified them into groups according to manner in which glaciers were involved in their origin. The lakes Škrčko Jezero and Valovito Jezero remained in cirques after ice melting. The lakes Crno Jezero, Zminje Jezero and Malo Jezero filled deep basins those have been hollowed out in limestone by enormous blocks of glacial ice which have been thrown from a considerable height into preglacial karst holes. The lakes Poščensko Jezero, Vražje Jezero, Riblje Jezero and many others smaller lakes and ponds have been formed in shallow basins among moraines on the plateau Jezera. Finally, a periodical lake Sušičko Jezero originated when morains dammed the river Sušica. - A complete list, with names and brief descriptions, of lakes and ponds situated in the area of Durmitor, has been published by BRAJOVIĆ (1987), and STANKOVIĆ (1992).

The plateau Jezera has been named according to the presence of lakes; "jezera" mean lakes, in Serbian. According to CVIJIC (1899, 1921) the coalescence of several glaciers from the mount Durmitor created an extensive piedmont glacier on the preglacial plateau Jezera in the Pleistocene. The piedmont sheet of ice on the plateau covered, in maximal state, an area of 120 square kilometres (MAROVIĆ & MARKOVIĆ, 1972).

The majority of lakes in the area of Durmitor are found in altitudinal zone of the Boreal, mainly coniferous forest, and partly the beech and fir forest. Some other details about the lakes in the area of Durmitor are found in description of the dragonfly habitats examined.

3. MATERIAL AND METHODS

A total of 1121 dragonfly specimens, referable to 27 species was collected and examined in the area of Durmitor, during 13 summers, from 1980 to 1992. Relative abundance of the dragonfly species was estimated from the evidence of specimens recorded in nine characteristic habitats, in order to get data for quantification of dragonfly species and evaluation of "Representative Spectrum of Odonata Species" of the habitat investigated, according to EB. SCHMIDT (1985). Observations were made, and dragonflies netted always on windless, sunny days from 9.00 till 15.00 hours. Plants were also collected and identified, as well as all other relevant details about the habitats examined.

Odonatological nomenclature is according to EB. SCHMIDT (1978, 1987), while the systematic order follows ER. SCHMIDT (1929).

The material is now located in the collection of the Natural History Museum, Beograd.

3.1. List of the collectors

A total of 17 entomologists took part in collection of dragonfly specimens in the area of Durmitor, during 13 seasons, from 1980 to 1992. Their names are marked by acronyms in the list of the dragonfly species identified. This is a complete list of the collectors, with corresponding acronyms:

A. Z. - Anka ZUPAN	M. V. - Mitar VUKOVIĆ
D. P. - Dragan PAVIĆEVIĆ	M. Ž. - Milan ŽIVKOVIĆ
D. S. - Duška SIMOVA	N. M. - Nela MIHAJLOVIĆ
F. P. - Franc POTOČNIK	P. G. - Predrag GUŽVICA
Lj. A. - Ljiljana ANĐUS	S. K. - Slobodan KUZMANOVIĆ
Lj. P. - Ljiljana PROTIC	S. Š. - Smiljka ŠIMIĆ
Lj. M. - Ljubodrag MIHAJLOVIĆ	S. V. - Srđan VUJOVIĆ
M. B. - Marina BARANIN	Ž. A. - Živko ADAMOVIĆ
M. T. - Miloš TAUŠANOVIĆ	

3.2. List of the locations examined

The following 25 locations were repeatedly visited to collect dragonflies in the area of Durmitor. The ending symbols in a short description of each location, have been taken from the UTM grid map of Yugoslavia.



Fig. 2 - Barno Jezero

Barno Jezero - a sphagnum peat bog at 1489 m, CN 48 (Fig. 2)

Bijeli Potok - the outflowing stream of the temporary pond Ševarita Bara on the plateau Jezera at 1410 m, CN 47

Bistrica - the left bank tributary stream of the river Tara, 750 m, CN 76

Crno Jezero - the largest lake in the area of Durmitor consisting of two lakes connected by a narrow stretch of water. It is an oligotrophic lake with pH 7.5 (ŽUNJIĆ, 1970), surrounded by spruce and fir forest at 1422 m, CN 47

Dragana - a small pool with a scattered growth of *Potamogeton natans*, and a litoral belt dominated by *Carex nigra* and *C. rostrata*, in the village of Nadgora, 1530 m, CN 48

Goveđa Jezera - two small pools overgrown with marshy vegetation at 1540 m, CN 48

Jablan Bara - a small pool and a short outflowing stream on peaty plain overgrown with *Carex* spp. div., 1840 m, Jablan Bara was named after the plant "jablan" (*Trollius europaeus*), which is very common on this marshy site (BRAJOVIĆ, 1987), CN 48

Jakšića Katun - a site near two small pools Lokvice, 1800 m, CN 47

Jezero, in Nadgora - a small pool supporting a scattered growth of *Nuphar luteum* in water, and a litoral belt of *Equisetum palustre* and *Carex* spp. div., in the village of Nadgora, 1540 m, CN 48

Malo Crno Jezero, in Nadgora - a small pool overgrown with *Equisetum palustre* and *Carex* spp. div., which is situated in a moist, quaking plain in the village of Nadgora, at about 1520 m, CN 48

Malo Jezero - a small but probably the most beautiful lake, situated in a glacial cirque at 1790 m. It is an oligotrophic lake, with pH 7.3, and almost without litoral rooted plants (STANKOVIĆ, 1975). Dragonflies have not been recorded at this lake, CN 48

Mlinski Potok - a rocky, cascading, steep sided stream, passing through an old spruce forest. It is a tributary stream of Crno Jezero, flowing from 1510 m to 1420 m, CN 47



Fig. 3 - Pošćensko Jezero



Fig. 4 - Valovito Jezero

- Otoka - the outflowing stream of Barno Jezero, 1487 m, CN 48
- Petrovački Potok - the left bank tributary stream of the Tara, at about 900 m, CN 58
- Pirlitor - a site on a left bank tributary stream of the Tara, at about 1200 m, CN 58
- Pošćenska Bara - a pool overgrown with marshy vegetation, near the village of Poščenje, at 890 m, CN 45
- Pošćenska Tresava - a peat bog with a floating, litoral bryophyte mat, near the village of Poščenje, at 1010 m, CN 45
- Pošćensko Jezero - the lake with a luxuriant emergent, floating and submergent vegetation, which is situated in the glacial trough Dobri Dol at 1495 m, CN 47 (Fig. 3)
- Riblje Jezero - a lake situated on the plateau Jezera, and surrounded with marshy meadows, at 1409 m, CN 57
- Valovito Jezero - a small lake with patches of *Potamogeton natans*, and a litoral growth dominated by *Carex rostrata*. It is situated in a glacial cirque, at 1695 m, CN 47 (Fig. 4)
- Virak - a village situated in the west part of the plateau Jezera, at 1480 m, CN 47
- Vražje Jezero - a lake with emergent plants dominated by *Phragmites australis*, a belt of floating growth of *Nuphar luteum* and *Potamogeton natans*, and submergent plants *P. lucens* and *Ranunculus trichophyllus*. The lake is situated in a broad, shallow depression among moraines on the plateau Jezera, at 1411 m, CN 47.
- Zminje Jezero - a small lake situated in a hole of the glacial trough, and enclosed by old spruce forest at 1520 m, CN 48
- Žabljačka Reka - the outflowing stream of the lake Crno Jezero. The stream is overgrown with marshy vegetation dominated by *Carex vesicaria*, *C. rostrata* and *Sparganium erectum*. It is about 2000 m long, and disappears into a swallow-hole near Žabljak, at 1420 m, CN 47
- Žugića Bare - a broad and deep part of the outflowing stream of the lake Riblje Jezero, at about 1400 m, CN 57

4. RESULTS AND COMMENTS

4.1. List of the Odonata species identified

4.1.1. CALOPTERYGIDAE

1. *Calopteryx virgo* (Linnaeus, 1758)

Petrovački Potok 25.VII-1987, 1 ♀ (D.P.); Bijeli Potok 15.VIII-1989, 1 ♂ (Ž.A.); 14.VIII-1991, 2 ♂♂ 1 ♀ (Ž.A.). Several males were recorded at Zminje Jezero in August of 1989 and 1991. Copulation and oviposition of the species were observed at the rivulet of Bijeli Potok.

This is a common species in Yugoslavia. It has been found in the area of Durmitor from 900 m (Petrovački Potok) to 1520 m (Zminje Jezero). Not large in amount but continuous population of *C. virgo* exists at Bijeli Potok, and probably at other rivulets on the plateau Jezera, about 1400 m. *C. virgo* was formerly recorded at several locations in the mountains of Yugoslavia, namely: Rogatica (525 m) and Goražde (about 600 m) in Bosnia (KLAPALEK, 1898); Lake Borke (397 m) on the mount Prenj in Bosnia; the rivulet Ribnica (1100 m) on the mount Zlatibor; Topli Do (700 m) on the mount Stara Planina; and, at the rivulet Vrla (1300 m) which empties into peat bog Vlasinska Tresava, in Serbia (AD-AMOVIC, 1948, 1949). Larvae and adult specimens were found at Lake Ohrid (695 m) in

Macedonia (FILEVSKA, 1954). "The little mobile species *Calopteryx virgo*" was found "at a lake (1429 m) on the mount Triglav, which is, as far as we know, the highest location of this species" (KIAUTA, 1960). The finding of *C. virgo* on the mount Durmitor is in full accordance with KIAUTA's record of the species in the Triglav National Park in the Julian Alps, Slovenia. *C. virgo* has been found at 1350 m in the mount Tatry, Poland (FUDAKOWSKI, 1930). According to SCHIEMENZ (1953) the species has been recorded at 700 m in the Alps. BILEK (1966) recorded the species at altitude of 50-150 m, and 1400-1500 m in Albania. *C. virgo* is distributed almost to the Arctic circle in Europa, and to the parallel of 55 N latitude in the Asia. The species is ranged from the mount Ural to the Ussurijski Kraj in the eastern Siberia (BELYSHEV, 1968).

2. *Calopteryx splendens* (Harris, 1782)

Bijeli Potok 14.VIII-1991, 2 ♂♂ 1 ♀ (Ž.A.). Copulation of the species has been observed at the same rivulet, Bijeli Potok (about 1410 m). (fig. 5)

C. splendens is widely distributed in lowlands of Yugoslavia. It has been formerly found at the following locations in the mountains of Yugoslavia: Topli Do (700 m) on the mount Stara Planina; a tributary rivulet (1250 m) of the large peat bog Vlasinska Tresava, in Serbia (ADAMOVIĆ, 1949); Lake Ohrid (695 m) in Macedonia (FILEVSKA, 1954); and, the Triglav National Park (about 1400 m) on the Julian Alps in Slovenia (KIAUTA, 1960). - According to SCHIEMENZ (1953) the species is to be found to an altitude of 1200 m in Germany. *C. splendens* has been recorded at 1260 m in Tyrol, and 1800 m in the Alps (FUDAKOWSKI, 1930).

4.1.2. LESTIDAE

3. *Lestes virens* (Charpentier, 1825)

Riblje Jezero 15.VIII-1989, 1 ♂ teneral (Ž.A.).

The finding of a single specimen can hardly be discussed. It is interesting because a teneral specimen was taken at the lake situated on 1409 m. *L. virens* has been formerly recorded at many marshes and swamps situated in the Pannonian Lowland of Serbia (ADAMOVIĆ, 1949). Larvae and adults were found at the Lake Ohrid (695 m) in Macedonia (FILEVSKA, 1954). - The species has been found at an altitude of about 800 m, on the mount Stara Planina, in Bulgaria (MAUERSBERGER, 1990), and 900 m in the mount Tatry Poland (FUDAKOWSKI, 1930). According to SCHIEMENZ (1953) the species is to be found "vorwiegend an Mooren" in Germany.

4. *Lestes sponsa* (Hansemann, 1823)

Zminje Jezero 22.VII-1984, 1 ♀ teneral (D.P.); 29. VIII-1984, 1 ♂ 1 ♀ (S.V.); Riblje Jezero 14.VII-1988, 1 ♂ (Lj. A.); 15.VIII-1989, 1 ♂ 2 ♀♀ (Ž.A.); Barno Jezero 11. VIII-1989, 5 ♂♂ 10 ♀♀ (Ž.A.); 13.VIII-1990, 24. ♂♂ 18 ♀♀ (Ž.A.); 13.VIII-1990, 3 ♂♂ 2 ♀♀ (Lj. M.); 12.VIII-1991, 6 ♂♂ 5 ♀♀ (Ž.A.); 29.VIII-1992, 2 ♂♂ (Lj.M.); Pošćensko Jezero 15.VIII-1989, 2 ♂♂ 3 ♀♀ (Ž.A.); Bijeli Potok 15.VIII-1989, 1 ♀ (Ž.A.); Goveđa Jezera 14.VIII-1990, 29 ♂♂ 1 ♀ (Ž.A.); Valovito Jezero 15.VIII-1990, 1 ♀ (Ž.A.); Žugića Bare 16.VIII-1990, 5 ♂♂ (Ž.A.); Malo Crno Jezero in Nadgora 17.VIII-1990, 3 ♂♂ (Ž.A.); Jezero in Nadgora 17.VIII-1990, 2 ♂♂ (Ž.A.); Dragana 17. VIII-1990, 2 ♂♂ 1 ♀ (Ž.A.). Copulation



Fig. 5 - *Calopteryx splendens* (Harris) male



Fig. 6 - *Aeshna juncea* (L.) male



Fig. 7 - *Aeshna juncea* (L.) female



Fig. 8 - *Aeshna grandis* (L.) female

and oviposition have been recorded at Barno Jezero, and the majority of the mentioned habitats.

