A C T A T H E R I O L O G I C A

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Age Determination, Age Structure and Sex Ratio in Mole, *Talpa europaea* Linnaeus, 1758 Populations*

[With 6 Tables, 2 Figs. & 1 Plate]

The author carried out an analysis of age of 380 skulls of moles *Talpa europaea* L., collected in the grasslands of Kraków and its environs, and 78 skulls from the Sądecki Beskid and Tatra Mts. The analysis was based on the degree of wear of the molars and premolars and the shape of the canine. Five age groups were distinguished. The use of the characteristics of the structure of winter nests for age determination in moles was proposed as an ancillary method, for young moles build one-chamber nests and the number of chambers increases with age. The whole material contained 45.74% juveniles, 27.19% one year olds, 13.65% two year olds, 9.7% three year olds and 3.7% four year olds. Some differences were found in the age composition of mole populations from different localities. In the optimum habitats the percentage of old moles was low, whereas the middle age groups were represented most numerously. The populations of moles from urban areas were characterized by a large proportion of old specimens (11—16.3%). The sex ratio is associated with the season of the year. In the spring, females predominated in surface runs and males in deep tunnels. In the second half of the year the number of females trapped in deep tunnels exceeded that of males. Males formed only 16.6% of the sample taken by the winter nests.

I. INTRODUCTION

The determination of the age structure of populations of small mammals is the key to the knowledge of a number of ecological phenomena characterizing these populations. According to Bodenheimer (1938), in animal ecology this field of researches was neglected very much. The main difficulty is to find appropriate criteria, which would make the objective distinction of particular age groups possible.

The decipherment of the age structure of populations of small mammals allows, in the first place, the ascertainment whether a population is expansive, stable, or regressive. The division into age groups throws light upon the average age of the population, the maximum age of its members as well as upon the mortality and its exact mechanism.

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Very little is known about the intra-population relations in moles. The hidden underground ways of life of this species are difficult of access to direct observation. Hence the great success of the method of labelling with radioactive isotopes (Godfrey, 1954; 1955; 1957). The studies of Stein (1959) show that the social life of these solitary mammals is governed by the laws of age and might (Rangordnung). The numerically small groups of old specimens suggest, especially in the optimum habitats, that this age group is probably ousted by stronger specimens and perhaps completely eliminated.

The criterion which is most frequently used in the determination of age in mammals is the tooth wear. As regards the mole, the shape and the degree of growth of the canine tooth are taken into account, in addition to the wear of the molars and premolars, as reliable indicators of age. The canine tooth, especially its posterior margin, becomes blunt with age and its base expands with growth, owing to the emergence of the roots from the alveolus, and forms a characteristic protuberance (Deparma, 1954) (Phot. 3). As the canine grows, the bifurcation of its root becomes visible in old moles.

Baškirov & Žarkov (1934) were the first to determine the age of moles by this method. More broadly this problem was treated by Deparma (1954). The study of Larkin (1948) is marked by his more analytical approach to the subject.

II. MATERIAL AND METHODS

A series of 953 skulls of moles, collected in the grasslands of Kraków and its environs as well as in the Sądecki Beskid and Tatra Mts. in 1955—1962, was used for the present study.

The materials from the Kraków grasslands were derived mainly from three localities: Błonia — a pasture with an area of 50 hectares and a fairly differentiated substratum — provided 419 moles; 156 specimens were caught in nearby Dr. Jordan's Park — 25 hectares in area, partly planted with trees and differentiated in respect of soil conditions — mostly in open several-hectare areas. The third locality was a peat pasture at Łęg (20 hectares, light humus soil), where 138 moles were collected. Further 180 specimens were caught in various localities, in suburbian and allotment gardens and arable fields. A total of 73 moles were taken in the region of the Sądecki Biskid (up to 500 m. a.s.l.) and in the Tatra Mts. (up to 1100 m. a.s.l.). Besides, I disposed of a collection of 300 skulls of moles, which had fallen a prey to buzzards *Buteo buteo* L., from the Poznań region.

