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Nesting of the Sylvia Warblers

[with Pls. XIV—XX and 17 text-figs]

Gnieżdżenie się pokrzewek z rodzaju Sylvia

Abstract. The description presented in this paper includes the site, construction, building materials as well as the shape and size of the nests of the following species: Sylvia atricapilla, S. communis, S. nisoria, S. curruca, S. althaea, S. borin, S. hortensis, S. melanocephala, S. rüppelli, S. cantillans, S. nana, S. mystacea, S. conspicillata, S. undata and S. sarda. The species characterized by a large breeding range show a greater variety of nest-sites than those with a smaller range. The occurrence of various types of nests is connected rather with the geographical distribution of the species than with the size of its range. The similarities in structure between these nests suggest closer phylogenetic relationships between some species within the genus Sylvia.

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The substance of the present paper consists of descriptions of warblers' nests, chiefly, the nests of five species belonging to the breeding fauna of Poland and Central Europe. An analysis of these descriptions is expected to lead to a precise determination of the characteristics of the nests of particular species, taking into consideration their widest possible range of variability and adaptability. This is why the data from the territory of Poland, gathered in a record card-index, are supplemented with descriptions of the nests collected in other countries and those stored in various collections, and with details from literature. Recently, a number of studies have been published, in which, among other things, the habitats and nest-sites of Central European warblers are analysed on big series (BAIRLEIN 1978; BAIRLEIN et al. 1980; BERTHOLD 1978; DECKERT 1955; NEUSCHULZ 1981 and others). On the other hand, the set of data about the nests of other species of the genus Sylvia, based on original field observations and studies of collections, or derived from literature makes it possible to show the Central European species against a broader background, to point out differences and similarities between species, and to put forward some phylogenetic suggestions. Such conclusions based on nest construction appear to have corroboration from genetic findings, just as they had earlier, e.g., in the case of thrushes (Bocheński 1968, 1974; Panov and Bulatova 1972).

The genus Sylvia contains about 18 species, there being some differences of opinion as to the rank of several forms, e.g., althaea, minuta and melanothorax (VAURIE, 1959; VOOUS, 1977; WILLIAMSON, 1968). Apart from the five Central European species, I managed to obtain some data about the nests of another 10 species from South Europe and Asia. However, I failed to get at any nests of the following warblers: Sylvia melanothorax (Cyprus), S. minuta (Asia) and two African species: S. deserticola (North Africa, chiefly the Atlas Mts.) and S. leucomelaena (East Africa, Arabia and Palestine). Unfortunately, these deficiencies impair the completeness of the picture of intrageneric differences and similarities.

The sequence of the species being described has been adopted from Clements's (1974) Checklist. Nevertheless, I make it clear that I have applied it only for the purpose of order and the vicinity of species in this paper is not intended to suggest any phylogenetic affinities.

II. MATERIAL AND METHOD

Field observations were taken down on nest record cards, on which nest measurements and sites, nest material and the manner of its use are given. Sketches of typical nest-sites are often presented and, in addition, photographic documentation is provided for many nests. Some of the nests have been gathered and included in the scientific collection of the Institute of Systematic and Ex-

perimental Zoology, Polish Academy of Sciences (ZZSiD). They come from Poland, England, Bulgaria, France, Iran and the USSR (some of them received as gifts from foreign ornithologists). Data concerning the sites of nests have besides been obtained from the nest and brood card-index in the Institute of Bird Ecology, Wrocław University (ZEPUW). I have also turned to use the nest record cards from the National Museum in Prague (NMP) and the following scientific collections (the abbreviations of the names of these collections given in brackets are used further in the text): The District Museum at Radom (MOR), Zoological Museum, State University of Moscow (ZMMGU), Prof. A. P. Kuzyakin's (APK) and Dr V. V. Leonovich's (VVL) private collections in Moscow, with specimens from various parts of the Soviet Union, British Museum (Natural History), Sub-Department of Ornithology at Tring (BMNH), Zoological Museum in Helsinki (ZMH), Royal Museum of Natural History in Brussels (MRHN), Royal Museum of Natural History at Leiden (RNH) and Pyrenean Centre of Experimental Biology at Jaca (CPBE).

In describing the nest-sites, I paid attention to various characteristics, such as the height above the ground, the species of trees, shrubs and other plants in which the nests were sited, the very manner of location (support), etc. In order to standardize the descriptions of nest-sites they have been divided into typical groups, illustrated diagrammatically in Fig. 1 and, same of them, also in photographs (Pls. XIV—XIX).

The analyses of the material used to build the nests are not uniformly accurate. Nests containing eggs or nestlings, found during field studies, were naturally — in view of the protection of birds — described only on the basis of their external appearances. The possibility to take nests stored in collections in one's hand permitted a more accurate description, whereas the demolition of a number of nests abandoned by birds anabled a very detailed analysis. In each case attention was given to the sort of material used, the manner in which it was used (e.g. the bending of long grass stems), the general amount of material and the amounts of its particular components, the compactness of the nest structure, the transparency of its walls or bottom, the protrusion of the ends of stalks of grasses and herbs beyond the nest surface, the presence or lack of a fairly tightly woven rim at the edge of the nest and the use of cocoons and cobwebs to build or adorn the nest.

Both the inner diameter of the cup and the outer diameter of the nest were usually measured twice, crosswise, to determine its elliptic shape if that was the case. The mean diameters used in further calculations were obtained from these two measurements. The height and depth of nests were also measured. Single ends of grass stems, stalks of herbs and sticks, projecting freely beyond the bulk of the nest and in some cases forming a "crown" round the nest were not included in the measurements of the outer diameter. The following types of nest shapes have been distinguished on the basis of mutual relations between particular dimensions: flat nests — when the nest height is smaller than the half of the outer diameter, hemispherical nests — when the height is more or less

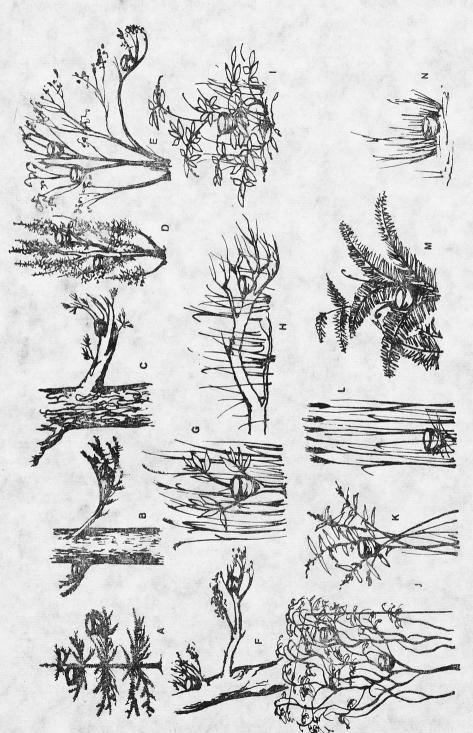


Fig. 1. Main types of nest-sites of Sylvia warblers: A — in young spruce or fir, B — in old spruce or fir, C — in old pine, thuja old deciduous tree, G — in tree or shrub seedling amidst grasses and herbs, H — on a branch laying on the ground among grasses or oypress, D — in juniper, etc. (young Taxodium, Stauracanthus), E — in deciduous shrub (or young tree, or raspberries), F — in and herbs, I — on shoots of bramble (also among grasses and nettles), J — in creepers (hop, grape-vine, etc.), K — in perennial plant (nettle, spirea, etc.), L — in grasses, reeds and cereals, M — in fern, N — on the ground (usually amidst grasses)

equal to the half of the outer diameter, high nests — when the height is greater than the half of the diameter, and very high — when it exceeds the whole outer diameter. Analogously, in the descriptions of inner cups four categories have been introduced (shallow, hemispherical, deep and very deep).

III. BLACKCAP SYLVIA ATRICAPILLA (LINNAEUS 1758)

The study material consists of 96 own nest record cards and 183 nest and brood record cards of the Institute of Bird Ecology. They come from various parts of Poland. The material contains also 6 nest record cards from the National Museum in Prague (from Czechoslovakia) and nests from the following collections: BMNH (4 nests from the British Isles, Nos N.1.1, N.191.17 and 2 unnumbered, and 4 nests from the Canary Is, Nos N.193.261, N.193.364—366), ZMMGU (1 from Kiev region), MRHN (2 from Belgium, Nos 9686E and 14375), CPBE (2 from the Barcelona environs) and ZMH (4 from Finland, Nos 234—237).

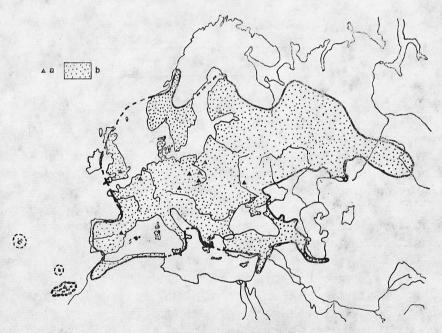


Fig. 2. Blackcap Sylvia atricapilla. The places of derivation of the nests examined — a, against the breeding range of the species acc. to Portenko and Vietinghoff-Scheel (1971b) with supplements (Williamson 1968) — b

The nests analysed belonged therefore to the nominative form S. atricapilla atricapilla (LINNAEUS 1758) from Europe and to S. a. heineken (JARDINE 1830) from the Canary Is. The places where these nests were taken are plotted against a background of the breeding range of this species on the map in Fig. 2.

Nest-site

The height at which 259 nests from Poland were situated ranges from about 0.1 to 4.5 m above the ground, averaging 1.08 m. The distribution of nesting heights is presented in Table I, which shows that the most nests, above 31% of the total, lie in the height group between 0.51 and 1.0 m. The height group

Nesting heights of 259 Blackcaps Sylvia atricapilla in Poland

Table I

Height, in m.	Number	%
0.010.50	65	25.10
0.51-1.00	82	31.66
1.01—1.50	60	23.17
1.51-2.00	38	14.67
2.01-2.50	7	2.70
2.51-3.00	4	1.54
3.01-3.50	1	0.39
3.50-4.00	1	0.39
4.01—4.50	1	0.39
Total	259	100.00

0.01—0.50 m comes second and the nests of these two groups together form above 56% of the nests examined.

Deciduous trees and shrubs altogether prevail considerably among the plants in which the nest were found (Table II), although the greatest number of nests were sited in spruce trees, which were followed by elders (both species together) and next by currants (wild and garden varieties together).

The most nests were built on thin twigs of young conifers spruces and firs, the height of which did not for the most part exceed 1.5 m and often was even lower than that. They were as a rule sited in the top portion of a tree, on a horizontal branch, where lateral twigs grew out of it, usually at a distance of several to some dozen centimetres from the trunk. Quantitatively these nests were followed by nests placed on relatively thin, horizontal or slant branches of shrubs in places where such branches forked or twigs grew out of them (Table III). Another type of nest-site includes nests built, inshrub whorls and among several (usually 3—5) vertical or partly slanting shoots. All the other types of nest-sites, e.g. on bramble shoots, among several leaning leaves of a fern, amidst twigs of junipers or on perennial shoots rarely occur in Poland.

Nest construction and material

A huge majority of nests of the Blackcap are relatively fine structures built chiefly of vegetable material. The rim that forms the edge of the nest is usually

Table II
Species of plants in which 287 nests of the Blackcap Sylvia atricapilla were built in Poland

Plant species	No of nests	%	Plant species	No of nests	%
Picea sp. (mainly excelsa)	57	19.8	Rosa canina	2	0.7
Sambucus sp.			Crategus sp.	2	0.7
(nigra and racemosa)	23	8.0	Sorbaria sp.	2	0.7
Ribes sp.	16	5.5	Pinus sp./Sambucus nigra	2	0.7
Grossularia reclinata	11	3.8	Thuja sp.	1	0.4
Fagus silvatica	11	3.8	Acer platanoides	1	0.4
Rubus fruticosus	11	3.8	Acer negundo	1	0.4
Chumulus lupulus			Betula sp.	1	0.4
(winding round			Populus sp.	1	0.4
a bush or tree)	10	3.5	Alnus sp.	1	0.4
Philadelphus coronarius	9	3.1	Sorbus sp.	1	0.4
Carpinus betulus	8	2.8	Cornus sanguinea	1	0.4
Corylus avellana	8	2.8	Prunus virginiana	1	0.4
Abies alba	7	2.4	Prunus domestica	1	0.4
Juniperus communis	7	2.4	Budica variabilis	1	0.4
Rubus idaeus	7	2.4	Undetermined deciduous		
Prunus padus	6	2.1	trees and shrubs	43	15.0
Tilia sp.	5	1.7	Broken branch lying		
Frangula alnus	5	1.7	in grasses	4	1.4
Symphoricarpus albus	4	1.4	Undetermined herbs	3	1.0
Ulmus sp.	4	1.4			
Dryopteris filix mas	4	1.4			188 2.0
Prunus spinosa	3	1.0	Total	287	100.0
Quercus sp.	2	0.d	10000	201	100.0

woven most tightly. Although the material used for building nests consisted of long components (grass, stalks, etc.), only rarely (7 in 81 nests of the nominative form) their free ends projected rather considerably and formed a "crown" outside the bulk of the nest. The transparency of the walls or/and the bottom was found in a great many nests, which shows that their open-work structure is a characteristic feature. One of the four nests of S. a. heineken from the Canary Is. (BMNH, N.193.261) differed considerably from this description, being a very Profuse and soft structure, with non-transparent thick walls and bottom.

The results obtained in an examination of the material used to build 72 nests of the nominative form are presented in Table IV. Grasses were used most frequently, usually stems but sometimes their leaves occurred as well. The stems varied in length (to about 30 cm). The long ones were bent, often several times. In nearly half the nests examined grass was the basic material of the external nest layer. In other nests dry rigid and fresh stalks of herbs, etc. were dominant in the external layer, e.g. one of the nests from the Barcelona region had that layer and the rim made for the most part of interlaced and not folded twigs of

Sites of 124 nests of the Blackcap Sylvia atricapilla in Poland

General designation	Symbol in Fig. 1	Features of nest site	No of nests	%
Young spruce or fir	A	on twigs close to trunk on twigs, distant from trunk	7 30	5.7 24.2
Old spruce or fir	В	on branches, distant from trunk	2	1.6
Junipers	D	amidst twigs	5	4.0
Deciduous saplings and shrubs	E	among vertical twigs in whorls on thin horizontal or slanting twigs between vertical twig and rock on raspberry shoots	8 12 23 1 2	6.5 9.7 18.6 0.8 1.6
Old deciduous tree	F	in suckers on horizontal branch	7	5.7 8.1
Broken branch	Н	lying in grasses	3	2.4
Bramble	I	on trailing shoots among nettles	3	2.4
Creepers	J	amidst stalks of hop winding round a shrub or tree	4	3.2
Perennials	K	on horizontal shoots	3	2.4
Ferns	M	in a cluster, amidst leaves	4	3.2
	100 May 200 Ma	Total	123	100.1

Clematis. In some other nests the material that dominated in the external layer consisted of dry thin twigs, mainly of fir and spruce, rootlets and rhizomes. In a dozen nests or so the material was so differentiated that it was hard to distinguish a definitively predominating component.

Cobwebs and cocoons stuck in various quantities on the external side of the nest walls and the rim can be observed in a large number of specimens (above 60%). Binding particular stalks or grass stems to each other and attaching nest to supporting branches, cobwebs play a structural role in many nests. Using cocoons for attaching nest was also observed in a few cases (see Phot. 5).

In the remaining cases the role of cobwebs and bright-coloured cocoons might be decorative. This trial of interpretation would be to some extent supported by single nests in which dry white bramble flowers or sparkling tinsel threads were attached to the external layer.

The second, inner, layer is a lining that covers the bottom and partly the walls of the nest on the inside. It is a transparent layer, usually built of a small

amount of material consisting of dry and very fine components: thin elastic fragments of grass stems, rootlets and long hair. Single small feathers happen here quite sporadically.

 ${\bf Table~IV}$ Material used for building 72 nests of the Blackcap Sylvia a. atricapilla

	Outer	layer	Lin	ing
Material	No of nests	%	No of nests	%
Grasses: stems (and leaves)	63	87.5	35	40.0
(as basic material)		(47.2)	39	48.6
Stalks of herbs	(34)	54.2	5	0.0
(as basic material)	(14)	(19.4)	3	6.9
Rootlets	17	23.6	31	43.1
(as basic material)	(3)	(4.2)	91	40.1
Sticks (twigs)	33	45.8		
Vegetable fibres, bast	7	9.7	3	4.2
Moss	10	13.9		7.2
Vegetable down	5	6.9		
Leaves (fragments)	4	5.6		
Bud scales	2	2.8		
Pine needles	2	2.8		
Fruit penducles	1	1.4	(6.0)	
Dry flowers of bramble	î	1.4		
Cobweb	36	50.0		
Cocoons	18	25.0		
Long hair	1	1.4	29	40.8
Hair and wool	1	1.4		20.0
Small feathers	1	1.4	2	2.8
String, yarn	5	6.9	1	1.4
Celophane strips	1	1.4	_	

The qualitative composition of the material used to build four nests of S. a. heineken did not differ from that described above.

The shape and size of nests

The shape of the Blackcap's nest is differentiated, ranging from flat (35 mm in height, 105 mm in outer diamter) to high, when the height is greater than the nest radius, and in one case even very high (100 mm in height, 95 mm in outer diameter). It seems to be dependent upon the fashion in which the nest is placed: nests placed on horizontal branches are lower than those sited among vertical twigs or in ferns. Scarcely 20 out of the 72 nests of the nominative form in which two measurements of diameter were taken crosswise had

							Sylv	ria atricap	illa atricaj	oilla							S. a. her	ineken
Measu- rement		/	Poland			Czecho- slovakia N = 5	/USSR: Kiev N = 1	Finland N = 7	$egin{array}{c} \operatorname{Belgium} \ \mathrm{N} = 2 \end{array}$	Great Britain N = 4	$egin{array}{c} ext{Spain} \ ext{N} = 2 \end{array}$			Total			The Cana	
	N	Range	\overline{X}	SD	V	\overline{X}		X	$\overline{\mathbf{x}}$	$\bar{\mathbf{x}}$	\overline{X}	N	Range	\overline{X}	SD	V	Range	\overline{X}
Outer diameter	62	82.5—115.0	98.26	7.40	7.53	101.0	100.0	105.62	93.75	94.37	102.5	80	82.5—115.0	98.62	7.20	7.30	82.5—125.0	100.25
Inner diameter	63	52.5—72.5	63.28	4.11	6.49	60.0	60.0	62.37	61.25	59.62	62.25	81	52.5—72.5	62.73	3.90	6.21	57.5—68.0	63.5
Height	63	35.0—100.0	60.94	10.74	17.62	54.0	50.0	51.25	55.0	57.5	50.0	81	35.0-100.0	59.31	10.36	17.46	45.0-70.0	53.75
D_{epth}	61	25.0-55.0	40.90	6.11	14.93	44.0	30.0	36.25	35.0	38.75	37.5	79	25.0-55.0	40.38	6.26	15.50	35.0-50.0	38.75

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a circular outline when seen from above, in the other nests it was elliptic or ovate (e.g. diameters — 85×105 mm). Similarly, the outline of the inner cup is mostly elliptic, two specimens departing most from the circular shape had diameters of 55×70 and 60×80 mm. The measurements taken are presented in Table V. The most stable dimension is the inner diameter, which, to be sure, ranges from 52.5 (50×55) to 72.5 (70×75) mm, but these extremal cases are rare and well above 50% of nests have this dimension within limits of 60 and 65 mm; and so, with the mean value equal to 62.9 mm the coefficient of variation is hardly 6.21. We are therefore concerned here with a dimension of great value as a distinctive feature. Although the means from particular countries juxtaposed in Table V differ somewhat from each other, these differences seem to result, above all, from the very small size of samples. As regards S. a. heineken, although its series numbers scarcely 4 nests, it is striking that the range of the values of its outer diameter is larger than that of the nominative form.

Discussion

The now calculated mean height of the nest-site (1.08 m) above the ground seems to be characteristic of Central Europe. It is supported by the data presented by Czarnecki (1956) from the Poznań province, who found 27 nests at a height of less than 2 m and 6 at that of more than 2 m from the ground, BAIRLEIN (1978) from southern Germany (1.21 m for 121 nests) and Stein (1979) from the Magdeburg region (1.12 m). HUDEC et al. (1983) give 1.1 m as the mean from 133 nests in Czechoslovakia, whereas according to NAUMANN (1898), the nests are most frequently placed at a height of 1.7 m and hardly ever below 0.5 m. Most of the nests seen by Malchevski (1959) in the regions of Leningrad and Voronezh were built less than 1 m above the ground, although on the rivers Volga and Kama, in the eastern range of the distribution area of the nominative form, nests were found between 0.20 and 3.0 m (ZATSEPINA, 1978). In Finland the mean height is, according to HAARTMAN (1969), 0.6 m. It is hard to tell whether these differences are connected with the geographical position or with the differences between the habitats occupied by the birds, which also exerts an influence on the choice of the nest-site (Berthold 1978). The Asiatic subspecies S. a. dammholzi Stresemann 1928 nests at various heights, also in fruit-trees, in which its nests occur 5-6 m above the ground (Volchanetski 1954).

The long list of trees, shrubs and other plants in which nests of the Blackcap were observed (Table II) can be extended considerably. The nests examined by BAIRLEIN et al. (1980) were placed in more than 50 plant species. More important are the similarities and differences in the dominance of species chosen by birds. The materials of BAIRLEIN et al. (1980), with conifers distinctly dominant, showed an analogous structure also in this respect to that found in the present study, although in another population investigated by BAIRLEIN (1978) the

jasmine (Philadelphus) prevailed. According to Mason (1976), nearly half of the nests observed in the British Isles were built in brambles, which agrees with Bannerman's (1954) general statement. Robien (1939) writes that in Pomerania a majority (19) of the 129 nests observed were sited in spiraea shrubs and only 8 in young spruces, whereas out of the 35 nests recorded by CZARNECKI (1956) from the Poznań Province, 8 were placed in elders and 5 in Spiraea sp. Most of the nests found by MALCHEVSKI (1959) in the region of Leningrad were in spruces and the nests in hazels dominated on the rivers Volga and Kama (Zatsepina 1978). The Finnish materials show a distinct dominance of spruce (Haartman 1969). Consequently, it may be assumed in general that the Blackcap shows a preference for nesting in conifers and, among these, in spruces, wherever these trees are available; this however does not limit its occurrence, which indicates the appreciable adaptability of this bird. The preference that it shows (e.g. in the British Isles) for brambles may evidence an inclination of this bird to building nests on branches with a rough (thorny) surface, which, just as it happens in the case of conifers, makes it easier for the bird to fasten the nest to them.

So far the nest structure has not been given a close study. All the authors agree in general that there are two layers: the outer layer and the lining (Bannerman 1954; Campbell and Ferguson-Lees 1972; Gotzman and Jabloński 1972; Harrison 1975; Naumann 1898; Verhayen 1967; Volchanetski 1954). Similarly, they more or less agree as to the basic nest building materials, although Naumann (1898) emphasizes their diversity and writes that materials may vary from nest to nest built by the same female. Attention is however attracted by some details that have not been observed now, namely, the role of woollen shreds, stressed by Gotzman and Jabloński (1972), as material binding together other components and fastening the nest to twigs, and the lack of cocoons and cobwebs, also noted by those authors. These last materials occurred in a high percentage of nests analysed in the present study and have also been recorded by other authors (e.g. Verhayen 1967), just as binding material.

It can be seen from Table V that the mean outer and inner diameters of the nests measured in Poland come near to the data from other European countries. Fairly great differences occur in the height and depth of nests. The mean height given by Hudec et al. (1983) for 56 nests from Czechoslovakia is much greater (70 mm) than that in Table V and so is the mean height (72 mm) obtained by Zatsepina (1978) from 20 nests on the rivers Volga and Kama; the inner diameter and depth are also greater by several millimetres (respectively, 66 and 45 mm). This may be to some extent connected with the mean size of the clutch, which in Central Europe ranges between 4.57 eggs in Switzerland, 4.76 in southern Germany (Barlein et al. 1980: Table 9), 4.78 in Czechoslovakia (Hudec et al. 1983) and 4.9 on the Volga and Kama (Zatsepina 1978). According to Bannerman and Bannerman (1966), the subspecies S. a. atlantis Williamson 1964, living in the Azores build larger nests than do the birds living in France. One of the above-mentioned nests of S. a. heineken from the Canary Is. (BMNH

N.193.261), distinctly exceeding the remaining ones in size (outer dia. 110×140 mm), may have been due to a fairly general tendency, prevailing in the populations of the islands in the Atlantic Ocean.

IV. COMMON WHITETHROAT SYLVIA COMMUNIS LATHAM, 1787

The study material consists of 60 own nest cards and the data concerning the situation of 111 nests from the nest and brood record cards of the Institute of Bird Ecology, Wrocław University, from various parts of Poland. To these have been added the data obtained from the nests of the following collections: MOR (15 nests from Poland), MRHN (3 from Belgium, Nos 9683E. 14382, 35281), ZMH (7 from Finland), BMNH (5 from the British Isles, Nos N.191.15, 191.16, 197.2, 217.1 and one unnumbered), ZMMGU (1 from the Alma-Ata region) and the data from 4 nest cards of the National Museum in Prague. Therefore, the nests under study belonged to the nominative form S. c. communis Latham, 1787, inhabiting Europe, except one from Central Asia, labelled as S. c. rubicola Stresemann, 1928, which subspecies is regarded by Vaurie (1959) and Williamson (1968) as synonymous with S. c. icterops, Ménétries, 1832.

The places where these birds have been collected are plotted on a map showing the breeding range of this species (Fig. 3).



