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Fauna trzmieli (*Bombus* LATR.) i trzmielców (*Psithyrus* LEP.) Tatr Polskich

Фауна *Bombus* LATR. и *Psithyrus* LEP. польской области Татр

The *Bombus* LATR. and *Psithyrus* LEP. fauna of the Polish part of the Tatry Mountains

INTRODUCTION

The studies on the *Bombus* LATR. and *Psithyrus* LEP. species of the Polish Tatry Mountains were started by A. WIERZEJSKI. He published in 1868 and 1874 lists of *Hymenoptera* collected in Galicia in which data concerning the Polish part of the Tatry Mountains are included. These lists were subsequently supplemented by J. ŚNIEŻEK (1910) and J. NOSKIEWICZ (1920). Thanks to these papers 14 *Bombus* LATR. and 4 *Psithyrus* LEP. species were hitherto known from the Polish Tatry Mountains. The paper by J. NOSKIEWICZ mentioned above comprises besides the list of *Aculeata* species from the Tatry Mountains also the considerations on their distribution in dependence on the altitude. In a paper on the distribution of the bumblebees in Poland (1957) I have presented some data concerning the Tatry Mountains, in the faunistic literature, however, there is still no detailed investigation on the *Bombus* LATR. and *Psithyrus* LEP. species distributed in the Polish part of the Tatry Mountains.

I have undertaken the publication of my studies on the

Bombus LATR. and *Psithyrus* LEP. species of the Tatry Mountains within the scope of joint investigations organized by the Cracow Branch of the Zoological Institute of the Polish Academy of Science.

This paper is based on materials of *Bombus* LATR. and *Psithyrus* LEP. species from the Tatry Mountains, the collecting of which I have started in 1951 and continued especially intensively in 1955 and 1956. During the last two summer seasons I have collected the insects, with only short interruptions, from April till October; thus I have been able to collect some thousand of specimens of the *Bombus* LATR. and *Psithyrus* LEP. species and to devote myself to phenological and biological observations of this group of insects. Besides the Polish part of the Tatry Mountains proper I have taken also an account of the regio sub-montana infra (Skalne Podhale) which J. NOSKIEWICZ in his work called the base of these montains. These investigations have comprised Gubałówka, Zakopane, Łosówki, Palenica, Poronin, Szaflary, Bukowina and Głodówka. Materials collected in that area were to facilitate the determination which *Bombus* LATR. and *Psithyrus* LEP. species occurring there do not appear in the Tatry Mountains. Collections of PROF. DR. J. STACH, PROF. DR R. and H. WOJTUSIAK and DOC. DR. J. FUDAKOWSKI served me as a supplementary material. The above mentioned collections, numbering about 300 specimens collected in the regio sub-montana infra as well as in the Tatry Mountains are in possession of the Cracov Branch of the Zoological Institute of the Polish Academy of Science.

After a detailed investigation and determination the material collected proved to be sufficient to represent the faunistic relations of the *Bombus* LATR. and *Psithyrus* LEP. species in the Polish part of the Tatry Mountains, to undertake zoogeographical considerations and to sum up biological observations.

I wish to express here my warmest thanks to PROF. DR. J. STACH and DOC. DR. J. FUDAKOWSKI for the help they have given me, to PROF. DR. J. STACH, PROF. DR R. and H. WOJTUSIAK and DOC. DR. J. FUDAKOWSKI for rendering me their collections, to DR. J. KUC for the determination of plants from the Tatry Moutains and to MGR. A. MIODOŃSKI and W. ŁODZIŃSKI for the help in collecting the insects.

I. THE FAUNISTIC RELATIONS IN THE *BOMBUS* LATR. AND *PSITHYRUS* LEP. GROUP IN THE POLISH PART OF THE TATRY MOUNTAINS

1. List of species with a detailed discussion of their occurrence

The investigated area is divided into several plant-zones with borders running in the Polish part of the Tatry Mountains generally on identical altitudes above the sea level. During the collecting it was difficult to determine in each case the absolute altitude, but relatively easy to localize the place of the catch of insects in a given plant-zone. Therefore besides giving the name of each locality in tne Tatry Mountains where the species cited below were taken I simultaneously give respective plant-zones marked by following numbers;

I. regio sub-montana infra (Skalne Podhale, up to 700 m alt.)
II. regio montana inferior (Regiel dolny, 700—1250 m alt.)
III. regio montana superior (Regiel górny, 1250—1550 m alt.)
IV. regio mugheti (1550—1800 m alt.)
V. regio alpina (1800—2300 m alt.)
VI. regio sub-nivalis (2300—2499 m alt.)

1. Genus: *Bombus* LATR.

1. *B. (Hortobombus) hortorum* L.

Fairly common in zone II and III, rare in zone IV. Occurring mainly in colouration characteristic for m. *hortorum* L., in addition several male and female specimens (about 5 per cent) belong to m. *corbicularis* P. H.

I. Szaflary VII. 1956 (leg. J. STACH) ♀♀ on *Symphytum* sp. and *Vicia* sp.
Poronin 19. VIII. 1956, ☿☿ and ♀♀ on *Vicia* sp.
Poronin 7. VIII. 1956, ☿☿ and ♀♀ on *Salvia verticillata* L.
Antałówka VIII. 1956, a nest in a trunk.
Zakopane 17. VIII. 1956, ♀♀ on *Salvia verticillata* L.
Zakopane 5. VIII. 1920, ♂ (leg. J. FUDAKOWSKI).
Gubałówka 28. VII. 1953, ☿☿ (coll. WOJTUSIAK).

II. Dolina Kościeliska 8. V. 1956, ☿☿ on *Crocus scepusiensis* BORB.

Przysłop Miętusi 9. V. 1956 ♀♀ on *Crocus scepusiensis* Borb.

Kalatówki 14. V. 1955, ♀♀ on *Crocus scepusiensis* Borb.

