

CHARACTERISTICS OF HABITAT AND DISTRIBUTION OF *SITTA NEUMAYER* MICH. (AVES) IN CROATIA AND NEIGHBOURING AREAS

GORDAN LUKAČ

Department of Botany, Faculty of Science,
University of Zagreb, Marulićev trg 20/II,
41000 Zagreb, Croatia.

MAURICIO STIPČEVIĆ

Marka Marulića 29, 59000 Zadar, Croatia.

ROBERT CRNKOVIĆ

Vinka Milata B-3, 58220 Trogir, Croatia.

DENIS BEM

Bijeli Brijeg II 30/IV, 88000 Mostar,
Republic of Bosnia and Herzegovina

Sitta neumayer Mich. was examined over a period of 10 years on more than 230 sites on the Croatian coast, in Herzegovina and in Montenegro. 92 nests were found and on majority were examined the following feature characteristics: colour of the rock basis near the nest, concavity around the nest, height of cliff, exposition of nest entrance and altitude. Based on the literature and personal observations, there is shown the distribution of *Sitta neumayer* Mich. on the Balkan peninsula.

Key words: *Sitta neumayer*, habitat, habitat colors, distribution, Croatia

Tijekom deset godina brgljez lončar, *Sitta neumayer* Mich. promatran je na više od 230 terenskih izlazaka u obalnom dijelu Republike Hrvatske, Hercegovini i Crnoj Gori. Pronađena su 92 gnijezda na većini kojih su ispitane slijedeće karakteristike: obojenost podloge stijena uz samo gnijezdo, udubljenost oko gnijezda, visina stijene, ekspozicija (s obzirom na njegov otvor) i nadmorska visina. Na temelju literaturnih podataka i vlastitih opažanja, prikazana je rasprostranjenost brgljeza lončara na Balkanskom poluotoku.

Ključne riječi: brgljez lončar, stanište, boja podloge staništa, rasprostranjenost, Hrvatska.

INTRODUCTION

Sitta neumayer, as VOOUS (1962), emphasises is widely found in the Mediterranean and steeper zones especially in hilly areas with sunny, warm, steep and rocky cliffs where the July isotherm is between 24° C and 32° C. Species is extensively found in the Balkan peninsula, in Asia Minor and in the Near East. STRESEMANN (1925), Grant (LEISLER 1977) and many others have worked on geographical differentiation and taxonomic problems of the related species *Sitta tephronota*. This species is noted as a nesting bird in all coastal parts of Croatia on the Balkan peninsula (MAŠTROVIĆ, 1942). MATVEJEV and VASIĆ (1973) also mentioned this species in the area of Istra. The most northerly border of distribution, RUCNER (1963) is around Novi Vinodolski (Kvarner), which has confirmed the results of other ornithologists (RUCNER, 1964; MATVEJEV, 1976) and our field ornitho-explorations. Many authors note the presence of this species in the area of Paklenica, Trogir, Neretva and Dubrovnik (RUCNER, 1954, 1959, 1963, 1970; KRPAŃ 1957, 1960; KOVAČEVIĆ & DANON 1959; TUTMAN, 1959, 1963; BENSON ET AL. 1962; FERNBACH 1963; RUCNER 1964, 1965; SUŠIĆ, RADOVIĆ & BARTOVSKY 1988; CRNKOVIĆ, 1990; LISSAK, 1990). In Herzegovina it is noted as a frequent species of karst and rocky areas (TALSKY, 1900; PICHLER, 1906; REISER, 1939; OBRATIL, 1966, 1984, 1986/87) and in Montenegro as the most numerous inhabitant from Boka Kotorska to Ulcinj at height up to 1200 metres (BRUSINA, 1892; FIRER, 1894; REISER & FÜHRER, 1896; FÜHRER,

1900, 1901; KOLLIBAY, 1903; ROHAČEK 1919a,1919b; HAINARD 1960; KATTINGER 1960; MOLL 1967; KARAMAN 1970; VASIĆ 1977,1980).

In Macedonia the species was noted in detail by STRESEMANN (1920), KARAMAN (1949), MAKATSCH (1950), MICHOLITSCH (1959) and HUGHES & SUMERFIELD (1959).

The north border of distribution in Serbia, (MATVEJEV 1950, 1976), is Suva Planina, and the nests lie on the southern exposed cliffs at a height of 800 metres. This species is found in Bulgaria in one part of the Rodopi and on the mountains of Rila and Pirin (REISER, 1894; MATVEJEV, 1976) at heights up to 2000 metres. *Sitta neumayer* came to the most distant part of the east Balkans through the valleys of the Marica to Krumovgrad. It is settled in Albanian rocky areas near rivers and sea coasts (KATTINGER, 1960; REISER, 1905 and MATVEJEV, 1976) emphasise that *Sitta neumayer* is found in most part of Greece and in the mountains of Peloponesus.