Fig. 3. Common Whitethroat Sylvia communis. The places of derivation of the nests examined — a, against the breeding range of the species acc. to Portenko and Vietinghoff-Scheel (1971a) — b

Nest-site

The height of nesting above the ground determined for 126 nests in Poland ranges from 0 (nests placed on the ground) to 1.6 m. The mean height is low and equals 34.05 cm, the quantitative distribution of nesting heights being presented in Table VI. About 80% of the nests examined lie within one height

 ${\bf Table~VI}$ Nesting heights of 126 Common Whitethroats ${\it Sylvia~communis}$ in Poland

Height, in m.	Number	%
0 (on the ground)	6	4.76
0.01-0.50	101	80.16
0.51-1.00	15	11.90
1.01—1.50	3	2.38
1.51—2.00	1	0.79
Total	126	99.99

interval, between 0.01 and 0.50 m above the ground, which seems to be very typical of this species in Europe. Table VII gives a list of plant species in which 162 nests examined in Poland were placed. Their variety is remarkable, which can be seen from the fact that 60 items have been noted. It appears that about one-fourth of the nests were held by more than one plant species (usually two). These other species were most frequently various grasses, nettles and other perennial plants (e.g. Solidago). The most nests (14) were built in brambles and in further 8 cases brambles occurred in combination with other plants (most often grasses — 5 cases). Altogether over 13% of the nests were therefore sited in brambles. Seven nests were found in briar-rose bushes. On the other hand, although grasses held only 6 nests by themselves, together with other plants they supported another 30 nests, thus forming 22% of the total. It seems hard to speak about a distinct preference on the basis of the data from Table VII. Considerably more characteristic were the ways in which the nests were placed in plants regardless of the specific membership of the plants. These have been noted in 83 cases. The division of these data according to the type of site (Fig. 1) is shown in Table VIII. Nests built in brambles prevail; next come those in herbs (perennials, grasses, cereals, etc.) and small shrubs or seedlings in the layer of herbs, which also help to support them.

It is worth mentioning here as an unheard-of fact in warblers that one nest of the collection of BMNH (N.197.2) was placed on an old flattened nest of another bird, built mostly of moss (Dunnock?).

Table VII
Species of plants in which 162 nests of the Common Whitethroat Sylvia communis were built in Poland

Plant species	No of nests	%	Plant species	No of nests	%
Rubus fruticosus	14	8.7	Salix cinerea Urtica	1	0.6
Prunus spinosus	8	4.9	Calamagrostis Urtica	1	0.6
Rosa canina	7	4.3	Crategus (small) / Urtica	1	0.6
Solidago sp.	6	3.7	Seedling of Alnus sp. /		
Rubus idaeus	6	3.7	/ Urtica	1	0.6
Gramineae undet.	6	3.7	Seedling of Prunus		
Urtica sp.	6	3.7	spinosa / Urtica	1	0.6
Urtica Gramineae	5	3.1	Sambucus nigra / Urtica	1	0.6
Rubus fruticosus /			Small Crategus sp. /		
/ Gramineae	5	3.1	/ Gramineae	1	0.6
Ribes sp.	5	3.1	Dryopteris filix mas /		
Undetermined shrub /			Gramineae	1	0.6
/ Gramineae	5	3.1	Sapling of Tilia sp. /		
Undetermined shrub /			Gramineae	1	0.6
/ Solidago	4	2.5	Seedling of Quercus		
Picea excelsa	3	1.9	sp. / Gramineae	1	0.6
Juniperus communis	3	1.9	Seedling of Carpinus		
Sambucus nigra	3	1.9	betulus / Gramineae	1	0.0
Prunus spinosus /			Salix purpurea /		
/ Gramineae	3	1.9	/ Gramineae	1	0.0
Triticum sp.	2	1.2	Rubus idaeus Gramineae	1	0.6
Grossularia reclinata	2	1.2	Solidago Gramineae	1	0.6
Ribes sp. / Gramineae	2	1.2	Sambucus nigra		
Crategus sp. (small)	2	1.2	/ Gramineae	1	0.6
Alnus sp. (shrubby)	1	0.6	Juncus sp. / Gramineae	1	0.6
Carpinus betulus (seedling)	1	0.6	Undet. perennials /		•
Salix cinerea	1	0.6	Gramineae	1	0.6
Salix sp.	1	0.6	Broken branch / Gramineae	2	1.5
Quercus sp. (seedling)	1	0.6	Undet. shrub / Phragites	- 4 -	
Malus silvestris (seedling)	1	0.6	communis	1	0.6
Symphoricarpus albus	1	0.6	Triticum sp. / undet.		
Taxodium sp.	1	0.6	thistle	1	0.6
Undetermined thistle	1	0.6	Heap of dry twigs	2	1.2
Carex sp.	1	0.6	Undetermined herbs	7	4.
Rumex obtusifolius	1	0.6	Undetermined perennials	2	1.5
Phragmites communis	1	0.6	Undet. tree saplings	-	2
Prunus spinosus Solidago	1	0.6	and deciduous shrubs	17	10.
Rubus fruticosus Solidago	1	0.6	and decidences smans		10.6
Rubus fruticosus / undet.			7.65		
shrub Rubus fruticosus / undet.	1	0.6	Total	162	99.4
herbs	1	0.6			

 ${\bf Table~VIII}$ Sites of 83 nests of the Common Whitethroat Sylvia communis

General designation	Symbol in Fig. 1	Features of nest site	No of nests	%
Young spruce or fir	A	on horizontal twigs, not touching the trunk	3	3.6
Junipers and the like	D	among twigs of juniper in the midst of 4 twigs	1	1.2
		of taxodium	1	1.2
Deciduous shrubs	Е	osier, blackthorn, with grass growing among twigs (nest low above ground)	5	6.0
		among twigs more than		0.0
		0.5 m from ground on horizontal twig	3	3.6
Tree seedlings or bushes in the layer of grasses	G	on twigs, hidden in grasses and/or nettles	13	15.7
Broken branch	H	lying in grasses	2	2.4
		heap of dry twigs	2	2.4
Bramble	I	on trailing shoots on shoots amidst grasses and/or herbs	14	16.9
		and/or nerbs		0.4
Herbs and perennials	K	among stalks of Solidago	6	7.2
		among several nettles	6	7.2
	31.1	amidst nettles and grass	5	6.0
Grasses, cereals	L	amidst grasses	6	7.2
and the like		amidst stems of cereals	2	● 2.4
		amidst reeds	1	1.2
Ferns	M	in a cluster, amidst leaves	1	1.2
On the ground	N	lying against a small bush or another plant	2	2.4
	-	Total	83	99.8

Nest construction and material

The nests of the Common Whitethroat are for the most part fairly voluminous but loose structures, which are only sporadically funrished with a well-woven rim. Owing to the abundance of material, the walls of most nests are hardly transparent. Table IX shows the composition of materials used to build 69 nests, of which 55 are from Poland and the remaining ones from Belgium, Finland and the British Isles. Grasses are the most often encountered material. Their stems predominate in the outer layer but leaves are also present. The stems in the outer layer may be 0.5 m or even more in length, sometimes with panicles and bent several times. The grass and herb stalks are bent at various angles, from acute to obtuse, or even folded up. These bends occur at various intervals, e.g., the segments marked out by the bends in a long stem were as follows: 35—30—42—145—50—49—40 mm. The ends of stems of grasses and herbs often protrude several centimetres beyond the bulk of the nest, forming a crown.

Table IX

Material used for building 69 nests of the Common Whitethroat Sylvia c. communis

	Outer	Lining		
Material	No of nests	%	No of nests	%
Grasses: stems and leaves	60	86.9	44	63.8
(as basic material)	(34)	(49.3)		
Stalks of herbs	41	59.4	4	5.8
(as basic material)	(19)	(27.6)		
Rootlets	10	14.5	13	18.8
(as basic material)	(2)	(2.9)		
Sticks (twigs)	2	2.9		
Leaves	3	4.3	- 19	
Moss	2	2.9	/	
Horsetail	1	1.4		
Vegetable down	19	27.5	4	5.8
Cocoons	23	33.3	1	1.4
Cobweb	5	7.2	1	
Long hair	1	1.4	28	40.6
Small feathers	1	1.4	\ 	
Wool and wollen yarn	3	4.3		

In half the number of the nests grasses are the main and in about 20 nests the only material of the outer layer (unless we count the cocoons stuck round the edge of some of them). In 28% of the nests various dead stalks are the basic material of the outer layer, usually however with an addition of grasses and rootlets. This kind of material is not uniform, it may consist of branching stalks of

herbs, e.g., St.-John's-wort, or those of nettles and horsetails. Rootlets and couch-grass rhizomes were the basic material of two nests. Cocoons, present in the outer layer, are hardly ever built into this layer but are mostly attached round the edge or on the outside of the walls. They usually occur in small numbers, rarely more than a dozen or so. The same is true of sherds of plant down, which is usually whitish and sometimes yellowish or greenish in colour. Cocoons and down generally occurred alternately in nests; only in 4 nests they were both present in each. Cobwebs were quite rare.

The inside of the nest is covered with a lining, most often of very thin and fine pieces of grass stems, sometimes parts of inflorescences. In nests in which they are the only material of the lining, they differ from the grasses used to build the outer layer exclusively in being fine. The second most frequent lining material is animal hair, used in most nests as an addition to grasses. The hair is long and dark — horse and boar hair has been identified among other kinds. In one of the nest record cards (Masurian District, May 1981) the observer states that the nest had a roof, hung on a twig of a shrub growing close by, 12 cm above the edge of the nest.

The above-mentioned nest of Sylvia communis icterops from the Alma-Ata region does not differ from the nests of the nominative form under study either in construction or in material.

The shape and size of nests

The nests of the Common Whitethroat were of various shape: from not very numerous hemispherical nests, through high ones, which were in the majority, to 2 very high nests, in which the height exceeded the mean from 2 measurements of the outer diameter. Three of the nests measured in collections belonged to flat ones (height smaller than outer radius), however, we may as well have been concerned here with an artificial partial flattening of the nest caused by improper storage. This is perhaps indicated indirectly by the fact that such proportions have not been found in any of the nests measured in field. The outline of the horizontal projection of most nests is somewhat elliptic: two most striking examples measured across: 80×110 mm and 100×130 mm. The inner cup that most resembled an ellipse had diameters of 62×78 mm (this situation was also reflected in the outer diameters, which were 100×125 mm). This remarkable deformation may have been caused by nestlings, the nest was measured when they had already left it. The height of the very high nests mentioned above was 108 and 100 mm. A huge majority of nests were deep, one of them even very deep: its depth, 75 mm, exceeded the inner diameter (70× 75 mm). The dimensions of all the nests measured are given in Table X.

The most stable and least differentiated measurement is the inner diameter, its coefficient of variation being 8.88. It is, therefore, of the greatest value as a characteristic feature of the nests of the Common Whitethroat.

The measurements of the nest of $Sylvia\ communis\ icterops$ are as follows: outer diameter — 98×100 mm, inner diameter — 60×65 mm, height —

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50 mm, depth — 40 mm. And so this nest does not differ from the nests of the nominative form in respect of dimensions.

The shape of the inner cup in its cross-section may be various. In deep nests the walls usually rise vertically, in hemispherical inner cups they may lean somewhat apart, and in those with a distinct rim, the opening of the inner cup is narrowed a little as compared with the cup itself.

One nest of a male Common Whitethroat observed did not differ from ordinary nests in size and shape, but it lacked lining.

Discussion

All the data published in literature confirm that the Common Whitethroat nests low. Basing himself on a very large series, more than 3000 nests, from the British Isles, Mason (1978) writes that above 60% of them were at a height to 1 ft (30 cm) above the ground and only about 10% higher than 2 ft. According to Bairlein et al. (1980), although the nesting heights ranged between 0.03 and 2.0 m, the mean height was 0.46 m above the ground. The mean height of nesting obtained from 145 nests investigated in Czechoslovakia was 0.5 m, though the highest of the nest-sites were 3—4 m above the ground (Hudec et al. 1983), and 0.40 m was the mean calculated for the Finnish material (Haartman 1969). Most of the nests found by Zatsepina (1987) in the Volga-Kama Land were placed less than 30 cm above the ground; Malchevski (1959) and Haartman (1969) relatively often found nests situated on the ground. Volchanetski (1954) writes that the eastern subspecies S. c. icterops (including rubicola) nests low, often close to the ground, although, according to Yanushevich et al. (1960), in Kirgizia nests were found at a height between 20 and 80 cm.

In the materials from Pomerania (Robien, 1939), central and northern Europe (Bairlein et al., 1980) and British Isles (Mason, 1976) the nests built in brambles are twice as many as the next type. However, the most nests of a small local Scottish population were placed in wild raspberries (Macdonald, 1979). In Finland the nests in junipers are most numerous (Haartman, 1969), whereas the data published by Malchevski (1959) and Zatsepina (1978) for the European part of the USSR show a similar structure to that described here, without any distinct dominants. Both this last authoress and Gotzman and Jabloński (1972) emphasize the low nesting sites in small bushes or seedlings among grasses or nettles as a characteristic type, which in the present material comes second in number. Anyway, both herbs and small bushes among them satisfy two conditions, on which Emmrich (1971) laid stress: they are fit for holding a nest and sheltering it from above.

HALLADIN (1935), VERHEYEN (1969), GOTZMAN and JABŁOŃSKI (1972), MACDONALD (1979) and other authors pay attention to the characteristic loose construction of the Common Whitethroat's nests. Moreover, MACDONALD (1979), claims that the nests for second broods are more disorderly and shallower. All the authors that analysed nests of both European and Asiatic birds (GOTZMAN and JABŁOŃSKI, 1972; NAUMANN, 1898; HAARTMAN, 1969; KORELOV, 1972;

Table X

Measurements (in mm) of nests of the Common Whitethroat Sylvia communis, showing their ranges, means, standard deviations and coefficients of variation

Total	\overline{X} SD V	04.94 11.59 11.04	64.66 5.42 8.38	73.05 14.29 19.56	
L	N Range	115.0 71 81.0—145.0 104.94 11.59	53.0—77.0	68.57 65 40.0—108.0	000
7	N	71	7.1	65	0
Finland $N = 7$	X	115.0	67.14 71	68.57	100
Great Britain N = 5	X	109.0	64.20	63.0	
Belgium $N = 2$	X	111.25 109.0	65.00	62.50	00
Czecho- slovakia Belgium N=4 $N=2$	X	92.50	60.00	56.25	000
	Λ	9.88	6.75 8.88	17.84	2000
	SD	.93 10.27	5.75	15.68	
Poland	×	103.93	64.72	76.66	0000
*	N Range	Juter 81.0—127.5 103.	nner liameter 53 53.0—77.0	Height 47 44.0—108.0	0 00
	N	53	53	47	2
Measu-rement		Outer diameter	Inner diameter	Height	17.1

Shnitnikov, 1949; Yanushevich et al., 1960; Zatsepina, 1978; Macdonald, 1979; Halladin 1935) mention grasses as the most characteristic material. Having analysed two nests, Macdonald (1979) writes that the birds used more than 400 pieces of grass to build either nest and 140 black hairs in one case and about 200 thin pieces of grass in the other to line it. The remaining sorts of material agree with those listed in Table IX, opinions differ only as to their frequencies. For instance, Hartman (1969) and Zatsepina (1979) think that the use of cobwebs to cement grasses is characteristic, whereas in the material under study they have been observed in scarcely 7.2% of the nests. Hartman (op. cit.) writes also about the frequent occurrence of single feathers and wool in the lining, but according to Yanushevich (1960) feathers are rare in it. Halladin (1935) found setae of moss sporophytes in the lining and simultaneously he drew attention to the fact that he had not met with hair, mentioned by Naumann (1898). All this indicates local differences in the materials selected, caused, at least partly, by their availability.

NAUMANN (1898), MACDONALD (1979) and Korelov (1960) write that the nests are deep or very deep; on the contrary, according to Halladin (1935), the cup resembles "a slightly flattened hemisphere". Both types were observed in the present material, but the deep nests prevailed. The nest measurements given by various authors generally verge upon those presented in Table X. It seems that in view of the soft and loose material used for building slight differences may be left out of account. The measurements given by Gotzman and Jabloński (1972) generally lie within the range of these measurements quoted from Poland in this paper. The means obtained by Hudec et al. (1983) from a series of 71 nests from Czechoslovakia, with the exception of the nest height (74 mm), nearly coincide with those given now and the mean depth of the nests from Scotland (MACDONALD 1979) exceeds that calculated now from the specimens from the British Isles only by 3 mm. The inner diameter and height of the nests from the Volga-Kama Land (ZATSEPINA 1878) are analogous to those obtained now, but the outer diameter is distinctly smaller (82 mm) and the mean depth greater (56 mm). Unfortunately, in their descriptions of the nests of Asiatic S. c. icterops (including rubicola) Volchanetski (1954), YANUSHEVICH (1960) and Korelov (1972) do not give any mean values. Anyhow, the ranges of measurements quoted by them show that the outer diameter of the nests of this subspecies was somewhat greater than in the nominative form, the remaining dimensions being similar.

V. BARRED WARBLER SYLVIA NISORIA (BECHSTEIN 1795)

The analysis of the nests of the Barred Warbler is based on 21 nest record cards from various parts of Poland and one from either, Bulgaria and Finland (some of these nests are stored in the collection of ZZSiD, Nos A/2111/69, A/2112/69, A/2355/70, A/3100/75, A/3106—3108/75). The data from Poland are supple-

mented with a description of 3 nests from MOR and with 24 nest and brood record eards from ZEP UW. Materials from other countries: data concerning 13 nests from Czechoslovakia from the nest record cards of NMP, descriptions of 4 nests from Finland in the collection of ZMH and 2 nests from the USSR



Fig. 4. Barred Warbler Sylvia nisoria. The places of derivation of the nests examined — a, against the breeding range of the species acc. to Volchanetski (1954) —b

(locality not given) stored at ZMMGU and a nest from the Alma-Ata region (ZZSiD, No A/4169/84). The places where these nests were taken are plotted against the range of breeding of this species (except for the above-mentioned 2 nests from the USSR) on the map in Fig. 4. The intraspecific systematics is controversial and for this reason has been left out of account in further considerations.

Nest-site

The height of the sites of 39 nests examined from Poland (Table XI) ranges between 0.3 and 1.3 m from the ground, averaging 73.5 cm. As regards 13 nests from Czechoslovakia, the mean height was 97 cm (0.5—1.3 m). The plants (chiefly trees and shrubs) in which the nests were sited are given in Table XII. It shows that the number of genera is large and that, though bramble comes first in this respect, it is hard to find out for a certainty if this plant is actually Preferred. If nests were built in trees, these were nearly always young trees, not exceeding 3 m in height, or suckers surrounding a tree stump. A close analysis of nest-sites (Table XIII) shows that the Barred Warbler decidedly prefers

Table XI

Nesting heights of 39 Barred Warblers Sylvia nisoria from Poland

Height, in m.	Number	%
0.01—0.50	11	28.20
0.51-1.00	22	56.41
1.01—1.50	6	15.39
Total	39	100.00

Table XII

Species of plants in which 44 nests of the Barred Warbler Sylvia nisoria were built in Poland

Plant species	No of nests	%
Juniperus communis	5	11.3
Betula sp.	4	9.1
Rubus fruticosus	4	9.1
Rubus fruticosus / Urtica	3	6.8
Ligustrum vulgare	3	6.8
Alnus sp.	3	6.8
Rosa sp.	3 2	4.5
Salix sp.	2	4.5
Carpinus betulus	2	4.5
Picea excelsa	1	2.3
Quercus sp.	1	2.3
Tilia sp.	1	2.3
Corylus avellana	1	2.3
Sambucus nigra / Vibur-		
num	1	2.3
Betula sp. / Urtica	1	2.3
Rubus idaeus	1	2.3
Parthenocissus sp.	1	2.3
Ribes sp.	1	2.3
Urtica sp.	1	2.3
Solidago sp.	1	2.3
Undetermined deciduous		
shrub	6	13.6
Total	44	100.0

thin vertical or almost vertical twigs of deciduous shrubs and young trees, especially ramifications which form whorls of 3—5 twigs. As a result, a great many nests are supported also from below. They are mostly squeezed in among the twigs, in two cases one of the twigs was surrounded by the nest material.

Sites of 44 nests of the Barred Warbler Sylvia nisoria (data from Poland, Czechoslovakia, Finland and Bulgaria)

General designation	Symbol in Fig. 1	Features of nest site	No of nests	%
Young spruce or fir	A	on twigs, distal from trunk	1	2.3
Junipers	D	amidst twigs	6	13.6
Deciduous saplings and shrubs	E	in vertical ramification (whorl) amidst various twigs at crossing of twigs	12 4	27.3 9.1
		of 2 different shrubs on horizontal or slanting twig on raspberry shoots	1 5 2	2.3 11.4 4.5
Old deciduous trees	F	on branch, distal from trunk in suckers	2	4.5 2.3
Bramble	I	on trailing shoots	6	13.6
Creepers	J	amidst winding stalks	1	2.3
Herbs (Perennials)	K	among stalks of spirea etc. amidst several nettles	2	4.5 2.3
Transfer of the second		Total	44	100.0

Nest construction and material

The nest of the Barred Warbler is usually robust, big and with relatively thick walls. The composition of the material used to build the nests observed in Poland, Finland, Czechoslovakia, Bulgaria and the Soviet Union, and so mostly in the western part of the breeding range of this species, is presented in Table XIV. It appears that there is no characteristic kind of material which occurs in all or in most of the nests; stalks (bents) of different herbs are the commonest material. They vary in length, reaching 40 cm and more, and are bent several times. Their ends are unfrequently tucked into the nest wall but protrude beyond it for several centimetres, forming a crown. Many of the stalks. which are withered top portions of various plants, e.g. Compositae, branch and bear remnants of inflorescences or fructifications. In about 60% of the nests they are the basic material of the outer layer, either the only one or with small admixtures of other components (grasses, rootlets and sticks). In about 35% of the nests grasses are the main material of the outer layer, chiefly in the form of long stems, often with remains of paniculate inflorescences. In at least a half of the nests they are accompanied by smaller amounts of other materials. Rootlets, which were present in the outer layer scarcely in 5 nests, constituted

Material used for building of 28 European nests of the Barred Warbler Sylvia nisoria

Material	Outer 1	Outer layer		
	No of nests	%	No of nests	%
Stiff stalks of herbs	21	75.0	11	39.3
(as basic material)	(17)	(60.7)		
Grass stems	16	57.1	12	42.3
(as basic material)	(10)	(35.7)		
Rootlets	5	17.8	9	32.1
(as basic material)	(1)	(3.6)	\ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \	
Sticks (twigs)	6	21.4		
Cocoons	10	35.7	_	
Cobweb	4	14.3		
Long hair	_		9	32.1
Pine needles			1	3.6

its bulk only in one (with a small addition of stalks). Sticks, found in 6 nests were always few in number, not very long, and came from both deciduous and coniferous trees and shrubs.

Towards the inside the material became increasingly tightly packed and fine. In nearly half the nests the upper edge was more compactly constructed and formed a rim, being loose in the remaining nests. Cocoons were observed in 10 nests, cobwebs in 4; they usually occurred close to the edge. The lining was for the most part rather scanty and consisted of delicate elastic material, mostly of not very long pieces, criss-crossing in all directions. Only long hairs and rootlets were arranged circularly.

The whole of the nest generally gives an impression of a compact structure. This notwithstanding, the sort of material used causes that the walls or bottoms of at least half the nests are transparent to varying extent.

The shape and size of nests

The Barred Warbler's nests are hemispherical, mostly high; one very high nest was observed at Tvarminne in southern Finland, its height (120 mm) exceeded the outer diameter (105 mm). A comparison of the measurements of 29 nests from Poland, Bulgaria, Czechoslovakia, Finland and the USSR is presented in Table XV. The inner diameter, with its mean approximating 73.1 mm, is the most stable and characteristic dimension, whereas the heigh is the most variable one.

In most of the nests the outline of the inner cup is elliptic, but its axes do not differ much from each other; in the extreme case they were 63×87 mm (there had been 3 nestlings in it). The outer outline was regularly circular also only in a small number of nests, being usually elongated in one direction. How-

Measurements (in mm) of nests of the Barred Warbler Sylvia nisoria, showing their ranges, means, standard deviations and coefficients of variation Table XV

Measure- ment	ja Linearen errena	Poland N = 18	Poland N = 18		Bulgaria N = 1	Czecho- $slovakia$ $N = 2$	Finland USRR $N = 5$ $N = 3$	USRR N = 3		H. N	$\begin{array}{c} {\rm Total} \\ {\rm N} = 29 \end{array}$	
	Range	M	SD	Δ		X		X	Range	IX	SD	Λ
Outer diameter	100—155 117.00	117.00	15.45	13.20	105	95.0	120.5	118.33	118.33 90—155	115.84	14.12	12.19
Inner diameter	65—85	73.39	5.42	7.38	70	75.0	73.4	70.83	65—85	73.12	4.76	6.51
Height	70—100	84.28	10.48	12.43	7.5	40.0	81.0	75.0	40—120	79.38	17.13	21.58
Depth	4065	49.78	6.91	13.88	40	32.5	44.6	40.66	40.66 30—65	46.41	7.76	16.72

ever, the ends of dead and thick stems, sticking out and forming a crown, somewhat disfigure the specific shape of the nest. The size of the inner diameter and that of the cup depth place most of these nests in the groups of fairly deep and deep. Only 2 nests from Czechoslovakia and one from the USSR had their cups resembling a hemisphere in shape.

Discussion

The mean height above the ground calculated here from 39 nests of the Barred Warbler is greater than that given recently by other authors from Poland, for the corresponding mean from 19 nests described by Gotzman (1965) is 40 cm and the nesting heights reported by Gotzman and Jabloński (1972) range from 30 to 60 cm. On the other hand, Taczanowski (1882) maintains that the Barred Warbler most often nests at a height of several feet above the ground; the above-mentioned 13 nest record cards from the National Museum in Prague give the heights from 0.5 to 1.3 m, averaging 97 cm, and HUDEC et al. (1983) obtained 1 m as the mean from 32 nests from Czechoslovakia. The mean calculated from STEINKE's data quoted by SCHMIDT (1981) for 45 nests from the GDR is about 55 cm and the mean height given by Neuschulz (1981) is 64 cm for 95 nests from the FRG. HAARTMAN (1969) writes that in Finland these birds nest at a height of 0.3—1.0 m, averaging 0.6 m. According to MAKATSCH (1976), the nesting height of the birds breeding in Europe may reach 1.8 m and according to Volchanetski (1954) and Harrison (1975), 2.5 m; so high-sited nests seem however to be rare. As regards Asiatic birds, the characteristic height given by Volchanetski (1954) is 30-60 cm and those given by Kovshar (1965, 1970), Shnitnikov (1949) and Yanushevich et al. (1960) are, respectively, 10-100, 50-100 and 10-60 cm.