L. sponsa is a common species in the area of Durmitor, breeding in various lakes and bogs, which are situated from 1400 m to 1520 m. It was formerly estimated as a common species, which breeds in non-sphagnum ponds and marshes located in the lowlands of Serbia as well as in sphagnum peat bogs situated on the mountains of Serbia (ADAMOVIĆ, 1990). The species has been found at the sphagnum peat bogs Daićsko Jezero (1556 m) on the mount Golija, and Vlasinska Tresava (1219 m) in Serbia (ADAMOVIĆ, 1949, 1990). *L. sponsa* has been found at the small peat bog Semolj (1550 m) on the mount Sinjavina, Montenegro (ANĐUS & ADAMOVIĆ, 1985). KIAUTA (1960) found *L. sponsa* in the Triglav National Park (about 1400 m) in Slovenia. *L. sponsa* has been found at 1226 m on the mount Tatry, Poland; at 1700 m in Tyrol, and, 2138 m - on the mount Kavkaz (FUDAKOWSKI, 1930). BILEK (1966) recorded the species at altitude of 1200-1400 m in Albania. *L. sponsa* has been found at about 800 m on the mount Stara Planina (MAUERSBERGER, 1990), and Ribnoto Ezero (2200 m) on the mount Rila, in Bulgaria (BESHOVSKI, 1960). In the north, the species is found up to 1230 m in Alps, Germany (SCHIEMENZ, 1953). *L. sponsa* is distributed from the mount Ural to the Kuril Islands, extending to the parallel of 65 N latitude in the Siberia (BELYSHEV, 1968).

5. *Lestes dryas* Kirby, 1890

Vražje Jezero 23. VIII-1984, 1 ♂ (Lj. P.); 15. VIII-1989, 7 ♂♂ 1 ♀ (Ž.A.); Riblje jezero 14. VII-1988, 1 ♂ 1 ♀ (Lj. A.); 15. VIII-1989, 5 ♂♂ 1 ♀ (Ž.A.); Barno Jezero 11. VIII-1989, 9 ♂♂ 20 ♀♀ (Ž.A.); 13. VIII-1990, 1 ♂ 3 ♀♀ (Ž.A.); 12. VIII-1991, 3 ♂♂ 1 ♀ (Ž.A.); 29. VIII-1992, 1 ♂ 1 ♀ (Lj. M.) Pošćensko Jezero 15. VIII-1989, 2 ♂♂ 1 ♀ (Ž.A.); Bijeli Potok 15. VIII-1989, 1 ♂ 2 ♀♀ (Ž.A.); Jablan Bara 16. VIII-1989, 1 ♂ (Ž.A.); Žabljačka Rijeka 13. VIII-1990, 1 ♂ (Ž.A.); Goveđa Jezera 14. VIII-1990, 1 ♂ 2 ♀♀ (Ž.A.); 12. VII-1991, 1 ♂ teneral 2 ♀♀ teneral (Lj. M.); Žugića Bare 16. VIII-1990, 70 ♂♂ 6 ♀♀ (A.Z.); 10 ♂♂ 2 ♀♀ (F.P.); 38 ♂♂ 5 ♀♀ (Ž.A.); 14. VIII-1991, 1 ♀ (Ž.A.); Malo Crno Jezero in Nadgora 17. VIII-1990, 1 ♂ 1 ♀ (Ž.A.); Dragana 17. VIII-1990, 4 ♂♂ 3 ♀♀ (Ž.A.); Pošćenska Bara 18. VIII-1990, 2 ♂♂ 1 ♀ (Ž.A.*).

L. dryas is a common species in the area of Durmitor from 1000 m to 1850 m, breeding in ponds, marshy lakes and peat bogs. Four males and four females of *L. dryas* have been found at the small peat bog Semelj (1550 m) on the mount Sinjavina, Montenegro (ANĐUS & ADAMOVIĆ, 1985). It was formerly estimated as a common species in marshy area of the Pannonian Lowland, as well as the large sphagnum peat bog Vlasinska Tresava (1219 m) in Serbia (ADAMOVIĆ, 1949). *L. dryas* has been found at Popove Livade (1200 m) on the mount Kozjak, Macedonia (KARAMAN, 1969). The species has been taken at about 900 m on the mount Stara Planina (MAUERSBERGER, 1990), and the peat bog Papaz Čair (1800 m) on the mount Pirin, in Bulgaria (BESHOVSKI, 1964). According to FUDAKOWSKI (1930) *L. dryas* has been recorded at 1131 m on the north and about 1300 m on the south slope of the mount Tatry, Poland; and, at an altitude of 1500 m in the Alps. BELYSHEV (1968) described *L. dryas* as a south Siberian species, reaching the parallel of 60 N latitude, and extending across the Siberia from the mount Ural to the Kuril Islands.

4.1.3. PLATYCNEMIDIDAE

6. *Platycnemis pennipes* (Pallas, 1771)

Žugića Bare 14.VIII-1991, 1 ♀ (Ž.A.)

A female of *P. pennipes* was taken from marshy plants growing on the bank of the stream Žugića Bare (1410 m). This is a common species on marshy vegetation growing on banks of ponds, lakes and streams in lowlands of Serbia, Bosnia, Herzegovina, Dubrovnik District and Macedonia (ADAMOVIĆ, 1949, 1967; ANĐUS 1985; FILEVSKA, 1984; KARAMAN, 1979; PETERS & HACKETHAL, 1986). The species was found at Lake Borke (397 m) on the mount Prenj in Bosnia (ADAMOVIĆ, 1948). KIAUTA (1960) recorded it in the Triglav National Park (about 1400 m) in Slovenia. A female of this species has been taken at Popove Livade (1200 m) on the mount Kozjak, in Macedonia (KARAMAN, 1969). Larvae were found in Lake Ohrid (695 m), in Macedonia (FILEVSKA, 1954). *P. pennipes* has been taken at about 800 m, on the mount Stara Planina, in Bulgaria (MAUERSBERGER, 1990). The species is to be found in the north Alps to an altitude of 939 m, in Germany (SCHIEMENZ, 1953). According to FUDAKOWSKI (1930) *P. pennipes* has been recorded at 1226 m in the mount Tatry, Poland; and 1920 m on the south slopes of the mount Caucasus.

4.1.4. COENAGRIONIDAE

7. *Pyrrhosoma nymphula* (Sulzer, 1776)

Mlinski Potok 12.VII-1983, 1 ♀ (M.V.); 11.VII-1987, 1 ♂ 1 ♀♀ (M.Ž.); Zminje Jezero 22.VII-1984, 1 ♂; 29.VIII-1984, 1 ♂ 1 ♀ (S.V.); 3.VIII-1985, 1 ♂ (M.Ž.); 13.VIII-1989, 15. ♂♂ (Ž.A.); 18.VIII-1991, 20 ♂♂ 6 ♀♀ (Ž.A.); Crno Jezero 14.VIII-1987, 2 ♂♂ (Lj.A.); Pošćensko Jezero 15.VIII-1989, 1 ♂ (Ž.A.).

P. nymphula is a moderately rare species in the area of Durmitor, from 1400 m to 1520 m. The species has been usually found in the lowlands of Bosnia and Serbia (ADAMOVIĆ, 1948; ANĐUS, 1985). For the present purpose, records of *P. nymphula* in the mountains of Yugoslavia are particularly interesting. The species has been recorded at the following locations: the peat bog Divčibare (970 m), and the large sphagnum peat bog Vlasinska Tresava (1219 m) in Serbia (ANĐUS, 1985); the peat bog Daićsko Jezero (1556 m) on the mount Golija, in Serbia (ADAMOVIĆ, 1990); the marshy brook Velmej (about 850 m) in Macedonia (PETERS & HACKETHALL, 1986); and, the Triglav National Park (about 1400 m) in Slovenia (KIAUTA, 1960). BILEK (1966) recorded the species at an altitude of 1500 m in Albania. *P. nymphula* has been taken at an altitude of about 900 m, on the mount Stara Planina, in Bulgaria (MAUERSBERGER, 1990). According to ROBERT (1959) the species has been found in the mount Jura at an altitude of 800 m, and in the Alps at 1730 m.

8. *Ischnura elegans* (Vander Linden, 1820)

Pošćenska Tresava 18.VIII-1990, 1 ♂ 2 ♀♀ (Ž.A.); Pošćenska Bara 18.VIII-1990, 2 ♂♂ 2 ♀♀ (Ž.A.)

I. elegans was a rare species at the peat bog Pošćenska Tresava (1010 m) in August 1990. It is a very common species in lowlands of Yugoslavia. The species has been also recorded in the following locations of hilly and mountainous area of this country: Lake

Borke (397 m) on the mount Prenj, Bosnia (ADAMOVIĆ, 1948); Popove Livade (1200 m) on the mount Kozjak, Macedonia (KARAMAN, 1969); Lake Ohrid (695 m) in Macedonia (FILEVSKA, 1954). KIAUTA (1960) recorded it in the Triglav National Park in Slovenia. *I. elegans* has been recorded at an altitude of about 800 m, on the mount Stara Planina, in Bulgaria (MAUERSBERGER, 1990), and Prespa Lake (853 m) in Greece (DEVOLDER, 1990). The species is to be found in German mountains to an altitude of 970 m (SCHIEMENZ, 1953). According to FUDAKOWSKI (1930) *I. elegans* has been recorded at 1226 m on the mount Tatry.

9. *Enallagma cyathigerum* (Charpentier, 1840)

Mlinski Potok 12.VII-1983, 1 ♂ 2 ♀♀ (M.V.); 11.VII-1987, 5 ♂♂ (M.Ž.); Zminje Jezero 22.VII-1984, 1 ♀ teneral (D.P.); 29.VIII-1984, 5 ♂♂ 1 ♀ (Lj.P.); 3. VIII-1985, 1 ♂ 1 ♀ (M.Ž.); 5.VIII-1985, 1 ♂ (D.P.); 13.VIII-1989, 26 ♂♂ 5 ♀♀ (Ž.A.); 18.VIII-1991, 1 ♂ 1 ♀ (Ž.A.); Virak 16.VII-1987, 2 ♀♀ (S.V.); Riblje Jezero 14.VIII-1987, 2 ♂♂ 1 ♀ (Lj. A.); 15.VIII-1989, 3 ♂♂ (Ž.A.); Vražje jezero 14.VII-1987, 3 ♂♂ (Lj. A.); 14.VIII-1988, 2 ♂♂ (Lj.A.); Barno Jezero 11.VIII-1989, 22 ♂♂ 1 ♀ (Ž.A.); 13.VIII-1990, 2 ♂♂ (Ž.A.); 11.VII-1991, 6 ♂♂ (Lj.M.); 12.VIII-1991, 16 ♂♂ 3 ♀♀ (Ž.A.); 19.VIII-1991, 1 ♀ (Ž.A.); 29. VIII-1992, 1 ♂ (Lj. M.); Crno Jezero 14.VIII-1989, 1 ♂ (Ž.A.); 13.VIII-1990, 1 ♂ (N.M.); 30.VIII-1992, 6 ♂♂ 2 ♀♀ (Lj. M.); Pošćensko Jezero 15.VIII-1989, 7 ♂♂ 3 ♀♀ (Ž.A.); Bijeli Potok 15.VIII-1989, 2 ♀♀ (Ž.A.); Žabljačka Rijeka 13.VIII-1990, 3 ♀♀ (Ž.A.); Pošćenska Bara 18.VIII-1990, 6 ♂♂ 3 ♀♀ (Ž.A.); Goveđa Jezera 12.VII-1991, 1 ♂ 1 ♀ (Lj.M.); Žugića Bare 14.VIII-1991, 1 ♂ (Ž.A.).