Dolina Chochołowska 15. V. 1956, ♀♀ on *Primula elatior* L. Hill. and *Crocus scepusiensis* Borb.

Dolina Kościeliska 22. V. 1956, ♀♀ on *Primula elatior* L. Hill.

Polana Zahradziska 26. V. 1956, ♀♀ on *Primula elatior* L. Hill.

Dolina Olczyska 8. VI. 1956, ♀♀ on *Alectrolophus* sp.

Meadow near Forestry Morskie Oko 18. VI. 1956, ♀♀ on *Alectrolophus* sp.

Wodogrzmoty Mickiewicza 18. VI. 1956, ♀♀ and 1 ♂ on *Lonicera* sp.

Przysłop Miętusi 10. VII. 1956, ♀♀ on *Alectrolophus* sp.

Droga pod Reglami 17. VIII. 1956, ♂♂ on *Brunella* sp.

Sarnia Skała 17. VIII. 1956, ♂♂ on *Brunella* sp.

Czuba Roztocka 24. VIII. 1956, ♀♀, ♀♀ and ♂♂ on *Gentiana asclepiadea* L.

Dolina Białej Wody 24. VIII. 1956, ♀♀ and ♂♂ on *Aconitum* sp. and *Brunella* sp.

Żar 5. IX. 1956, ♀♀ and ♂♂ on *Chamaenerion angustifolium* (L.)

Żar 7. IX. 1956, ♀♀ and ♂♂ on *Gentiana asclepiadea* L.

Dolina Tomanowa 6. IX. 1956, ♂♂ on *Gentiana asclepiadea* L.

III. Path to Karczmisko 11. VI. 1956, 1 ♀ on *Vaccinium myrtillus* L.

Kalacka Turnia 17. VI. 1955, ♀♀ on *Lamium purpureum* L.

Kalacka Turnia 19. IX. 1956, ♀♀ and ♂♂ *Aconitum callibotryon* Rchb.

Smreczyński Wierch 4. IX. 1956, ♂♂ on *Chamaenerion augustifolium* (L.) Scop. and in a wood flying around lower parts of trees (*Picea excelsa* LK.).

Dolina Tomanowa 5. IX. 1956, ♀♀ and ♂♂ on *Aconitum callibotryon* Rchb.

Żar 5. IX. 1956, ♀♀ on *Chamaenerion angustifolium* (L.) Scop.

Kominy Tylkowe 10. IX. 1956, ♀♀ on *Aconitum callibotryon* Rchb.

IV. Dolina Roztoki 28. VIII. 1956, ♀♀ on *Aconitum callibotryon* Rchb.

Siwe Sady 6. IX. 1956, ♀♀ and ♀♀ on *Aconitum callibotryon* Rchb.

Kobylarz 9. IX. 1956, ♀♀ on *Aconitum callibotryon* Rchb.

Kominy Tylkowe 10. IX. 1956, ♂♂ on *Aconitum callibotryon* Rchb.

Ciemniak 3. IX.1 956, ♀♀ on *Aconitum callibotryon* Rchb.

2. *B. (Hortobombus) ruderatus* F.

I. Szaflary 30. VII. 1955, 4 ♀♀ on *Salvia* sp. (leg. J. Stach).

3. *B. (Subterraneobombus) subterraneus* L.

Very rare, in the Tatry Mountains occurs exclusively m. *latreillellus* (K.).

I. Bukowina 28. VIII. 1955, 1 ♂ on *Euphrasia* sp.

Szaflary 29. VII. 1955, 1 ♀ on *Symphytum* sp.

II. Kalatówki 14. V. 1955, 1 ♀ on *Crocus scepusiensis* Rchb.

Kalatówki 23. V. 1956, 1 ♀ on *Primula elatior* L. Hill.

Sarnia Skała 17. VIII. 1956, 1 ♀ on *Brunella* sp.

III. Pod Rówienkami 31. VII. 1956, ♂ on *Carduus* sp.

V. Świnica 23. VIII. 1956, ♀ on *Pedicularis verticillata* L.

4. *B. (Subterraneobombus) distinguendus* Mor.

One of the rarest species occurring in the Tatry Mountains, known in Polish collections as reaching only to zone I (Podhale).

I. Gubałówka 17. VII. 1953 (coll. Wojtusiak), ♀ on *Trifolium* sp. Dalla Torre (1878) mentions it from the Tatry Mountains.

5. *B. (Pomobombus) pomorum* Panz. f. *nigromaculatus* Schmdk.

New for the Polish part of the Tatry Mountains.

III. Przysłop Miętusi 13. V. 1955, 1 ♀ on *Crocus scepusiensis* Rchb.

6. *B. (Pomobombus) elegans* Seidl.

Very rare, hitherto observed in the Tatry Mountains in Hala Gąsienicowa only by J. Noskiewicz (1920). Available specimens come from zone I (Podnóże Tatr).

I. Zakopane 12. VI. 1920, (leg. Fudakowski) 1 ♀

Gubałówka 14. VI. 1955, 1 ♀.

II. Toporowa Cyhrla 9. VIII. (Noskiewicz 1920) 1 ♀.
IV. Dolina Gąsienicowa 1. IX. (Noskiewicz 1920) 1 ♂.

7. *B. (Agrobombus) agrorum* F. m. *agrorum* F.

A bumble-bee rare in the Tatry Mountains, distributed only in zone II and III (Regiel).

I. Szaflary 29. VI. 1955, ♀♀ (leg. J. Stach).
Poronin 7. VIII. 1955, ♀♀ on *Vicia* sp.
Łosiówki 14. VI. 1955, ♀♀ on *Vaccinium myrtillus* L.
Gubałówka 14. VI. 1955, ♀♀ on *Vaccinium myrtillus* L.
Bukowina 15. VI. 1955, ♀♀ on *Vaccinium myrtillus* L.
Bukowina 28. VIII, 1955, 1 ♂.
Dolina Niebieska 28. VIII. 1955, 1 ♀.
Głodówka 28. VIII. 1955, ♀♀.

