

## Abnormal Coloration in Bats (*Chiroptera*) of Czechoslovakia

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With 8 Figures

### Introduction

In the present time there are known findings of albino individuals from the Czechoslovak region in almost all groups of mammals, especially in small terrestrial mammals and in game (HANÁK 1957, ZEJDA and KLÍMA 1958, PACHINGER 1974, POSPÍŠIL 1974, MÁRA 1975, VELEK 1975, ČERVENÝ and BÜRGER 1976, HERÁŇ and MAZÁK 1976 and others). In other group of mammals, much less findings of albinos are known e.g. in *Carnivora* (HERÁŇ and MAZÁK 1976, SLÁDEK 1976). Also bats belong to the group, where in spite of a very intensive research only very few findings of albino individuals are known so far. In some findings there is not sufficient evidence, if the respective example is the case of albinism, leucism eventually flavism, thought the criterions of evaluation are known:

1. When the skin (including derivatives) has no pigment, the eyes are red or pink, the hair is quite white, it is the case of a total albino.

2. When only some parts of skin are without any pigment (white spots), it is the case of a partial albino.

3. Flavism, eventually rufism is by its character hypochromatism and the affected individuals have a yellow or red hair on the insufficiently pigmented skin.

4. When the hair is white on a normally coloured skin, it is the case of leucist individuals, whose hair became white during their ageing due to the loss of the pigment.

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### Findings

Nowadays there are two publications (WALLEY 1971, ČERVENÝ and BÜRGER 1977), which summarize the majority of findings of abnormally coloured bats. They do not concern with some interesting problems, such as the geographic extension of certain species with a relatively frequent occurrence of abnormally coloured subjects within a certain region.

This paper gives a survey of all known findings in Czechoslovakia together with the discussion remarks on the occurrence in Europe as well.

### *Rhinolophus hipposideros* (Bechstein 1800)

1. Jeseník (Šumperk, district) — 28.I.1958, limestone cave "Na Pomezí", ad. ♂, ochre coloured including the wings, eyes normal coloured (Fig. 1) — flavistic individual — (GAISLER 1961).