MATERIAL AND METHODS

During 10 yearly explorations we covered more than 230 areas in the coastal part of Croatia and Montenegro from Istra to Ulcinj (Tab. 1). We have in detail researched the canyons of rivers and cliffs of mountains in the coastal and island areas of Croatia and also in part of Herzegovina and Montenegro. Localities of investigation are visible from Fig. 1. Field observations were done with binoculars 8x30, 10x40 and with field glass 20x50.

Tab. 1. Number of field visits during ten years investigation.

Year	Months											
	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII
1981								1				
1983			2		1							
1984				4		4	5	15		2	2	1
1985	2	2	1	8	8			4	4	4	3	1
1986	3	1	4	4	7	5						2
1987	3		4	16	4	11	2	3				1
1988	4		4	4	5		3	1	6	2		2
1989	4	2	3	2	10	8	5	7				
1990	1	4	2	1	3	1		1		1		
Total	17	9	20	39	38	29	15	32	10	9	5	7

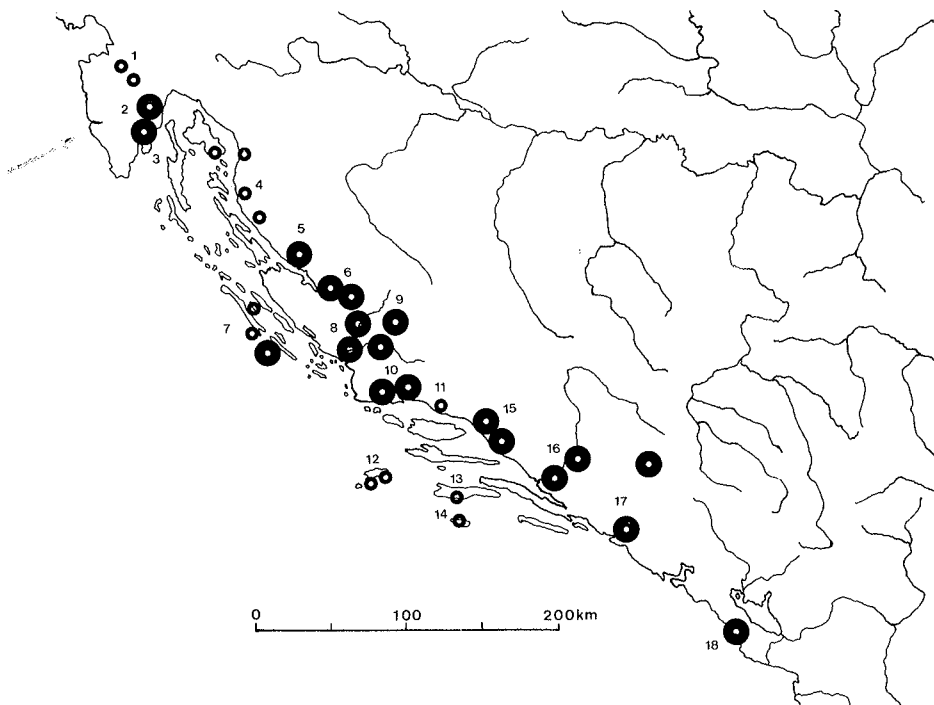


Fig. 1. Areas of investigations

1.-Čičarija, 2.-Učka, 3.-Kvarnerski otoci (Krk, Cres), 4.-Sjeverni Velebit, 5.-Mala i Velika Paklenica, 6.-rijeke (rivers) Krupa, Krnjeza, Zrmanja and Karinsko more, 7.-Dugi otok, Kornati, 8.-rijeke (rivers) Krka, Čikola, 9.-planina (mountain) Dinara, 10.-Trogir, Split, 11.-Omiš, 12.-otok (island) Vis, 13.-otok (island) Korčula, 14.-otok (island) Lastovo, 15.-planina (mountain) Biokovo, 16.-rijeka (rivers) Neretva, 17.-Dubrovnik, Popovo i Gatačko polje, 18.-Bar, Rumija.

In these areas we found 92 nests and on them examined the following feature: colour and concavity of the rock basis around the nest, height of the cliff where the nest is settled and altitude (Tab. 2). Distribution was determined in consideration of the nest aperture position and altitude was determined by using the geographical map and altimetre.

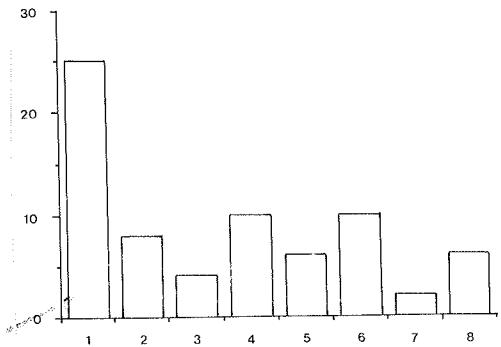


Fig. 2. Colour of the rock basis near the nest and number of nests ($n = 71$). x - colour of basis: 1. red, 2. grey-red, 3. white-red, 4. yellow-red, 5. white, 6. grey, 7. yellow, 8. grey-yellow, y - number of nests.