II. Dolina Kościeliska 8. V. 1956, 2 ♀♀ on *Crocus scepusiensis* Rchb.
Źleb Staników 14. V. 1955, 1 ♀ on *Vaccinium myrtillus* L.
Toporowa Cyrhla 11 and 13. VI. 1956, ♀♀ on *Vaccinium vitis idaea* L.
Kalatówki 14. V. 1955, ♀♀ on *Crocus scepusiensis* Rchb.
Łysa Polana 18. VI. 1956, 2 ♀♀ on *Gentiana asclepiadea* L.
Dolina Kościeliska 22. VI. 1956, ♀♀ on *Pulmonaria obscura* Dum.
Dolina Kościeliska 10. VII. 1955, ♀♀ on *Alectrolophus* sp.
Droga pod Reglami 17. VIII. 1955, 1 ♀ and 1 ♀.
Czuba Roztocka 24. VIII. 1956, 1 ♀ on *Gentiana asclepiadea* L.
Zazadnia 25. VIII. 1956, 1 ♀ on *Euphrasia* sp.
Dolina Kościeliska 9. IX. 1956, 1 ♂ on *Carduus* sp.

III. Kalacka Turnia 17. VI. 1956, ♀♀ on *Lamium purpureum* L.
Kalacka Turnia 7. VIII. 1955, 1 ♀ and 1 ♀ on *L. purpureum* L.

8. *B. (Agrobombus) humilis* Ill.

Very rare in zone I (Podhale).

I. Poronin 7. VIII. 1955, 2 ♀♀ on *Vicia* sp.
Palenica (Noskiewicz 1920).

9. *B. (Agrobombus) ruderarius* Müll. m. *ruderarius* Müll.

Very rare in zone I (Podhale) and in the Tatry Mountains.

I. Zakopane 7. VIII. 1920 (leg. FUDAKOWSKI).
Gubałówka VII. and VIII. 1952 and 1953, ♀♀ and ♂♂ (coll. WOJTUSIAK).
Poronin 7. VIII. 1955, ♀♀ on *Vicia* sp.
Bukowina 28. VIII. 1955,
Reported from the Tatry Mountains by WIERZEJSKI (1874). Apparently from zone II.

10. *B. (Agrobombus) silvarum* L. m. *distinctus* VOGT.
Very rare in the Tatry Mountains and in zone I (Podhale).
I. Szaflary VII. 1955, ☿☿ on *Vicia* sp. (leg. J. STACH).
Poronin 7. VIII. 1955, ☿☿ and ♀♀ on *Vicia* sp.
II. Reported from the Tatry Mountains by WIERZEJSKI (1874).

11. *B. (Agrobombus) equestris* F. var. *monochromus* F.
Distributed only up to zone I (Podnóże Tatr).
I. Szaflary 30. VI. 1956. 1 ☿ on *Vicia* sp. (leg. J. STACH).
Zakopane 17. VIII. 1955, 1 ♀ *Salvia verticillata* L.

12. *B. (Lapidariobombus) lapidarius* L. ssp. *lapidarius* L.
New for the Polish part of the Tatry Mountains. Reported first by J. FUDAKOWSKI.
I. Gubałówka VIII. 1953 (Ex coll. WOJTUSIAK).
II. Przysłop Miętusi 13. V. 1955, ☿☿ on *Crocus scepusiensis* RCHB.
Dolina Strążyska 8. VIII. 1925, 1 ♂ (leg. FUDAKOWSKI).
Kalatówki 14. V. 1955, ☿☿ on *Crocus scepusiensis* RCHB.
Czoła Jaworzyńskie 13. VI. 1955, 1 ☿ on *Vaccinium myrtillus* L.
Kopieniec Wielki 9. VI. 1955, ☿☿ on *V. myrtillus* L.
Meadow near Forestry Morskie Oko 18. VI. 1956, on *Alectorolophus* sp.
III. Path to Karczmisko 11. VI. 1956, 1 ☿ on *V. myrtillus* L.
Sarnia Skała 23. V. 1956, 1 ☿ on *Pulmonaria auricula* L.
Karczmisko 9. VII. 1955, 2 ☿☿ on *Vaccinium myrtillus* L.

13. *B. (Soroeensibombus) soroeensis* F. ssp. *soroeensis* F.
New for the Polish part of the Tatry Mountains. Occurs in the Tatra Mountains in the following colour forms; typical form (3 ☿☿ and 5 ♀♀), f. *laetus* Schmdk. (2 ☿ and 4 ♀), f. *collinus* (Sm.) (1 ♂ and 1 ♀), f. *rarus* F. (1 ♀).

I. Gubałówka VII and VIII 1953 and VI. 1955, ♀♀ on *Thymus* sp. (coll. Wojtusiak).
Głodówka 28. VII. 1955, ♂.
Bukowina 28. VIII. 1955, ♂.
II. Path to Przełęcz Iwaniacka 16. VI. 1955, ♀.
Źleb Staników 14. VI. 1955, ♀, *Vaccinium myrtillus* L.
Kopieniec Wielki 9. VI. 1955, ♀, *Vaccinium myrtillus* L.
Meadow near Forestry Morskie Oko 18. VI. 1956, ♀ on *Alectorophus* sp.
Dolina Białej Wody 18. VI. 1956, ♀.
III. Karczmisko 9. VII. 1955, ☿☿ and ♀♀ on *Vaccinium myrtillus* L.
Jaworzynka Miętusia VII. 1953, ♀♀ on *Campanula* sp. and *Cnautia* sp. (coll. Wojtusiak).
Pod Rówienkami 31. VIII. 1956, ♂♂ on *Carduus* sp.

ssp. *proteus* Gerst.