1. Methods of Catching

Moles were mostly caught alive in surface runs and in deep tunnels. This method of catching is especially effective in pastures with short grass or in arable fields without any plant cover. It consists in taking advantage of the inattention of a mole, while it is busy digging a tunnel. The shallow tunnel was pressed down with the foot behind the animal to intercept retreat. Then the tunnel was dug up by hand close to the shoe, where the mole was usually found squeezed in under the sole of the shoe. Catching in deep tunnels requires a great skill and knowledge of the arrangement of passages as well as the foreseeing of all the possibilities of escape of the mole to the remaining parts of the tunnel system so as to prevent it.

Scissor traps proved to be the most efficient of all the mechanical traps. They were constructed on the old principle of Le Court (Cadet de Vaux, 1803) slightly modified (Fig. 1).

In order to catch moles in their nests traps were set at a distance of 20—30 cm. from the edge of the hill. Characteristically enough, the closer to the hill and the nest chamber the traps were set, the more difficult it was to catch the mole; it was so because of the increasing caution of the animal. Right in the nest chamber I failed to catch any moles.

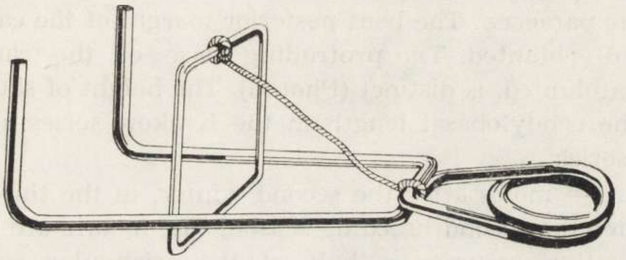

Fig. 1. A scissor trap of the Le Court type, modified.

The mole having been caught, the nest was dug up and the number of chambers and the condition of nest litter were noted.

2. Determination of Age by the Wear of Teeth

The material used consisted of yearly series of skulls (the collections from Błonia and Dr. Jordan's Park covered the two year period). So complete collections could be arranged in systematic sequences, which were analysed by the method of Deparma (1954) for each locality separately. The material was divided into three groups according to the seasons of collection (spring, summer and autumn) and the particular groups were also considered separately. As a result, 5 age groups were distinguished, their characteristics being as follows:

Group O — young-of-the-year (Phots. 1 and 2). Cusps of molars pointed, enamel undamaged. Bifurcations of mesostyles pointed. The canine of the young is sabre-shaped, with a sharp posterior margin. Its posteriorly protruding base occurs in the young-of-the-year in later months (Phot. 1). Small triangles of disclosed dentine may appear on the tops of the cusps in the third month of life.

Additional diagnostic characters: Dark pigmentation of limbs occurs in young specimens up to the end of August, sometimes to mid-September. Before the first autumn moult it is also possible to recognize them by the coloration of the fur. The fur of young moles is lighter and lacking in lustre. The brain case is high and smooth. The mean height of skull amounts to 30.13% of its condylobasal length in young moles of the Kraków series and to 30.97% in those of the Poznań series. After the autumn moult the size and weight of testes and the development of the penis in males as well as the development of the uterus in females are, besides the dentition and the appearance of the skull, the only criterion of age (Stein, 1950b).

Group I — moles after the first winter, in the second year of life and in or after the first breeding season. The characteristic triangles of disclosed dentine on the cusps do not cover a quarter of the triangular surface of the paracone. The bent posterior margin of the canine is sometimes markedly blunted. The protruding base of the canine, with its lower margin blunted, is distinct (Phot. 3). The height of skull constitutes 29.49% of the condylobasal length in the Kraków series and 29.80% in the Poznań series.

Group II — moles after the second winter, in the third year of life and in or after the second breeding season. The molars are largely worn. Disclosed dentine occupies a half of the triangular surface of the paracone. On M^3 it covers the whole surface of the paracone. The protocones and metacones are heavily worn, but still protruding. Especially the metacone of M^1 projects above the surface of the tooth. The canine is very much shortened, at the base markedly expanded and thickened owing to the emergence of the roots (Phot. 4). The height of skull equals 29.5% of the condylobasal length in the series from Kraków and 29.14% in that of Poznań.