E. cyathigerum is a common species at various water-habitats in the area of Durmitor, from 1000 m (Pošćenska Bara) to 1520 m (Zminje Jezero). The species has been recorded in the Pannonian Lowland as well as in hilly and mountainous area of Yugoslavia. For the present scope, records of *E. cyathigerum* in the mountains are particularly interesting. The species has been recorded at the lake Volujačko Jezero (1517 m) on the mount Volujak (ADAMOVIĆ, 1948); Biogradsko Lake (1094 m) on the mount Bjelasica (DUMONT, 1977); and the small peat bog Semolj (1550 m) on the mount Sinjavina, in Montenegro (ANĐUS & ADAMOVIĆ, 1985). It was repeatedly found at the large peat bog Vlasinska Tresava (1219 m) on the mount Vardenik (ADAMOVIĆ, 1949; ANĐUS, 1985); the peat bog Semeteško Jezero (900 m) on the mount Kopaonik (ANĐUS, 1985); and, the peat bog Daićsko Jezero (1556 m) on the mount Golija, in Serbia (ADAMOVIĆ, 1990). *E. cyathigerum* has been formerly recorded at Lake Borke (397 m) on the mount Prenj in Bosnia (ADAMOVIĆ, 1948). The species was recorded at the man-made Lake Mavrovo (1233 m) on the mount Bistra, and Lake Prespa (853 m) in Macedonia (PETERS & HACKETHAL, 1986). FILEVSKA (1954) found the larvae of the species in Lake Ohrid (695 m) in Macedonia. *E. cyathigerum* has been recorded in the Triglav National Park (about 1400 m), and mount Kranjska Gora (to 800 m), in Slovenia (KIAUTA, 1960, 1961). FUDAKOWSKI (1930) recorded this species at 1226 m in the mount Tatry, Poland. *E. cyathigerum* has been found at an altitude of 1100 m in Obenbayern (FREY, 1951), on 1800 m in the Alps (RIS, 1909) and 2270 m in the Alps, Italy (CONCI & NIELSEN, 1956). The species has been taken recently at 1400 m in Marocco, North Africa (LOHMANN, 1990). According to BELYSHEV (1968) *E. cyathigerum* is "one of the most widespread species in the Siberia". It is distributed from the mount Ural to the Kamčatka Peninsula, reaching the parallel of 70 N latitude in the valleys of the Lena and the Indigirka.

10. *Coenagrion hastulatum* (Charpentier, 1840)

Pošćensko Jezero 15. VIII-1989, 8 ♂♂ (Ž.A.); Goveđa Jezera 12.VII-1991, 3 ♂♂ (Lj. M.).

This is a species of the boreo-mountain distribution. *C. hastulatum* has been formerly found in the Triglav National Park (about 1400 m) in Slovenia (KIAUTA, 1960), and at the sphagnum peat bog Daićsko Jezero (1556 m) in Serbia (ADAMOVIĆ, 1990). FUDAKOWSKI (1930) examined the species at 1226m on the north and 806 m on the south slopes of the mount Tatry, Poland. *C. hastulatum* is to be found in the Alps to an altitude of 1860 m (RIS, 1909). DEGRANGE & SEASSAU (1974) recorded *C. hastulatum* at Lac Lait (2180 m), Savoie in France. According to BELYSHEV (1968) *C. hastulatum* is to be found from the mount Ural to Lake Baykal in Siberia, reaching the parallel of 64 N latitude in the river Ob valley, and the village of Žigansk, situated north of the Arctic circle in the river Lena Valley.

11. *Coenagrion puella* (Linnaeus, 1758)

Žabljačka Rijeka 23.VII-1980, 1 ♂ (S.K.); 7.VII-1983, 1 ♂ (D.S.); Vražije Jezero 23.VIII-1984, 1 ♂ (Lj.P.); Goveđa Jezera 12.VII-1991, 1 ♂ (Lj. M.); Barno Jezero 12.VIII-1991, 2 ♂♂ 1 ♀ (Ž.A.); Zminje Jezero 18.VIII-1991, 1 ♂ 2 ♀♀ (Ž.A.).

The species has been found in the area of Durmitor, from 1400 m to 1520 m. Copulation and oviposition have been observed at Barno Jezero. *C. puella* is a common species in lowlands of Yugoslavia. The records of the species in the mountains are particularly interesting. *C. puella* has been found repeatedly at the large peat bog Vlasinska Tresava (1219 m) in Serbia (ADAMOVIĆ, 1949; ANĐUS, 1985); at Popove Livade (1200 m) on the mount Kozjak (KARAMAN, 1969) and Lake Ohrid (695 m) in Macedonia (FILEVSKA, 1954). KIAUTA (1960) recorded the species in the Triglav National Park, at about 1400 m, in Slovenia. *C. puella* has been found at an altitude of about 900 m, on the mount Stara Planina, in Bulgaria (MAUERSBERGER, 1990). According to RIS (1909), the species can be found to an altitude of 1000 m in the mount Jura, and 1800 m in the Alps. FUDAKOWSKI (1930) examined *C. puella* at 1350 m on the north and 850 m on the south slopes of the mount Tatry, Poland.

4.1.5. AESHNIDAE

12. *Aeshna juncea* (Linnaeus, 1758)

Mlinski potok 16.VII-1982, 1 ♂ (M.V.); 1.IX-1982, 1 ♂ (S.V.); 29.VIII-1983, 1 ♂ (M.V.); 11.VII-1987, 1 ♂ 1 ♀ (M.Ž.); 13.VIII-1989, 1 ♂ (Ž.A.); Zminje Jezero 29.VIII-1984, 3 ♂♂ (S.V.); 13.VIII-1989, 1 ♂ (Ž.A.); 18.VIII-1991, 1 ♂ (Ž.A.); Crno Jezero 21.VIII-1983, 1 ♂ (M.V.); 10.VIII-1985, 1 ♂ 1 ♀ (M.Ž.); Barno Jezero 11.VIII-1989, 2 ♂♂ 2 ♀♀ (Ž.A.); 13.VIII-1990, 18 ♂♂ 1 ♀ (Ž.A.); 1 ♂ (N.M.); 12.VIII-1991, 3 ♂♂ 1 ♀ (Ž.A.); 19.VIII-1991, 1 ♀ (Ž.A.); 29.VIII-1992, 11 ♂♂ 1 ♀ (Lj.M.); Jablina Bara 16.VIII-1989, 1 ♀ (Ž.A.); 14.VIII-1990, 3 ♂♂ (N.M.); Goveđa Jezera, 14.VIII-1990, 2 ♂♂ (Ž.A.); Valovito Jezero 15.VIII-1990, 1 ♀ teneral (Ž.A.); Malo Crno Jezero in Nadgora 17.VIII-1990, 1 ♂ (Ž.A.); Dragana 17.VIII-1990, 1 ♂ (Ž.A.); Žabljačka Rijeka 29.VIII-1992, 4 ♂♂ (Lj.M.) (fig. 6&7)

A. juncea is a common species in the area of Durmitor, from 1400 m to 1850 m. Copulation and oviposition were observed at Barno Jezero, Zminje Jezero, Poščensko Jezero,



Fig. 9. - *Aeshna grandis* (L.) female



Fig. 10. - *Aeshna cyanea* (Muller) male



Fig. 11. - *Aeshna cyanea* (Muller) female

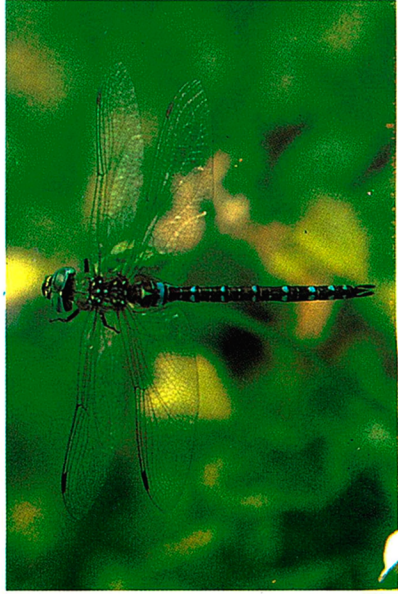


Fig. 12. - *Aeshna mixta* (Latr.) male

Žugića Bare and Goveđa Jezera. This is a species of the boreomountain distribution, and has been formerly taken on the following other mountains: the small peat bog Semolj (1550 m) on the mount Sinjavina, in Montenegro (ANĐUS & ADAMOVIĆ, 1985); Veliko Jezero (1550 m) on the mount Treskavica, in Bosnia (ADAMOVIĆ, 1948); the peat bog Daićsko Jezero (1556 m) on the mount Golija, in Serbia (ADAMOVIĆ, 1949, 1990); and, the large peat bog Vlasina (1219 m) in Serbia (a teneral male, taken by Ž. Adamović on the 27th June, 1947; the data unpublished). The species has been recorded in the country surrounding Ljubljana (300 m) and the Triglav National Park (1400 m) in Slovenia (KIAUTA, 1960, 1961). *A. juncea* has been found at 2000 m (Belički Močuri, peat bog), and 2200 m (Ribnite Ezera) on the mount Rila, in Bulgaria (BESHOVSKI, 1960, 1964). According to FUDAKOWSKI (1930) the species has been recorded at 1400 m on the mount Tatry, Poland; at 1740 m in Tyrol, and 2500 m on the mount Pyrenees. Larvae of *A. juncea* are to be found at an altitude of 2000 m, and adult dragonflies at 2200 m in the German mountains (SCHIEMENZ, 1953). The species is to be found at an altitude of 2400 m in the Italian Alps (CONCI & NIELSEN, 1956). According to KIAUTA & KIAUTA (1986) "this is the dominant *Aeshna* species in the alpine zone" in Switzerland. Adult dragonflies were found from 435 m (Flums) to 1800 m (Murgsee), and larvae were taken at 1670 m in a sphagnum moor (Charzenberg), in that country. The authors added the following comment: "in the Flumserberg area records from lower elevations are exceptional". Larvae and exuviae of *A. juncea* have been found on the mount Jura and / or the Alps, from 530 m to 2240 m altitude, in Switzerland (WILDERMUTH, 1992). BELYSHEV (1968) described *A. juncea* as one of the most widely distributed dragonfly in the Siberia, which is to be found from the mount Ural to the Kamčatka Peninsula, and to the 70 N latitude in the valleys of the river Jenisej and the Lena.

13. *Aeshna grandis* (Linnaeus, 1758)

Crno Jezero 21. VIII-1983, 1 ♂ (M.V.); Mlinški Potok 21. VIII-1983, 2 ♂♂ (M.V.); 13. VIII-1989, 1 ♀ (Ž.A.); 19. VIII-1991, 1 ♂ (Ž.A.); Žabljačka Rijeka 24. VIII-1983, 1 ♀ (M.V.); 29. VIII-1992, 2 ♂♂ (Lj. M.); Zminje Jezero 29. VIII-1984, 1 ♀ (S.V.) 13. VIII-1989, 1 ♂ (Ž.A.); Jablan Bara 16. VIII-1989, 1 ♀ (Ž.A.); Barno Jezero 13. VIII-1990, 1 ♂ 3 ♀♀ (Ž.A.); 3 ♂♂ (N.M.); 29. VIII-1992, 5 ♂♂ 1 ♀ (Lj. M.); Goveđa Jezera 14. VIII-1990, 1 ♂ (Ž.A.). (Fig. 8 and 9).

A. grandis is a moderately common species in the area of Durmitor, from 1400 m to 1850 m. Copulation and oviposition were observed at Barno Jezero, Zminje Jezero, Pošćensko Jezero and Žabljačka Rijeka. The species has been found previously in the Triglav National Park (about 1400 m), and the mount Pokljuka (1200 m) in Slovenia (KIAUTA, 1960, 1961). FRAY (1951) described *A. grandis* as the most frequent *Aeshna*-species in Oberbayern and Schwaben (about 1200 m) in Germany. According to FUDAKOWSKI (1930) the species has been recorded at the altitude of 1226 m on the mount Tatry, Poland; and 1580 m in Tyrol. According to SCHIEMENZ (1953), the species is to be found at an altitude of 1400 m in Alps. KIAUTA & KIAUTA (1986) found *A. grandis* at Flums (435 m) and Schwarzsee (1621 m) in the Flumserberg region of eastern Switzerland, and made an interesting remark "in the Flumserberg area it does not show any altitudinal preferences." According to BELYSHEV (1968) *A. grandis* reaches Lake Baykal to the east, and the country surrounding the village of Andri (about the 63 N latitude) in the river Ob valley, in the west Siberia.

14. *Aeshna cyanea* (Müller, 1764)

Mlinski Potok 2.V-1982, 1 ♂ (M.V.); 21.VIII-1984, 1 ♀ (S.V.); 13.VIII-1989, 2 ♀♀ (Ž.A.); Crno Jezero 18.VII-1983, 2 ♂♂ (M.V.); 24.VIII-1983, 3 ♀♀ (M.V.); 14.VIII-1985, 1 ♂ (D.P.); 13.VIII-1990, 2 ♂♂ 1 ♀ (N.M.); Barno Jezero 13.VIII-1990, 1 ♂ 1 ♀ (N.M.); Pirlitor 29.VIII-1984, 1 ♂ (S.Š.); Goveda Jezera 14.VIII-1990, 3 ♂♂ (Ž.A.); Žugića Bare 17.VIII-1990, 3 ♂♂ (Ž.A.); Zminje Jezero 18.VIII-1991, 3 ♂♂ (Ž.A.); Otoka 13.VIII-1990, 1 ♂ (Lj. M.); Žabljačka Rijeka 29.VIII-1992, 8 ♂♂ 1 ♀ (Lj. M.). (Fig. 10 and 11)

A. cyanea is a rare species in the area of Durmitor, from 1400 m to 1520 m. Copulation and oviposition were observed at Barno Jezero, Goveda Jezera, Žugića Bare and Žabljačka Rijeka. The species has been found previously as a rare and sporadic dragonfly from lowlands to hilly area and mountains of Bosnia, Croatia and Serbia. The species has been recorded in the following mountains: Ivan (about 1000 m), and Treskavica (1550 m) in Bosnia (ADAMOVIĆ, 1948); Rajac (840 m) and Miroč (760 m) in Serbia (ANĐUS, 1985; and unpublished data). It was found by KIAUTA (1960) in the Triglav National Park (about 1400 m) in Slovenia. According to SCHIEMENZ (1953) *A. cyanea* is to be found up to 1400 m in the mountains of Germany, as well as on the mount Tatry, Poland (FUDAKOWSKI, 1930). KIAUTA & KIAUTA (1986) found the species from 435 m (Flums) to 1622 m (Grosse) in the eastern Switzerland, and added an interesting remark: "In the Flumserberg area this is the most common *Aeshna* species of the lower elevations. Above the 1000 m mark it is rare, at higher elevations it is practically entirely replaced by *A. juncea*". *A. juncea* is by far more frequent than *A. cyanea* in the area of Durmitor. INOUE & OGAWA (1992) found recently several males of *A. cyanea* at La da Tarasp (1404 m), several males at Lai da Staz (1809 m) and one male at Palüds dels Pelets, St. Moritz (1820 m), in Engadine, Switzerland.