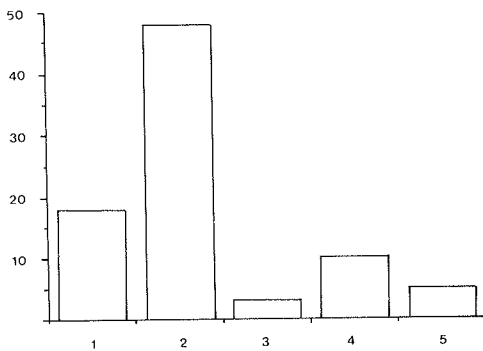


Fig. 3. Concavity of the rock basis near the nest and number of nests ($n = 84$): x - concavity of basis: 1. smooth basis, 2. shallow concave, 3. hollow, 4. half-cave, 5. cave, y - number of nests.

RESULTS

Colour of the basis from 92 nests was established on the pattern of 71 nests. Thus 47 of them are settled on different shades of red colour and 24 on a different coloured basis (Fig 2). Terra rossa is the most wide-spread soil in submediterranean and eumediterranean parts of the Balkans and because of that plenty of nests are made from it, so they insert the nest into a red coloured basis. The biggest number of nests are built in the shallow hollows the rocks (48) or on a smooth basis (18), which corresponds to present teaching (BRUSINA, 1892; REISER, 1905). We found the nests in half-caves and caves (Fig. 3), and also one nest was found in a perpendicular trench in soil of a depth of 50 cm.

The height of the cliff is a less important factor of habitation. Thus 73 nests are settled equally on low,

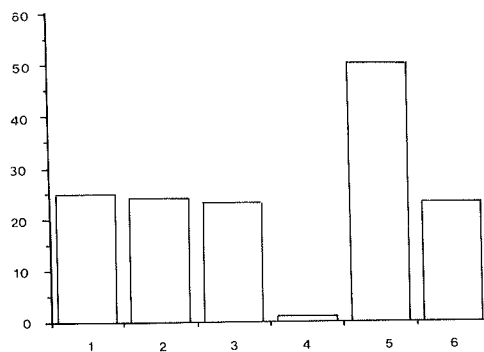


Fig. 4. Size of the cliff and number of nests ($n = 73$): x - number of the cliff: 1. low cliffs (to 5 m), 2. middle-high cliffs (5-15 m), 3. high cliffs (higher than 20 m), 4. hollow in the stone (scrape), 5. Total number of nests on low, middle-high and high cliffs, 6. Total number of nests on high cliffs, y - number of nests.

middle-high and high cliffs (Fig. 4). However low and middle-high cliffs, are favoured.

Tab. 2. Characteristics of habitats

I Colour of the rock basis near the nest

1. reddish
2. grey-reddish
3. white-reddish
4. yellow-reddish
5. white
6. grey
7. yellow
8. grey-yellow

II Concavity of the rock basis near the nest

1. smooth basis
2. shallow concave and hollow
3. crack
4. half cave
5. cave

III Size of the cliff

1. low cliffs (to 5m)
2. middle- high (from 5-15m)
3. high (higher than 15m).

IV Exposition

1. south
2. south-west
3. south-east
4. west
5. east
6. north-west
7. north-east

Exposition of 84 nests showed that a south ward position was dominant. 24 nests faced the south-west or south-east. No North exposition was recorded, while on 10 the aperture was toward the north-west and on 2 toward the north-east (Fig. 5).

The biggest number of nests in explored biotopes, was at a height of from 0 to 250 m (Fig. 6). Direction of regression does not show any greater dependence of nests on altitude ($r=0.39$). The highest altitude, where nests were found is 640 metres in

Croatia, 690 metres in Montenegro and 1100 metres in Herzegovina. According to the literature (ROHAČEK, 1919) found a nest in Boka Kotorska at a height of 1400 metres, and REISER (1894) found one at the highest altitude of 2000 metres in Bulgaria.

The nest is a very strong and compact product and the same pair can use it for a couple of years (REISER, 1905; CRNKOVIĆ, 1990). Thus, one nest was active for two years in Mala Paklenica and 3 years on Roški Slap. In the immediate vicinity of the nest on a surface of about 1 m, *Sitta neumayer* fill the cracks and hollows with feathers of other birds (*Aquila chrysaetos*, *Falco* sp., *Alectoris graeca*, *Columba livia*, *Bubo bubo*, *Corvus corax*). External plastering of the nest is made from earth pieces, tiny stones, hytin, some tiny feathers and plants, which all tallies with the literature. Hytin remains, which are accumulated into nesting season, give the nest a special smell.