Group III — moles after the third winter, in the fourth year of life (Phot. 5). The molars are completely worn, the wear is sometimes such that only the roots stick out. The fourth premolar is worn and often has the shape of a rounded club. The canine is worn out completely up to the base of the roots. The opening between the roots is large and free. The incisors are worn and blunted, in the form of short stubs, whereas the molars are almost entirely flattened. In the place of the cusps there are only slight protuberances. The paracones are worn up to their bases and M^3 has the form of a lamella.

Additional diagnostic characters: The flattening of the skull is marked, as its height forms 28.43% of the condylobasal length in the Kraków series and 28.55% in the Poznań series. The skull is also marked by tuberosity and rough surfaces. Naked places under the chin and in the anal region may be observed, especially in males, in the spring.

Group IV — moles after the fourth winter, in the fifth year of life (Phots. 6 and 7). This group is very small. The canine is completely worn and the roots, usually separated, stick out of the alveoli. The premolars are also heavily worn and M^3 has been reduced to a cracked lamella. In this group there occurred specimens in which the margins of the alveoli grew strongly out and in a few cases played the part of teeth.

Additional diagnostic characters: as above. The height of skull amounts to 28.30% of the condylobasal length in the Kraków series.

G r o u p V — moles after the fifth winter. This group was represented by only one skull (Phot. 8) in my material. Heavily worn single roots are left from the canines and premolars. The remains of such roots stuck out in the place of M^1 and M^2. The projection of the maxillary bone played the part of teeth.

3. An Attempt to Determine the Age of Moles by the Structure of Winter Nests

The ancillary method of determining the age of moles proposed by me consists in the juxtaposition of the data concerning the wear of teeth and the shape of the canine with those on the structure of the winter nests, that is, the number of nest chambers and the degree of decomposition of the litter in the chambers. My own observations and the data offered by other authors, especially by A d a m s (1903) and L a r k i n (1948), show that the mole is attached to its territory and every year builds its winter nest under the same hill. Hence the number of the chambers and nests littered in them may be an index of age of the whole nest with the following reservations:

a) The state of preservation of the litter in nests is dependent on local conditions. In damp places the litter is preserved better than in the dry ones. Generally, however, a nest from the previous year or even from before two years can be easily distinguished. Nests littered with leaves make an exception, for they soon undergo decomposition. Consequently, the one- and two-year-old nests are the most appropriate for estimation. Older nests are an uncertain criterion, especially when twin nests exist under the same hill.

b) The number of chambers littered under a hill may be various, which is due to such facts as, for example, the abandonment of a wet nest chamber by the mole. Then it makes another nest in a new chamber dug out somewhat higher, usually under the same hill. It often happens that a mole, for unknown reasons, digs two chambers at the same time. In one case, I found that both such chambers had been inhabited. These facts do not, however, prevent the objective estimation of the age of a nest.

c) The best time for determination of the age of a nest and, consequently, the age of the mole inhabiting it, is autumn, when moles reduce their territories to the close neighbourhood of the nest. In the spring, males leave their nests fairly early and wander about looking for females. As a result, it is not uncommon to catch 2—3 moles in the same tunnel. The advantage of the method offered is that in the autumn, when distinction of age groups in mole populations encounters difficulties, it provides comparative material, important to the appropriate estimation of the age of specimens. Areas which are not very densely inhabited by moles, whose nests lie in isolated territories, are especially suitable for this purpose.

III. RESULTS

1. Age of moles and the structure of nests. Twenty moles were caught in the close neighbourhood of winter nests. The nests were next dug up and put to detailed examination (Table 1). Seeing that the material was rather scanty, results are fairly univocal. Only the

Table 1.

A comparison of age of moles with the number of chambers in their winter nests.