15. *Aeshna mixta* (Latreille, 1805)

Zminje Jezero 5.VIII-1985, 1 ♂ (D.P.); Bistrica 12.VIII-1990, 1 ♀ (Lj. M.). (Fig. 12).

A. mixta is an extremely rare species in the area of Durmitor. It has been taken at altitude of 850 m (Bistrica) and 1520 m (Zminje Jezero). This is a common, late summer and early autumn, dragonfly in lowlands and, partly, hilly area of Yugoslavia (ADAMOVIĆ, 1948, 1949; ANĐUS, 1985). It has been also found at the following locations in mountains: Gacko (950 m) in Hercegovina (ADAMOVIĆ, 1948); Topli Do (700 m) and Dugo Bilo (1900 m) on the mount Stara Planina in Serbia (ADAMOVIĆ, 1949); Gračanička Reka (about 700 m) on the mount Jastrebac, and Račanska Reka (about 900 m) on the mount Tara, in Serbia (ANĐUS, 1985). The species has been found at about 800 m on the mount Stara Planina in Bulgaria (MAUERSBERGER, 1990). According to SCHIEMENZ (1953), *A. mixta* "avoids mountains" in Germany.

16. *Anax imperator* (Leach, 1815)

Pošćenska Bara 18.VIII-1990, 1 ♂ (Ž.A.)

A. imperator is an extremely rare species in the area of Durmitor. A single male was seen and taken at an altitude of 1000 m (Poščenska Bara). This is a widely distributed and common species in lowlands of Yugoslavia. The species has been also recorded on the mount Jahorina (about 1100 m), in Bosnia (ADAMOVIĆ, 1948). *A. imperator* has been found at Prespa Lake (853 m) in Greece (DEVOLDER, 1990). According to ROBERT

(1959), *A. imperator* is a typical dragonfly of the plain, which is to be found in a hilly area to an altitude of 500 m, and only rarely to 1000 m. SCHIEMENZ (1953) marked 1226 m, as maximum in the altitudinal distribution of *A. imperator*. Everything quoted is valid for the distribution of the species in Yugoslavia.

4.1.7. GOMPHIDAE

17. *Onychogomphus forcipatus* (Linnaeus, 1758)

Bijeli Potok 15.VIII-1989, 1 ♂ (Ž.A.); 14.VIII-1991, 36 ♂♂ 7 ♀♀ (Ž.A.); Žugića Bare 16.VIII-1990, 1 ♀ (Lj. M.). (Fig.13)

O. forcipatus seems to be restricted to the rivulets on the plateau Jezera (about 1400 m). The copulation and oviposition of the species were observed at Bijeli Potok. *O. forcipatus* is a common and widely distributed dragonfly in lowlands and hilly area of Yugoslavia. However, the species has been also recorded at the following locations, in the mountains, namely: Ribnica (1000 m) on the mount Zlatibor, and Topli Do (700 m) on the mount Stara Planina, in Serbia (ADAMOVIĆ, 1948, 1949); Gračanička Reka (about 700 m) on the mount Jastrebac, Račanska Reka (about 900 m) on the mount Tara, and Divčibare (980 m) on the mount Maljen, in Serbia (ANĐUS, 1985). KIAUTA (1960) recorded the species in the Triglav National Park (about 1400 m) in Slovenia. *O. forcipatus* has been taken at an altitude of 800 m on the mount Stara Planina in Bulgaria (MAUERSBERGER, 1990), and 853 m (Prespa Lake) in Greece (DEVOLDER, 1990). According to ROBERT (1959), the species is distributed almost everywhere in France, Switzerland and Germany; it is to be found along streams and large lakes, but also at forest brooks up to an altitude of 800 m. A female has been found at 1100 m, in Bavaria, Germany (LOHMANN, 1967). Everything is the very same about the distribution of *O. forcipatus* in Yugoslavia, except the altitudinal distribution, namely: the species is locally a common dragonfly at an altitude of 1400 m, in mountains.

4.1.8. CORDULEGASTRIDAE

18. *Cordulegaster bidentata* (Selys, 1843)

Bistrica 12.VIII-1990, 1 ♂ (Lj. M.).

A single male has been taken at an altitude of 850 m, in the canyon of the river Bistrica. *C. bidentata* is a sporadic but widely distributed species, particularly in hilly area of Yugoslavia. It has been also recorded at the following locations in the mountains: Kolašin (about 900 m) in Montenegro (DUMONT, 1977); Goražde (about 600 m) and Glamoč (about 900 m) in Bosnia (KLAPALEK, 1898); Foča (about 500 m), the mount Igman (about 1200 m), the mount Vranica (about 1000 m) also in Bosnia (ADAMOVIĆ, 1948); the mount Deli Jovan (about 700 m) in Serbia (ADAMOVIĆ, 1949); Račanska Reka (about 900 m) on the mount Tara, in Serbia (ANĐUS, 1985); the rivulet Manastirski Potok (450 m) near Strumica (ADAMOVIĆ, 1990), Bogomila (about 500 m) on the mount Golešnica, a site in the area of Ljuboten (about 1500 m) on the mount Šara, a location at about 1500 m on the mount Pelister (BUCHHOLZ, 1963; KARAMAN, 1969), and a location at 1400 m, on the mount Ilinska Planina (PETERS & HACKETHAL, 1986), all in Macedonia. The species has been noticed up to 1000 m, in Slovenia (KIAUTA, 1961). *C. bidentata* has been recorded in Albania from 400 m to 1200 m altitude (BILEK, 1966). Nine specimens

have been taken at altitude between 700 m and 1000 m on the mount Stara Planina in Bulgaria (MAUERSBERGER, 1990). According to SCHIEMENZ (1953). *C. bidentata* is to be found in the mountains of Europe up to 1700 m.

4.1.9. CORDULIIDAE

19. *Cordulia aenea* (Linnaeus, 1758)

Zminje Jezero 29.VIII-1984, 2 ♂♂ (Lj. P.); 3.VIII-1985, 1 ♂ (M. Ž.); 11.VII-1987, 1 ♂ 2 ♀♀ (M.Ž.); Crno Jezero 24.VII-1984, 1 ♂ (D.P.); 14.VIII-1987, 1 ♂ (Lj. A.); Barno Jezero 11.VIII-1989, 1 ♂ (Ž.A.); 13.VIII-1990, 1 ♂ (Ž.A.); 11.VII-1991, 11 ♂♂ (Lj.M.); 12.VIII-1991, 37 ♂♂ (Ž.A.); 19.VIII-1991, 2 ♂♂ (Ž.A.); 29.VIII-1992, 1 ♂ (Lj.M.). (Fig. 14).

C. aenea is a common species at various water bodies in the area of Durmitor, from 1400 to 1520 m. Copulation and oviposition were observed at Barno Jezero and Zminje Jezero. *C. aenea* is a widely distributed species in lowlands of Yugoslavia (ADAMOVIĆ, 1948, 1949; ANĐUS, 1985). The species has been also recorded at the following sites situated in the mountains: the small peat bog Semelj (1550 m) on the mount Sinjavina, in Montenegro (ANĐUS & ADAMOVIĆ, 1985); the large peat bog Vlasina (1219 m) on the mount Vardenik (ADAMOVIĆ, 1949; ANDJUS, 1985); the small peat bog Daičko Jezero (1556 m) on the mount Golija in Serbia (ADAMOVIĆ, 1990). KIAUTA (1960) recorded the species in the Triglav National Park (about 1400 m) in Slovenia. *C. aenea* has been found at Prespa Lake (853 m) in Greece (DEVOLDER, 1990). According to ROBERT (1959), the species is to be found up to 1780 m in the Alps. KIAUTA & KIAUTA (1986) found *C. aenea* at the large marshy pond Schwarzsee (1621 m) in the Flumserberg area of Switzerland. BELY SHEV (1968) estimated *C. aenea* as one of the most widely distributed species in the Siberia, extending from the mount Ural to the Kamčatka Peninsula, and exceeding here and there the Arctic circle.

20. *Somatochlora metallica* (Vander Linden, 1825)

Jakšića Katun 19.VII-1983, 1 ♀ (M.V.); Zminje Jezero 29.VIII-1984, 4 ♂♂ 1 ♀ (S.V.); 13.VIII-1989, 2 ♂♂ (Ž.A.); 18.VIII-1991, 31 ♂♂ (Ž.A.); Barno Jezero 11.VIII-1989, 3 ♂♂ (Ž.A.); 12.VIII-1990, 1 ♂ (N.M.); 13.VIII-1990, 1 ♂ (Ž.A.); 19.VIII-1991, 4 ♂♂ (Ž.A.); Crno Jezero 14.VIII-1989, 3 ♂♂ (Ž.A.); 13.VIII-1990, 1 ♂ (N.M.); 30.VIII-1992, 1 ♂ (Lj. M.); Žabljačka Rijeka 15.VIII-1976, 2 ♂♂ 2 ♀♀ (Lj.M.); 18.VIII-1990, 1 ♂ (P.G.); 12.VII-1991, 1 ♂ (Lj. M.); Goveđa Jezera 12.VII-1991, 1 ♂ (Lj. M.); Otoka 12.VIII-1991, 1 ♂ (Ž.A.); Žugića Bare 14.VIII-1991, 1 ♂ (Ž.A.).

S. metallica is a common species along the streams and at the lakes and peat bogs in the area of Durmitor, from 1400 m to 1820 m. Copulation and oviposition were observed at Zminje Jezero, Barno Jezero and Žugića Bare. KIAUTA (1960, 1961) recorded the species in the Triglav National Park (about 1400 m) and Bohinj Lake (525 m), Slovenia. *S. metallica* has been found at the peat bogs Beličkite Močuri (1800 m) on the mount Pirin, and Ribnite Ezeri (2200 m) on the mount Rila, in Bulgaria (BESHOVSKI, 1960, 1964). The species is to be found in the Alps at an altitude of 1500 m (FREY, 1951), or 1730 m (ROBERT, 1959). "*S. metallica* and *S. alpestris* females were found ovipositing" at the sides of the peat bog (1925 m) Laghi di Colbrico, Trentino (MORTON, 1928). KIAUTA & KIAUTA (1986) found *S. metallica* in the Flumserberg area of Switzerland, from 490 m



Fig. 13. - *Onychogomphus forcipatus* (L.) male



Fig. 14. - *Cordulia aenea* (L.) male



Fig. 15. - *Platetrum depressum* (L.) female



Fig. 16. - *Sympetrum flaveolum* (L.) female

(Plons) to an altitude of 1670 m (Chatzenberg), and added the following remark: "it breeds in all Seebenalp lakes, and occur there in large number". This is valid for the distribution of the species in the area of Durmitor. According to BELYSHEV (1968) *S. metallica* is widely distributed in the Siberia from the mount Ural to the Kuril Islands, reaching about the parallel of 60 N latitude in the river Ob valley and 70 N latitude in the river Lena valley.

4.1.10. LIBELLULIDAE

21. *Libellula quadrimaculata* (Linnaeus, 1758)

Zminje Jezero 3.VIII-1985, 1 ♀ (M.Ž.); 18.VIII-1991, 2 ♂♂ (Ž.A.); Mlinski Potok 11.VII-1987, 1 ♀ (M.Ž.); Žabljačka Rijeka 14.VIII-1987, 1 ♂ (Lj.A.); Barno Jezero 13.VIII-1990, 3 ♂♂ 4 ♀♀ (Ž.A.); 11.VII-1991, 7 ♂♂ 1 ♀ (Lj. M.); 12.VIII-1991, 2 ♂♂ 5 ♀♀ (Ž.A.); Goveđa Jezera 12.VII 1991, 2 ♂♂ (Lj. M.).