The presented lists of plant species in which Barred Warblers built their nests are usually short. Most of the nests found by Neuschulz (1981) in Germany were placed in briar bushes followed by those in bramble, although, as he emphasized, the genus Rubus as a whole emerged in the first place, which coincides with the data in Table XII. In Finland most nests found by Haartman (1969) were in junipers, which plant has not been mentioned at all, e.g., by Robien (1939) and Neuschulz (1981). On the other hand, Shnitnikov (1949) writes that the nests were most frequently placed in berberries. There are therefore local preferences in so far as nesting-site is concerned, which is confirmed by Neuschulz's (1981, Table 2) data about two different populations.

In discussing the position of the Barred Warbler's nests, Neuschulz (1981) points out a preference for placing them in the south-eastern portion of a shrub, to which fact unfortunately no attention was given while the present material was being collected. Writing about the position of nests among twigs or shoots, in a fork of twigs and at their junctions, Volchanetski (1954) and Korelov (1972) emphasize that such nests are squeezed in between twigs, which are not built round with the nest material. And so this manner of placing nests corres-

ponds with Type E in Fig. 1, which type appears also to be most characteristic in the present material.

All the authors describing nests of Barred Warblers agree as to their larger volume than in the case of the nests of the four remaining Central-European Warblers. They agree also as regards nest material. Taczanowski (1882) writes that the nests are built "of dry branchy stalks of various hard herbs". Similarly, GOTZMAN and JABLOŃSKI (1972) describe the construction of the outer layer. chiefly of dry woody stalks of herbs, laying stress upon the fact that these were not grass stalks, round in section. Nevertheless, NAUMANN (1889) and Volcha-NETSKI (1954) mention grasses and so does Korelov (1972) in connection with the nests of Asiatic forms, which is as a rule consistent with the data from Table XIV. These authors agree also as to the type of elastic lining and the use of cocoons and cobwebs for building. Out of the kinds of materials not listed in Table XIV, Korelov (1972) mentions goat wool as a rare occurrence. Particular items of the material may vary from nest to nest. This can be seen not only from the quantitative proportions of different sorts of material going to the making of the bulk of a nest but also from an observation made by ZATSEPINA (1978), who closely determined the composition of material used to build 2 nests. hardly 70 m apart. To built one of them the birds used 13 plant species, to build the other only five, none of which was however present in the former. This may suggest that the selection of nest material is conditioned not so much (or not only) by its availability as by individual preferences of the building birds.

The accumulation of rigid material of the outer layer, bringing about the protrusion of the ends of stalks in all directions on the outside, is emphasized by TACZANOWSKI (1882) and NAUMANN (1898). This can also be seen in the photographs of nests obtained from different parts of the range of these birds in Europe and Asia published by MAKATSCH (1976), CHRISTIE (1975), FRANZ (1962), SCHMIDT (1981), HUDEC et al. (1983) and Korelov (1972). On the other hand, Gotzman and Jabloński (1972) write plainly about the lack of "free Protruding ends (typical of the Garden Warbler)". The transparence of the walls and/or the bottom of nests is mentioned as characteristic by Taczanowski (1882); NAUMANN (1898) writes about it as a frequent occurrence, whereas GOTZMAN and JABŁOŃSKI (1972) claim that the construction is not transparent. These differences may be due, among other things, to the fact that the descriptions are based on small series of nests, for the material described at present permits the statement that the nests represent all these characteristics and, besides, intermediate ones, i.e. those poorly transparent and with slightly protruding ends of stalks used to build the outer layer.

The measurements of the nests from Poland and other countries, shown in Table XV, are in principle similar to those given in literature. The greatest differences are observed in the nests from Czechoslovakia. The mean measurements of 2 nests described on record cards from NMP (Table XV) differ most from the remaining ones. It appears, however, that the data obtained by HUDEC

et al. (1983) from 17 nests come much nearer to the Polish and general mean values; their outer diameter is 115 mm (95—135 mm), inner diameter 71 mm (55—85 mm), depth 51 mm (40—70 mm) and, above all, height 82 mm (60—130 mm). The dimensions given by Neuschulz (1981) from Germany, Melcher (1952) and Wartmann (1977) from Switzerland, Schubert (1978) from Austria, Zatsepina (1978) from eastern Europe and Shnitnikov (1949), Yanushevich (1960), Kovshar (1970) and Korelov (1972) from Asia lie within the limits of the measurements presented in this paper. The differences between the measurements given are slight and become still smaller where the authors provide mean values. This suggests that, if we allow for individual differences, the nests have generally similar size and proportions throughout the breeding range of the species.

VI. LESSER WHITETHROAT SYLVIA CURRUCA (LINNAEUS 1758)

This description of nests of the Lesser Whitethroat is based on 24 nest record cards from ZZSiD: 22 from different, chiefly southern regions of Poland and 2 from Finland. Some of these nests are themselves stored in ZZSiD (Nos A/2876/73, A/2886/73 and A/3363/77). The materials from Poland are supplemented with data about 101 nests included in the nest and brood record cards of Wrocław University and a description of one nest from MOR. Data concerning six nests from Czechoslovakia come from the record cards of NMP. The nests

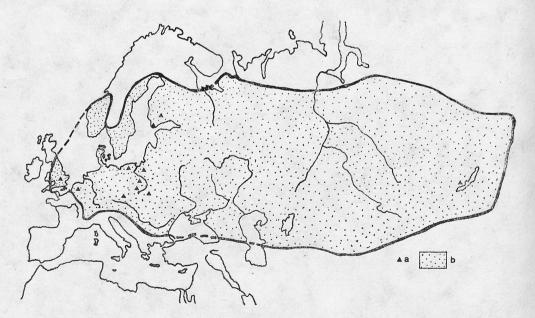


Fig. 5. Lesser Whitethroat Sylvia curruca. The places of derivation of the nests examined — a, against the breeding range of the species acc. to Volchanetski (1954) and excluding the ranges of minula, affinis and cauciasica — b

described here come, in addition, from the following collections: BMNH (6 nests from the British Isles — Nos N.191.21, N.197.3, N.212.1, N.1975.3.2., N.1976. 1.17 and one unnumbered), MRHN (2 from Belgium, Nos 9688E and 41663), ZMH (11 from Finland, Nos 29, 182, 183, 188, 190—193, 566, 567 and 582) and ZMMGU (3 nests from the region of Irkutsk and Lake Baykal). The places where these nests have been collected are plotted against a background of the breeding range of this species in Fig 5. It shows that most of the specimens belonged to the nominative form S. c. curruca (LINNAEUS 1758) inhabiting Europe and only 3 nests from the Irkutsk region to the subspecies S. c. blythi Ticehurst et Whistlet 1933.

Nest-site

The height at which 113 nests analysed from Poland were placed ranges from 20 to 220 cm from the ground, averaging 95.9 cm. The quantitative distribution of the nesting heights is shown in Table XVI. The most nests were built

 ${\bf Table~XVI}$ Nesting heights of 113 Lesser Whitethroats ${\it Sylvia~curruca}$ in Poland

Height, in m.	Number	%
0.01—0.50	33	29.20
0.51—1.00	34	30.09
1.01—1.50	30	26.55
1.51-2.00	15	13.27
2.01—2.50	1	0.88
Total	113	99.99

between 0.51 and 1.0 m above the ground. The numbers of nests in the height group immediately preceding and that following the previous one show however so slight differences from it that they do not seem to be significant and then it should be assumed in general that most of the nests are distributed between 0.20 and 1.50 m fairly uniformly. The plants in which 119 nests from Poland were placed are given in Table XVII. Spruce clearly takes the lead in this respect, including both old big trees and young ones. Altogether 17% of the nests were placed in spruces. Juniper comes second (nearly 11%), followed by bramble (nearly 6%). If it is assumed that in so far as the attachment of nests is concerned, needles (leaves) of juniper and also needles of spruce and nodular protuberances on the bark of its thin dry twigs (left after the needles have fallen) play an analogous part to that of thorns, then a total of over 45% of the nests were built in plants with twigs the surface of which facilitated their attachment (thorns, needles, roughness) and so in spruce, juniper, bramble, gooseberry,

Table XVII

Species of plants in which 119 nests of the Lesser Whitethroat Sylvia curruca were built in Poland

Plant species	No of nests	%	Plant species	No of nests	%
Picea sp.	21	17.7	Prunus domesticus	1	0.8
Juniperus communis	13	10.9	Salix sp.	1	0.8
Picea Juniperus	1	0.8	Corylus avellana	1	0.8
Rubus fruticosus	7	5.9	Lonicera xylosteum	1	0.8
Grossularia reclinata	5	4.2	Alnus sp. (shrubby)	1	0.8
Prunus spinosus	5	4.2	Caragana sp.	1	0.8
Chumulus lupulus			Syringa vulgaris	1	0.8
(winding round a bush			Sambucus nigra	1	0.8
or tree)	5	4.2	Vitis vinifera	1	0.8
Ligustrum vulgare	5	4.2	Partenocissus sp.	1	0.8
Crategus sp.	4	3.4	Convonvulus sp.	7	
Philadelphus coronarius	4	3.4	(winding round a bush)	1	0.8
Ribes sp.	3	2.5	Solidago / Urtica	1	0.8
Rosa sp. (wild and			Spirea sp.	1	0.8
garden ones)	3	2.5	Dryopteris filix mas	1	0.8
Symphoricarpus albus	2	1.7	Undetermined deciduous		
Carpinus betulus (young)	2	1.7	shrub	20	16.8
Prunus padus	2	1.7	<u> </u>		
Rubus idaeus	2	1.7			
Prunus divaricatus	1	0.8	Total	119	99.5

blackthorn and rose. This indicates the fact that these birds were not quite indifferent to the bases on which they built their nests.

Unfortunately, not all nest record cards provide full descriptions of nestsites, which refers mainly to the nests in various deciduous shrubs. The manner in which 62 nests (60 from Poland and 2 from Finland) were sited is presented in Table XVIII. It appears, for instance, that in spruces the nests were most often built on twigs of young trees, at a distance from the trunk.

Nest construction and material

The nests of the Lesser Whitethroat obtained from various parts of Europe were built in a similar way and of similar materials. And so were 3 specimens from the Irkutsk region, belonging to the subspecies Sylvia curruca blythi. The results of analyses of the materials used to build them are for this reason shown all together in Table XIX. As in the case of the Barred Warbler, none of the materials was fully characteristic and occurring in all the nests. The most frequently encountered material of the outer layer were grasses, usually their stems, though leaves were also observed. The percentage of nests in which stiff and often branchy dead stalks of herbs were found is somewhat lower. In some nests they occurred together with grasses and in others replaced them

Table XVIII
Sites of 62 nests of the Lesser Whitethroat Sylvia curruca (data from Poland and Finland)

General designation	Symbol in Fig. 1	Features of nest site	No of nests	%
Young spruce or fir	A	on twigs close to trunk	4	6.4
		on twigs, distant from trunk	10	16.1
Old spruces and firs	В	on branches, distant from trunk	6	9.7
		amidst suckers, close to trunk	.1	1.6
Junipers and the like	D .	amidst vertical twigs	15	24.2
Deciduous saplings	E	among thin vertical twigs	4	6.4
and shrubs		in whorls among suckers growing	4	6.4
		from trunk	1	1.6
		on horizontal twigs	7	11.3
Bramble	I	on several shoots	7	11.3
Herbs (perennials)	K	among stalks	2	3.2
	The second	Total	62	99.8

Table XIX

Material used for building 40 nests of the Lesser Whitethroat Sylvia c. curruca and S. c. blythi

	Outer	layer	Linning		
Material	No of nests	%	No of nests	%	
Grasses: stems and leaves	25	62.5	18	45.0	
Stalks of herbs	23	57.5	1	2.5	
Sticks (twigs)	16	40.0	<u> </u>		
Rootlets	16	40.0	22	55.0	
Needles	4.	10.0	_		
Fragments of leaves	2	5.0	200		
Moss	8	20.0	1	2.5	
Bast	1	2.5	hb. —		
Vegetable down	3	7.5	1	2.5	
Long hair	2	5.0	16	40.0	
Cocoons	16	40.0	1	2.5	
Cobweb	24	60.0	_		
Small feathers	1	2.5	_	46	
Fine cooper wire			1	2.5	

The stems of grasses and, more rarely, dead stalks of herbs were broken at various angles, from obtuse to acute, often however they were only somewhat bent. The third sort of material that formed the bulk of a nest were sticks. These were mostly thin dry elastic spruce sticks. Some of them were branched and they rarely exceeded a dozen centimetres in length. In one nest sited in a jasmine shrub pieces of very thin dry twigs of jasmine constituted the basic material. The ends of stems, dry stalks and sticks usually protruded outside, not so much however as to form a loose crown.

Various rootlets (among others those of spruce) occur in the outer layer of the nests of the Lesser Whitethroat as often as do sticks. Unlike the preceding sorts of materials they were (with the exception of a single nest) supplementary materials. And so were such remaining vegetable materials of the outer layer as moss, bast, spruce and pine needles and fragmentary leaves of dicotyledons, which occurred mainly as single or at any rate not numerous pieces.

The occurrence of spiders' cobwebs and cocoons in the outer layer or in the rim is recorded in descriptions of 32 out of the 40 nests examined. In 8 of them, and so in 20% of all the nests described, both these materials occurred together and one of them was present in each of the remaining nests. The quantitative proportion of cobwebs in the material of a nest was usually small. They were most often seen in the region of the rim. Only in 3 nests a considerable portion of the outer surface was entwined (stuck over) with cobwebs. The role of cobwebs is to join together (cement) particular constructional components, although it may well be that their role is also decorative in a sense, owing to the refraction of the rays of light. Such a decorative role, I think, should be ascribed to the white cocoons attached on the outside of the outer layer and at the nest edge in 40% of the nests examined, from one to more than ten cocoons each.

The nests of the Lesser Whitethroat are lined with delicate materials: thin rootlets, fine grass and animal hair (chiefly horsehair). In more than half the nests only one sort of material was used for lining (the most nests, as many as 12, were lined exclusively with rootlets, five with grass stems, as many with animal hair, and one with very thin copper wire). In the remaining nests the lining consisted of 2 or 3 sorts of materials.

Male nests were usually built of the same materials, but in one, out of the two such nests examined, the lining was lacking.

The rim of the nest, constructed more strongly than the rest of it, was observed in about half the nests. The fairly compact structure and the relatively large amount of material used for building caused that the walls and/or bottoms were distinctly transparent in less than a half of the nests, the other nests were only slightly transparent or, sporadically, not transparent at all.

The shape and size of nests

Most of the nests of the Lesser Whitethroat are high and 20—25% of then resemble a hemisphere in shape. Only one in 46 nests was very high: it was the highest nest (90 mm) and at the same time its outer diameter lay right close

to the lower limit of this dimension (77.5 mm). In a vast majority of the nests the inner cup was deep and only in a low percentage of them it had an almost hemispherical shape.

Table XX shows the measurements of 43 nests of *S. curruca curruca* from Poland, Czechoslovakia, Belgium, Great Britain and Finland and 3 nests of *S. curruca blythi* from the region of Irkutsk. The inner diameter of the cup is the least variable dimension and its mean values calculated for different countries little differ from each other. Much greater fluctuations characterize the remaining measurements, of which the nest height has the highest coefficient of variation. The outer diameter is the smallest in 6 nests from Czechoslovakia and its values are very similar for the nests from Poland, Belgium and the British Isles; they are, in turn, the highest in the nests from Finland and the Irkutsk region, which may indicate a somewhat greater thickness of the walls of nests in northern Europe and eastern Asia.

Discussion

The mean height of nesting of the Lesser Whitethroat given by most European authors fluctuates about 1 m above the ground and so it resembles that found at present. According to Hudec et al. (1981), it is 0.9 m from 116 Czecho-Slovakian nests and, according to Haartman (1969), 1.0 m from 130 Finnish nests; this last author mentions also that the highest situated nest was 9 m above the ground. The mean height calculated by BAIRLEIN et al. (1980) on the basis of the data presented by Mason (1976) for 334 nests from Great Britain is 0.95 m. In Naumann's (1898) opinion, nests are rarely built below 50 cm and most frequently between 90 and 110 cm above the ground, whereas GOTZMAN and Jabloński (1972) write that the largest number of nests were encountered at heights between 60 and 120 cm. However, the data quoted by HALLADIN (1935) for several nests from the Poznań Province give a mean below 0.5 m. MALCHEVSKI (1959) found nests between 0.1 and 1.0 m from the ground and, according to Zatsepina (1978), in eastern Europe the nests are built at a height from 10 to 80 and exceptionally up to 150 cm, similar heights being given by Volchanetski (1954) and by Korelov (1972) from Kazakhstan. In Kirgizia, however, the birds nest lower, between 25 and 30 cm (Yanushevich et al. 1960). None of the authors reports nests built directly on the ground or close above it. Siefke (1962) relates the height of the nest-site with the height of the shrub in which it is placed, usually 10 to 30 cm below its upper outline.

The total of plant species in which the nests of the Lesser Whitethroat Were built, given in Table XVII, resembles those given by Robien (1939), Bairlein et al. (1980), Mason (1967) and Hudec et al. (1983), although, on the other hand, Haartman (1969) found 144 nests in no more than 7 different species of plants. The dominant species are however very various. In the light of the materials obtained from Pomerania (Robien 1939), south Germany (Bairlein et al. 1980) and Czechoslovakia (Hudec et al. 1983) as well as the data published here from Poland spruce comes firsts in this respect, and this situation seems

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Table XX

Measurements (in mm) of nests of the Lesser Whitethroat Sylvia curruca, showing their ranges, means, standard deviations and coefficients of variation

0	bytthi N = 3	X	95.83	56.66	63.33	45.00
		Δ	10.11	5.56	18.86	13.42
		SD	8.99	3.12	10.83	5.47
	Total	X	88.89	56.04	57.43	40.77
		Range	43 70.0—115.0 88.89	45.0—60.0	40.0—90.0	40 30.0—50.0
		Z		42	42	
	Finland $N = 13$	M	95.38	57.5	61.54	42.54
v curruca		X	88.33	56.83	47.50	34.66
Sylvia curruca curruca Czecho- Belgium Great slovakia	$\begin{array}{c} \text{Belgium} \\ \text{N} = 2 \end{array}$	X	85.0	55.0	67.5	35.0
	Czecho- slovakia N = 6	X	76.66	55.0	53.0	42.50
		Λ	8.34	90.9	20.02	11.62
		SD	7.41	3.35	12.17	4.87
Poland	X	88.90	55.3	8.09	41.92	
	**	Range	Juter 16 77.5—105.0 88.90	Inner diameter 15 45.0—59.0	15 40.0—90.0	13 35.0—50.0
	•0	Z	16	15	15	13
	Measu- rement		Outer diameter	Inner diameter	Height	Depth

to be characteristic of Central Europe. According to HAARTMAN (1969), juniper is decidedly dominant (over 55%) in Finland and followed by spruce there. Preference for spruce and juniper in the European part of the USSR can be clearly seen from Malchevski's (1959) and, partly, Zatsepina's (1978) papers. In the British Isles (MASON 1976) 47% of nests were placed in brambles and, as regards Kazachstan, Korelov (1972) mentions bushes and small trees. His observation is in accord with those made by Shnitnikov (1949) and YA-NUSHEVICH et al. (1960), who name, among other plants, Haloxylon, growing in deserts and semideserts.

The way in which the nests were placed is not discussed closely in literature. The photographs included (MAKATSCH 1976; KORELOV 1972) show that the nests illustrated in them belonged to the now distinguished types of nest-sites A, D, E and J and TACZANOWSKI (1882) mentions also nests built at the end of horizontal branches (type F). HALLADIN (1935) emphasizes that the nests were unattached to their supports and simply lay on the twigs. However, this observation seems to refer mainly to the nests built on horizontal branches of spruce and deciduous trees and shrubs.

Descriptions of nests of the Lesser Whitethroat often contain the statements that these nests are loose and transparent structures, made of a small amount of material (Taczanowski 1882; Halladin 1935; Gotzman and Jabłoński 1972). HAARTMAN (1969) writes that the nests are thin-walled. On the other hand, Bannerman (1954) describes a nest as "a fairly substantial structure of twigs, stalks and grass". The data published by Shnitnikov (1949) and Volchanetski (1954) suggest that the nests of the subspecies S. c. halimodendri Sushkin 1904 in Central Asia often have thick walls, but Korelov (1972) maintains that in the south of Kazakhstan the nest walls are frequently thinner. These apparent inconsistencies disappear when we take into consideration the above-described materials, of which some are conducive to the formation of loose transparent nests and some favour compact and not transparent ones. There may be, besides, local preferences for building nests either more or less massive.

The composition of nest material is generally similar, although different species may be represented in it in different geographical regions. The following building materials of the outer layer are mentioned: dead stems of herbs, including Galium (NAUMANN 1898; HALLADIN 1935; GOTZMAN and JABLOŃSKI 1972), grasses (Verheyen 1967; Haartman 1969; Korelov 1972; Zatsepina 1978; HUDEC et al. 1983) and sticks (HALLADIN 1935; HAARTMAN 1969; ZATSE-PINA 1978); these materials are bound together by means of cobwebs (NAUMANN 1898; Halladin 1935; Haartman 1969; Gotzman and Jabloński 1972; Ko-RELOV 1972; ZATSEPINA 1978). NAUMANN (1898) writes that the nest lining consists of animal hair, often mixed with rootlets, and where hair is not available, fine grass stems occur in it. Other authors specify all these components or only some of them. Verheyen (1967) mentions also (vegetable?) down and wool, Korelov (1972) bast fibres and sometimes vegetable down, which is given by Volchanetski (1954) as well.

The shape of the Lesser Whitethroat's nest is sometimes described as cuplike (KORELOV 1972; HUDEC et al. 1983) and, according to HALLADIN (1935), it is hemispherical and somewhat flattened. As has already been said above, such nests are in the minority, and their number is considerably smaller than that of high and deep nests. The fact that most nests belong to this very category is besides indicated by the measurements quoted by various authors. The mean measurements given by Siefke (1962) and Hudec et al. (1983) very much resemble those from Poland (Table XX). The outer nest diameter presented by this last author (mean value: 91 mm) is much greater than that given in Table XX for 6 nests from Czechoslovakia, instead it approximates to the European mean. For 5 nests of S. c. halimodendri from the Kyzyl-Kum Desert VOLCHANETSKI (1954) gives the outer diameter equal to 85-130 mm and averaging 101 mm, and the inner diameter, which is 50-53 mm, averaging 51 mm, whereas as regards 11 nests examined by Korelov (1972), these measurements are, respectively, 85-100 mm and 50-52 mm. These nests are therefore generally somewhat larger than the European ones and, at the same time, their inner diameter is smaller, which is consistent with the above-mentioned greater thickness of their walls.

VII. HUME'S LESSER WHITETHROAT SYLVIA ALTHAEA HUME 1878

This form is regarded by some systematicians (Hartert 1903—1910; Williamson 1968; Wolters 1980; Voous 1977) as a subspecies of S. curruca. In Volchanetski's (1954) opinion, its name is synonymous with the Central Asiatic subspecies S. c. affinis Blyth 1854. Vaurie (1959) unites the two subspecies mentioned by Volchanetski (1954), S. c. affinis and S. c. caucasica Ognev et Bankowski 1910, as a separate species, Sylvia althaea. Korelov (1972) treats it analogously and recently Stepanyan (1982, 1983) has supplied documentary evidence for this opinion.

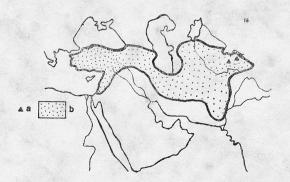


Fig. 6. Humes Lesser Whitethroat Sylvia althaea. The places of derivation of the nests examined — a, against the breeding range of the species as given by Harrison (1983) with an addition of the breeding range of the subspecies caucasica (acc. to Volchanetski 1954), included by Stepanyan (1982, 1983) in S. althaea — b

The nests under study, 3 in number, come from the Soviet collections of ZMMGU, APK and VVL, one from each. They have been collected in the Gissar Range in Tadzhikistan and at Arslanbob in Kirgizia. The places of collection

are shown against the breeding range of this species in Fig. 6. It can be seen from it that the birds that built these nests belonged to the nominative form S. a. althaea Hume 1878.

Nest site

Information about the site is given only for the nest collected by Prof. A. P. Kuzyakin. It was found in an undetermined shady bush at a height of 1.6 m above the ground.

Nest construction and material

Two nests have been described in this respect. Both were relatively substantial, with a distinct rim, and weakly transparent, which evidences the compactness of their structure and thickness of walls. The outer layer of both nests was of sticks and dead stalks, varying in thickness, fairly long, sometimes broken at obtuse angles, and with slightly protruding ends. In both nests, webs occurred as cement, but in various numbers. Both nests were lined with fine elastic grass stems arranged in all directions. In the lining of one of them there were, in addition, dry fine stalks.

The shape and size of nests

All the three nests were high and deep. Their measurements are presented in Table XXI. The outline of all of them was more or less elliptic.

Table XXI

Measurements (in mm) of 3 nests of Hume's Lesser Whitethroat Sylvia althaea stored in Soviet collections

	Outer di	ameter	Inner di	ameter	100	
Origin of nest	measure - ments	\overline{X}	measure - ments	$\overline{\mathbf{X}}$	Height	Depth
Arslanbob (coll. APK) Gussarski Ridge (ZMMGU) Gussarski Ridge (coll. VVL)	$ \begin{vmatrix} 100 \times 95 \\ 105 \times 75 \\ (95 \times 80) \end{vmatrix} $	97.5 90 (87.5)	$\begin{bmatrix} 55 \\ 65 \times 53 \\ (55 \times 50) \end{bmatrix}$	55 59 (52.5)	65 80 60	44 45 40

(figures in brackets show that the measurements may have been a little changed owing to the deformation of the nest, kept in too small a box)

Discussion

The data on the nesting of Hume's Lesser Whitethroat published in Soviet literature concern the nominative form (in some papers under the synonym S. c. affinis). According to Volchanetski (1954), no information has been published about the nesting of S. c. caucasica.