I. Szaflary 30. V. 1955, ☿☿ typical form (leg. Stach).
II. Reported from the Tatry Mountains (Dolina Białego and Kamieniołom) by J. Noskiewicz (1920). Typical form and f. *centriventris* Fr. e. Wag. In materials available I have found no specimens of this ssp. from the Tatry Mountains.

14. *B. (Pratobombus) jonellus* K.

Very rare in the Tatry Mountains.

III. Reported only by J. Noskiewicz from Dolina Tomanowa (1920).

15. *B. (Pratobombus) pyrenaeus* Pér.

A bumble-bee common in the Tatry Mountains. Most numerous in Alpine zone. Occurring in three colour varieties:

1. m. *pyrenaeus* Pér. 4,8 per cent of the collection (mainly ♂♂ and not numerous ☿☿).
2. m. *tenuifasciatus* Vogt. 71,8 per cent of the collection ♂♂, ☿☿ and ♀♀).
3. m. *afasciatus* nov.[1], 23,4 per cent of the collection (mainly ☿☿ and ♀♀ not numerous ♂♂).

The above mentioned colour forms occur together in all altitudes.

[1] The second and first tergite exclusively black-haired or with not numerous yellow hairs at the base of the first tergite.

II. Dolina Kościeliska 8. V. 1956, ♀♀ on *Crocus scepusiensis* Rchb.

Przysłop Miętusi 9. V. 1956 and 13. V. 1955, ♀♀ on *Crocus scepusiensis* Rchb.

Dolina Małej Łąki 13. V. 1955, ♀♀ on *Crocus scepusiensis* Rchb.

Kalatówki 14. V. 1956, ♀♀ on *Crocus scepusiensis* Rchb.

Dolina Chochołowska 15. V. 1956, ♀♀ on *Crocus scepusiensis* Rchb.

Kiry 16. V. 1955. 1 ♀ on *Taraxacum* sp.

Dolina Kościeliska 22. V. 1956, ♀♀ on *Primula elatior* L.

Hala Ornak 22. V. 1956, ♀♀ on *Caltha palustris* L.

Kopieniec Wielki 9. VI. 1955, ♀♀ on *Vaccinium myrtillus* L.

Przysłop Miętusi 10. VI. 1955, ♀♀ on *Vaccinium myrtillus* L.

Czoła Jaworzyńskie 13. VI. 1955, ♀♀ on *Vaccinium myrtillus* L.

Źleb Staników 14. VI. 1955, ♀♀ on *Vaccinium myrtillus* L.

Wodogrzmoty Mickiewicza 18. VI. 1956, ♀♀ on *Lonicera* sp.

Roztoka 18. VI. 1956, ♀♀ on *Veronica* sp.

Toporowa Cyrhla 13 and 19. VI. 1956, ♀♀ on *Vaccinium vitis idaea* L.

Dolina Białej Wody 18. VII. 1956, ♀♀ and ♀♀ on *Aconitum* sp.

Dolina Strążyska 1. VIII. 1955, ♀♀ *Brunella* sp.

Kuźnice 8. VIII. 1955, ♂♂ on *Brunella* sp. and *Geranium robertianum* L.

Kalatówki 8. VIII. 1955, ♂♂ on *Thymus* sp.

Kalatówki 8. VIII. 1955, ♂♂ and ♀♀ on *Aconitum* sp.

Dolina Suchej Wody 13. VIII. 1955, ♂♂ and ♀♀ on *Rubus* sp. and *Thymus* sp.

Droga pod Reglami 17. VIII. 1955, ♂♂ on *Carduus* sp., *Brunella* sp. and *Thymus* sp.

Dolina Filipki 21. VIII. 1955, ♂♂ and ♀♀ on *Brunella* sp., *Carduus* sp. and *Thymus* sp.

Meadow near Forestry Morskie Oko 18. VI. 1956, ♀♀ on *Alectorolophus* sp.

III. Kalacka Turnia 23. V. 1955, ♀♀ on *Dentaria glandulosa* W. K.
Grzybowiec 13. VI. 1955, ♀♀ on *Vaccinium myrtillus* L.
Myślenickie Turnie 13. VI. 1955, ♀♀ on *Vaccinium myrtillus* L.
Path to Karczmisko 11. VI. 1956, ♀♀ on *Vaccinium myrtillus* L.
Path to Przełęcz Iwaniacka 16. VI. 1955, ♀♀ and ♀♀ on *V. myrtillus* L.
Dolina Kondratowa 17. VI. 1955, ♀♀ on *Vaccinium myrtillus* L.
Opalone 10. VI. 1955, ♀♀ on *Vaccinium myrtillus* L.
Dolina Roztoki 15. VI. 1956, ♀♀ on *Vaccinium myrtillus* L.
Karczmisko 9. VII. 1955, ♀♀ and ♀♀ on *Vaccinium myrtillus* L.
Dolina Suchej Wody 6. VII. 1955, ♀♀ on *Aconitum* sp. and *Brunella* sp.
Path to Przełęcz Iwaniacka 18. VIII. 1956, ♂♂ and ♀♀ on *Aconitum* sp.
Dolina Kasprowa 10. VIII. 1955, ♀♀ on *Thymus* sp.
Pod Rówienkami 31. VIII. 1956, ♀♀ on *Chamenerion angustifolium* (L.) Scop., and *Carduus* sp.
Dolina Suchej Wody 13. VIII. 1955, ♂♂ and ♀♀ on *Vaccinium myrtillus* L.
Rusinowa Polana 28. VIII, 1955, ♀♀ on *Aconitum* sp. and *Thymus* sp.
Przełęcz Iwaniacka 18. VIII. 1955, ♀♀ on *Aconitum* sp.
Kalacka Turnia 7. VIII. 1955, ♂♂ and ♀♀ on *Lamium purpureum* L.
Dolina Roztoki 28. VIII. 1956, ♂♂ on *Thymus* sp.
Smreczyński Wierch 4. IX. 1956. ♂♂ and ♀♀ on *Chamenerion angustifolium* (L.) Scop.
Żar 5. IX. 1956, ♂♂ on *Ch. angustifolium* (L.) Scop.
Kominy Tylkowe 10. IX. 1956, ♀♀ on *Aconitum* sp., *Brunella* sp. and *Rubus* sp.
Siwe Sady 6. IX. 1956, ♀♀ on *Aconitum* sp.