L. quadrimaculata is a moderately rare species in the area of Durmitor. Copulation and oviposition were observed at Zminje Jezero, Barno Jezero, and Žabljačka Rijeka. The species has been formerly recorded at the following sites in hilly and mountainous area of Yugoslavia: the mount Igman (about 1000 m), and the mount Zelengora (1800 m) in Bosnia (ADAMOVIĆ, 1948); the large peat bog Vlasina (1219 m), and small peat bog Daićsko Jezero (1556 m) on the mount Golija, in Serbia (ADAMOVIĆ, 1949, 1990); Ohrid Lake (695 m) in Macedonia (FILEVSKA, 1954, PETERS & HACKETHAL, 1986). KIAUTA (1960) recorded the species in the Triglav National Park (about 1400 m) in Slovenia. According to SCHIEMENZ (1953), *L. quadrimaculata* is one of the most frequent dragonfly species in Germany, occurring to an altitude of 1230 m in the Alps. The species is to be found from Camargue, Mediterranean Sea coast, to 1200 m in the French mountains, and more than 2000 m in Pyrenees (AGUESSE, 1968). According to BELYSHEV (1968) the species is distributed from the mount Ural to the Kamčatka Peninsula, in the Siberia. The northern distribution limit of *L. quadrimaculata* in the Siberia goes roughly along the parallel of 63 N latitude. The species has been found in the country surrounding Jakutsk.

22. *Platetrum depressum* (Linnaeus, 1758)

Mlinski Potok 21.VIII-1983, 1 ♀ (M.V.); 11.VII-1987, 1 ♂ (M.Ž.); Poščenska Bara 18.VIII-1990, 1 ♂ (Ž.A.); Otoka 12.VIII-1991, 1 ♂ (Ž.A.).

P. depressum is an extremely rare species in the area of Durmitor. This is a common dragonfly in lowlands of Yugoslavia. *P. depressum* has been found sporadically as rare species in hilly area and extremely rare in the mountains, namely: Rogatica (525 m) in Bosnia (KLAPALEK, 1898); Pale (1000 m) in Bosnia (ADAMOVIĆ, 1948); the large peat bog Vlasinska Tresava (1219 m), and the mount Rajac (about 800 m) in Serbia (ADAMOVIĆ, 1949; ANĐUS, 1985); Ljuboten (about 1500 m) on the mount Šara (ADAMOVIĆ, 1948), Lake Ohrid (695 m) in Macedonia (FILEVSKA, 1954). According to PETERS & HACKETHAL (1986) this dragonfly is to be seen to an altitude of 1500 m in Macedonia. The species has been recorded in the Triglav National Park (about 1400 m) and the mount Pokljuka (1000 m) in Slovenia (KIAUTA, 1960, 1961). *P. depressum* has been found at about 800 m, on the mount Stara Planina, in Bulgaria (MAUERSBERGER, 1990). According to ROBERT (1959) the species is to be found up to 1000 m, in the mount Jura. FUDAKOWSKI (1930) recorded *P. depressum* at 1080 m on the mount Tatry, and 2900 m on the mount Pyrenees.

23. *Sympetrum striolatum* (Charpentier, 1840)

Zminje Jezero 29.VIII-1984, 1 ♀ (S.V.); Mlinski Potok 13.VIII-1989, 1 ♂ (Ž.A.); Riblje Jezero 15.VIII-1989, 1 ♂ (Ž.A.); Crno Jezero 13.VIII-1990, 1 ♀ (N.M.); 30.VIII-1992, 1 ♂ (Lj. M.)

S. striolatum is an extremely rare species in the area of Durmitor. The species is widely distributed in lowlands of Yugoslavia, and particularly common in the Mediterranean area (ADAMOVIĆ, 1948, 1949, 1967, 1990; KIAUTA, 1969; GEISTER & SOVINČ, 1992). It has been also recorded in the hilly and mountainous part of the country, namely: Rogatica (525 m), Pale (1000 m), and Gacko (900 m) in Bosnia and Hercegovina (KLAPALEK, 1898; ADAMOVIĆ, 1948); Divčibare (980 m) in Serbia (ADAMOVIĆ, 1949); Vratnica (500 m) and Ljuboten (about 1500 m) on the mount Šara, in Macedonia (BUCHHOLZ, 1963); the mount Skopska Crna Gora (about 800 m) in Macedonia (KARAMAN, 1969). *S. striolatum* has been found on the mount Stara Planina, from 500 to 800 m, in Bulgaria (MAUERSBERGER, 1990). According to SCHIEMENZ (1953) the species is to be found at 1800 m, in the Alps. KIAUTA (1983) recorded *S. striolatum* (and *S. meridionale*) at a "Gletschergeröllteich" (2720 m) on the glacier-island Isla Persa in Bernina-Massif, Switzerland.

24. *Sympetrum flaveolum* (Linnaeus, 1758)

Mlinski Potok 23.VIII-1983, 1 ♀ (M.V.); Crno Jezero 30.VIII-1992, 8 ♂♂ 4 ♀♀ (Lj. M.); Vražje Jezero 23.VIII-1984, 1 ♂ 2 ♀♀ (Lj. P.); 15.VIII-1989, 3 ♂♂ 3 ♀♀ (Ž.A.); Riblje Jezero 14.VIII-1987, 1 ♀ (Lj.A.); 14.VII-1988, 1 ♂ (Lj. A.); 15.VIII-1989, 5 ♂♂ 2 ♀♀ (Ž.A.); Bijeli Potok 15.VIII-1989, 1 ♂ 1 ♀ (Ž.A.); Barno Jezero 11.VIII-1989, 7 ♂♂ 17 ♀♀ (Ž.A.); 2 ♂♂ (M.B.); 3 ♀♀ (M.T.); 13. VIII-1990, 3 ♂♂ 3 ♀♀ (Ž.A.); 1 ♂ (N. M.); 12.VIII-1991, 3 ♂♂ 1 ♀ (Ž.A.); 19.VIII-1991, 1 ♂ 2 ♀♀ (Ž.A.); 29.VIII-1992, 6 ♂♂ 6 ♀♀ (Lj. M.); Zminje Jezero 13.VIII-1989, 2 ♀♀ (Ž.A.); 18.VIII-1991, 1 ♂ (Ž.A.); Pošćensko Jezero 15.VIII-1989, 1 ♂ 1 ♀ (Ž.A.); Jablan Bara 16.VIII-1989, 1 ♀ (Ž.A.); Goveda Jezera 14.VIII-1990, 1 ♂ (Ž.A.); Valovito Jezero 15.VIII-1990, 2 ♀♀ (Ž.A.); Žugića Bare 17.VIII-1990, 10 ♂♂ 10 ♀♀ (Ž.A.); 14.VIII-1991, 1 ♂ 5 ♀♀ (Ž.A.); Malo Crno Jezero in Nadgora 17.VIII-1990, 1 ♂ 1 ♀ (Ž.A.); Dragana 17.VIII-1990, 3 ♂♂ 1 ♀ (Ž.A.); Pošćenska Bara 18.VIII-1990, 10 ♂♂ 4 ♀♀ (Ž.A.); Pošćenska Tresava 18.VIII-1990, 1 ♂ 1 ♀ (Ž.A.). (Fig. 16).

S. flaveolum is a common species at various lakes and ponds in the area of Durmitor, from 1000 m to 1850 m. The species is widely distributed in Yugoslavia. It has been formerly recorded at some locations in mountainous area of the country, namely: the small peat bog Semolj (1550 m) on the mount Sinjavina, in Montenegro (ANĐUS & ADAMOVIĆ, 1985); Kalinovik (1100 m), and Veliko Jezero (1550 m) on the mount Treskavica, in Bosnia (ADAMOVIĆ, 1948); the large peat bog Vlasinska Tresava (1219 m), and Sjenica (1100 m) in Serbia (ADAMOVIĆ, 1949; ANĐUS, 1985); lake Ohrid (695 m) and Velmež (850 m) in Macedonia (FILEVSKA, 1954; PETERS & HACKETHAL, 1986, respectively). *S. flaveolum* has been recorded in the country surrounding Ljubljana (300-500 m), Bohinj Lake (525 m), and Triglav National Park (about 1400 m) in Slovenia (KIAUTA, 1960, 1961). FUDAKOWSKI (1930) examined *S. flaveolum* at 920 m on the south and 1350 m on the north slopes (max. 2550 m) of the mount Tatry, Poland. According to PRENN (1935) *S. flaveolum* was abundant at Gampenwiesen (2016 m) in S. Tyrol. *S. flaveolum* has been found at an altitude of about 800 m on the mount Stara Planina (MAUERSBERGER,

1990), and 2200 m (Popovo Ezero) on the mount Pirin, in Bulgaria (BESHOVSKI, 1960). *S. flaveolum* "is not rare in the Alps of Italy, and it was also recorded certainly only in the Appennino Mountains, at the altitude of more than 1000 m, towards SW till Abruzzi on the Peninsula" (CONCI & NIELSEN, 1956). The species has been recorded at Ovindoli (1400 m) and Castel del Monte (1300-1500 m), Gran Sasso d'Italia, Appennino Abruzzese (NIELSEN & CONCI, 1951); and, at Lac Noir (2040 m), Dauphiné and Lac de Lait (2180 m), Savoie in France (DEGRANGE & SEASSAU, 1974). According to SCHIEMENZ (1953) the species is to be found to an altitude of 2765 m in the Alps. According to BELYSHEV (1968) *S. flaveolum* is distributed from the mount Ural to the Kamčatka Peninsula, reaching the upper stream of the river Jana to the north, about 65° N latitude.

25. *Sympetrum sanguineum* (Müller, 1764)

Crno Jezero 14.VIII-1987, 1 ♂ (Lj. A.); Pošćenska Bara 18. VIII-1990, 1 ♂ (Ž.A.).

S. sanguineum is an extremely rare species in the area of Durmitor. The species is common and widely distributed in the lowlands of Yugoslavia. It has been also found at Ohrid Lake (695 m) in Macedonia (FILEVSKA, 1954). KIAUTA (1960) recorded the species in the Triglav National Park (about 1400 m) in Slovenia. *S. sanguineum* has been found at an altitude of about 800 m, on the mount Stara Planina, in Bulgaria (MAUERSBERGER, 1990), and 855 m (Prespa Lake) in Greece (DEVOLDER, 1990). ROBERT (1959) cited DE BEAUMONT's record of *S. sanguineum* at Lake Ter (1023 m), on the mount Jura.

26. *Tarnetrum fonscolombi* (Selys, 1840)

Bistrica 12.VIII-1990, 5 ♂♂ 7 ♀♀ (Ž.A.); Bijeli Potok 17.VIII-1990, 3 ♂♂ 3 ♀♀ (Ž.A.).

T. fonscolombi was common species on pebbly terraces of the river Bistrica (800 m), and a rare species on the rocky bank of the rivulet Bijeli Potok (1410 m). This is a common species in the Mediterranean lowlands of Yugoslavia (ADAMOVIĆ, 1948, 1967; GEISTER & SOVINC, 1992, DUMONT, 1977). However, it has been found at the large peat bog Vlasinska Tresava (1219 m) in Serbia (ADAMOVIĆ, 1949). *T. fonscolombi* has been found at an altitude of 800 m, on the mount Stara Planina, in Bulgaria (MAUERSBERGER, 1991), and 853 m (Prespa Lake) in Greece (DEVOLDER, 1990). ROBERT (1959) cited DE BEAUMONT's records of *T. fonscolombi* at Tenasses (1235 m) in the Alps and Lake Ter (1023 m) in the mount Jura. MORTON (1928) made an interesting comment on finding of *T. fonscolombi* at a lake (over 1500 m) in Trentino, Italy: "the species seldom fails to appear at such elevated lakes and is very often to be seen ovipositing, but it is more than doubtful that it maintains itself continuously at these high-lying places, the supply being kept up by fresh immigrants from the lower parts of the valleys."

27. *Leucorrhinia dubia* (Vander Linden, 1825)

Mlinski Potok 13.VII-1983, 2 ♀♀ (M.V.); 11.VII-1987, 1 ♂ 1 ♀ (M.Ž.); Barno Jezero 11.VIII-1989, 1 ♂ 1 ♀ (Ž.A.); 13.VIII-1990, 1 ♀ (Ž.A.); 11. VII-1991, 12 ♂♂ 3 ♀♀ (Lj.M.); 12.VIII-1991, 2 ♂♂ 2 ♀♀ (Ž.A.); 19.VIII-1991, 2 ♂♂ 3 ♀♀ (Ž.A.).

L. dubia was a moderately rare species at the peat bog Barno Jezero (1489 m), in the area of Durmitor. This species has boreo-mountain distribution, breeding regularly in sphagnum peat bogs. Copulation and oviposition were observed at Barno Jezero. The species

has been formerly found at two other peat bogs, namely: Semolj (1550 m) on the mount Sinjavina, in Montenegro (ANĐUS & ADAMOVIĆ, 1985) and Daićsko Jezero (1550 m) on the mount Golija, in Serbia (ADAMOVIĆ, 1990). The species has been recorded in the Triglav National Park (about 1400 m) and mount Pokljuka (1200 m) in Slovenia (KIAUTA, 1960, 1961). FUDAKOWSKI (1930) examined *L. dubia* at 1350 m on the mount Tatry, Poland. PRENN (1935) recorded a couple of species at Gampenwiesen (2016 m) in S. Tyrol. According to SCHIEMENZ (1953) the species is to be found at an altitude of 2000 m, in the Alpes. KIAUTA & KIAUTA (1986) found *L. dubia* at the lake Schwarzsee (1621 m) in Switzerland. FREY (1951) estimated it as the most common *Leucorrhinia*-species in Oberbayern and Schwaben confined exclusively to sphagnum peat bogs. "The old records of *L. dubia* were exclusively from Alto Adige in Italy; the species was found the most frequently from the end of June to the middle of July, 1935 and 1941, at Lago d'Antorno (1800 m), Misurine, Veneto, Italy" (NIELSEN & CONCI, 1951). BALESTRAZZI et al. (1983) recorded the species at the sphagnum-bog of Pian di Gembro (1350 m) near Trivigno, N Italy. DEGRANGE & SEASSAU (1970) found *L. dubia* at Lac de Punay (1695 m), and the sphagnum-bog near Lac d'Achard (1880 m), Dauphiné, in France. The species has been discovered at the lake Estans de Trescuro (2000 m) on the Spanish side of the mount Pyrenees (MICHIELS & VERHEYEN, 1990). According to BELYSHEV (1968) *L. dubia* is distributed "only in W Siberia, reaching the Ob river-basin to the east and the Arctic circle to the north."