The height of nesting of 56 specimens from Central Asia ranges between 30 and 200 cm, averaging 90 cm (Kovshar et al. 1976). The figures given by Volchanetski (1954) and Korelov (1972) lie within these limits. All the nests

were built on twigs of shrubs, among which Sagitov (1960) and Kovshar et al. (1976) mention also Lonicera. Fewer nests were sited in hawthorn and next in juniper (mostly Juniperus semiglobosa). Kovshar et al. (1976) found that these birds build nests in junipers early in the spring, when other shrubs are still leafless. According to these authors, in deciduous bushes the nest is usually placed in the fork of a twig, no matter whether, it is vertical, oblique or horizontal, whereas in junipers it can be placed either close to the trunk or at a distance from it.

As for the nest construction, the authors differ in opinion. Korelov (1972) writes that the nests are generally compact, with thick tight walls, sometimes contracted at the edge, indicating the presence of a stronger rim. Similar descriptions are given by Ivanov (1969) and Volchanetski (1954 — after Zarudny). This last however maintains that there occur occasional "loose nests like those of the European Lesser Whitethroat, but here they always seem to be stronger and thick-walled". Observations carried out by Kovshar et al. (1976) on a series of several dozen nests show their compact structure and not transparent walls. This generally corresponds with the description of the now examined nests. On the contrary, Sagitov (1960) writes about a loose structure and sheer walls.

Kovshar et al. (1976) present the results of an analysis that they made on a set of 13 nests. Strips of bast of Lonicera occurred both in the outer and in the inner layer in all the nests, followed by webs in respect of frequency, in addition to which Galium and different grasses were often present in the outer layer (it may be judged from the description that the "inner" layer does not form the lining but lies under it — Z.B.). Animal fur (sheep and boar) happens in the outer layer but not in the lining, which is also emphasized by Ivanov (1969). Kovshar et al. (1976), too, write that warm lining is missing from the nest and so are bush twigs from the outer layer. Korelov (1972) mentions the use of grass stems, bast and bark, sometimes mixed with vegetable down, and the occasional presence of horse-hair in the lining. It is hard to tell whether the differences occurring in the composition of materials of the nests described now and those presented by the above-mentioned authors reflect the birds' preferences or whether they are local differences in the availability of suitable materials, as can be observed for some European species.

Korelov (1972) claims that Hume's Lesser Whitethroat's nests are deep, which is fully confirmed by the present observations. According to Sagitov (1960), the shape of the nest depends on its situation: nests placed on horizontal branches are broader and lower and those between vertical twigs are higher and more slender. Measurements taken by Volchanetski (1954) and Kovshae et al. (1976) indicate that the outlines of these nests and their cups are usually elliptic and their sizes, like those quoted by Korelov (1972), do not as a rule differ from each other and resemble the measurements shown in Table XXI. Only the measurements of 6 nests given by Sagitov (1960) are distinctly smaller: they fluctuate about or below the lower limit of the values from Table XXI and from the three above-quoted papers.

VIII. GARDEN WARBLER SYLVIA BORIN (BODDAERT 1783)

Fifty nest record eards, of which 48 have been collected in various parts of Poland and 2 in Spain, have been used and supplemented with descriptions of 22 nests from the collection of MOR and with the data about the sites of 96 nests obtained from the nest and brood record eards of ZEP UW. Data concerning 3 nests from Czechoslovakia on the basis of the record eards from NMP have also been used and the nests stored in the following collections: ZMH (3 nests from Finland, Nos 419, 434 and 435), MRHN (2 nests from Belgium, Nos 9693 and 48271) and BMNH (an unnumbered nest from England), have



Fig. 7. Garden Warbler Sylvia borin. The places of derivation of the nests examined — a, against the breeding range of the species acc. to Portenko and Vietinghoff-Scheel (1967) — b

been described. The places where these nests were taken are plotted against the breeding range of this species in Fig. 7. All the nests analysed belonged to the nominative form.

Nest-site

The height of nesting above the ground of 144 nests described from Poland ranges from 0 (nest bottom touching the ground) to 2.0 m, averaging 62.2 cm. The quantitative distribution of the nests according to the height of their position above the ground is presented in Table XXII. The most nests are in the group up to 50 cm. The nests that touched the ground were in sedges and nettles. Out of the 4 nests found at 2 m above the ground, 2 were in the bushes of elder, one in a young spruce and one in a hop winding around a spruce.

The plants in which the nests of the Garden Warbler were placed are specified in Table XXIII. Their list is diversified (above 40 species). The most nests were built in both wild and garden raspberries (10.42%). The nests in brambles

 ${\bf Table~X\,XII}$ Nesting heights of 144 Garden Warblers ${\it Sylvia~borin}$ in Poland

Height, in m.	Number	%
0 (on the ground)	2	1.39
0.01-0.50	82	56.94
0.51-1.00	42	29.17
1.01—1.50	8	5.56
1.51—2.00	10	6.94
Total	144	100.00

Table XXIII
Species of plants in which 144 nests of the Garden Warbler Sylvia borin were built in Poland

Plant species	No of nests	%	Plant species	No of nests	%
Rubus idaeus	15	10.4	Rosa sp. / Urtica	1	0.7
Rubus fruticosus	13	9.0	Deciduous sapling / Urtica	1	0.7
Ribes sp.	8	5.6	Picea excelsa / Frangula		
Salix purpurea	8	5.6	alnus	1	0.7
Sambucus nigra	7	4.8	Prunus spinosa Rubus		250
Picea excelsa	7	4.8	fruticosus	1	0.7
Urtica sp.	6	4.2	Abies alba / Rubus		
Chumulus lupulus			fruticosus	1	0.7
(winding round			Populus tremula	1	0.7
a bush or tree)	6	4.2	Populus sp.	1	0.7
Juniperus sp.	5	3.5	Betula sp.	1	0.7
Carpinus betulus (young)	5	3.5	Ulmus sp.	1	0.6
Dryopteris filix mas	4	2.8	Prunus padus	1	0.7
Crategus sp.	3	2.1	Fraxinus excelsior	1	0.7
Tilia sp. (young)	3	2.1	Sorbus aucuparia	1	0.7
Alnus sp.	3	2.1	Viburnum sp.	1	0.7
Symphoricarpus albus	2	1.4	Rosa sp.	1	0.7
Acer platanoides (young)	2	1.4	Pinus sp. (dry)	1	0.7
Corylus avellana	2	1.4	Spirea sp.	1	0.7
Fagus silvatica	2	1.4	Filipendula ulmaria	1	0.7
Quercus sp. (young)	2	1.4	Solidago sp.	1	0.7
Phragmites calamus	· 35		Undet. herbaceous plant	1	0.7
(growing on land)	2	1.4	Undet. deciduous shrub	11	7.6
Frangula alnus	2	1.4	Tree branch lying on		
Carex sp.	2	1.4	earth	2	1.4
Prunus spinosa Urtica Salix caprea Urtica	$\begin{bmatrix} 2 \\ 1 \end{bmatrix}$	1.4 0.7	Total	144	100.1

were fewer by 2 and they were followed in respect of the frequency of nests by wild and garden currants and various species of willows (8 nests each). It is therefore scarcely possible that this bird has a decided preference, though altogether nearly 20% of nests were sited in the genus Rubus. The suspension of nests on twigs (shoots) of 2 different plant species (e.g. blackthorn and nettles, spruce and alder buckthorn, etc.) is relatively frequent. This is undoubtedly connected with a tendency for this species to nest in thickets.

Unluckily, not all cards contained descriptions of the nesting site; the statement "in a bush" (deciduous, often even its species given) allows of several different possibilities and so such cases have been omitted here. Closer data concerning 85 nests are collected in Table XXIV. It shows that the manner in which these nests are placed is also very various, there being again no particular preferences of places, although the largest number of nests, that is 10, were placed on procumbent bramble shoots. It is interesting that comparatively many nests (6) were situated among stalks of hops, winding round an alder in 2 cases and round a spruce, willow, blackthorn and an undetermined bush, one each. This is not a local preference, because each of these nests was found in a different part of Poland.

Nest construction and material

The nest of the Garden Warbler is usually loose on the outside and underneath; it is often built of long elements (e.g. dead spruce twigs, branching and needless, 30 cm or more in length, or stems of herbs and grasses, frequently bent several times). Further, the structure is more compact, bordered by a rim, which is however distinctly tightly woven only in a minority of nests, being looser in the remaining ones. In a great number of nests the long end portions of Particular elements stuck out on the outside and formed a loose crown. In 7 nests one to several twigs of the nest-supporting plant (bush) were observed to be enclosed in the material of the outer layer. The inside of the nest was covered with a lining, varying in thickness, of fine, often homogeneous material, more rarely consisting of 2 or 3 sorts of it. The nests have usually their walls and/or bottoms transparent, but mostly to a small extent only on account of their thickness.

The qualitative composition of the material used to build 61 nests and the frequency of its components are presented in Table XXV. Grass (stems and/or leaves) was the commonest material, present in the outer layer and the rim of 56 nests, in 33 of which it was the main material. It was followed by stalks of various herbs and next (in 13 nests) by sticks, which only in 1 nest were numerous enough to form the bulk of the nest. In the other nests they were an additional material and their number ranged from 1 to more than 10 pieces. At least half of them were dry spruce twigs. Cocoons and cobwebs were met with rarely and in small numbers. In one case however cobwebs were found to have been used to attach the nest. Fine fragments of grasses were the most commonly

 ${\bf Table~XXIV}$ Sites of 85 nests of the Garden Warbler $Sylvia~borin~{\bf in~Poland}$

General designation	Symbol in Fig. 1	Features of nest site	No of nests	%
Young spruce or fir	A	on twigs close to trunk on twigs, distant from trunk	4 3	4.7
Old spruce or fir	В	on branches, distant from trunk	1	1.2
Junipers and the like	D	amidst twigs, distant from trunk	5	5.9
Deciduous saplings and shrubs	E	in whorls among thin vertical twigs on thin horizontal or slanting twig in a fork of raspberry shoots	4 6 4 9	4.7 7.1 4.7 10.6
Deciduous trees	F	in suckers	1	1.2
Tree seedlings or little bushes in the layer of grasses	G	on twigs, hidden in grasses on twigs, hidden in nettles	6 5	7.1 5.9
Broken branch	H	lying in grasses	4	4.7
Bramble	Ι	on trailing shoots (often in grasses) on trailing shoots and twigs of other shrubs	10 3	11.8
In creepers	J	amidst stalks of hop winding round a shrub or small tree	6	7.1
Herbs (perennials)	K	among stalks of spirea, dropwort etc. amidst several nettles	2 3	2.3
Grasses, cereals etc.	L	in grasses and sedge amidst reeds	1 1	1.2 1.2
Ferns	M	in a cluster, amidst leaves	4	4.7
On the ground	N	among nettles with its bottom resting on the ground among sedges with its bottom resting on the ground	1	1.2
1		Total	84	99.6

encountered material of lining, but only in 16 nests they were the exclusive material. Hair was found and identified as horse- and boar-hair (respectively, in 4 and 3 nests), being the only material of lining in 4 nests.

Table XXV Material used for building 61 nests of the Garden Warbler Sylvia borin in Poland

	Outer	layer	Lin	ing
Material	No of nests	%	No of nests	%
Grasses: stems and leaves	56	91.8	35	57.4
(as basic material)	(33)	(54.1)		
Stalks of herbs	35	57.4	8	13.1
(as basic material)	(21)	(34.4)		
Sticks (twigs)	13	21.3	I	
(as basic material)	(1)	(1.64)		
Rootlets and rhizomes	11	18.0	28	45.9
(as basic material)	(2)	(3.3)		
Leaves	3	4.9		
Vegetable fibres, bast	4	6.5		
Vegetable down	3	4.9	_	
Cobweb	7	11.5		
Cocoons	3	4.9		
Long hair			18	29.5
Celophane strips	1	1.6		1

The shape and size of nests

The Garden Warbler's nest is low, hemispherical or high; I have not observed very high nests. The outer outline is slightly elliptic in most nests. Similarly, the utterly regular outline of the inner cup is a rarity, though, on the other hand, the difference between the long and the short diameter hardly ever exceeded 10 mm, ranging usually from 4 to 7 mm. The cups are from shallow, through hemispherical, to deep; most of them are fairly deep.

Table XXVI gives a survey of the measurements of the Garden Warbler's nests. The inner diameter of the nest cup is least variable, its mean calculated from 67 nests from Poland is 62.78 mm. The values of the inner diameter of the nests from other countries lie within the limits found for the Polish series, and the means for the nests from Belgium, Czechoslovakia and Finland approximate very much to the mean obtained for Poland. The nest height shows the greatest fluctuations; hence the data from Czechoslovakia, Finland and Great Britain, included in Table XXVI, lie near the lower limit of this dimension in the Polish series of nests.

Discussion

The mean nesting heights of Garden Warblers quoted by different authors are various. The highest value, 80 cm, is given by HUDEC et al. (1983) for 94 nests from Czechoslovakia. BAIRLEIN et al. (1980) give 76 cm as the mean from 642 nests from southern Germany; the highest situated nest they found was at 3.7 m above the ground. A still higher sited nest has been described only by

Table XXVI

Measurement (in mm) of nests of the Garden Warbler Sylvia borin, showing their ranges, means, standard deviations and coefficients of variation

	Δ	10.43	6.56	19.76	13.70
	SD	10.94	4.12	12.86	5.52
Total	X	104.83	62.70	65.07	40.31
	N Range	78 80.0—127.5	65.0 78 52.5—72.5	40.0—95.0	40.0 77 25.0—60.0
1000	N	78	78	73	11
Spain N = 1		110.0	65.0	0.09	40.0
Great Britain N = 1		107.50	65.0	45.0	30.0
Finland $N=3$	×	93.33	61.50	45.0	31.66
	X	107.50	62.50	67.50	45.0
Czecho- slovakia $N = 4$ N	X	97.50	61.25	47.50	37.50
	Δ	9.97	6.94	17.18	12.68
	SD	10.53	4.36	11.58	5.19
Poland	X	105.59	62.78	67.43	40.89
	N Range	Juter 67 80.0—127.5	52.5—72.5	62 47.0—95.0	66 30.0—60.0
	×	19	19	62	99
Measu-		Outer diameter	Inner	Height	Depth

MARJAKANGAS (1980) from Finland: it was built on an unfinished nest of a Brambling in a birch, at a height of 9.8 m. Nevertheless, according to Haartman (1969), the mean height from 233 nests from Finland was 55 cm. The structure of the distribution of heights (Table XXII) most resembles that obtained by Mason (1976) for 560 nests examined in the British Isles. As regards nests resting on the ground, Haartman (1969) mentions 5 such nests and Naumann (1898) writes about a nest built in a burrow under the roots of a juniper. Barelein et al. (1980) maintain that later into the breeding season these birds build their nests higher up.

BAIRLEIN et al. (1980) name over 50 plant species in which the Garden Warbler's nests were placed and MASON (1976) 63, but the dominant species differ very much. NAUMANN (1898) mentions raspberries in the first place. next bramblers, and so the arrangement is analogous to that in Table XXIII. He however emphasized the fact explicitly that the Garden Warbler does not like coniferous trees, which opinion is besides shared by Gotzman and Jabłoński (1972). On the contrary, in HAARTMAN'S (1969) materials more than 18% of nests were built in spruces and followed, in number, by those in junipers. Nearly 22% of the nests found by Robien (1939) in Pomerania were in brambles, which, reaching 52%, were the absolute dominant in Great Britain (Mason 1976). In southern Germany the most nests (16.2%) were placed in nettles, and raspberries were in the second place (BAIRLEIN et al. 1980). TACZANOWSKI (1882) states that the Garden Warbler particularly readily nests in hops creeping along the ground and in ferns. Although the ferns are not numerously represented in our material (cf. Table XXIII), in Finland over 10% of nests were found in them (Haartman 1969). In eastern Europe Malchevski (1959) mentions Spiraea and elder from the Leningrad region and alder buckthorn from the Savalski Forest. On the other hand, ZATSEPINA (1978) writes that 50% of the nests found in one region of the Volga-Kama District were constructed in young limes, maples and oaks and in another region, where conifers prevailed, in young pines, firs and spruces. Basing herself on these data, she claims that the selection of a nest-site is not determined by the species the plant belongs to, but by the conditions that this plant provides, among other things, for keeping the nest out of sight. Out of the atypical nest-sites, that in reeds deserves special attention (cf. Table XXIII); analogous nests, two in number, are described by Meiklejohn (1936) from Crete and regarded by him as exceptional.

Regarding the construction of these nests, Taczanowski (1882) writes that it is loose, disorderly, and with the ends of building elements projecting. A similar description is given by Gotzman and Jabloński (1972), who lay stress on the fact that the nest is not tied to the twigs by anything. Volchanetski (1954), too, confirms this fact. The nests analogously described by Zatsepina (1978) have their bottoms resting on a twig and are weakly fastened to the twigs on their sides; they are usually transparent, which is specially true of the nests built anew after the loss of the first brood. Building materials mentioned in literature are as a rule similar to those given in Table XXV. All the authors

(Taczanowski 1882, Naumann 1899, Veryeyen 1967, Gotzman and Jabłoński 1972, Hudec et al. 1983) consider grass to be the commonest material. Gotzman and Jabłoński (1972) besides, emphasize lack of cocoons and cobwebs, which, however, are mentioned by Verheyen (1967) and regarded by Naumann (1898) as used sparingly. Out of the materials not included in Table XXV, Volchanetski (1954) mentions the occasional use of moss and Pedrocchi (1977) writes about setae of arthropods occurring as material of nest foundations.

In so far as the shape of the nest is concerned, Volchanetski (1954) states that the nest is a deep cup and HUDEC et al. (1983) write that it is cup-shaped and thin-walled. The measurements of the nest and particularly their ranges given by various authors widen the ranges presented in Table XXVI. And so the smallest outer diameter is 70 mm according to Hudec et al. (1983) and 75 mm according to Volchanetski (1954) and Zatsepina (1978), whereas its greatest value is 100 mm according to both Volchanetski (1954) and Gotzman and Jabloński (1972). Also the greatest inner diameter goes beyond the limits given in Table XXVI and reaches 80 mm according to ZATSEPINA (1978) and HUDEC et al. (1983). Similarly, in ZATSEPINA'S (1978) opinion, the nest height may be as great as 105 mm. The ranges of the nest depth given in literature do not extend beyond the limits from Table XXVI. Despite some differences in the ranges of measurements, their means calculated from a series of 39 nests from Czechoslovakia by Hudec et al. (1983) resemble the mean values for Poland and are 107 mm in outer diameter, 60 mm in inner diameter, 71 mm in height and 44 mm in depth. This fully rectifies the means given for 4 nests from Czechoslovakia in Table XXVI, especially as regards their height and depth. The means obtained from 124 nests from eastern Europe, given by ZATSE-PINA (1978), do not depart, in general, from those presented in Table XXVI and by Hudec et al. (1983) except for the outer diameter, which, according to that authoress, is somewhat smaller and comes to 96 mm.

As for the nests of the Asiatic subspecies Sylvia borin pallida Johansen 1907, Volchanetski (1954) writes only in general that they "have a structure and measurements typical of the Garden Warbler".

IX. ORPHEAN WARBLER SYLVIA HORTENSIS (GMELIN 1789)

Twelve nests described in the field come from the valley of the river Struma in south-west Bulgaria; nine of them were next gathered and included in the collection of ZZSiD (Nos A/3027/75, A/3029/75, A/3197/76, A/3200/76, A/3207/76, A/3244/76, A/4147/84, A/4148/84, A/4149/84. Supplementary information covers the nests stored in the collections of BMNH (No N.189.45 from Spain), APK and VVL (1 nest from Azerbaydzan, 4 nests from Turkmenia and one from the region of Dushanbe) and ZZSiD (No A/2866/73 — collected by J. H. Mc Nellle in Iran). This last nest is besides heavily deformed. The places where the nests described come from have been plotted on a map of the breeding range of this

species (Fig. 8), all the three subspecies recognized by Williamson (1968) being included.

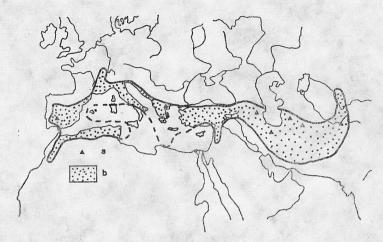


Fig. 8. Orphean Warbler Sylvia hortensis. The places of derivation of the nests examined — a, against the breeding range of the species acc. to MAUERSBERGER, PORTENKO and VIETINGHOFF--SCHEEL (1967) — b

Nest-site

All the nests of Orphean Warblers analysed were sited relatively high above the ground in trees and shrubs. This height was noted for 17 nests. Twelve nests belonging to the subspecies S. h. crassirostris Kretzschmar 1826 from the Struma valley were situated between 80 and 200 cm, averaging 134 cm above the ground, whereas 6 nests belonging to S. h. jerdoni Blyth 1847 from Turkmenia and the Dushanbe region were at a height of 100—200 cm from the ground-averaging 150 cm. The mean from all these 18 nests is 139 cm.

The species of the trees and shrubs in which the nests were built have been identified for 17 nests and specified in Table XXVII. It seems to be essential that these were mostly thorny plants, growing in places well exposed to the sun rays, on a stony substratum (Bulgaria) or in semideserts (Turkmenia). The nests were usually placed in the forks of slanting or horizontal branches (often fairly thick ones, several centimeters in diameter). These nests must therefore be classified in nest-site types C, E and F (Fig. 1). There seem to be no significant differences between the nesting sites of birds belonging to various subspecies.

Nest construction and material

Most of the nests of Orphean Warblers had a stiff and tight structure. They were chiefly built of dead stalks, often hairy and mixed with plant down, furnished with a rim, which varied in compactness. In many nests cobwebs were used as a binding material. The ends of stiff pieces used for building (grass stems, sticks, lignified stalks of herbs) usually protruded slightly on the outside. Only in 2 or 3 nests they projected distinctly for a few centimetres and formed

Table XXVII
Trees and shrubs in which nests of Orphean Warbler Sylvia hortensis were placed

Genus of trees and shrubs	S. h. hortensis	S. h. crassirostris	S. h. jerdoni	Total	%
					10
Paliurus		7	1 (?)	8	40
Rubus	- 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1	2	1	3	15
Thuja	<u> </u>	2	_	2	10
Rosa		1	_	1	5
Berberis	_	<u></u>	1	1	5
Crategus			1	1	5
Ilex	1	303-		1	5
Undetermined shrubs		1	2	3	15
Total	1	13	6	20	100

a loose crown. The stalks of grass and herbs in the outermost layer were frequently bent. The pieces of materials of somewhat deeper regions were more often intertwined with each other than broken. The well-woven rim was responsible for the fact that in some nests the opening was a little narrowed in relation to the size of the inner cup. The thickness of the walls and the use of such material for building as bast fibres and plant down caused that the walls and bottoms of most nests were not transparent. Only 2 nests (one of S. h. crassirostris and the other of S. h. jerdoni) were distinctly transparent and scarcely 3 other ones were regarded as weakly transparent.

The materials used to build 20 nests belonging to all the 3 subspecies are specified in Table XXVIII. Stalks of herbs, including those of the genus Artemisia, were the most characteristic material, occurring in nearly all nests. They were often built into the wall of the nest with their leaves and dry flowers or fruits on them (in the case of last year's plants). Grasses used for building also bore their spikes. Bast fibres occurring in strands in one of the Bulgarian nests were recognized as those of juniper Juniperus excelsa. The lining generally consisted of one sort of material. Grasses observed in it in 40% of the nests, were usually represented by pieces of thin elastic stems, but their leaves were used, as well. Two sorts of materials were found only in 2 nests (grass stems with fibres in one and grasses with hair in the other). It is noteworthy that inside 3 nests, in addition to the normal lining, spread-out cocoons were encountered, one to several in each.

The shape and size of nests

The external proportions of the nests of the Orphean Warbler indicate that some of them are subhemispherical, but most should be numbered in the group of high nests, although they lie in the lower half of this category. Similarly, the shape of the inner cup of most nests may be described as fairly deep. Only one nest had its cup almost hemispherical (inner diameter — 70 mm, depth

Table XXVIII

Material used for building 20 nests of the Orphean Warbler Sylvia hortensis

1	,	1	1												
	lining	%	0.06		40.0		14 T			5.0		45.0	5.0	15.0	
	1	Z	4	4	00		1	1	1	٦	1	6	-	ಣ	1
Total N = 20	outer layer	%	0 26	(60 0)	60.0	(5.0)	40.0	5.0	10.0	45.0	10.0	30.0	5.0	15.0	0.09
	onter	N	19	(19)	12	(1)	600	1	63	6	67	9	1	က	12
· vi	9	lin.	6		က		1	1	1	1	1	1	1	1	1
S. h. jerdoni	N =	out. 1.	9	(1)	4		5	1	1	က	Ι	Τ	1	1	73
	lining	%	7.9		38.5							69.2	7.7	23.1	
tris	1	Z			20		1	1	1	1	1	6	Τ	က	21
S. h. crassivostris N = 13	outer layer	%	92.3	(84.6)	53.8	(7.7)	15.4	7.7	7.7	38.5	7.7	38.5		32.1	69.2
20	oute	N	12	(11)		(1)	2	1	Γ	10	_	20	1	က	6
r. 8i8	_ -	lin.	1		1		1	1	1	1	1	1	1		1
S. h. hortensis	N = 1	out. 1.	1		1		-	1	1 2 2 2	1	1	 -	1	1,	Н,
T. P.	Material		Stalks of herbs	(as basic material)	Grasses	(as basic material)	Sticks	Moss	Rootlets	Vegetable down	Farts of leaves	Bast strips (vegetable fibres)	Long hair	Cocoons	Cobweb

38 mm). The outlines of both the nests and their inner cups are regularly circular in about half the number of specimens and in the remaining nests somewhat, but usually only very slightly, elliptic.