Inside the nest is filled with 70% of shage, 25% of feathers and 5% of plant blades and grass. Birds were watched, both in nesting season, and several time during October, February and March during entry and exit from nests, whether they used them for sleeping or resting.

Sitta neumayer has optimal distribution in eumediterranean, submediterranean-mountainous zones of the Mediterranean region in the Balkan peninsula (HORVAT, GLAVAC & ELLENBERG 1974).

It is found in relation to vegetation of *Oleo-Ceratonion* (south-mediterranean) *Quercion ilicis* (middle and north

Mediterranean) in eumediterranean zone and with *Abietion cephalonicae* in Mediterranean-mountainous zones. It populates the submediterranean zone in connexion with *Ostryo-Carpinion orientalis*. Higher, more termophilus mediterranean-mountainous habitations are in connexion with *Fagion illyricum*. East parts of the Balkan peninsula with expressive influence of steeper, where the species is noted, populate the connexion *Quercion frainetto*, while more termophilus and higher habitations are in connexion with *Fagion moesiacum* (Fig. 7). *Sitta neumayer* penetrated more deeply inland in the canyons of Velebit, and rivers Krnjeza, Krupa, Dabarnica, Zrmanja, Krka, Cetina, Neretva, Vardar, Morava, Nišava, Marica, Struma and Arda. Because of the influence of a warmer climate it populates the south exposed cliffs in zones of termophilous beech forests there is also an overlap of areas with related species *Sitta europea* L. It is interesting that *Sitta neumayer* is not found in established nestings on

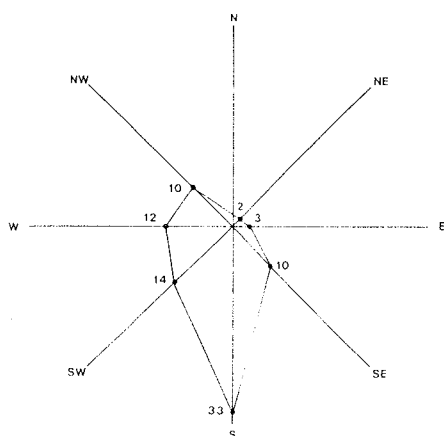


Fig. 5. Number of nests according to exposition (n=84).

adjacent Adriatic islands, which mostly have steep cliffs and coasts, and are situated in the quoted vegetation zones. There is not reliable find of this bird on island of Dugi otok (HIRTZ, 1930).

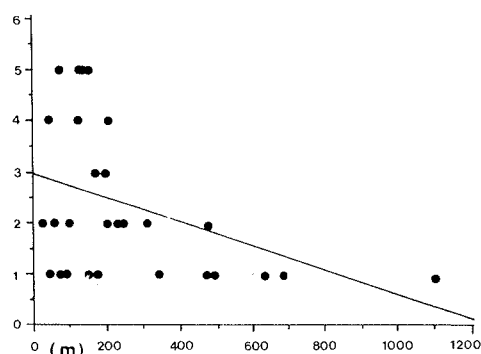


Fig. 6. Dependence of number of discovered nests on altitude (n=64) $y = 2.964$, $r = 0.39$.

DISCUSSION

The greatest number of nests were on a red basis or on a red shade basis, and because of their red colour they perfectly match with the surrounding basis of the rocks. Something more espied nests were grey on white basis and red on yellow-white or grey basis. As in mediterranean region the soil is made from terra rossa it is audibly why the nests are mostly built from red pieces of ground. Site of the nests in the shallow hollows is the most important characteristics of habitation though the birds build the nests also on smooth basis. Smaller number of nests were settled in half-caves, caves or in hollows. When birds choose the cliff for building a nest it's visible that they choose low, middle-high and high cliffs. Connected on the first two, high cliffs are less chosen probably because

of a bigger danger on the occasion of flying over to material for building the nests or feeding the youths.

Experimental learnings to related species *Sitta europea* shows that optimal height of the nest is about 11.1 metres (LÖHRL, 1987b). It's also known that some species for protection of the youths (HELLMICH, 1987) reduce the number of visits to nest (visit minimisation - FAGERSTROM, MORENO & CARLSON, 1983). Whether the adults by feeding the youths change a part of plunder in its volume with size of youths (HELLMICH 1984, 1987; LÖHRL 1975, 1976; THALER, 1979), as it's noticed at some other species of birds, it's only needed to establish.

Sole nest of *Sitta neumayer*, because of inaccessible position on the cliff and its solidity, is certain protection for youths from potential predator. Lower cliffs in biotope possibly have various positions favourable for nutrition, what give them advantage at selections of location and for building the nests (LÖHRL, 1987a, 1987b).

The nest are built on the south and south-west expositions, what we have explained with ecological factors of biotope (influence and possible exposing of the nest aperture type to strong north wind-tempest, which have in this area a stormy strength especially in winter in early spring and at the beginning of summer).