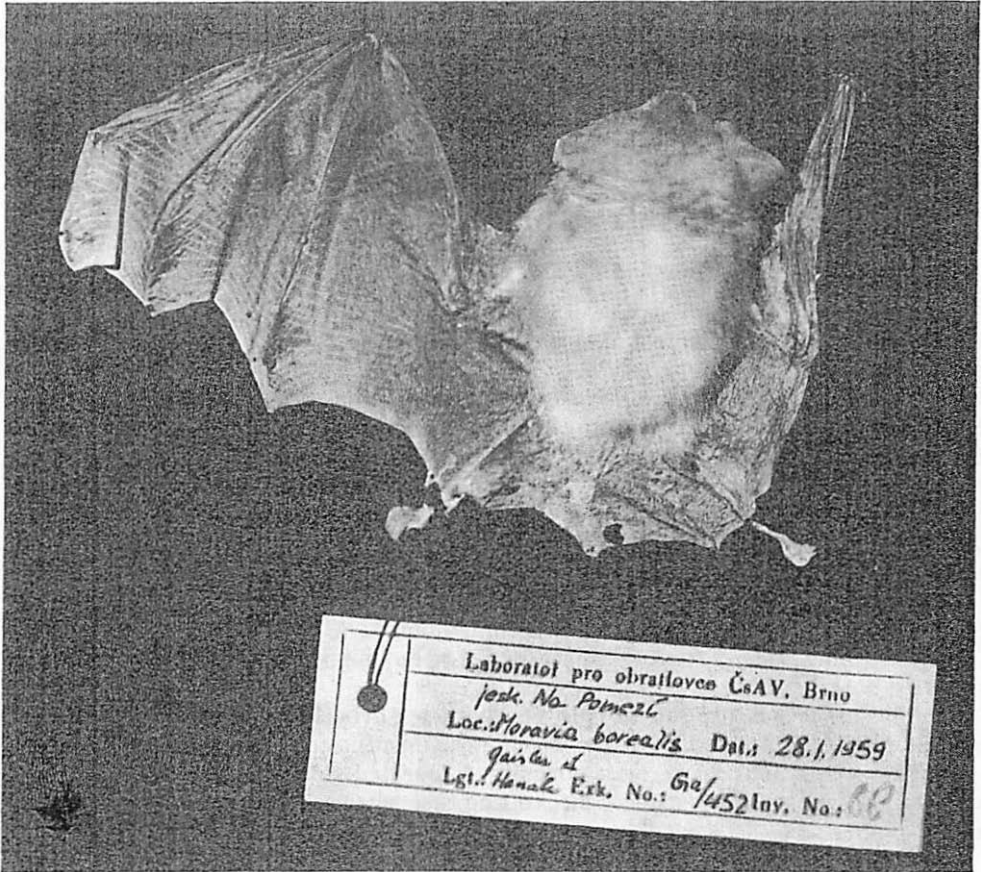


Fig. 1. Flavistic ♂ of *Rhinolophus hipposideros*. Phot.: J. ČERVENÝ

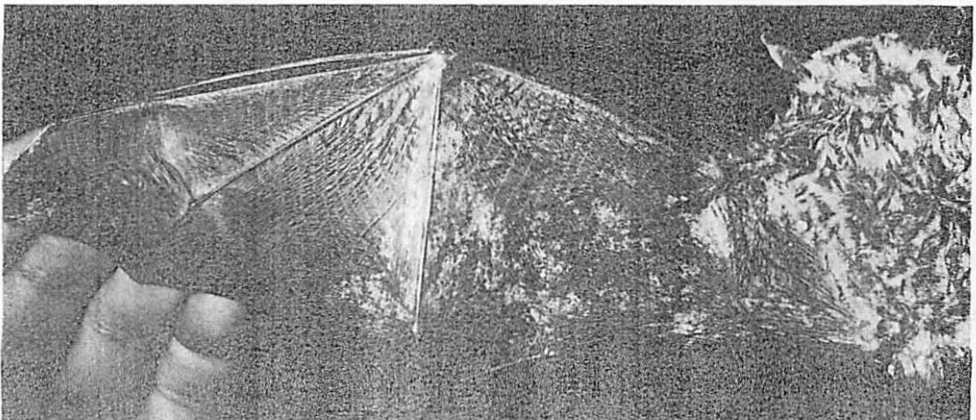


Fig. 2. The debatable partial albino ♂ of *Myotis myotis* with the irregular white spots on the wing. Phot.: J. ČERVENÝ

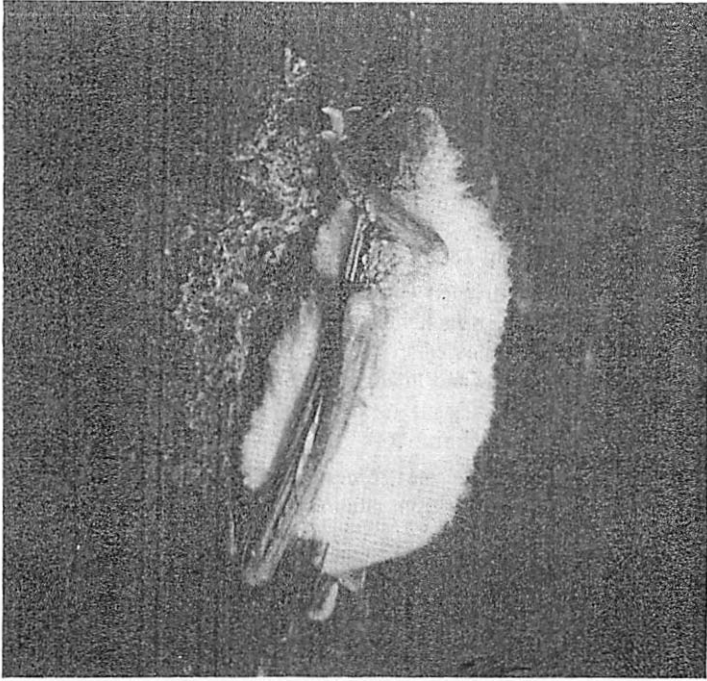


Fig. 3. The total albino ♀ of *Myotis daubentoni* on the wall of gallery in hibernation quarter (Černá v Pošumaví). Phot.: J. ČERVENÝ



Fig. 4. The portrait of total albino ♀ of *Myotis daubentoni*. Phot.: J. ČERVENÝ

*Myotis myotis* (Borkhausen 1797)

2. Adamov (Brno, district) – 17. III. 1962, limestone cave "Býčí skála", ad. ♂ with white spots on the back – partial albino – (GAISLER in litt.).
3. Muckov (Český Krumlov, district) – 27. X. 1977, limestone artificial cave, 11. X. 1978 ibid., 6. I. 1979 ibid.; ad. ♂ with a white irregular spots on the plagiopatagium (Fig. 2) – partial albino? – BÜRGER ad verb.). 3a. Sušice (Klatovy, district) – 19. VII. 1980 subad. ♂ with a white top of the right wing – partial albino – (ČERVENÝ leg.).