4.2. Patterns of the biogeographical distribution

The total of 27 Odonata species recorded in the area of Durmitor can be arranged into the following six groups according to the pattern of biogeographical distribution.

Holarctic distribution have 3 species (11.1%), namely:

Lestes dryas
Enallagma cyathigerum
Libellula quadrimaculata;

Palaearctic-Aethiopian-Oriental distribution, 1 species (3.7%):

Tarnetrum fonscolombei;

Palaearctic-Aethiopian distribution, 1 species (3.7%):

Anax imperator;

Palaearctic-Mediterranean distribution, 18 species (66.7%):

<i>Calopteryx virgo</i>	<i>Cordulegaster bidentata</i>
<i>Calopteryx splendens</i>	<i>Cordulia aenea</i>
<i>Lestes virens</i>	<i>Somatochlora metallica</i>
<i>Lestes sponsa</i>	<i>Ischnura elegans</i>
<i>Platynemesis pennipes</i>	<i>Coenagrion puella</i>
<i>Pyrrhosoma nymphula</i>	<i>Aeshna grandis</i>
<i>Aeshna cyanea</i>	<i>Platetrum depressum</i>
<i>Aeshna mixta</i>	<i>Sympetrum striolatum</i>
<i>Onychogomphus forcipatus</i>	<i>Sympetrum sanguineum</i> ;

Palaearctic distribution, without Mediterranean, 1 species (3.7%):

Sympetrum flaveolum;

Boreo-mountain distribution, 3 species (11.1%):

Coenagrion hastulatum

Aeshna juncea, and

Leucorrhinia dubia.

The list of dragonfly species found in the area of Durmitor is, on a certain way, very similar to the Odonata fauna recorded on some other high mountains of Europe, namely: Pyrenees, Alps, Carpathians, Balkans, Caucasus. All the 27 dragonfly species found in the area of Durmitor have been previously recorded on the Swabian-Bavarian table-land from about 600 m to 1500 m, in south Germany (FREY, 1951). Almost all the 27 species taken on the mount Durmitor have been formerly recorded on many other European mountains, namely: the Triglav National Park, from 1319 m (Crno Jezero) to 2002 m (Rjava Mlaka), on the Julian Alps in Slovenia (KIAUTA, 1960); the north Tyrol, from 503 m (Kufstein) to 892 m (Hintersteinersee), in Austria (PRENN, 1926); Tyrol and Trentino, from 762 m (Schwarzsee) to 1925 m (Laghi di Colbricon) in Austria and Italy (MORTON, 1928); "una palude" at 2274 m (Val del Carerer) in Venezia Tridentina, Italy (CONCI, 1948); the sphagnum bogs in Auvergne, France (FRANCEZ & BRUNHES, 1983); the Chiemgau Alps from 518 m (Chiemsee) to about 1500 m (Hochriss), in Bavaria (LOHMANN, 1967); Tatra Mountains from 900 m (Mlaki pod Capkami) to 1400 m (Mlaka kolo Morskiego Oka) in Poland (FUDAKOWSKI, 1930); the mount Schwarzwald, at 880 m (Hinterzarten Moor) in Germany (SCHMIDT, 1967); the lake Geroldsee at 929 m, near Garmisch-Partenkirchen, in Germany (SCHMIDT, 1987 a); the Flumserberg region, from 425 m (Walensee) to 2000 m (Alp Eursch) in Switzerland (KIAUTA & KIAUTA, 1986); the Canton of Grisons, from 530 m (Oberau) to 2225 m (Jufplaun), the average altitude of 38 sites examined is 1557 m, in Switzerland (SCHIESS & DEMARMELS, 1979); Sphagnum bogs in the Hautes-Vosges, France (BOUDOT et al., 1990); Lac de Luitel (1235 m) and Lac de Praver (1170 m), Dauphiné, in France (DEGRANGE & SEASSAU, 1970); the sphagnum-bog of Pian di Gembro (1350 m), near Trivigno, N Italy (BALESTRAZZI et al., 1983). In addition, the mount Durmitor dragonfly fauna is similar to those which have been recorded in Scandinavia, Baltic, Finland, and the area of the Boreal coniferous forests in Russia (MILERZEJEWSKI, 1913; SCHMIDT, 1978; VALTONEN, 1980; BELYSHEV & HARTONOV, 1981).

However, the differences between the Odonata fauna of the mount Durmitor and those of the above mentioned European mountains are also interesting.

HOLDHAUS (1912) gave a rigid definition of the boreoalpine (glacial relict) species and, consequently, estimated only *Aeschna caerulea* (STURM, 1783) and *Somatochlora alpestris* (SELYS, 1840) as dragonfly species fit for such a signification. The two species have a strict boreoalpine distribution, being absent in a considerably wide belt between the northern and mountainous areas of distribution. The distribution and ecology of those two stenoeicous species have been repeatedly examined (PRAENN, 1935; ST. QUENTIN, 1938; ANDER, 1950). Both species have been recorded in the Central European mountains, including the Slovenian Alps (KIAUTA, 1960, KIAUTA & KIAUTA, 1992). However, any one of these species has not been found either in the Durmitor range or in any other mountains of Montenegro, Serbia, Macedonia, Albania and Bulgaria.

Several other Odonata species, namely: *Coenagrion hastulatum* (CHARPENTIER, 1840), *Aeshna subarctica* WALKER, 1908, *Aeshna juncea* (LINNAEUS, 1758), *Somatochlora arctica* (ZETTERSTEDT, 1840), *Sympetrum danae* (SULZER, 1776), *Leucorrhin-*

ia rubicunda (LINNAEUS, 1758), and *Leucorrhinia dubia* (VANDER LINDEN, 1825), has the boreo-mountain distribution. They are often found together with *A. caerulea* and *S. alpestris* at the same sphagnum peat bogs on the European mountains. These species are not so stenotopic as two boreoalpine species, and have been also recorded at suitable locations in the belt stretching between nordic and alpine areas of distribution. However, a rational explanation of their disjunct distribution in the south European mountains must take also into account the changes produced by the Pleistocene glaciers, and the movement of species after the Würm glaciation. Almost all these species have been recorded in the Slovenian Alps, namely: *C. hastulatum*, *A. juncea*, *S. arctica* and *L. dubia* (KIAUTA, 1960, 1961), *S. danae* and *L. rubicunda* (GEISTER, 1992). A female of *A. subarctica* has been found at the peat bogs Belichki Mochuri (2000 m), on the mount Rila in Bulgaria (BESHOVSKI, 1960, 1991).

Three out of these seven species, *C. hastulatum*, *A. juncea* and *L. dubia*, have been found in the Durmitor range, Montenegro, and at the sphagnum peat bog Dačko Jezero (1556 m) in Serbia (ADAMOVIĆ, 1990).

The species *C. hastulatum*, *A. juncea* and *A. subarctica* have been recorded in the Bulgarian mountains (BEHOVSKI, 1960, 1991).

However, no one of the seven, above quoted, boreo-mountain species, has been recorded (until now) in the countries situated south from Serbia and Montenegro, namely: Albania (PUSCHING, 1926; BILEK, 1966; DUMONT, et al. 1993), and Macedonia (KARAMAN, 1969, 1981). PUSCHING (1926) pointed out to the lack of species of the "Torf - und Moor - Libellengattung *Leucorrhinia*" in Albania. PETERS HACKETHAL (1986) assumed that *Aeshna juncea* could be found on the high mountains in Macedonia.

ŠIMIĆ (1987) examined the hover-flies (*Diptera: Syrphidae*) in the area of Durmitor. She described - among many other details - the basin of Škrka as "a refuge of glacial relicts of Central European origin" and "a wide forest complex around Crno Jezero as a glacial refuge of the North European and European-Siberian syrphid species". The number of Odonata species with Boreoalpine distribution is only three. However, they are in a particular way interesting. - According to DŽUKIĆ (1991) "two groups of faunistic elements" among amphibians and reptiles of the mount Durmitor are of particular interest, namely: "Arcto-alpine with Boreal characteristic, and Mediterranean with Mediterranean-Central European characteristic. The boundary between the two dominant groups is determined approximately by the altitude of 1400 m". Three species: *Bufo bufo*, *Rana temporaria* and *Vipera berus* were listed as "Boreal elements" and the species *Salamandra atra* as an "Arcto-alpine element". - A total of 10 bird-species breeding on the mount Durmitor, namely: *Tetrao tetrix*, *Tetrao urogallus*, *Aegolius funereus*, *Picus canus*, *Aegithalos caudatus*, *Parus cristatus*, *Nucifraga caryocatactes*, *Bucephala clangula*, *Loxia curvirostra* and *Carduelis spinus*, have been estimated by VASIĆ et al. (1990) as "Boreal elements" in the bird-fauna of the mountain. "Boreal elements can be divided in two small groups" namely: the former seven species are distributed in the north Europe, and the latter three species in "the large boreal zone of Palearctic and even Holarctic".

While discussing likeness and dissimilarity between the mammals fauna of the mount Durmitor and the Alps, MIRIĆ (1987) pointed to an interesting fact, namely: three species, distributed in the Euro-Siberien mainly coniferous Boreal forests, *Lepus timidus*, *Microtus agrestis* and *Mustela erminea*, "which are specific for the Alps, were absent in the Durmitor National Park".

In addition, the southern limit of the Boreocontinental butterfly fauna stretches across the N and E Albania and the N Greece ("ohne zerstreute Exklaven") on the Balkan Peninsula (VARGA, 1975, Fig. 15). That is, actually, "Markgraf's line" of the southern range of the Central-European *Fagus-Abies* forests on the Balkan Peninsula, as it has been pointed out by HORVAT (1962): "die Grenze des zonalen mitteleuropäisch-illyrischen Buchen-Tannen-Waldes liegt in Nordgriechenland ungefähr an der Südgrenze Mitteleuropas im Sinne von MARKGRAF (1943)." Geographical division based upon the distribution of Odonata corresponds in particular details better with the schemes of geobotanists than those of many zoogeographers (BELYSHEV, CHARITONOV, BORISOV et al., 1989, p. 59).

4.3. Habitat distribution of the Odonata species

In order to collect data for "Representative Spectra of Odonata species" in EB. SCHMIDT's meaning (SCHMIDT, 1985), habitat distribution, relative abundance and reproductive behaviour of the dragonfly species have been examined in the following nine remarkable habitats out of the total of 25 locations visited in the area of Durmitor.

BARNO JEZERO - the sphagnum peat bog situated in a shallow depression among moraines, at 1489 m (CVIJIC, 1899). According to RADULOVIC (1984) the bog is about 250 m long, 80 m wide, and about 2 m deep, covering an area of 18,000 square metres. It was larger a hundred years ago. CVIJIC (1899) recorded that Barno Jezero was 320 m long and 150 m wide. Moreover, another smaller peat bog, 200 m s of Barno Jezero, has been marked on the CVIJIC's sketch map of the area. The depression is surrounded with a spruce forest. The lake is provided with water of melted snow, rainfall, run-off, and several short meandering streams. The outflowing stream of Barno Jezero is called Otoka. Transparency of water is till the bottom. According to BIRKS & WALTERS (1973) pH of the bog water ranged from 5.5. to 5.8, the rich-fen 5.5 to 7.0, and the poor-fen sites 5.0 to 5.5. The bog supports a scattered growth of *Nuphar luteum*. *Utricularia minor* is a submergent plant. In shallow water at and on the edge of the floating litoral raft *Phragmites australis* is joined by *Carex gracilis*, *C. lasiocarpa*, *C. vesicaria*, *C. nigra*, *C. limosa*, *Menyanthes trifoliata*, *Potentilla palustris*. The well-developed bryophyte raft consists mainly of *Scorpidium sorpioides*, *Acrocladium giganteum*, *Sphagnum contortum*. On slightly drier organic black peat substratum is found "carpet" of *Drepanocladus revolvens*, *D. vernicosus*, *Acrocladium trifarium*, *Scorpidium turgenscens*, with *Carex hostiana*, *C. panicea*, *C. lepidocarpa*, *C. capillaris*, *C. davaliana*, *C. echinata*, *C. pallescens*, *Sesleria coerulea*, *Juncus alpinus*, *Parnassia palustris*. Stands of *Eriophorum latifolium*, *Galium palustre*, *Deschampsia caespitosa*, *Briza media*, *Potentilla palustre*, *Dactylobriza maculata*, occur on SW side of the fen, particularly "along rather open soligenous soaks with *Blysmus compressus*, *Juncus alpinus* and *Carex lepidocarpa*" (BIRKS & WALTERS, 1973). A broad, level and moist area dominated by *Molinia coerulea* is found NW of the bog. Isolated trees of *Salix petandra* and *Pinus mugo* are found at the edge of the depression.