Altitude of nesting is about from 0 to 1400 metres, but we have noticed the highest nest on height of 1100 metres. REISER (1894) has found it in Bulgaria at 2000 metres. Altitude in interaction with climate factors cause definite type of vegetation, so in that case probably have

influence on vertical distribution of this species.

Through canyons it populates internal parts of continent also those with steep south-exposed cliffs in zone of the coast beechen forests. Mentioned zones are places of folding over areals with related species *Sitta europea*. Its non-arrival on cliffs of islands of the Adriatic sea is explained by big influence of direct winds (tempest and south-wind), and with intensive salinity of cliffs what could have the influence on strength of the nest. Besides that choice and offer of food of external steep cliffs of islands could be also one of possible limiting factors of its distribution.

CONCLUSION

Based on 230 fields' researchings of *Sitta neumayer* and on 92 found nests, we have established that the nests are mostly built on the red basis. Basis were shallow concave or entirely smooth. Only the less number of them were settled in hollows, half-caves and caves. The nests were equally built on low and middle-high cliffs, and something less on the high cliffs. South exposition of nests has domination, while altitude has bigger influence on choice of habitation, in as much is the areal inside of corresponding vegetation zones with steep cliffs and rocks. In the canyons, especially in more termophilus habitations, *Sitta neumayer* has climbed also in the zone of coast beechen forests.

Non appearance on the Adriatic islands could be explained by negative influence of direct winds (tempest and south-wind), by intensive salinity of rocks and cliffs and by offer and choice of food.