*Myotis daubentonii* (Kuhl 1819)

4. Spálené Poříčí (Plzeň – south, district) – 23. VIII. 1965, space in the window of a building, subad. ♀ with a white spot on its head's crown – partial albino – (HŮRKA in litt.).
5. Černá v Pošumaví (Český Krumlov, district) – 5. XII. 1976, gallery of St. Josef (Fig. 3 and 4) – total albino ♀ – (ČERVENÝ and BÜRGER 1977).

*Eptesicus serotinus* (Schreber 1774)

6. Smolenice (Trnava, district) – 11. II. 1961, limestone cave "Driny", ♀ with a white spot in the middle of the front (Fig. 5) – partial albino – (GAISLER in litt.).

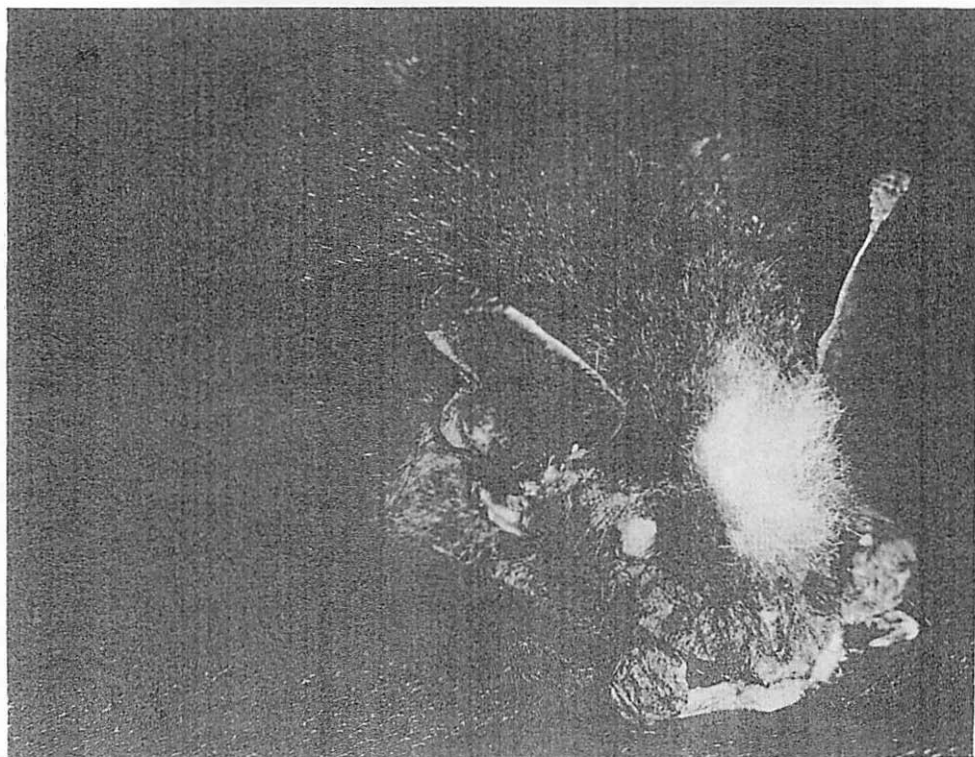


Fig. 5. The partial albino ♀ of *Eptesicus serotinus*. Phot.: J. ČERVENÝ

*Barbastella barbastellus* (Schreber 1774)

7. Cheb (Cheb, district) – 23. II. 1962, the castle cellar, ad. ♂ with a white spot on the head's crown and on the front – partial albino – (HŮRKA in litt.).
8. Chýše (Plzeň – north, district) – 16. II. 1971, the brewery cellar, ad. ♂ with a white spot on the head's crown and on the front – partial albino – (HŮRKA in litt.).