The Odonata species breeding in Barno Jezero:

<i>Lestes sponsa</i>	<i>Aeshna juncea</i>
<i>Lestes dryas</i>	<i>Aeshna grandis</i>
<i>Enallagma cyathigerum</i>	<i>Aeshna cyanea</i>
<i>Coenagrion puella</i>	<i>Cordulia aenea</i>

Somatochlora metallica
Libellula quadrimaculata

Sympetrum flaveolum
Leucorrhinia dubia.

ZMINJE JEZERO - the lake situated in a hole of the glacial trough, at altitude of 1520 m. It is 230 m long and 123 m wide, covering an area of 18,000 or 14,000 square metres, in spring and summer, respectively. The depth of lake is 7.7 m (STANKOVIĆ, 1975). The lake loses water through an underground channel connected with the karst spring of the Mlinski Potok. It is an oligotrophic lake with pH 7.4, and transparency to 4.2 m (ŽUNJIĆ, 1970). N, E and S litoral zones of the lake are shallow, muddy and overgrown with marshy vegetation. The following emergent plants were found: *Carex rostrata*, *C. nigra*, *Equisetum palustre*, *Heleocharis palustris*, *Juncus atratus*, *Potentilla palustre*, *Parnassia palustris*, *Galium palustre*. The species *Nuphar luteum* and *Potamogeton natans* are water plants with floating leaves, while *Potamogeton pusillus* is a common submergent plant in Zminje Jezero. The lake is enclosed by old spruce forest (Fig. 5).

The Odonata species breeding in Zminje Jezero:

Lestes sponsa
Lestes dryas
Pyrrhosoma nymphula
Enallagma cyathigerum
Aeshna juncea

Aeshna grandis
Cordulia aenea
Somatochlora metallica
Libellula quadrimaculata
Sympetrum flaveolum.

POŠĆENSKO JEZERO - the lake situated in a broad, shallow hollow at the end of the glacial trough Dobri Dol, at 1495 m. The lake is surrounded with marshy meadow, and luxuriant hay meadows. It covers an area of 15,300 square metres. The depth of lake is 3.6 m (STANKOVIĆ, 1975). Poščensko Jezero has a greater primary productivity than the glacial lakes Crno Jezero and Zminje Jezero. Secchi disk transparency is 3 m, and pH 7.4 (ŽUNJIĆ, 1970). The area of open water is about 120 m long and 70 m wide. Flourishing clumps of submergent plants are found in the water. The open water is enclosed by a floating wreath of *Potamogeton natans*, and after that a broad floating ring of *Nuphar luteum*. The broad, litoral belt of emergent vegetation is dominated by *Equisetum palustre*, *Typha latifolia* and *Carex rostrata*. A dense and thick mat of vegetation consisting of *Sphagnum* spp., and other moss species, with *Carex rostrata*, *Equisetum palustre*, *Menyanthes trifoliata*, *Parnassia palustris*, and other plants, grows on low, broad and muddy bank of Poščensko Jezero (Fig. 3).

The Odonata species breeding in Poščensko Jezero:

Lestes sponsa
Lestes dryas
Pyrrhosoma nymphula
Enallagma cyathigerum
Coenagrion hastulatum

Aeshna juncea
Aeshna grandis
Aeshna cyanea
Sympetrum flaveolum.

GOVEĐA JEZERA - two pools overgrown with marshy vegetation, situated in shallow depression among morains, at 1540 m. The pools are less than 2 m deep. They are surrounded with marshy meadow and spruce forest. The larger pool appears to be an intermittent water body. The smaller pool seemed to be much more interesting as a dragonfly breeding habitat. It is provided with water of melted snow, rainfall, run-off, and a spring. There is no outflowing stream of the pool. It supports a growth of *Nuphar luteum*. The

litoral belt of emergent vegetation consists of *Alisma plantago aquatica*, *Sparganium erectum*, *Carex lepidocarpa*, *C. gracilis*, *Deschampsia caespitosa*.

The Odonata species breeding in Goveđa Jezera:

<i>Lestes sponsa</i>	<i>Aeshna juncea</i>
<i>Lestes dryas</i>	<i>Aeshna cyanea</i>
<i>Coenagrion hastulatum</i>	<i>Sympetrum flaveolum</i> .

RIBLJE JEZERO - the lake situated in a broad, shallow depression among moraines on the plateau Jezera, at an altitude of 1409 m. It is surrounded with marshy meadows and luxuriant hay-meadows. The lake is 5.5 m deep, and covers an area of 42,400 square metres (STANKOVIĆ, 1975). Transparency of water is 3.8 m, and pH 7.3. Riblje Jezero has a greater primary productivity than the other glacial lakes of the area of Durmitor (ŽUNJIĆ, 1970). The open water is enclosed by *Potamogeton natans* and *Nuphar luteum* with floating leaves and flowers. Flourishing clumps of submergent plants consists of *Potamogeton lucens*, *P. crispus*, *P. mucronatus*, *Ranunculus trichophyllus*. Emergent vegetation consists of *Phragmites australis* and *Schoenoplectus lacuster* in deeper water, and *Juncus glaucus*, *Heleocharis palustris*, *Carex davalliana*, *C. gracilis*, *C. paniculata*, *C. flacca*, *C. buxbaumii*, *C. hostiana*, *Galium palustre*, in shallow, litoral water.

The Odonata species breeding in Riblje Jezero:

<i>Lestes virens</i>	<i>Enallagma cyathigerum</i>
<i>Lestes sponsa</i>	<i>Sympetrum striolatum</i>
<i>Lestes dryas</i>	<i>Sympetrum flaveolum</i> .

ŽUGIĆA BARE - a broad and deep part of the outflowing stream of the lake Riblje Jezero. The stream of clear and clean water flows slowly and meanderingly through swampy meadows dominated by *Carex rostrata*, at an altitude of 1400 m. It is from 4 m to 10 m wide, and more than 2 m deep, supporting a scattered growth of *Nuphar luteum*, and marginal growth of *Schoenoplectus lacuster*, *Carex nigra*, *C. rostrata*, *Potentilla palustris*, *Molinia coerulea*, *Parnassia palustris*. Moist, quaking peaty soil bears a dense, thick mat of several moss species with *Carex nigra* and *C. hostiana*. Bushes of *Salix rosmarinifolia* are found here and there.

The Odonata species breeding in Žugića Bare:

<i>Lestes sponsa</i>	<i>Aeshna cyanea</i>
<i>Lestes dryas</i>	<i>Onychogomphus forcipatus</i>
<i>Platychemis pennipes</i>	<i>Somatochlora metallica</i>
<i>Enallagma cyathigerum</i>	<i>Sympetrum flaveolum</i> .
<i>Aeshna juncea</i>	

BIJELI POTOK - the outflowing stream of the temporary pond Ševarita Bara. The Bijeli Potok and several other streams flow from S to N over a shallow and elongated depression on the central part of the plateau Jezera, at about 1400 m. The brooks flow meanderingly through swampy meadows dominated by *Carex rostrata*, and luxuriant hay-meadows. The lower part of the brooks are connected. The western branch of the ending stream enters a sink hole near the limestone hill Krš, while the eastern branch (Žugića Bare) enters another sink hole near the limestone hill Pešeljevac (BEŠIĆ, 1969).

The Odonata species breeding in Bijeli Potok:

Calopteryx virgo
Calopteryx splendens
Onychogomphus forcipatus

POŠĆENSKA BARA - the large pool of clean and clear water near the village of Pošćenje, at an altitude of 890 m. The pool supports a floating wreath of *Nuphar luteum*, and a flourishing submergent plants. The litoral belt of emergent vegetation consists of *Phragmites australis*, *Schoenoplectus lacuster*, *Sparganium erectum*, *Alisma plantago aquatica*, *Carex* spp. div.

The Odonata species breeding in Poščenska Bara:

Lestes dryas *Enallagma cyathigerum*
Ischura elegans *Sympetrum flaveolum*.

BISTRICA - the left bank tributary stream of the river Tara. The Bistrica originates on the mount Sinjavina, at an altitude of about 1300 m. It is almost 3 km long, entering the Tara at 750 m, in front of the river Tara canyon (MILOJEVIĆ, 1955). The lower part of the Bistrica is rich in water. It flows through the forest of *Alnus glutinosa* and *Salix alba*.

The odonata species breeding in the Bistrica:

Cordulegaster bidentata
Tarnetrum fonscolombeii

The results of field examinations of the habitat distribution, relative abundance and reproductive behaviour of the Odonata species - which were observed during four years, namely: 1989, 1990, 1991 and 1992 - are summarized in Table 1.

The habitat distribution and Representative Spectrum of Odonata Species of the sphagnum peat bogs, high mountain lakes and streams in the area of Durmitor appear to be in a good conformity to the results obtained by EB. SCHMIDT in Germanu, and published in the best studies about the subject (SCHMIDT, 1964, 1967, 1989). According to EB. SCHMIDT's grouping of the sphagnum peat bog Odonata, the dragonflies *Leucorrhinia dubia*, *Aeshna juncea*, *Coenagrion hastulatum*, *Lestes sponsa*, *Libellula quadrimaculata*, *Cordulia aenea* and *Enallagma cyathigerum* (which have been found at the sphagnum peat bog Barno Jezero and/or at other lakes examined) are the characteristic species of the sphagnum peat bogs in the Central European mountains. *Coenagrion puella*, *Aeshna cyanea*, *Aeshna grandis*, and *Sympetrum flaveolum* are the sphagnum peat bog tolerant species, while *Lestes dryas* and *Somatochlora metallica* are foreign to the sphagnum peat bogs in the Central European mountains.

The following six dragonfly species: *Aeshna subarctica*, *Aeshna caerulea*, *Somatochlora arctica*, *Somatochlora alpestris*, *Sympetrum danae* and *Leucorrhinia rubicunda*, in addition to the seven, above mentioned species, are described as the characteristic dragonfly species of the sphagnum peat bogs in the Central European mountains and the northern plains (SCHMIDT, 1967). However, these species have not been recorded (until now) in Serbia and Montenegro.

Leucorrhinia dubia appears to be a stenoecious Odonata species confined to the sphagnum peat bog in the high European mountain (PRENN, 1930). The species has a permanent population in the sphagnum peat bog Barno Jezero. The other species recorded at the bog, were not so stenoecious, and have been also found at the high mountains lakes and ponds, namely: Zminje Jezero, Poščensko Jezero, Goveđa Jezera, and Riblje Jezero.

Pošćenska Bara a pool at 1000 m, has not been examined completely. *Ischnura elegans*, *Anax imperator*, *Platetrum depressum* and *Sympetrum sanguineum* have been recorded as rare or extremely rare species at the pool. The same is valid for the Bistrica, the left bank tributary stream, at 750 m, where *Cordulegaster bidentata* as an extremely rare species, and *Tarnetrum fonscolombi* as a moderately common dragonfly have been taken.

A considerable majority of Odonata recorded at the sphagnum peat bog Barno Jezero (1489 m), and the lakes Zminje Jezero (1520 m), Poščensko Jezero (1495 m), Goveđa Jezera (1540 m) and Riblje Jezero (1409 m), namely: *Calopteryx virgo*, *Lestes sponsa*, *L. dryas*, *Enallagma cyathigerum*, *Coenagrion hastulatum*, *Aeshna juncea*, *A. grandis*, *Cordulia aenea*, *Somatochlora metallica*, *Libellula quadrimaculata*, *Sympetrum flaveolum*, *Leucorrhinia dubia* - have been usually described as the Euro-Siberian species reaching, and sometimes exceeding the Arctic circle in north distribution (SCHMIDT, 1929; SCHIEMENZ, 1953; ROBERT, 1959; BELYSHEV, 1968; BELYSHEV & CHARITOMOV, 1981; FRANCEZ & BRUHNES, 1983; SCHMIDT, 1967, 1978; VALTONEN, 1980). Moreover, these species were almost always estimated as common or moderately common dragonflies at the mentioned bogs and lakes in the area of Durmitor. These dragonflies can be considered as the constant species of the "Biome of European, mainly coniferous boreal woodlands" on the mount Durmitor, in MATVEJEV & PUNCER's meaning (MATVEJEV & PUNCER, 1989).

On the other hand, Odonata designated as Mediterranean species, namely: *Lestes virens*, *Aeshna mixta*, *Anax imperator*, *Cordulegaster bidentata*, *Sympetrum striolatum*, *S. sanguineum*, *Tarnetrum fonscolombi* - have been found sporadically in the area of Durmitor, and were estimated as rare or extremely rare during the present examinations.