IV. Morskie Oko 19. VI. 1956, ♀♀ and ♀♀ on *Vaccinium myrtillus* L.

Dolina Roztoki 16. VI. 1956, ♀♀ on *V. myrtillus* L.
Dolina Pięciu Stawów 15. VI. 1956, ♀♀ and ♀♀ on *V. myrtillus* L.
Piekło 17. VI. 1955, ♀♀ on *V. myrtillus* L.
Dolina Gąsienicowa 6. VII. 1955, ♀♀ and ♀♀ on *V. myrtillus* L.
Długi Staw Gąsienicowy 8. VII. 1955, ♀♀ on *V. myrtillus* L.
Czarny Staw Gąsienicowy 8. VII. 1955, ♀♀ and ♀♀ on *V. myrtillus* L.
Kasprowe Uhrocie 8 and 26. VII. 1955, ♀♀ on *V. myrtillus* L.
Kasprowe Uhrocie 9 and 26. VIII. 1956, ♀♀ , ♂♂ and ♀♀ on *Aconitum* sp. and *Thymus* sp.
Dolina Pięciu Stawów 28. VIII. 1956, ♂♂ and ♀♀ on *Aconitum* sp.
Southern slopes of Krzyżne 29. VIII. 1956, ♂♂ and ♀♀ *Campanula* sp.
Dolina Gąsienicowa 11. VIII. 1955, ♀♀ on *Thymus* sp. and *Brunella* sp. (rain and fog).
Siwe Sady 6. IX. 1956. ♂♂ and ♀♀ on *Aconitum* sp., *Gentiana asclepiadea* L.
Kasprowe Uhrocie 16. IX. 1955, ♂♂ on *Calluna vulgaris* (L.).

V. Beskid 8 and 13. VIII. 1956, ♂♂ and ♀♀ on *Campanula alpina* Jacq. and V. *myrtillus* L.
Pośrednia Turnia 23. VIII. 1955, ♂♂ on *Campanula alpina* Jacq.
Skrajna Turnia 27. VIII. 1955, ♀♀ on *Vaccinium vitis idea* L.
Ciemniak, Krzesanica and Małołączniak 3. IX. 1956, ♂♂ and ♀♀ on *Campanula alpina* Jacq., *Aconitum* sp., and *Delphinium* sp.

16. *B. (Pratobombus) pratorum* L.

Very common in the Tatry Mountains in zones II and III. In Alpine-zone rare but distributed even in zone V. This species occurs in several colour forms, independent, however, of altitude.

1. f. *pauper* Pitt., 34,5 per cent; the commonest colour

form among ♀♀, represented also by unfrequent ♂♂ and ♀♀.
2. f. *subalpinus* Rad., 34,5 per cent. The commonest colour form among ♀♀; represented also by unfrequent ♀♀ and ♂♂.
3. f. *donovanellus* K., 14 ♀♀ collected (4 per cent).
4. f. *subluctuosus* Pitt., 6 per cent, represented mainly by ♀♀ and ♂♂.
5. f. *subborealis* Pitt., 2 ♀♀ (about 1 per cent).
6. typical form *pratorum* L. Rare (2 per cent, ♀♀, ♂♂, ♀♀.
7. f. *fasciatus* Pitt. 1 ♀, (0,5 per cent).
8. f. *subfasciatus* Pitt., 4,5 per cent. Mainly ♂♂, and not numerous ♀♀.
9. f. *subburrellanus* Pitt. ♂♂ zone II and III (8 per cent).
10. f. *tatranus* Rad. Not numerous ♂♂ (1 per cent) zone II and III.
11. f. *subtatranus* Pitt. 8 per cent ♂♂ zone II and III and Alpine-zone.

I. Gubałówka 14. VI. 1955, ♀♀ and ♀♀ on *Vaccinium myrtillus* L.
Łosiówki 14. VI. 1955, ♀♀ and ♀♀ on *Vaccinium myrtillus* L.
Poronin 7. VIII. 1955, ♀♀ on *Salvia verticillata* L.
Zakopane 17. VIII. 1955. ♀♀ on *Salvia verticillata* L.
Bukowina 28. VIII. 1955, ♂♂ on *Carduus* sp.

II. Przysłop Miętusi 13. V. 1955, ♀♀ on *Crocus scepusiensis* Rchb.
Kalatówki 14. V. 1955, ♀♀ on *C. scepusiensis* Rchb.
Dolina Chochołowska 15. V. 1956, ♀♀ on *C. scepusiensis* Rchb.
Dolina Kościeliska 8. V. 1956, ♀♀ on *C. scepusiensis* Rchb.
Dolina Kościeliska 22. V. 1956, ♀♀ on *Pulmonaria obscura* Dum.
Dolina Kościeliska 22. V. 1956, ♀♀ on *Petasites* sp.
Polana Zahradziska 26. V. 1956, ♀♀ on *Primula elatior* L.
Hala Ornak 22. V. 1956, ♀♀ on *Caltha palustris* L.
Kopieniec Wielki 9. VI. 1955, ♀♀ on *Vacinium myrtillus* L.

