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Nesting of the European Members of the Genus *Turdus* LINNAEUS 1758 *(Aves)*

[Pp. 349—440, pls. XX—XXVI and 4 text-figs]

Gnieżdżenie się europejskich przedstawicieli rodzaju *Turdus* LINNAEUS 1758 *(Aves)*

Гнездование европейских представителей рода *Turdus* LINNAEUS 1758 *(Aves)*

Abstract. The site, material, shape and size of nests of the European species of thrushes, i. e., *Turdus philomelos*, *T. iliacus*, *T. pilaris*, *T. viscivorus*, *T. merula* and *T. torquatus*, are discussed. As a result of comparative studies a key to the nests of these species has been worked out. The complementary material for further considerations consists of descriptions of nests of some extra-European species of the *Turdini*. The conclusions made on the basis of the analysis of similarities and differences in nest structure refer mostly to phylogenetic relationships between different species within the genus *Turdus*.

CONTENTS

I. INTRODUCTION

The present work is one of the series of studies on the nesting of birds in Poland. Its objective has been to get well acquainted with the structure of nests of the six European species of thrushes. All of them belong to the breeding avifauna of this country, but differ much in number and in the manner of occurrence, representing a range of forms, from those common all over Poland (Song Thrush and Blackbird) through dwellers of highland forests only (Ring Ouzel) to very rare species encountered occasionally on the peripheries of their geographical ranges (Redwing).

In this work I attempted to establish the characteristics of the nests of each species under study, taking into consideration the widest possible range of variation brought about by the adaptive capabilities of these birds. On the other hand, I carried out comparative studies of these species so as to find the characters which would allow the distinction of their nests from each other. Moreover, a more speculative purpose of this work was to trace such similarities and differences between the nests of the members of the genus *Turdus*, including the nests of non-European species available in collections and those whose descriptions I managed to find in literature, as indicate phylogenic relations, if any, between particular species.

II. METHODS

The data being discussed in this paper have been worked out in the form of nest record cards, such as we generally use in the Institute od Systematic Zoology, Polish Academy of Sciences, to collect information about the nesting of different species of birds. Each card serves to record the data concerning one nest and, in addition to such items as the specific membership of the bird and the date and place of observation, contains also blanks for 1) nest measurements (inner and outer diammeters, height and depth), 2) nest site (with a very brief description of the habitat), 3) nest material and construction and 4) number of eggs or nestlings. There is a little room left for a sketch, if need be, on the back of the card. Most of the nest record cards were collected by the author, some were supplied by students and other members of the Ornithological Division of the Polish Zoological Society in the years 1946—1968; they were obtained, for the most part, from Poland, there being also some records from Czechoslovakia, the European part of the Russian SFSR and Great Britain. As regards the Mistle Thrush and Fieldfare, which were represented in my material by rather a small number of nest record cards, I also utilised

similar cards of the Institute of Vertebrate Researches, CSASc, in Brno, providing the data from the Czechoslovakian territory. Finally, I examined the nests of some non-European species in several museums and private collections for comparative purposes.

The cards often lacked some data, because the respective nests were inaccessible or partly destroyed or their examination was given up for fear of frightening away the birds, etc. As a result, the number of specimens of particular species varies from analysis to analysis and is always smaller than the total number of cards or nests of this species included in the study.

The present work consisted in close analyses of the data concerning the site, material, shape and size of nests.

Measurements of the inner and outer diameters of nests were generally taken twice, crosswise. If a nest was irregular in shape and the outlines of its cup resembled a circle flattened on one side or an ellipse, the measurements were taken so as to represent the longest and the shortest dimensions. The arithmetic means were next calculated from such pairs of measurements and used in further calculations in the same way as in my previous studies on nest building in other species (Bocheński, 1957, 1961, 1962, 1966). Standard deviations σ and coefficients of variation V were calculated for each of these four measurements *.

Whenever the size of series permitted, each of the four measurements was dealt with separately for „new" nests, that is, those newly built or in which there were eggs or very young nestlings, and separately for „used" nests with fledged nestlings or already abandoned by them. This was done so to find to what extent the nestlings contribute to the deformation of nests. Besides, all the nests were also treated seperately as a whole.

Two of the species discussed in this paper, i. e., the Redwing and Mistle Thrush, are so scarce in Central Europe that I succeeded in gathering only scanty material in my nest record cards. In the case of the Mistle Thrush I completed it with the data obtained from the Czechoslovakian nest cards, which were not very numerous, either. This was, however, impossible in so far as the Redwing was concerned, because practically it does not occur in Czechoslovakia and, consequently, has not been recorded in the nest cards from that country. For this reason, I have included short descriptive notes on single nests of these two species published in Central Europe, though they are quite few, as material for study. On the other hand, the papers in which more abundant material has been analysed are dealt with, as in the case of other species, in the sections entitled "Discussion".

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* For this purpose I used the formulae given in the work by Simpson, Roe and Lewontin (1960): $\sigma = \sqrt{\frac{\Sigma x^2 - \frac{(\Sigma x)^2}{N}}{N-1}}$ and $V = \frac{\sigma 100}{M}$ where N is the number of cases, x the value of each particular case and M the arithmetic mean.

III. SONG THRUSH *TURDUS PHILOMELOS* C. L. BREHM 1831

Own material

The data recorded in 220 record cards concern the nests of the nominative form, *Turdus philomelos philomelos* BREHM, 1831, inhabiting the greater part of the European mainland, and are completed by the findings on 3 nests of the form living in the British Isles, i. e., *Turdus philomelos clarkei* HARTERT 1909 and 1 nest of the subspecies *T. ph. hebridensis* CLARKE 1913 from the Hebrides. This last nest is in the possession of the Tring Museum. The data about the nests of the nominative form were collected chiefly in Poland, then also in Russia and Czechoslovakia. The material from Poland includes fairly large series from the Wolski Wood near Kraków, the Tatra Mts., the Pieniny Mts., Mt. Babia Góra and Białowieża, which makes it possible to demonstrate some differences between the populations living in these regions. The nests of the nominative form analysed in this study were collected in various environments, mostly in highland forests, where it belongs to characteristic species, but also in forests and different sorts of wooded areas and parks in lowlands, presenting various degrees of human interference.

Nest-site

The nests of Song Thrushes are as a rule placed in trees and shrubs, not very high above the ground. The distribution of nesting heights in this group is shown in Table I. Generally speaking, the largest number of nests occur in the 1—2 m. height group, but their number in the next height group (2—3 m.) is only slightly smaller. The number of nests in these two groups together forms more than 70% of the total of nests examined. The arithmetic mean from the heights of all the 196 nests analysed is 2.5 m. However, it fluctuates from 2.0 to 3.7 m. in different populations.

Song Thrushes particularly often nest in coniferous trees. Table II shows that nearly 90% of the 211 nests analysed in this respect were placed in conifers, mainly in firs and spruces. These last trees are most frequently inhabited (about 65% of the total in this group), and this is particularly true of young trees which do not exceed 10 m. in height. As for the nests in deciduous trees, shrubs, creepers, etc., which all together form less than 10% of the total, they were for the most part found in oaks and junipers. A comparioson of the data obtained for different populations reveals that the proportions of various species of trees and shrubs and, in the case of the spruce, of different age groups undergo some fluctuations, which, however, do not seem to be great enough to allow any far-reaching conclusions.

Table III shows the manners of placing of nests in different morphological types of trees and shrubs irrespective of their specific classification. In the most numerous group of nests, i. e., those built in young conifers (spruce, fir and larch), the nests are usually situated on two twigs and leaned against the trunkt.

Table I

The distribution of 196 nests of the Song Thrush *Turdus philomelos* according to nesting height, for total number of nests and for 7 selected regions

Height, in m.	Total		Selected regions													
			Tatra Mts.		Pieniny Mts.		Babia Mt.		Ojców Nat. Park		Wolski Wood near Kraków		Białowieża		surroundings of Rzepin	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
0—0.99	5	2.55	—		—		—		—		2	4.25	—		1	6.25
1.0—1.99	72	37.24	6	33.33	25	40.98	2	10.53	1	16.66	21	44.68	7	46.67	7	43.75
2.0—2.99	71	36.22	7	38.89	22	36.06	6	31.58	1	16.66	18	38.30	7	46.67	7	43.75
3.0—3.99	24	12.24	4	22.22	6	9.84	4	21.05	2	33.33	5	10.64	—		1	6.25
4.0—4.99	11	5.61	1	5.56	3	4.92	2	10.53	1	16.66	1	2.13	—		—	
5.0—5.99	9	4.59	—		4	6.56	4	21.05	—		—		1	6.66	—	
6.0—6.99	1	0,51	—		—		—		1	16.66	—		—		—	
7.0—7.99	2	1.02	—		1	1.64	1	5.26	—		—		—		—	
Total	196	99.98	18	100.00	61	100.00	19	100.00	7	99.97	47	100.00	17	100.00	16	100.00
Approximate mean height	2.5		2.5		2.6		3.7		3.6		2.1		2.2		2.0	

Species of trees and shrubs in which nests of Song Thrushes *Turdus phi*

Species of trees and shrubs	Total		Selected				
			Tatra Mts.		Pieniny Mts.		Babia
	No.	%	No.	%	No.	%	No.
Coniferous trees (total)	(188)	(89.09)	(18)	(100.00)	(59)	(95.16)	(20)
Abies alba	43	20.38	1	5.56	24	38.71	7
Larix sp.	1	0.47	—		—		—
Picea excelsa — young	86	40.76	13	72.22	27	43.55	9
Picea excelsa — old	28	13.27	4	22.22	8	12.90	4
Picea pungens	24	11.37	—		—		—
Pinus sp.	6	2.84	—		—		—
Deciduous trees (total)	(9)	(4.25)	—		—		—
Alnus nigra	1	0.47	—		—		—
Carpinus betulus	1	0.47	—		—		—
Quercus sp.	4	1.90	—		—		—
Sorbus aucuparia	1	0.47	—		—		—
Ulmus sp.	2	0.95	—		—		—
Shrubs (total)	(12)	(5.68)	—		(3)	(4.84)	—
Juniperus sp.	3	1.42	—		2	3.23	—
undetermined coniferous shrubs (decorative)	1	0.47	—		—		—
Corylus avellana	2	0.95	—		—		—
Crategus sp.	2	0.95	—		—		—
Sambucus nigra	1	0.47	—		—		—
Syringa vulgaris	1	0.47	—		—		—
undet. deciduous shrubs	2	0.95	—		1	1.61	—
Wall creepers	(1)	(0.95)	—		—		—
Other nest-sites	(1)	(0.95)	—		—		—
Total	211	99.97	18	100.00	59	100.00	20

Table II

omelos were placed, for the total number of nests and for 7 selected regions

regions								
Mt.		Ojców Nat. Park		Wolski Wood near Kraków		Białowieża		Environs of Rzepin	
%		No.	%	No.	%	No.	%	No.	%
(100.00)		(6)	(100.00)	(53)	(92.97)	(13)	(81.25)	(11)	(64.69)
35.00		2	33.33	10	17.54	—		—	
		—		—		—		1	5.88
45.00		1	16.67	14	24.56	11	68.75	3	17.64
20.00		3	50.00	5	8.77	2	12.50	1	5.88
		—		24	42.10	—		—	
		—		—		—		6	35.29
		—		(3)	(5.27)	(2)	(12.50)	(3)	(17.64)
		—		—		—		1	5.88
		—		1	1.76	—		—	
		—		2	3.51	—		1	5.88
		—		—		—		1	5.88
		—		—		2	12.50	—	
		—		(1)	(1.76)	(1)	(6.25)	(3)	(17.64)
		—		—		—		—	
		—		—		—		—	
		—		—		—		1	5.88
		—		—		—		1	5.88
		—		—		—		—	
		—		—		—		1	5.88
		—		—		1	6.25	—	
		—		—		—		—	
		—		—		—		—	
100.00		6	100.00	57	100.00	16	100.00	17	99.97

More than 20% of the 170 nests analysed in Table III were sited in this manner. The commonest nests in old tall conifers (spruce and fir) are those built agains. the trunk on two or more twigs in the lower part of the tree. It may be assumed in general that the most characteristic nest-site of the Song Thrush is that in a conifer against the trunk, on twigs, which vary in number, but as often as not are two. Such a site was found in more than 65% of the nests (Table III). The tendency for the nests to be leaned against upright elements is still more striking, if we keep in mind that it is also reflected in other types of nest-sites, namely, those between the stems of two coniferous saplings growing near each other (6 nests), in a whorl formed after the top of a fir or spruce has been cut off (4 nests), in the fork of a trunk (1 nest) and at the base of a branch in a deciduous tree (3 nests). Similar conditions are also provided by shrubs of juniper and thuja (4 nests) as well as wall creepers (1 nest). The 20 nests enumerated here make about 12% and, therefore, all in all nearly 80% of the nests were leaned against something at least on one side.

In June 1968 a nest was found in the Ojców National Park, placed on a rock (Phot. 8); however, it has not been included in Tables I—V and only marked in Table XXXI.

Nest construction and material

In outline, the construction of the Song Thrush's nests may be described as follows:

The external portion of the nest is built of relatively loosely arranged sticks, moss, grass, etc.,wh ich become finer and finer towards the inside as the nest-structure grows more and more compact. The inside of nest is plastered with hard material of variable composition, forming a more or less regular hemispherical or ovoid cup with no additional lining. In new nests the margin of the plastering runs just below the edge of the nest, which often ends in a kind of ring, made mainly of grasses and thin twigs woven together more firmly than the rest of the nest. In nests whose external portion is constructed exclusively or almost exclusively of moss, it is hard to distinguish such a "ring".

In about 80% of the nests examined the plastering, usually several millimetres thick, was made of something resembling papier mâché. In most of the nests it consists of small fragments of rotten wood, gathered by birds from mouldering trunks and stumps, which in the forest remain damp for a long time, especially in the spell of spring showers. When shaped and dried, this damp paste, probably containing also an admixture of saliva, becomes hard. In a remarkably smaller proportion of these nests the plastering is made of mud mixed with vegetable parts, or of cattle dung mixed with mud and pieces of grass and straw. There are occasional nests in which several layers can be distinguished in the plastering. In particular cases the first layer, which lies directly on other sorts of material (moss, grass, etc.), is of mud mixed with cow dung, mud alone, or mud with tree-needles and dead leaves, and it is overlaid by another layer which contains rotten wood.

Table III

Nest-sites of the Song Thrush *Turdus philomelos*

General designation of place	Symbol in Fig. 2	Nest-site	Number of nests	%
Young coniferous trees (spruce, fir, larch)	A	against trunk (in general)	20	11.76
	A	against trunk, on 1 twig	3	1.76
	A	against trunk, on 2 twigs	39	22.94
	A	against trunk, on 3 and more twigs	20	11.76
	B	between 2 saplings	6	3.53
	C	on twigs, clear of trunk	6	3.53
	C	on crossed twigs of 2 saplings	2	1.18
	D	in whorls	4	2.35
Old coniferous trees (spruce, fir)	E	against trunk, on 1 thick branch	5	2.94
	F	against trunk, on 2 and more thin branches	19	11.18
	G	in trunk crotch	1	0.59
	H	on thick branch, distant from trunk	17	10.00
Pine	I	on a branch of young tree, close to trunk	6	3.53
Deciduous trees	L	against trunk, on 1 or more branches	4	2.35
	M	on branch, distant from trunk	2	1.18
Shrubs	P	junipers and other conifers	4	2.35
	Q	among branches of deciduous shrubs and saplings	10	5.88
Creepers	R	among creepers, close to wall	1	0.59
Heaps of dry brush-wood	S	among horizontally lying branches	1	0.59
		Total	170	99.99

Table IV

The qualitative analysis of material used to build the external layer in the nests of the Song Thrush *Turdus philomelos*

Material	*Turdus philomelos philomelos*						*Turdus ph. hebridensis*	*Turdus ph. clarkei*		Total	
	whole nests		demolished		total						
	No.	%	No.	%	No.	%		No.	%	No.	%
Natural materials:											
sticks — twigs (total)	(60)	(92.30)	(67)	(94.36)	(127)	(93.38)	(+)	(2)	(66.6)	(130)	(92.85)
of which: undetermined	24	36.92	30	42.25	54	39.70	1	2	66·6	57	40.71
of conifers	30	46.15	36	50.70	66	48.52	—	—		66	47.14
of deciduous trees	9	13.84	8	11.26	17	12.50	—	—		17	12.14
grass	56	86.15	63	88.73	119	87.50	—	2	66.6	121	86.42
moss	44	67.69	66	92.95	110	80.88	—	3	100.0	113	80.71
fern	2	3.07	10	14.08	12	8.82	—	—		12	8.57
lycopod	—		1	1.40	1	0.73	—	—		1	0.71
horsetail	—		1	1.40	1	0.73	—	—		1	0.71
lichens	6	9.23	9	12.67	15	11.02	—	—		15	10.71
dead leaves	13	20.00	17	23.94	20	22.05	—	—		30	21.42
bast (fibres)	2	3.07	—		2	1.46	—	—		2	1.42
stalks	16	24.61	19	26.76	35	25.73	1	1	33.3	37	26.92
rootlets	11	16.92	18	25.35	29	21.32	—	1	33.3	30	21.42
rhizomes (couch grass etc.)	2	3.07	4	5.63	6	4.41	1	—		7	5.00
needles	1	1.53	4	5.63	5	3.67	—	—		5	3.57
stems of blackberries	1	1.53	1	1.40	2	1.46	—	—		2	1.42
flower of *Cirsium* sp.	1	1.53	—		1	0.73	—	—		1	0.71
pieces of rotten wood	—		1	1.40	1	0.73	—	—		1	0.71
broad bean	—		1	1.40	1	0.73	—	—		1	0.71
Artificial materials:											
paper	—		1	1.40	1	0.73	—	—		1	0.71
Total of nests examined	65		71		136		1	3		140	

The results of a qualitative analysis of the material used to build the external portion of the nest (excluding its plastering) are given in Table IV. In addition to the global data tabulated for all the nests of the Song Thrush examined, the findings have been juxtaposed seperately for the European subspecies in the last two columms. The nests of the nominative form, *T. ph. philomelos*, were analysed in two ways: the nests which contained eggs or nestlings at the time of examination were described in detail on the basis of their external appearance, whereas those abandoned by young birds were broken up so as to detect all the component materials. There were 65 nests in group 1 and 71 nests in group 2. The percentage shares of materials were for the most part similar in both groups. These were naturally materials of which the external portion of nests was constructed, i. e., sticks, grasses, lichens, leaves and stalks. The proportion of moss was found larger in the second group (demolished nests), there being different amounts of moss in particular nests, ranging from a pronounced quantitative predominance over the remaining materials to hardly a few stems, usually directly under the plastering. A similar situation was also observed in so far as fern fragments and needles are concerned, only that these materials never predominated in the nests. Other differences seem to have been incidental or connected with the sporadic occurrence of given sorts of materials.

Table V

Survey of measurements of nests of nominative form of the Song Thrush *Turdus philomelos*, showing their ranges, means, standart deviations and coefficients of variation

Measurement	Kind of nest	Number of nests	Range in cm.	Mean	Standard deviation	Coefficient of variation	Notes
Inner diameter	new nests	67	8.0—10.3	9.11	±0.488	5.35	
	used nests	67	8.0—11.25	9.34	±0.445	4.76	
	total	134	8.0—11.25	9.23	±0.480	5.20	
Outer diameter	new nests	68	9.3—18.0	14.84	±1.719	11.58	
	used nests	64	12.5—19.5	15.23	±1.309	8.59	
	total	132	9.3—19.5	15.03	±1.540	10.24	
Depth	new nests	66	5.5— 9.5	6.72	±0.672	10.00	
	used nests	67	3.0— 7.8	6.19	±0.917	14.81	
	total	133	3.0— 9.5	6.45	±0.845	13.10	
Height	new nests	68	7.5—23.0	11.67	±2.858	24.49	
	used nests	64	6.0—13.0	9.50	±1.566	16.48	
	total	132	6.0—23.0	10.62	±2.559	24.09	

As regards material, the composition of the 3 nests of *T. ph. clarkei*, inhabiting the British Isles, which nests were besides analysed whole, does not differ from that observed in the nominative form, whereas the nest of *T. ph. hebridensis* was built, in addition to sticks, of stalks and rhizomes, which certainly were found only in a minority of nests of the nominative form.

It may be assumed in general that the commonest material in the Song Thrush's nests is sticks (over 92% of nests), of which thin dry twigs of conifers (without needles) occur more often than any others. Further, the basic nest material is different species of grasses and mosses, which may occur beside each other or replace each other so that eventually one of them becomes the only component (of the two) in the nest. Nests in which neither of them is present are exceptions. Other sorts of materials are either additional or vicarious and are not usually applied for the essential structure of nests.

Shape and size of nest

Owing to the great stiffness of the plastering layer, the inside of the Song Thrush's nest is regular, semicircular or ovoid, in shape. The external outline depends to some extent on the nest material used, which is as a rule compact in the inner portion of the nest, just under the plastering, and becomes looser and looser outwards. Then, there is often a loose "crown" of twigs, which may be up to 40 cm. long and stick out at intervals beyond the bulk of the nest. The foregoing accounts for variation in the horizontal projection of these nests, which in shape may range from nearly circular to irregular. The manner in which a nest is placed also affects its shape, because on the side where it adjoins the tree trunk, the external portion may be reduced or quite absent, and there may even be a gap in the plastering in this place. The way in which a nest rests on one twig or more twigs also has an effect on its external shape so that it is often possible to recognise from it how the nest was sited, after it has been removed from the tree. In its lateral view, the nest may have the shape of a sphere flattened on two opposite sides or it may have its lower portion dilated, in which it is dependent upon its position.

The variation in shape entails variation in nest measurements, especially in the external dimensions. The ranges of measurements, their arithmetic means, as well as the standard deviations and coefficients of variation are given in Table V. When measuring the external diameters in nests with a "crown" of twigs, I did not include these projecting sticks in the measurements, and thus they refer to the compact portion of the nest only. The smallest fluctuation characterises the inner diameter, which is reflected in its narrow range and also in the smallest values of the standard deviation and the coefficient of variation. The mean inner diameter calculated for 67 new nests is 9.11 cm., that for 67 used nests is 9.34 cm. and for all the 134 nests together 9.23 cm. The increase in the mean for the used nests and the widening of the range of inner diameters, which has besides been shifted upwards, are comparatively

small and undoubtedly connected with the stiffness of the plastering. The diagram A in Figure 4 shows the distribution of the nest cup diameters. The outer diameter of 132 nests ranges from 12.5 to 19.5 cm. The arithmetic mean from the outer diameters in the new nests differs only a little from that calculated for the used nests. Far greater differences between new and used nests can be observed in their heights and, especially, depths. A very wide range of the depths in the used nests and the coefficient of variation indicate that the changes (flattening) of nests resulting from the presence of young ones in them are not uniform. However, I failed to find what bears upon the magnitude of this deformation.

Discussion

The nesting heights of the Song Thrush given in this paper are as a rule consistent with those reported by different authors. The fact that most nests are no higher than 3 m. above the ground is also beyond question. Nevertheless, a comparison of the detailed distribution of nesting heights given by CZARNECKI (1956), DYRCZ (1963), JOGI (1963) and MALCHEVSKY (1959) with that presented in the present paper shows that, although the highest percentage of the nests of my series were at heights between 1 and 2 m. above the ground, the proportion of nests in the next height group (2—3 m.) is higher than that given by the above-mentioned authors. This fact influences also the mean nesting height, which is 2.5 m. in the present series, whereas WILLGOHS (1952) reported 1.9 m. from Norway and the approximate means calculated from the data given by MALCHEVSKY (1959) are 1.7 m. for the Leningrad region (op. cit., Table 10) and 2.0 m. for the Savalsky Woods (op. cit., Table 11). On the basis of the Belgian material VERHEYEN (1953) arrived at the conclusion that the mean nesting height undergores fluctuations in dependence on the human factor, being 1.6 m. in large assemblages of people, 2.0 m. in the outskirts of large and small human settlements and 1.65 m. out of town. The findings of DYRCZ (1963) from a forest and a town park seem to indicate a reverse situation. Thus, the data from the Wolski Wood near Kraków (Table I, column 7), which may be regarded, in a sense, as situated in the outskirts of a large assemblage of people, correspond with the data from similar environments in Belgium, on the one hand, and to those from the Savalsky Woods, on the other hand. The mean nesting height for Białowieża (Table I, column 8), calculated chiefly for the nests collected in the Palace Park, approximates to the data of VERHEYEN (op. cit.) from small settlements of people. The mean nesting heights from 4 national parks, which concern, for the most part, the nests taken a long way from human settlements, where tourist traffic follows beaten tracks almost exclusively, often in nature reserves, and so in places hardly disturbed by man, deviate obviously from the data given above. What is more, the heights from the Ojców and Babia Góra National Parks are on the average 1 m. greater than those from the Tatra Mts. and Pieniny Mts. All these facts indicate that in

addition to human inteference there are also some other factors that control the height of nesting. These factors should perhaps be sought among the biological adaptations or genetic tendencies of particular populations of Song Thrushes inhabiting different regions.

The building of nests chiefly on fir-spruce type conifers is reported in concert by most of the authors who discuss the nesting of the nominative form in Europe (Czarnecki, 1956; Halladin, 1935; Siivonen, 1939; Willgohs, 1951, and others). Moreover, Siivonen (op. cit.) writes that within the range of spruce forests this tree is preferred as a nest-site also on psychological grounds. Malchevsky (1959) found a relatively large number of nests in junipers (Leningrad region) and elders (Savalsky Woods). The findings of Bykov (1896) and Dyrcz (1963) stand out against the foregoing data. Most of the large number of nests observed by the first of these authors in the Warsaw region were built in junipers and in his paper he did not mention a nest sited in a fir or spruce. The majority of the nests observed by Dyrcz (op. cit.) were woven in elms. In Azerbaydzhan (Caucasus), out of the range of mixed forests, the Song Thrush builds its nests in deciduous trees and shrubs and is marked by its preference for prickly species (Mustafayeva, 1965). Other species of trees and shrubs mentioned by European authors would extend the list in Table II very much, nevertheless it may be assumed that Thrushes, especially the Central-European ones, nest in them rarely, in many cases only sporadically. The picture of adaptations represented by rare manners of nesting under different conditions may be completed by additional data on the nests built on the ground (Bykov, 1896; Malchevsky, 1959; Siivonen, 1939; Verheyen, 1953; Wessel, 1953), on beams of wooden houses (Siivonen, 1939), on scaffolds and in building material stores of houses under construction (Černy, 1963), and in abandoned nests of other birds (Siivonen, 1939). Unlike the nominative form from the European continent, the British subspecies, *T. ph. clarkei*, shows great variation in nest-site (Bannerman, 1954; Campbell, 1953; Fitter & Richardson, 1954; Witherby et al., 1938).

The most frequently reported type of nest-sites is that on twigs near the trunk of a coniferous sapling (Aleksandrova, 1956; Halladin, 1935; Siivonen, 1939; Willgohs, 1951). The results given in Table III, converted into percentage values, resemble the data given by Aleksandrova (op. cit.). Therefore, this sort of nest-sites may be considered to be the most characteristic of the Song Thrush in cool regions of the temperate zone in the European continent.

The composition of materials used by the Song Thrush to build nests, analysed in Table IV, as a rule, agrees with the materials listed in general studies. The fundamental material is sticks, grass and moss (Bannerman, 1954; Campbell, 1953; Fitter & Richardson, 1954; Gladkov, 1954; Mustafayeva, 1965; Taczanowski, 1882, and others). The present data coincide also with the results of the close analysis of materials carried out by Halladin (1935), but only in quality, since the quantitative findings of this author cannot be

compared, giving the amount of materials in particular nests and not the number of nests containing these materials. They are, besides, confirmed in general by the result obtained by SIIVONEN (1939), though he distinguished as many as 7 different types of nests of the Song Thrush on the basis of the composition of materials of their external layer. All the writers hold an unanimous opinion on the occurrence of nest plastering. In contrast to the results of the present studies, which show that rotten wood, earth and dung are used in various proportions in nest plastering, HALLADIN (1935) states that it consists of crushed rotten vegetable fragments ("humus") with a small admixture of peat. TACZANOWSKI (1882) writes that the plastering proper with vegetable remains lies on the material cemented with clay. BYKOV (1896) distinguished 4 types of nest plastering according to its material and stratification, if any. I found the presence of stratification, e. g., mud underlying rotten wood, in some nests. This was not a rule, however, but, on the contrary, occurred in a minority of samples. The qualitative composition of plastering seems to depend chiefly on the availability of its components. In TACZANOWSKI'S (1882) opinion, clay or rotten wood used for plastering is glued with saliva. CAMPBELL (1953) holds a similar view. The significance of saliva as the main cementing substance is undermined by HALLADIN (1935), according to whom, the amount of pepsin found in plastering is slight and does not justify this supposition. On the other hand, it is well known that Swallows and Swifts use saliva to glue together nesting materials (FERENS & WOJTUSIAK, 1960; FARNER, 1960). CAMPBELL (1953) and WITHERBY et al. (1938) write that some nests of thrushes in the Hebrides, and so those of the subspecies *T. ph. hebridensis*, occasionally have no plastering in drought periods and in certain definite environments. These facts militate against the view that saliva is the main cementinge substance in nests. COCHEN (1933), too, found a Song Thsush's nest devoid of plastering and he writes that it was similar to a Blackbird's nest. However, he does not mention if he took it to pieces so as to examine its layers, and for this reason it cannot be established for certain whether there was no plastering at all or whether it was hidden under tne lining layer. This is just how the nest found by JABŁOŃSKI was built (in litt)*, but even here it cannot be ruled out definitely that the Song Thrust occupied a nest of another thrush species as in the case described by TICEHURST (1933), however JABŁOŃSKI did not observe any other thrush species in this locality.

The sizes of nests given by CAMPBELL (1953), GLADKOV (1954) and HALLADIN (1935) lie within the limits of the series of nests examined at present (Table V). In addition to the range of each measurement, BYKOV (1896), MUSTAFAYEVA

* For the sake of its being a rarity I present the description of a nest from Dr JABŁOŃSKI's letter in extenso: „The nest found in a pine forest near Gąsiorowo, Ostrów Mazowiecka District, on June 1st, 1967. It was situated in a juniper, at a height of 80 cm, and contained 4 eggs. Its external portion was built of green stems of moss and pine needles. In the base, under the lining, there was some putrefied plastering, mixed with moss, as in *Turdus iliacus*".