9. Karlštejn (Beroun, district) – winter 1969, gallery, ♂ with the white crown and with irregular spots on plagiopatagium – partial albino – (HORÁČEK ad verb.).
10. Staré Hutě near Rejštejn (Klatovy, district) – 15. I. 1978, shaft, ad. ♂ with white spots on the back and on the head's crown – partial albino – (ČERVENÝ leg.).
11. Tišnov (Brno, district) – 20. I. 1959, gallery in the hill "Květnice", ♂ with white spots on back, neck, and head (Fig. 6). – partial albino – (GAISLER 1961; the author mentions the verbal statement of GRUICH, who found in this locality a larger number of partial albinos).

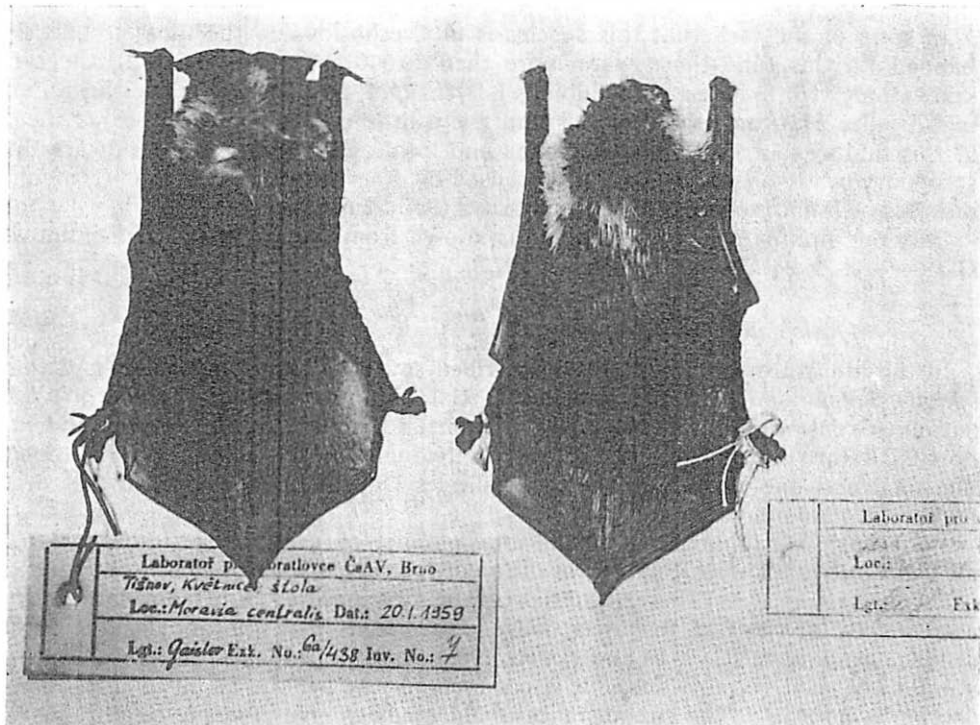


Fig. 6. The partial albinos of *Barbastella barbastellus* (right ♂, left ♀).  
Phot.: J. ČERVENÝ

12. Šumperk (Šumperk, district) – 6. IX. 1966, beams in the loft of a building, ad. ♂ with white spots on the wings – partial albino – (SOUČEK 1968).
13. Smolenice (Trnava, district) – 11. II. 1961, limestone cave "Driny", ♀ with depigmented places in the hair and the patagium – partial albino – (GAISLER in litt.).
14. Tisovec (Rimavská Sobota, district) – 3. II. 1955, limestone cave "Kostolík", 8 ad. ♂♂ and 5 ad. ♀♀ with irregular white spots in the hair – partial albinos – (VACHOLD 1955); 15. II. 1961, more individuals with white spots in the hair, 2 ♂♂ and 1 ♀ collected (GAISLER in litt.).
15. Libanka pri Dubniku (Prešov, district) – hibernating 1963–1967 in galleries, 17 ♂♂ and 4 ♀♀ partially albinotic, in 20 cases the patagium and only in 2 cases also the hair were affected. The colour was passing from dirty white or yellow to pure white (PALÁŠTNY 1968).

## Discussion

### *Rhinolophus hipposideros*

The only finding of a flavistic individual in Czechoslovakia was published by GAISLER (1961). In further literature, there is no another mention of any abnormally coloured individual, in spite of the fact, that this species has belonged so far to the most frequently banded species (not only in Czechoslovakia).