5. CONCLUSIONS

Durmitor (2523 m), the most remarkable mountain in the whole Dinaric Alps, is mostly a limestone area with a karst topography, including crevices, hollows, dales, caves, swallow-holes, and underground channels. In spite of that, the mountain is rich in lakes, pools, peat-bogs, streams, which are situated chiefly in the zone of the Boreal coniferous forests. Consequently, the Odonata fauna of the mount Durmitor is rather rich.

A total of the following 27 Odonata species are found in the area of Durmitor: *Calopteryx virgo*, *C. splendens*, *Lestes virens*, *L. sponsa*, *L. dryas*, *Platycnemis pennipes*, *Pyrrhosoma nymphula*, *Ischnura elegans*, *Enallagma cyathigerum*, *Coenagrion hastulatum*, *C. puella*, *Aeshna juncea*, *A. grandis*, *A. cyanea*, *A. mixta*, *Anax imperator*, *Onychogomphus forcipatus*, *Cordulegaster bidentata*, *Cordulia aenea*, *Somatochlora metallica*, *Libellula quadrimaculata*, *Platetrum depressum*, *Sympetrum striolatum*, *S. flaveolum*, *S. sanguineum*, *Tarnetrum fonscolombi*, *Leucorrhinia dubia*.

The dragonfly species recorded on the mount Durmitor can be arranged into the following six groups according to the pattern of biogeographical distribution: 3 species (11,1%) have the Holarctic distribution, 1 species (3,7%) has the Palaearctic-Aethiopian-Oriental distribution, 18 species (66,7%) have the Palaearctic-mediterranean distribution, 1 species (3,7%) has the Palaearctic distribution without Mediterranean, and 3 species (11,1%) have boreo-mountain distribution.

The list of the dragonfly species recorded in the area of Durmitor is, in a certain way, very similar to the Odonata fauna specified on some other high mountains of Europe, namely: Pyrenees, Alps, Carpathians, Balkans, Caucasus, as well as in Scandinavia, Baltic, Finland, and the area of the Boreal coniferous forests in Russia. All or almost all the 27 dragonfly species found on the mount Durmitor, have been previously recorded on the named European mountains, and in the mentioned northern countries.

The differences between the Odonata fauna of the mount Durmitor and those of the above mentioned European mountains and the northern countries, are also conspicuous.

The boreolapine (glacial relict) Odonata species has not been found either in the Durmitor range or in any other mountains of Montenegro, Serbia, Macedonia and Albania.

Three boreo-mountain species, namely: *C. hastulatum*, *A. juncea* and *L. dubia* have been found in the Durmitor range, out of seven such species, which are recorded in the Central European mountains, including Slovenian Alps.

No one of the boreo-mountain species of Odonata has been recorded (until now) in the countries situated south of Serbia and Montenegro, namely: Albania and Macedonia.

The number of Odonata species which are to be regularly found at sphagnum peat bogs in the European mountains decreases from the Alps towards the mountains of the Balcan Peninsula.

L. dubia, *A. juncea*, *L. sponsa*, *L. quadrimaculata*, *C. aenea* and *E. cyathigerum* are the characteristic species of the *Sphagnum* peat bog Barno Jezero. *C. puella*, *A. cyanea*, *A. grandis* and *S. flaveolum* are the *Sphagnum* peat bog tolerant species. The species *L. dryas* and *S. metallica* have also continuous populations in Barno Jezero.

L. dubia is obviously a stenoecious Odonata species, confined to the *Sphagnum* peat bog Barno Jezero. The other species recorded at Barno Jezero are not so stenoecious, and have been also found at the above named lakes and ponds.

A considerable majority of Odonata recorded at the *Sphagnum* peat bog Barno Jezero, and the lakes Zminje Jezero, Pošćensko Jezero, Riblje Jezero and Goveđa Jezera, namely: *C. virgo*, *L. sponsa*, *L. dryas*, *E. cyathigerum*, *C. hastulatum*, *A. juncea*, *A. grandis*, *C. aenea*, *S. metallica*, *L. quadrimaculata*, *S. flaveolum* and *L. dubia* - have been usually described as the Euro-Siberian species reaching, and sometimes exceeding, the Arctic circle in the north distribution. These species were, almost, always, estimated as common or moderately common dragonflies at the habitats examined in the area of Durmitor, during the present examinations. These dragonflies can be considered as the constant species of the Biome of European, mainly coniferous Boreal woodlands on the mount Durmitor (in MATVEJEV & PUNCER's meaning).

On the other hand, Odonata designated as the mediterranean species, namely: *L. virens*, *A. imperator*, *C. bidentata*, *S. striolatum*, *S. sanguineum* and *T. fonscolombi* - have been found sporadically, and estimated as rare or extremely rare dragonflies in the area of Durmitor.

6. LIST OF TAXA RECORDED

<i>aenea, Cordulia</i>	19	<i>Calopterygidae</i>	4.1.1
<i>Aeshna</i>	12	<i>Calopteryx</i>	1
<i>Aeshnidae</i>	4.1.5	<i>Coenagrion</i>	10
<i>Anax</i>	16	<i>Coenagrionidae</i>	4.1.4
<i>bidentata, Cordulegaster</i>	18	<i>Cordulegaster</i>	18

<i>Cordulegastridae</i>	4.1.8	<i>Platetrum</i>	22
<i>Cordulia</i>	19	<i>Platycnemididae</i>	4.1.3
<i>Corduliidae</i>	4.1.9	<i>Platycnemis</i>	6
<i>cyanea</i> , <i>Aeshna</i>	14	<i>puella</i> , <i>Coenagrion</i>	11
<i>cyathigerum</i> , <i>Enallagma</i>	9	<i>Pyrrhosoma</i>	7
<i>depressum</i> , <i>Platetrum</i>	22	<i>quadrifasciata</i> , <i>Libellula</i>	21
<i>dryas</i> , <i>Lestes</i>	5	<i>sanguineum</i> , <i>Sympetrum</i>	25
<i>dubia</i> , <i>Leucorrhinia</i>	27	<i>Somatochlora</i>	20
<i>elegans</i> , <i>Ischnura</i>	8	<i>flaveolum</i> , <i>Sympetrum</i>	24
<i>Enallagma</i>	9	<i>fonscolombi</i> , <i>Tarnetrum</i>	26
<i>Ischnura</i>	8	<i>forcipatus</i> , <i>Onychogomphus</i>	17
<i>juncea</i> , <i>Aeshna</i>	12	<i>Gomphidae</i>	4.1.7
<i>Lestes</i>	3	<i>grandis</i> , <i>Aeshna</i>	13
<i>Lestidae</i>	4.1.2	<i>hastulatum</i> , <i>Coenagrion</i>	10
<i>Leucorrhinia</i>	27	<i>imperator</i> , <i>Anax</i>	16
<i>Libellula</i>	21	<i>splendens</i> , <i>Calopteryx</i>	2
<i>Libellulidae</i>	4.1.10	<i>sponsa</i> , <i>Lestes</i>	4
<i>metallica</i> , <i>Somatochlora</i>	20	<i>striolatum</i> , <i>Sympetrum</i>	23
<i>mixta</i> , <i>Aeshna</i>	15	<i>Sympetrum</i>	23
<i>nymphula</i> , <i>Pyrrhosoma</i>	7	<i>Tarnetrum</i>	26
<i>Onychogomphus</i>	17	<i>virens</i> , <i>Lestes</i>	3
<i>pennipes</i> , <i>Platycnemis</i>	6	<i>virgo</i> , <i>Calopteryx</i>	1

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ODONATA (INSECTA)

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Rezime

Durmitor (2523 m), najistaknutija planina u Dinaridima predstavlja uglavnom krečnjačko područje sa tipičnim karstnim oblicima reljefa. Uprkos tome, planina je bogata jezerima, barama, tresavama, pa i tokovima, koji se nalaze najviše u zoni četinarskih šuma. Otuda je fauna Odonata Durmitora prilično brojna vrstama.

Na području Durmitora nađeno je ukupno 27 vrsta Odonata, i to: *Calopteryx virgo*, *C. splendens*, *Lestes virens*, *L. sponsa*, *L. dryas*, *Platycnemis pennipes*, *Pyrrhosoma nymphula*, *Ischnura elegans*, *Enallagma cyathigerum*, *Coenagrion hastulatum*, *C. puella*, *Aeshna juncea*, *A. grandis*, *A. cyanea*, *A. mixta*, *Anax imperator*, *Onychogomphus forcipatus*, *Cordulegaster bidentata*, *Codrulia aenea*, *Somatochlora metallica*, *Libellula quadrimaculata*, *Platetrum depressum*, *Sympetrum striolatum*, *S. flaveolum*, *S. sanguineum*, *Tarnetrum fonscolombi*, *Leucorrhinia dubia*.

Vrste Odonata koje su utvrđene na Durmitoru mogu biti razvrstane u sledećih šest grupa prema biogeografskom rasprostranjenju: 3 vrste (11,1%) imaju Holarktičko rasprostranjenje, 1 vrsta (3,7%) ima Palearktičko-Etiopsko-Orijentalno rasprostranjenje, 18 vrsta (66,7%) ima Palearktičko-Mediterransko rasprostranjenje, 1 vrsta (3,7%) ima Palearktičko rasprostranjenje bez Mediterana, i 3 vrste (11,1%) imaju Boreo-planinsko rasprostranjenje.

Spisak vrsta Odonata nađenih na Durmitoru je na određeni način vrlo sličan fauni ovih insekata poznatoj sa drugih visokih planina u Evropi: Pirineja, Alpa, Karpata, Balkana, Kavkaza kao i onoj u Skandinaviji, Baltiku, Finskoj, i tajgama u Rusiji. Svih, ili skoro svih 27 vrsta Odonata nađenih na Durmitoru nađeno je ranije na pomenutim evropskim visokim planinama, i u severnim evroazijskim područjima.

Znatne su, međutim, i razlike između faune Odonata Durmitora i onih nađenih na visokim planinama Evrope, i u severnim predelima Evrope i Azije.

Nijedna od dve boreoalpiske vrste, naime: *Aeshna caerulea* i *Somatochlora alpestris*, koje se smatraju glacijalnim reliktima i srednjeevropskim visokim planinama, uključujući i Slovenačke Alpe - nije nađena na Durmitoru, niti na bilo kojoj visokoj planini Crne Gore, Srbije, Makedonije i Albanije.

Samo tri boreo-montane vrste, i to: *C. hastulatum*, *A. juncea* i *L. dubia*, nađene su na Durmitoru, kao i na Pl. Goliji u Srbiji - od sedam takvih, boreo-montanih vrsta, koje su rasprostranjene u visokim planinama Srednje Evrope, uključujući i Slovenačke Alpe.

Nijedna od tih boreo-montanih vrsta, čak ni pomenute tri takve vrste utvrđene na Durmitoru, Crna Gora i Pl. Golija, Srbija - nije nađena u Makedoniji i Albaniji, koje leže još južnije.

Broj vrsta Odonata koje se redovno nalaze na sfagnumskim tresavama evropskih planina - opada idući od Alpa južno ka planinama Balkanskog poluostrva.

Podaci za "Reprezentativne Spektre Vrsta odonata" (u EB. SCHMIDT-ovom smislu), prikupljeni su za tresavu Barno Jezero (1489 m), i četiri druga jezera i bara: Zminje jezero (1520 m), Pošćensko jezero (1495 m), Riblje jezero (1409 m) i Goveđa jezera (1540 m)

L. dubia, *A. juncea*, *L. sponsa*, *L. quadrimaculata*, *C. aenea* i *E. cyathigerum* su karakteristične vrste sfagnumske tresave Barno jezero. *C. puella*, *A. cyanea*, *A. grandis* i *S. flaveolum* su vrste koje podnose tresavska staništa. Vrste *L. dryas* i *S. metallica* imaju takođe stalne populacije na Barnom jezeru.

L. dubia je očevidno stenoeciozna vrsta. Ona je vezana za sfagnumsku tresavu Barno jezero. Druge vrste utvrđene na ovoj tresavi nisu toliko stenoeciozne, i nalaze se takođe na drugim jezerima i barama Durmitora.

Znatna većina Odonata utvrđena na tresavi Barno jezero, kao i na Zminjem jezeru, Pošćenskom jezeru, Goveđim jezerima i Ribljem jezeru, naime: *C. virgo*, *L. sponsa*, *L. dryas*, *E. cyathigerum*, *C. hastulatum*, *A. juncea*, *A. grandis*, *C. aenea*, *S. metallica*, *L. quadrimaculata*, *S. flaveolum* i *L. dubia*, obično se smatraju za Euro-Sibirske vrste koje u svom severnom rasprostranjenju dosežu, a nekad i premašuju, Arktički krug. Ove vrste su skoro uvek, ocenjene kao obične ili umereno obične u ispitanim staništima Durmitora. Ove vrste Odonata se mogu smatrati stalnim u Biomu evropskih, pretežno četinarskih, borealnih šuma na planini Durmitor (u MATVEJEV & PUNCER-ovom smislu).

Sa druge strane, Odonata koje se obično označavaju kao mediteranske vrste, naime: *L. virens*, *A. imperator*, *C. bidentata*, *S. striolatum*, *S. sanguineum* i *T. fonscolombi* - nalažene su sporadično, i bile ocenjene kao retke ili krajnje retke vrste na području Durmitora.