(1965) and SIIVONEN (1939) give also the arithmetic means for their series. The first of these authors compares the measurements of a series of 94 nests, these being, however, round values expressed in half centimetres. The mean inner diameter of nests (9.0 cm.) and their mean depth (6.5 cm.) calculated by him nearly coincide with those given in Table V, and the slight differences between them are not significant in view of the round figures used by BYKOV. None the less, the differences in the ranges of measurements are apparent. The outer measurements of nests, i. e., the outer diameter and the height, given by BYKOV (op. cit.) are somewhat smaller than those in my series. The measurements of 79 nests from the Caucasus Mts. recorded by MUSTAFAYEVA (1965) have their means distinctly smaller than those obtained for all the four dimensions in the present study. This is especially true of the depth and height of nests. The measurements of nests from Finland, Estonia and Denmark, classified by SIIVONEN (1939) in 7 groups according to the sort of material used for building, differ somewhat in both directions from those in Table V. Their mean outer diameters in particular groups are somewhat higher or lower than the value in Table V and the mean inner diameter somewhat lower. The depth of nests, showing a tendency to increase, behaves similarly. In the face of these data the mean depth of Norwegian nests, 7.1 cm. (WILLGOHS, 1952), is striking. If we take into account the geographic position of nests, the mean depths given by the authors quoted can be compared with the course of the July isotherms on the basis of BARTHOLOMEW'S (1954) Atlas. The following data summarise this comparison:

somewhat below 60°F (15.55°C)	Bergen region (Norway)	7.1 cm. (WILLGOHS)
60—70°F (15.55—21.1°C)	Finland, Estonia, Denmark	6.1—6.6 cm. (SIIVONEN)
	Warsaw region	6.5 cm. (BYKOV)
	Central Europe (most of the nests in this group are from South Poland)	6.45 cm. (Table V)
about 80°F (26.65°C)	Azerbaydzhan	5.3 cm. (MUSTAFAYEVA)

Though the values of isotherms are lower in the breeding season (May-June) and their courses may be somewhat different, it should be stated in general that the nest depth in Song Thrushes is inversely proportional to the mean temperature of the given region in the breeding season.

IV. REDWING *TURDUS ILIACUS* LINNAEUS 1766

Own material

The Redwing nests in the northern regions of Eurasia and in Iceland, being a very rare species in Central Europe. For this reason the number of nest record cards I had at my diposal was small, namely, 17 cards from the European

mainland. Some of them were filled up on the basis of specimens from the collection of the Department of Vertebrate Zoology, Leningrad University, and from the priwate collection of W. E. FLINT in Moscov. In addition, 1 nest was taken in eastern Siberia (collection of W. E. FLINT) and one from England (collection of the Tring Museum). In the British Isles the Redwing has nested scarcely several times, which is true both of its nominative form, *T. i. iliacus*, from the continent, and of *T. i. coburni* SHARPE, 1901 from Iceland (WITHERBY et al., 1938). The nest from England included in this study belonged to the continental form and, therefore, the material examined was confined to this form only. I completed it with the data from notes published recently and comprising descriptions of single nests found in Poland, Slovakia and Germany (BOROWSKI, 1962; JABŁOŃSKI, 1963; KARCZEWSKI, 1963; MOŠANSKÝ, 1962; WILKE & MORLING, 1965; WOŁK, 1960).

The nests used for study were collected chiefly in lowland forests and manorial parks and in the zone of mixed forests in the highlands. They were often found in detached groups of trees and in the vicinity of clearings.

Nest-site

The findings concerning the height of nests above the ground are given in Table VI. The arithmetic mean calculated from the heights of the 27 nests examined is 1.5 m., the largest number of nests being in the 1—2 m. height

Table VI

The distribution of nests of the Redwing *Turdus iliacus* according to nesting height. In addition to the data from nest record cards, those from literature, concerning concrete specimens, are included (BOROWSKI, 1962; JABŁOŃSKI, 1963; KARCZEWSKI, 1963; MOŠANSKÝ, 1962; WILKE, MORLING, 1965; WOŁK, 1960)

Height, in m.	Nest record cards		Data from literature (from Poland, Czechoslovakia and Germany)	Total	
	from the north of European part of Russian SFSR	from Poland		Number	%
0 (on the ground)	—	1	—	1	3.70
0 —0.99	5	2	2	9	33.33
1.0—1.99	1	2	7	10	37.04
2.0—2.99	—	1	3	4	14.81
3.0—3.99	—	—	2	2	7.40
4.0—4.99	—	—	1	1	3.70
Total	6	6	15	27	99.98
Mean height	0.7 m	1.1 m	2.0 m	1.5 m	
		1.7 m			

Table VII

Species of trees and shrubs in which nests of Redwings *Turdus iliacus* were placed. In addition to the data from nest record cards, those from literature, concerning concrete nests are included (Borowski, 1962; Jabłoński, 1963; Karczewski, 1963; Mošaeský, 1962; Wilke, Morling, 1965; Wołk, 1960)

Species of trees and shrubs	No. of nests (nest record cards)	No. of nests (from literature	Total	
			Number	%
Coniferous trees (total)			(8)	(28.57)
Picea excelsa — young	4	3	7	25.00
Picea excelsa — old	—	1	1	3.57
Deciduous trees (total)			(8)	(28.57)
Acer negundo	—	3	3	10.71
Acer pseudoplatanus	1	—	1	3.57
Alnus sp.	—	1	1	3.57
Betula sp.	1	—	1	3.57
Quercus sp.	—	1	1	3.57
Salix caprea	—	1	1	3.57
Deciduous shrubs (total)			(7)	(25.00)
Caragana sp.	1	1	2	7.14
Lonicera sp.	1	—	1	3.57
Salix sp.	—	1	1	3.57
Sambucus nigra	—	1	1	3.57
Undetermined	—	2	2	7.14
Total of nests in trees and shrubs	8	15	23	82.14
Other nest-sites	5	—	5	17.85
Total	13	15	28	99.99

group. Nevertheless, it is worth while to trace the dependence of the nesting heights upon the region in which the nests were found. The nests from Russia had the lowest position (on the average 0.7 m.), whereas the nests from Mazury and Białowieża exceed them on the average by 0,4 m. The mean from the data obtained from the records in literature is the highest (2.0 m.). However, all the nests were placed less than 5 m. and 70% of them less than 2 m. above the ground, which height seems characteristic.

An analysis of the list of trees and shrubs in which most of the nests examined were built (Table VII) shows the preference by the Redwing for the spruce, especially for its young small specimens (a quarter of the nests observed). The same number of nests as in the spruce (8) was found in 6 species

Table VIII

Nest-sites of the Redwing *Turdus iliacus*. In addition to the data from nest record cards, those from literature, concerning concrete nests, are included (Borowski, 1962; Jabłoński, 1963; Karczewski, 1963; Mošanský, 1962; Wilke, Morling, 1965; Wołk, 1960)

General designation of place	Symbol in fig. 2	Nest-site	Data from cards	Data from literature	Total	
					No.	%
Young coniferous trees (spruce, fir)	A	against trunk (in general)	—	3	3	10.71
		against trunk, on 2 twigs	3	—	3	10.71
Old coniferous trees (spruce, fir)	H	on thick branch in lower part of crown, far from trunk	—	1	1	3.57
Deciduous trees	K	trunk crotch	1	2	3	10.71
	L	against trunk, on 1 and more branches	1	1	2	7.14
	M	on branch, distant from trunk	—	1	1	3.57
Stumps	O	on stump, among projecting splinters or shoots	1	2	3	10.71
	O	on flat stump	1	—	1	3.57
Shrubs	Q	among branches of deciduous shrubs or saplings	2	5	7	25.00
Heaps of dry brushwood	S	among horizontally lying branches of deciduous trees	2	—	2	7.14
On the ground	U	among grasses	1	—	1	3.57
Others	—	on lying trunk	1	—	1	3.57
		Total	13	15	28	99.97

of deciduous trees. It must have happened by chance that the largest number of nests of this group were built in *Acer negundo* (all of them, 3 in number were found in the Palace Park at Białowieża), which does not belong to the native flora of this region.

The types of placement of Redwing nests are given in Table VIII. The most numerously represented type of placement was that of nests situated among twigs of deciduous shrubs and such saplings as did not project above the shrub layer of the forest. Nearly as many nests were built on twigs of young

conifers, close to the trunk. Although the table being discussed includes 10 different types of nest-sites, most of them provide conditions necessary for the nests to follow the general tendency to lean against an upright object at least on one side. Such types of nest-sites as in a trunk-fork of a deciduous tree or among the splinters of a broken trunk exemplify the possibilities of supporting a nest on two and even three sides.

Nest construction and material

In spite of great differences in appearance (cf. Phots. 11, 12) the nests of Redwings consist as a rule of three layers. The external layer is the thickest and built of one or several different sorts of material, which on the outside may be arranged rather loosely, according to its quality, and becomes more and more compact towards the inside. This is covered by plastering, which forms the second layer and is made chiefly of clay or mud with occasional vegetable fragments embedded in it. In most nests the plastering is moulded into a deep cup and reaches high up the side walls (it may be wanting in the place where the nest adheres to the tree trunk). Of the 14 nests examined 11 were plastered in this manner. In the remaining 3 nests only the bottom and the adjoining

Table IX

The qualitative analysis of the material used to build the external layer and lining in the nests of the Redwing *Turdus iliacus*

Material	Data from cards		Data from literature (No. of nests)	Total	
	number	%		No.	%
Natural materials:					
sticks — twigs (total)	(4)	(25.0)	(1)	(5)	(22.72)
of which: undetermined	1	6.25	1	2	9.09
of conifers	3	18.75	—	3	13.63
grass	16	100.00	6	22	100.00
moss	5	31.25	1	6	27.27
lycopod	1	6.25	—	1	4.54
leaves	3	18.75	2	5	22.72
bast (vegetable fibres)	6	37.50	—	6	27.27
stalks	11	68.75	3	14	63.63
rootlets	2	12.50	1	3	13.63
Total of nests examined	16		6	22	

lower parts of the walls of the nest were plastered. Inside the nest, on the plastering, there is a lining layer. It is a noticeable fact that this layer may vary very much in thickness, ranging from a very thin lining composed of a slight number of thin dry grass blades with the underlying material visible in the interspaces to an elastic layer, about 1 cm. thick, composed of similar material, i. e., dry thin blades of grass and occasional pieces of bast, etc. A ring with which the upper edge is rimmed in most nests strikes the eye. It is usually firmly woven, mainly of long grasses; in addition, there may be stalks and bast in it. It reaches 2 cm. in thickness. Owing to this finishing in the form of a ring the nest-cup becomes narrower at the top, which is particularly well seen in the nests with a poor lining layer, because in the nests lined profusely the lining material fills the concavity under the ring in the side walls of the nest.

The results of a qualitative analysis of the material used to build the external layer and lining in 22 nests of the Redwing are given in Table IX. Blades of grass have been found in all the nests. They may be absent in the external layer, and then are replaced by stalks, or occur in it in various quantities: they may form 100 % of the material used or only a slight proportion in addition to stalks and bast. Delicate springy blades of grass are, however, always encountered in the lining layer as its almost exclusive component (only one of the nests examined had a bast admixture in the lining of grass). Other materials than grass and stalks are present in the minority of nests and they never predominate in them; consequently, they may be regarded as additional materials.

Shape and size of nest

In outline, the nests of the Redwing have the shape of a sphere truncated above its equator and somewhat flattened at the bottom. This schematic picture is actually blurred by deformations brought about by the properties of the site and the sort of building material used. Thus, hard and long stalks, even if bent, project beyond the main structure of the nest and form a kind of crown, whereas the location of a nest on a tree stump results in a distinct widening of its base.

The measurements of 20 nests and the statistical indices calculated for these measurements are given in Table X. The inner and outer diameters show a similar degree of variation, which is obviously smaller than that in the other two measurements. The mean inner diameter calculated for all the 20 nests approximates to 8,5 cm. The same value determined for 16 new nests is 1 mm. smaller and its standard deviation and coefficient of variation are the smallest in Table X. The mean inner diameter for the 4 used nests is 5 mm. larger than in the new nests, which may be due to the stretching of these nests by the young. The difference between the new and used nests is stiill greater, if their mean depths are compared (8 mm.), and it is the greatest in the case of heights (11 mm.). Moreover, this last measurement shows the greatest variability. It may be supposed that it is so owing to the flattening of the used nest trodden down by

Table X

Survey of measurements of nests of the Redwing *Turdus iliacus iliacus*, showing their ranges, means, standard deviations and coefficients of variation. In addition to the data for 14 nests from nest record cards, those concerning 6 nests recorded by JABŁOŃSKI (1963), KARCZEWSKI (1963), MOŠANSKÝ (1962), WILKE, MORLING (1965) and WOŁK (1960) are included

Measurement	Kind of nest	Number of nests	Range in cm	Mean	Standard deviation	Coefficient of variation	Notes
Inner diameter	new nests	16	6.75— 9.50	8.39	±0.593	7.06	*) I have given up calculating the values of standart deviation and coefficient of variation in this group because of the small number of nests belonging to it.
	used nests	4	7.5 —10.0	8.89	*)	*)	
	total	20	6.75—10.0	8.49	±0.729	8.52	
Outer diameter	new nests	14	11.5 —16.0	13.48	±1.238	9.18	
	used nests	4	12.25—13.75	13.06	*)	*)	
	total	18	11.5 —16.0	13.38	±1.129	8.43	
Depth	new nests	14	4.5 — 6.8	5.39	±0.612	11.35	
	used nests	4	4.0 — 5.5	4.57	*)	*)	
	total	18	4.0 — 6.8	5.21	±0.708	13.58	
Height	new nests	12	7.0 —11.0	9.27	±1.637	17.65	
	used nests	4	7.0 — 9.5	8.12	*)	*)	
	total	16	7.0 —11.0	8.98	±1.573	17.51	

the nestlings. The ranges of these three measurements vary in different groups of nests correspondingly to their arithmetic means. Only the outer diameter is independent of the hatching of the young, which have no effect on its change (elongation).

Discussion

The geographical distribution of the Redwing causes that the publications for comparative purposes should be sought after in the Russian literature as well as in that of the Baltic and Scandinavian countries. All the authors agree that the Redwing's nests occur at heights smaller than 5 m. above the ground. The mean nesting height given by WILLGOHS (1952) for Norway is 1.3 m., the same mean calculated from the data of MALCHEVSKY (1959, Table 10, p. 43) for the Leningrad region is 1.2 m., and a similar value is indicated by the data presented by ALEKSANDROVÀ (1956). These means correspond with the mean nesting height from Białowieża and Mazuria (cf. Table VI, col. 3). Other Russian findings show a tendency towards still lower nesting. For instance, KISHCHINSKY (1960) writes that in the Murmansk District nests are often

built on the ground or, at most, 1 m. above it, and GLADKOV (1951) gives heights ranging from 0.3 to 0.5 m. for the Timansk Tundra. The mean nesting heights calculated approximately from the data given in the paper by DANILOV & TAPCHEVSKA (1962) on geographical variation in the nesting of birds in the Ural Mts., including the Redwing, appear intersting against the figures presented above. The mean height of 30 nests from the northern Ural is about 1.4 m. (it therefore resembles the data given by MALCHEVSKY, 1959, and WILLGOHS, 1952), whereas the approximate mean for the 13 nests from the Sverdlovsk region (southern Ural) is 1 m. higher and in size approaches only the corresponding dimensions from Central Europe, collected from the notes published in literature (Table VI, col. 4). The question arises why the nests from Białowieża and Mazuria (Table VI, col. 3) were built much lower than those included in column 4, although part of these last specimens were also derived from Białowieża (BOROWSKI, 1962; WOŁK, 1960). The reference of this difference to the geographical situation of the nests is out of the question, but one may try to explain it in another way. The figures from column 4 concern the nests observed in this region for the first time, e. g., those from Białowieża (BOROWSKI, 1962; WOŁK, 1960) were observed in the years 1957—1960, immediately after the Redwing had appeared there as a breeding species. On the other hand, the data for the nest record cards (column 3) were collected in Białowieża in the years 1962—1964. Perhaps, the birds, having made themselves at home in an area colonised as a result of the extension of their nesting range, feel safer there than they did just after their arrival and, consequently build their nests lower.

Lists of trees and shrubs chosen by the Redwings for their nests and the nest-sites are very different in reports of various authors. According to KARVIK (1964), the majority of the nests in southern Sweden (about 60%) are built in small spruces, the juniper coming in second. The same two species predominate also in Norway (WILLGOHS, 1952) and, what is more, in the same order. In the Leningrad region the commonest nesting site of the Redwing was the spruce, especially its sapling, the nests placed in alders and directly on the ground being also very frequent (MALCHEVSKY, 1959). ALEKSANDROVA (1956), however, claims that the greater part of the nests observed by her (more than 50%) were situated on tree stumps with flat tops and sheltered by young shoots. The findings reported by DANILOV & TAPCHEVSKA (1963) show that in the northern Ural most nests were built in birches, whereas in the southern part of these mountains many of them were placed directly on the ground. This last type of nests predominated also in the Murmansk region (KISHCHINSKY, 1960). At the top of his list of nesting sites GLADKOV (1951) mentions the many-pronged crotch of a goat willow shrub, whereas KANITONOV and CHEPNYAVSKY (1960) write that on the River Lena nests were found on the branches of larches, in steep river-banks and on the ground. In addition to the above-mentioned species of trees and types of nest-sites, most of these authors record other types which were a minority in the regions investigated by them, but very

often predominated in other territories. The total list of shrubs and trees remarkably exceeds that given in Table VII, but the types of placement of nests coincide roughly with those given in Table VIII, though some types predominate quantitatively according to some authors and are not mentioned at all by others. Nesting in junipers and rock fissures was, in addition, observed in Sweden (KARWIK, 1964). In the thirties of the present century *T. iliacus coburni* colonised Reykjavik, where it nests in crevices in walls, on cornices, gutters, etc. (TIMMERMANN, 1934). This fact indicates a very great plasticity in its adaptation to varied conditions, which, on the other hand, confirms WILLGOHS'S (1952) opinion that it is hardly possible to recognise any nest-site as characteristic of this species. Populations inhabiting different areas seem to prefer one of the sites or tree species mentioned above to all the others, which may become to some extent characteristic in this region.

In contrast to this great variety of nest-sites the material used to built nests is rather uniform. All the authors analysing the materials place grasses at the top of the list. Their thick fragments can be seen in the external portion of the nest and the fine delicate parts are used to line it (DAVIES & FRASER ROWELL, 1956; GLADKOV, 1954; KANITONOV & CHEPNYAVSKY, 1960; KISHCHINSKY, 1960). Other sorts of materials, too, coincide as a rule with those listed in Table IX except for lichens, which are not mentioned in this table but were used (genus *Stereocaulon*) to decorate one of the nests described by DAVIES and FRASER ROWELL (1956). However, this is not the case with the earth plastering of nests, in the description of which these authors differ. For example, KISHCHINSKY (op. cit.) writes that a nest is „usually besmeared and strengthened with earth or peat", whereas GLADKOV (1951) mentions that BIBIKOV found a nest, the inside of which was daubed with deer dung, whereas the rest of nests seen by him were not daubed (!). Neither did KANITONOV and CHEPNYAVSKY (1960) „encounter any nests besmeared with clay and earth" (sic!). Similarly, TIMMERMANN (1934) did not find any earth plastering in the cups of nests of *Turdus i. coburni*, which were only lined with grass blades. This divergence can be explained in two ways. Either the birds actually built their nests without strengthening their grassy construction or there was such a thick lining pad in the nests that the underlying earth plastering could not be seen for it, and the investigators conteneted themselves with external examination. This type of nests being well known and by no means rare (see the section on the nest construction and material), the latter explanation seems more convincing.

Most of the nest measurements recorded by GLADKOV (1951), KANITONOV and CHEPNYAVSKY (1960) and KISHCHINSKY (1960) lie within the limits given summarily in Table X. The mean outer diameter, inner diameter and height, calculated by the last mentioned author for 13 nests, also come close to the means analysed in the present study, only the mean nest depth and its upper limit are greater. Higher values were also found in most measurements and their means given for the nests from the Ural Mts., both from their northern and southern parts, by DANILOV and TAPCHEVSKA (1962), the nests of the

nothern population being deeper according to these authors. These differences are remarkable even in the case of the mean inner diameter, which measurement is regarded practically constant, and in relation to the data from Table X they are 1,4 cm. for the 3 nests from the southern Ural and 1.9 cm. for the 16 nests from the northern part of these mountains.

V. FIELDFARE *TURDUS PILARIS* LINNAEUS 1758

Own material

A total of 42 nest record cards were collected chiefly in various parts of the Carpathian Mts. in southern Poland. Several cards concern the nests from the Leningrad region. This material was completed with the specimens collected in Lower Silesia by DRESCHLER at the beginning of the present century and kept in the Upper-Silesian Museum at Bytom and with nest record cards from Czechoslovakia. All these findings, therefore, refer to the nests of the subspecies *Turdus pilaris subpilaris* BREHM, 1831. This is true even of the specimens from the Leningrad region, situated near the boundary of this subspecies with the nominative form.

All the colonies of Fieldfares that I observed, both the ones from which the nests were described and those recorded only from the faunistic standpoint, were located in the proximity of water, chiefly a river or a stream. The spinneys in which they were situated were usually small in area. The colonies were often closely connected with human buildings (e. g., in the park at Krościenko on the Dunajec River or in a clump of old pines at Rondo in Zakopane in the Tatra Mts.). It may be assumed in general that in Poland this species nests in two types of wooded areas, i. e., in relatively small and swampy groves, in which alders and willow-trees predominate, and in park environments, not excepting town parks.

Nest-site

The nesting heights of 121 Fieldfares are analysed in Table XI. The variation of the heights, which range from 1 to 25 m. above the ground, is remarkable. It will be seen from Table XI that, although the Fieldfares avoid placing their nests particularly low (all the nests but two were sited more than 2 m. above the ground), yet there is no evidently characteristic height group in which the clear majority of nests would be contained. A trend to nesting at similar heights seems to exist only within particular colonies. The upper limit of the nesting heights seems to depend only upon the height of the trees in which the bird nests in the given region and is independent of any biological and ethological factors. A list of tree species in which the nests were built is given in Table XII. It shows that most of the nests were placed in deciduous trees, among which a high variety of the willow predominated. So far as the frequency of nests

Table XI

Nesting heights of the Fieldfare *Turdus pilaris*

Height, in m.	Number of nests	%
0 — 0.99	—	
1.0— 1.99	2	1.65
2.0— 2.99	8	6.61
3.0— 3.99	11	9.09
4.0— 4.99	10	8.26
5.0— 5.99	8	6.61
6.0— 6.99	9	7.44
7.0— 7.99	6	4.96
8.0— 8.99	11	9.09
9.0— 9.99	8	6.61
10.0—10.99	12	9.92
11.0—11.99	3	2.48
12.0—12.99	6	4.96
13.0—13.99	1	0.83
14.0—14.99	4	3.30
15.0—15.99	8	6.61
16.0—16.99	—	
17.0—17.99	1	0.81
18.0—18.99	2	1.65
19.0—19.99	4	3.30
20.0—20.99	4	3.30
21.0—21.99	2	1.65
22.0—22.99	—	
23.0—23.99	—	
24.0—24.99	1	0.83
Total	121	99.98
Mean height	9.4 m	

is concerned, this last tree is followed by ashes, alders and poplars. Coniferous trees generally constitute a distinct minority. In this group, pines are the most numerous; they are mostly old and tall trees. It is striking that no nests were recorded from shrubs.

Table XII

Species of trees and shrubs in which the nests of the Fieldfare *Turdus pilaris* were found.

Species of trees and shrubs	Number of nests	%
Coniferous trees (total)	(18)	(14.51)
Abies alba	1	0.81
Larix sp.	1	0.81
Picea excelsa	6	4.83
Pinus sp.	10	8.06
Deciduous trees (total)	(105)	(84.68)
Acer pseudoplatanus	1	0.81
Aesculus hippocastanus	1	0.81
Alnus sp.	18	14.51
Betula sp.	5	4.03
Carpinus betulus	3	2.42
Fraxinus excelsior	19	15.32
Malus silvestris et *domesticus*	4	3.22
Populus alba	5	4.03
Populus nigra	9	7.26
Populus sp. (poplar)	8	6.45
Populus tremula	1	0.81
Prunus racemosa	1	0.81
Quercus sp.	3	2.42
Robinia pseudoacacia	1	0.81
Salix sp.	25	20.16
Tilia sp.	1	0.81
Deciduous shrubs (total)	(1)	(0.81)
Sambucus nigra	1	0.81
Total	124	100.00

There are comparatively few manners of placement of nests in trees (cf. Table XIII). Most of the nests were placed in two- or many-pronged crotches of trunks and on thick boughs, either close to the trunk or, fairly often, at a distance from it. The same is true of the nests built in pines. The majority of nests seem to rest on strong bases such as are provided by boughs, branches, or crotches, and the sites which give the possibility for birds to lean the nest on one or more sides are readily chosen by them.

Table XIII

Nest-sites of Fieldfare *Turdus pilaris*.

General designation of place	Symbol in Fig. 2	Nest-site	Number of nests	%
Young coniferous trees (spruce, fir)	A	against trunk, on 2 or more twigs	3	3.30
Old coniferous trees (spruce, fir, larch)	F	on branch against trunk	2	2.20
	H	on branch in the lower portion of crown, distant from trunk	3	3.30
Pines	I	in crotch of old tree	2	2.20
	I	on branch of young tree against trunk	2	2.20
	J	on branch, distant from trunk	6	6.59
Deciduous trees	K	in two- or many-pronged crotch of thick trunk	25	27.47
	K	in crotch of thin trunk close to the top of tree	5	5.49
	L	against trunk, where a thick branch grows out	14	15.38
	L	against trunk, behind thin shoots	8	8.79
	M	on side branch, distant from trunk	20	21.98
Deciduous shrubs	Q	among branches hanging over a river	1	1.10
		Total	91	100.00

Nest construction and material

The Fieldfare's nest has a massive and compact structure. The external portion of the side walls of a nest consists chiefly of grasses (long blades arranged horizontally). In addition to grass, there occur also small numbers of different sticks, stalks and couch grass rhizomes. These last may predominate in the external layer or even replace grass entirely in some cases. On the inside the material is strengthened very much and cemented with a thick layer of mud. The upper margin of the nest is made into a "ring", woven of long grass blades, stalks, rhizomes, etc. glued with mud, which stretches out on to the top

surface of the nest to a great extent and can occasionally be seen from the outside. The bottom and sides of a new nest are lined with a thick pad of dry and fine blades of grass and sometimes of fine rootlets. The pad contains also, though rather seldom, horse hair, fragments of fur, etc. In the nests abandoned by the young the pad, which is not attached to the mud plastering of the side walls, having been trodden down heavily, accumulates on the floor uncovering the mud layer.

Table XIV

The qualitative analysis of the material used to build the external layer and lining in the nests of the Fieldfare *Turdus pilaris*.

Material	No. of nests	%
Natural materials:		
sticks — twigs (total)	(9)	(17.31)
of which: undetermined	2	3.85
of coniferous trees	4	7.69
of deciduous trees	3	5.77
dry grass	50	96.15
fresh grass	1	1.92
moss	16	30.77
horsetail	1	1.92
lichens	4	7.69
leaves	14	26.92
vegetable fibres	9	17.31
stalks	14	26.92
rootlets	26	50.00
rhizomes of couch grass	14	26.92
hair	6	11.54
Artificial materials:		
paper	1	1.92
string	1	1.92
thread	1	1.92
Total of nests examined	52	

The results of a qualitative analysis of the material used to build the external layer and lining in 52 nests of Fieldfares are given in Table XIV. They indicate that various species of grass are the most characteristic material,

encountered in nearly all nests (96%). Rootlets, which may be used to build both the outer portion of the nest and its pad, were found in the half of the specimens. Sixteen nests contained moss, always in their external portion. Stalks were present in a quarter of the nests and the same number of them had dead leaves. Sticks were used to construct the outer part of the base of 9 nests, in which they formed only a small proportion of the material. The frequent nesting of these birds in the close neighbourhood of peoples's houses accounts for the occurence of paper, string and thread in the material used for building nests.

Shape and size of nest

The external shape of the Fieldfare nest is very variable and much conditioned by its site. In general, the nests squeezed in, for instance, among 3 prongs of a trunk crotch are by nature narrow and relatively high (Pl. XXI, Phot. 4), whereas those built on a side branch are more "stumpy" in structure and they are much broader than high. Naturally, this fact results in great variation in the outer measurements of nests.

The large amount of mud (clay or loam) used to plaster the inside of the nest, covering a relatively thin external layer of grass, causes that the nest, like a cast, conforms to the shape of the place where it rests and, therefore, its horizontal projection may vary from a more or less regular circle (nests placed on a thick branch, which affects, above all, the shape of its bottom) through nondescript irregular outlines to a triangle (nests placed in a three-pronged crotch), etc. In spite of this great diversity of the outer shapes, the horizontal projection of the nest-cup is generally circular, elliptical or oval, of which the first is the rarest.

In the place where the nest touches the branch the external layer, as well as the earth plastering, is reduced to the minimum or lacking at all, leaving a hole in the bottom or in the lower part of the side wall, covered by a lining pad alone. The outline of the hole corresponds to the contour of the convex part of the branch or another element which fills it up. Naturally, this hole cannot be seen until the nest has been taken off the tree.

The ranges of measurements, their arithmetic means, as well as standard deviations and coefficients of variation, are given in Table XV. This table includes data concerning 61 nests.

The nest-cup diameter exhibits the smallest fluctuations, its mean, calculated from the values for 61 nests (both new and used taken together), being 10.38 cm. with the standard deviation scarcely exceeding 1 cm. The nest heights, which range from 8 to 20 cm., undergo the greatest fluctuations. Though, as has already been mentioned, these fluctuations may be referred to the different manners of placement of the nests, yet the fact that the values of the height in the group of used nests are smaller than those in new nests is obvious and the same is true of their arithmetic means. This condition might be explained

Table XV

Survey of nest measurements of the Fieldfare *Turdus pilaris subpilaris*, showing their ranges, means, standard deviations and coefficients of variation.