Źleb Staników 14. VI. 1955, ☿☿ on *Vaccinium myrtillus* L.
Czoła Jaworzyńskie 13. VI. 1955, ☿☿ on *Vaccinium myrtillus* L.
Toporowa Cyrhla 13. VI. 1956, ☿☿ and ♀♀ on *V. myrtillus* L. and *V. vitis idaea* L.
Wodogrzmoty Mickiewicza 18. VI. 1956, ☿☿ and ♀♀ on *Lonicera* sp.
Roztoka 16. VI. 1956, ☿☿ on *Lonicera* sp. during rain.
Dolina Kościeliska 10. VII. 1955, ☿☿ on *Brunella* sp.
Droga pod Reglami 16. VI. 1955, on *Vaccinium myrtillus* L.
Kuźnice 8. VIII. 1955, ♂♂ and ♀♀ on *Geranium robertianum* L and *G. phaeum* L.
Sarnia Skała 17. VIII. 1955, ♂♂ and ♀♀ on *Brunella* sp.
Droga pod Reglami 19. VIII. 1955, ☿☿, ♂♂ and ♀♀ on *Brunella* sp.
Dolina Kościeliska 19. VIII. 1955, ♂♂ and ♀♀ on *Brunella* sp.
Dolina Białej Wody 24. VIII. 1956, ☿☿, ♂♂ and ♀♀ on *Brunella* sp.
Between Cyrhla and Zazadnia 25. VIII. 1955, ♀♀ on *Euphrasia* sp. and *Carduus* sp.
Dolina Filipki 21. VIII. 1955, ☿☿, ♂♂ and ♀♀ on *Brunella* sp.
Dolina Za Bramką 17. VIII. 1955, ♂♂ on *Brunella* sp.
Dolina Białego 27. VIII. 1955, ♂♂ on *Euphrasia* sp. and *Carduus* sp.
Dolina Małej Łąki 10. VII. 1955, ♀♀ on *Melandryum rubrum* Gke.
Dolina Strążyska 18. VIII. 1955, ♂♂ on *Carduus* sp.
Dolina Suchej Wody 17. VIII. 1955, ♀♀ on *Thymus* sp. and *Geranium robertianum* L.
Czuba Roztocka 24. VIII. 1956, ♂♂ and ♀♀ on *Gentiana asclepiadea* L.
Goły Wierch 20. VIII. 1955, ♂♂ on *Euphrasia* sp.
Żar, 6. IX. 1956, ♂♂ on *Carduus* sp.

III. Kalacka Turnia 23. V. 1956, ☿☿ on *Dentaria glandulosa* W. K.
Dolina Kondratowa 23. V. 1956, ☿☿ on *Gagea* sp.

Dolina Kondratowa 17. VI. 1955, ♀♀ on *Vaccinium myrtillus* L.
Grzybowiec 17. VI. 1955, ♀♀ on *V. myrtillus* L.
Dolina Gąsienicowa 8. VII. 1955, ♂♂ and ♀♀ on *V. myrtillus* L.
Karczmisko 9. VII. 1955, ♀♀ on *V. myrtillus* L.
Kalacka Turnia 7. VIII. 1955, ♂♂ and ♀♀ on *Lamnium purpureum* L.
Dolina Kasprowa 10. VIII. 1955, ♀♀ on *Rubus* sp. and *Aconitum* sp.
Dolina Suchej Wody 13. VIII. 1955, ♀♀ and ♂♂ on *Brunella* sp. and *Rubus* sp.
Rusinowa Polana 28. VIII. 1955, ♀♀ on *Euphrasia* sp.
Dolina Roztoki 28. VIII. 1956, ♂♂ and ♀♀ on *Digitalis* sp., *Chamenerion angustifolium* (L.) Scop., and *Trifolium repens* L.
Dolina Roztoki 25. VIII. 1956, ♂♂ and ♀♀ on *Gentiana asclepiadea* L.
Pod Rówienkami 31. VIII. 1956, ♂♂ and ♀♀ on *Chamenerion angustifolium* (L.) Scop. and *Carduus* sp.
Rusinowa Polana 31. VIII. 1956, ♂♂ on *Carduus* sp.
Dolina Tomanowa 2. IX. 1956. ♂♂ on *Aconitum* sp.
Smreczyński Wierch 4. IX. 1956, ♂♂ on *Chamenerion angustifolium* (L.) Scop.
Żar 5. IX. 1956, ♂♂ and ♀♀ on *Chamenerion angustifolium* (L.) Scop. and *Carduus* sp.
Kominy Tylkowe 10. IX. 1956, ♂♂ on *Carduus* sp.
Path to Iwaniacka Przełęcz 16. VI. 1955, ♀♀ on *Aconitum* sp., *Thymus* sp. and *Brunella* sp.
Path to Iwaniacka Przełęcz 18. VIII. 1955, ♂♂ and ♀♀ on *Aconitum* sp., *Thymus* sp. and *Brunella* sp.
Kopa Królowej Mała 10. V. 1956, ♀♀ on *Silene acaulis* L.

IV. Skupniowy Upłaz 10. V. 1956, ♀♀ on *Silene acualis* L.
Wołoszyn 14. VI. 1956, ♀♀ on *Vaccinium vitis ideae* L.
Piekło 17. VI. 1955, ♀♀ on *Vaccinium myrtillus* L.
Dolina Gąsienicowa 8. VII. 1955, ♀♀ on *V. myrtillus* L.
Miedziane 19. VI. 1956, ♀♀ on *V. myrtillus* L.
Dolina Pięciu Stawów 15. VIII. 1955 on *Pedicularis verticillata* L. and *Soldanella carpatica* Vierh.