The sizes of 19 nests of all the 3 subspecies are given in Table XXIX. The differences between particular subspecies are minimal and the general range of individual variation is not very wide either. This exerts an influence upon the value of the coefficient of variation, which is the lowest for the inner diameter of the nest cup, whereas the greatest fluctuations characterize its depth.

Discussion

The heights of nest-sites quoted in literature are more differentiated than the corresponding data given in this paper. Schifferli (1968) found a nest at a height of 3.5 m in Switzerland, Bottani (1967) at 1.25 m and Meier (1972) at 1.7 and 1.25 m. Desfayes (1967) writes in general that this height ranges between 0.5 and 2.0 m. These nests belonged, as may be believed, to the nominative form. Steinfatt (1954) described a nest of S. h. crassirostris sited at 3 m above the ground from Greece and Kovshar and Rukina (1968) found nests, 60 in number, 0.35 to 3.5 m above the ground in western Tian Shan. Judging from the geographical point of view, these last data concern the subspecies S. h. jerdoni, even though the authors refer to it as crassirostris (just like Volcha-NETSKI 1954, they do not distinguish the form jerdoni, at all). So far as trees and shrubs in which the nests were placed are concerned, NAUMANN (1898), on the basis of 25 nests from Italy, Dalmatia and Greece (and so hortensis and crassirostris together), mentions deciduous shrubs in forests and gardens. SCHIFFERLI (1968) mentions the cherry-tree, Bottani (1967) berberry, Meier (1972) berberry in both cases, STEINFATT (1954) pine and 35 out of the 69 nests observed by Kovshar and Rukina (1968) were built in junipers and 34 in Lonicera bushes.

As regards structure, Kovshar and Rukina (1968) maintain that these nests consist of 2 layers, an outer and an inner, but they emphasize the lack of the lining proper. Out of the 46 plant species found in 60 nests, fragments of Lonicera were found in all these nests and Oryganum in 59. As the main material of the outer layer they give bast fibres of Lonicera with an addition of stalks of various plants, of which Galium was the commonest; cobwebs also often occurred in this layer and they were also met with in the inner layer. KOVSHAR and RUKINA (1968) stressed the remarkable uniformity of the inner layer, just as it appears in the present material; it consisted nearly exclusively of bast fibres of Lonicera in 59 out of the 60 nests examined. Also STEINFATT (1954) writes about 2 layers, an outer, of woody stalks and a few grass stems, and an inner, of rootlests and stalks mixed with sheep wool and cobwebs. A similar description of the nest material is given by Meier (1972) and NAUMANN (1898), who reports, as a curious detail, a nest lined with fish scales. Both NAU-MANN (198) and Kovshar and Rukina (1968) regard the lack of horse-hair in the lining as a characteristic feature.

Table XXIX

Measurements (in mm) of nests of the Orphean Warbler Sylvia hortensis, showing their ranges, means, standard deviations and coefficient of variation

V	8. 7.	B.	S. h. crassirostris	stris		ß.	S. h. jerdoni	ni			Total		
rement	hortensis		N = 13				9 2			7	31 = N		
	N = 1	Range	X	SD	Δ	Range	\overline{X} SD		Λ	V Range	\overline{X} SD V	SD	Λ
Onter							1	1/8					
diameter	100.0	97.5—122.5	22.5 110.19	9.15	8.30	8.30 100.0—118.0 111.1	1111.1	7.32	6.59	6.59 97.5—122.5 109.89 8.58	109.89	8.58	7.80
Inner			1		1	6				1			1
diameter	65.0	61.0—75.0	67.65 3.86	3.86	5.70	65.0—70.0	66.5	2.24		3.37 61.0—75.0	67.21 3.4	3.4	5.06
Height	0.09	55.0—75.0	61.92	6.30	10.17	55.0—75.0	65.0	7.91	12.17	55.0—75.0	62.64 6.53	6.53	10.42
Depth	40.0	38.0—57.0	45.38	6.58	45.38 6.58 14.49	40.0—55.0		47.0 5.7	12.13	12.13 38.0—57.0 45.53 6.19 13.59	45.53	6.19	13.59

The dimensions of the nest described by STEINFATT (1954) lie well within the limits given new for S. h. crassirostris; it was hemispherical and rather deep. On the other hand, the nest described by Meier (1972) from Switzerland was exceptionally flat and shallow, for, although its outer and inner diameters (110 and 73 mm, respectively) lie within the general limits given in Table XXIX, their height (35 mm) and depth (24 mm) are considerably smaller than those found at present or quoted by the other authors. The measurements of 48 nests of Central-Asiatic birds given by Kovshar (1965) and Kovshar and RUKINA (1968) have a much wider range than that quoted for 5 nests of the subspecies jerdoni in Table XXIX. Their mean outer and inner diameters (105 and 65 mm, respectively) are somewhat smaller than the values from Table XXIX, whereas the height (69 mm) and depth (49 mm) are distinctly greater. This may indicate more forcibly than do the data analysed now that the Central-Asiatic birds build higher and deeper nests than do European populations. The mean values quoted by NAUMANN (1898) for the height of nest somewhat reduce this difference, which however his mean values of the depth increase considerably, anyhow, the accuracy of his findings is very small (to 0.5 ins).

X. SARDINIAN WARBLER SYLVIA MELANOCEPHALA (GMELIN 1789)

This description is based on 14 nests from the following collections: ZZSiD (6 nests from southern France, Nos A/3477/78, A/3479/78, A/3482—85/78), RNH (an unnumbered nest from Italy) and BMNH (4 nests from southern Spain, Nos N.189.47—50, one from Crete, No N.189.46, one from Palestine, No N.125.8, and one from Egypt, No N.197.22). The places where they have been collected are plotted on a map of the breeding range of this species (Fig. 9).



Fig. 9. Sardinian Warbler Sylvia melanocephala. The places of derivation of the nests examined — a, against the breeding range of the species acc. to Vietinghoff-Scheel (1967 b) — b

The nests belonged mostly to the nominative form S. m. melanocephala (GMELIN 1789) and 2 subspecies, S. m. momus (HEMPRICH et EHRENBERG 1833) and S. m. norrisae NICOLL 1917 (even though on the original label of BMNH this specimen is referred to as momus). This last nest, taken in 1910, is the more

interesting since, according to Williamson (1968), the contribution of this subspecies is confined to the region of Lake Birket Qarun near El Faiyum in Egypt.

Nest-site

The nests kept in the collection of ZZSiD had been cut off with pieces of twigs, which made it possible to determine the genus of the shrubs in 3 cases: Juniperus, Ilex and Rosmarinus. The labels of 4 nests from Spain (BMNH) inform that they were found in Chenopodium, Cistus, Nerium and Rubus. Six nests in 12 were placed on horizontal or slanting twigs of shrubs, between their suckers, supporting the nest on the sides, which corresponds to the E type of nest-sites (cf. Fig. 1). One nest found in a bramble bush (type J) and one in a juniper (type D). The remaining 4 nests cannot be categorized.

Nest construction and material

The Sardinian Warbler's nest is a compact and rather stiff construction. furnished with a rim. In more than half the nests the rim was tightly woven and in the remaining nests it contrasted less sharply with the rest of the nest. It usually consisted of the same materials as went to the making of the bulk of the outer layer, chiefly stalks of grasses and herbs (often hairy ones of Artemisia and the like), which were bent, interlaced and not rarely bound together by cobwebs. The end portions of stems and stalks sometimes projected a little outside the outer layer but they did not form a crown, observed with other species of warblers. Various amounts of plant down often occurred in this layer. either as fluffs in the rim or mixed with the material of the outer layer of the bottom and walls. Sometimes they formed as if a separate thin layer between the outer layer and the lining. The tightness of the structure and the frequent occurrence of plant down in it caused that most of the nests were not transparent and the others only slightly transparent. The lining inside the nest was very uniform, it mostly consisted of pieces of thin elastic grass stems. The frequency of materials used to build the nests under study is shown in Table XXX.

The shape and size of nests

The proportions of the Sardinian Warbler's nests permit their inclusion in the group of high nests — only one was distinctly hemispherical; most of them were fairly high, and the index of the highest one approximated to 1 (height — 80 mm, outer diameter — 85 mm). Also the inner cup was mostly rather deep, in one nest it was hemispherical, and the greatest depth was 50 mm against the inner diameter of 57.5 mm. In most of the nests both the external outline of the nest and the shape of the opening were slightly elliptic.

The measurements obtained for 13 nests are given in Table XXXI. The outer and inner diameters of these nests are the most stable dimensions, the coefficient of variation of the outer diameter being the lowest, whereas that of the inner diameter somewhat higher.

 ${\bf Table~XXX}$ Material used for building 14 nests of the Sardinian Warbler Sylvia melanocephala

	S.	m. melan N =		hala	S.			m.		To		
Material	out	er layer	li	ning	mon N =		nori N	ssae = 1		ıter yer	15	ining
	N	%	N	%	out.	lin.	out.	lin.	N	%	N	%
Grasses:							3.5					N.
stems, leaves,										1		
spikelets	12	100.0	7	58.3	1	1	_		13	92.8	8	57.1
Stalks												
of herbs	11	91.7	6	50.0	1	1	1	_	13	92.8	7	50.0
Vegetable					V 100 100							
down	9	75.0	-		1		_		10	71.4	_	
Bast, vege-										1		
table fibres	4	33.3	-		_	_	_		4	28.6	-	
Rootlets	1	8.3	1	8.3		_	-	1	1	7.1	2	14.3
Leaves	1	8.3	-				_		1	7.1	_	
Horsetail	1	8.3	-				_		1	7.1	-	
Cobweb	6	50.0	-		1	_	1		8	57.1	-	
Spiders'												
cocoons	2	16.6	-	100	1	_			3	21.4	-	
Cloth	_		_				1		1	7.1		
String	-		_				1	_	1	7.1	_	

Table XXXI

Measurements (in mm) of nests of the Sardinian Warbler Sylvia melanocephala, showing their ranges, means, standard deviations and coefficients of variation

Measure- ment	m	S. m. nelanocep $N = 1$	hala		S.m. $mo mus$ $N=1$		Total N = 1	3	1 A
	Range	\bar{x}	SD	v		Range	$\overline{\mathbf{X}}$	SD	v
Outer diameter	82.5—99.0	91.17	5.24	5.75	80.0	80.0—99.0	90.30	5.90	6.53
diameter	52.5—65.0	58.29	3.51	6.02	50.0	50.0—65.0	57.65	57.65	7.06
Height Depth	50.0—85.0 30.0—50.0	61.81	13.83 6.69	22.37 16.84	40.0 30.0	40.0—85.0 30.0—85.0	60.0 38.92	14.91 6.98	24.35 17.93

Discussion

The height of nesting of Sylvia melanocephala, about which I have no data of my own, ranged, according to Naumann (1898), from 0.5 to 1.0 m, and according to Makatsch (1976), from 0.20 to 0.65 m; Berthold and Berthold (1973) extend this height to 1.6 m. Ferguson-Lees (1967) writes that most of the nests were built between 0.75 and 1.35 m, although some happened at 1.8 m. This coincides with Cody and Walter's (1976) data, which indicate that these birds inhabit the most diversified biotopes of these inhabited by the 6 Mediterranean warblers under study. Also the species of shrubs chosen to build nests in are various. Naumann (1898) mentions lavender bushes, ivies, Smilax, Asparagus, opuntia hedges, etc., whereas Berthold and Berthold (1973) found nests in shrubs of Cupressus, Juniperus oxycedrus, Erica arborea, Pistacia, Quercus ilex and Rosmarinus officinalis. Makatsch (1976) names, among other plants, evergreen Quercus lusitanica, and Ferguson-Lees (1967), in addition, Hamilium, Ulex and, in the eastern part of the range, Tamarix.

The composition of materials used to build nests, given by NAUMANN (1898), well agrees with the materials listed in Table XXX. Berthold and Berthold (1973) mention, besides, sheep wool and they emphasize the frequent presence of green leaves of grass and rosemary in the walls of nests. On the other hand, Makatsch (1976) found horse-hair in the lining, not observed there now, and cocoons of insects, used to strengthen the rim. Judging from the description of Etchecopar and Hue (1964), the nests from North Africa did not differ from those from Europe and Balearie Is.

The measurements of nests quoted by Naumann (1898) differ much from those given in Table XXXI. The nests studied by him must have been smaller, for some of their measurements lay below the lower limits shown in Table XXXI (the measurements of 4 nests from southern France, Sardinia, Sicily and Dalmatia were as follows: out. dia. — 76—90 mm, in. dia, — 43—45 mm, height — 42—65 mm and depth — 27—35 mm); all their mean values would necessarily have been distinctly lower. The measurements of 9 nests given by Berthold and Berthold (1973) differ somewhat from those in Table XXXI, as well: their mean outer diameter (94 mm) and height (71 mm) are greater, whereas the mean of the inner diameter (55 mm) is somewhat lower and agrees with that given by Ferguson-Lees (1967), according to whom the depth is 45 mm.

XI. RÜPPEL'S WARBLER SYLVIA RÜPPELLI TEMMINCK 1823

This description is based on 2 nests from BMNH (Nos N.239.1 and N.239.2), both from Asia Minor. The places where these nests were taken are plotted on a map showing the breeding range of this species (Fig. 10).

Nest construction and material

Both nests had a loose and disorderly structure. The rim was inconspicuous in one nest and indistinguishable in the other. The amount of material used for building was however remarkable, which accounted for the fact that the



Fig. 10. Rüppell's Warbler Sylvia rüppelli. The places of derivation of the nests examined — a, against the breeding range of the species acc. to Vietinghoff-Scheel (1967a) —

bottom of the nest was not transparent and the walls were only slightly transparent. The basic material of the outer layer of both nests consisted of dead stalks, some of them branched and either bent or curved. In both of them there were besides rotten pieces of plants (these were long leaves in one). The supplementary material included rhizomes, remains of dry flowers, fluffs of plant down and cobwebs. The lining was a thin layer of crossing, resilient, fine and straight vegetable components: these were rootlets in one nest and dead stalks (stems of inflorescences) in the other.

The shape and size of nests

The outlines of both the nests and their inner cups were elliptic. Generally speaking, the nests were hemispherical, with a relatively shallow inner cup with its walls inclined outwards. Their measurements are given in Table XXXII. The thickness of the bottom and walls ranges from 15 to 25 mm. The loose structure causes that both thick and thin components of the building material protrude up to several centimetres on all sides.

Table XXXII

Measurements (in mm) of 2 nests of the Rüppell's Warbler Sylvia ruppelli

Nest N° (BMNH)	Outer diam	meter	Inner di	ameter	TT	D 11
Trost It (Dilliti)	crosswise	\overline{X}	crosswise	X	Height	Depth
N.239.1 N.239.2	100×90 115×85	95 100	68×58 80×70	63 75	55 ca 55	35 ca 30

Discussion

About 60 nests of Rüppel's Warbler observed by Meiklejohn (1934, 1935, 1936a, b) in Greece and Crete were sited at a height of 45—90 cm (18 in to 3 ft) and all of them in shrubs of Calycotome villosa. The framework of these

nests was constructed of "stalks and downy headed grasses" (the author probably means herbs); besides, supplementary material was added and the inside of nest was lined. As regards material, Meiklejohn's (1934) description agrees with the list given at present; he claims that he has never found animals' hair in the lining and states elsewhere (Meiklejohn 1935) that the lining "seems invariably of fibres". The mean measurements of the nests observed in successive years (Meiklejohn 1934, 1935, 1936b) differ from each other and are as follows: outer diameter 4.5 and 4.25 in (about 11.5 and 11 cm), inner diameter 2.5 and 2.2 in (6.3 and 5.5 cm), depth 2.25 and $2\frac{1}{16}$ in (5.8 and 5.2 cm). These dimensions (especially the depth) differ from those presented in Table XXXII and indicate that the nests observed in the field are clearly deeper than the 2 nests from the collections. The synthetic descriptions of nests by Harrison (1975) and Makatsch (1976) seem to be, at least for the most part, based on Meiklejohn's (o.c.) findings.

XII. SUBALPINE WARBLER SYLVIA CANTILLANS (PALLAS 1746)

Eight record cards for nests from Bulgaria, one of which is included in the collection of ZZSiD (No A/3198/76) and, in addition, nests from the collections of ZZSiD (No A/3478/78 from Corsica) and BMNH (Nos N.189.22, N.189.29—32, N.189.34—36 and 2 unnumbered, from Andalusia, Sicily and Asia Minor formed the basis for this description. The nests under study belonged to the

Fig. 11. Subalpine Warbler Sylvia cantillars. The places of derivation of the nests examined — a, against the breeding range of the species acc. to MAUERSBERGER and VIETINGHOFF-SCHEEL (1967) — b



nominative form S. c cantillans (Pallas 1746) and the eastern subspecies S. c. albistriata (C. L. Brehm 1850). The places where they have been collected are shown on a map of the breeding range of this species (Fig. 11).

Nest-site

The height of the nest-site above the ground is recorded on 8 cards from Bulgaria. It ranges between 0.35 and 1.30 m, averaging 59.4 cm, for 6 nests were at a height from 35 to 50 cm and the remaining two at 1.0 and 1.3 m. All the 8 nests from Bulgaria were found in junipers Juniperus sp., 1 nest of the

same subspecies from Asia Minor was in an undetermined shrub and so was one of the nominative form from Corsica. The nest from Sicily was built in a bramble and out of the 8 nests from southern Spain three were in Cistus bushes, two in brambles and the others in Spartium junceum, Prunella sp. and a small leutisk, one in each.

Nest construction and material

The nest of the Subalpine Warbler is rather thick and sturdy, though soft nests also happen, which depends upon the material used (if there are no stiff stalks in it); it is mostly furnished with a distinct ringlike rim, which may cause a small constriction of the opening of the inner cup in relation to its capacity. The amount and sort of material were responsible for the fact that only 3 nests (out of the 17 completed and not destroyed) were slightly transparent. In some nests single ends of the stems of grasses and herbs, not woven into the wall, projected somewhat beyond the outer layer or rim (cf. Phot. 17). Only a small proportion of the grass stems and dead stalks of herbs used for building were bent at an angle; usually they were gently curved and entangled. Cobwebs were used in most of the nests of the nominative form to strengthen the construction. The building of a vertical twig of the shrub into the nest wall

Table XXXIII

Material used for building 17 nests of the Subalpine Warbler Sylvia cantillans

	٨	S. c. can N =		ns	1	S. c. a: N =		riata		Total N = 17		
Material		lining		lining outer lining outer layer				ШШ				
	N	%	N	%	N	%	N	%	N	%	N	%
Grasses: stems,												
leaves, spikelets,												7 41.2
panicles	10	100.0	2	20.0	7	100.0	5	71.4	17	100.0	7	
Stalks of herbs	8	80.0	5	50.0	6	85.7			14	82.3	5	29.
Bast, vegetable fibres	1	10.0	-		6	85.7	_		7	41.2	-	
Leaves (of herbs etc.)	5	50.0			-				5	29.4	-	
Rootlets	2	20.0	3	30.0	1	14.3	2	28.6	3	17.6	5	29.
Vegetable down	3	30.0			4	57.1	_		7	41.2	-	
Juniper bark (strips)			-		1	14.3			1	5.9	-	
Spiders' cocoons	_				1	14.3	-		1	5.9	-	
Cobweb	9	90.0			_				9	52.9	-	1 1
Long hair			4	40.0	1	14.5			1	5.9	4	23.
Wool					1	14.3	1	14.3	1	5.9	1	5.
String					1	14.3			1	5.9	-	
Threads	_			144	1	14.3			1	5.9	-	

(just as, e.g. in *Hippolais icterina*) was seen in the nest of Asia Minor. A list of materials found in the nests and the frequency of their occurrence are given in Table XXXIII. The basic material that formed the bulk of the nest casing consisted of grasses (mainly stems, sometimes with spikelets and leaves) and stalks of herbs; these last were often, e.g., rotten stalks of nettles or pieces of hairly stems of herbs. Such materials may have been mixed with pieces of bast, plant down, etc. The lining was more uniform, although often fairly thick; it usually consisted of one or two sorts of materials.

The shape and size of nests

A majority of the nests of the Subalpine Warbler are rather high and only some of them resemble a hemisphere in shape. Similarly, the inner cup is nearly deep or deep. The outer outline of the nest is usually elliptic, the outline of the inner cup being quite regular in some nests and somewhat elliptic in the others.

The measurements of the nests are presented in Table XXXIV. It shows that the nests of the eastern subspecies S. c. albistriata were somewhat higher and had larger inner cups (inner diameter and depth). The inner diameter is the most stable dimension, its coefficient of variation being scarcely 3.43.

Discussion

The heights of Subalpine Warblers' nest-sites given by BEVEN (1967), 1 to 3 ft, and by NAUMANN (1898), 85 to 140 cm above the ground, are as a rule in accord with those presented now. Both ARMITAGE (1930) and BEVEN (1967) mention Ulex as the plant in which the nests were most frequently built. In addition to the genera specified at present, they give rushes and low branches (among others those of young trees) of Pinus pinea, and BEVEN (1967) anumerates also Quereus ilex, myrtle, oleander, Cytisus and bracken.

ARMITAGE (1930) distinguished 3 types of the Subalpine Warbler's nests: large nests of grasses (in gorse), small and more compact ones (on twigs of bushes, e.g. Cistus), both with lining of fine grasses, wool and goat hair), and male nests without lining. The description of material used to build 3 nests from Portugal, published by Beven (1967), does not, in general, differ from the data in Table XXXIII. However, it may be interesting that among the leaves used to build he found thorny leaves of the holm oak Quercus ilex; in another nest he also met with some bracken. In photographs included in Beven's (1967) and Makatsch's (1976) papers the straight endings of some stems of grasses and herbs protrude visibly outside the nest.

The measurements of one nest quoted by Bevan (1967) show that it was small and high (outer diameter — 7.5 cm, height — 6.5 cm), with an inner cup intermediate between deep and very deep (inner diameter and depth — 5 cm). The outer diameter of this nest was therefore smaller than each of the 17 measurements given in Table XXXIV, whereas the depth reached the upper limit.

Table XXXIV Measurements (in mm) of nests of the Subalpine Warbler Sylvia cantillans, showing their ranges, means, standard deciations and coefficients of variation

	Δ		3.43		8.89	12.97	16.51
7	SD		2.97		4.93	7.20	6.43
Total $N = 17$	X		86.5		55.41	55.47	38.94
	Range	,	82.5—91.0		47.0—68.5	45.0—65.0	30.0—50.0
	۸		2.58		9.86	13.02	13.53
triata T	SD		2.25		5.77	7.50	5.84
S. c. albistriata $N = 7$	IX		87.14		58.50	57.57	43.14
	Range		85.0—90.0		51.0—68.5	45.0—65.0	35.0—50.0
	Λ		3.43 3.98	- 14	5.44	12.94	5.25 14.58
tillans 10	SD		3.43		2.90	6.99	5.25
S c. cantillans $N=10$	IM.		86.05		53.25	54.0	36.0
Ø	Range		82.5-91.0		47.0—58.0	45.0—65.0	30.0—45.0
Measu-		Outer	diameter	Inner	diameter	Height	Depth

XIII. DESERT WARBLER SYLVIA NANA (HEMPRICH et EHRENBERG 1833)

The only nest in the possession of ZZSiD (No A/4170/84) was found by A. Kovshar in Kazakhstan and so it belonged to the nominative form. The place where it was found is plotted on the map of the breeding range of this species in Fig. 12.

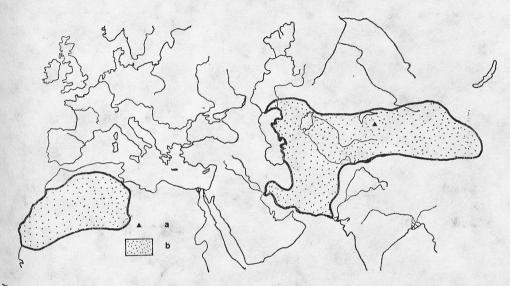


Fig. 12. Desert Warbler Sylvia nana. The place of derivation of the nest examined — a, against the breeding range of the species acc. to Volchanetski (1954), Harrison (1983), Etchecopar and Hue (1964) and Heim de Balsac and Mayaud (1962) — b

Nest construction and material

The nest is large with thick and soft walls. The outer layer contains a small number of rigid sticks with buds, many rotten and crushed twigs of saxaul, and various fibres. In the bottom there is much plant down, which is rather visible through the thin lining of very fine and soft fibres. The rim of the nest is weak and loosely woven, a small number of cobwebs have been used to bind its components together.

The shape and size of the nest

At present the nest is low and shallow; its outlines and those of its inner cup are slightly elliptic. Being a soft structure, it may have been flattened to some extent during its transport; nevertheless, to be sure, it was never a very high nest. Its present measurements are as follows: outer diameter — 120×140 mm, inner diameter — 60×70 mm, height — 55 mm, depth — 35 mm.

Discussion

The Desert Warbler nests in various shrubs (Korelov 1972; Meinertzhagen 1954; Volchanetski 1954), which Shnitnikov (1949) describes as transparent. The nest is usually placed close to the ground, often even touching it with the bottom (GROTE 1936; KORELOV 1972; VOLCHANETSKI 1954), sometimes however it is sited up to 1 m above the ground (Volchanetski 1954). Among other plants. Grote (1936) mentions seabuckthorn, Pterococcus, Atraphaxis, saxaul and thickets of high wormwood. Korelov (1972) lays stress on the fact that the nests were incommensurably large in relation to the size of the bird and that their walls were thick. Basing themselves on ZARUDNY'S data, GROTE (1936) and Volchanetski (1954) provide the most accurate description, which Ko-RELOV (1972) and MAKATSCH (1976) abridged later. It may be inferred that despite differences between the assortments of materials the nests were distinctly many-layered (2-3), thick-walled, non-transparent and with no projecting ends of stiff components used for building. Plant down (sometimes also fur of animals and cocoons) is not applied as a decoration but integral component of the walls and bottom, which are sometimes lined with a thin layer of animal hair. The rim often reduces the size of the opening of the inner cup. According to HEIM de Balsac and Mayaud (1962), the nests of the African subspecies S. n. deserti (LOCHE 1858) vary from region to region; some of them are deep, resembling the nests of the Read Warbler.