### *Myotis myotis*

In spite of the fact, that this species is in Czechoslovakia the most frequently banded (to this time there were more than 20 000 specimens banded), there is known only two findings of the albinos ("Býčí skála" and "Sušice"). The third finding (locality Muckov) stated in this paper is a little debatable. The circumstances of this finding, but especially the shape and location of wing's spots indicate the secondary origin of white colouration caused by others influences e.g. frost, mould diseases or intensive infesting with parasites (*Spinturnicidae* ?).

Only one finding of a partial albino is known from the literature: Hohenfinow, GDR — juv. ♂, 24. VII. 1969 (HAENSEL 1972).

### *Myotis daubentoni*

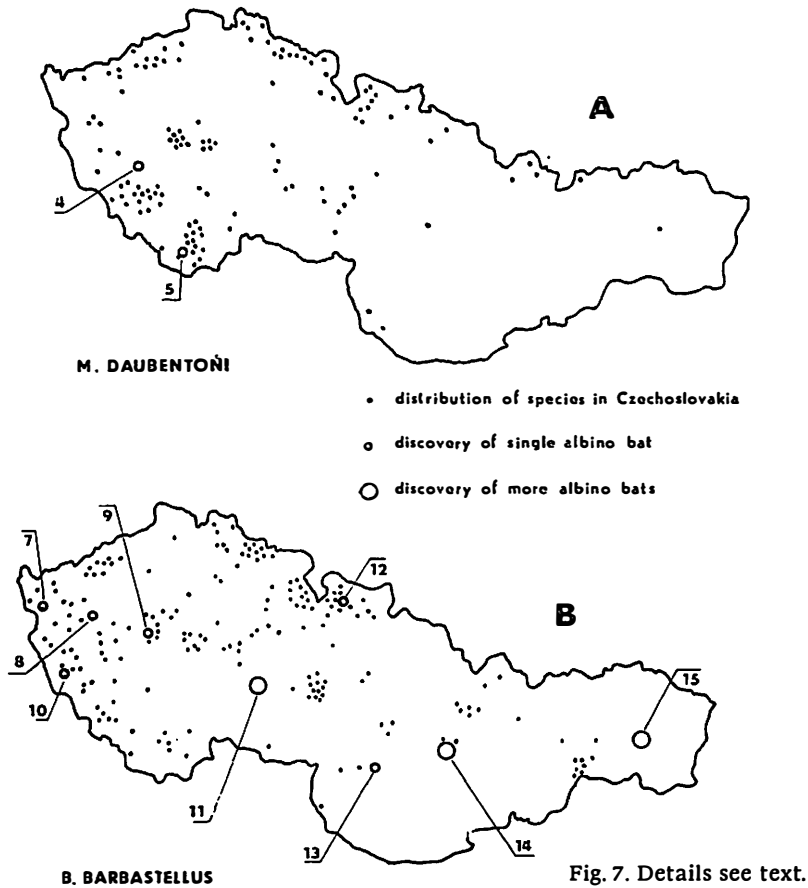
In the literature there have been described several albinotic individuals of this species. STEBBINGS (1965) mentions one partial albino from the cave Glen in West Suffolk (Great Britain), HAENSEL (1968) a partial albino from galleries in Rüdersdorf/GDR (of the total number of 8000 individuals), EGŠBAEK (ex. HAENSEL 1968) one total and one partial albino from galleries Daugbjerg/Denmark (of the total number of 7000 individuals).

2 Czechoslovak findings out of the total number of 3000 banded individuals in all Czechoslovakia were found in 2 different localities: Spálené Poříčí and Černá v Pošumaví (Fig. 7 A). These localities are in a distance 105 km from each other and in spite of the fact that even longer movements than the above mentioned distance are known (GAISLER and HANÁK 1969), it is not probable, that this was the question of relative individuals. It is not certain, whether the albinism in *M. daubentoni* is heritable. The circumstances of all findings give evidence against it. In the locality Černá v Pošumaví among 528 individuals, which were quantitatively examined during more seasons in hibernation and in reproduction, only 1 albinotic ♀ was found.

In the mentioned winter quarters abroad, the findings of albinos are rare as well. Furthermore it is possible, that the albinism in *M. daubentoni* is associated with other factors, which stop retaining of deviations in the population (e.g. lower vitality, sterility etc.). The social discrimination in the period of mating may be another delimitating factor. Hence the found albinos may be mutants. We cannot omit the possibility, that albinos are recessive homozygots descendants of heterozygotic parents with a very low frequency of occurrence.