Dolina Pięciu Stawów 28. VIII. 1956 on *Aconitum* sp.
Kasprowe Uhrocie 26. VIII. 1955, ♀♀ on *Calluna vulgaris* (L.) SALISB.
Dolina Roztoki 23. VIII. 1955, ♂♂ and ♀♀ on *Rubus* sp.
Dolina Roztoki 28. VIII. 1956, ♀♀ an *V. myrtillus* L.
Siwe Sady 6. IX. 1956, ♀♀ on *Gentiana asclepiadea* L.
Kominy Tylkowe 10. IX. 1956, ♀♀ on *Aconitum* sp.
V. Pośrednia Turnia 23. VIII. 1956, ♀♀ on *Vaccinium vitis ideae* L.
Krzyżne 28. VIII. 1956, 4 ♀♀ and 1 ♂ on *Campanula alpina* JACQ., *Sempervivum montanum* L. and *Polygonum* sp.

17. *B. (Pratobombus) hypnorum* L.
Rarely occuring in zone II and III in two colour varieties.
1. m. *hypnorum* L. (♀♀ and ♀♀).
2. m. *calidus* ERICH. (♂♂).
I. Łosiówki 8. VI. 1955, ♀♀ on *Vaccinium myrtillus* L.
Poronin 16. VIII. 1955, ♀♀ on *Salvia verticillata* L.
Zakopane 17. VIII. 1956, ♀♀ on *Salvia verticillata* L.
Głodówka 28. VIII. 1955, ♀♀.
II. Kalatówki 14. V. 1955, ♀♀ on *Crocus scepusiensis* RCHB.
Dolina Bystrej 23. V. 1956, ♀♀ on *Vaccinium myrtillus* L.
Toporowa Cyrhla 13. VI. 1955, ♀♀ on *Vaccinium vitis ideae* L.
Dolina Białej Wody 18. VI. 1956, ♀♀ on *V. vitis ideae* L.
Dolina Strążyska 18. VII. 1955, ♂♂ and ♀♀ on *Brunella* sp.
Wodogrzmoty Mickiewicza 18. VI. 1956, 1 ♀ on *Lonicera* sp.
Kuźnice 10. VII. 1955, ♀♀ on *Geranium phaeum* L.
Droga pod Reglami 17. VIII. 1956, ♂♂ on *Carduus* sp., *Brunella* sp. and *Thymus* sp.
Sarnia Skała 17. VIII. 1955, ♀♀ on *Brunella* sp.
III. Dolina Kondratowa 17. VI. 1955, ♀♀ on *Vaccinium myrtillus* L.

18. *B. (Bombus) terrestris* L.

The commonest species of bumble-bees in zone II and III. It makes about 80 per cent of bumble-bees frequenting *Crocus scepusiensis* Rchb. Rare in Alpine zone. Occuring in three colour forms.

1. m. *terrestris* L. majority of specimens.
2. m. *cryptarum* F. very rare (♀♀).
3. m. *dalmaticus* D. T. a great number of ♂♂.

I. Łosiówki 8. VI. 1955, ♀♀ on *Vaccinium myrtillus* L.
Gubałówka 14. VI. 1955, ☿☿ on *V. myrtillus* L.
Bukowina 15. VI. 1955, ♀♀ and ☿☿ on *V myrtillus* L.
Szaflary 19. VIII. 1955, ☿☿ on *Salvia* sp.

II. Kalatówki 27. V 1956, ♀♀ on *Crocus scepusiensis* Rchb.
Dolina Kościeliska 26 and 30. IV. 1956, ♀♀ on *C. scepusiensis* Rchb.
Przysłop Miętusi 30. IV. 1956, ♀♀ on *C. scepusiensis* Rchb.
Przysłop Miętusi 9. V. 1956, ♀♀ *C. scepusiensis* Rchb.
Dolina Kościeliska 8. V. 1956, ♀♀ on *Petasites* sp.
Dolina Małej Łąki 13. V. 1955, ♀♀ on *C. scepusiensis* Rchb.
Kalatówki 14. V. 1955, ♀♀ on *C. scepusiensis* Rchb.
Przysłop Miętusi 13. V. 1955, ♀♀ on *C. scepusiensis* Rchb.
Dolina Kościeliska 13. V. 1955, ♀♀ on *Crocus scepusiensis* Rchb.
Dolina Chochołowska 15. V. 1956, ♀♀ on *C. scepusiensis* Rchb.
Polana Zahradziska 26. V. 1956, ♀♀ on *Primula elatior* L.
Kopieniec Wielki 9. VI. 1955, ♀♀ on *Vaccinium myrtillus* L.
Czoła Jaworzyńskie 13. VI. 1955, ♀♀ on *V. myrtillus* L.
Źleb Staników 14. VI. 1955, ♀♀ on *Vaccinium myrtillus* L.
Meadow near Forestry Morskie Oko 18. VI. 1956, on *Alectorolophus* sp.
Toporowa Cyrhla 13. VI. 1956, ♀♀ and ☿☿ on *Vaccinium vitis ideae* L.
Wodogrzmoty Mickiewicza 17. VI. 1956 on *Lonicera* sp.

Dolina Białej Wody 18. VI. 1956, ♀♀ and ♀♀ on *Vaccinium vitis ideae* L.
Path to Karczmisko 11. VI. 1956, ♀♀ on *V. myrtillus* L.
Dolina Bystrej 17. VI. 1955, ♀♀ on *V. myrtillus* L.
Dolina Kościeliska 18. VI. 1956, ♀♀ on *Polygonum* sp.
Przysłop Miętusi 10. VII. 1955, ♀♀ on *Alectorolophus* sp.
Dolina Białego 16. VII. 1955 a nest in the ground.
Dolina Suchej Wody 17. VIII. 1955, ♀♀ on *Brunella* sp.
Droga pod Reglami, 17. VIII. 1956, ♂♂ on *Carduus* sp., *Cirsium* sp., *Trifolium* sp. and *Brunella* sp.
Dolina Białej Wody 24. VIII. 1956, ♂♂ and ♀♀ on *Gentiana asclepiadea* L.
Czuba Roztocka 24. VIII. 1956, ♀♀ on *Gentiana asclepiadea* L.
Dolina Filipki 21. VIII. 1955, ♂♂ and ♀♀ on *Brunella* sp.
Dolina Strążyska 18. VIII. 1955, ♂♂ on *Carduus* sp. and *Cirsium* sp.
Droga pod Reglami 17. VIII. 1955, ♀♀ on *Aconitum* sp.