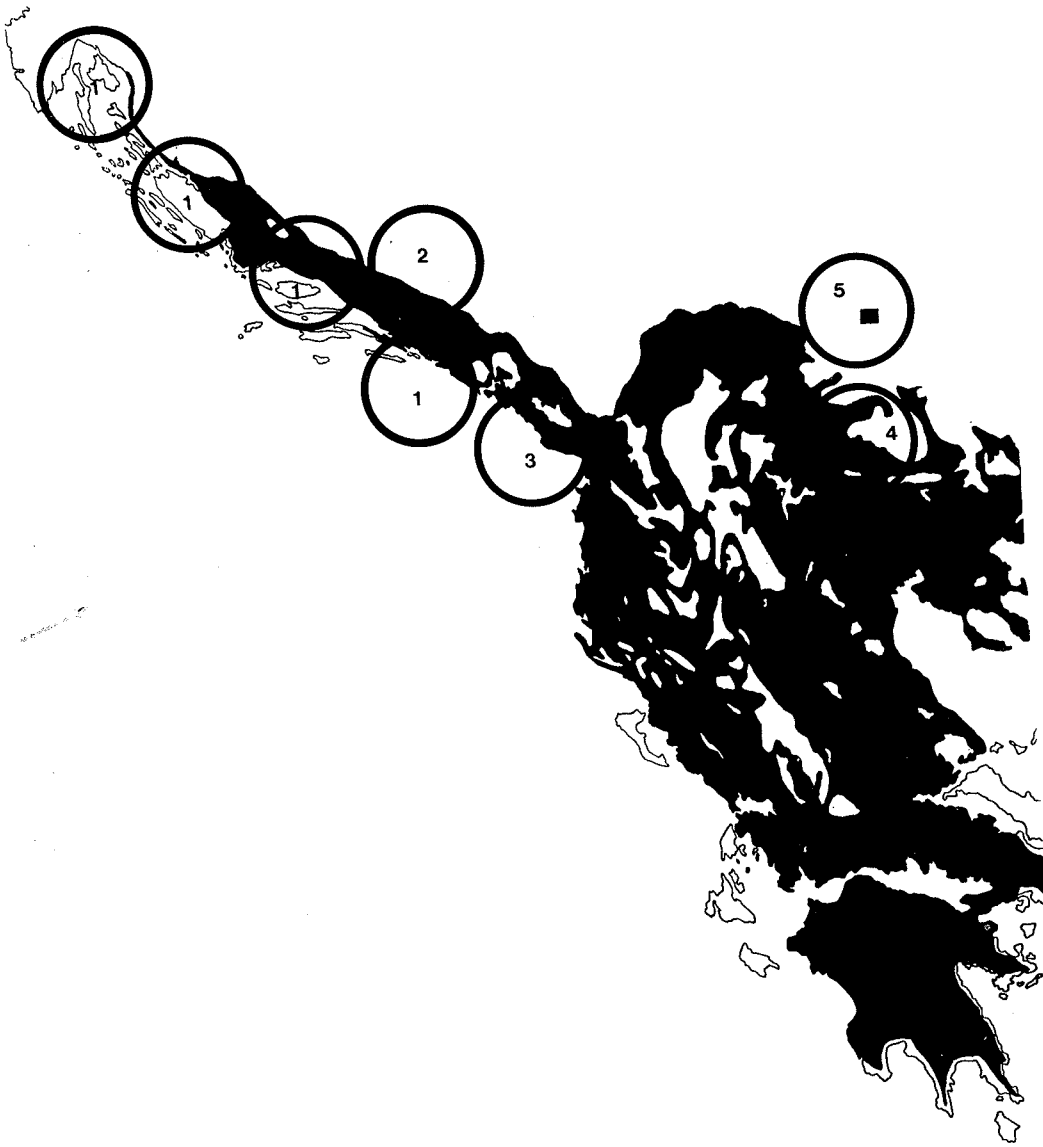


Fig. 7. Distribution of *Sitta neumayer* in the south-east Europe. Distribution is shown according to researching of many authors. We use the vegetation's map from HORVAT-GLAVAC-ELLENBERG.

1. Republic of Croatia

1.Glušci	8.Gradac	14.Jurjevo, Jablanac
2.Pologoš	9.Metković	15.Karlobag
3.Dubravice	10.Kozjak	16.Lukovo šugarje
4.Grudice	11.Dubrovnik	17.Velika i Mala Paklenica
5.Mosor	12.Vinodol	18.Kastavsko lovište*
6.Ploče	13.Senjska draga	18a.? Dugi otok
7.rnjeka Dubrovačka		

* Birds' collection of Croatian Natural History Museum), HIRTZ 1930, RUCNER 1954, 1959, 1964, 1965, KRPAŃ 1957, TUTMAN 1959, KOVAČEVIĆ & DANON 1959, KRPAŃ 1960, BENSON et al. 1962, SUŠIĆ et al. 1988.

2. Republic of Bosnia and Herzegovina

19.Mostar	39.Stolac-Dabar polje
20.Bunica	40.Ergot
21.Radobolje	41.Ljubinjje-Kotezi
23.Bjelašnica-Popovo polje	42.Hutovo blato-Budisavina
24.Klana	43.Hutovo blato-Ljutosiv
25.Fatničko polje	44.Hutov grad
26.Dabarsko polje	45.Popovo polje-Zavala
27.Gatačko polje	46.Popovo polje-Dračevo
28.Popovo polje	47.Gacko
29.Kozje stijenje	48.Trebinje
30.Rotimlja	49.Neum
31.Mostarsko blato-vrelo Lištice	50.Neum-Klek
32.Mostar-vrelo Bunice	51.Drežnica-Grabovica
33.Stjepan grad	52.Stepena
34.Mostar-Blagaj	53.kanjon Bregove
35.Velež	54.Klečarski vrhovi
36.Stolac	55.kanjon Radmilja
37.Ubovsko	
38.Stolac-kanjon Bregave	

REISER 1939, FERNBACH 1963, RUCNER 1965, OBRATIL 1966, OBRATIL 1982, OBRATIL 1984, OBRATIL 1986/7

3. Montenegro

56.Cetinje	66.Virpazar	76.Rijeka-Podgorica*
57.Sv.Stefan	67.Brca	77.Crnojević Rijeka*
58.Morača (Titograd)	68.Rijeka	78.Crnojević Rijeka*
59.Lijeva Rijeka	69.Crna Gora*	79.Crnojević Rijeka*
60.Kameno	70.Crna Gora*	80.Janković Rijeka*
61.Boka Kotorska	71.Crna Gora*	81.Crnojević Rijeka*
62.Krstac	72.Crna Gora*	82.Crnojević Rijeka*
63.Han Bogetić	73.Crna Gora*	83.Crnojević Rijeka*
64.Kakarička gora	74.Crna Gora*	84.Rijeka*
65.Skadarско jezero	75.Rijeka-Podgorica	85.Rijeka-Podgorica

*Birds' collection of Croatian Natural History Museum), Fuhrer 1896, REISER & Fuhrer 1896, HAINARD 1960, KATTINGER 1960, RUCNER 1965, MOLL 1967, IVANOVIĆ 1970, VASIĆ 1977, VASIĆ 1980, SUŠIĆ et al. 1988.

4. Macedonia

86.Treska	89.Titov Veles	93.Demir Kapija
87.Topolka	90.Jeni	94.Prilep
88.Vardar	91.Pasarkoj	95.Treskavac
89.(Babuna)	92.Babuna	96.Baba

STRESEMANN 1920, KARAMAN 1949, MAKATSCH 1950, MICHOLITSCH 1959, HUGHES & SUMMERFIELD 1959, BENSON et al. 1962, RUCNER 1965.