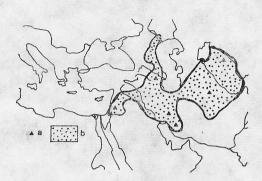
The measurements of 10 nests quoted after Zarudny by Grote (1936), Volchanetski (1954), Korelov (1972) and Makatsch (1976) and those of several other nests, given by Korelov (1972), are as follows: outer diameter—8.0—12.0 cm, inner diameter—5—6.2 cm, height—8.4—13.0 cm, depth—4.5—7.8 cm. Naturally, this refers exclusively to the nests of Asiatic birds. The measurements and the shape of the nest described here differ from them, which is certainly connected with its deformation. None-the-less, its material and general construction agree with the description given by the above-mentioned authors. Of 2 nests depicted by Shnitnikov (1949), one corresponds with the nest presented here and the other, looking, according to that author, like a hastily executed structure, was shallow (1.5 cm) and did not contain plant down. This nest seems to have been a reconstruction of its destroyed predecessor, and so the Desert Warbler's nests are high or very high and very deep.

XIV. MÉNÉTRIES'S WARBLER SYLVIA MYSTACEA MÉNÉTRIES 1882

A total of 11 nests have been described. Seven of them come from Soviet collections: APK (1 nest from the Araks River Valley in Transcaucasia) and VVL (3 nests from the Mary region in Turkmenia and 3 from the Bayga-kum Desert on the River Syr Dar'ya). Further nests were from the collections of BMNH

(Nos N.189.44 from Iran and N.193.337 and 338 from Palestine) and ZZSiD (No A/2870/73 from Iran). The places where these nests were taken are plotted against the breeding range of this species on a map (Fig. 13).

Fig. 13. Ménétries's Warbler Sylvia mystacea.
The places of derivation of the nests examined — a, against the breeding range of the species acc. to MAUERSBERGER and
PORTENKO (1967) — b



Nest-site

The labels of 7 nests contained information about the height of the nest-site above the ground. It ranged from 0 to 0.7 m, averaging 0.29 m. The nests from Transcaucasia and Iran were built in undetermined shrubs and the other six in herbs: 3 from Kazakhstan in papilionaceous plants, two from Turkmenia in Salsola and one in an undetermined Compositae.

Nest construction and material

A relatively large amount of material was used to build these nests. The most compact part of the construction was the rim, bordering the nests and welldefined in most of them. Grasses occurred in all these nests, represented mainly by stems or their fragments, but there were also grass leaves in 3 nests and a spikelet in one. The material used to build particular nests was differentiated and 80, e.g., one nest from Palestine contained dead stalks and sticks up to 2.5 mm thick in the outer layer, while the other was whole made of fine material. In the nests from Kazakhstan and Turkmenia the components of the rim were often bound together with cobwebs, which was not observed in the nests from Palestine. A large number of white and dark-coloured covering feathers of poultry, mixed With other materials, were used to build one of the nests from Iran. The pieces of material, according to their rigidity, were either bent and partly protruding outside the nest or woven into the wall. The sort of material used, its amount and method of construction were responsible for the fact that the walls of 2 nests examined were not transparent and those of most of the remaining ones were poorly transparent. The lining of the inside was elastic and fine, but the amounts and composition of material were various. Very thin stems of grasses or rootlets were commonly used and dead stalks of herbs and hair made up the supplementary material. The qualitative composition of the material used to build 11 nests and its frequency are shown in Table XXXV.

Material used for building 11 nests of the Ménétries's Warbler Sylvia mystacea

	Outer	layer	Lin	ning
Material	No of nests	%	No of nests	%
Grasses: stems and leaves	11	100.0	8	72.7
Stalks of herbs	8	72.7	2	18.2
Sticks (twigs)	3	27.3	_	
Rootlets	4	36.4	5	45.4
Vegetable down	4	36.4	_	04
Bast, vegetable fibres	3	27.3	_	•
Cocoons	3	27.3	_	
Cobweb	k	54.5	_	
Small feathers	1	9.1	1	9.1
Long hair	/ Au - 194		1	9.1

The shape and size of nests

One of the nests (from Iran) was hemispherical and all the other ones were high; they were all deep and in horizontal projections the cups were subcircular or slightly elliptic (e.g. 65×60 mm). The measurements of all the 11 nests are shown in Table XXXVI. The inner diameter of the cup is the least variable dimension, its mean value being 54.4 mm and the coefficient of variation as low as 6.83.

Table XXX^{VI}

Measurements (in mm) of 11 nests of the Ménétries's Warbler Sylvia mystacea, showing their ranges, means, standard deviations and coefficients of variation

Measurement	Range	$\overline{\mathbf{X}}$	SD	v
Outer				
diameter	70.0—110.0	93.41	11.36	12.16
Inner				
diameter	50.0 - 62.5	54.41	3.72	6.83
Height	45.0-70.0	59.54	7.89	13.25
Depth	35.0-50.0	43.0	5.10	11.86

Discussion

The heights at which 8 nests described by Sagitov and Bakaev (1980) were situated ranged from 14 to 25 cm above the ground. Volchanetski (1954) and Korelov (1972) observed some nests which almost touched the

ground. According to Makatsch (1976), the height of nesting reaches 90 cm from the ground and Harrison (1975) describes in general that it is "from ground level to a few feet up", which range includes both the data obtained now and those given by the foregoing authors. All of them state unanimously that these birds build their nests in various shrubs, among which Volchanetski (1954) mentions tamarisks.

In addition to grasses and twigs, in the nest material Sagitov and Bakaev (1980) distinguish leaves of shrubs and in the lining animal fur and horse hair, which have not been observed at present. Makatsch (1976) found dry inflorescences in one nest. Otherwise the descriptions of material generally agree with the data in Table XXXV. (Korelov, 1973, based his descriptions on the same 3 nests from the collection of VVL, as have been included in the material described in this paper). None of the authors mentions the use of plant down as an essential component of the outer layer of a nest (as, e.g., in Sylvia nana); it occurs only as single shreds.

According to Sagitov and Bakaev (1980), the nest bottom and walls are usually soft and thin, with a strong and thicker rim, and so they generally correspond with the present description. The measurements of 8 nests described by these authors are as follows: outer diameter — 75—95 mm, inner diameter — 51—75 mm, height — 45—67 mm, depth — 35—55 mm, bottom thickness — 15—20 mm and wall thickness — 15—25 mm. They were therefore certainly fairly high and deep nests. The outer diameter of these nests and their height lie within the range of these measurements given in Table XXXVI, whereas the upper limits of the inner diameter and depth somewhat exceed those given in it.

XV. SPECTACLED WARBLER SYLVIA CONSPICILLATA TEMMINOR 1820

The material used for description consisted of 13 nests stored in the collections of BMNH (Nos N.189.38—42 from Malta, N.189.43 from southern Spain, N.193.262 from the Canar Is. and N.193.815 from Corsica), RNH (Nos N.16533 and 16534 from Camarque and 2 unnumbered from Sicily) and ZZSiD (No A/3480/78 from Camarque). The places where these nests have been collected are plotted against the breeding range of the species on the map in Fig. 14, Which shows that 12 nests belonged to the nominative form and one, from the Canary Is., to the subspecies S. c. orbitalis (WAHLBERG 1854).

Nest-site

The height of nesting has been recorded for 4 nests belonging to the nominative form: 2 of them were close to the ground, 1 less than 30 cm, and 1 about 30 cm from the ground. The labels of 7 nests of the nominative form provide brief information about plants they were built in: between twigs of a thorny bush

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in a thistle among grasses, in *Cistus* with *Asparagus* grown into it, in a grass tussock, and among twigs of a Spanish gorse, one nest in each, and 2 nests in heather.

Nest construction and material

The Spectacled Warbler's nests were compactly structured, with the edge shaped into a more or less distinct rim, the components of which were often bound together with cobwebs. The fairly loose outermost portion of the outer layer



Fig. 14. Spectacled Warbler Sylvia conspicillata. The places of derivation of the nests examined—a, against the breeding range of the species acc. to Vietinghoff-Scheel (1967 c)—b

was of dead stalks bent at various angles, grasses (chiefly stems, more rarely leaves and single spikelets or their fragments), rootlets, etc.; deeper into the layer this material was mixed with various sorts of plant down. In 9 nests, typical in form, down constituted a layer, isolated to a certain degree and underlying the lining proper of fine flexible rootlets, grass stems and hair. In most nests this lining layer was thin and transparent and the light-coloured down could be seen through it. Owing to this sort of material, in 6 nests, typical in form, the bottom and walls were not transparent at all and in the other three they were poorly transparent. The nest of S. c. orbitalis from the Canary Is. belonged to the type encountered twice among the nests of the nominative form (one from Corsica and one from Camarque), with very transparent walls, in which nest there was no down substratum underlying the lining. A list of materials used to build these nests is given in Table XXXVII.

The shape and size of nests

The nests of Spectacled Warblers are high and deep, some of them even very deep, e.g., one of the nests from Camarque, in which the diameters of the inner cup were 55×50 mm and the depth also 50 mm. The nest from Corsical was the smallest, with a somewhat elliptic outline, 78 by 85 mm across and 60 mm in height. Its inner cup was circular (52×52 mm) and scarcely 35 mm in depth, and so it was one of the shallowest nests. The measurements of all the nests examined are presented in Table XXXVIII. It shows that the outer diameter is the least variable measurement, which may be to some extent con-

Table XXXVII

Material used for building 13 nests of the Spectacled Warbler Sylvia conspicillata

	Outer	layer	Lir	ning
Material	No of nests	%	No of nests	%
CI 13 4 7 7		1000		
Stalks of herbs	13	100.0	5	38.4
Grasses: stems and leaves	10	76.9	1	7.7
Downy fruits (and down originating from them)	10	76.9		47.
Rootlets	5	38.4	9	69.2
Cobweb	7	53.8	_	
Cocoons	1	7.7		
Bast, vegetable fibres	1	7.7	_	
Leaves	1	7.7	_	
Small feathers	2	15.4	1 - 33	F 0.5
Long hair	-		7	53.8
String	1	7.7	A	

Table XXXVIII

Measurements (in mm) of nests of the Spectacled Warbler Sylvia conspicillata, showing their ranges, means, standard deviations and coefficients of variation

Measure- ment	c	S.~c. onspicille $N=12$			S. c. orbi- talis	T. William	Total N = 13	3	
	Range	$\overline{\mathbf{X}}$	SD	V	N = 1	Range	\overline{X}	SD	v
Outer diameter Inner	81.5—100.0	93.46	4.56	4.88	95.0	81.5—100.0	93.57	4.39	4.69
diameter	52.0—62.5	56.17	3.26	5.80	60.0	52.0—62.5	56.46	3.29	5.83
Height	55.0-80.0	65.0	6.74	10.37	50.0	50.0-80.0	63.84	7.68	12.03
Depth	35.0-50.0	42.5	4.52	10.63	35.0	35.0—50.0	41.92	4.80	11.45

nected with the compactness of their construction, and that the outer and inner diameters of the nest of S. c. orbitalis do not differ from those of the nominative form; it is lower and its depth lies at the lower limit of this measurement in the nominative form. It is hard to tell on the basis of a single specimen whether this is a general tendency.

Discussion

GIBB (1947) writes that most of the nests of the Spectacled Warbler are placed to 30 cm above the ground and very rarely higher, to 75 cm, since these birds nest in low plants. The same is suggested by the data published by Cody and Walter (1976). The plants which support nests of this species, specified by GIBB (1947), do not differ from those listed at present. In Sardinia Bezzel (1957) found a nest in a bramble shrub.

In his descriptions of the nest construction and material GIBB (1947) distinguishes an outer layer, a layer of plant down and an inner loose lining. According to him, the birds used dry stems of grasses, rootlets and dead leaves to build the outer layer. This description agrees in general with the nests examined now, though GIBB (1947) does not mention cobwebs, which however were quoted by MAKATSCH (1978). Anyway, neither GIBB (1947) nor HARRISON (1975) nor MAKATSCH (1976) mentions the occurrence of nests in which plant down was not used and in consequence the construction was transparent. It is interesting that the nests from areas situated south of the Atlas Mts. in Africa are more massive (GIBB 1947).

XVI. DARTFORD WARBLER SYLVIA UNDATA (BODDAERT 1783)

The present analysis is based on 12 nests. One of them was described in the field, in the National Park at Doñana in southern Spain and 11 in the following collections: BMNH (Nos N.203.35, 193.239, 189.24—28 and 2 unnumbered from southern Spain and British Isles), CPBE (1 nest from the Barcelona region) and ZZSiD (No A/3459/77 from the British Isles). And so this material covers both the nominative form S. undata undata (BODDAERT 1783) and the subspecies



Fig. 15. Dartford Warbler Sylvia undata. The places of derivation of the nests examined — a, against the breeding range of the species acc. to Vietinghoff-Scheel (1967d) and Willliamson (1968) — b

S. undata dartfordiensis LATHAM 1787. The localities from which the nests have been derived are plotted against the breeding range of the species on the map in Fig. 15.

Nest-site

Only the site of the nest from the National Park at Doñana is described fairly closely. This nest was placed between vertical twigs of a bush of Staura-canthus genistoides (90 cm high), 35 cm above the ground in a vast thicket on stabilized sands. It therefore belonged to the nest sites of type D. Presumably, 3 other nests collected in southern Spain, built in shrubs of Spanish gorse were the same type. Further two nests were built in lavender bushes. One of the nests of S. u. dartfordiensis was sited in a heather shrub and the other in the fork of a vertical twig of an undetermined tree. The height of the nest-site has been recorded only in one case and it was 30 cm above the ground.

Nest construction and material

The nest is usually compact, not transparent or slightly transparent. There is a distinct rim in about a half of the nests. Dead stalks and grasses used to build the outer layer do not generally exceed a dozen centimetres in length (being very often shorter), usually bent at obtuse angles or curved so that their ends do not stick out or stick out sporadically and for a slight distance. The rim components were often bound together with cobwebs (this is especially true of the nests from Spain). On the inside the outer layer is frequently mixed with plant down, particularly in the bottom of the nest; the down may form as if a middle layer overlain by the lining proper. I found similar large amounts of down inside the outer layer of 5 nests from Spain and one from the British Isles. The distinctly separated lining (inner layer) consists of fine and elastic material; the lining is usually thin and often transparent so that the down or other materials can be seen through it in the bottom.

The qualitative composition of the material used to build 12 nests is shown in Table XXXIX. The basic material that constitutes the bulk of all the nests are grasses (stems and leaves) and stalks of herbs; as regards quantity, they may occur in proportions varying in different nests. The only difference between the nest materials of the two subspecies examined seems to be the more frequent use of plant down and cobwebs as cementing material in the rim and outer layer by the birds from southern Spain.

The shape and size of nests

The nests of the Dartford Warbler are hemispherical to high and their inner cups hemispherical to deep. Only one nest, from the Barcelona region, was relatively shallow (depth about 25 mm against the inner diameters of 55×60 mm), which may have been due to its being lightly compressed after collection. The horizontal outline of the nest is circular or somewhat elliptic: two nests departing most from a circle in outline were from southern England and their diameters were 90×105 and 80×100 mm. The outline of the inner cup was also circular or only very slightly elliptic; the most elliptic opening was 56×62 mm across.

Table XXXIX

Material used for building 12 nests of the Dartford Warbler Sylvia undata

		undata = 8	dartfo	u. $rdiensis$ $= 4$			tal = 12			
Material	outer	lining	outer	lining	out		lini	ng		
	layer	8	layer	Aming .	No of nests	%	No of nests	%		
Stalks of herbs	7	5	4	2	11	91.6	7	58.3		
Grasses: stems										
and leaves	3	1	4	2	7	58.3	3	25.0		
Rootlets	2	2	_	1	2	16.7	3	25.0		
Vegetable fibres, bast	1:	_	1		1	8.3	_			
Sticks (twigs)	1	· <u> </u>	_		1	8.3	_			
Vegetable down	5	_	1	_	6	50.0				
Long hair		3	_	1			4	33.3		
Cocoons	3		2	_	5	41.7)—			
Cobweb	5	_	1		6	50.0	_			
Small feathers	2	_	_	1	2	16.7	1	8.3		

The measurements of all the 12 nests, divided according to two subspecies they belonged to, are given in Table XL. It shows that both diameters are little variable, whereas the height and particularly the depth of the nests undergo major fluctuations. The nests of S. u. darfordiensis have the means of all dimensions somewhat greater.

Discussion

The most information given in literature concerns the nest-site. Fairly close studies on this subject were made in the British Isles. BIBBY and TUBBS (1975) and Mason (1976) state that in Great Britain scrubs are the nesting habitat of the Dartford Warbler, whose nests are placed in various species of gorse (Genista sp.) and heather. In Moore's (1975) opinion, in the breeding season this bird does not occur in biotopes with trees exceeding 2.4 m in height. Similar inferences can be drawn from works published by WITHERBY et al. (1938), BANNERMAN (1954) and CAMPBELL and FERGUSON-LEES (1972). According to Bannerman (1954) and Harrison (1975), in the Mediterranean the Dartford Warbler is a typical inhabitant of maquis, nesting also, among other plants, in bramble and cistus. Cody and Walter (1976) write that in Sardinia and Corsica it rarely nests in thickets more than 2 m high. They maintain that the height of nesting reaches 1.20 m and Bannerman (1954) thinks that it is connected with the plant in which the nest is sited. Nevertheless, a vast majority of nests from the British Isles were built less than 60 cm above the ground (MASON 1976).

Table XL Measurements (in mm) of nests of the Dartford Warbler Sylvia undata, showing their ranges, means, standard deviations and coefficients of variation

Measu-	න න	S. Spain S. u. undata $N = 8$. undata 8	7.24	S. Engl	and 8. 4. 0 N = 4	S. England S. u. dartfordiensis $N=4$	msis	1	Total $N = 12$	63	#
rement	Range	X	SD	V	Range	X	SD	Λ	Range	IM	SD	
Outor												
diameter	80.0—95.0	86.87	5.09	5.86	90.0—97.5 91.87	91.87	3.75	4.08	4.08 80.0—97.5	88.42	6119	5.87
Inner												
diameter	49.0—57.5	53.93	2.74	2.08	62.0—60.0	56.26	3.86	6.86	49.0-60.0	54.71	3.19	5.83
Height	40.0-60.0	50.0	7.07	14.14	50.0—55.0	53.75	2.50	4.65	40.0—60.0	51.25	80.9	11.86
Depth	25.0—40.0	35.12	4.52	12.87	30.0-20.0	38.75	8.54	22.03	25.0—50.0	36.33	0.9	16.51

The nest-building material mentioned by different authors varies from site to site: e.g., a nest built in heather may be nearly whole made of pieces of this plant (WITHERBY et al. 1938). According to these authors, this bird used also wool and, sometimes, pieces of moss or paper as building material; however, they did not observe the occurrence of the middle (third) layer with plant down dominant in it. NAUMANN (1898) writes in general that these nests are similar to the nest of the Lesser Whitethroat only that they are more strongly built. CAMPBELL and FERGUSON-LEES (1972) state that the nest of the Dartford Warbler is "more compact and substantial than other Sylvia warblers"; this statement should be regarded as referring only to the species inhabiting the British Isles.

According to these authors, the inner diameter of the nest is 5 cm and so it lies close to the lower limit of this dimension established in the present paper. The outer diameter of the nest described by BERGMANN (1978) from Minorca was 7.8 cm, coming near to the mean from the nests of the birds in southern Spain, the inner diameter 4.5 cm and then distinctly smaller than that in all the nests examined now, and the height 8 cm, which markedly exceeds the value obtained now for the Dartford Warbler (cf. Table XL).

XVII. MARMORA'S WARBLER SYLVIA SARDA TEMMINCK 1820

The material consisted of 2 nests: one from the collection at RNH (unnumbered, from Sicily) and one from ZZSiD (No A/3481/78 from Corsica). The places where these nests were taken are plotted against the breeding range of this spe-



Fig. 16. Marmora's Warbler Sylvia sarda. The places of derivation of the nests examined — a, against the breeding range of the species acc. to Vietinghoff-Scheel (1967 d) and Williamson (1968) — b

cies on a map (Fig. 16), from which it can be seen that they belonged to the no-minative form.

Nest-site

The nest from Corsica has been cut off together with an almost vertical thin rosemary twig in the fork of which it was built.

Nest construction and material

Both nests were fairly massive and virtually non-transparent. In the outer layer the ends of stalks of grasses and herbs did not project outside but were tucked into the walls. The nest was furnished with a distinct and well-woven

rim, chiefly of grass stems and rootlets. There was also plant down, built into the outer layer. The inside was lined with fine, elastic material. The results of an analysis of the material used to build these two nests are shown in Table

Table XLI

Material used for building 2 nests of the Marmora's Warbler Sylvia sarda (2 crosses indicate basic material)

M-4	iq.	Nest from Sicily		Nest from Corsica	
Material		outer layer	lining	outer layer	lining
Grasses: stems and leaves		+		++	+
Stalks of herbs		++		+	
Rootlets		+	+ 90	+	
Sticks (twigs)		E miliana		+	
Bast, vegetable fibres			à	+	_
Moss		+	_		
Vegetable down				+	-

XII. The characteristic material includes stems of grasses and dead stalks of herbs, which form the bulk of the nest, although quantitative relations between them may be various.

The shape and size of nests

If it is assumed that the nest from the Museum at Leiden, collected in 1833, has been somewhat flattened, the nests of Marmora's Warblers should be regarded as deep. The measurements of the 2 nests examined are given in Table $\chi_{\rm LTT}$

Table XLII

Measurements (in mm) of 2 nests of the Marmora's Warbler Sylvia sarda

The nest	Outer diameter		Inner diameter		Height	Donth
The nest	crosswise	$\overline{\mathbf{X}}$	crosswise	\overline{X}	Height	Depth
from Sicily	100×90	95.0	55×60	57.5	47	32
from Corsica	85×90	87.5	48×55	51.5	80	42

Discussion

Berthold and Berthold (1973) gathered the data about the nest-sites of Marmora's Warbler available in literature. It can be seen from their survey that the nesting height ranges from 15 to 100 cm (both together, S. s. sarda and balearica). Their own findings concerning 19 nests of balearica from Formen-

tera show that this height ranges between 32 and 125 cm, averaging 65 cm. The height given by Koenig (1929) and Congreve (1962) lie within these limits. Out of the 19 nests described by Berthold and Berthold (1973), 13 were in shrubs of Juniperus oxycedrus and the remaining ones in Rosmarinus and Erica. Congreve's (1962) data from Majorca show that most of the nests observed there were in shrubs of Pistacia and the remaining ones in Rosmarinus, Erica, Cistus, Asparagus, Dorycnium, asphodel and grasset. Boxberger (1927) mentions cistus from Corsica.

Among the differentiated and generally typical materials of the warblers' nests Berthold and Berthold (1973) give attention to the nest lining of fresh and last year's spikelets of the grass Lagurus ovatus as characteristic of S. sarda. Regrading materials not mentioned in Table XLI, Koenig (1929) observed cobwebs and feathers, Ferguson-Lees (1955) hair and wool, and Congreve (1962) threads of pine bark in the lining.

FERGUSON-LEES (1955) and BERTHOLD and BERTHOLD (1973) lay stress on the solidity of the nest of Marmora's Warbler and Congreve (1962) on the occurrence of a robust rim, in which his description agrees with the present one. The dimensions of nests given by various authors differ somewhat. Although BERTHOLD and BERTHOLD (1973) regard the short inner diameter as characteristic of this species (it was 45—55 mm, averaging 48 mm, in 18 nests measured by them), yet according to MAKATSCH (1976), it reaches 60 and, as Koenig (1929) writes, even 63 mm. It also turns out that the small depth of the nest described from Sicily (Table XLII — 32 mm) has its equivalents in some nests, 30—35 mm deep, reported in literature (MAKATSCH 1976).

XVIII. GENERAL COMMENTS

Little is known of the structure of nests of 4 species of the Sylvia warblers which I failed to get at. It is worth while recapitulating the information about them to obtain a full picture. The data obtained from literature are as follows: Sylvia minula Hume 1873. Volchanetski (1954) writes in general that the nests of this species are built in shrubs and trees up to 3 m above the ground and have a lining of grass leaves and horse hair. Treating this form as a subspecies of S. curruca, Yanushevich et al. (1960), Korelov (1972) and Shnitnikov (1949) do not discriminate the descriptions of nests belonging to particular subspecies. Sylvia leucomelaena (HEMPRICH et EHRENBERG 1836). It occurs in East Africa, Arabian Peninsula and has recently shifted its range to the north, appearing in Israel. MEIHERTZHAGEN (1954) and ARCHER and GODMAN (1961) write that there are no data concerning nesting biology from Arabia and East Africa, whereas, according to AIZIK and PINSHOW (1984), all the 15 nests observed in Israel "were built in accacia trees, 0.8—3 m above the ground....Nests were cup-shaped, with average outer and inner diameters of 85 mm and 55 mm. They were an average of 70 mm high on the outside, and the inside of the cups averaged 30 mm deep. The unlined nests were roughly constructed from the stems and fine branches of dry annual plants, interwoven with the fibres ... Some nests contained the hair-covered seeds ... Some nests were fairly robust, whilst others were thin to the point of transparency".

Sylvia melanothorax 1872. VAURIE (1957), among other authors, considers it to be a Cyprian subspecies S. melanocephala. The descriptions comprised in books by BANNERMAN and BANNERMAN (1958, 1971) show that its nests are built low above the ground, in small shrubs, most often those of Calycotome villosa. They are usually stout, with the external layer built of "bents, grasses, leaves, and nearly always of stripes of juniper bark", This last component seems to be characteristic. The deep cup is lined with fine grasses and, sometimes, with hair and rootlets. There is no mention of a rim, the use of cobwebs and co-coons for building and the transparency of the nest.