Measurement	Group of nests	Number of nests	Range in cm	Mean	Standard deviation	Coefficient of variation	Notes
Inner diameter	new nests	37	8.0—12.0	9.92	±0.789	7.95	
	used nests	24	8.5—14.5	11.10	±1.196	10.77	
	total	61	8.0—14.5	10.38	±1.123	10.81	
Outer diameter	new nests	37	12.5—17.5	14.52	±1.259	8.67	
	used nests	24	13.0—25.0	15.82	±2.986	18.87	
	total	61	12.5—25.0	15.03	±2.186	14.54	
Depth	new nests	37	4.5— 8.5	6.79	±0.780	11.49	
	used nests	24	4.5— 8.0	6.49	±1.289	19.86	
	total	61	4.5— 8.5	6.67	±1.012	15.17	
Height	new nests	34	9.0—20.0	12.88	±2.178	16.90	
	used nests	24	8.0—15.0	10.77	±1.818	16.88	
	total	58	8.0—20.0	12.01	±2.276	18.95	

in some cases by the treading down of the nest by the nestlings, which is, however, surprising on account of the great hardness of the nest caused by the large quantity of dry mud. There are also some differences in depth between the new and used nests, so it is possible that a nest becomes shallower owing to the pressing down, and, in conseguence, the lowering of the upper edge by the birds. This phenomenon may also be connected with the sliding down of all the lining material and its gathering at the bottom of the nest-cup.

Discussion

The Scandinavian, Russian and Central European authors agree that the Fieldfare nests high. No differences in nest-sites are observed between the two European subspecies. The mean nesting height is 5.7 m. in Norway (WILLGOHS, 1952), about 4 m. in the Leningrad region and 4.7 m. in the Savalsky Wood near Moscow (calculated from the data given by MALCHEVSKY, 1959). The findings reported by ALEKSANDROVA (1956) point to a mean of about 5 m. In the Ural Mts. the nesting height ranges from about 5 m. in the Sverdlovsk region to 3 m. in the Arctic part of the mountains (rough calculations from the data quoted by DANILOV and TAPCHEVSKA, 1962), whereas in Central Siberia, in Krasnoyarsk, the mean nesting height is 4.8 m. (approximate value computed

on the basis of the data given by KISLENKO, 1965). All these values are smaller than the mean from the nests included in my material (9.4 m.). Other findings from Poland indicate still higher nesting sites, e. g., the mean nesting height of 25 nests in the Łańcut Park is 13.4 m. (calculated from the data concerning 12 nests recorded by KULCZYCKI, 1966) and the same value for the Warsaw region is 10 m. (on the basis of BYKOV'S 1896 data). GRACZYK (1954) writes about the nests from the Town Park at Toruń, placed at a height of 15—18 m. According to FERIANC (1966) the mean calculated from the data for 25 nests from Slovakia is 9.2 m., and thus it is equal to that obtained in the present study, whereas the figure given by HOHLT (1957) for 119 nests from southern Germany amounts to 7.4 m., having an intermediate position between the mean reported in this paper and those quoted from Scandinavia and Russia. It may be assumed that in Central Europe, on the south-western border of its geographic range, the Fielfare, generally speaking, nests much higher than in Russia or Scandinavia. This may be connected with the more frequent occurrence of man and his settlements in the neighbourhood, which, according to MALCHEVSKY (1959) and WILLGOHS (1952), makes these birds build their nests at greater heights.

Nests placed on the ground are quite exceptional. DANILOV and TAPCHEVSKA (1962) found such a nest in the southern Ural Mts. and another in their northern part, and GLADKOV (1951) recorded two from the Timansk tundra. Nests on the ground have also been described from Greenland by SALOMONSEN (1951). In addition, WILLGOHS (1952) writes about the nesting of Fieldfares in depressions in rocks in the Norvegian mountains. It seems that at least the majority of these cases may be referred to the nominative form, which inhabits the northern areas (the Sverdlovsk region in the Ural Mts. lies close to the boundary between the two subspecies mentioned, but the authors make no distinction between them in their papers).

The species of trees in which the nests of Fieldfares were found in different parts of Europe generally corresponds to those given in Table XII. According to the authors who have analysed fairly large series of specimens, the nests built in deciduous trees apparently outnumber those in conifers (ALEKSANDROVA, 1956; BYKOV, 1896; HOHLT, 1957; KISLENKO, 1965; WILLGOHS, 1952). The findings presented by DANILOV and TAPCHEVSKA (1962) indicate that the nests in deciduous trees predominate in the northern Ural Mts., whereas in the south most of the nests are built in pines. About half the nests examined by MALCHEVSKY (1959) were sited in coniferous trees, especially in pines. A noteworthy supplementary item of Table XII is the nesting of Fieldfares in elder shrubs (MALCHEVSKY, 1959; MONTEANU, 1966). The data of the above-quoted authors show that the deciduous trees most frequently inhabited by Fieldfares in different regions are the birch, alder, willow and ash, and out of the conifers, the pine and spruce. By an odd set of circumstances, this last tree species was the most readily chosen tree (the only coniferous one) in the region investigated by HOHLT 1957), though 70% of the nests found by this author

were placed in deciduous trees. The descriptions given by different writers (FRIC, 1958; GRACZYK, 1954; KULCZYCKI, 1966; STRAWIŃSKI, 1960, 1963) in their papers and notes concerning particular colonies suggest that the pairs which make up a colony nest for the most part in trees of the same species or, at least, morphologically similar, which has also been confirmed by the observations of the colonies analysed in the present study.

The descriptions of nesting sites published by different authors on the basis of fairly large series or single colonies and nests corroborate the conclusions obtained from my material that the majority of nests are built in trunk forks, on a thick bough close to the trunk and on thick branches a long way from the trunk (ALEKSANDROVA, 1956; BYKOV, 1896; DANILOV and TAPCHEVSKA, 1962; FRIC, 1958; GRACZYK, 1954; SCHOENNAGEL, 1960). The position of a nest on a growing large tinder-fungus (MALCHEVSKY, 1958) supplies it with a strong base similar to that formed by the stud of a cut-off bough. In the Prioksko-Terrasny Reserve ALEKSANDROVA (1956) found nests on small boards nailed to tree trunks and roughly resembling tinder-fungi in shape. The beams of abandoned houses, on which MALCHEVSKI (1959) found nests in Karelia, as well as those of the wooden spans of a bridge in Lapland (TISCHHOFF, 1956), play the part of thick branches. Another type of nest-sites, unrecorded before, is represented by a nest in a shallow tree-hole in the southern Ural Mts. (DANILOV & TAPCHEVSKA, 1962). The typical and commonest nest-sites are those in crotches or on thick branches of deciduous trees or pine trees, with the simultaneous possibilities of nesting in spruce saplings, shrubs, on the ground and rocks and in different occasional places like those mentioned above. This fact and the large number of preferable tree species, as well as the wide range of nesting heights, point to the great adaptive capacities displayed by Fieldfares in nesting.

Only a few authors of detailed papers deal with the method of building and with building materials. BYKOV (1896) gives the most abundant data, which agree with the general description of the model nest offered in the present paper. The same is true of the schematic drawings presented by HOHLT (1957) and the observations of nests in Greenland (SALOMONSEN, 1951), made directly after the colonization of this island by Fieldfares. All these papers say about the use of grass to built the outer layer, plastered thickly with mud on the inside and, in addition, lined with some delicate material. Similar descriptions will be found in certain general publications (GLADKOV, 1954; SOKOŁOWSKI, 1958; TACZANOWSKI, 1962; 1882). Some of these writers (BYKOV, o. c.; TACZANOWSKI, o. c.) record also the presence of mud at the upper edge of the nest so that it can be seen from the outside. The main materials used for building coincide with those listed in Table XIV.

The sizes of nests examined for their dimensions are different in different authors. DANILOV and TAPCHEVSKA (1962) give the arithmetic means and the ranges of measurements for 26 nests from the southern Ural Mts. and for 26 nests from their northern part, BYKOV (1896) presents these values for 25 nests from the Warsaw region and HOHLT (1957) for 25 nests from southern Germany.

The mean inner diameter is 9.5 cm. according to BYKOV (o. c.) and 9.8 cm. according to HOHLT (o. c.), which values are obviously smaller than the data obtained at present (cf. Table XV), not only for all the nests together (10.38 cm.) but also for the series of new nests (9.92 cm.). On the other hand, the figures from the southern Ural (DANILOV and TAPCHEVSKA, 1962) are similar to mine and in the northern region of these mountains they are even larger (the arithmetic mean equal to 11.2 cm.). The mean depths of nests approximate to 6—7 cm. and only the nest depths of the northern Ural series are markedly greater and range from 7.5 to 13 cm., averaging 9.3 cm. (DANILOV & TAPCHEVSKA, 1962). However, these very authors regard this difference as characteristic and discriminating the northern nests from the southern ones. The depths of 2 nests from the Timansk tundra (GLADKOV, 1951) seem to follow this tendency; they are greater than the means from Central Europe and closely approach the upper limit of their range. According to the data reported by BYKOV (1896) and DANILOV and TAPCHEVSKA (1962), the fluctuating depth of nests is evidently shifted downwards in relation to the values given in Table XV, and the nest heights lie far lower than the upper limit in this Table. This situation is naturally reflected in the arithmetic means of these measurements.

VI. MISTLE THRUSH *TURDUS VISCIVORUS* LINNAEUS 1758

Own material

The quantitative distribution of the Mistle Thrush in Europe is very irregular. On the basis of DOBROWOLSKI'S (1963) criteria it may be numbered among rare and, mostly, not numerous species in East-Central Europe (Poland, Czechoslovakia, Hungary, European republics of the U.S.S.R.), since it does not satiate the environments occupied by it. As a result, the material concerning the nesting of the Mistle Thrush in these territories is scanty. It consists of 14, mostly incomplete, nest record cards from Poland, the data about 1 nest in the Moscow region (from W. E. FLINT'S collection) and the data on 9 nests from the Czechoslovakian nest record cards, also incomplete for the most part. As in the case of the Redwing, I completed these data with descriptions of single nests from Poland (JABŁOŃSKI, 1965) and Hungary (GYÖRY, 1960; THIBAUT de MAISIÈRES, 1940).

The nests described in this paper were derived from various environments. Most of them were found in forests or in clumps of trees a long way from human abodes. The forests were both coniferous, mountainous with predominant firs and spruces or lowland pine woods, and mixed or deciduous; they were dry or grew in damp and even seasonally inundated places. Several nests, in contrast to those mentioned above, were sited near or within human settlements and were built in trees, usually deciduous ones, at the roadside.

Nest-site

The Mistle Thrush's nesting heights are given in Table XVI. Nests were found at heights ranging from 1.7 to about 21 m., averaging 9.5 m. The quantitative distribution of the nests between the extreme values does not indicate the special preference for any height groups, though it may be stated in general that more nests were placed below 10 m. above the ground than above this

Table XVI

Nesting heights of the Mistle Thrush *Turdus viscivorus*, as indicated by the nest record cards and the data from literature concerning concrete nests (GYÖRY, 1960; JABŁOŃSKI, 1965; THIBAUT de MAISIÈRES, 1940)

Height, in m.	Nest record cards from Poland and Czechoslovakia	Data from literature	Total	
			No. of nests	%
0 — 0.99	—	—	—	
1.0— 1.99	1	—	1	4.54
2.0— 2.99	—	2	2	9.09
3.0— 3.99	2	—	2	9.09
4.0— 4.99	1	1	2	9.09
5.0— 5.99	1	1	2	9.09
6.0— 6.99	1	—	1	4.54
7.0— 7.99	—	—	—	
8.0— 8.99	2	—	2	9.09
9.0— 9.99	1	—	1	4.54
10.0—10.99	1	—	1	4.54
11.0—11.99	2	—	2	9.09
12.0—12.99	—	—	—	
13.0—13.99	—	—	—	
14.0—14.99	—	—	—	
15.0—15.99	—	—	—	
16.0—16.99	—	1	1	4.54
17.0—17.99	2	—	2	9.09
18.0—18.99	—	—	—	
19.0—19.99	1	—	1	4.54
20.0—20.99	2	—	2	9.09
Total	17	5	22	99.96
Mean nesting height			9.5 m	

Table XVII

Species of trees and shrubs in which the nests of the Mistle Thrush *Turdus viscivorus* were found, as indicated by the nest record cards and the data from literature concerning concrete nests (GYÖRY, 1960; JABŁOŃSKI, 1965; THIBAUT de MAISIÈRES, 1940)

Species of trees and shrubs	No. of nests (nest record cards)	No. of nests (from literature)	Total	
			Number	%
Coniferous trees (total)			(10)	(35.71)
Picea excelsa (old trees)	4	—	4	14.28
Pinus sp.	5	1	6	21.43
Deciduous trees (total)			(17)	(60.70)
Acer pseudoplatanus	1	—	1	3.57
Alnus sp.	2	—	2	7.14
Carpinus betulus	—	1	1	3.57
Fagus silvatica	1	—	1	3.57
Populus sp. (poplar)	5	—	5	17.86
Quercus sp.	1	3	4	14.28
Salix sp.	3	—	3	10.71
Deciduous shrubs (total)			(1)	(3.57)
Sambucus nigra	1	—	1	3.57
Total	23	5	28	99.98

level. It is hard to establish what influences the height of nesting, because this species decidedly avoids young trees and in old tall trees builds its nests in different parts of the crown.

A survey of the species of trees and shrubs in which the nests were found is given in Table XVII. Out of the 28 nests included in this table, the majority (over 60%) were in deciduous trees, 10 nests, which makes about 38%, were placed in conifers and divided equally between pines and spruces, and 1 nest was built in an elder shrub. The species in which most nests were found are the pine (6) and poplar (5). Spruces and oaks had 4 nest either. On the basis of this survey none of tree species may be considered to be more readily chosen by Mistle Thrushes than the remaining ones.

A comparison of the sites of 24 nests (Table XVIII) shows that the majority of them were placed on thick branches, which provided them with a broad and firm base. 21 nests were situated in this manner (irrespective of the tree species). Another distinct tendency is the leaning of nests against some vertical elements, at least on one side. This tendency is fulfilled in the nests sited on twigs close to the trunk in spruces, in a crotch of a pine, in places where thick branches grow out in deciduous trees, and on flat studs left after

Table XVIII

Nest-sites of the Mistle Thrush *Turdus viscivorus*, as indicated by the nest record cards and the data from literature concerning concrete nests (GYÖRY, 1960; JABŁOŃSKI, 1965; THIBAUT MAISIÈRES, 1940)

General designation	Symbol in fig.	Nest-site	Data from cards	Data from literature	Total	
					No.	%
Old coniferous trees (spruce, fir)	E	on 1 or 2 branches in the upper portion of crown, against trunk	2	—	2	8.33
	H	on branch in the lower portion of crown, distant from trunk	1	—	1	4.17
Pines	I	in trunk-crotch	4	1	5	20.83
	J	on side branch, distant from trunk	1	—	1	4.17
Deciduous trees	K	in trunk-crotch	2	—	2	8.33
	L	on thick branch, against trunk	5	3	8	33.38
	L	on flat stud left after cut-off bough, against trunk, among shoots	1	—	1	4.17
	M	on thick branch, distant from trunk	2	1	3	12.50
Deciduous shrubs	Q	among branches, leaned against tree trunk	1	—	1	4.17
		Total	19	5	24	100.00

a bough has been cut off near the trunk and surrounded by young shoots. Even the nest built in an elder bush was leaned against the trunk. Nineteen nests, or more than 79%, were supported in this fashion. The preferable nest-site was that at the base of a thick branch of a deciduous tree, close to the trunk.

Nest construction and material

The Mistle Thrush nest consists of 3 layers, of which the external one is the most varied. Its base and the superficial outer portion may have a fairly loose structure of sticks, grass, moss, stalks, rootlets, etc., but the deeper parts are more firmly woven and form a compact wall glued with mud on the inside. The mud, or mud with grass or leaves, constitutes the middle layer,

which in most cases cannot be seen for the abundant layer lining the inside of the nest as long as it remains in the tree. When removed, the nest shows the place where the external layer can be pushed to the sides and the mud plastering adheres directly to the tree. In extreme cases the plastering can be seen also from the outside, but only at the base of the nest, where it touches a branch or a crotch and not in the side-walls or in the upper edge rimmed with a rather indistinct ring. In addition to mud, rotten wood is used for plastering, as well. The internal lining layer is elastic and fairly thick, covering the bottom and side-walls. It consists mostly of grass blades, which are more delicate than those in the ring or in the external layer. In nests built in pines, dry and long pine needles are sometimes used for lining (found in 1 nest).

Table XIX

The qualitative analysis of the material used to build the external layer and lining in the nests of the Mistle Thrush *Turdus viscivorus*, as indicated by the nest record cards and the data from literature (GYÖRY, 1960; JABŁOŃSKI, 1965; THIBAUT de MAISIÈRES, 1940).

Material	Nest record cards		Data from literature	Total	
	No. of nests	%		No. of nests	%
Natural material:					
sticks — twigs (total)	(3)	(27.27)	(4)	(7)	(43.75)
of which: undetermined	1	9.09	—	1	6.25
of coniferous trees	1	9.09	1	2	12.50
of deciduous trees	2	18.18	3	5	31.25
grass	11	100.00	5	16	100.00
moss	1	9.09	2	3	18.75
fern	—		2	2	12.50
lichens	1	9.09	2	3	18.75
leaves	4	36.36	1	5	31.25
vegetable fibres	—		1	1	6.25
stalks	2	18.18	—	2	12.50
rootlets	4	36.36	1	5	31.25
rhizomes and stalks of couch grass	3	27.27	—	3	18.75
pine needles	—		1	1	6.25
Total of nests examined	11		5	16	

Table XIX shows the results of a qualitative analysis of the material used to build the external layer and lining in 16 nests of the Mistle Thrush. Grass appears to be the most characteristic material, present in all the nests examined.

Naturally, it varies in length and thickness, in which it depends upon the fact whether used to build the external layer of the nest or to line it. It may also be used as a main constructional material or as an admixture only together with moss, stalks and rootlets. Sticks, which were found in 7 nests, come in second in the order of frequency. They are chiefly thin (2—3 mm.) twigs of deciduous trees used, above all, for the bases of nests. They may be branched and about 10—20 cm. in length.

Nest shape and size

The general appearance of a Mistle Thrush's nest resembles a hemisphere somewhat flattened at the bottom. It may exhibit some further deformations, making its shape irregular and dependant upon its external conditions. As the layer plastering the bottom is relatively thick, the nest base corresponds in shape fairly exactly to the place where the nest rested. The outline of the nest-cup may be circular, but it is more often approximately elliptical or oval.

The measurements of several nests are given in Table XX. They are, however, too scanty to be put to an extensive statistical analysis. Therefore, I limited myself to the tabulation of the ranges of particular measurements and their arithmetic means. Only in the case of inner diameter, having completed my material with the data from literature, I calculated the standard deviation and coefficient of variation for 12 nests. The mean inner diameter is 10.15 cm. Its coefficient of variation is remarkable and amounts to nearly 15.

Table XX

The ranges and means of nest measurements of the Mistle Thrush *Turdus viscivorus*, as indicated by the nest record cards and the data from literature concerning concrete nests (GYÖRY, 1960; THIBAUT de MAISIERES, 1940).

Measurement	Number	Range	Mean	Notes
Inner diameter	12	8.6—14.0	10.15	For inner diameter: standard deviation = 1.52 coefficient of variation = 14.96
Outer diameter	9	15.0—24.0	18.46	
Depth	9	5.5— 7.2	6.05	
Height	9	8.4—11.0	9.32	

Discussion

The data concerning the nesting height in the Mistle Trush, published in the European literature, are not quite concurrent. GLADKOV (1954) writes in general that the nesting height ranges from 0.4 to 16 m. According to SOKOŁOWSKI (1958), the Mistle Thrush nests several metres above the ground and in TACZANOWSKI'S (1862, 1882) opinion, its nest is situated low. Two nests found by MALCHEVSKY 1959) were at heights of 1—2 and 6—8 m., and

other two nests, recorded by NIKITINA and SHKLAROV (1961) from Byelorussia, were in the 3—6 m. height group. In Slovakia TURČEK (1963) observed nests at heights of 6—8 m. and, according to FERIANC (1965), most nests are situated at 4—5 m., though those built more than 10 m. above the ground are not rare. In LABITTE'S (1952) opinion, the Mistle Thrush nests at heights ranging from 1.5 to 8 m. in France and the average height given by VERHEYEN (1953) for 209 nests from Belgium is 3.95 m., i. e., 3.65 m. for the nests found in the country and 4.7 m. for those from large human settlements. PETERS (1936) observed nests at 1.5 and 3 m. above ground in an orchard in Mecklenburg. It will be seen from the graphic comparison of nesting heights in the Song Thrush and Mistle Thrush given by SIIVONEN (1939) that the frequency of nests of the latter is fairly uniform within the limits of 2 and 8 m., with a small peak in the 2.0—2.5 m. group. The nests described by MUSTAFAYEVA (1965) from the Caucasus were at heights of 3,4—11.8 m., averaging 6.1 m., whereas according to DOLGUSHIN and SLUDSKY (1960), the Mistle Thrush nests at heights of 2—10 m. in Kazakhstan. The foregoing data seem to indicate that the general pattern of dispersion of heights for Europe and West Asia is similar to that obtained by SIIVONEN (1939). The material presented in the present paper (cf. Table XVI) differs from it only in having no peak at all. This may, however, be connected with the small number of specimens in the series examined.

In the Polish ornithological literature the nesting of the Mistle Thrush is associated with forest environment (MNISZEK-TCHÓRZNICKI, 1947; SOKOŁOWSKI, 1958; TACZANOWSKI, 1862, 1882). GLADKOV (1954) writes the same about the nominative form in Russia and FERIANC (1965) in Slovakia. The Asiatic subspecies *T. v. bonapartei* CABANIS (SHNITNIKOV, 1949) and the forms intermediate between these subspecies (DOLGUSHIN & SLUDSKY, 1960) also inhabit the same environment. In Western Europe the nominative form occurs, in addition, in parks and gardens, as recorded, among other writers, by BANNERMAN (1954) from the British Isles. In the thirties of the twentieth century this "park" population appeared also in Germany (CORDES, 1937; PETERS, 1936), where it had come from France and spread in the eastern, north-eastern and northern directions at a speed of 5—10 km. a year (PEITZMEIER, 1949, 1951). Polemizing with PEUS (1951), PEITZMEIER (o. c.) decidedly refutes the interpretation of the "park" population as an ecological adaptation of the "forest" population. Nevertheless, his opinion does not seem absolutely true on account of the observations, however scanty, of the nesting of Mistle Thrushes in environments, which are, according to this writer (PEITZMEIER, 1949), typical of the "park" population, in the region of Krościenko and Sromowce (Pieniny Mts., Western Carpathians), with the simultaneous lack of continuity in colonization, strongly emphasized by him. Regardless of how one will try to explain this phenomenon, the Mistle Thrushes, nesting in gardens and in the proximity of people's houses, not only add to the number of tree species in which they build their nests, e. g., different cultivated varieties of fruit-trees such as cherry-trees, plum-trees (PETERS, 1936) or pear-trees (WOLF &

GEHREN, 1951), but also place their nests on projecting beams of farm-buildings (CORDES, 1937; WOLF & GEHREN, 1951) or on a beam of a wooden fence near a railway line (ALEXANDER, 1928). Of the other nest-sites providing evidence of the great plasticity of adaptive capabilities of the Mistle Thrush, I should mention the placement of a nest on top of a beam of a wooden breakwater (LACK, 1928) and in a large nesting box for owls (HARTMANN, 1963). In East-Central Europe, where the Mistle Thrush nests in forests and the "park" population has not, as yet, reached, these types of nest-sites are still unknown. Judging from the statements of SOKOŁOWSKI (1958) and TACZANOWSKI (1862, 1882), this bird most often builds its nest in conifers (pine, spruce). MALCHEVSKY (1959) and TURČEK (1963) also recorded nests in pines. The data of SIIVONEN (1939), who found most of his nests in birches and pines in forests in which the pine predominated, and also in deciduous trees, but only rarely in spruces, come out controversial against the previous findings. According to DOLGUSHIN and SLUDSKY (1960) most nests in Kazakhstan were in birches, aspens and pines, and in the Caucasus MASTAFAYEVA (1965) found them only in deciduous trees, especially in hornbeams. A comparison of these data with Table XVII suggests that the Mistle Thrush shows no special preference for any tree species as nest-sites and, further, that the selection of trees for nests and the predominance of any of the species in a given region are governed by the local conditions, reflected not only in the qualitative composition, but also in the age composition of particular components of the stand.

Unlike the nesting height and tree species, the tendency for the Mistle Thrush to place its nest on a massive base, which will be well seen from Table XVIII, is strongly evidenced by the data from literature irrespective of the geographical situation of the nests observed. Thus, according to LABITTE (1952), in France this species prefers forks of thick branches or, more rarely, forks of tree trunks. At the other end of Europe (Caucasus) an analogous situation is described by MUSTAFAYEVA (1965). Half of the nests observed by SIIVONEN (1939) from Finland, Estonia and Denmark were placed in forks of two or more branches of the thick trunk of a deciduous tree, and the nests recorded by TURČEK (1963) from Slovakia were sited on side branches and close to the trunk of pines. Of all the authors only TACZANOWSKI (1862, 1882) writes about the nesting of the Mistle Thrush on saplings, whereas the remaining investigators more or less strongly emphasize the choice of old and robust trees, which quite agrees with the present observations. The other nest-sites, quoted above from the West-European literature (e. g. on beams), also always satisfy the condition of providing a massive base.

Both the general publications (FITTNER & RICHARDSON, 1954; GLADKOV, 1954; WITHERBY et al., 1938) and more detailed papers devoted to the nesting of thrushes (MUSTAFAYEVA, 1965; RYVES, 1928; SIIVONEN, 1939) agree as to the occurrence of three basic layers in the Mistle Thrush's nest. The external of these layers is the best differentiated from the point of view of the qualitative composition of material and the middle layer is the plastering which

cements the nest material and strengthens the structure of the nest. All the authors mentioned above concordantly name mud and soil as main materials adopted to plaster the inside of the nest, and only RYVES (1928) writes about dung used in addition to mud. The composition of the vegetable material applied for building nests about which the above-mentioned authors write corresponds in general with that given in Table XIX, from the qualitative viewpoint. The quantitative data of MUSTAFAYEVA (1965), however, differ very much, namely, the ratio of the number of nests which contain moss to that of nests with grasses is inverted: in all the 18 nests from Azerbaydzhan this authoress found the presence of moss, whereas grass occurred only in 6 of them. The decoration of some nests with pieces of cloth, wool, feathers, etc., reported by WITHERBY et al. (1938) excites special interest. SHNITNIKOV (1949) also found feathers of the Rock Partridge in addition to dry grass in the lining of a nest of *Turdus v. bonapartei*.

A comparison of the measurements of the Mistle Thrush nest obtained at present (Table XX) with the findings quoted by MUSTAFAYEVA (1965) for 18 nests from the Caucasus shows that not only the arithmetic means of all the four dimensions are apparently greater for the nests being described, but also the ranges of these measurements are shifted considerably upwards. For example, the mean inner diameter from 12 nests from Central Europe (Table XX) comes to 10.15 cm. and the same value for the Caucasus nests is scarcely 8.3 cm. The inner diameter given in general by CAMPBELL (1953) as equal to 4 inches (about 10 cm.) and the measurements of single nests of the nominative form and *T. v. bonapartei*, recorded by GLADKOV (1954) and SHNITNIKOV (1949) — 10 and 11 cm. respectively, come decidedly close to those given in the present study. Unfortunately, both the small number of data concerning the size of nests of the Mistle Thrush from different regions of its range and too small series of specimens make it impossible to explain these differences.

VII. BLACKBIRD *TURDUS MERULA* LINNAEUS 1758

Own material

The material consisted of 157 nest record cards mainly from Poland, but also from Czechoslovakia and England. They, therefore, concerned only the nominative form *Turdus merula merula* LINNAEUS, 1758, which inhabits a large part of Europe. Since two populations, a forest and a garden one, which differ, above all, in their ways of life, occur in Central Europe at present (GRACZYK, 1959; HEYDER, 1955), I attempted to treat them separately in particular analyses, except for general surveys, so as to grasp the differences in their nesting biology, if there are any.

The range of environments from which the nests analysed were derived is very wide, from highland and lowland woods and forests through large pala-

tial parks situated far from crowded human settlements, next town parks and suburban gardens to small town courtyards, poor in green. Dividing my material into a forest and a garden group, in the first of them I numbered nests found in different types of forests and spinneys with various degrees of human interference, as well as large uncared-for palatial parks at a distance from human settlements. In the garden group I included nests collected in town cemeteries, parks, gardens of residential town districts, courtyards, etc.

Nest-site

The nesting height has been recorded for 146 nests. It ranges from O to about 12.5 m., the arithmetic mean being 2.3 m. The detailed distribution of the nesting height is shown in Table XXI. Most of the nests (about 90%) turn out to lie in the 0—4 m. height groups, the majority of them (36%) being placed at heights of 1—1.9 m. The total of 146 nests comprised 81 nests of forest Blackbirds and 65 of Blackbirds inhabiting town parks and gardens. A comparison of the numbers of nests in particular height groups shows clear-cut differences between these two classes. Most nests of forest Blackbirds

Table XXI

Nesting heights of 146 Blackbirds *Turdus merula* for forest and garden populations.

Height, in m.	Total		Forest Blackbirds		Garden Blackbirds	
	Number	%	Number	%	Number	%
0 — 0.99	23	15.75	19	23.46	4	6.15
1.0— 1.99	53	36.30	34	41.97	19	29.23
2.0— 2.99	33	22.60	13	16.05	20	30.77
3.0— 3.99	25	17.12	10	12.34	15	23.07
4.0— 4.99	5	3.42	3	3.70	2	3.07
5.0— 5.99	1	0.68	—		1	1.54
6.0— 6.99	1	0.68	—		1	1.54
7.0— 7.99	1	0.68	—		1	1.54
8.0— 8.99	2	1.37	1	1.23	1	1.54
9.0— 9.99	1	0.68	—		1	1.54
10.0—10.99	—		—		—	
11.0—11.99	—		—		—	
12.0—12.99	1	0.68	1	1.23	—	
Total	146	99.96	81	99.98	65	99.99
Mean nesting height	2.3 m		2.0 m		2.7 m	

Table XXII

Species of trees and shrubs in which the nests of Blackbirds *Turdus merula* were found, as they occur in forest and in garden.