No.	Period of catching	Locality	Sex	Age	Weight in g	Number of chambers in nest
153	30. X. 1957	Łęg	♀	0	82	1
156	2. XI. 1957	,,	♀	0	73	1
157	4. XI. 1957	,,	♀	III	79	3
160	5. XI. 1957	,,	♀	0	79	1
171	1. II. 1958	,,	♀	0	72	1
176	18. II. 1958	,,	♀	0	84	1
182	28. II. 1958	,,	♀	0	79	1
273	26. II. 1959	,,	♀	0	72	1
274	28. II. 1959	,,	♂	0	93	1
275	5. III. 1959	,,	♀	0	75	1
276	6. III 1959	,,	♂	II	112	2
348	6. XI. 1960	,,	♀	0	80	1
349	6. XI. 1960	,,	♂	0	110	1
418	14. XII 1962	,,	♀	0	73	1
419	14. XII. 1962	,,	♀	0	74	1
458	23. IV. 1963	,,	♂	IV	108	3
266	11. XII. 1958	Borek Fałęcki	♀	II	76.5	3[1])
268	12. XII. 1958	,,	♀	II	58	1[2])
269	20. XII. 1958	,,	♂	II	85.5	2
270	22. XII. 1958	,,	♂	0	99.5	1

[1]) One from the previous year, two from this year's. [2]) Small chamber, female moved to it from another.

structure (age) of the nest of female No. 268 disagrees with the age determination based on the wear of the dentition. Everything suggested that this female had moved from another place. Also the estimation of the nest age of male No. 458 is not certain, the decomposition of the litter in the nest chambers being very much advanced. In the other cases the determination of the age of moles by the structure of their nests coincided with that based on the state of their teeth.

2. Age structure of mole populations. The whole collection contained 45.74% juveniles, 27.19% one-year-old moles, 13.65% two--year-old moles, 9.7% moles of age group III and 3.7% those of group IV (Table 2). The proportion of young moles in the samples from particular localities (Tables 3 and 5) fluctuates between 40 and 50%. Particularly great differences occur in the proportion of the middle age groups (I and II), which increased with the favourableness of the habitat (edaphic

Table 2.

Age and sex of moles collected in Kraków and its environs in 1955—1962.

Age classes	N	%	♂♂	♀♀	♂♂ in %
0	382	45.74	204	178	53.5
I	227	27.19	115	112	50.6
II	114	13.65	63	51	55.2
III	81	9.70	42	39	51.8
IV	31	3.70	16	15	51.6

Table 3.

Age composition of mole populations in particular localities.

Age	Błonia		Dr. Jordan's Park		Łęg		Tatry Mts. & Beskid Sądecki	
	N	%	N	%	N	%	N	%
0	202	48.21	70	44.80	56	40.60	34	46.60
I	94	22.43	47	30.13	50	36.23	16	22.00
II	55	13.13	19	12.20	25	18.11	15	20.60
III	43	10.26	17	10.85	6	4.35	6	8.22
IV	25	6.00	3	1.90	1	0.70	2	2.74

conditions). On the other hand, age groups III and IV formed only 5.05% of the sample taken at Łęg against 16.26% in Błonia, 12.75% in Dr. Jordan's Park and 11% in the Sądecki Beskid and Tatra Mts.

Table 4 shows the proportions of age groups in the samples from particular months. These data reflect objective biological phenomena. The dispersion of the young began in May and reached its full intensity in June. In September, October and November there was a remarkable increase in the number of the young, which is usually connected with late litters, but may be also caused by second litters. The proportions of the other age groups, including the oldest ones, were higher in the catches carried out in the rutting season up to the end of May (Fig. 2, Table 4).

In 1956 the proportion of one-year moles in the sample from Błonia was somewhat smaller than that in the sample from Dr. Jordan's Park, whereas the proportion of old moles (group IV) in the material from Błonia was 3 times as large as that in the material from the park (Table 5).

Table 4.

Age groups of moles in particular months in per cent.