### *Eptesicus serotinus*

The only finding of a partial albino was done by GAISLER (in litt.). Several more findings are known from the literature. HAVĚKOST (ex. HAENSEL 1968) mentions 1 albino without any closer determination and 1 total albino from 2 summer localities in the district Oldenburg (FRG). STRATMANN (1971) described 1 total albino from 1 locality in GDR.



*Barbastella barbastellus*

The majority of albino bats from the area of Czechoslovakia is known in this species (Fig. 7 B). In some collective hibernating quarters they may be found in a relatively large number. VACHOLD (1955) describes 13 individuals with white spots (e.g. 12,6% of the total number of 103 *B. barbastellus*) from the cave "Kostolík" in Tisovecko – Muráňský Karst (Middle Slovakia). The description of the individuals was not accurate and it indicated rather to be the question of leucism, however the specimens collected by GAISLER (in litt.), who visited this locality 6 years later, proved a partial albinism. PALÁŠTHY (1968) mentions 21 partial albinos from the winter quarter Libanka pri Dubníku in Slánské mountains (east Slovakia), which makes 2,19% of the hibernating population of 1002 animals. Another winter locality with more frequent occurrence of partial albinos is noticed by GAISLER (1961): the galleries in the hill "Květnice" near Tišnov (Moravia). In Bohemia there is the situation different. Although we know a number of collective hibernating quarters from this area, the occurrence of albinos has not been mentioned so far (BÜRGER and NEVRLÝ in litt.). 4 findings of partial albinos in Bohemia are from 3 west bohemian and 1 middle bohemian winter quarters, where the individuals hibernate in small numbers (1–10 specimens in a respective locality). All these localities are about 60–100 kms far away from each other and they occur in a densely and continuously settled area of *B. barbastellus* (Fig. 7 B). According to

another fact, that on the territory of Czechoslovakia there are known more longer flights (50 kms and more) of this species (GAISLER and HANÁK 1969), we cannot exclude the possibility of a certain relationship of partial albinos in west parts of Czechoslovakia. Therefore it is probable that on the territory of west and middle west Bohemia the penetrating and movements of the population in the period of mating takes place. On the other hand the findings in collective hibernation quarters in Slovakia show the isolation of local populations. Except the mentioned facts also the further factors indicate that the partial albinism in *B. barbastellus* is heritable:

1. Up to now there have been banded in Czechoslovakia about 3700 individuals, out of which 44 were affected by albinism, i.e. 1,19%. It is also possible, that even more individuals of *B. barbastellus* were overlooked due to their silver colouration. The percentage of occurrence of partial albinos is very high, especially if compared with other bat species e.g. more than 20 000 individuals of *M. myotis* have been banded so far, but only 2 genuine and 1 discutable partial albinos were found among them.

2. The albinotic individuals within particular territories are much alike as to the form of white spots and on the other hand they differ within different territories. The individuals of west and middle Bohemia have mostly white front, crown; the individuals in east Slovakia have white spots on patagium only.

Another interesting problem is a higher number of partially albinotic ♂♂ (33 ♂♂ : 11 ♀♀ i.g. 75% : 25%), sex ratio in all individuals in collective hibernating quarters (Kostolík and Libanka) being 676 ♂♂ : 429 ♀♀, i.g. 61,9% : 38,1% (in these 2 winter quarters there were found 84,3% of all albinotic individuals). The superiority of ♂♂ 3 : 1 indicates also the mode of heridity in albinotic colouration, where the partial albinism is associated with the dominant gift on ♂ (KARAKOZ 1964) — see Fig. 8. The albinism is conditioned by the existence of the allelomorphe pair of gift (named as *A* — albinism, *a* — normal coloration) deposited in a single pair of autosomes. By mating of different homozygot types in generation  $F_1$  there arise always only albinotic ♂♂ and normally coloured ♀♀. The crossed individuals of generation  $F_2$  give arise to albinos and normally coloured ♂♂ in a ratio 3 : 1, in ♀♀ the ratio being converse. In the sex chromosome *X*, the presence of another factor *Z*,