Species of trees and shrubs	Total		Forest		Garden	
	Number	%	Number	%	Number	%
Undetermined trees	7	4.52	3	3.33	4	6.15
Coniferous trees (total)	(36)	(23.22)	(35)	(38.88)	(1)	(1.54)
Abies alba	5	3.23	5	5.55	—	
Picea excelsa	12	7.74	11	12.22	1	1.54
Picea pungens	15	9.68	15	16.67	—	
Pinus sp.	3	1.93	3	3.33	—	
Taxus baccata	1	0.64	1	1.11	—	
Deciduous trees (total)	(50)	(32.22)	(34)	(37.76)	(16)	(24.59)
Acer platanoides	2	1.29	—		2	3.07
Aesculus hippocastanus	4	2.58	—		4	6.15
Alnus sp.	4	2.58	4	4.44	—	
Betula sp.	4	2.58	2	2.22	2	3.07
Carpinus betulus	9	5.80	8	8.89	1	1.54
Fagus silvatica	10	6.45	10	11.11	—	
Populus nigra	1	0.64	—		1	1.54
Populus sp.	1	0.64	1	1.11	—	
Prunus padus	3	1.93	3	3.33	—	
Quercus sp.	3	1.93	3	3.33	—	
Robinia pseudoacacia	2	1.29	1	1.11	1	1.54
Sorbus aucuparia	1	0.64	—		1	1.54
Tilia sp.	4	2.58	2	2.22	2	3.07
Ulmus sp.	2	1.29	—		2	3.07
Shrubs (total)	(28)	(18.04)	(6)	(6.66)	(22)	(33.84)
Juniperus sp.	1	0.64	—		1	1.54
Corylus avellana	1	0.64	1	1.11	—	
Crategus sp.	6	3.87	1	1.11	5	7.69
Forsythia sp.	1	0.64	—		1	1.54
Philadelphus coronarius	8	5.16	1	1.11	7	10.77
Prunus spinosa	1	0.64	—		1	1.54
Rhamnus cathartica	1	0.64	1	1.11	—	
Sambucus nigra	2	1.29	1	1.11	1	1.54
Syringa vulgaris	2	1.29	—		2	3.07
undetermined shrubs	5	3.23	1	1.11	4	6.15
Wall creepers (total)	(9)	(5.79)	—		(9)	(13.85)
Rosa sp.	1	0.64	—		1	1.54
Hedera helix	1	0.64	—		1	1.54
Vitis vitacea et *vinifera*	6	3.87	—		6	9.23
undetermined creeper	1	0.64	—		1	1.54
Palm: *Washingtonia*	1	0.64	1	1.11	—	
Other nest-sites	24	15.48	12	13.33	12	18.46
Total	155	99.91	90	99.96	65	99.97

Table XXIII

Nest-sites of Blackbirds *Turdus merula*.

General designation of plaxe	Symbol in Fig. 2	Nest-site	Number of nests	%
Young coniferous trees (spruce, fir, yew)	A	against trunk (in general)	7	5.43
	A	against trunk, on 2 twigs	2	1.55
	A	against trunk, on 3 and more twigs	3	2.32
	C	not leaned against trunk	1	0.77
	D	in whorl of truncated tree top	2	1.55
Old coniferous trees (spruce, fir)	H	on branch, distant from trunk	1	0.77
Pines	I	in young tree, against trunk	3	2.32
Deciduous trees	K	in trunk-crotch	14	10.85
	L	on branch (1 or more), against trunk	18	13.95
	M	on branch, distant from trunk	3	2.32
	N	in shallow tree-holes	5	3.87
	O	on broken trunk	1	0.77
Shrubs	P	junipers among branches	1	0.77
	Q	among branches of deciduous shrubs or saplings	34	26.36
Creepers	R	against wall, among branches	9	6.98
Heaps of dry brushwood	S	among horizontally lying branches	4	3.10
Stalks	T	among, stalks, in burdock etc.	2	1.55
On ground	U	on the ground, on sloping wall of gorge	1	0.77
Rocks	V	in rock cervices	4	3.10
	W	on rock ledges	1	0.77
Walls	X	in holes in walls	3	2.32
	Y	on cornices, beams, against wall	5	3.87
	Z	in lamps, monuments etc.	4	3.10
Others		in palm-tree in greenhouse	1	0.77
		Total	129	99.93

(65%) were built at heights of 0—1.99 m., whereas the town Blackbirds nest mostly from 1 to 2.99 m. above the ground (60%). Naturally, this fact is also reflected in the mean heights, which are 2.0 and 2.7 m., respectively.

A quantitative analysis of tree and shrub species in which the nests of Blackbirds were placed is presented in Table XXII. The majority of nests occurred in deciduous trees (above 32%), which fall into 13 species, the oak being chosen most readily. The nests built in coniferous trees come in second (36 nests, or 23.22%). Here, the nests placed in the spruce, both in its ordinary European species and in the decorative "silver" species, are the most numerous. All in all, above 17% of the nests were sited in spruces. The third group contains nests built in shrubs, in which the hawthorn predominates. Further, 9 nests were found in different kinds of wall creepers. Analysing the nests of forest birds and those from town parks and gardens separately, one is struck by distinct differences: in forests Blackbirds nest mostly in coniferous trees, in towns they prefer shrubs. This is the more noteworthy because the nests of Blackbirds in town parks and gardens are situated on the average 0.7 m. higher, as has already been mentioned.

The manners of placement of 129 nests of Blackbirds are given in Table XXIII, which shows that this species has great adaptive capabilities. They manifest themselves in the wide range of places chosen for nests: from the site most typical of thrushes, namely on twigs of coniferous saplings, close to the trunk, through various placements on the branches of deciduous trees and shallow tree-holes, then shrubs, wall creepers, crevices in walls and rocks, to those falling without the scope of the types discussed, namely, on the trunk of a palm-tree of the genus *Washingtonia* in a greenhouse. This last case was observed in the park surrounding the palace at Konopiště near Prague in Czechoslovakia. To reach their nest the Blackbirds had to fly in through a hole in the broken window, about 2.5 m. away from the palm. When gathering nest material, the bird, however, did not fly out of the greenhouse, since, as shown by an analysis of the nest, it was built of material available inside, in the close vicinity of the palm. The type of nest-sites, represented most numerously in the material included in Table XXIII, is that on twigs of deciduous shrubs or saplings and next, on branches of deciduous trees, close to the trunk. A general tendency of leaning nests against an upright element is apparent, as it has been found in more than 50% of the nests.

Nest construction and material

The external portion of the Blackbird nest is built of thick grass blades, stalks, sticks and similar materials. Decoration of nests with loosely hanging pieces of paper, nylon foil, tinfoil, etc. is often observed in the nests of park Blackbirds, these materials being replaced, for example, by fern leaves in forest birds. Towards the inside, the material is more and more compact and on the inside plastered with mud or (rarely) lined with last year's putrifying leaves or something like that, gathered in muddy pools, ditches, etc. When dried,

Table XXIV

The qualitative analysis of material used to build the external layer and lining in the nests of the Blackbird *Turdus merula*.

Material	whole nests		demolished		total	
	No.	%	No.	%	No.	%
Natural materials:						
A. of vegetable origin						
sticks — twigs (total)	(30)	(57.69)	(20)	(74.04)	(50)	(63.29)
of which: undetermined	16	30.77	9	33.33	25	31.65
of conifers	8	15.38	9	33.33	17	21.52
of deciduous trees	7	13.46	4	14.81	11	13.92
grass	46	88.46	26	96.29	72	91.14
moss	12	23.07	12	44.44	24	30.38
fern	4	7.69	8	29.63	12	15.19
lycopod	—		2	7.41	2	2.53
horsetail	—		1	3.70	1	1.26
lichens	2	3.84	—		2	2.53
dead leaves	35	67.31	16	59.26	51	64.55
bast (fibres)	6	11.54	5	18.52	11	13.92
stalks	25	48.07	10	37.04	35	44.30
rootlets	18	34.61	14	51.85	32	40.50
reeds	1	1.92	1	3.70	2	2.53
needles	—		2	7.41	2	2.53
bulrush	—		2	7.41	2	2.53
bark	2	3.84	2	7.41	4	5.06
B. of animal origin						
feathers	1	1.92	—		1	1.26
hair	1	1.92	—		1	1.26
C. pebbles	3	5.77	1	3.70	4	5.06
Artificial materials:						
paper	—		4	14.81	4	5.06
celophane	3	5.77	4	14.81	7	8.86
celluloid	1	1.92	—		1	1.26
tin-foil tape	1	1.92	—		1	1.26
nylon foil	4	7.69	1	3.70	5	6.33
string	1	1.92	2	7.41	3	3.79
ribbon (white)	—		1	3.70	1	1.26
thin copper wire	1	1.92	—		1	1.26
Total of nests examined	52		27		79	

such leaves caked with mud give the nest compactness and stiffness as only the plastering of mud does in other cases. I have found lack of mud plastering under the lining only in one nest of Blackbird *T. merula cabrerae* HARTERT, 1901 from the Canary Is. kept in the Tring Museum. Inside the nest the plastering is covered with a layer of lining, which is mostly fairly thick (1 cm. or more) and composed of thin dry blades of grass or rootlets. In one case there were feathers in the lining. A "ring" woven for the most part of stalks, grass blades, or twigs strengthened with plastering on the inside is often present at the edge of the nest. The plastering mud is sometimes, though rarely, visible through the material of the ring. It happens mainly in the case of old nests, partly damaged by the leaving young birds. In the nest placed on top of a high stump in a depression among splinters the external layer was reduced to the minimum, the ring was lacking, and the plastering, though obviously present, was thinner than usual (the splinters surrounding the nest directly were also daubed with mud in part). The lining layer was, however, of ordinary thickness.

Table XXIV shows the results of a qualitative analysis of materials used to build the external layer and lining in 79 nests of Blackbirds. As in the case of the Song Thrush, part of the nests were examined whole (52) and part after having been demolished (27). The nests examined belonged both to the forest and garden forms, but on account of the small number of specimens were treated all together. The material which occurred in the largest number of nests is grass (91% of the nests), next come sticks treated jointly (63%), dead leaves, excluding those used for plastering (64%), and rootlets and stalks (but these, each in less than a half of the nests only). The remaining sorts of materials may be regarded as additional. The differences between the nests analysed only on the basis of a careful external inspection and those demolished for examination consist, above all, in the greater differentiation of sorts of materials in the nests of the latter group. This, however, concerns mainly additional materials, which occur in a small number of nests. These materials never form the essential bulk of a nest. The general differences in material composition between the nests of forest Blackbirds and those of garden populations are limited, above all, to the much more frequent occurrence of artificial materials connected with the neighbourhood of man, such as pieces of paper or nylon, in the nests from towns.

Nest shape and size

The external shape of Blackbirds nests varies considerably in connection with the great diversity of nest-sites. Nests squeezed in among the prongs of crotches or placed in narrow crevices in rocks or holes in walls are small, often somewhat flattened laterally, and their side walls have reduced amounts of material in the places in which they lean against a wall or trunk. In these cases the external shape of a nest corresponds to the shape of the recess, crevice or crotch. On the contrary, nests placed, e. g., on a cornice or on a thick horizontal branch and leaned against a vertical element on one side only or

Table XXV

Survey of nest measurements of the Blackbird *Turdus merula*, showing their ranges, means, standard deviations and coefficients of variation.

Measurement	Kind of nest	Number of nests	Range in cm.	Mean	Standard deviation	Coefficient of variation	Notes
Inner diameter	new nests	44	8.1 —10.7	9.56	±0.508	5.31	
	used nests	29	8.25—11.5	9.92	±0.717	7.22	
	total	73	8.1 —11.5	9.71	±0.621	6.39	
Outer diameter	new nests	44	10.25—20.0	14.68	±1.830	12.46	
	used nests	30	11.5 —19.0	15.60	±1.423	9.12	
	total	74	10.25—20.0	15.06	±1.727	11.46	
Depth	new nests	44	3.7 — 7.2	6.02	±0.826	13.74	
	used nests	28	4.5 — 9.4	6.05	±1.333	22.03	
	total	72	3.7 — 9.4	6.03	±1.044	17.31	
Height	new nests	41	8.0 —21.0	12.30	±2.669	21.69	
	used nests	28	7.5 —18.0	11.40	±2.742	24.05	
	total	69	7.5 —21.0	11.93	±2.715	22.75	

not leaned at all have a far wider outline of their horizontal projection. This is connected with the use of latge amounts of material so as to fasten the nest better and prevent it from falling off. The diversity of shapes is also due to the Blackbird's habit, relatively often observed in the garden form, of decorating or camouflaging nests with pieces of paper or foil, which hang down loosely on their sides.

The extreme values of all the four dimensions and the results of statistical calculations concerning the measurements of Blackbird nests are given in Table XXV. The inner diameter of nests shows the smallest fluctuation, its mean for all the 73 nests measured being 9.71 cm. with the coefficient of variation equal to 6.39. This coefficient for the series of new nests included in the above-quoted total amounts hardly to 5.31. The height and depth of nests, especially those in the series of used nests, reveal the greatest fluctuation.

On account of the small number of the nests measured, the calculations for Table XXV were carried out jointly for the forest and garden populations. By way of experiment the division into these groups was introduced for analyses of the distribution of the inner diameter (Fig. 1). The new nests and the used ones were treated separately in each group. The distributions of new nests of both these groups show exact likeness, whereas there is a clear-cut differ-

ence in length of inner diameter between the used nests of the garden form and the corresponding group of nests of the forest form. Unfortunately, the number of nests in this series is too small to confirm this opinion statistically.

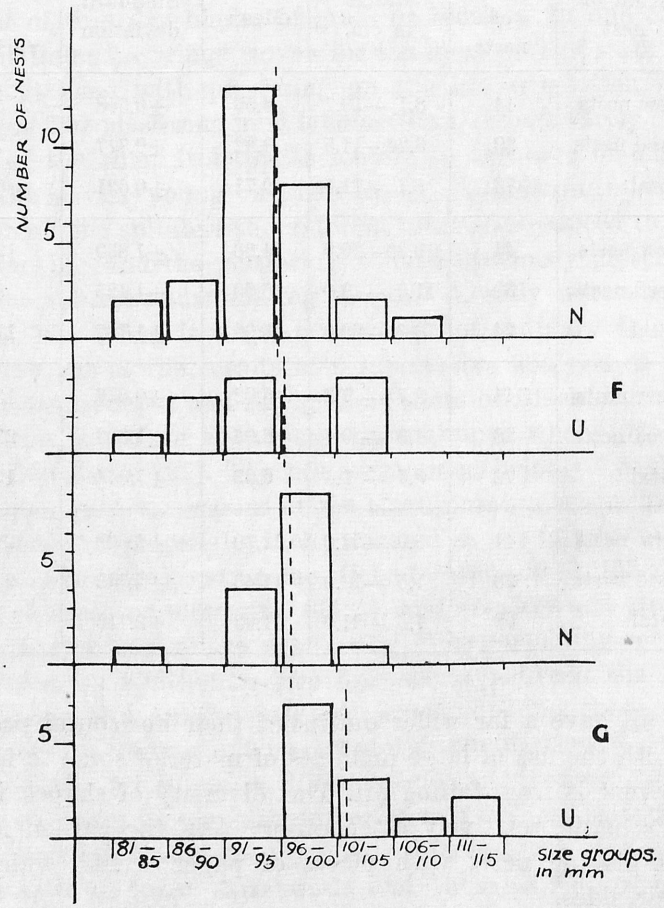


Fig. 1. The distribution of new and used nests of the Blackbird *Turdus merula* according to nest cup diameter for the forest and garden populations. F — forest population, G — garden population, N — new nests, U — used nests; broken line — arithmetic mean.

Discussion

The general pattern of distribution of nesting heights of all the nests of the Blackbird (Table XXI) resembles that for the material presented by DYRCZ (1963), HAVLÍN (1962), KULCZYCKI (1966) and MALCHEVSKY (1959), that is, the most abundant height group is from 1 to 2 m. above the ground. Studies carried out by HAVLÍN (o.c.) and VERHEYEN (1953) show that the forest Blackbirds generally nest lower than the garden ones. However, the differences between the mean nesting heights given by these authors are not so great as

those in Table XXI, and their values are lower. Thus, for instance, in VERHEYEN (o. c.) the means from large human settlements range from 2.0 to 2.1 m. (which in the present material corresponds to the mean nesting height of forest Blackbirds), whereas the mean from out of town is scarcely 1.45 m. The means obtained from the whole material by HAVLÍN (1962) are higher, and, besides, his results show that the mean values fluctuate markedly both in the forest population and in the garden birds and are dependent on the types of environment. The Blackbirds inhabiting town cemeteries have, for example, the lowest mean nesting height. These fluctuations controlled by types of environment within the forest and garden populations may account for the results given by DYRCZ (1962), seemingly discordant to the results of the present investigations and those obtained by the above-quoted authors.

The number and diversity of the species of trees and shrubs in which Blackbirds build their nests, as presented in Table XXII and compared with the data given by DYRCZ (1963), HAVLÍN (1962), KULCZYCKI (1966), MALCHEVSKY (1959) and MUSTAFAYEVA (1965), indicate the enormous adaptive capabilities of this bird. The dominancies of particular species, however, fluctuate considerably in dependence on different types of environments. For this reason, the statement of GRACZYK (1959) that the Blackbirds nested most readily in spruces seems to be true only for some types of forests, though this tree species is inhabited by Blackbirds most frequently both according to my (Table XXII) and HAVLÍN's (1962) findings and in the light of the paper by HALLADIN (1935). In general, it may be assumed that the tree and shrub species in which garden Blackbirds build their nests outnumber those inhabited by forest populations, but this seems to result from the greater possibilities of choice in town parks and cemeteries. An interesting example of adaptation to a biotope completely different from the forest is the nesting of Blackbirds in reeds at the waterside recorded from western and northern Europe by HUBER and HOFER (1951), MARTENS (1960), SVENSSON (1957) and VOLLBRECHT (1945).

The list of nest-sites of the Blackbird reveals the still greater adaptive capabilies of this species. The descriptions taken from literature considerably expand the list given in Table XXIII. Thus, nests were found on broken reeds (HUBER & HOFER, 1951; SVENSSON, 1957) and even in the gear-box of a truck in spite of its being driven a distance of 2 km. every morning and evening (UDDLING, 1955). As a result of adaptation to open areas in the Shetland Is. most of the nests there are placed on cornices and ledges inside buildings, under eaves, in stone garden walls, etc. (VENABLES, 1952). It will be seen from the data reported by GRACZYK (1960), MROCZKIEWICZ (1962), SOMEREN (1933) and, above all, those tabulated by HAVLÍN (1962) that the nesting of this bird in different holes in walls, shallow tree-holes, etc. is far more frequent than it might be supposed on the basis of Table XXIII. All the data show clearly that the nest sites and their frequency depend to a great extent on the local conditions in the close vicinity of the territory occupied by a given pair or in the forest, park, etc. inhabited by a population. One cannot, however, resist

the suggestion that they are also conditioned by psychological factors, as can be exemplified, among other things, by the comparatively large number of nests in lamps constructed of iron and glass in cemetries, recorded by HAVLÍN (1962).

The groups of nest materials introduced for Blackbirds in Table XXIV are comprehensive enough to include most materials mentioned by different authors, just as the group of "fibres" comprises fibres from palm leaves used to build the nest in the greenhouse at Konopiště. The groups in Table XXIV might also include the vast majority of materials listed by HALLADIN (1935) and divided by him according to the specific membership of plants. Feathers are rarely represented in nesting materials, none the less they are mentioned by HALLADIN (1935) and HEYDER (1953), and MUSTAFAYEVA (1965) found them in 2 out of the 90 nests examined. Out of other materials of animal origin this authoress still recorded various hairs from 3 nests. It must, however, be stated in general that materials of animal origin are very rarely encountered in Blackbird nests. The nest materials described by HEYDER (1953) and SNOW (1958) agree on the whole with the results of the present analyses. The frequency of different materials in nests is different. For example, according to the data from Table XXIV, moss was found in more than 30% of the nests. A similar proportion of nests with this material is suggested by HEYDER'S (1953) statement, whereas BANNERMAN (1953) and HALLADIN (1935) found this proportion higher, and only in Caucasian Blackbirds it was observed in all the nests examined (MUSTAFAYEVA, 1965). The use of mud or leaves coated with mud for plastering nests has been confirmed by observations of most authors. HALLADIN (1935) adds that earth is mixed with a small amount of vegetable fragments and SOMEREN (1933) emphasizes that, unlike the Song Thrush, the Blackbird does not use dung to plaster its nests.

The measurements of Blackbirds' nests, both their ranges and means, undergo more or less marked fluctuations. The data given by HALLADIN (1935) differ most from those in Table XXV, as well as from the findings presented by GLADKOV (1954, after SOMOV), HAVLÍN (1962), MUSTAFAYEVA (1965) and WILLGOHS (1952). The values given by HALLADIN for the inner diameter, depth and height of nest approach or lie below the lower boundaries of the ranges of the corresponding measurements found by the remaining authors. Unfortunately, he does not write about the abundance of the series which he employed to obtain these values and, therefore, he may as well have based himself on several exceptionally small nests, which cannot be ascertained at present. At any rate, as a result of comparisons it may be assumed that the measurements given by HALLADIN (o. c.) are not typical of Central Europe. The greatest value of the mean inner diameter was that calculated for Norway by WILLGHOS (1952), namely, 10.4 cm. It is 11 mm. greater than the mean from the Caucasus, obtained by MUSTAFAYEVA (1965). The data obtained during the present investigations (Table XXV) and those of HAVLÍN (1962) are intermediate. The mean outer diameters show very small and practically insignificant fluctuations,

from 15.0 cm. (MUSTAFAYEVA, 1965) to 15.3 cm. (HAVLÍN, 1962), the present values being similar. The ranges of this measurement also resemble each other and correspond with the particular mean values except for those given from the Khar'kov region by GLADKOV (1954, after SOMOV); these are extended in both directions. The mean depths of nest-cups exhibit great fluctuations, from 4.5 cm. (HALLADIN, 1935) to 6.4 cm. (HAVLÍN, 1962). If we leave out HALLADIN'S data as atypical, which has been mentioned above, the means and, especially, the lower boundaries of the ranges of measurements of the series examined seem to indicate that there is a tendency for these birds to build their nests deeper in the north, where the mean summer temperatures are lower, than in the south of Europe, in the case in point, in Caucasia.

The differences in size of inner diameter between the forest and garden populations have not hitherto been recorded in literature. A tendency for garden Blackbirds to increase this measurement (cf. Fig. 1), discussed in the section on the shape and size of nests, appears to be associated with the increase in the clutch-size (GRACZYK, 1963). Especially as regards used nests, their extension may be due under certain conditions to a larger number of growing-up nestlings.

VIII. RING OUZEL *TURDUS TORQUATUS* LINNAEUS 1758

Own material

The basis for present studies are 26 nests record cards with data on the Ring Ouzel, collected in three Polish Carpathian National Parks (Pieniny, Tatra, Babia Góra) and areas closely adjacent to them as well as in the Bieszczady Mts. They, therefore, concern the subspecies *Turdus torquatus alpestris* C. L. BREHM, 1831, inhabiting the mountains of Central and Southern Europe. I must not leave out completely the data on 9 nests found in the same regions but so old and heavily damaged that one cannot be absolutely certain whether they are nests of Ring Ouzels or those of Blackbirds dealt with as such by mistake; Blackbirds occur in these areas, though they are less numerous. These nests have not been included in the Tables, but discussed marginally, especially in so far as their sites are concerned. In addition, the descriptions of 2 nests of the nominative form *T. t. torquatus* are included. They were taken in northern Wales by H. LYNES and are in the possession of the Tring Museum, but nothing is known about their sites.

The nests from the Tatra, Pieniny and Babia Góra were found in mountain forests of various types, but generally in their lower zones. They were mostly collected at the edge of forests bordering upon cultivated fields or clearings, irrespective of the fact whether it was a thicket of young conifers, a coniferous forest of old trees or a mixed forest of the *Fagetum carpaticum* type.

Nest-site

All the nests of the Ring Ouzel from the Carpathian Mts. were in trees, at various heights above the ground, as shown by Table XXVI. The mean nesting height is 3.5 m. and the vast majority of the nests (above 80%) were in the 1—5 m.

Table XXVI

Nesting heghts of 16 nests of the Ring Ouzel *Turdus torquatus* in the Carpathian Mts.

Height, in m.	Number of nests	%
0 — 0.99	1	3.85
1.0— 1.99	8	30.77
2.0— 2.99	4	15.38
3.0— 3.99	6	23.07
4.0— 4.99	3	11.53
5.0— 5.99	1	3.85
6.0— 6.99	1	3.85
7.0— 7.99	1	3.85
8.0— 8.99	—	
.		
.		
.		
15.0—15.99	1	3.85
Total	26	100.00
Mean height	3.5 m	

Table XXVII

Species of trees in which the nests of the Ring Ouzel *Turdus torquatus* were found in the Carpathian Mts.

Species of trees	Number of nests	%	
Coniferous trees (total)	(25)	(96.14)	
Abies alba — young	5	19.23	53,84
Abies alba — old	9	34.61	
Picea excelsa — young	8	30.77	42.30
Picea excelsa — old	3	11.53	
Deciduous trees (total)	(1)	(3.85)	
Alnus nigra	1	3.85	
Total	26	99.99	

height groups. Nevertheless, it is hard to establish what factor influences the nesting height. The factor of human interference is certainly of no importance here, since, for instance, of the 2 nests found in the neighbourhood of the Gubernasówka Clearing on the southern slope of Babia Góra on May 13, 1966 one was placed in a spruce at a height of 15—16 m and about 8—10 m. from the top, whereas the other was sited on a spruce of a similar height but only 3—3.5 m. above the ground. These nests were about 300 m. apart.

Table XXVIII

Nest-sites of the Ring Ouzel *Turdus torquatus* in the Western Carpathian Mts.

General designation of place	Symbol in Fig. 2	Nest-site	Number of nests	%
Young coniferous trees (spruce, fir)	A	against trunk, on 2 twigs	3	11.54
	A	against trunk, on 3 or more twigs	4	15.38
	B	between trunks of 2 or 3 saplings growing near each other, on 1 or more twigs	3	11.54
	C	on twigs, not leaned against trunk	1	3.84
	D	in whorl left after the tree top has been cut off	1	3.84
	D	on short horizontal portion of a trunk of a lyra-shaped spruce, among twigs which form something like a whorl	1	3.84
Old coniferous trees (spruce, fir)	E	on thick branches (1 or 2), against trunk	7	26.92
	F	against trunk, among shoots	2	7.68
	H	on branch, distant from trunk	2	7.68
	H	between 2 parallel branches growing near each other, distant from trunk	1	3.84
Deciduous shrubs	Q	among branches of alder shrub	1	3.84
		Total	26	99.94

It will be seen from Table XXVII, which shows the distribution of 26 nests of the Ring Ouzel from the Carpathian Mts. according to the species of trees in which they were built, that this bird is closely associated with coniferous

trees, most of the nests being placed in old firs. Only one nest was found in a deciduous sapling. If we added all above-mentioned old "uncertain" nests, the nests sited in young spruces would become the most numerous. Besides, one of these nests was placed among the splinters of a broken fir trunk and another between two twigs and the trunk of a dead sycamore maple.

The nest-sites of the Ring Ouzel in the Carpathian Mts. are shown in Table XXVIII. The largest number of nests were on twigs, against the trunk of young coniferous trees and on 1 or 2 thicker branches growing out in the lower portion of the crown, against the trunk, in old big spruces or firs. The nests built in a clump of shoots, close to the trunk, are decidedly fewer. There is a general trend for the nests to be leaned against an upright element (in this case a tree trunk). Above 80% of the nests were leaned in this manner. If the "uncertain" nests were included, the percentage would be still higher.

Nest construction and material

The nests of the Ring Ouzel are built after a general model, typical of most thrushes. They consist of three main layers. The external layer, built of different materials, is thick and usually fairly compact. The end parts of sticks, projecting beyond the nest, often form a "crown". The middle layer is composed of plastering, which is thin and sometimes incomplete and confined to the bottom and the lower portions of the side walls. This layer is very often of earth mixed with a large quantity of vegetable fragments, such as broken grass blades, pieces of moss, etc. The boundary between the external layer and the plastering is not always well defined, because in some nests the bird glues together the more inwardly placed vegetable materials of the external layer with a small amount of earth and next increases the amount of earth by degrees. In extreme cases the thin plastering layer may be constructed of rotten fragments of moss mixed with humus. The upper edge of the nest is rimmed with a ring, usually very strongly woven of long grass blades, stalks and sticks. Its thickness may be as great as 3 cm. The inside of the nest is always abundantly lined with delicate and elastic dry blades of grass, which may occasionally be replaced by fine rootlets. The lining makes the internal layer of the nest and differs distinctly from the ring, upon which it borders at the edge, not only in delicacy but often also in colour; it is generally lighter. It should be emphasized that in freshly finished nests the mud of the plastering layer cannot be seen in their outer aspect. Only in one case a small quantity of earth was visible in the region of the ring in a nest with 4 nestlings already fledged at that time. However, it may well be that this small amount of earth, occasionally found in the external layer, was brought with bundles of grass torn out together with rootlets by the bird and carried on them to the nest.

The results of an analysis of the material used to build the external layer and lining of nests are presented in Table XXIX. The material present in all the nests examined is grass in the form of delicate blades in the lining and long

Table XXIX

The qualitative analysis of the material used to build the external layer and lining in the of the Ring Ouzel *Turdus torquatus*.

Material	*Turdus torquatus alpestris*		*Turdus t. torquatus*	Total	
	No. of nests	%	No. of nests	No. of nests	%
Natural materials:					
sticks — twigs (total)	(19)	(86.36)	—	(19)	(79.16)
of which: undetermined	3	13.63	—	3	12.50
of coniferous trees	16	72.72	—	16	66.66
of deciduous trees	1	4.54	—	1	4.16
grass	22	100.00	2	24	100.00
moss	16	72.72	2	18	75.00
fern	3	13.63	—	3	12.50
horsetail	2	9.09	—	2	8.33
lichens	2	9.09	—	2	8.33
leaves of trees	3	13.63	—	3	12.50
leaves of thistle	1	4.54	—	1	4.16
stalks	13	59.09	2	15	62.50
rootlets	3	13.63	1	4	16.66
pieces of rotten wood	1	4.54	—	1	4.16
Total of nests examined	22		2	24	

thick blades in the ring. Its single blades or whole bundles with rootlets occur in the external layer. Along with sticks they may be the main constructional material, of which the bulk of the nest is built, or its amount in the external layer may be reduced in favour of stalks and moss. Different sticks were found in more than 85% of the nests in the Carpathians. They were, above all, spruce and fir twigs, mostly dry and needleless. In one nest several dry twigs of the spruce in which it was placed were twined in the external layer, and in the rings of other nests there was a twig with green needles. Moss was observed in more than 70% of the nests and in many of them it was one of the main materials of the external layer. It may also occur in the ring and its small fragments may be added to the mud of the plastering layer. Occasionally, single stems of moss are found directly on the plastering under the lining layer of grass. In the structure of the external layer various stalks play the same part as the thick grass blades, which they complement or replace. The same may be true of rootlets. Other sorts of materials occur in nests more or less sporadically and never form the main component of the structure.