Age	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII
0			1.66	25.00	64.96	49.68	53.30	60.60	60 00	67.85	70.00
I	76.92	66.66	56.67	32.57	13.37	23.90	24.00	13.11	24.00	14.28	30.00
II	15.38	29.17	15.00	18 94	10.20	15.10	13.33	11.47	9.33	8.93	
III	7.70	4.16	16.66	18.94	8 91	9.43	5.43	8.20	2 66	5.35	
IV			10.00	4 54	2.55	1.88	4.00	6.55	4.00	3.57	
N	26	26	65	139	162	174	75	64	79	60	10

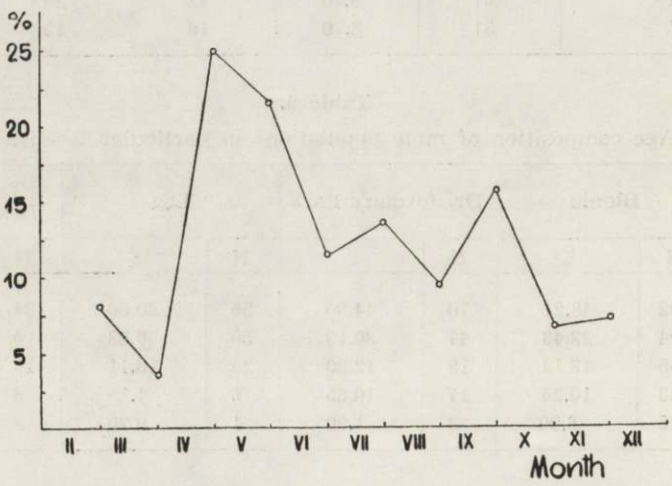

Fig. 2. The percentage of old moles (groups III and IV) in the whole material.

In 1957—1962 the results of catches in these two localities were strikingly coincident. In comparison with 1956 the proportion of one-year moles was markedly higher owing to immigration or to an increase in the survival rate of the young. The relative number of old moles dropped in both localities.

3. S e x r a t i o. Males formed 52.2% of the total. In particular age groups the sex ratio was rather various (Table 2). The numbers of males and females in the catches were dependent upon the method of catching

and the activity of moles in particular seasons of the year. As will be seen from Table 6, the total of 75 moles caught in surface runs up to the end of May contained 50 females. In the remaining months of the year 51 females and 84 males were collected in the surface runs. Sixty females and 117 males were taken in deep tunnels up to the end of July, whereas in the remaining months these figures were 55 and 30 respectively. The differences in quantitative relations between males and females were due, especially in trapping, among other things, to the greater cautiousness of females, as could be clearly seen in laboratory moles. It might be supposed in some cases that females outnumber males overwhelmingly. For example, in the catches of moles in winter nests in 1957 and 1958, including 24 specimens (17 from Łęg), there were only 4 males (16.6%).

Table 5.
Age composition of mole populations in two localities (Błonia and Dr. Jordan's Park) in two different periods of time.

Age group	Błonia, 1956		Dr. Jordan's Park, 1956		Błonia, 1957—1962		Dr Jordan's Park, 1957—1962	
	N	%	N	%	N	%	N	%
0	152	50.5	38	47.5	50	42 3	32	42.1
I	57	18.9	20	25.0	37	31.3	27	35.5
II	37	12.3	10	12.5	18	15.2	9	12.0
III	33	10.9	10	12.5	10	8.5	7	9 2
IV	22	7 3	2	2 5	3	2.5	1	1.3

Table 6.
Sex ratio in samples from tunnels at different depths.

	Sex	1st half year		2nd half year	
		N	%	N	%
Surface runs	♂♂	25	33.3	84	62.2
	♀♀	50	66.7	51	37.8
Deep tunnels	♂♂	117	66.1	30	35.3
	♀♀	60	33 9	55	64.7

Nevertheless, it seems that in the populations of young moles males exceed females in number, at least under some ecological conditions (overcrowded populations), e.g., the sample of 83 young moles taken in Błonia in June 1956 contained 61.4% males. On the other hand, males formed 55.9% of 186 young moles caught at the same locality during the whole year.

The superior number of males decreases in the first year of life, because, being stronger and bolder in explorations of the surface of the territory (observations of moles in captivity), males are exposed to greater danger of life than females. The evidence of this would be the sex ratio in the series of mole skulls collected from the food of the buzzard *Buteo buteo* L. Out of the 204 young specimens, 75.5% were males (Skoczeń, 1962).