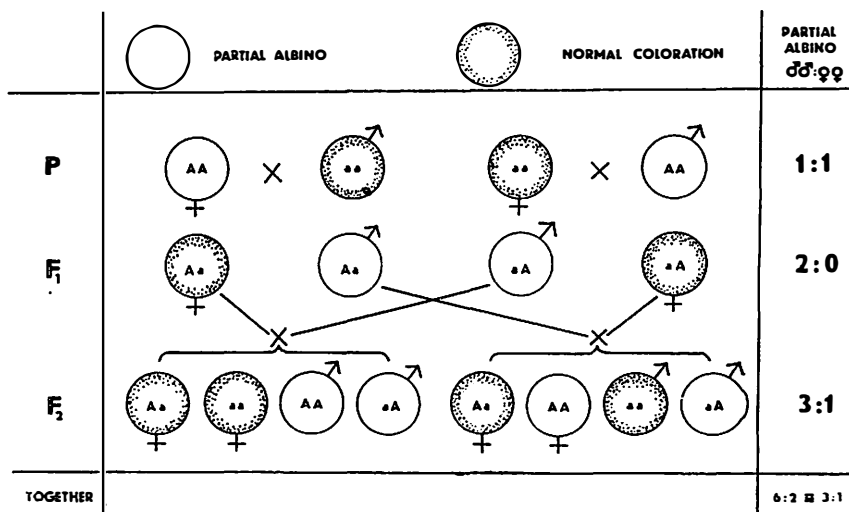


Fig. 8. Details see text.



i.e. the factor of dominances' reverse is presumed. This factor changes the mutual relation between dominance and recessivity only if it is present in both chromosomes, which case is possible to occur only in ♀♀. In this case a becomes dominant over A. Because the factor Z is not present in chromosome Y, dominances' reverse cannot take place in ♂♂. The recessive gift for normal coloration occurs in homozygotes, in heterozygotes in ♂♂ only. It is also possible, that the albinos keep up in the population only by means of inbreeding as recessive homozygotes with the lowered ♀♀ vitality. The answer to this questions can be given only by a more detailed analysis of circumstances in a larger number of albinotic individuals examined.

Only few findings of partial albinos of *B. barbastellus* outside the territory of Czechoslovakia come from the collective hibernation quarter in the locality in Bavaria (FRG), where KRAUS (in litt.) collected 2 ♂♂ on 3. I. 1959. Another finding of a partial albino (sex ?, date ?) is known from High Austria (BAUER ad verb.).

### S u m m a r y

The present paper brings survey of all known findings of abnormally coloured bats in Czechoslovakia. The further findings are known so far: 1 flavistic individual of *Rh. hipposideros*, 3 partial albinos (?) of *M. myotis*, 1 partial albino and 1 total albino of *M. daubentoni*, 1 partial albino of *E. serotinus*, 44 partial albinos of *B. barbastellus* (see Fig. 7). The partial albinism in *B. barbastellus* is probably connected with the ♂ sex (see Fig. 8). The circumstances and conditions influencing the occurrence of albinos are discussed. According to the findings of partial albinos of *B. barbastellus* (with regards to all the findings in Czechoslovakia) it is probable, that in west Bohemia there are movements and mixing of the population in the time of mating. The concentrated findings in collective hibernation quarters of Slovakia indicate the relative isolation of local populations in this species.

### Z u s a m m e n f a s s u n g

Die Arbeit bringt eine Übersicht über alle bekannten Funde abnormal gefärbter Fledermäuse in der Tschechoslowakei. Bisher wurden gefunden: 1 flavistisches Individuum von *Rhinolophus hipposideros*, 3 partielle Albinos von *Myotis myotis* (?), 1 totaler und 1 partieller Albino von *Myotis daubentoni*, 1 partieller Albino von *Eptesicus serotinus*, 44 partielle Albinos von *Barbastella barbastellus* (siehe Abb. 7). Der partielle Albinismus bei *Barbastella barbastellus* ist wahrscheinlich an das männliche Geschlecht gebunden (siehe Abb. 8).

In der Arbeit werden auch die Umstände der Funde und die möglichen Einflüsse auf die Entstehung des Albinismus diskutiert. Nach den Funden der Teilalbinos von *Barbastella barbastellus* (im Hinblick auf alle Funde bei dieser Art in der ČSSR) ist wahrscheinlich, daß es in Westböhmen während der Paarungszeit zu Überflügen und zum Vermischen der Population kommt. Im Gegensatz dazu zeigt die Konzentration von zahlreichen Exemplaren in den Massenwinterquartieren der Slowakei die relative Isolation von lokalen Populationen an.

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