Table XXX

Survey of nest measurements of the Ring Ouzel *Turdus torquatus*, showing their ranges, means, standard deviations and coefficients of variation.

Measurement	Subspecies	Group of nests	Number of nests	Range in cm.	Mean	Standard deviation	Coefficient of variation	Notes
Inner diameter	*T. t. alpestris*	new nests	12	9.25—10.90	9.95	±0.443	4.45	*) There being only 2 specimens, standard deviations and coefficients of variation have not been calculated.
		used nests	8	9.75—11.50	10.53	±0.558	5.29	
		total	20	9.25—11.50	10.18	±0.560	5.50	
	T. t. torquatus	total	2	9.0 — 9.25	9.12	*)	*)	
Outer diameter	*T. t. alpestris*	new nests	12	15.50—20.50	17.75	±1.530	8.61	
		used nests	8	16.0 —19.50	17.33	±1.200	6.92	
		total	20	15.50—20.50	17.58	±1.389	7.90	
	T. t. torquatus	total	2	14.0	14.0	*)	*)	
Depth	*T. t. alpestris*	new nests	12	5.3 — 7.5	6.19	±0.800	12.92	
		used nests	8	5.0 — 7.0	6.25	±0.845	13.52	
		total	20	7.0 — 7.50	6.21	±0.797	12.83	
	T. t. torquatus	total	2	4.0 — 4.50	4.25	*)	*)	
Height	*T. t. alpestris*	new nests	12	9.50—20.0	12.23	±3.283	26.84	
		used nests	7	9.50—18.50	12.21	±2.928	23.98	
		total	19	9.50—20.0	12.22	±3.073	25.14	
	T. t. torquatus	total	2	6.0 — 6.5	6.25	*)	*)	

The 2 nests of the nominative form from northern Wales were built in a similar way and of material which in birds from the Carpathian Mts. also belonged to the main sorts (grass, moss and stalks). Only the lack of sticks in the external layer strikes the eye.

Nest shape and size

The comparatively small variation in the situation of nests and in the composition of nest material causes that the shape of most nests little differs from the general model of a slightly flattened hemisphere. Seen from above, the nests are generally circular or ellipsoidal in shape, often somewhat flattened in the place where they touched the trunk. The nest-site exerts also some influence upon the shape of the nest base. It may be flat and partly embracing the bough (in nests place don thick branches) or have a kind of a compressed comb (if part of material has been squeezed in between 2 fir or spruce branches growing near each other). The outline of the nest-cup is more often oval or ellipsoidal than quite circular, but its shape is only rarely very elongate.

The ranges of measurements of 20 nests of Ring Ouzels from the Carpathians with the results of statistical calculations are presented in Table XXX. The measurements of the two nests of the nominative form from Wales are given in this table seperately. The steadiest measurement, with a small coefficient of variation, is the inner nest diameter. Its mean value for 12 new nests is nearly 10 cm., the coefficient of variation being scarcely 4.45. The mean inner diameter for 8 used nests is 0.5 cm. larger. The ranges of the outer diameter indicate fairly great fluctuations of this measurement. The height of nests, averaging 12.22 cm., shows the greatest fluctuations and, consequently, the highest coefficient of variation (25.14).

The measurements of the 9 "uncertain" nests discussed above lie within the limits given in Table XXX. Only the outer diameter in four nests and height in 2 were below the minimum values from Table XXX.

The 2 nests of *Turdus t. torquatus* from Wales included in Table XXX are smaller than the nests of *T. t. alpestris* from the Carpathians. Not only are the means of all the four measurements lower than the means for the nests from the Carpathians, but also the absolute values of these measurements are smaller than the corresponding minima given in the table. If Table XXX included also the data for the "uncertain" nests, the values of the inner and outer diameters would lie near the lower limit of these measurements for the nests of the form *T. t. alpestris* from the Carpathian Mts.

Discussion

The data from literature concerning the nesting of the Ring Ouzel in Central Europe indicate that *Turdus torquatus alpestris* always nests above the ground. According to the data of Marisova and Vladyshevsky (1961), covering the

eastern Carpathians, this bird builds nests at heights ranging from 0.5 to 10 m. The findings from the Sudetes, Alps and other mountains of Western Europe are similar, though the upper limit of nesting heights is higher (CORTI, 1952; FISCHER, 1955; MARTORELLI, 1960; NAUMANN, 1905; NIETHAMMER, 1937). In NIETHAMMER's (o. c.) opinion, most nests occur at heights about 2—3 m., which agrees roughly with the present data from the Polish Carpathian ranges. The preference by the Ring Ouzel for nesting in firs and spruces is emphasized (NAUMANN, 1905; NIETHAMMER, 1937; NOLL, 1959). According to FERIANC (1965), nests are occasionally placed in dwarf mountain pines, which is also mentioned, as a rare phenomenon, by NAUMANN (1906). In the Eastern Carpathians, MARISOVA and VLADYSHEVSKY (1961) found nests of this species, in addition to conifers, in beeches and sycamores and CORTI (1952) recorded one built in an alder. One of the Carpathian nests, the contents of which in the form of 4 eggs are kept in the K. WODZICKI collection, was sited, according to the original label, in a beech. In addition to the nests found in trees, CORTI (1949) quotes, after other authors, the descriptions of a nest placed in a recess of a small rock and another under the eaves of a shack. The descriptions of nest-sites in coniferous trees encountered in literature (FISCHER, 1955; MARISOVA & VLADYSHEVSKY, 1961; NAUMANN, 1905) agree with those published in the present paper. MARISOVA and VLADYSHEVSKY (1961) mention a shallow tree-hole and a tinder-fungus growing on a trunk as exceptional nest-sites.

The nominative form, *Turdus t. torquatus*, which occurs in the British Isles and Scandinavia, nests for the most part on the ground, amidst marshes and moors, in cracks of rocks and cliffs, often in nearly treeless regions, but there occur its nests also in firs, spruces, birches, junipers and old shrubs of heather (BANNERMAN, 1954; LØPPENTHIN, 1935; STORRS FOX, 1900; WILLGOHS, 1952; WITHERBY et al., 1938).

According to GLADKOV (1944), the nesting of the third subspecies *Turdus torquatus amicorum*, which lives in Caucasia, has been little investigated. Referring to MENZBIR, he writes that the nests of this form are built on the ground, in crevices in rocks or in shrubs at no great height. All the 8 nests observed by MUSTAFAYEVA (1965) were, however, exclusively on rocks. A similar nest-site is recorded by NAUMANN (1905, after RADDE).

The nest material of the form *Turdus t. alpestris* from the Swiss Alps consists, as reported by FATIO (1899), of moss mixed with earth and leaves and twigs, whereas the lining inside the nest is of dry grass. In his general description FERIANC (1965) mentions blades of grass, moss and lichens, but he emphasizes the lack of plastering. Similarly, MARISOVA and VLADYSHEVSKY (1961) hold the opinion that there is very little or no earth in the nests of this form, which disagrees with my observations revealing the presence of plastering in all the nests examined. The plastering forms a distinct superficial layer, which can be seen inside the nest after the lining has been removed. The plastering of some nests with humus mixed with moss, instead of clay or earth, may to some degree justify the opinion of MARISOVA and VLADYSHEVSKY

(1961). On the other hand, the plasteringis in visible from the outside (unless the nest has been broken) owing to the abundance of the external and lining layers. NAUMANN (1905), too, notes the invisibility of the plastering hidden within the nest walls.

The material composition of 8 nests of *T. torquatus amicorum* from Caucasia, analysed by MUSTAFAYEVA (1965) and the frequency of its particular components much resemble those found in Poland (Table XXIX). The fact that this authoress does not mention plastering does not mean that this layer is lacking, since she has also passed over the presence of plastering in her descriptions of nests of the Song Thrush and Blackbird.

The nests of the nominative form examined by STORRS FOX (1900) had the foundation and the external layer of the side walls made of fern stems with occasional branches of heather twined in. Some of them were built of moss only. All the nests were plastered with mud and lined with thin blades of grass. In their material they agree with the general description given by BANNERMAN (1954).

The inner and outer diameters of 6 nests of the Ring Ouzel from the Eastern Carpathians given by MARISOVA and VLADYSHEVSKY hardly differ from those of *T. t. alpestris* in Table XXX. The mean nest height is smaller by about 1 cm., which still does not make a distinct difference. The depths of nests show the greatest differences, because the mean presented by these authors amounts to 4.47 cm. and is not only about 1.5 cm. smaller than the mean given for *T. t. alpestris* in Table XXX, but even lies below the range of this measurement. A comparison of the measurements of the nests of *T. t. amicorum* described by MUSTAFAYEVA (1965) shows a nearly identical length of the inner diameter and a somewhat shorter outer diameter (this difference is, however, of no major importance), whereas not only the means but also the ranges of the nest heights and depths are lower than those presented for *T. t. alpestris* in Table XXX. The approximate inner diameter in the nests of the nominative form from the British Isles quoted by CAMPBELL (1953) is 3.5 inches or about 8.8 cm., and so slightly smaller than the mean from 2 nests of this form included in Table XXX. This, therefore, confirms the observations made on the basis of this table that the nests of the British Ring Ouzels are smaller. The observation cannot be generalized for all the nests of the nominative form, since, according to WILLOGHS (1952), the mean inner diameter of 3 nests from Norway is 10.1 cm. and the depth 6.5 cm. which figures correspond closely to the means from the nests of the Polish Carpathians. According to WITHERBY et al. (1938). the birds of the nominative form and those of *T. t. alpestris* do not differ in dimensions, and thus the cause of these differences in the length of the inner diameter should be sought somewhere else. There is, however, a slight difference in the mean size of eggs: those of *T. t. alpestris* are larger (mean measurements: 30,8×22.16 mm.) than the eggs of *T. t. torquatus* from the British Isles (30.4×21.5 mm.), and, besides, there are generally 4 eggs in clutches from the British Isles whereas the number characteristic of the form *T. t. alpe-*

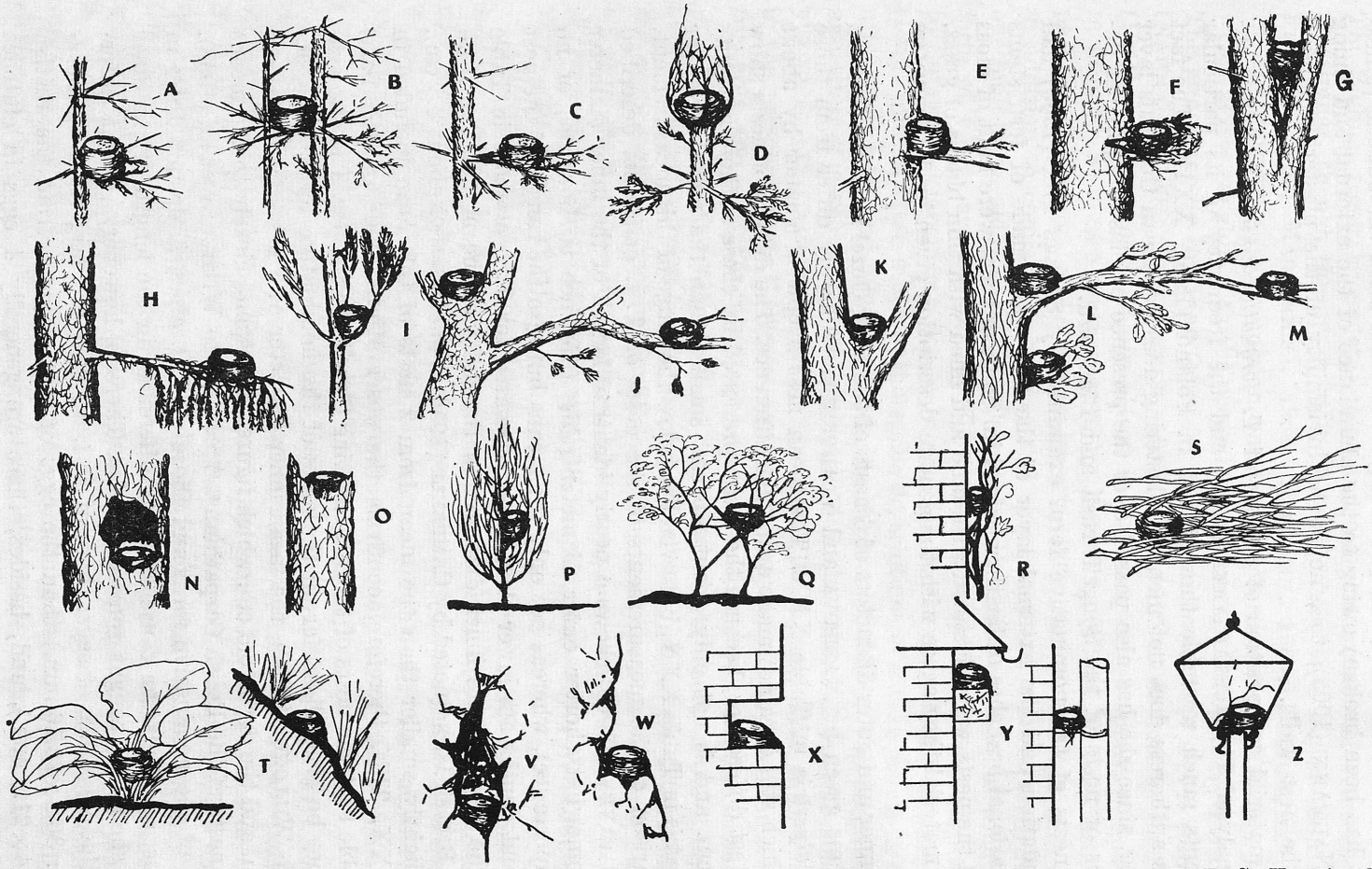


Fig. 2. Main types of the nest-sites of European thrushes: A, B, C, D — in young spruces, firs and yews; E, F, G, H — in old spruces, firs and larches; K, L, M — in deciduous trees; N — in shallow tree-holes; O — on tree stubs; P — in shrubs of juniper, thuja, etc.; Q — in deciduous shrubs; R — in wall creepers; S — in heaps of branches; T — in brambles, burdocks, etc.; U — on the ground; V, W — in rocks; X, Y — in walls; Z — in lamps, on monuments and the like. (Note: left "U" left out in the drawing wing to oversight).

The numbers of nests of European thrushes according to particular types of nest-sites (Fig. 2), worked out on the basis of materials given in Tables III, VIII, XIII, XVIII, XXIII, XXVIII. Percentage values are given below the absolute numbers of nests

Species	Types of nest-site as in fig. 2																									Other	Total
	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z		
Turdus philomelos	82 48.22	6 3.53	8 4.71	4 2.35	5 2.94	19 11.18	1 0.59	17 10.00	6 3.53	*	*	4 2.35	2 1.18	—	—	4 2.35	10 5.88	1 0.59	1 0.59	—	*	(1) **	—	*	*	—	* (scaffold)	170 99.99%
Turdus iliacus	6 21.42	—	—	—	—	—	—	1 3.57	—	—	3 10.71	2 7.14	1 3.57	—	4 14.28	*	7 25.00	—	2 7.14	—	1 3.57	*	—	*	*	—	1 on lying trunk 3.57	28 99.97%
Turdus pilaris	3 3.30	—	—	—	—	2 2.20	—	3 3.30	4 4.40	6 6.59	30 32.96	22 24.17	20 21.98	*	—	—	1 1.10	—	—	—	*	*	—	—	*	—	* (on beams of a bridge)	91 100.00%
Turdus viscivorus	*	—	—	—	2 8.33	—	—	1 4.17	5 20.83	1 4.17	2 8.33	9 37.50	3 12.50	* (nest- -box)	—	—	1 4.17	—	—	—	—	—	—	—	*	—	* (on wooden fence) (on wooden breakwater)	24 100.00%
Turdus merula	12 9.30	—	1 0.77	2 1.55	—	—	—	1 0.77	3 2.32	—	14 10.85	18 13.95	3 2.32	5 3.87	1 0.77	1 0.77	34 26.36	9 6.98	4 3.10	2 1.55	1 0.77	4 3.10	1 0.77	3 2.32	5 3.87	4 3.10	1 in palm-tree 0.77 *(on a heap of reeds) * (in a truck)	129 99.93%
Turdus torquatus	7 26.92	3 11.54	1 3.84	2 7.68	7 26.92	2 7.68	—	3 11.54	* dwarf mt. pines	—	*	*	—	*	—	*	1 3.84	—	—	—	*	*	*	*	—	—	—	26 99.94%

* This nest-site was quoted in one of the papers refered to in the discussion of the species.

** A nest with such a site (Phots. 7, 8) was found in the Ojców National Park in June 1968 and for this reason it has not been included in calculation of percentages.

stris is 4—5 eggs in a clutch (WITHERBY et al., 1938). The mean size of 13 eggs from 8 clutches of the Ring Ouzel in the Carpathian Mts. is 31.0×21.9 mm., the number of four-egg clutches being however, according to present observations, twice as large as the number of the clutches of 5 eggs. The findings from the Alps, quoted by CORTI (1952), show that the clutches of 5 eggs are far more frequent there.

IX. A COMPARISON OF THE NESTING OF EUROPEAN THRUSHES

Both the ranges of nesting heights of thrushes and their means are marked by fairly great variation. If all the species of the genus *Turdus* are dealt with together, the range of their nesting heights stretches, as shown by the material being analysed, from 0 (on ground) to 25 m. The Redwing nests lowest, up to 5 m. above the ground. The mean values for the Song Thrush and Blackbird (both forest and garden forms together) are similar, about 2.5 m., but the Song Thrush never nests higher than 8 m., whereas the nests of Blackbirds are only exceptionally placed as high as some dozen metres above the ground. Of the European thrushes, Fieldfares nest at various heights above 10 m. most frequently, in which they are followed, but in smaller numbers, by Mistle Thrushes and Ring Ouzels. High-sited nests of Mistle Thrushes are found both in deciduous and in different coniferous trees; in the case of Fieldfares they are mainly in deciduous trees and pines, in Ring Ouzels in coniferous trees of the spruce-fir group, and the sporadic high-placed nests of Blackbirds occur in deciduous trees.

The lists of species of trees and shrubs in which thrushes nest vary considerably from bird species to species. The list made for the Blackbird (Table XXII) is the most varied. Unlike it, the list of tree species in which Ring Ouzels nest in the Carpathians is very poor (Table XXVII), which is due to the predilection of *T. torquatus alpestris* for nesting in conifers, in which it resembles the Song Thrush. The other species nest readily in conifers also, but the percentages of their nests built in them are much lower and do not indicate any particularly close connections.

Figure 2 shows the adaptive capabilities, as illustrated by the choice of various nest-sites. The quantitative data concerning the choice of particular types of nest-sites by each of the 6 species of thrushes are given in Table XXXI. The fact that a given type of nest sites has been recorded in literature is marked with an asterisk in the Table, but only when the type of nest-site in question is not represented in the material of the present study, and even then without specifying the numbers of cases (which are often quite exceptional). As in the case of tree and shrub species, the most diversified nest-sites were found in the Blackbird. Its nests were observed in 21 of the 26 types of nest-sites. The Song Thrush has a silmilar number of nest-site types distinguished in Table XXXI but in a remarkably larger series of nest examined. It has also fewer sites

defined as "others", which suggests its somewhat poorer adaptive abilities. The last of the 3 most numerous species in this table, i. e., the Fieldfare, has the smallest number of nest-site types, like the Mistle Thrush, which is, however, represented in the table by the smallest series of nests. The number of types of the sites occupied by the Ring Ouzel on the basis of the series of nests of the subspecies *T. t. alpestris* suggests moderately well-developed adaptive capabilities, even when enhanced by the data from literature for this and the other two subspecies. This fact may also be connected, at least partly, with the smallness of the series, which is also true of the nesting of the Redwing. Four nest-sites, i. e., in coniferous sapling against the trunk ("A"), on a branch of an old fir or spruce, at a distance from the trunk ("H"), against the trunk of a de-

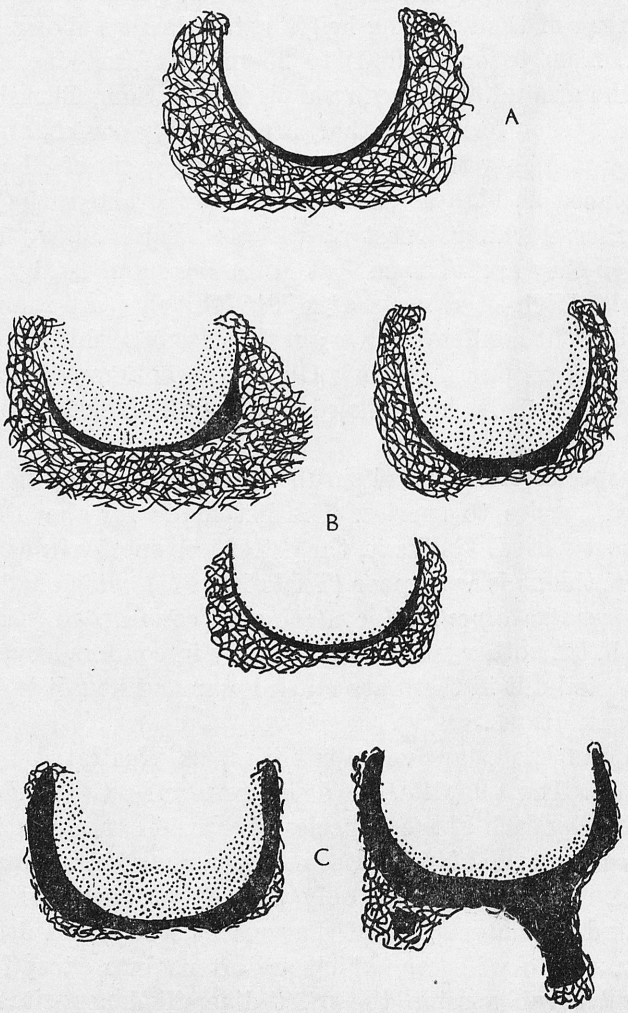
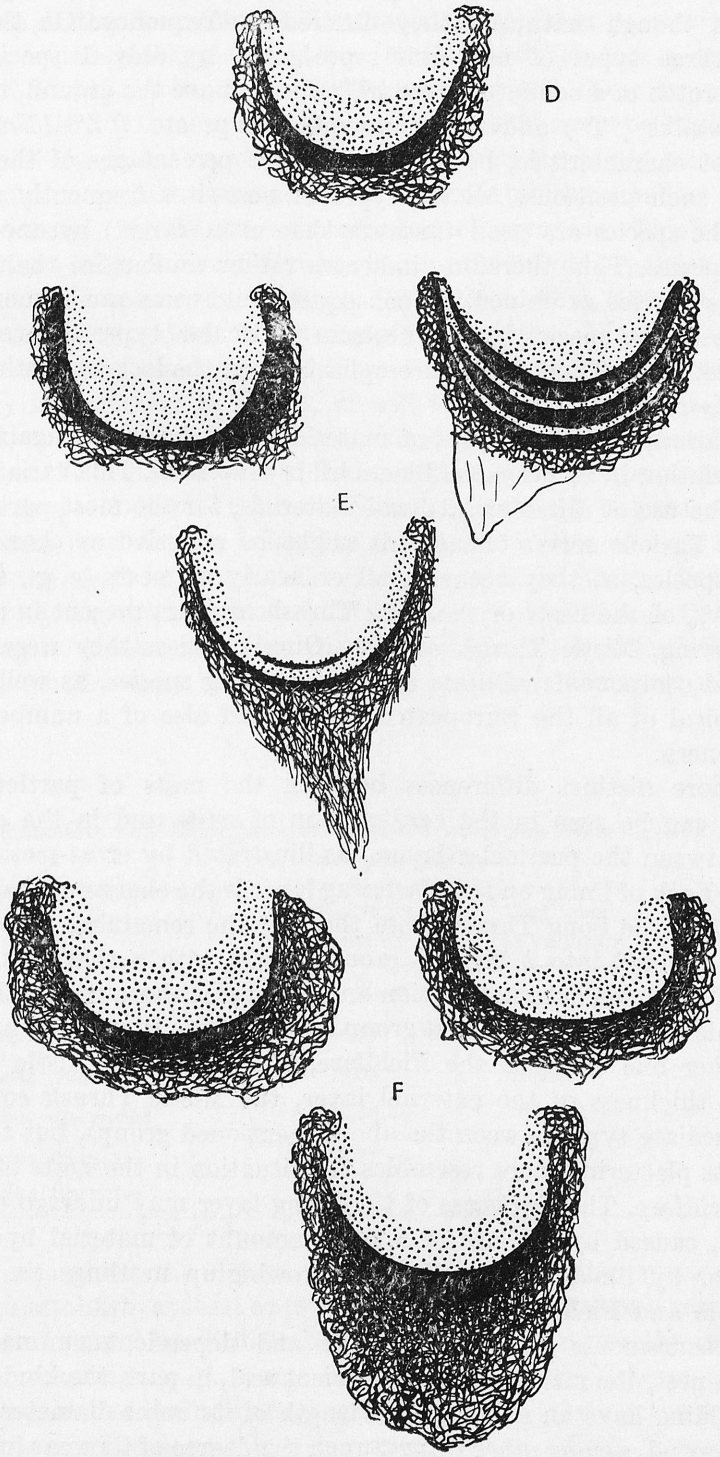


Fig. 3. Sections through the nests of the European species of thrushes, showing the interrelations between the layers. A — *Turdus philomelos*, B — *T. iliacus*, C — *T. pilaris*, D — *T. viscivorus*, E — *T. merula*, F — *T. torquatus*.


D
E
F

ciduous tree, on a fairly thick branch or several small twigs ("L"), and among the branches of a deciduous shrub ("Q"), were found in all the species under comparison, though naturally they differed in frequency. On the contrary, there are three types of nest-sites represented by only 1 species, namely, in a trunk crotch of a coniferous tree ("G"), just above the ground, in a burdock or similar stalks ("T") and in monuments, lamps etc. ("Z"). None the less, they are not characteristic, because only slight percentages of the nests were marked by such positions. All the types of nest-sites frequently encountered in one of the species are used (many a time even rarely) by one or more of the other species. This, therefore, indicates rather similarities than differences between the species examined. In consequence it seems much more characteristic if one of the species has no nests in particular types or even groups of types of nest-sites. Thus, one can emphasize just the lack of nesting of Mistle Thrushes on rocks.

A comparison of the analyses of materials used for nests again shows the greatest variation in so far as the Blackbird is concerned. This variation consists mainly in the use of different artificial materials, for the most part, by garden Blackbirds. Various sorts of materials might be regarded as characteristic of particular species, as they occur in all or nearly all nests (e. g., sticks found in above 90% of the nests of the Song Thrush or grass present in all the nests of the Redwing, Mistle Thrush or Ring Ouzel), unless they were one of the fundamental components of nests of the remaining species, as well. Thus, dry grass is typical of all the European thrushes and also of a number of species of other genera.

Some more distinct differences between the nests of particular species of thrushes can be seen in the construction of nests and in the quantitative relations between the particular layers, as illustrated by cross-sections of nests in Figure 3. Lack of lining on the plastering layer is the character that distinguishes the nest of the Song Thrush from those of the remaining 5 species. These last can be divided into 2 distinct groups: nests with a thin plastering layer as compared with the external portion and vice versa those with a thin external layer and thick plastering. The first group consist of the Ring Ouzel and Redwing and the other one contains the Fieldfare, Blackbird and Mistle Thrush. As regards the thickness of the external layer, the Mistle Thrush constitutes as if an intermediate type between the above-mentioned groups, but the quantity of mud in its plastering more resembles the situation in the nests of the Blackbird and Fieldfare. The thickness of the lining layer may undergo considerable fluctuations, caused by the use of a small amount of material by some birds (Redwing) or by its destruction by the growing-up nestlings (in some nests of Blackbirds and Fieldfares).

Nest measurements are very variable and dependent on many factors. The site of a nest, the manner of its placement and, in part, the kind of material used for building have an effect on the length of its outer diameter. Its height and depth depend, among other things, upon the degree of its wear (cf. Tables V,

X, XV, XXV and XXX, which show that used nests are lower and shallower), as well as upon the mean temperature of the given region in the breeding season. The example of the Song Thrush illustrates this opinion particularly well (cf. section III.: nests are deeper in colder regions). The differences in depth between the nests of Fieldfares from the Northern Urals and those from the Middle Urals observed by DANILOV and TAPCHEVSKA (1962) may be explained in the same way. All the tables in which the nest measurements are juxtaposed show that the inner nest diameters are characterized by the smallest fluctuations and, consequently, by the lowest coefficient of variation. This character has been found not only in thrushes, but also in other birds representing different families and even orders (BOCHEŃSKI, 1957, 1961, 1962, 1966; KULCZYCKI & MAZUR-GIERASIŃSKA, 1968, KUŚNIERCZYK, in prep.; WALIGÓRA, in prep.). A comparison of the dispersions of inner diameters in the nests of the species under study is presented in Fig. 4. It will be seen from the diagrams in this Figure that, as in the case of height and depth, the mean values of this measurement reflect the degree of wear of the nest; the higher groups of measurements, the greater proportions of used nests in them. Although the magnitude of the inner diameter may depend upon the number and size of eggs (see sections devoted to the nests of Blackbirds and Ring Ouzels), in the first place it is conditioned by the innate manner of formation of nest and the size of the bird building it. Hence, the inner diameter of the nests of Redwing (Fig. 4B) is evidently smaller than in the remaining species, which more resemble each other.