IV. DISCUSSION

Age determination in wild animals is a very difficult task, for it involves such problems as the hardness of dentition, the rate of its wear in relation to the kind of food, indirectly to the nature of the habitat (in moles the kind of soil), to individual and, perhaps, seasonal variation in the hardness of the teeth.

Deparma (1951) states that the distinction of age groups in moles is possible on condition that the material is derived from one locality and from a short period of time. According to this authoress, series of specimens from different localities and, the more so, from different periods of time cannot be compared.

The material discussed in this paper was collected in several localities and considered separately for each of them as well as for each season. It was easy to segregate the specimens in the spring, but in the autumn the division of the material into age groups was more difficult owing to the advanced tooth wear and late litters. In this case the possibility of obtainment of "standard" specimens for a given period and locality by determining their age on the basis of the structure of the winter nests is very valuable.

Larkin (1948) divided his material into 3 age groups according to the measurements of the height of M^2. He also ascertained that small triangles of disclosed dentine may appear on the tops of the cusps in juveniles at an age of 3 months. Tooth measurements in moles showed clear-cut differences in the rate of tooth wear depending on the kind of soil. Three age groups were distinguished in the material from Suffolk ($N = 800$) described by Godfrey & Crowcroft (1960), whereas in the samples from other parts of England the tooth wear in moles was more differentiated.

The basic question is here whether the rate of tooth wear increases as the dentine becomes uncovered and the tooth blunted. No doubt, the wearing of new teeth does not proceed in the same way as that of teeth which are already worn and have large islands of disclosed dentine. It may be supposed that the rate of tooth wear in the mole is directly proportional to the increase in the wear surface of the teeth.

Adamczewska-Andrzejewska (1966) found seasonal differences in the hardness of teeth in *Sorex araneus* Linnaeus, 1758. Adult shrews from 3 successive years showed differences in this respect.

Quoting the results of Hall *et al.* (1957) on age determination in bats, Stein (1959) stated that the degree of wear of molars and the shape of the canine are valuable indicators of age. Ancillary characters which, according to Stein (*l. c.*), may be used for age determination are the degree of development of the sagittal crest, the degree of obliteration of skull sutures, the development and size of the uterus, the development of the penis and the size of the testes (up to the first rutting season).

In the material covering the whole year the division into age groups becomes less clear because the space of time in which each group is considered is too long. Therefore, for practical purposes the moles from February, March and April have been shifted by one age group, though they were one year old in April or at the beginning of May (Table 4). As regards the material from the autumn months, it must be kept in mind that the moles of age group I are a year and a half old then.

The skulls illustrated in Phots. 1—8 represent particular age groups and, compared with the standards established for the European mole by Deparma (1954), show some differences. For example, Phot. 1 presents the skull of a young mole from July 1956, in which the canine has a projection, characteristic of the older groups, at the base of the posterior margin. Phot. 2 shows the skull of a young mole from November 1956. In respect of the shape of the canine both these skulls correspond to age group I in Deparma's division (1954). Skull No. 100, as well as the next two skulls (Phots. 4 and 5), coincides with age group II of Deparma, whereas the skulls shown in Phots. 6 and 7 would correspond in shape of the canine to age group IV of Deparma (*l. c.*), but the complete wear of the molars sets them in group V. Group V is also represented by the skull in Phot. 8.

The opinions on the longevity of the mole are controversial. The investigations of Larkin (1948) suggest that the normal life-span of moles is 3 years. Stein (1950, 1959) holds the same opinion, but Deparma (1954) thinks that moles live, on an average, 4 years, never, however, longer than 5 years. A similar opinion may be found in the monograph by Godfrey & Crowcroft (1960). My materials suggest that only few moles can live as long as 5 years (Table 2); 9.7% of the specimens reached an age of 3—3.5 years and about 3.7% lived to be 4—4.5 years old.