5. Serbia

97.Suva Planina	MATVEJEV 1976.
-----------------	----------------

REFERENCES

- BENSON, S. V., IRVING, W. H., MCDOWELL, C., HIGGINBOTTOM, C. and LIND, P. B., 1962: Birds seen in Yugoslavia. — *Larus*, 14, 157-161.
- BRUSINA, S., 1892: K ornitologiji Kotora i Crne gore. — *Glas. Hrv. naravosl. društva*, 6, 59-81.
- CRNKOVIĆ, R., 1990: Gnjezdariće Trogirskog područja. — *Larus*, 41-42, 151-164.
- FAGERSTROM, T., MORENO, J. & CARLSON, A., 1983: Load Size and Energy Delivery in Birds Feedings Nestlings: Constraints on and Alternative strategies to Energy Maximization. — *Oecologia*, 56, 93-98.
- FERNBACH, J., 1963: Ornithological Notes from the Dinara and Šator-Planina Mountains. — *Larus*, 15, 177-178.
- FIRER, Lj., 1894: Jedna godina ornitološkog izučavanja u Crnoj Gori. — *Glas. Zem. Muz. B. i H.*, 6, 543-608.
- FÜHRER, L., 1900: Beiträge zur Ornis Montenegros und des angrenzenden Gebietes von Nordalbanien. — *Ornith. Jahrb.*, 11, 165-189, 1900.
- FÜHRER, L., 1901: Beiträge zur Ornis Montenegros und des angrenzenden Gebiets von Nordalbanien. — *Ornith. Jahrb.*, 12, 41-79, 1901.
- HAINARD, R., 1960: List of Birds observed on a trip through Yugoslavia. — *Larus*, 12-13, 99-106.
- HELLMICH, J., 1984: Beobachtungen an der Blaumerle *Monticola solitarius* während der Nestlingszeit. — *Orn. Mitt.*, 1, 9-16.
- HELLMICH, J., 1987: Futterstrategie eines Paares der Gartengräsmücke (*Sylvia borin*). — *Die Vogelwelt*, 108 (5), 161-169.
- HIRTZ, M., 1930: Prirodoslovna istraživanja sjevernodalmatinskih otočja I. Dugi i Kornati. — *Prirodosl. Istraž. Kraljevine Jugoslavije*, JAZU, Zagreb, sv. 16, 94-118.
- HORVAT, I., GLAVAČ, V., ELLENBERG, H., 1974: *Vegetation Südsteuropas*. Gustav Fischer Verlag, Stuttgart.
- HUGES, C. and SUMERFIELD A.R., 1959: List of birds seen in Yugoslavia from 17.-25. May, 1957. — *Larus*, 11, 59-61.
- IVANOVIĆ, B., 1970: Neka ornitološka zapažanja na Skadarskom jezeru. — *Larus*, 21-22, 137-160.
- KARAMAN, S., 1949: Ornithofauna of the Skopska kotlina basin. — *Larus*, 3, 196-280.
- KATTINGER, E., 1960: Contribution to the study of birds of Albania (Shqipëria) and certain adjacent Yugoslav regions. — *Larus*, 12-13, 123-216.
- KOLLIBAY, P. R., 1903: Beiträge zur Kenntnis der Vogelwelt Dalmatiens. — *Orn. Jahrbuch*, 1-2, 22-45.
- KOVAČVIĆ, J. and DANON, M., 1959: The stomach contents of birds. part III. — *Larus*, 11, 111-130.
- KRPAN, M., 1957: Birds of the Mosor mountain and its environs. — *Larus*, 9-10, 125-142.
- KRPAN, M., 1960: Contribution to the study of the birds of the environs of Split. — *Larus*, 12-13, 65-91.
- LEISLER, B., 1977: Oekomorphologische Aspekte von Speziation und adaptiver Radiation bei Vögeln. — *Die Vogelwarte*, 29, 136-153.
- LISSAK, W., 1990: Beitrag zur Avifauna des Küstenlandes Kroatiens. Ornithologische Beobachtungen in Norddalmatien/Jugoslawien. — *Larus*, 41-42, 165-187.
- LÖHRL, H., 1975: Brutverhalten und Jugendentwicklung beim Mauerläufer (*Tichodroma muraria*). — *J. Orn.*, 116, 229-262.
- LÖHRL, H., 1976: Der Mauerläufer. Neue Brehm Bücherei 498, Wittenberg.
- LÖHRL, H., 1978a: Der Bruterfolg des Kleibers (*Sitta europea*) in Beziehung zu Brutraumgröße und Habitat. — *Oekol. Vögel*, 9, 53-63.
- LÖHRL, H., 1978b: Versuche zur Wahl der Bruthöhle und Nisthöhe am Baum durch den Kleiber (*Sitta europea*). — *Oekol. Vögel*, 9, 65-68.
- MAKATSCH, W., 1950: *Die Vogelwelt Mazedoniens*. Akademische Verlagsgesellschaft Geest & Portig K.-G. Leipzig.
- MASTROVIĆ, A., 1942: *Die Vögel des Küstenlandes Kroatiens*. I Band, Zagreb.
- MATVEJEV, S. D., 1950: Rasprostranjenje i život ptica u Srbiji. SANU, Beograd.