Table XXXII

Mean inner diameters and coefficients of variation of thrush nests against the magnitude of series examined

Species	Mean inner diameter	Coefficient of variation	Magnitude of series
Turdus philomelos	9.23	5.20	134
Turdus iliacus	8.49	8.52	20
Turdus pilaris	10.38	10.81	61
Turdus viscivorus	10.15	14.96	12
Turdus merula	9.71	6.39	73
Turdus torquatus	10.18	5.50	20

Having examined the details of nesting in particular species, one seems to be able to establish, at least approximately, the fact that as a result of adaptation to environmental conditions the site of nests undergoes the greatest variation. In some species (e. g., Song Thrush and Redwing), however, this takes place in the aspect of their whole geographic ranges, whereas the nesting height remains more stabilized, and in other species (e. g., Mistle Thrush and Field-

fare) the situation is reversed. The qualitative composition of the nest material is somewhat more stabilized, for in spite of the fact that the available material is collected in the close neighbourhood, and one of its sorts is often replaced by another, all this happens within limits, definite though varying with parti-

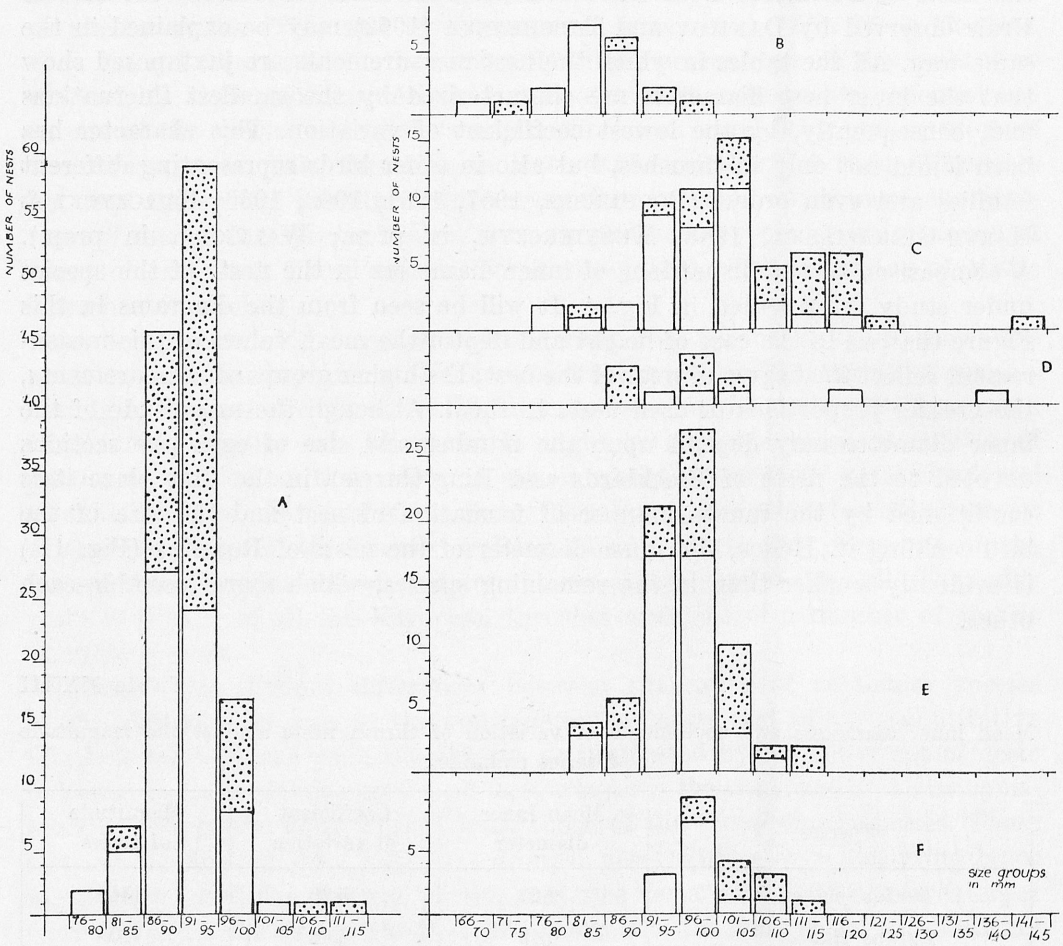


Fig. 4. The distribution of the nests of European thrushes according to nest cup diameter. A — *Turdus philomelos*, B — *T. iliacus*, C — *T. pilaris*, D — *T. viscivorus*, E — *T. merula*, F — *T. torquatus*, The dotted parts of the bars show the used nests.

cular species. The coincidence of considerable variation in the nest-site, nesting height and nest material in the Blackbird cannot be incidental and indicates the greatest adaptive capabilities of all the species examined. The limits of variation in the nest size are different for different dimensions. The smallest fluctuations were found in the inner diameter. Though the variation coefficients are different for different species, it seems on the basis of the list in Table XXXII that their magnitude depends on the variation of species and only to a smaller extent on the size of the series examined. The general model of

nests, consisting in the proportions preserved and the order of successive layers, also shows only slight variation. One can, therefore, base oneself on these last, most stabilized characters, when attempting to construct a key to the nests of particular species of thrushes. The objective of such a key would be to facilitate identification of nests found under their natural circumstances, without their contents of eggs or nestlings. This key covers the forms nesting in Central Europe (nests of *Turdus t. torquatus* and *T. t. amicorum* has been tfle out because of the small number of data). One must take into account the possibility of occasional deviations of single nests even from the most distinctive characters of a given species; they make the identification of such nests very difficult or quite impossible. By way of example I shall mention a nest of the Song Thrush without inner plastering, described by COHEN (1933), and another of the Blackbird, discussed in the present paper, placed in a depression among the splinters of a broken trunk and practically without the external layer, whereas the layer of mud plastering was largely reduced. The characteristic picture of a nest may also be blurred by another nest, belonging to a different species, built in its cup. For example, I observed a nest of the Greenfinch *Carduelis chloris* placed in the cup of a Song Thrush nest so that it completely covered the plastering of the latter. In another case a nest of the House Sparrow *Passer domesticus* lay in a Fieldfare nest (KULCZYCKI & MAZUR-GIERASIŃSKA, 1968). In these two cases, however, both the material and the method of building of the nests indicated that they had not been built by a thrush but a member of another genus. Using this key for faunistic studies, one must at least keep in mind the possibility of laying eggs by thrushes in other bird's nests, as exemplified by a Song Thrush's clutch in a Blackbird nest, described by TICEHURST (1933). On the other hand, other birds, such as, e. g., *Tringa ochropus*, may also occupy the nests of thrushes (see SOKOŁOWSKI, 1958).

I think that in spite of all these qualifications the key, with the help of which the clear majority of nests of thrushes can be identified, may appear serviceable in field study.

KEY

Inner diameter from 6.5 to 14.5 cm. Structure obviously including several (2—3) layers, of which one is plastering (in some nests invisible until the nest has been broken). The basic material of plastering in some nests is mud (loam, clay) alone or with a small admixture of vegetable fragments; rotten wood, dung or putrefying leaves from the previous year as well as small plant fragments cemented together mostly with a small amount of mud predominate in other nests . . . . . *Turdus* (genus) *

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* Analogous plastering occurs also in other genera of the *Turdinae*, such as *Zoothera* or *Catharus*, which, however, do not belong to the breeding fauna of Europe.

A. 1. Nest consist of 2 main layers: external layer, generally of considerable thickness, built of various vegetable materials and relatively thin plastering, without any soft lining on it (fig. 3A) . . . *Turdus philomelos*
2. Nest of 3 layers; inside the nest, on plastering, lining of delicate vegetable material, varying in thickness but mostly thick. The lining may, however, be scanty and then the plastering is visible through it . . . . . B

B. 1. Plastering composed of mud (clay and the like) or of mud with an admixture of vegetable materials (leaves, grass, or small pieces of them etc.) C
2. Plastering is made up of a compact layer of putrefying plant fragments (tree-leaves, fragments of mosses, ferns, etc.) mostly with a small amount of mud, sometimes without it . . . . . K

C. 1. Thickness of plastering small; it often does not exceed 1 cm., even in the region of the bottom, where it is generally thickest. In the side walls the plastering is very thin and in some cases does not reach the nest rim. External layer abundant or very abundant . . . . . D
2. Plastering of mud or clay, thick and solid, often much thicker than relatively thin adjacent external layer . . . . . H

D. 1. Nest lining scanty; plastering in side walls visible through it (Fig. 3B — lower nest) . . . . . *Turdus iliacus*
2. Nest lining thick and soft, entirely concealing the plastering . . . . E

E. 1. Inner diameter up to 9 cm . . . . . *Turdus iliacus*
2. Inner diameter above 9 cm . . . . . G

F. 1. Plastering of mud or mixed with small fragments of plants; inner diameter rarely exceeding 8.5 cm . . . . . *Turdus iliacus*
2. Plastering layer of grasses, leares or their large fragments cemented with mud or silt; inner diameter never below 8.5 cm . . *Turdus viscivorus*

G. 1. Rim of nest always distinct; plastering of mud, often mixed with vegetable material, in the floor reaching 15 mm. and more, in the side walls thinner, stretches up almost to the rim. External layer does not exceed 2 cm. (often thinner) . . . . . *Turdus viscivorus*
2. Nest rim indistinct as a seperate structural element or often absent at all. Plastering of vegetable fragments (pieces of decayed leaves, bark, moss) mixed with various amounts of mud, mostly thin, in walls very thin, often does not reach the nest edge; may be incomplete, confined to the bottom layer (Fig. 3F-upper nest). Part of inwardly situated material of the external layer may be cemented with small quantities of mud, and then the passage from this layer to the plastering is gradual. In the walls the thickness of the external layer may reach 3 cm. and more at places. The lining material is often apparently lighter and demarcated from the external layer . . . . . *Turdus torquatus*

H. 1. External layer thin, in the upper part of the walls firmly cemented with the mud of plastering, reaching up to the rim (Fig. 4.C). Mud vi-

sible from the outside in the rim and side walls of nest. Lining abundant and soft in new nests — in the used ones it may be trodden down at the bottom by the nestlings and partly uncover the plastering from the inside . . . . . *Turdus pilaris*

2. External layer somewhat thicker, the mud of plastering cannot often be seen through it, if visible, mostly in the rim of used nests (after the removal of a nest, mud can also be seen in places where it touched the branch, rock or the like) I

I. 1. Plastering of mud or last year's leaves caked with mud, always thick in walls (in the bottom it may be either thicker or thinner than in the walls) and reaching the rim in the form of one layer or more (Fig. 3E-upper nests) . . . . . *Turdus merula*

2. Plastering, generally of mud or mud with an admixture of small vegetable fragments, in the upper portion of walls, below the rim, thin or even lacking (it may cover only the lower portion of walls) . . . . . J

J. This type of nests is for the most part referred to the Mistle Thrush *T. viscivorus* and in small proportions to the Ring Ouzel *T. torquatus alpestris* (the last type of nests occurs far more rarely than that described in item E. 2.). On account of difficulties in reliable distinction I give the characters speaking for one species or for the other, which however do not exhaust all the possibilities. This remark concerns only these areas of Central Europe in which the Ring Ouzel occurs, i. e., mountain forests.

1. Nests placed in young coniferous trees (spruce, fir), in dwarf mountain pines, among twigs of shrub alders etc., or on rocks . . . . . *Turdus torquatus*

2. Nests placed on thick branches of large pines or on deciduous trees more than 8 m. above ground . . . . . *Turdus viscivorus*

3. Nests placed on beams of houses (this concerns the range of the „garden" Mistle Thrush in Western Europe), in villages . . *Turdus viscivorus*

4. Nests placed in old firs and spruces, against trunk or distant from it, but not more than 4—5 m. above ground . . . . . presumably *Turdus torquatus*

Nest-sites in deciduous trees, against the trunk, on thick branches and high up in spruces and firs rather suggest *T. viscivorus*, because the nests of *T. torquatus* in such sites 1° — occur rarely, 2° — correspond mainly to the type described in item E. 2.

K. 1. Plastering composed of whole putrefying leaves or their fairly large fragments. This layer may be confined to the bottom portion of the nest (Fig. 3E-lower nest . . . . . *Turdus merula*

2. Plastering containing small fragments, chiefly of mosses and ferns, and also small (and unfrequent) pieces of leaves or little leaves . . . . . *Turdus torquatus*

X. THE STRUCTURE OF NESTS OF SOME EXTRA-EUROPEAN SPECIES OF THE *TURDINI*

For practical purposes I have assumed the division of the group in question into genera after RIPLEY (1952), though the structure of nests does not support this system in all its details. The order in which the species are here described has not, however, been supposed to suggest any close phylogenetic relationships. I simply want to present the descriptions of the structure of nests of some dozen species that I managed to examine in different collections. These descriptions have been confronted with the data from literature and completed with the descriptions of nests of other species, which I have not seen personally, quoted after different authors.

Turdus chrysolaus TEMMINCK, 1831

1 nest of the collection of W. E. FLINT (Moscow). Measurements: in. dia. about 90 mm., out dia. 145 mm., height 100 mm., depth 50 mm. External layer of bast, birch sticks, small amount of grass and several leaves, not very abundant. Distinct rim of grass blades. Plastered thickly with mud and lined with soft grass.

Turdus pallidus GMELIN, 1789

1 nest from south-western Primorsk, in the collection of W. E. FLINT (Moscow). Measurements: in. dia. 82×92 mm., out. dia. about 140×150 mm., height 86 mm., depth 50 mm. External layer of large quantities of dead long grass blades is not very thick. The nest rim is built of the same grass leaves and rootlets. The nest is plastered with mud, which is, however, lacking on the side adjacent to the tree trunk. Lining of rootlets, pieces of grass blades and several leaves.

Turdus ruficollis PALLAS, 1776

1 nest of the nominative form *T. r. ruficollis* PALLAS, 1776 in the collection of W. E. FLINT (Moscow). Measurements: in. dia. 85×103 mm., out. dia. 120×150 mm., height about 90 mm., depth 50 mm. The external layer contains grass, moss, stalks and 1 spruce twig. Rim very thick, woven of stalks. Mud of plastering mixed with some moss. Lining, of fine grass, very thick and soft. 1 nest of the form *T. ruficollis atrogularis* JAROCKI, 1819 from the Yenisey region near Krasnoyarsk, in the collection of W. E. FLINT (Moscow). Measurements: in. dia. 102×105 mm., out. dia. 130×135 mm., height 120 mm., depth 75 mm. Thin external layer of grass and stalks, thick rim of stalks. Nest plastered thickly with large amount of mud, lined with stalks.

The description of the external layer given by MALYSHEV (1960) agrees with the present one, but he does not mention about plastering, the presence of which is emphasized by GROTE (1935). BAKER (1924) writes about the nests of the subspecies *atrogularis* that they are „sometimes with an inner lining of mud, sometimes without", and GLADKOV (1954) mentions earth in the descriptions of nests of both subspecies. JOHANSEN (1954) states the same clearly about *atrogularis*.

Turdus naumanni TEMMINCK, 1820

1 nest of the nominative form *T. n. naumanni* TEMMINCK, 1820 from Siberia, in the collection of W. E. FLINT (Moscow). Measurements: in. dia. 90×102 mm., out. dia. 150×160 mm., height 80 mm., depth 60 mm. The external layer is mainly of grass with an addition of moss and several leaves. Rim, of grass and stalks, marked off distinctly. Mud plastering, though thick, invisible from the outside. The inside of nest lined with delicate grass.

4 nests of the form *T. naumanni eunomus* TEMMINCK, 1831 from Siberia, among other places from the Yakutsk region and Taymyr; 2 nests in the collection of W. E. FLINT (Moscow) and 2 in the collection of SPANGENBERG (Moscow), who presented one to the author of this paper (Phot. 14). Measurements: mean inner diameter ranges from 95 to 98 mm., outer diameters from 132 to 150 mm., heights 90—105 mm., depths 60—72 mm. The main material of the external layer is smoothly woven grass (present in all the nests examined). This layer contains also spruce twigs and thin stalks. The thick mud plastering reaches up to the distinct rim of grass and/or stalks. In 2 nests the mud is visible through the material of the external layer. The inner lining, of thin and dry grass blades, in one of the nests so scanty that the mud plastering is visible through it (the destruction of lining by nestlings is, however, out of the question, since when the nest was collected there were 5 eggs in it); in the remaining 3 nests the lining was thicker. These nests correspond with the descriptions given by GLADKOV (1954) and VOROBEV (1959).

Turdus hortulorum SCLARER, 1863

3 nests from Siberia, in the collection of W. E. FLINT (Moscow). Measurements of 2 nests (the third destroyed): mean in. dia. 82.5 and 87.5 mm., out. dia. 135 and 112 mm., height 90 and 85 mm., depth 50 and 45 mm. External layer of grass, stalks, leaves and moss. Rim of stalks and rootlets, distinct. Thick mud plastering, up to the rim (rather visible from the outside). The inside of nest lined with a thin layer of dry grass.

Turdus sibiricus PALLAS, 1776

1 nest from on the Yenisey, in the collection of W. E. FLINT (Moscow). Measurements: in. dia. 100×80 mm., out. dia. not given, height 70 mm., depth 45 mm. Stalks, several millimetres thick, present in the external layer, as well as in the well-defined rim, where they are partly broken. Thick plastering of large quantities of mud. Lining of broken grass blades. The present description agrees with that presented by BAKER (1924).

Turdus migratorius LINNAEUS, 1758

1 nest from Ithaca, in the collection of the Tring Museum (N. 36. 1). Measurements: in. dia. 86×94 mm., out. dia. 115×125 mm., height 65 mm., depth 42 mm. External layer of grass, stalks and rootlets. The thick plastering of large amounts of mud reaches up to the rim. At places, the mud is visible through the external layer. Lining of delicate grass.

The descriptions quoted by BENT (1949) from different publications on various

subspecies reveal considerable variation in the choice and amount of material. Nests are plastered with a large amount of material, which, however, is not visible from the outside in all of them.

Turdus boulboul (LATHAM, 1790)

9 nests from the southern slopes of the Himalayas (Sikkim and Eastern Nepal), in the collection of the Tring Museum (N. 219. 392 — 219. 400). Measurements: in. dia. 80—92.5 mm., (mean 87.7 mm.) out. dia. about 115—160 mm., height 50—70 mm., depth 25—55 mm. External layer thick, built in the first place of moss (present in all these nests) then (in the order of frequency) of rootlets, stalks, grass blades, pieces of fern and sticks. Nest rim indistinct or lacking at all. Mud plastering scanty, in most nests confined to the bottom part, in one case was not found at all. Inside the nest a thin lining of rootlets. The foregoing data coincide with the description of BAKER (1924).

The occurrence of a distinguishable hard layer of plastering of mud or other substances (e. g., rotten wood mixed with mud, dung, etc.), or the cementing of part of nest material with mud (earth) is observed not only in most of the Holarctic members of the genus *Turdus*. Among the Neotropical species, the use of mud in nest building has been found in *Turdus rufiventris* VIEILLOT (EULER, 1900) and *T. leucomelas* VIEILLOT CARVALHO, 1957; IHERING, 1900). Although HAVERSCHMIDT (1959) does not mention mud when writing about this last species, he emphasizes the resemblance of its nest to that of the European Blackbird. The nest of *T. fumigatus* LICHENSTEIN has been defined in a similar way by WIED (after EULER, 1900). The use of mud is clearly pointed to also in the descriptions of nests of *T. nudigenis casius* (BONAPARTE) (syn.: *T. grayi casius*, used by BLAKE, 1956) and *T. albicollis* VIEILLOT from Brazil (EULER, 1900; IHERING, 1900). Oddly enough, the description of a nest of *T. albicollis cnephosus* (BANGS) from Panama given by BLAKE (1956: "*Turdus assimilis cnephosus*... The nest consisting of a little more than a shallow cup loosely constructed of coarse twigs...") rather suggests the lack of plastering.

As regards the African species mentioned by ARCHER and GODMAN (1961), BANNERMAN (1953), CHAPIN (1953), CLANCEY (1964), NEWMAN (1967) and WINTERBOTTOM (1966), in the case of the nests of *Turdus libonyanus* (SMITH) CLANCEY (1964) NEWMAN (1967) and CHAPIN (1953) write clearly about the strengthening of nests with mud, whereas BANNERMAN (1953) is silent about plastering in connection with this species. Similarly, only CHAPIN (1953) NEWMAN (1967) write about the use of mud for building nests in *Turdus olivaceus* LINNAEUS, which fact has not been mentioned by CLANCEY (1953) and WINTERBOTTOM (1966). Nothing has been written about plastering in the nests of *Turdus olivaceofuscus* HARTLAUB, *T. litsipsirupa* (SMITH), *T. fischeri* HELMAYER and *T. ludoviciae* (PHILIPS).

Confrontations of the descriptions of nests made by different authors seem to suggest that the lack of a mention on the plastering layer of nests need not imply its actual lack but may be connected with the description of the external

appearance only, as was the case with some authors describing the nests of the European species (see sections on *T. iliacus* and *T. torquatus*).

Zoothera dauma (LATHAM, 1790)

1 nest from Ceylon, in the collection of the Tring Museum (N. 194. 1), labelled: *Zoothera dauma imbricata*. According to VAURIE (1959), this name is synonymous with the nominative form. Measurements: in. dia. 80 mm., out. dia. 140 mm., height 80 mm., depth 30 mm. The external layer consists of a large amount of moss and is poorly plastered with mud on the inside. Thick lining of very delicate rootlets and grass.

1 nest from southern Primorsk, in the collection of W. E. FLINT (Moscow), which on account of the locality should be included in the subspecies *Z. dauma aurea* (HOLANDRE, 1825). Measurements: in. dia. about 100 mm., out. dia. 200×250 mm. (the height and depth were not measured because the nest was flattened). Very much green moss on outside; rim of moss, plaster of mud, lining of stalks, grass blades with an admixture of rootlets and pine needles.

1 nest from Japan, in the collection of the Tring Museum; in VAURIE'S (1959) opinion, therefore, it belongs to the subspecies *Z. dauma toratugumi* (MOMIYAMA, 1940). Measurements: in. dia. 95×120 mm., out. dia. 160×185 mm., height 90 mm., depth 50 mm. External layer of a large amount of moss, stalks and sticks, very thick, from the inside plastered with mud and lined with pine needles.

1 nest from south-eastern New Guinea, in the collection of the Tring Museum (N. 193. 453), designated „*Geocichla papuansis*", and so according to RIPLEY (1952) *Zoothera dauma papuensis* (SEEBOHM). Measurements: in. dia. 85× 90 mm., out. dia. 140×150 mm., height about 80 mm., depth 45 mm. External layer of a large quantity of moss, which is plastered with mud on the inside. Inner lining of a thick layer of delicate rootlets.

Zoothera monticola VIGORS, 1831

2 nests from the Roungbong Valley, the Sikkim Himalayas, in the collection of the Tring Museum (N. 219. 384, 219. 391). Measurements: in. dia. 85×100 mm., and 80×90 mm., out. dia. 155×140 mm. and 120×110 mm., height 70 and 50 mm., depth 40 and 20 mm. External layer of stalks, grass blades, rootlets and moss, varying in thickness, on the inside cemented with a small amount of mud, especially in the bottom layer. Thick and elastic lining of delicate rootlets with an addition of grass blades.

Zoothera marginata BLYTH, 1847

3 nests from the Roungbong Valley, the Sikkim Himalayas, in the collection of the Tring Museum (N. 219. 389, 386, 390). Measurements: in. dia. 85 mm., 85×90 mm., 90×95 mm., out. dia., respectively, 120 mm., 110×115 mm., 130×140 mm., height 50, 50 and 60 mm., depth 25, 35 and 35 mm. External layer of moss, rootlets and stalks, of varying thickness, on the inside glued together with a small quantity of mud. Thick inner lining layer of delicate rootlets.

According to GLADKOV (1954), in the nests of *Z. dauma varius* (PALLAS, 1811) there is some earth brought in together with other materials. BAKER (1924) writes that the above-discussed species do not use earth and mud to build nests. As for *Z. citrina* (LATHAM, 1790), he thinks that the presence of some amount of mud distinguishes the nests of the subspecies *Z. c. cyanota* (JARDINE et SELBY) from those of the nominative form. CLANCEY (1964) does not mention the use of earth in his description of the nest of the African species *Zoothera gurneyi* (HARTLAUB, 1864).

Catharus (= *Hylocichla*) *minimus* (LAFRESNAYE, 1848)
1 nest from East Siberia and so belonging to the subspecies *aliciae* (BAIRD) = *bicknelli* (RIDGWAY), in the collection of W. E. FLINT (Moscow). Measurements: in. dia. 70×73 mm., out. dia. 110 mm., height 80 mm., depth 50 mm. The fairly thick external layer is made of rather loosely arranged dead leaves of grass and pieces of straw. The rim is distinct, built of bent blades of grass. The inner mud plastering is invisible from the outside. Thick lining of delicate grass blades.

The foregoing coincides with the description presented by GLADKOV (1954). BENT (1949) says nothing about plastering in connection with this subspecies and about a small amount of mud with the nominative form, whereas WALLACE (1939) is inclined to state that plastering is „decayed organic matter".

The descriptions of nests of other species numbered by RIPLEY (1952) in the genus *Catharus* included in the monograph by BENT (1949) show that a layer of mud or mud mixed with vegetable fragments occurs only in the nests of *C. mustellinus* (GMELIN). In nests of *C. ustulatus* (NUTTAL), *C. fuscescens* (STEPHENS) and *C. guttatus* (PALLAS) no layers of mud were found, at most putrefying leaves and the like.

Monticola saxatilis (LINNAEUS, 1758)
1 nest collected by the author in the Vertes Mts. in western Hungary. Measurements: in. dia. about 90 mm., out. dia. 115×140 mm., height 50 mm., depth 30 mm. The foundation is of moss, dry stalks and grass blades, the last of which are also used to make the walls. The nest is lined inside with delicate rootlets. There is no plastering at all. The structure as a whole is fairly loose. This picture agrees with the descriptions from southern Poland given by TACZANOWSKI (1862) and those of GLADKOV (1954), FATIO (1899) and MARTORELLI (1960), only that these authors also mention hair and wool in the lining. None of them mentions plastering.

Monticola solitarius (LINNAEUS, 1758)
1 nest from Malta, in the collection of the Tring Museum. Measurements: in. dia. 90×95 mm., out. dia. 140 mm., height 50 mm., depth 35 mm. On the outside and at the base there are loosely arranged stalks and rootlets. Little earth in the bottom layer (presumably from the substratum). Nest lined with very delicate springy rootlets. These characters are confirmed by the descriptions of WHITAKER (cited after ARCHER and GODMAN, 1961) from Tunisia,

GLADKOV (1954) from southern Russia and MARTORELLI (1960) from Italy. None of these authors writes about plastering.

The data concerning the structure of nests of the Asiatic species of the genus *Monticola*, i. e., *M. gularis* (SWINHOE, 1862), *M. erythrogaster* (GULDENSTAEDT, 1778) and *M. cinclorhynchus* (VIGORS, 1831) included in the papers by NEUFELDT and SOKOLOV (1960) and NEUFELDT (1966), and the South-African species: *Monticola brevipes* (WATERHOUSE), *M. rupestris* LINNAEUS, 1758 and *M. explorator* (VIEILLOT, 1818) published by FARKAS (1962—63) show that though the nests of these species consist of 2—3 layers, still they lack any plastering at all, whether of mud, clay or decayed organic matter. The nests are relatively loosely constructed and in their pattern are, as a rule, very similar to those of the European species described above.

Myophonus caerulaeus (SCOPOLI, 1786)
1 nest from Tadzhikistan, in the collection of W. E. FLINT (Moscow). No measurements were taken because of its being considerably compressed. A large nest with a large amount of moss and rootlets on the outside and lined with delicate rootlets on the inside. Loose. No plastering. The descriptions of the nests of the subspecies *M. c. turcestanicus* SARUDNY, 1909 (which was probably represented also by the above-mentioned nest) given by GLADKOV (1954) and GROTE (1926) are analogous. BAKER (1924) writes about the nest of this species from India, and thus belonging to another subspecies, that it is „a very solid cup, made of living moss with the muddy roots, still adhering to the moss and mixed up with it, whilst the lining is of the fine dry maidenhair fern and moss-roots". The description of a nest of another species, *M. horsfieldii* VIGORS, 1831, given by the same author, shows a great likeness.

XI. FINAL REMARKS AND CONCLUSIONS

The lack of data on the structure of nests of different exotic species and even genera (often containing only one species), such as *Geomalia* and *Cataponera* from Celebes, *Amalocichla* from New Guinea, *Nesocichla* from Tristan da Cunha and *Cichleherminia* from the West Indies, does not allow me to embrace the whole of the problem and to carry out close comparative studies on the group in question. Nevertheless, the detailed investigation of the nests of 6 European thrushes presented in this paper and the perfunctory descriptions of the nests of a number of other species (all in all more than twenty), completed with the data from literature, allow several remarks, which seem interesting.

1. The most distinctive characters of nests of the particular species of thrushes i.e., those showing the smallest variation and differentiation, with a wide range of adaptive capabilities are the length of the inner diameter of the nest and its general constructional pattern, depending on the maintaining of steady relations between individual layers despite differences in materials, site, etc.

2. The nests of the Song Thrush *Turdus philomelos* represent a constructional pattern unknown in nests of other thrush species. In the inside, they have no soft, even residual, lining on the plastering layer (irrespective of the composition of this last). It is present, varying in thickness, in other species (even very perfunctory and quite superficial descriptions of nests of exotic species mention it).

3. A resemblance in external appearance between the nests of the Ring Ouzel *T. torquatus* and those of the Blackbird *T. merula* is due to the fact that both these species use similar materials to construct the external layer of the nest in the same or similar environments. In most cases a comparison of the inner structure of the nests and their sections show clear-cut differences expressed in the thickness ratio of the external layer to the plastering (see section IX and Fig. 3). On the other hand, it should be emphasized that in both these species there occur nests (varying in frequency) in which the basic material of plastering is putrefying vegetable fragments with a small admixture of mud (in extreme cases even without mud). The thickness ratios of the external layer to the plastering are quite similar in *T. torquatus* and *T. boulboul* as well as, if one bases oneself on the description by BAKER (1924), in *T. rubrocanus* (= *castaneus*). Among the nests of genus *Turdus* similar relations in thickness occur also, partly, in *T. iliacus*. In other related genera the thick external layer plastered thinly from the inside occurs in *Zoothera* (above-described species) and in *Catharus minimus*.

4. The nests of the other three European species, i. e., *Turdus viscivorus*, *T. merula* and *T. pilaris* are relatively similar to each other. They have a fairly thin (*T. viscivorus*) or very thin (the 2 other species) external layer, under which there is a thick plastering of mud. In *T. pilaris* the external layer is so thin that the mud plastering is visible through it in most cases. Out of the extra-European species of the genus *Turdus*, roughly, the nests of all the other species hitherto examined may be classified in this group. If we, however, assume the structure pattern of the nest of *T. pilaris* (Fig. 3C) as the most typical of this group, the nests of *T. migratorius*, *T. naumanni* and *T. hortulorum* and then the majority of nests of *T. merula* reveal the greatest resemblance to it. More of the exotic species might probably be included in this group, but the descriptions of their nests available in literature are often too perfunctory to do it without a risk of error.