Table 3 indicates that the survival rate of moles is connected with the nature of the habitat. Considering this fact, Stein (1959) concluded that in the optimum habitats the proportion of moles of older age groups is smaller than in the most unfavourable localities. In my material from

Łęg the moles of age groups III and IV formed only 5.05% of the sample, whereas in the other localities they ranged from 11% (Sądecki Beskid and Tatra Mts.) to 16.26% (Błonia in Kraków). In no case can this last locality be numbered among the most unfavourable habitats. The great proportion of old moles in Błonia and Dr. Jordan's Park may have been due to isolation, which is characteristic of urban areas.

In Larkin's (1948) materials, the young-of-the-year formed 47% of the total, 1—2 year old specimens 40% and 2—3 year old ones 13%. In recently colonized areas the proportion of juveniles came to 92—96% of the populations. The young moles constituted two-thirds of the sample taken by Stein (1950).

The reduction of a population concerns, above all, juveniles and old moles. According to Deparma (1954), three-quarters of the young moles lose their lives in the first year. In the material of this authoress the number of moles of group IV was equal to a quarter of the number of specimens of group III. According to Godfrey & Crowcroft (1960) the reduction of the young-of-the-year in areas inhabited by the maximum number of moles included $^2/_3$ of this group. In their opinion, every 100 moles would theoretically contain 67 one-year olds, 22 two-year olds, 7 three-year olds, 3 four-year olds and 1 five-year old.

It is worth while to consider what factors exert influence on the reduction of old specimens in the optimum habitats. Godfrey & Crowcroft (1960) think that some other factors than tooth wear come into play here, because the animals die before their teeth are completely worn out. Studies on the diet of moles from southern Poland showed that stomach stones most often occur in old specimens, which seems to point to an insufficiency of the stomach of these animals (Skoczeń, in the press). Besides, the influence of inter-population relations is not insignificant. The heaviest bite-marks were found in old moles caught in the field (Skoczeń, in prep.).

The sex ratio has been discussed in almost each paper about moles as well as other small mammals, and nearly all the authors of these papers asserted the preponderence of males in moles. Folitarek (1932), for instance, collected 89.5% males in some localities and 67.6% in others. In sandy areas the relation of males to females was nearly as 1:1. Baškirov & Žarkov (1960) state that the sex ratio in samples is dependent on the season and the differences in activity between males and females. In the materials of Godfrey & Crowcroft (1960) the males formed 57% of the total. In some months the sex ratio approached 1:1. The authors add that the preponderance of males was sometimes associated with the habitat, e.g., males predominated decidedly in arable fields. In Stein's materials (1960) there were 61.4% males. Larkin

(1948) claims that the proportions of both sexes are equal if catching is continued untill all the moles of the area have been taken. The results of Godet (1951) indicate that the preponderance of males appears in the embryonic period. Out of the 369 mole embryos examined, 210 (57%) were male.

In shrews, as in moles, after leaving the nest in June, males outnumber females as 1.16 to 1. As early as August, however, there occurs a marked preponderance of females expressed by the ratio 1.12 (Pucek, 1959). According to this author, the method of catching, the sexual activity of animals (rutting, breeding, lactation) and the activity connected with age exert essential influence upon both the sex ratio and the age composition of a population.

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EXPLANATION OF PLATE XVI.

Phot. 1—2. Age group 0 — young-of-the-year. Phot. 3. Age group I — moles after the first winter. Phot. 4. Age group II — moles after the second winter. Phot 5. Age group III — moles after the third winter. Phot 6—7. Age group IV — moles after the fourth winter. Phot 8. Age group V — moles after the fifth winter.

Stanisław SKOCZEŃ

OZNACZANIE WIEKU, STRUKTURA WIEKOWA I STOSUNKI PŁCI W POPULACJACH KRETA (*TALPA EUROPAEA* LINNAEUS, 1758)