- MATVEJEV, S. D., 1976: Pregled faune ptica Balkanskog poluostrva. Conspectus avifaune Balcanicae, Piciformes et Passeriformes. SANU, Beograd.
- MATVEJEV, S. D. & VASIĆ, V. F., 1973: Catalogus faunae Jugoslaviae, IV/3 *Aves*, Ljubljana.
- MICHOLOTSCH, A., 1959: Ornithological observations in Yugoslavia (Macedonia). — *Larus*, 11, 37-58.
- MOLL, G., 1967: Ornithological observations in the Yugoslav littoral particularly in the Boka Kotorska area (Montenegro) from 31.7. - 21.8.1965. — *Larus*, 19, 212-213.
- OBRATIL, S., 1966: Pregled istraživanja ornitofaune Bosne i Hercegovine, I dio. — *Glas. Zem. Muz. B. i H.*, 5, 191-268.
- OBRATIL, S., 1984: Naselja ptica (*Aves*) u kopnenim biocenozama kraških polja Hercegovine. — *Glas. Zem. Muz. B. i H.*, 23, 147-184.
- OBRATIL, S., 1986-1987: Naselja ptica (*Aves*) u ekosistemima Gatačkog polja i okoline prije izgradnje termoelektrane Gacko. — *Glas. Zem. Muz. B. i H.*, 25-26, 211-237.
- PICHLER, A., 1906: Beitrage zur Kenntnis der Avifauna der Umgebung von Mostar. — *Ornit. Monatschrift*, 31 (7), 378-572.
- REISER, O., 1894: Materialien zu einer Ornithofauna Balcanica II, Bulgarien. Wien.
- REISER, O., 1905: Materialien zu einer Ornithofauna Balcanica III, Griechenland. Wien.
- REISER, O., 1939: Materialien zu einer Ornithofauna Balcanica I, Bosnien und Hercegovina. Wien.
- REISER, O. & FUEHRER, L., 1896: Materialien zu einer Ornithofauna Balcanica IV. Montenegro. Wien.
- ROHAČEK, F. H., 1919a: Uebersicht ueber die Brutvoegel der Bocche di Cattaro. — *Ornithol. Jahrb.*, 28, 116-129.
- ROHAČEK, F. H., 1919b: Beitrage zur Biologie der *Sitta neumayer* Mich. — *Ornithol. Jahrb.*, 28, 130-136.
- RUCNER, D., 1954: Ptice doline Neretve. — *Larus*, 6-7, 53-138.
- RUCNER, D., 1959: New data for the Study of the Ornithofauna of the lower Neretva. — *Larus*, 11, 63-73.
- RUCNER, D., 1963: Die Verbreitung des Felsenkleibers *Sitta neumayer* im Kroatischen Kuestenlande. — *J. Orn.*, 104, 58-61.
- RUCNER, D., 1970: Nadopuna poznavanju ptica doline Neretve (III). — *Larus*, 21-22, 99-114.
- RUCNER, R., 1964: Utjecaj ekoloških faktora na ornitofaunu gornjeg Jadrana. Disertacija, Zagreb.
- RUCNER, R., 1965: Odnos mediteranske vegetacije i mediteranskih elemenata ornitofaune na Balkanskom poluotoku. — *Larus*, 16-18, 79-105.
- STRESEMANN, E., 1920: Avifauna Macedonica. Muenchen.
- STRESEMANN, E., 1925: Zur Systematik der Felsenkleibers. — *Ornit. Monatsber.* p 108.
- SUŠIĆ, G., RADOVIĆ, D., BARTOVSKY, V., 1988: Znanstvena zbirka ptičjih svlakova Zavoda za ornitologiju JAZU. U: Ornitologija u Hrvatskoj. Razr. za prir. znanosti, 37-87, Zagreb.
- THALER, E., 1979: Das Aktionssystem von Winter- und Sommergoldhaenchen (*Regulus regulus*, *R. ignicapillus*) und deren ethologische Differenzierung. — *Bonn. Zool. Monogr.*, 12, 1-151.
- TUTMAN, I., 1959: Ornithophenological Notes from the Dubrovnik area. — *Larus*, 11, 75-103.
- TUTMAN, I., 1963: Ornithological Notes from the environs of Zavala. — *Larus*, 15, 178-182.
- TALSKY, J., 1900: Die ornithologische Versammlung in Sarajevo. — *Ornith. Jahrb.*, 11-12, 47-60.
- VASIĆ, V. F., 1977: Klisura kod sela Brača (Sutomore, Crna Gora) i njena ornitofauna. — *Larus*, 29-30, 357-358.
- VASIĆ, V. F., 1980: The List of birds of Skadar Lake (Montenegro, Yugoslavia). — *Larus*, 31-32, 185-208.
- VOOUS, K.H., 1962: Die Voegelwelt Europas und ihre Verbreitung. Hamburg.

Received August 22, 1992