5. The nests of the genera *Monticola* and *Myophonus* are similar in structure and layers to those of the genera *Oenanthe and Saxicola* and not to the nests of the genus *Turdus* described in this paper.

Inference on phylogenetic relationships (and systematic possition) of birds on the basis of nest structure has as yet been adopted by MAYR and BOND (1943) for specific classification of swallows, whereas LACK (1956) has based on it his survey of the species of swifts. In MAYR'S (1958) opinion, the changes in the systemaitc positions of species, genera or group of genera, proposed on the basis of nest structures in the above-mentioned works, were next con-

firmed by morphological evidence. Further, MOREAU (1960) based the systematic division of weaverbirds on the structure of their nests and CROOK (1963), having made more analyses of nests, introduced some modifications into his division.

According to PROMPTOV (1945), in birds the method of formation of the nest is innate. This is evidenced, in addition to his experiments, by the observations of young *Turdus viscivorus* and *Catharus ustulatus* performing movements typical of adult females when they form nests (GOODWIN, 1954; DILGER, 1956a). The movement stereotype connected with the formation of nest, especially with its final stage, the formation of nest-cup, innate and characteristic of a species or a group of related species, is reflected in the fact that the inner diameter of the nest in particular species is least differentiated and its coefficient of variation is the smallest. It is naturally different in various birds, being dependent on many factors, among other things, on the stiffness and elasticity of the material used for building, but nevertheless this dimension is always the most characteristic one (BOCHEŃSKI, 1957, 1961, 1962, 1966).

The innate method of formation of the nest-cup makes all the species of the genus *Turdus* examined in this study continue building the nest up to the stage of a smoothly plastered basin, which, in addition, most species line with various amounts of delicate vegetable material. The same innate agents, to be sure, control the stage at which, in the course of nest building, the bird begins to bring mud or other materials (wet rotten wood, dung) used to plaster (strengthen) the nest. This, in turn, has an effect on the general pattern of the nest and the mutual relations between the external and the plastering. The foregoing considerations seem to allow several conclusions based mainly on the items specified at the beginning of this section and concerning the systematics of thrushes. Unlike the papers of MAYR and BOND (1943) and LACK (1956), which referred chiefly to genera, but similarly to those of MOREAU (1960) and CROOK (1963), these conclusions will, above all, concern the phylogenetic relationships between the species within the genus *Turdus*.

1. *Turdus philomelos* constitutes a completely distinct branch within the genus. This disagrees with the systematics put forward by DORST (1950), who included the genus *Catharus* (= *Hylocichla*) in the genus *Turdus* and united with *T. philomelos* into one group. This suggestion is undermined by the lack of plastering in the nests of some members of the genus *Catharus* and the occurrence of abundant lining. On the other hand, the present conclusion based on the nest structure quite coincides with the conclusion made by ETCHECOPAR (1950) on the basis of the coloration of eggs.

2. *Turdus torquatus* shows the closest affinity to *T. boulboul* and, presumably, to *T. rubrocanus*. I cannot say anything about *T. albocinctus* and *T. kessleri*, but the systematic position of *Turdus merula*, which is regarded by DROST (1950) as a typical member of this group, is uncertain, for, on the one hand, its relationship to *T. torquatus* would be supported by the possibility of using putrefied vegetable remains (leaves), on the other hand, however, the thick

plastering with mud present in most nests and accompanied by a thin external layer of the wall may indicate a closer kinship to the group of thrushes including *T. naumanni*, *T. pilaris*, *T. ruficollis*, *T. hrysolaus*, *T. hortulorum* and *T. pallidus*. The types of egg coloration (ETCHECOPAR, 1950) seem to point to both these alternatives. At any rate, they do not deny them.

3. The exact resemblance of the nest of *T. migratorius* to those of *T. pilaris*, *T. naumanni* and *T. hortulorum* would indicate a close phylogenetic relationship of these species. This, however, does not find support in a distinct type of egg coloration (ETCHECOPAR, 1950). On the other hand, it agrees with the opinion of PORTENKO (in litt.) based on morphological characters.

4. The nest structure of *T. sibiricus*, which DORST (1950) did not include in the genus *Turdus* and RIPLEY (1952) placed in the genus *Zoothera*, though next GLADKOV (1954) and VAURIE (1959) numbered it again in the genus *Turdus*, in which it had been described by PALLAS, diverges decidedly from the nests of *Zoothera* and owing to the thick layer of mud plastering indicates the connections with the genus *Turdus*.

5. The occurrence of a distinct layer of mud in the nests of *Catharus mustellinus* and their similarity in structure to the nests of *T. migratorius*, observed by BENT (1949), seems to coincide unincidentally with great similarities, found by DILGER (1956 b), between these species in behaviour and anatomic structure, on the basis of which this author suggests a very close phylogenetic relationship and in the future even the inclusion of *C. mustellinus* in the genus *Turdus*. The species *C. minimus*, in which the plastering layer does not occur in all nests (see the previous section), may consequently be placed, in theory, between *C. mustellinus* and the remaing species of this genus discussed in the present study.

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REFERENCES

Aleksandrova, I. V. 1956. Nekotorye dannye o gnezdovanii drozdov. Puti i metody isp. ptic v borbe s vred. nasek. Moskva: 127—129.

Alexander, H. G. 1928. Mistle-Thrush's Nest on a Fence. Brit. Birds, London, **22**(2): 67.

Archer, G., Godman, E. M. 1961. The Birds of British Somaliland and the Gulf of Aden, Edinburgh — London, **4**.

Baker, E. C. Stuart 1924. The Fauna of British India including Ceylon and Burma, Birds, London, **2**.

Bannerman, D. A. 1953. The Birds of West and Equatorial Africa, Edinburgh — London, **2**.

Bannerman, D. A. 1954. The Birds of British Isles. London, **3**.

Bartholomew, J. 1954. The Edinburgh World Atlas. Edinburgh.

Bent A. C. 1949. Life Histories of North American Thrushes, Kinglets and their Allies. U. S. Nat. Hist. Mus. Bull., Washington, Smiths. Inst., **196**.

Blake, E. R. 1956. A Collection of Panamanian Nests and Eggs. Condor, Berkeley, **58**(5): 386—388.

Bocheński, Z. 1957. Obserwacje nad umiejscowieniem i budową gniazda u muchołówki szarej *Muscicapa striata* (Pall). Zesz. Nauk. UJ, Zoologia, Kraków, **2**: 77—83.

Bocheński, Z. 1961. Nesting Biology of the Black-necked Grebe. Bird Study, Oxford, **8**(1): 6—15.

Bocheński, Z. 1962. Nesting of Black-headed Gull *Larus ridibundus* L. Acta zool. cracov., Kraków, **7**(6): 87—120.

Bocheński, Z. 1966. Nesting of Common and Black Terns. Acta zool. cracov., Kraków, **11**(14): 423—462.

Borowski, S. 1962. Drozd rdzawoboczny *Turdus iliacus* L. ptakiem lęgowym w Puszczy Białowieskiej. Przegl. Zool., Wrocław, **6**(3): 229—230.

Bykov, A. M. 1896. Kollekcji Zoologičeskago Kabineta Imperatorskago Varšavskago Universiteta. III. Spisok i opisanje kollekcji bo piologji ptic Privislinskago Kraja. Vyp. I.

Campbell, B. 1953. Finding Nests. London.

Carvalho, C. T. de 1957. A nidificação do *Turdus l. albiventer* Spix. Bol. do Museu Paraense E. Goeldi, Belem, Para, **4**: 1—13.

Chapin, J. P. 1953. The Birds of the Belgian Congo. Part 3. Bull. Am. Mus. N. H., New York, **75 A.**

Clancey, P. A. 1964. The Birds of Natal and Zululand. Edinburgh — London.
Cohen, E. 1933. Song-thrush's nest without mud linning. Brit. Birds, London, 27(1): 25..
Cordes 1937. Die Misteldrossel als Dorfbewohnerin in Osnabrücker Land. Orn. Monatsber., Berlin, **45**(2): 46—48.
Corti, U. A. 1949. Einführung in die Vogelwelt des Kantons Wallis, (Die Vogelwelt der Alpen, **3**), Chur.
Corti, U. A. 1952. Die Vogelwelt der Schweizerischen Nordalpenzone, (Die Vogelwelt der Alpen, **4**). Chur.
Crook, J. H. 1963. The Asian Weaver Birds: Problems of coexistence and evolution with particular reference to Behaviour. J. of the Bombay N. H. Soc., **60**(1): 1—48.
Czarnecki, Z. 1956. Materiały do ekologii ptaków gnieżdżących się w śródpolnych kępach drzew. Ekol. Pol. ,Warszawa, (A)**4**(13): 379—417.
Černy, A. 1963. Hnízdění drozda zpěvného (*Turdus ericetorum* Turt.) na technických zařizenich. Živa, Praha, **11**(5): 178—179.
Danilov, N. N., Tapchevska, V. A. 1962. Geograficheskaya izmenchivost' razmnoženiya i belobrovika na Urale. Ornitologija, Moskva, **4**: 142—152.
Davies, S. J. J. F., Fraser Rowell, C. H. 1960. Observations of the Redwing in Swedish Lappland. Bird Study, Oxford, **3**(4): 242—248.
Dilger, W. C. 1956a. Nest-building movements performed by a juvenile Olive-backed Thrush. Willson Bull., Morgantown, **68**(2): 157—158.
Dilger, W. C. 1956b. Relationships of the Thrush Genera *Catharus* and *Hylocichla*. Syst. Zoology, Baltimore, **5**(4): 174—182.
Dobrowolski, K. A. 1963. Próba analizy pojęcia „rzadki gatunek". Ekol. Pol., Warszawa, (B)**9**(3): 207—212.
Dolgushin, I. A., Sludskij, A. A. 1960. Iz rezultatov ornitologicheskich issledovanij v Centralnom Kazachstane. Perv. Vsechs. Orn. Konf., Trudy Probl. i Temat. Soveshch., Moskva—Leningrad, **9**: 67—72.
Dorst, J. 1950. Considerations systematiques sur les grives du genre *Turdus* L. L'Oiseau et la Rev. Fr. d'Orn., Paris, **20**(3—4): 121—248.
Dyrcz, A. 1963. Badania porównawcze nad awifauną środowisk: leśnego i parkowego. Acta Ornith., Warszawa, **7**(11): 337—385.
Etchecopar, R. D. 1950. Contributions oologiques a l'etude systematique du genre *Turdus*. L'Oiseau et la Rev. Fr. d'Orn., Paris, **20**(3—4): 249—262.
Euler, C. 1900. Descripção de ninhos e oues das Aves do Brasil. Riv. do Museu Paulista, St. Paulo, **4**: 9—148.
Farkas, T. 1962—63. Zur Biologie und Ethologie der Südafrikanischen Arten der Gattung *Monticola* (Boie). Die Vogelwelt, Berlin — München, **83**(4): 97—116, **83**(6) :161—173, **84**(1): 11—22.
Farner, D. S. 1960. Digestion and Digestive System [in: "Biology and Comparative Physiology of Birds", New York — London, **1**: 411—467].
Fatio, V. 1899. Faune des vertébrés de la Suisse. Geneve et Basle, **2**.
Ferens, B., Wojtusiak, R. J. 1960. Ornitologia Ogólna. Warszawa.
Ferianc, O. 1965. Stavovce Slovenska. III. Vtáky, **2**. Bratislava.
Ferianc, O. 1966. Die Verbreitung der Wacholderdrossel in der Slovakei nebst einigen Bemerkungen zu ihrer Ökologie. Acta F. R. N. Univ. Comen., Zoologia, Bratislava, **13**: 25—38.
Fischer, W. 1955. Zum Vorkommen der Ringdrossel *Turdus torquatus* L. im Oberen Erzgebierge. Beitz. z. Vogelk., Leipzig, **5**(1): 29—39.
Fitter, R. S. R., Richardson, R. A. 1954. The Pocket Guide to Nests and Eggs. London.
Fric, F. 1958. Z poznámek ornitologa. Živa, Praha, **6**(6): 239—240.
Gladkov, N. A. 1951. Pricy Timanskoy tundry. Sb. tr. Zool. Muzeya M. G. U., Moskva, **7**: 15—89.
Gladkov, N. A. 1954. *Turdidae* [in: Pticy Sovetskogo Soyuza, Moskva, **6**: 399—621].

GOODWIN, D. 1954. Juvenile Mistle Thrushes showing reproductive behaviour-patterns. Brit. Birds, London, **47**(3): 81—83.

GRACZYK, R. 1954. Kwiczoł (*Turdus pilaris* L.) w Parku Miejskim w Toruniu. Chrońmy przyr. ojcz., Kraków, **10**(6): 46—49.

GRACZYK, R. 1959. Badania nad występowaniem i stanem ilościowym kosa (*Turdus merula* L.) w Polsce. Ekol. Pol. ,Warszawa, (A)**7**(3): 55—82.

GRACZYK, R. 1960. Z badań nad liczebnością kosa *Turdus merula* L. w Poznaniu w latach 1958 i 1959. Przegl. Zool., Wrocław, **4**(3): 223—228.

GRACZYK, R. 1963. Badania eksperymentalne nad etologią gatunków z rodzaju *Turdus*. Roczn. WSR w Poznaniu, **17**: 21—71.

GROTE, H. 1926. Zur Fortpflanzungsbiologie einiger wenig bekannter paläarktischer Vögel. Beitr. Fortpfl. d. Vögel, Berlin, **2**(4): 99—102.

GROTE, H. 1935. Zur Oekologie und Biologie von *Turdus ruficollis* und *Turdus atrogularis*. Beitr. Fortpfl. d. Vögel, Berlin, **11**(6): 215—217.

GYÖRY, J. 1960. Data on the nesting of the Coal Tit, Crested Tit, Tree Creeper and Mistle Thrush. Aquila, Budapest, **66**: 314—315.

HARTMANN, J. 1963. Misteldrossel *(Turdus viscivorus)* bütet in einem Nistkasten. Orn. Mitteil., Hamburg, **15**(5): 112—113.

HALLADIN, R. 1935. Próba analizy budowy gniazd ptasich na terenach Nadleśnictwa Czarnożyły. Prace Kom. Mat.-Przyr. Poznańskiego Tow. P. N., (B)**7**(5): 1—108.

HAVERSCHMIDT, F. 1959. Notes on the nesting of *Turdus leucomelas* in Surinam. Wilson Bull., Morgantown, **71**(2): 175—177.

HAVLÍN, J. 1962. Nároky kosa černého *Turdus merula* L. na prostředi. Prácé Brněnské zakl. ČSAV, **34**(1): 1—48, 4 tabl.

HEYDER, R. 1953. Die Amsel. Die Neue Brehm Bücherei, Leipzig, **95**.

HEYDER, R. 1955. Hundert Jahre Gartenamsel. Beitr. z. Vogelk., Leipzig. **4** (2/3): 64—81.

HUBER, J., HOFER, J. 1951. Die Amsel als Rohrbrüter in der Schweiz. Die Vogelwelt, Berlin — München, **72**(6): 183—185.

IHERING, H. 1900. Catalogo critico-comparativo dos ninhos e ovos das aves de Brasil. Riv. do Museu Paulista, St. Paulo, **4**: 191—299.

JABŁOŃSKI, B. 1963. Obserwacje droździka *Turdus musicus* L. na Niżu Polskim w okresie lęgowym. Not. Orn., Warszawa, **4**(4): 38—41.

JABŁOŃSKI, B. 1965. Materiały do znajomości gniazd paszkota *Turdus viscivorus* L. Not. Orn., Warszawa, **6**(2): 26—29.

JÕGI, A. 1963. Rästaste pesitsemisest Puhtulaiul. Orn. Kogumik, Tartu, **3**: 101—121.

JOHANSEN, H. 1959. Die Vogelfauna Westsibriens. II Teil, 3 Fortsetzung: *Turdus — Saxicola*. J. Orn., Berlin, **95**(3/4): 319—342.

KANITONOV, V. J., CHEPNIAVSKY, F. B. 1960. Vorobinye pticy Nizovev Leny. Ornitologiya, Moskva, **3**: 80—96.

KARCZEWSKI, Z. Drozdzik *Turdus iliacus* L. ptakiem lęgowym na Mazurach. Przegl. Zool., Wrocław, **7**(3): 264—265.

KARVIK, N. O. 1964. The terrestrial vertebrates of Dalsland in southwestern Sweden. Acta Vertebr., Stockholm, **3**(1): 1—239.

KISLENKO, G. S. 1965. O biologii riabinnika v Krasnoyarskom Kraye. Novosti Ornitologii, Mat. IV. Vsechs. Ornit. Konf., Alma-Ata, : 159—160.

KISHCHINSKY, A. A. 1960. K faune i ekologii ptic Teriberskogo rayona Murmanskoy oblasti. Tr. Kandalashskogo Gos. Zap., Murmansk, **2**: 122—212.

KULCZYCKI, A. 1966. Ptaki Parku w Łańcucie. Acta Zool. Cracov., Kraków, **11**(11): 351—396.

KULCZYCKI, A., MAZUR-GIERASIŃSKA, N. 1968. Nesting of House Sparrow *Passer domesticus* (LINNAEUS 1758). Acta Zool. Cracov., Kraków, **13**(9): 231—250, pls VI—VII.

KUŚNIERCZYK, P. (in praep.) Nesting of Middle-European Warblers of genus *Acrocephalus*

Labitte, A. 1952. Notes sur la biologie et la reproduction de *Turdus v. viscivorus* Linnaeus, 1758. Alauda, Paris, **20**(1): 21—30.

Lack, D. L. 1928. Mistle Thrush's Nest on Breakwater. Brit. Birds, London, **22**(2): 40.

Lack, D. L. 1956. A Review of the Genera and Nesting Habits of Swifts. Auk, Lancaster, **73**(1): 1—32.

Løppenthin, B. 1935. Ringdroslen, *Turdus t. torquatus* L., som dansk Ynglefugl (samt Bemaerkninger om Vanderfalk). Dansk Orn. For. Tid., København, **29**(3—4): 100—106.

Malchevsky, A. S. 1959. Gnezdovaya zizn pevchikh ptic. Leningrad.

Malyshev, L. I. 1960. Pticy severo-vostocnogo poberezja Baykala. Perv. Vsechs. Orn. Konf., Trudy Probl. i Temat. Soveshch, Moskva — Leningrad, **9**: 81—91.

Marisova, I. V., Vladyshewsky, D. V. 1961. O biologii belozobogo drozda (*Turdus torquatus* L.) na Ukraine. Zool. Żurn. Moskva, **40**(8): 1240—1245.

Martens, J. 1960. Schilf als Brutbiotop der Amsel *(Turdus merula)*. Orn. Mitteil. Hamburg, **12**(11): 211—212.

Martorelli, G. 1960. Gli uccelli d'Italia. Milano.

Mayr, E. 1958. Behavior and Systematics [in: Behavior and Evolution, edited by A. Roe and G. G. Simpson, New Haven].

Mayr, E., Bond, J. 1943. Notes on the Generic Classification of the Swallows, *Hirundinidae*. Ibis, London, **85**(3): 334—341.

Mikheyev, A. V. 1957. Opredelitel ptichikh gnezd. Moskva.

Moreau, R. E. 1960 Conspectus and Classification of *Ploceine* Weaver Birds. Ibis, London, **102**(3): 298—321, (4): 443—471.

Mošanský, A. 1962. O změne areálu drozda žervenkaveho (*Turdus iliacus* L.) a drozda cvikovateho europskeho (*Turdus pilaris pilaris* L.). Sb. Vychodosl. Múzea, Kosice, (A)**2-3**: 197—212.

Mniszek-Tchórznicki, N. 1947. Oologia ptaków łownych. Warszawa.

Mroczkiewicz, D. 1962. Ekologia ptaków występujących w stanie dzikim na terenie Ogrodu Zoologicznego w Poznaniu. Przegl. Zool., Wrocław, **6**(4): 290—302.

Monteanu, D. 1966. The Fieldfare *Turdus pilaris* L. breeding in northern Rumunia. Bull. B. O. C., London, **86**(9): 171—172.

Mustafayeva, R. G. 1965. K izucheniyu gniezd i gniezdovogo materiala drozdov Azarbaydzhana. Tr. Inst. Zool. A. N. Azerb. SSSR, Baku, **25**: 124—132.

Naumann, F. 1805. Naturgeschichte der Vögel Mitteleuropas. 1 (Drosseln), Herausgegeben von C. R. Hennicke, Gera.

Neufeldt, I. A. 1966. Lesnye „kamennye" drozdy. Tr. Zool. Inst. A. N. SSSR, Moskva — Leningrad, **39**: 120—184.

Neufeldt, I. A., Sokolov, B. V. 1960. Gnezdovanye lesnogo kamennogo drozda v Verkhnem Priamurie. Ornitologiya, Moskva, **3**: 236—250.

Newman. K. 1967. Garden Birds of South Africa. Cape Town — Johanesburg.

Niethammer, G. 1937. Handbuch der deutschen Vogelkunde. Leipzig, **1**.

Nikitina, G. A., Shklyarov, L. I. 1961. Nekotorye osobennosti gnezdostroyenia vorobilnych ptic v usloviakh Belorussii. Fauna i ekol. naz. pozv. Belorussii, Minsk, : 170—184.

Peitzmeier, J. 1949. Zur Ausbreitung der Parklandschaftpopulation der Misteldrossel in Niedersachsen. Beitr. z. Natk. Nieds. Hannover, **2**(6): 4—8.

Peitzmeier, J. 1951. Zur ökologischen Verhalten der Misteldrossel (*Turdus v. viscivorus* L.) in Nordwesteuropa. Bonn. zool. Beitr. **2**(3—4): 217—224.

Peters, W. 1936. Brutstätten der Misteldrossel. Orn. M-tsschr., Gera, **61**(1/2): 68.

Peus, F. 1951. Nüchterne Analyse der Massenvermehrung der Misteldrossel (*Turdus v. viscivorus* L.) in Nordwest Europa. Bonn. zool. Beitr. **2**(1—2): 55—82.

Promptov, A. N. 1945. Fizyologichesky analyz instinkta gnezdostroyenia u ptic. Izv. Akademii Nauk SSSR, (ser. biol.), Moskva, **1**: 1—26.

Ripley, S. D. 1952. The Thrushes. Postilla, New Haven, **13**: 1—48.

RYVES, B. H. 1928. Some breeding-Habits of the Mistle-Thrush in Cornwall. Brit. Birds, London, **22**(2): 31—33.

SALOMONSEN, F. 1951. The immigration and Breeding of the Fieldfare (*Turdus pilaris* L.) in Greenland. Proc. Xth. Int. Orn. Congress, Uppsala, : 515—526.

SCHOENNAGEL, E. 1960. Wacholderdrossel *(Turdus pilaris)* 1960 Brutvogel im Kreis Hameln-Pyrmont. Beitr. z. Natk. Nieds., Hannover, **13**(4): 115.

SHNITNIKOV, V. I. 1949. Pticy Semirecha. Moskva — Leningrad.

SIIVONEN, L. 1939. Zur Okologie und Verbreitung der Singdrossel (*Turdus ericetorum philomelos* BREHM). Ann. Zool. Soc. Zool.-Bot. Fennicae Vanamo, Helsinki, **7**(1): 1—285.

SIMPSON, G. G., ROE, A., LEWONTIN, R. C. 1960. Quantitative Zoology. Revised edition, New York.

SNOW, D. W. 1958. A Study of Blackbirds. London.

SOKOŁOWSKI, J. 1958. Ptaki ziem Polski. Warszawa. **1**.

SOMEREN, V. D. 1933. Some observations on the nesting habits of the Blackbird. Scot. Nat., Edinburgh, (201): 75—85.

STORRS FOX, W. 1900. The Ring-ouzel in Derbyshire. Zoologist, London, (4)**4**(703): 1—10.

STRAWIŃSKI, S. 1960. Drobne obserwacje ptaków gnieżdżących się w województwie bydgoskim. Część II Zesz. Nauk UMK w Toruniu, Nauki Mat.-Przyr., **7**: 99—104.

STRAWIŃSKI, S. 1963. Ptaki podmiejskich zadrzewień Torunia. Studia Soc. Sc. Toruniensis, (E)**7**(5): 101—123.

SVENSSON, B. 1957. Ett egendomligt boplastval av koltrast *(Turdus merula)*. Vår Fagelv., Stockholm, **16**(4): 304—305.

TACZANOWSKI, W. 1862. Konstantego hr. Tyzenhauza Oologia Ptaków Polskich. Opisy. Warszawa.

TACZANOWSKI, W. 1882. Ptaki krajowe. Kraków, **1**.

THIBAUT de MAISIÈRES, C. 1940. Au sujet de la nidification de la Grive draine (*Turdus viscivorus viscivorus* L.) au Mont Bükk. Fragm. Faun. Hung., Budapest, **3**(1): 3—5.

TICEHURST, N. F. 1933. Song-thrush adapting a Blackbird's nest. Brit. Birds, London, **27**(1): 25.

TIMMERMANN, G. 1934. Die Rotdrossel (*Turdus musicus coburni* SHARPE) als Stadtvogel in Südwest-Island. J. f. Ornith., Berlin, **82**(3): 319—324.

TISCHHOFF, N. 1956. Ornithologische Beobachtungen in Lappland. Orn. Mitteil., Stuttgart, **7**(7): 121—125 .

TURCEK, F. J. 1963. Vtáky bórovych lesov tatranských predhori. Biológia, Bratislava, **18**(7): 504—514.

UDDLING, A. 1955. Nagra fall av häckiingsanomali hos koltrasten *(Turdus merula)*. Vår Fagelv., Stockholm, **14**(2): 112—114.

VENABLES, L. S. F., U. M. 1952. The Blackbirds in Shetland. Ibis, London, **94**(4): 636—653.

VERHEYEN, R. 1953. Etude statistique relative à la biologie de nos trois Grives indigenes. Le Gerfaut, Bruxelles, **43**(2—3): 231—261.

VOLLBRECHT, K. 1943. Nest der Amsel über dem Wasser. Beitr. Fortpfl. d. Vögel, Berlin, **19**(6): 161—162.

VAURIE, C. 1959. The Birds of Palearctic Fauna, Passeriformes, London.

VOROBEV, K. A. 1959. Rezultaty ornitologicheskikh issledovanii Khrebta Cherskogo. Ornitologiya, Moskva, **2**: 115—121.

WALIGÓRA, E. (in praep.). Nesting of Chaffinch *Fringilla coelebs* LINNAEUS 1758.

WALLACE, G. J. 1939. Bicknellis Thrush, its taxonomy, distribution and life history. Proc. Boston Soc. N. H., **41**(6): 211—402.

WESSEL, M. 1953. Singdrossel *(Turdus ericetorum philomelos)* als Bodenbrüter. Orn. Mitteil., Stuttgart, **5**(11): 214.

WILLGOHS, J. F. 1952. Bidrag til trostenes forplantningsbiologi. Univ. i Bergen Arbok 1951, Nat. rekke (2): 1—95.

Wilke, H., Morling, K. 1965. Brut der Rotdrossel *Turdus iliacus* in der Niederlausitz. Beitr. z. Vogelk., Leipzig, **11**(1/2): 32—34.
Winterbottom, M. G. 1966. A study of the Cape Thrush *Turdus olivaceus* L. Ostrich, Rondebosch, **37**(1): 17—22.
Witherby H. F. et al., 1938. The Handbook of Britisch Birds. London, **2**.
Wolf, G., v. Gehren, R. 1951. Uber das Nisten der Ringeltaube und der Misteldrossel am Gebauden. Vogelwelt, Berlin — München, **72**(1): 14—16.
Wołk, K. 1960. Pierwsze stanowisko lęgowe droździka (*Turdus iliacus* L.) na Niżu Polskim. Przegl. Zool., Wrocław, **4**(3): 218—222.

STRESZCZENIE

Materiały do obecnego opracowania zbierane były w postaci kartoteki gniazd, w której notowano były wymiary, usytuowanie, materiał i sposób budowy pojedynczych, badanych w terenie gniazd. Dane, zbierane w większości przez autora, a prócz niego przez członków Sekcji Ornitologicznej P. T. Zool. pochodzą głównie z Polski, a ponadto z Czechosłowacji, ZSRR i Anglii. W przypadkach kwiczoła i paszkota wykorzystana została do opracowania również analogiczna kartoteka z Czechosłowacji, będąca w posiadaniu Zakładu Badań Kręgowców CSAN. Przebadane zostały także okazy z Muzeum w Tring oraz z trzech kolekcji radzieckich.

Turdus philomelos. Materiały dotyczą w większości formy nominatywnej oraz 3 gniazd *T. ph. clarkei* i *T. ph. hebridensis*. Większość gniazd znajdowała się na wysokości 1—3 m (Tab. 1), a średnia dla 196 gniazd wynosi 2,5 m. Listę drzew i krzewów, na których umieszczone były gniazda przedstawia tabela II: znaczna większość gniazd była na drzewach szpilkowych. Wśród różnych typów umiejscowienia (Tab. III) największą grupę stanowią gniazda położone na gałązkach przy pniu młodych świerków i jodeł. Gniazdo drozda śpiewaka składa się z bogatej warstwy zewnętrznej i czarkowatego wylepienia, które w większości gniazd zbudowane jest głównie z próchna, a niekiedy z mieszaniny błota i roślinnych szczątków lub z nawozu. Skład materiału zewnętrznej warstwy gniazda przedstawia tabela IV. Najczęściej spotykanym materiałem są suche gałązki drzew szpilkowych, a dalej trawy i mech. Wśród wymiarów gniazd (Tab. V) najmniejsze wahania ma średnica wewnętrzna, której średnia dla 134 gniazd wynosi 9,23 cm. Porównanie z danymi z literatury z różnych stron Europy wykazuje, że wahania średniej głębokości gniazd zależą od średniej temperatury w danej okolicy w okresie lęgowym: im zimniej, tym gniazda są głębsze.