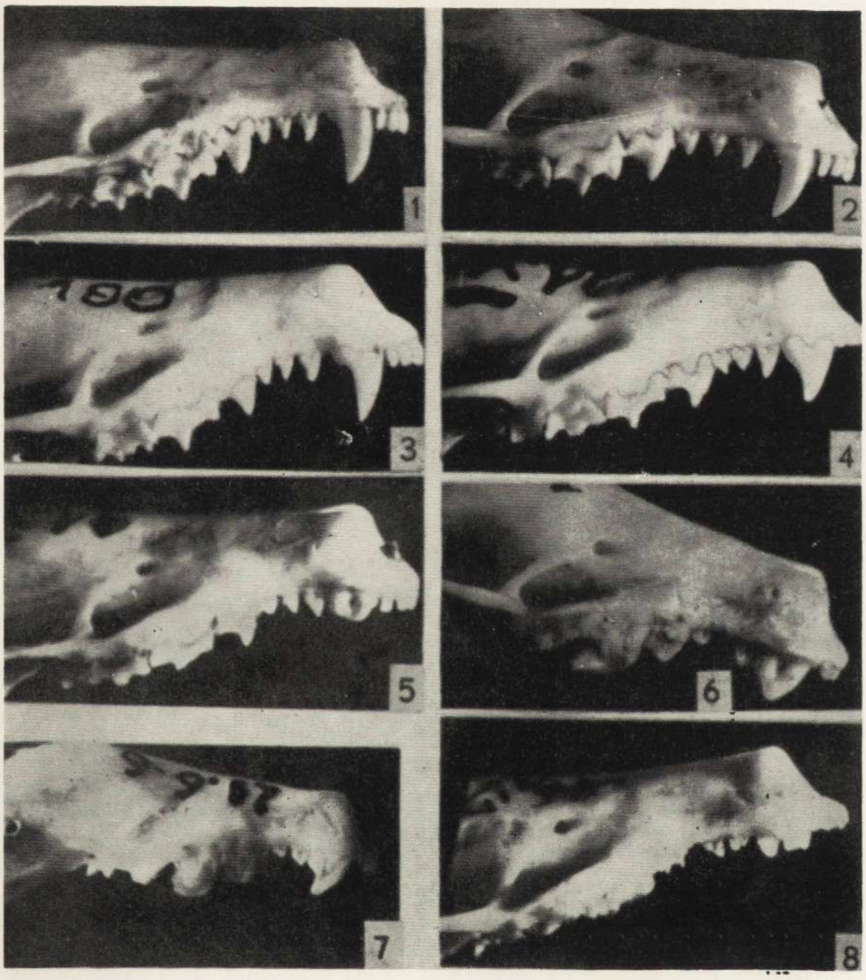
Streszczenie

Dokonano analizy wiekowej populacji kreta, *Talpa europaea* Linnaeus, 1758 z terenów zielonych Krakowa i okolic (N = 880), oraz Beskidu Sądeckiego i Tatr (N = 76), badanych w latach 1955—1962. Oparto się na stopniu zużycia trzonowców i przedtrzonowców oraz kształcie kła. Wykorzystano również cechy dodatkowe, jak ubarwienie futra, pigmentację odnóży, wysokość czaszki, wielkość jąder, rozwój prącia i macicy. Wyodrębniono 5 grup wiekowych.

Zaproponowano nową, pomocniczą, metodę oznaczania wieku kretów wykorzystując cechy budowy gniazda zimowego. Tą drogą można otrzymać „wzorcowe okazy" kretów z poszczególnych grup wieku z różnych biotopów. Krety młode bowiem budują zimowe gniazda jednokomorowe. Z wiekiem ilość komór wzrasta. W przypadku przesiedlanie się kretów nowowykopane gniazda są jednokomorowe.

W całości materiału krety młode stanowiły 45,74%, krety jednoroczne 27,19%, dwuletnie 13,65%, trzyletnie 9,7% i czteroletnie 3,7%.

Zaznaczały się różnice w strukturze wiekowej populacji kreta w różnych biotopach. Biotopy optymalne (np. Łęg), charakteryzowały się małą liczebnością kretów starych (z III i IV grupy wieku), najsilniejszą liczebnie obsadą grup średnich wieku (I i II). Tereny śródmiejskie natomiast (Błonia, Park dr Jordana) miały skład wiekowy populacji kreta charakterystyczny dla biotopów pesymalnych mimo, że warunki edaficzne w tych terenach były dobre.



S. Skoczeń *auctor phot.*