Sylvia deserticola TRISTRAN 1859. The general descriptions given by Heim de Balsac and Mayaud (1962) and Etchecopar and Hue (1964) show that the nests of this species are similar to the nests of other Mediterranean warblers, of which the former authors name S. undata and melanocephala. Harrison's (1975) short description, according to which, the nest of dry grasses is lined with fine grasses, vegetable down and hair, may suggest the occurrence of vegetable down under a thin and openwork layer of hair or grasses, just as it occurs, e.g., in melanocephala. Unfortunately, it is again hard to tell anything about the constructional details on the basis of these data.

Unhappily, the descriptions of the nesting of particular species presented in the preceding sections are not uniformly accurate. Notably, when they are based on specimens from collections, the data concerning the nest-sites, usually fairly characteristic and differing in details, are fragmentary or lacking at all. The descriptions given in literature are as a rule very general in this respect, reduced to the height of nest-sites above the ground and to the species of plants supporting the nests. Nevertheless, a comparison of even these incomplete data suggests that the sites of nesting are more differentiated in species that have large breeding areas than they are in the species with limited breeding ranges. This can be exemplified with the Blackcap, which ranges from the Canary Is. to the River Ob'. Its nests are placed from 0.1 to 6.0 m above the ground in a very large number of plant species, the dominant species being different in different parts of the breeding range. The very manner in which a nest is placed is also very various (cf. Table III). These remarks are also true of the nests of the Lesser Whitethroat and Garden Warbler. To be sure, in the Common Whitethroat the height of nest sites above the ground is somewhat less differentiated, but then the number of plant species in which its nests are placed is very large and the mode of their placement is various. The nests of the Barred Warbler show the relatively smallest differentiation in this respect. On the other hand, the species that have small breeding ranges, such as Rüppel's Warbler or Marmora's Warbler, are characterized by a very narrow range of heights of their nest-sites (to 1 m) and a small number of plant species in which they are built. The other warbler species, whose breeding ranges more or less outsize the preceding ones in area, hold an intermediate position between the two extremal groups. A small breeding range undoubtedly brings about a much smaller differentiation of biotopes than does a large one, comprising different climatic and vegetable zones. It is however difficult to determine whether the euryecesis of some species results in their remarkable adaptability and wide breeding range or whether the small breeding range provides relatively uniform conditions of nesting.

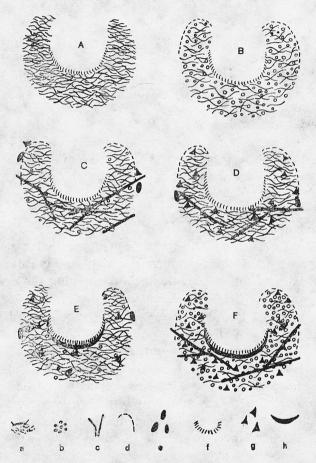


Fig. 17. Diagrams of the types of nests built by the Sylvia warbler species examined. Materials used to build the nests: a — grasses, dry stalks, b — vegetable fibres, bast, strips of bark, c — sticks, d — spiders' cobwebs, e — cocoons, f — lining of animal hair or/and fine delicate plant material, g — shreds of down or wool, h — plant down, forming a separate layer

The question arises whether and, if so, to what extent a similar relationship occurs between the size of the breeding range and the differentiation of the nest structure within the same species. Fig. 17 and Table XLIII constitute the point of departure for the following reasoning. Fig. 17 shows the types of nests distin-

Table XLIII

the present study and literature). +++ observed in all nests, ++ observed in most nests, + observed in a minority of nests (or the frequency of the character cannot be determined on the basis of the data from literature) A comparison of various features occurring in the construction of nests of the species of warblers under study (on the basis of data from

	nwo	uns ppa- te te rer reen te	
	lant de	a sepa- rate layer between the outer layer and the linning	+ + + + + + +
	Occurrence of plant down	various numbers mingled with material of outer layer	+ + + + + + + + + + + + + + +
	Occurr	single frag- ments on the outside of the nest	++++ + ++ +
		Occur- rence of cocoons	++++ +++ +++++
		Occur- rence of the cobweb	+++++++++++++++++++++++++++++++++++++++
	ency t	no	+ + + + + + + + + + + + + + + + + +
	reansparency of nest	weak	+ + + + + + + + + + + + + + + + + +
E	17	mer-	++++ + +
f the	edge	no	+++++
Oct to consumino	at the edge	weak	++++++
000	ring	conspi-	+++++++++++++++++++++++++++++++++++++++
		Material of outer layer soft	++ ++++++++++++++++++++++++++++++++++++
1 2		Material of outer layer rigid	++++++++++++++++++++++++++++++++++++++
		Bird species	S. atricapilla S. communis S. nisoria S. eurruca S. eurruca S. borin S. hortensis S. nortensis S. rippelli S. cantillans S. nana S. nana S. nana S. nana S. nana S. nana S. sarda

guished for Sylvia species under study and simplified very much on purpose: the nests have been reduced to one shape and size. In spite of the fact that types A—F, presented in Fig. 17, differ from each other, it should be kept in mind that in nature there are besides many intermediate forms. Some of the characters of the nests of the species examined, omitted in Fig. 17, are given in Table XLIII (e.g., transparency of nest walls, occurrence of a rim, various kinds of materials, etc.). The occurrence of the types of nests and of their shape in the species under study has been surveyed in Table XLIV. It appears that all the five widely distributed species have 2—3 nest types, type C being common to all of them. Also type A appears more or less frequently exclusively in these species. The other types (B and D) are met with rarely. Type D seems to be the commonest among the remaining species, although type C will also be seen. Type F, which differs from E in having an abundance of soft fibres instead of stalks and bents, was observed in only one species, Sylvia nana, whose breeding

Table XLIV

A survey of the nest types (acc. to Fig. 17), occurring in particular species of the Sylvia Warblers examined and the outer shape of their nests: Fl — flat, Hem — hemispherical, H — heigh, VH — very high. The types and shapes encountered rarely are placed in brackets (on the basis of own material and literature)

Bird species	Nest types	Nest shapes	
Sylvia atricapilla	(A, B), C	Fl, Hem, H, (VH)	
Sylvia communis	A, C, (D)	Hem, H, (VH)	
Sylvia nisoria	A, C	Hem, H, (VH)	
Sylvia curruca	(A), C	(Fl), Hem, H, (VH)	
Sylvia althaea	C, D	\mathbf{H}_{0}	
Sylvia borin	(A), C	Fl, Hem, H	
Sylvia hortensis	(C), D, E	Hem, H	
Sylvia melanocephala	(C), D, E	(Hem), H	
Sylvia rüppeli	D	Hem, (H)	
Sylvia cantillans	D, (F?)	(Hem), H	
Sylvia nana	F	Hem, H, VH	
Sylvia mystacea	C, (D)	(Hem), H	
Sylvia conspicillata	D, E	H	
Sylvia undata	C, D, E	Hem, H	
Sylvia sarda	D, (E?)	H (?)	

range is not very large. Out of the species with small breeding ranges, S. rüppelli has only one type of nests, D, whereas S. undata builds nests which are more differentiated and belong to types C, D and E.

The differentiation of the nest shape (Table XLIV) is distinctly greater in widely distributed species, e.g. S. atricapilla and S. curruca build nests from flat

to very high. It has already been emphasized before that the shape of a nest often depends on the mode of its arrangement. This is probably why the species with a small breeding range and less differentiated nest-sites have a steadier shape of their nests (e.g., S. althaea, S. rüppelli, S. conspicillata).

The transparency of a nest or the degree to which its walls are openwork, and so its aeration are to a great extent connected with the type of its structure (cf. Table XLIII). This bears on the insulating function of the nest. It appears here, too, that the widely distributed species, reaching far to the north, to the zone of temperate and cool climate, generally have oftener more transparent Openwork nests than those living in the zone of mild climate (e.g., Mediterranean species). As regards the desert species, S. nana, only non-transparent nests have been found. This tendency may be supported by two facts described in some Preceding sections: 1) the only non-transparent nest of S. atricapilla (type B) comes from the Canary Is. and 2) most of the transparent nests of S. undata have been reported from the British Isles and most of the nests from southern Spain belong to non-transparent ones. The full explanation of this seemingly paradoxical phenomenon would call for experimental studies of thermal conditions in different types of nests in different climatic zones. Nevertheless, it seems that the tendency to build unairy nests in a warm and dry (desert) climate may be connected with the protection of incubated eggs or chicks from loss of moisture rather than with thermal insulation.

A comparison of the characteristic features of nests of the warbler species examined (summary Tables XLIII and XLIV and descriptions and tables concerning particular species), revealing some similarities and differences, permits us to distinguish several groups, which may reflect the degree of phylogenetic affinities within the genus:

- 1. Sylvia nana isolated because the type of its nest has no direct equivalent in other species.
- 2. Sylvia hortensis, S. melanocephala, S. conspicillata, S. undata and S. sarda Mediterranean species, in whose nests, at least in a part of them, a layer of vegetable down occurs under the lining (nest type E). Judging from fragmentary descriptions in literature, S. deserticola may belong in here as well.
- 3. Sylvia atricapilla, S. communis, S. nisoria, S. curruca and S. borin (and so all the five widely distributed species), which chiefly build openwork nests (types A and C). S. atricapilla can be distinguished in this group on account of the frequent occurrence of distinct transparency in its nests and also of fairly frequent using cobwebs and cocoons for attaching nests to supporting branches.

4. Sylvia althaea, S. rüppelli, S. cantillans and S. mystacea, all of which have with vegetable down mixed with other materials of the nest casing.

Because of the fragmentariness of information or its complete lack in literature I am unable to categorize the nests of S. minula, S. leucomelaena and S. melanothorax.

The division presented above coincides to only a small extent with the groups proposed by Harrison (1983) and Wolters (1980). Both these authors place S. undata, S. sarda and S. deserticola in one group. Bergmann (1978) includes these species in the subgenus Melizophilus, which Wolters (1980) even raises to the rank of genus. These are species with a tail longer than the folded wing. The same character occurs also in S. melanocephala (cf. Williamson 1968), which I place in the same group on the basis of its nest structure. As regards the remaining subgenera distinguished by Wolters (1980), two one-specific ones — S. nana and S. atricapilla — are reflected in the structure of nests, the last of them being separated less sharply (on another level). It may be an interesting fact that S. curruca and S. althaea, which, according to Stepanyan (1983), form a superspecies-type complex, find themselves in different groups now, and the nests of S. althaea show the greatest structural similarity to S. mystacea. However, it should be kept in mind that the systematic differentiation is overlapped by the above-mentioned geographical variation.

XIX. ACKNOWLEDGMENTS

I should not have been in a position to complete this work in the range presented here without the kind and disinterested help of many persons in collecting materials. I owe them all my most heartfelt gratitude. First of all, my thanks go to my Polish colleagues: Mr A. Dombrowski, Dr W. Górski, Assitt. Prof. W. HARMATA, Dr A. KULCZYCKI, Dr P. KUŚNIERCZYK, Mr Z. KWIATEK, Dr R. MACKOWICZ, Mr T. OLEŚ, Dr T. TOMEK, Mr T. UCHIMIAK and Mr. P. ZIEMANN for their help in gathering materials. I wish to thank Dr B. IVANOV of the Zoological Institute, Bulgarian Academy of Sciences, for his help in the territory of Bulgaria and for several excellent photographs included in this paper. I am very grateful to Dr J. BLONDEL, University of Montpellier, for his gift of nests from Camarque and Corsica, to Dr A. F. Kovshar, Institute of Zoology, Kaz. SSR A. Sc. in Alma-Ata for the nests from Central Asia and to my friend, the late John McNelle for the donation of warblers' nests from Great Britain and Iran now in the collection of the Institute of Systematic and Experimental Zoology, Polish Ac. of Scs. in Kraków. I heartily thank Prof. A. P. Kuzyakin and Dr V. V. LEONOVICH from Moscow for permitting me to examine and describe the nests of their private collections. Furthermore, I wish to express my thanks to Dr P. DEVILLERS (Inst. Royal des Sciences Naturalles de Belgique), Prof. V. E. FLINT (Zoological Museum of Moscow State University), Dr A. FORSTEN (Zoological Museum, Helsinki), Dr C. HARRISON (British Museum of Natural History, Sub-Dept. of Ornithology at Tring), Dr J. P. MARTINEZ RICA (Centro Pirenaico de Biologia Experimental CSIC, Jaca), Dr G. F. MEES (Rijkmuseum van Naturlijke Historie, Leiden) and Mr P. NAWROCKI (District Museum at Radom) for giving me access to specimens in respective museums and institutions. I am also greatly indebted to Dr J. Hanzák (National Museum in Prague) and Dr T. Wesołowski (Department of Avian Ecology, Wrocław University) for submitting the nest record cards used in this study.

Translated into English by Jerzy Zawadzki

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REFERENCES

AIZIR D., PINSHOW B. 1984. Notes on the breeding biology of the Arabian Warbler Sylvia leucomelaena in the Arava (Rift Valley), Israel. Ibis, London, 126 (1): 82-89.

Archer G., Gowman E. M. 1961. The Birds of British Somaliland and the Gulf of Aden. Oliver and Boyd, Edinburgh and London, 4.

ARMITAGE J. 1930. Field-notes on the Subalpine Warbler. Brit. Birds, London, 24 (7): 176—178. B_{AIRLEIN} F. 1978. Über die Biologie einer südwestdeutschen Population der Mönchsgrasmücke

(Sylvia atricapilla). J. Ornith., Berlin, 119 (1): 14-51.

BAIRLEIN F., BERTHOLD P., QUERNER U., SCHLENKER R. 1980. Die Brutbiologie der Grasmücken Sylvia atricapilla, borin, communis und curruca in Mittel- und N-Europa. J. Ornith., Berlin, 121 (4): 325-369.

B_{ANNERMAN} D. A. 1954. The Birds of the British Isles. Oliver and Boyd, Edinburgh and Lon-

BANNERMAN D. A., BANNERMAN W. M. 1958. Birds of Cyprus. Oliver and Boyd, Edinburgh. B_{ANNERMAN} D. A., BANNERMAN W. M. 1966. Birds of the Atlantic Islands. 3. History of Birds of the Azores. Oliver and Boyd, Edinburgh.

B_{ANNERMAN} D. A., BANNERMAN W. M. 1971. Handbook of the birds of Cyprus and migrants of the Middle East. Oliver and Boyd, Edinburgh.

Bergmann H-H. 1978. Étude d'une population de Fauvettes pitchous Sylvia undata sur l'ile de Minorque (Baléares). Alauda, Paris, 46 (4): 285-294.

Berthold P. 1978. Brutbiologische Studien an Grasmücken: über die Nistplatzwahl der Mönchsgrasmücke Sylvia atricapilla im Fichten-Picea abies-Wald. J. Ornith., Berlin, 119 (3): 297-297.

BERTHOLD P., BERTHOLD H. 1973. Zur Biologie von Sylvia sarda balearica und S. melanocephala. J. Ornith., Berlin, 114 (1): 79—95

Beven G. 1967. Studies of less familiar birds 143. Subalpine Warbler. Brit. Birds, London, 60 (3): 123-129+pls 13-16.

B_{EZZEL} E. 1957. Beiträge zur Kenntnis der Vogelwelt Sardiniens. Anz. Ornith. Ges. Bayern, München, 4 (8): 589-707.

BIRBY C. J., Tubbs C. R., 1975. Status, habitats and conservation of the Dartford Warbler in England. Brit. Birds, London, 68 (5): 177-195.

B_{00HENSKI} Z. 1968. Nesting of the European Members of the Genus Turdus Linnaeus 1758 (Aves). Acta zool. cracov., Kraków, 13 (16): 349-440+pls XX-XXVI.

В_{ОСИЕŃSKI} Z. 1974. Na marginesie systematyki drozdów. Przegl. zool., Wrocław, 18 (2): 217—

B_{OTTANI} C. 1967. Nid de la Fauvette orphée Sylvia hortensis en Valais. Nos oiseaux, Lausanne, 29 (1): 20—22.

Acta Zoologica Cracoviensia XXIX/1-12

BOXBERGER L. 1927. Nester und Eier einiger seltener Arten. Beitr. Fortofl. Vögel, Berlin, 3 (1): 23-24.

CAMPBELL B., FERGUSON-LEES I. J. 1972. A Field Guide to Birds' Nests. Constable, London. CHRISTIE D. A. 1975. Studies of less familiar birds 176 Barred Warbler. Brit. Birds, London, 68 (3): 108-114+pls 12-15.

CLEMENTS J. F. 1974. Birds of the World: a Check List. The Two Continents Publ. Group, New

York. CODY M. L., WALTER H. 1976. Habitat selection and intraspecific interactions among Mediterranean Sylviid warblers. Oikos, Copenhagen, 27 (2): 210-238.

CONGREVE W. M. 1962. Breeding notes on Marmora's Warbler. Ool. Record, London, 36, Part I (2): 17-22, Part II (3): 33-37, Part III (4): 53-60.

CZARNECKI Z. 1956. Materiały do ekologii ptaków gnieżdzących się w śródpolnych kępach drzew. Ekol. pol., Warszawa, A, 4 (13): 379-417.

DECKERT G. 1955. Beiträge zur Kenntnis der Nestbau-Technik deutscher Sylviiden. J. Ornith., Berlin, 96 (2): 186-206.

DESFAYES M. 1967. Remarques sur l'ecologie de la Fauvette orphée en Valais. Nos oiseaux, Lausanne, 29 (6): 161-162.

Emmrich R. 1971. Beobachtungen zur Brutbiologie und -ökologie der Dorngrasmücke (Sylvia communis LATH.). Zool. Abh., Dresden, 30 (21): 285-296.

ETCHECOPAR R. D., HÜE F. 1964. Les oiseaux du nord de l'Afrique. Ed. N. Boubee, Paris. Ferguson-Lees I. J. 1955. Photographic studies of some less familian birds 65. Marmora's Warbler. Brit. Birds, London, 48: 312.

Ferguson-Lees I. J. 1967. Studies on less familiar birds 146. Sardinian Warbler. Brit. Birds, London, 60 (11): 480-481, pls. 57-59.

Franz E. 1962. Zur Brutbiologie der Sperbergrasmücke. Der Falke, Leipzig, 9 (9): 299-300. GIBB J. 1947. Some notes on the Spectacled Warbler in the Maltese Islands. Brit. Birds, London, 40: 298-304.

Gotzman J. 1965. Die transspezifischen räumlichen Beziehungen zwischen dem Neuntöter (Lanius collurio L.) und der Sperbergrasmücke (Sylvia nisoria (Bechst.)) in der Brutzeit. Ekol. pol. A, Warszawa, 13 (1): 1-22.

Gotzman J., Jabłoński B., 1972. Gniazda naszych ptaków. PZWS, Warszawa.

GROTE H. 1936. Beiträge zur Biologie südostrussischer Steppenvögel. Beitr. Fortpfl. Vögel, Berlin, 12 (6): 234-238.

HAARTMAN L. v. 1969. The Nesting Habits of Finnish Birds. I. Passeriformes. Comm. Biol. Soc. Sc. Fen., Helsinki, 32.

Halladin R. 1935. Próba analizy budowy gniazd ptasich na terenach nadleśnictwa Czarnożyły. Prace Kom. Mat.-Przyr., PTPN, Poznań, B, 7 (5): 139-246.

HARRISON C. 1975. A Field Guide to the Nests, Eggs and Nestlings of British and European Birds. Collins, Glasgow.

HARRISON C. 1983. An Atlas of the Birds of the Western Palaearctic. Collins, London.

HARTERT E. 1903-1910. Die Vögel der paläarktischen Fauna. R. Friedländer und Sohn, Berlin, Bd 1.

HEIM de BALSAC H., MAYAUD N. 1962. Les Oiseaux du Nord-Ouest de l'Afrique. Editions P. Lechevalier, Paris.

HUDEC K. et al. 1983. Ptáci — Aves. Fauna ČSSR, sv. 23, Dil III/1. Academia, Praha.

Ivanov A. I. 1969. Иванов А. И. 1969. Птицы Памиро-Алтая. Koenig A. 1929. Nidologisches von den Balearen. Beitr. Fortpfl. Vögel, Berlin, 5 (3): 90—96. Копелоу М. N. 1972. Корелов М. Н. 1972. Род Славка — Sylvia. В кн. Птицы Казакстана.

Алма-Ата. Том 4: 153-205. Kovshar A. F. 1965. Ковшарь А. Ф. 1965. К виологии размножений славок в западном

Тянь-Шане. Тр. Гос. Зап. Аксу-Джабаглы, Алма-Ата, 2: 246—253. Kovshar A. F. 1970. Ковшарь А. Ф. 1970. О гнездовой биологии ястребинов славки в западном Тямь-Шане. Материалы Вт. Н. Конф. Мол. Уч. А. Н. Каз. ССР., Алма-Ата: 372—374.

- Коузная А. F. et al. 1976. Ковшарь А. Ф., Иващенко А. А., Губин Б. М. 1976. Материалы по экологии горной славки в Таласском Алтау. В кн.: Заповеднику Акср Джабаглы 50 лет. Алма-Ата: 139—150.
- Коузнак А. F., Rukina A. K. 1968. Ковшарь А. Ф., Рукина А. К. 1968. Биология размножения певчей славки в западном Тянь-Шане. Тр. Ин-та зоологии АН КазССР, Алма-Ата, 29: 58—63.
- MACDONALD D. 1970. Notes on the Whitethroat in Sutherland. Scotish Birds, Edinburgh, 10 (8): 296—305.
- Makatsch W. 1976. Die Eier der Vögel Europas. Neumann V., Leipzig-Readebeul, 2.
- Маlснеvsкі А. S. 1959. Мальчевский А. С. 1959. Гнездовая жизнь певчих птиц. Изд. ЛГУ, Ленинград.
- Marjakangas A. 1980. Lehtokertua Sylvia borin pesä korkealla koivussa. Lintumies, Turku, 15 (4): 180.
- MASON C. S. 1976. Breeding Biology of the Sylvia Warblers. Bird Study, Tring, 23 (3): 213—232. MAUERSBERGER G., PORTENKO L. A. 1967. Sylvia mystacea Ménétries. In: Atlas der Verbreitung Palaearktischer Vögel. Akademie-Ver., Berlin, Lief. 2.
- Mauersberger G., Portenko L. A. Vietinghoff-Scheel E. 1967. Sylvia hortensis (Gmelin). In: Atlas der Verbreitung Palaearktischer Vögel. Akademia-Verl., Berlin, Lief. 2.
- Mauersberger G., Vietinghoff-Scheel E. 1967. Sylvia cantillans (Pallas). In: Atlas der Verbreitung Palaearktischer Vögel. Akademia-Ver., Berlin, Lief. 2.
- Meier H. 1972. Brutvorkommen der Orpheusgrasmücke Sylvia hortensis im Gebiet von Brigerbad (Wallis). Orn. Beob., Bern, 69 (3/4): 150—152.
- Meiklejohn R. F. 1934. Notes on Rüppell's Warbler Sylvia rüppelli (Temminck). Ibis, London, 76 (2): 301—305.
- Meiklejohn R. F. 1935. The Nesting of Rüppell's Warbler Sylvia rüppelli (Temm.). Ibis, London, 77 (3): 432—435.
- Meiklejohn R. F. 1936a. Nesting notes on Rüppell's Warbler and Black-headed Bunting. Ibis, London, 78 (2): 377—378.
- Meiklejohn R. F. 1936b. Oological notes 1933 to 1935. Ool. Rec., London, 16 (1): 5—10.
- Meinertzhagen R. 1954. Birds of Arabia. Edinburgh—London.

 Melcher R. 1952. Brutvorkommen der Sperbergrasmücke, Sylvia nisoria (Bechst.) im Domleschg (Kt. Graubünden). Orn. Beob., Bern, 49 (4): 105—116.
- MOORE N. W. 1975. Status and habitats of the Dartford Warbler, Whitethroat and Stonechat in Dorset in 1959—60. Brit. Birds, London, 68 (5): 196—202.
- Neumann F. 1898. Naturgeschichte der Vögel Mitteleuropas. Verl. E. Kölher, Gera, Bd 2. Neuschulz F. 1981. Brutbiologie einer Population der Sperbergrasmücke (Sylvia nisoria) in Norddeutschland. J. Orn., Berlin, 122 (3): 231—257.
- Р_{АNOV} Е. N., Видатоvа N. Sh. 1972. Панов Е. Н., Вулатова Н. Ш. 1972. Сравнительный анализ кариотипов 18 видов семейства *Turdidae* (Aves). Зоол. журнал, Москва, 51 (9): 1371—1380.
- Pedrocchi C. 1977. Biocenologia ornitica en Bosques submediterraneo-montanes de *Pinus silvestris* en San Juan de la Peña y sus relaciones con la avifauna del Alto Aragon occidental.

 Universidad de Barcelona, doctor th., unpubl.
- Portenko L. A., Vietinghoff-Scheel E. 1967. Sylvia borin (Boddaert) In: Atlas der Verbreitung Palaearktischer Vögel. Akademia-Ver., Berlin, Lief. 2.
- Portenko L. A., Vietinghoff-Scheel E. 1971a. Sylvia communis Latham. In: Atlas der Verbreitung Palaearktischer Vögel. Akademia-Ver., Berlin, Lief. 3.
- PORTENKO L. A., VIETINGHOFF-SCHEEL E. 1971b. Sylvia atricapilla (L.). In: Atlas der Verbreitung Palaearktischer Vögel. Akademia Ver., Berlin, Lief. 3.
- Roblen P. 1939. Die Brutbüsche der Grasmücken. Beitr. Fortpfl. Vögel., Berlin, 15 (4): 146—
- 8 АGITOV А. К. 1960. Сагитов А. К. 1960. К биологии размножения горной славки-завирушки в бассейне Зеравшана. Орнитология, Москва, 3: 346—350.