Turdus iliacus. Badano gniazda formy nominatywnej. Dane kartotekowe zostały uzupełnione opisami konkretnych gniazd, zaczerpniętymi z literatury. Wszystkie gniazda znajdowały się poniżej 5 m, najwięcej w przedziale 1—2 m (Tab. VI). Średnia wysokość dla 27 gniazd wynosi 1,5 m. Gatunkiem drzewa najczęściej wybieranym do założenia gniazda był świerk (Tab. VII), najczęściej reprezentowanym typem usytuowania gniazda (Tab. VIII) jest położenie

między gałązkami liściastych krzewów i podrostów drzew. Gniazda składają się z 3 warstw: obfitej zewnętrznej, stosunkowo cienkiego wylepienia i wyściółki, której grubość może ulegać znacznym wahaniom. Materiał użyty do budowy warstwy zewnętrznej i wyścielającej jest dość mało urozmaicony i składa się głównie z traw i badyli (Tab. IX). Średnica zewnętrzna ulega najmniejszym wahaniom (Tab. X), a jej średnia dla 20 pomierzonych gniazd wynosi 8,5 cm.

Turdus pilaris. Badano gniazda podgatunku *T. p. subpilaris*. Znajdowane były one na wysokości od 1 do 25 m (Tab. XI), przy czym średnia wysokość dla 121 gniazd wynosi 9,4 m. Większość gniazd znajdowała się na drzewach liściastych, wśród których dominują wysokopienne wierzby (Tab. XII). Najczęściej spotykane są gniazda położone w rozwidleniu pnia, na grubych gałęziach przy pniu lub z dala od niego, co dotyczy zarówno drzew liściastych, jak i sosen (Tab. XIII). Gniazda zbudowane są z 3 warstw. Warstwa zewnętrzna jest cienka i zwykle widać przez nią błoto leżącego pod nią grubego wylepienia. Wewnątrz znajduje się dość gruba wyściółka. W materiale warstwy zewnętrznej i wyściółki (Tab. XIV) najczęściej spotykane są trawy i korzonki. W zależności od położenia gniazda mają zróżnicowane kształty zewnętrzne. Najmniej zróżnicowana jest średnica wewnętrzna (Tab. XV), której średnia dla 61 gniazd wynosi 10,38 cm.

Turdus viscivorus. Dane kartotekowe uzupełniono opisami konkretnych gniazd, zaczerpniętymi z literatury. Gniazda znajdowane były na wysokości 1,7—21 m (Tab. XVI). W tych granicach nie ma jakiegoś szczególnie częściej wybieranego przedziału wysokości. Średnia dla 22 gniazd wynosi 9,5 m. Większość położona była na drzewach liściastych (Tab. XVII). W wyborze miejsca (Tab. XVIII) widać wyraźną tendencję do położenia gniazda na grubych gałęziach, bez względu na przynależność gatunkową drzewa. Gniazdo składa się z 3 warstw. Wylepienie błotem, stanowiące warstwę środkową, jest stosunkowo grube. Wyniki analizy materiału, użytego do budowy warstwy zewnętrznej oraz wyścielającej, przedstawia tabela XIX. Materiałem stwierdzonym we wszystkich gniazdach są trawy, poza tym dość często spotyka się patyczki. Średnia arytmetyczna średnicy wewnętrznej wynosi 10,15 cm.

Turdus merula. Badane gniazda należały do formy nominatywnej, która jednak w Europie reprezentowana jest przez populację leśną i ogrodową. Gniazda znajdowały się na wysokościach od 0 do 12,5 m (Tab. XXI). Średnia wysokość dla wszystkich 146 gniazd wynosi 2,3 m, w tym jednak dla kosów leśnych 2,0 m a dla ogrodowych 2,7 m. Lista drzew i krzewów, w których znajdowano gniazda (Tab. XXII) jest bardzo urozmaicona. Najwięcej ich znajdowało się na drzewach liściastych, choć najliczniej reprezentowanym rodzajem jest świerk. Kosy leśne gnieżdżą się głównie na drzewach szpilkowych, podczas gdy u ogrodowych najwięcej gniazd znajdowało się na krzakach. Sposoby umiejscowienia gniazd (Tab. XXIII) są bardzo zróżnicowane i wskazują na duże możliwości przystosowawcze u tego gatunku. Gniazdo składa się z 3 zasadniczych warstw. Warstwa zewnętrzna jest u większości cienka i wówczas pod nią leży grube wylepienie błotem, które zresztą może składać się z kilku

cieńszych warstewek. W niewielkiej grupie gniazd wylepienie błotem może zastępować warstwa zeszłorocznych liści, zbieranych zwykle z błotnistych kałuż. Ułożone płasko, po wyschnięciu pełnią one rolę wylepienia. Wewnątrz gniazdo wyścielone jest zwykle delikatnym materiałem roślinnym. Zestawienie materiałów użytych do budowy warstwy zewnętrznej i wyścielającej przedstawia tabela XXIV. Najczęściej używana jest trawą, a poza nią patyczki, liście, badyle i korzonki. Wielkości gniazd ilustruje tabela XXV. Średnia średnicy wewnętrznej wynosi 9.71 cm. Przedstawione na fig. 1 diagramy sugerują, że wielkości średnicy wewnętrznej kosów ogrodowych w przypadku gniazd świeżych nie różnią się, a w przypadku gniazd używanych są większe od leśnych.

Turdus torquatus. Badane gniazda pochodzą z polskich Karpat i tym samym należą do ptaków z podgatunku *T. t. alpestris*. Prócz tego do opracowania włączone zostały 2 gniazda formy nominatywnej z Walii. Gniazda z Karpat położone były na wysokości od 1 do 16 m (Tab. XXVI), a średnia dla 26 gniazd wynosiła 3,5 m. Prawie wszystkie zakładane były na drzewach szpilkowych (Tab. XXVII), przy czym większość umiejscowiona była na młodych świerkach i jodłach na gałązkach przy pniu (Tab. XXVIII). Gniazda składają się z 3 warstw. Zewnętrzna, zwykle bardzo obfita, ustępuje często stopniowo warstwie pośredniej, którą stanowi wylepienie. Wylepienie u większości gniazd składa się z błota, zwykle zmieszanego z fragmentami roślinnymi, zwykle też jest cienkie i ogranicza się do dna i dolnej części ścianek. U niektórych gniazd wylepienie błotem zastępuje warstwa zbitych butwiejących części roślinnych, głównie mchów i fragmentów liści paproci, które po wyschnięciu dają od wewnątrz sztywną i stosunkowo gładką powierzchnię. Wewnątrz gniazdo jest bogato wyścielone. Do budowy warstwy zewnętrznej i wyścielenia używane są przede wszystkim trawy (Tab. XXIX) oraz patyczki (głównie drzew szpilkowych) i mech. Średnia średnicy wewnętrznej 20 gniazd z Karpat wynosi ok. 10.2 cm (Tab. XXX). Wszystkie wymiary 2 gniazd z Walii są mniejsze.

Porównanie danych o gnieżdżeniu się 6 gatunków europejskich drozdów wykazuje, że najniżej gnieździ się droździk, a najwyżej kwiczoł i paszkot. Największe możliwości przystosowawcze wykazuje kos, co objawia się zarówno w postaci największej listy drzew i krzewów używanych do zakładania na nich gniazd, jak i największej ilości sposobów usytuowania gniazd (Tab. XXXI, Fig. 2) oraz największego zróżnicowania używanego do budowy materiału. Materiały, zwłaszcza podstawowe, są u wszystkich gatunków podobne. Różnice między gniazdami poszczególnych gatunków widoczne są dopiero przy analizie modelu budowy na przekrojach gniazd (Fig. 3). Wielkości gniazd, nawet w przypadku średnicy wewnętrznej, wykazującej we wszystkich najmniejszą zmienność, są do siebie podobne (Fig. 4). Tylko średnica wewnętrzna gniazd droździka jest mniejsza od średnic u reszty 4 gatunków wyścielających gniazdo. Klucz do oznaczania gniazd środkowoeuropejskich drozdów (s. 417—419) został oparty na różnicach modelu budowy gniazda.

W celach porównawczych w rozdziale X opisane są przebadane w kilku kolekcjach gniazda różnych pozaeuropejskich gatunków *Turdini*, kolejno:

Turdus chrysolaus, *T. pallidus*, *T. ruficollis ruficollis* i *T. ruficollis atrogularis*, *T. naumanni naumanni* i *T. naumanni eunomus*, *T. hortulorum*, *T. sibiricus*, *T. migratorius*, *T. boulboul*, *Zoothera dauma* (4 podgatunki), *Z. monticola*, *Z. marginata*, *Catharus minimus*, *Monticola saxatilis*, *M. solitarius* oraz *Myophonus caeruleus*. Po uzupełnieniu tych opisów danymi z literatury o innych gatunkach, autor dochodzi do wniosków na temat pokrewieństwa filogenetycznego, z których najważniejsze są następujące:

1. *Turdus philomelos* stanowi osobną gałąź wewnątrz rodzaju *Turdus*,
2. *Turdus torquatus* najbardziej zbliżony jest do *T. boulboul* i *T. rubrocanus*.
3. *Turdus migratorius* wykazuje pokrewieństwa z *T. pilaris*, *T. naumanni* i *T. hortulorum*.
4. *T. sibiricus* należy wyraźnie do rodzaju *Turdus*, a nie, jak chcą niektórzy systematycy, do rodzaju *Zoothera*.

РЕЗЮМЕ

Материалы к настоящей работе собирались в виде картотеки гнёзд, в которой отмечалось: размеры, размещение, материал и способ строения отдельных, исследуемых на местности гнёзд. Данные, в большинстве случаев, были собраны автором, а кроме его — членами Орнитологической Секции Польского Зоологического Общества. Они происходят, главным образом, из Польши, а кроме того из Чехословакии, СССР и Англии. В случаях рябинника и дерябы к обработке использовано также аналогичную картотеку из Чехословакии, принадлежащую Исследовательскому Институту Позвоночных Чехословацкой Академии Наук. Изучено также экземпляры из музея в Тринг и с трёх советских коллекций.

Певчий дрозд *Turdus philomelos*. Материалы относятся в большинстве случаев к *T. ph. philomelos*, а также к 3 гнездам *T. ph. clarkei* и 1 *T. ph. hebridensis*. Большинство гнёзд находилось на высоте 1—3 м (Табл. I), а средняя для 196 гнёзд равна 2,5 м. Список деревьев и кустов, на которых были размещены гнёзда представляет таблица II. Большинство гнёзд было на хвойных деревьях. Среди различных типов размещения (Табл. III) найбольшей группой являются гнёзда, расположенные на ветках у ствола молодых елей и пихт. Гнездо певчего дрозда состоит из внешнего толстого слоя и вылепленной чаши — (лотка), которая у большинства гнёзд построена главным образом из трухи, а иногда со смеси болота и растительных остатков или навоза. Состав материала внешнего слоя гнезда показан на таблице IV. Наиболее часто встречающийся материал — это сухие ветки хвойных деревьев, а затем травы и мох. Среди размеров гнёзд (Табл. V) самые малые отклонения имеет внутренний диаметр, среднее арифметическое которого для 134 гнёзд равно 9,23 см. Сравнения с литературными данными из различных сторон Европы указывают, что отклонения средней глубины гнёзд зависят от средней температуры в данной местности во время высиживания: чем холоднее, тем глубже гнездо.

Белобровик *Turdus iliacus*. Произведено исследования гнёзд номинативной формы. Данные из картотеки дополнено описью конкретных гнёзд из литературы. Все гнёзда находились ниже 5 м. Наибольшее их количество было в интервале 1—2 м (Табл. VI). Средняя высота для 27 гнёзд равна 1,5 м. Наибольшее количество гнёзд было построено на ели (Табл. VII), а также между ветвями лиственных кустов и подростов деревьев. Гнёзда состоят из 3 слоёв: внешнего довольно толстого; тонкого вылепленного, и подстилки, толщина которой может изменятся. Употреблённый материал к построению внешнего слоя мало разнообразен и состоит, главным образом, из трав и сухих стеблей (табл. IX). Внутренний диаметр подвержён незначительным изменениям (табл. X), а его среднее арифметическое для 20 измеренных гнёзд равно 8,5 см.

Рябинник *Turdus pilaris*. Проведено исследования гнёзд подвида *T. p. subpilaris*. Найдено их на высоте от 1 до 25 м (Табл. XI), причём средняя высота 121 гнезда равна 9,4 м. Большинство гнёзд находилось на лиственных деревьях, среди которых доминируют высокоствольные вербы (Табл. XII). Наиболее часто встречаются гнёзда, расположенные в развилке стволов, на толстых ветках у ствола или подальше от него, что касается, в равной мере, лиственных деревьев и сосен (Табл. XIII). Гнёзда построены с 3 слоёв. Внешний слой — тонкий и через него просвечивает болото лежащего под ним толстого вылепленного слоя. Внутри находится довольно толстый слой подстилки. В материале внешнего слоя и подстилки (Табл. XIV) чаще всего встречаются травы и корни. Гнёзда имеют дифференцированную внешнюю форму, в зависимости от их расположения. Внутренний диаметр гнезда наименее дифференцирован (Табл. XV). Среднее арифметическое его для 61 гнезда равно 10,38 см.

Деряба *Turdus viscivorus*. Данные картотеки дополнено описью конкретных гнёзд из литературы. Гнёзда найдено на высоте 1,7—21 м (Табл. XVI). В этом интервале нет какого-то, особенно часто выбираемого, промежутка высоты. Среднее арифметическое для 22 гнёзд равно 9,5 м. Большинство гнёзд размещено на лиственных деревьях (Табл. XVII). В выборе места (Табл. XVIII) видно отчётливую тенденцию к расположению гнёзд на толстых ветках, невзирая на видовую принадлежность дерева. Гнездо состоит из 3 слоёв. Результаты анализа материала, использованного для построения внешнего слоя и подстилки, представлено на XIX таблице. Вылепленный болотом средний слой является довольно толстым. Материал, найденный во всех гнёздах — это травы. Кроме этого часто встречаются веточки. Среднее арифметическое внутреннего диаметра равно 10,15 см.

Чёрный дрозд *Turdus merula*. Исследованные гнёзда принадлежали к номинативной форме, которая, однако, в Европе представлена лесной и садовой популяциями. Гнёзда находились на высоте от 0 до 12,5 м (Табл. XXI). Средняя высота для 146 гнёзд равна 2,3 м. Список деревьев и кустов, в которых нахождено гнёзда (Табл. XXII) очень разнообразен. Наибольшее количество их найдено на лиственных деревьях, хотя ели здесь было наибольше. Чёрные лесные дрозды гнездятся главным образом на хвойных деревьях. Наибольше гнёзд садовых чёрных дроздов найдено на кустах. Способы размещения гнёзд (Табл. XXIII) очень разнообразны и указывают на большие приспособительные возможности

у этого вида. Гнездо состоит с трёх основных слоёв. Внешний слой, у большинства гнёзд, тонкий, а под ним лежит толстый слой, вылепленный болотом, которое может состоять из нескольких тонких слоёв. В небольшой группе гнёзд, слой вылепленный болотом, может заменять слой прошлогодних листьев, собранных обычно в болотистых лужах. Уложенные плоско и высушеные, они выполняют роль вылепленного болотом слоя. Внутри гнездо выстлано деликатным растительным материалом. Сравнение использованных материалов для построения внешнего и выстеляющего слоёв показано на XXIV таблице. Чаще всего к этому используется трава, веточки, листья, сухие стебли и корни. Величину гнёзд иллюстрирует XXV таблица. Средний внутренний диаметр равен 9,71 см. Представленные на фиг. 1 диаграммы подсказывают, что величины внутреннего диаметра гнёзд садовых чёрных дроздов, в случае свежих гнёзд, не отличаются между собой, а в случае гнёзд употребляемых, они являются большими от величин внутреннего диаметра гнёзд лесных чёрных дроздов.

Белозобый дрозд *Turdus torquatus*. Исследованные гнёзда происходят из Польских Карпат и этим самым принадлежат к птицам из подвида *T. t. alpestris*. Кроме этого к обработке взято 2 гнёзда номинативной формы из Уэльса. Гнёзда из Карпат расположены были на высоте от 1 до 16 м. (Табл. XXVI), а среднее арифметическое для 26 гнёзд равнялось 3,5 м. Почти все они были прикреплены на хвойных деревьях (Табл. XXVII), причём большинство гнёзд было расположено на молодых елях и пихтах, на ветвях у ствола (Табл. XXVIII). Гнёзда состоят из 3 слоёв. Внешний, обычно очень толстый, уступает часто среднему, вымазанному болотом с растительными фрагментами, слою. Средний слой тонкий и находится на дне и нижней части стенок. В некоторых гнёздах средний слой заменён гниющими растительными фрагментами, главным образом, мхов и листьев папоротников, которые после просушки, делают внутренюю поверхность жёсткой и сравнительно гладкой. Внутри гнездо хорошо выстлано. К построению внешнего слоя и выстилке употребляются, прежде всего, травы (Табл. XXIX) и веточки (главным образом хвойных деревьев), а также мох. Средний внутренний диаметр 20 гнёзд из Карпат равен около 10,2 см (Табл. XXX). Все размеры 2 гнёзд из Уэльса являются меньшими.

Сравнение данных о гнездовании 6 видов европейских дроздов указывает на то, что белобровик гнездится ниже остальных, а рябинник и деряба выше всех остальных. Наибольшие приспособительные возможности проявляет чёрный дрозд, что видно из списка употребляемых деревьев и кустов для прикрепления на них гнёзд, а также наибольшего количества способов размещения гнёзд (Табл. XXXI, Фиг. 2) и наибольшей дифференциации, употребляемого строительного материала. Основной материал у всех видов похож. Разницы между отдельными гнёздами различных видов видны лишь при анализировании модели строения на разрезе гнёзд (Фиг. 3). Величины гнёзд, даже в случае внутреннего диаметра, проявляющего у всех наименшее изменение, похожи к себе (Фиг. 4). Только внутренний диаметр гнёзд белобровика является меньшим чем у остальных 4 видов, выстилающих гнёзда. Определитель гнёзд среднеевропейских дроздов (стр. 417) основывается главным образом на разницах строения модели гнезда.

С целью сравнения, в X разделе описано исследованные в нескольких коллекциях гнёзда разных не европейских видов *Turdini* поочерёдно: *Turdus chrysolaus, T. pallidus, T. ruficollis ruficollis* и *T. ruficollis atrogularis, T. naumanni naumanni* и *T. naumanni eunomus, T. hortulorum, T. sibiricus, T. migratorius, T. boulboul, Zoothera dauma* (4 подвида), *Z. monticola, Z. marginata, Catharus minimus, Monticola saxatilis, M. solitarius,* и *Myophonus caeruleus.* После дополнения этих описей данными из литературы о других видах, автор приходит к выводам филогенетического родства. Наиболее важными из этих выводов являются следующие:

1. *Turdus philomelos* представляет отдельную ветвь внутри рода *Turdus.*
2. *Turdus torquatus* наиболее сближён к *T. boulboul* и *T. rubrocanus.*
3. *Turdus migratorius* проявляет родство с *T. pilaris, T. naumanni* и *T. hortulorum.*
4. *T. sibiricus* не принадлежит к роду *Zoothera,* как желают некоторые систематики, а к роду *Turdus.*

PLATES

Plate XX

Phot. 1. The nest of a Blackbird *Turdus merula* in a young spruce in the Tatra Mts. The nest-site corresponds to the type A in Fig. 2.

Phot. 2. The nest of a Song Thrush *Turdus philomelos* leaned against the stems of two spruce saplings. The nest-site corresponds to the type B in Fig. 2.

Phot. 1

Phot. 2

Z. Bocheński
Phot. author

Plate XXI

Phot 3 The nest of a Blackbird *Turdus merula* in the trunk fork of an alder. The nest-site corresponds to the type K in Fig. 2.

Phot. 4. The nest of a Fieldfare *Turdus pilaris* at the base of a willow branch growing off slantingly. The nest-site corresponds to the type L in Fig. 2.

Phot. 3

Phot. 4

Z. Bocheński
Phot. author

Plate XXII

Phot. 5. The nest of a Blackbird *Turdus merula* among the twigs of an elder bush. The nest-site corresponds to the type Q in Fig. 2.

Phot. 6. The nest of a Blackbird *Turdus merula* among the twigs of an ivy twining around a tomb. The nest site corresponds to the type R in Fig. 2.

Phot. 5

Phot. 6

Z. Bocheński
Phot. author

Plate XXIII

Phot. 7. The limestone rocky wall in the Ojców National Park, where in June 1968 a nest of the Song Thrush was found. The nest-site is marked with an arrow.

Phot. 8. The nest of a Song Thrush *Turdus philomelos* sited on a rock shown in Phot. 7. The nest-site corresponds to the type V in Fig. 2.

Phot. 7

Phot. 8

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Phot. author

Plate XXIV

Phot. 9. The nest of a Blackbird *Turdus merula* in a hole in a wall. The nest-site corresponds to the type X in Fig. 2.

Phot. 10. The monument in the Kraków Town Gardens in which there was a nest of the Blackbird *Turdus merula*. The nest-site is marked with an arrow. A long cellophane strip can be seen hanging out of the nest.

Phot. 9

Phot. 10

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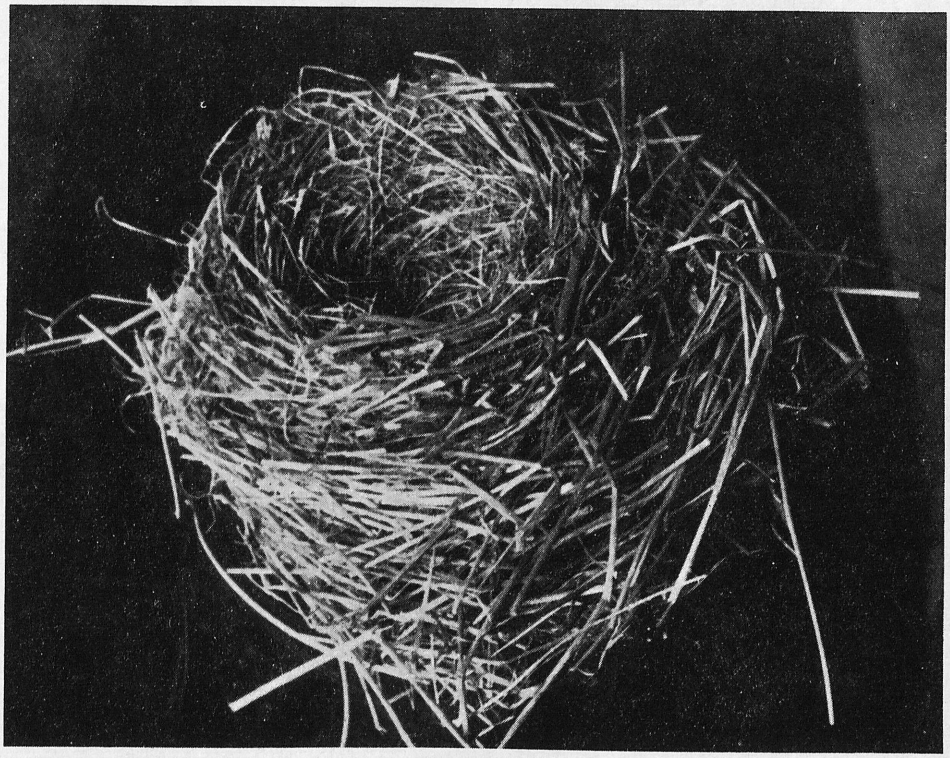
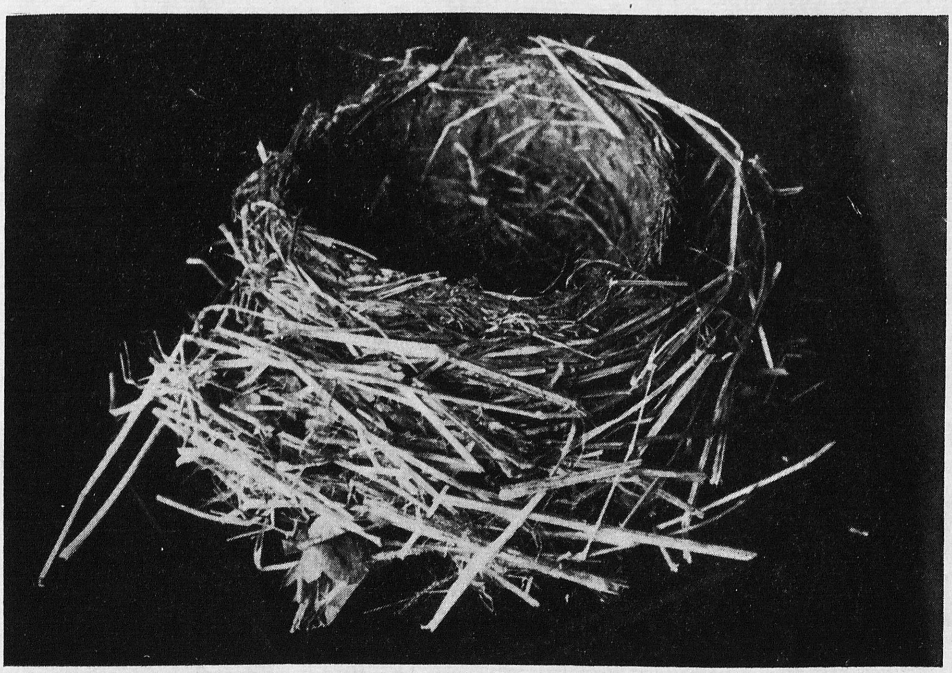
Phot. author

Plate XXV

Phots. 11 and 12. Two different nests of the Redwing *Turdus iliacus* isolated from the environment. A similarity of the materials used for external layer of the nest and a difference in lining thickness are visible.



Phot. 11

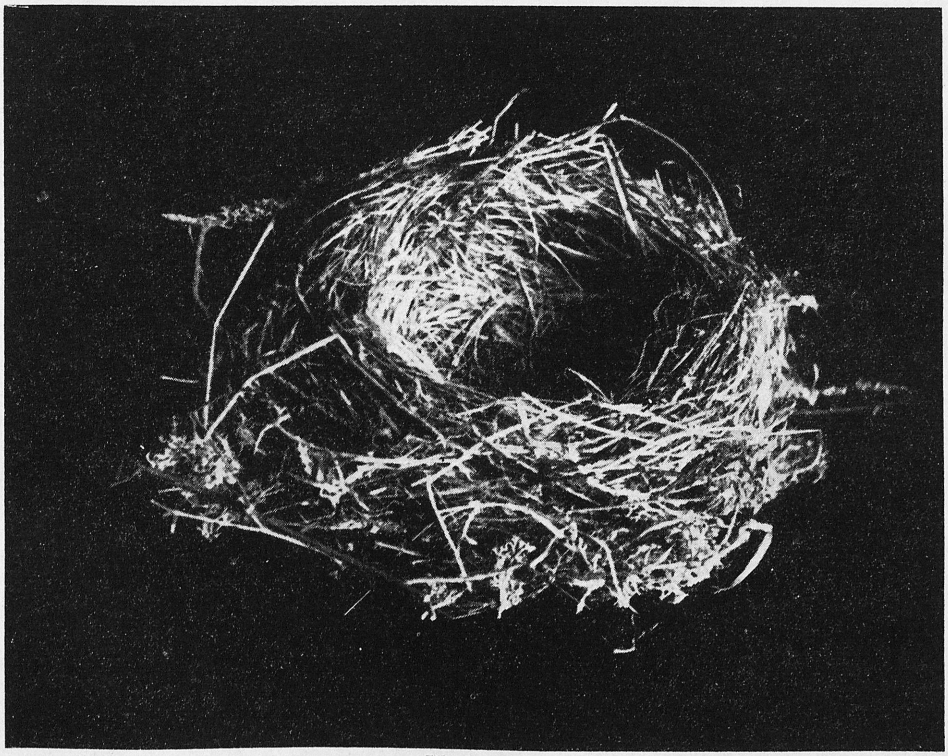


Phot. 12

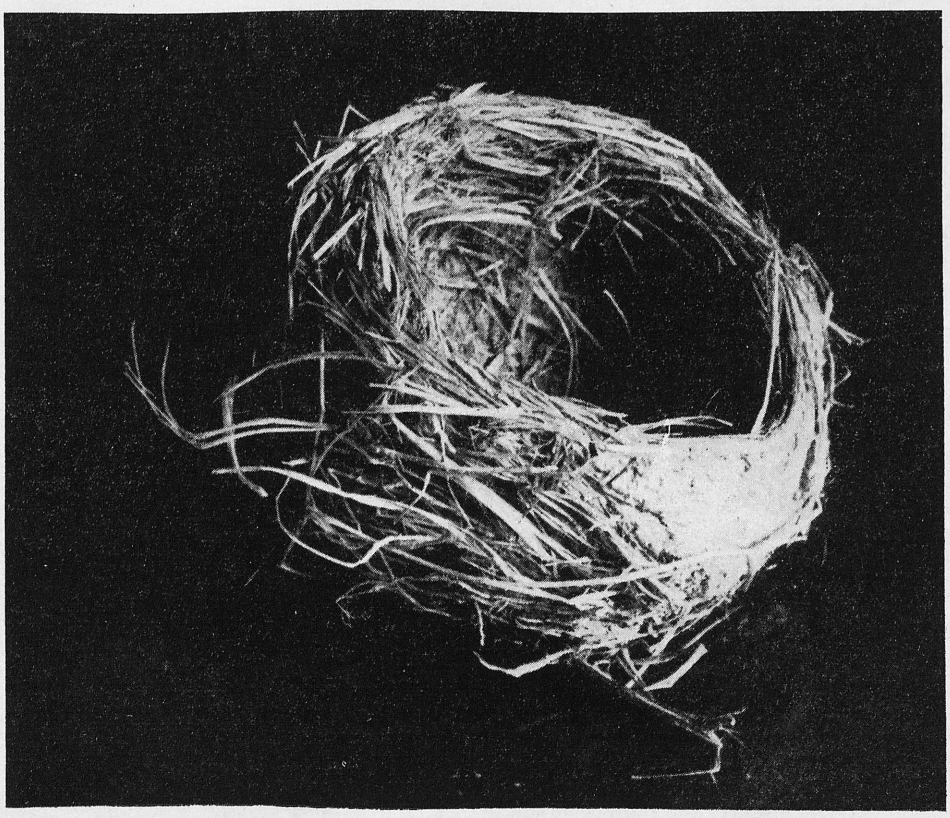
Z. Bocheński
Phot. author

Plate XXVI

Phot. 13. The nest of a Mistle Thrush *Turdus viscivorus* isolated from its environment.
Phot. 14. The nest of a Dusky Thrush *Turdus naumanni eunomus* from the Yakutsk District isolated from its environment. On the right-hand side, below the "ring" some mud can be seen penetrating through the thin external layer of the nest.



Phot. 13



Phot. 14

Z. Bocheński
Phot author

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