- SAGITOV A. К., Вакаеv S. В. 1980. Сагитов А. К., Бакаев С. А. 1980. Экология гнездования массовых видов птиц Юго-Западного Узбекистана. Изд. "ФАН" Узб. ССР, Ташкент.
- Schifferli A. 1968. Orpheusgrasmücke brütet im Mendrisiotto (Tessin). Orn. Beob., Bern. 65 (4/5): 195—196.
- Schmidt E. 1981. Die Sperbergrasmücke. Die Neue Brehm-Bücherei, Wittenberg Lutherstadt, 542
- Schubert W. 1978. Zur Brutverbreitung und Brutbiologie der Sperbergrasmücke (Sylvia nisoria) im Vinschgau, Südtirol. Egretta, Wien, 21 (1): 12—17.
- Shnitnikov V. N. 1949. Шнитников В. Н. 1949. Птицы Семиречья. Изд. А. Н. СССР, Москва--Ленинград.
- Siefke A. 1962. Dorn- und Zaungrasmücke. Die Neue Brehm-Bücherei, Wittenberg Lutherstadt. 297.
- Stein H. 1974. Ein Beitrag zur Brutbiologie von Singdrossel, *Turdus philomelos*, Amsel, *Turdus merula*, und Mönchsgrasmücke, *Sylvia atricapilla*, mit besonderer Berücksichtigung der Brutverluste. Beitr. Vogelkd., Leipzig, **20** (6): 467—477.
- STEINFATT O. 1954. Vogelkundliche Beobachtungen in Attika. Spezieller Teil. J. Orn., Berlin, 94 (3/4): 245—262.
- Stepanyan L. S. 1982. Степанян Л. С. 1982. Таксономические отношения двух форм рода Sylvia (Sylviidae) как пример надвидовой группировки типа superspecies. Зоол. ж., Москва, 61 (7): 1042—1947.
- Stepanyan L. S. 1983. Степанян Л. С. 1983. Надвиды и виды-двойники в авифауне СССР. Изд. "Наука", Москва.
- TACZANOWSKI W. 1882. Ptaki krajowe. Kraków.
- VAURIE Ch. 1959. The birds of the palearctic fauna. Passeriformes. Witherby Ltd., London.
- VERHEYEN R. 1967. Oologia belgica. IRSNB, Bruxelles.
- VIETINGHOFF-SCHEEL E. 1976a. Sylvia rüppelli TEMMINCK. In: Atlas der Verbreitung Palaearktischer Vögel. Akademia-Verl. Berlin, Lief. 2.
- VIETINGHOFF-SCHEEL E. 1967b. Sylvia melanocephala (GMELIN) und Sylvia melanothorax Tristam. In: Atlas der Verbreitung Palaearktischer Vögel. Akademia-Verl., Berlin, Lief. 2.
- VIETINGHOFF-SCHEEL E. 1967c. Sylvia conspicillata Temminck. In: Atlas der Verbreitung Palaearktischer Vögel. Akademia-Verl., Berlin, Lief. 2.
- VIETINGHOFF-SCHEEL E. 1967d. Sylvia deserticola Tristam, Sylvia undata (Boddaert) und Sylvia sarda Temminck. In: Atlas der Verbreitung Palaearktischer Vögel. Akademia-Verl. Berlin, Lief. 2.
- Volchanetski I. В. 1954. Волчанецкий И. Б. 1954. Род славки Sylvia Scopoli, 1768. В кн. "Птицы Советского Союза", Изд. Советская Наука, Москва, 6: 330—398.
- Voous K. 1977. List of recent Holarctic bird species. Passerines (part 1). Ibis, London, 119 (2): 223—250.
- Wartmann B. 1977. Zur Verbreitung und Brutbiologie der Sperbergrasmücke Sylvia nisoria in der Schweiz. Orn. Beob., Bern, 74 (1): 1—11.
- WILLIAMSON K. 1968. The genus Sylvia. Identification for Ringers, 3, Revised edition, BTO, Tring.
- WITHERBY H. F., JOURDAIN F. C. R., TICEHURST N. F., TUCKER B. W., 1938. The Handbook of British Birds. Witherby Ltd., London, 2.
- Wolters H. E. 1980. Die Vogelarten der Erde. Paul Parey, Hamburg und Berlin, Lief. 5. Yanushevich A. I. et al. 1960. Янушевич А. И. и др. 1960. Птицы Киргизии. Изд. А. Н. КирССР, Фрунзе, 2.
- ZATSEPINA R. A. 1978. Зацышна Р. А. 1978. Семейство славковые Sylviidae. В кн.: "Птицы Волжско-Камского Края. Воробъиные". Изд. Наула, Москка, стр. 94—134.

W obecnym opracowaniu zostały wykorzystane: kartoteka gniazd Zakładu Zoologii Syst. i Dośw. PAN w Krakowie, Kartoteka Gniazd i Lęgów Zakładu Ekologii Ptaków Uniwersytetu Wrocławskiego, kartoteka gniazd Muzeum Narodowego w Pradze, a także zbiory naukowe Zakładu Zoologii Syst. i Dośw. PAN, Muzeum Okręgowego w Radomiu, Muzeum Zoologicznego w Helsinkach, Oddziału Ornitologicznego Brytyjskiego Muzeum Historii Naturalnej w Tring, Królewskiego Muzeum Historii Naturalnej w Brukseli, Królewskiego Muzeum Historii Naturalnej w Brukseli, Królewskiego Muzeum Historii Naturalnej w Leidzie, Pirenejskiego Centrum Biologii Eksperymentalnej w Jaca, Muzeum Zoologicznego Uniwersytetu w Moskwie oraz zbiory prywatne Prof. A. P. Kuzjakina i Dra W. W. Leonowicza w Moskwie.

Badane były umiejscowienie, konstrukcja, materiał gniazdowy, kształt ⁱ wielkość gniazd 15 gatunków z rodzaju *Sylvia*. Typy umiejscowienia gniazd Przedstawiono schematycznie na fig. 1.

Sylvia atricapilla. Badane gniazda pochodzą z różnych stron Europy (fig. 2). Średnia wysokość położenia 259 gniazd z Polski wynosi 1,08 m, choć są one rozłożone w przedziałach od 0,1 do 4,5 m (tab. I). Najwięcej gniazd zbudowanych było w świerkach (tab. II), a najczęstszym typem umiejscowienia jest Położenie na poziomych lub lekko skośnych gałązkach krzewów liściastych (tab. III). Gniazda mają ażurową konstrukcję z silniej uwitym pierścieniem na krawędzi; najczęściej używanym do budowy materiałem są trawy (tab. IV). W wielu gniazdach występuje pajęczyna i kokony używane dla przymocowania gniazda do gałązki, zespojenia materiału, choć w pewnych przypadkach mogą one pełnić rolę dekoracyjną. Gniazda wahają się od płaskich do bardzo wysokich, a spośród wymiarów najmniejszą zmienność wykazuje średnica wewnętrzna o średniej arytm. 62,9 mm (tab. V), która do pewnego stopnia jest skorelowana z wielkością zniesienia.

Sylvia communis. Badane gniazda pochodzą głównie z Europy (fig. 3). Wysokość umiejscowienia 126 gniazd z Polski wahała się między 0 a 1,6 m, przy średniej 0,34 m (tab. VI). Gniazda były budowane na wielu gatunkach roślin (tab. VII) — nie ma jednak roślin wyraźnie preferowanych. Bardziej charakterystyczne są typy umiejscowienia: w roślinach zielnych i na małych krzaczkach i siewkach drzew w piętrze traw (tab. VIII). Najczęściej spotykanym materiałem budowlanym (tab. IX) są trawy, często wielokrotnie pozałamywane, a gniazdo zwykle ma luźną konstrukcję. Kształt gniazd waha się od półkulistych do bardzo wysokich, a najbardziej charakterystyczna jest średnica wewnętrzna (tab. X).

Sylvia nisoria. Miejsca pochodzenia badanych gniazd pokazano na mapie (fig. 4). 39 gniazd z Polski zbudowane było na wysokości 0,3 do 1,3 m (tab. XI), przy średniej 0,73 m. Wśród roślin, na których umieszczone były gniazda (tab. XII) na pierwsze miejsce wysuwa się ostrężyna, lecz najczęstszym typem umiejscowienia (tab. XIII) są okólki w gałązkach krzewów i młodych drzew. Gniazdo pokrzewki jarzębatej jest masywne, a najczęściej spotykanym materia-

łem budowlanym są sztywne łodyżki ziół (tab. XIV). Mimo zwartej budowy gniazda mają często przeświecające ścianki. Większość gniazd należy do wysokich, a wśród wymiarów najmniejsze wahania wykazuje średnica wewnętrzna, której średnia arytm. wynosi 73,1 mm — największą zmienność ma wysokość gniazda (tab. XV).

Sylvia curruca. Badane gniazda należące do formy nominatywnej pochodzą z Europy, a do podgatunku S. e. blythi z okolic Irkucka (fig. 5). Wysokość położenia 113 gniazd z Polski wahała się między 0,2 a 2,2 m, przy średniej 0,96 m (tab. XVI). Najwięcej gniazd w Polsce znaleziono na świerkach, a na dalszych miejscach znalazły się jałowiec i ostrężyny (tab. XVII). Zróżnicowanie umiejscowienia przedstawia tab. XVIII. Podstawowym materialem gniazdowym są trawy (tab. XIX), w większości spotyka się pajęczynę lub kokony; również większość jest słabo ażurowa. Przeważają gniazda wysokie. Wymiary gniazd zestawione są w tab. XX — najmniejszą zmienność wykazuje średnica wewnętrzna. Azjatyckie podgatunki mają grubsze ścianki.

Sylvia althaea. Przebadano 3 gniazda z Tadzykistanu i Kirgizji (fig. 6). Są to gniazda grubościenne, słabo przeświecające. Wszystkie były wysokie i głębokie, a ich wymiary przedstawione są w tab. XXI.

Sylvia borin. Badane gniazda pochodzą z różnych stron Europy (fig. 7). Wysokość umiejscowienia 144 gniazd nad ziemią (tab. XXII) wahała się od 0 do 2, m — średnia arytm. 0,62 m. Lista roślin, na których były one zbudowane przekracza 40 pozycji (tab. XXIII): najwięcej było na malinach i ostrężynach. Sposoby umiejscowienia też są znacznie zróżnicowane (tab. XXIV) i brak wyraźnej preferencji któregoś z typów. Zewnętrzna część gniazda zbudowana jest często z długich załamywanych elementów, których końce sterczą na zewnątrz tworząc koronę. Najczęstszym materiałem są trawy, a dalej łodyżki roślin zielnych (tab. XXV). Kształt gniazd waha się od płaskich do wysokich; ich wymiary zestawiono w tab. XXVI. Najmniejsze wahania wykazuje średnica wewnętrzna (61,9 mm).

Sylvia hortensis. Badanych 20 gniazd pochodzi ze wszystkich części areału i reprezentuje wszystkie 3 podgatunki (fig. 8). 18 z tych gniazd znajdowało się na wysokości 0,8 — 2,0 m. Rodzaje drzew i krzewów, na których zbudowane było 17 gniazd, zestawiono w tab. XXVII. Zwykle umieszczone są one na skośnych lub poziomych gałęziach. Gniazda zbudowane są głównie z łodyżek ziół, często owłosionych (m. in. piołunu) i przemieszanych z watą roślinną (tab. XXVIII). Są one półkuliste lub wysokie. Wymiary 19 gniazd przedstawia tab. XXIX. Znowu najbardziej stała jest średnica wewnętrzna.

Sylvia melanocephala. Miejsca pochodzenia 14 badanych gniazd przedstawiono na mapie (fig. 9). Gniazda budowane na jałowcach i różnych krzewach liściastych, są zwarte i dość sztywne, głównie ze źdźbeł traw i łodyżek ziół, często przemieszanych z watą roślinną, która może czasem tworzyć jakby osobną warstwę pod cienkim wyścieleniem. Zestawienie stwierdzonych materiałów ukazuje tab. XXX. Większość gniazd jest wysoka. Wymiary zestawiono w tab. XXXI;

najbardziej charakterystyczne są średnice zewnętrzna i wewnętrzna — u tego gatunku najmniejszą zmienność wykazuje średnica zewnętrzna.

Sylvia rüppelli. Opisano 2 gniazda z Azji Mniejszej (fig. 10). Były zbudowane dość luźno, jednak ze znacznej ilości materiału, którym są przede wszystkim łodyżki ziół i zbutwiałe fragmenty roślin. Oba przeświecały bardzo słabo. Oba też były półkuliste, a ich wymiary przedstawia tab. XXXII.

Sylvia cantillans. Opisano 19 gniazd reprezentujących oba podgatunki (fig. 11). 8 gniazd z Bułgarii zbudowane było na wysokości 0,35—1,3 m (średnia 0,59 m), wszystkie na jałowcach; inne gniazda znajdowały się w różnych krzewach, m. in. w ostrężynach. Są one dość grube i masywne; tylko niewiele słabo prześwieca. Najczęstszym materiałem są trawy i łodyżki ziół (tab. XXXIII), które często są przemieszane z watą roślinną. Większość gniazd jest wysoka. Ich wymiary przedstawiono w tab. XXXIV. Gniazda wschodniego podgatunku S. c. albistriata mają nieco większą czaszę.

Sylvia nana. Tylko 1 gniazdo z Kazachstanu (fig. 12). Jest to duże gniazdo o miękkiej konstrukcji i grubych ściankach. Zupełnie nie przeświecające; w jego

dnie znajdowało się dużo waty roślinnej.

Sylvia mystacea. Opis oparty na 11 gniazdach pochodzących z różnych stron areału (fig. 13). Wysokość położenia 7 z nich wahała się od 0 do 0,7 m (średnia 0,29 m). Materiał użyty do budowy poszczególnych gniazd jest bardzo zróżnicowany (tab. XXXV), we wszystkich jednak stwierdzone były trawy. Większość słabo przeświecała. Większość też należała do wysokich. Wymiary wszystkich gniazd przedstawiono w tab. XXXVI. Najmniejsze wahania wykazuje średnica wewnetrzna (średnia 54,4 mm).

Sylvia conspicillata. Opisano 13 gniazd, których pochodzenie przedstawia mapa (fig. 14). Są to gniazda o spoistej konstrukcji, zbudowane z łodyżek ziół i traw (tab. XXXVII), przemieszanych z watą roślinną, która w większości przypadków tworzy też osobną warstwę pod wyściółką. 3 gniazda w których waty nie było, były ażurowe — pozostałe przeświecały słabo lub w ogóle nie. Wszystkie gniazda należały do wysokich, a wyniki ich pomiarów przedstawia tab. XXXVIII. Najmniejszą zmienność wykazuje średnica zewnętrzna.

Sylvia undata. Opisanych zostało 12 gniazd z Hiszpanii i Wysp Brytyjskich (fig. 15), które reprezentują 2 podgatunki. Są one zwykle zbite i nie przeświecające lub przeświecające bardzo słabo. Obudowa głównie z traw i łodyżek ziół (tab. XXXIX) bywa często (częściej w Hiszpanii niż na Wyspach Bryt.) przemieszana z dużą ilością waty roślinnej, która też tworzy osobną warstwę pod Wyściółką. Gniazda należały do półkulistych i wysokich, a ich wymiary przedstawia tab. XL. Obie średnice wykazują niewielką zmienność.

Sylvia sarda. Opis 2 gniazd z Sycylii i Korsyki (fig. 16). Oba gniazda są dość masywne i prawie nie przeświecające. Do warstwy zewnętrznej z trawek i łodyżek ziół domieszana jest wata roślinna (tab. XLI). Wymiary obu gniazd przed-

stawia tab. XLII.

Dane z literatury o gniazdach 4 form, do których nie udało się dotrzeć

(Sylvia minula, S. leucomelaena, S. melanothorax i S. deserticola) otwierają rozdział poświęcony ogólnym uwagom. W wyniku porównań okazuje się, że ogólnie gatunki o szerokim rozsiedleniu (np. atricapilla, curruca czy borin) mają znacznie bardziej zróżnicowane umiejscowienie gniazd niż gatunki o ograniczonym areale lęgowym (np. rüppelli czy sarda). Porównane elementy struktury i kształtu badanych gniazd (tab. XLIII, fig. 17, tab. XLIV) wskazują, że kształt jest również bardziej zróżnicowany u gatunków szeroko rozsiedlonych. Gatunki te mają też znacznie bardziej ażurowe gniazda niż gatunki śródziemnomorskie, a u pustynnej S. nana nie stwierdzono w ogóle przeświecania. Tendencja do budowania nieprzewiewnych gniazd w ciepłym i suchym klimacie może wiązać się nie tyle z funkcją izolacji termicznej, co z ochroną przed nadmiernym wysuszeniem jaj czy piskląt.

Porównanie cech charakterystycznych gniazd badanych gatunków pozwala na ich następujące pogrupowanie, które może być odbiciem stopnia ich pokrewieństwa filogenetycznego:

- 1. Sylvia nana,
- 1. Sylvia hortensis, melanocephala, conspicillata, undata, sarda,
- 3. Sylvia atricapilla, communis, nisoria, curruca i borin (w tej grupie wyróżnia się S. atricapilla),
- 4. Sylvia althaea, rüppelli, cantillans, mystacea.

Redaktor pracy: prof. dr M. Młynarski

Plate XIV

Nests of Sylvia atricapilla:

Phot. 1. Young fir with nest pointed by the arrow (nest-site type A)

Phot. Z. Bocheński

Phot. 2. The same nest as in phot. 1. photographed from the shorter distance

Phot. Z. Bocheński

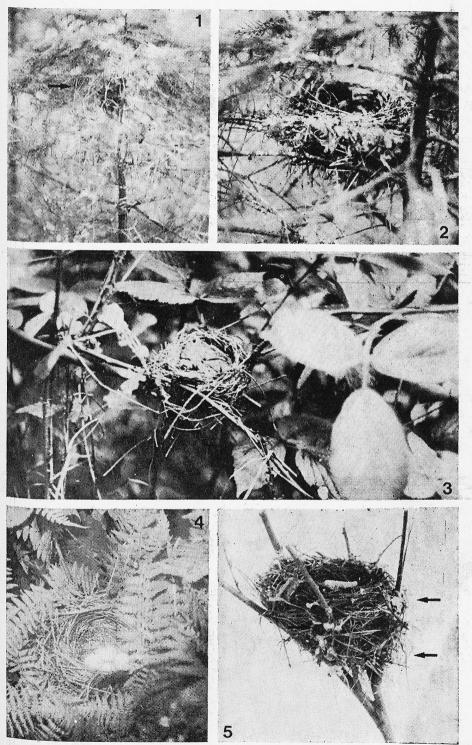
Phot. 3. The nest on the horizontal branch of a young birch-tree (nest-site type E)

Phot. Z. Bocheński

Phot. 4. The nest in a fern cluster (nest-site type M)

Phot. Z. Bocheński

Phot. 5. The nest (coll. ZZSiD No A/3031/75) attached with cocoons (pointed by the arrows) to supporting branches



Z. Bocheński, Nesling...

Plate XV

Phot. 6. The nest of Sylvia communis built in broken reeds (nest-site type L)

Phot. Z. Bocheński

Phot. 7. The nest of Sylvia nisoria in a small briar-rose shrub (nest-site type E)

Phot. Z. Bocheński



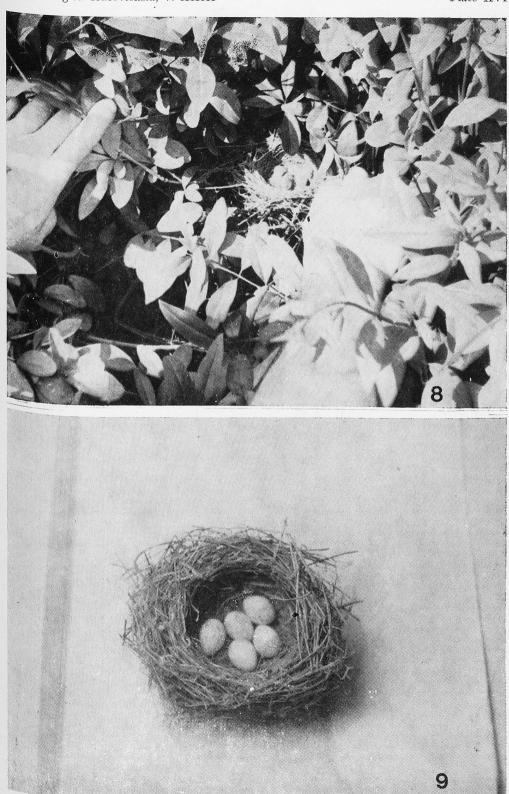
Z. Bocheński, Nesting...

Plate XVI

Phot. 8. The nest of Sylvia curruca built in the whorle of a privet shrub (nest-site type E)

Phot. Z. Bocheński

Phot. 9. The nest of Sylvia althaea from Tadzhikistan (coll. VVL)



Z. Bocheński, Nesting...

Plate XVII

Nests of Sylvia borin:

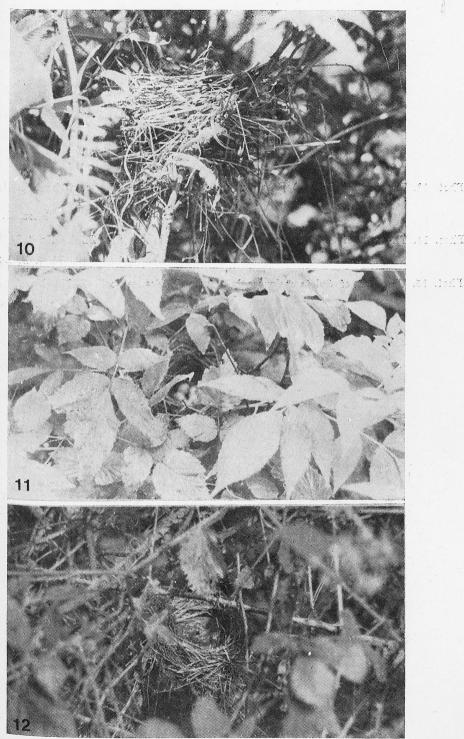
Phot. 10. The nest built on spirea (nest-site type K)

Phot. 11. The nest hidden in an elder shrub (nest site type E)

Phot. 12. The nest on trailing bramble shoots (nest-site type I)

Phot. Z. Bocheński

Phot. Z. Bocheński



Z. Bocheński, Nesting...

Plate XVIII

- Phot. 13. The nest of Sylvia hortensis crassirostris built in a briar-rose shrub in Bulgaria (nest-site type E)

 Phot. B. Iyanov
- Phot. 14. The nest of Sylvia melanocephala from S. France (coll. ZZSiD No A/3479/78)

 Phot. Z. Bocheński
- Phot. 15. The nest of Sylvia melanocephala from S. France (coll. ZZSiD No A/3483/78)

 Phot. Z. Bocheński



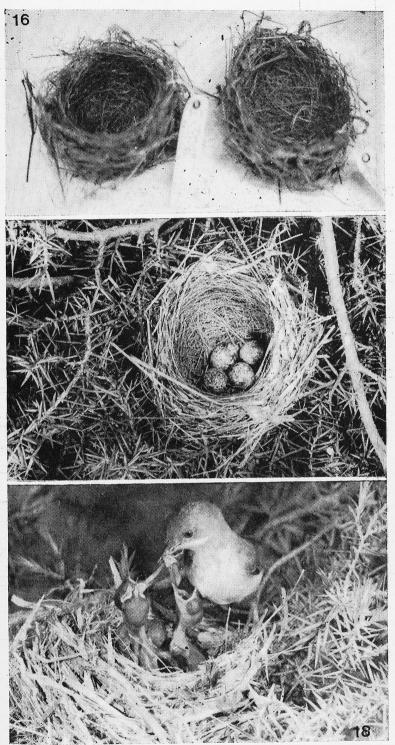
Z. Bocheński, Nesting...

Plate XIX

Phot. 16. Two nests of Sylvia rüppelli from Asian Turkey stored at the collection of BMNH (Nos N. 239.1 and N.239.2)

- Phot. 17. The nest of Sylvia cantillans sited in a juniper shrub (nest-site type D) in Bulgaria
 Phot. B. Ivanov
- Phot. 18. Another nest of Sylvia cantillans sited in a juniper shrub in Bulgaria

 Phot. B. Ivanov

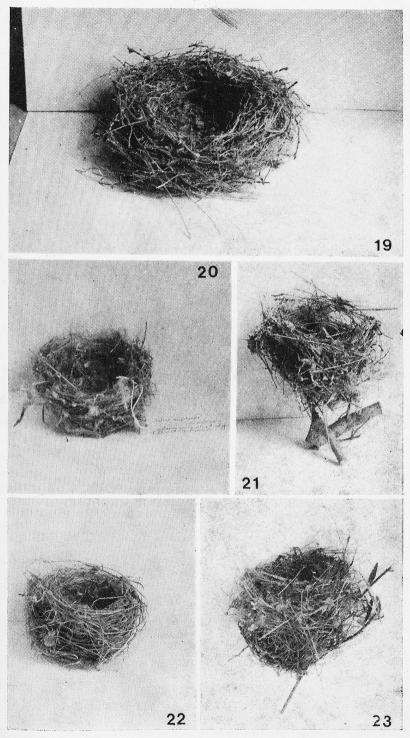


Z. Bocheński, Nesting...

Plate XX

- Phot. 19. The nest of Sylvia nana from Kazakhstan (coll. ZZSiD No A/4170/84)
 - Phot. Z. Bocheński
- Phot. 20. The nest of Sylvia mystacea from Iran (coll. ZZSiD No A/2870/73)
 - Phot. Z. Bocheński
- Phot. 21. The nest of Sylvia conspicillata from Camarque, S. France (coll. ZZSiD No A/3480/78)

 Phot. Z. Bocheński
- Phot. 22. The nest of Sylvia undata dartfordiensis from Hampshire, S. England (coll. ZZSiD No A/3459/77)
- Phot. 23. The nest of Sylvia sarda from Corsica (coll. ZZSiD No A/3481/78)
 - Phot. Z. Bocheński



Z. Bocheński, Nesting...