III. Wołoszyn 14. VI. 1956, ♀♀ on *Vaccinium vitis ideae* L.
Grzybowiec 17. VI. 1955, ♀♀ on *V. myrtillus* L.
Dolina Kondratowa 17. VI. 1955, ♀♀ on *V. myrtillus* L.
Myślenickie Turnie 13. VI. 1955, ♀♀ on *V. myrtillus* L.
Path to Przełęcz Iwaniacka 16. VI. 1955, ♀♀ on *Aconitum* sp.
Karczmisko 9. VII. 1955, ♀♀ on *V. myrtillus* L.
Path to Przełęcz Iwaniacka 18. VIII. 1955, ♀♀ on *Aconitum* sp. and *Rubus* sp.
Rusinowa Polana 31. VIII. 1956, ♂♂ and ♀♀ on *Carduus* sp. and *Euphrasia* sp.
Dolina Kasprowa 10. VIII. 1956, ♂♂ on *Thymus* sp.
Pod Rówienkami 31. VIII. 1956, ♂♂ *Carduus* sp.
Opalone 10. VI. 1956, ♀♀ on *Vaccinium myrtillus* L.
Żar 5. IX. 1956, *Chamenerion angustifolium* (L.) Scop.
Boczań 17. IX. 1956, ♂♂ on *Carduus* sp.
Boczań VIII. 1955 a nest in roots of *Picea excelsa* Lk.

IV. Kopa Królowej Mała 10. V. 1956, ♀♀ on *Silene acaulis* L.
Dolina Gąsienicowa 6. VII. 1955, ♀♀ on *Vaccinium myrtillus* L.

Dolina Gąsienicowa 8. VII. 1955, ☿☿ and ♀♀ on *V. myrtillus* L.
Kasprowe Uhrocie 8. VII. 1955, ☿☿ and ♀♀ on *V. myrtillus* L.
Siwe Sady 6. IX. 1956, ♀♀ on *Campanula* sp.
Siwe Sady 6. IX. 1956, ♂♂ on *Gentiana asclepiadea* L.
Małołączniak 3. IX. 1956, ☿☿ on *Campanula alpina* Jacq.
Kasprowe Uhrocie 13. IX. 1956, ♂♂ and ♀♀ on *Calluna vulgaris* Sal.
V. Krzyżne 28. VIII. 1956, ♀♀ on *Campanula alpina* Jacq. and *Sempervivum montanum* L.
Ciemniak 3. IX. 1956, ♀♀ on *Aconitum* sp.

19. *B. (Bombus) lucorum* L.

Rarer in the Tatry Mountains than the previous species. Occurring mainly as m. *terrestriformis* Vogt.

I. Zakopane 1932, ☿☿ (leg. Stecki).
Szaflary 19. VII. 1956, ♀♀ (leg. Stach).
Poronin 7. VIII. 1955, ♀♀ on *Salvia verticillata* L.
Bukowina 18. VIII. 1955, ♀♀ on *Brunella* sp.
II. Kalatówki 29. VI. 1956, ☿☿ on *Crocus scepusiensis* Rchb.
Przysłop Miętusi 13. V. 1955, ☿☿ on *C. scepusiensis* Rchb.
Dolina Chochołowska 15. V. 1956, ☿☿ on *C. scepusiensis* Rchb.
Dolina Kościeliska 8. VI. 1956, ☿☿ on *Petasites* sp.
Kopieniec Wielki 9. VI. 1956, ☿☿ on *Vaccinium myrtillus* L.
Czoła Jaworzyńskie 13. VI. 1955, ☿☿ *V. myrtillus* L.
Dolina Bystrej 17. VI. 1956, ☿☿ on *V. myrtillus* L.
Dolina Białej Wody 18. VI. 1956, ♀♀.
Goły Wierch 28. VII. 1956, ♂♂ on *Euphrasia* sp. and *Thymus* sp.
Czuba Roztocka 24. VIII. 1956, ♀♀ and ♂♂ on *Gentiana asclepiadea* L.
Dolina Białej Wody 24. VIII. 1956, ♂♂ and ♀♀ on *G. asclepiadea* L.
Przysłop Miętusi 10. VIII. 1956, ☿☿.

Dolina Suchej Wody 13. VIII. 1956, ♀♀ on *Rubus* sp., *Aconitum* sp. and *Brunella* sp.

Dolina Filipki 21. VIII. 1955, ♀♀ on *Brunella* sp.

Dolina Bystrej 17. IX. 1955, ♀♀.

Kalacka Turnia 23. V. 1956, ♀♀ on *Dentaria glandulosa* W. K.

Opalone 10. V. 1955, ♀♀ on *V. myrtillus* L.

III. Path to Karczmisko 11. VI. 1956, ♀♀ and ♀♀ on *Vaccinium myrtillus* L.

Karczmisko 9. VII. 1955, ♀♀ on *V myrtillus* L.

Rusinowa Polana 28. VIII. 1956, ♀♀ on *Euphrasia* sp.

Pod Rówienkami 31. VIII. 1956, ♂♂ and ♀♀ on *Chamenerion angustifolium* (L.) Scop.

Rusinowa Polana 31. VIII. 1956, ♂♂ and ♀♀ on *Carduus* sp.

Smreczyński Wierch 4. IX. 1956, ♀♀ on *Chamenerion angustifolium* (L.) Schp.

Dolina Tomanowa 5. IX. 1956, ♀♀ on *Aconitum* sp.

Kominy Tylkowe 10. IX. 1956, ♂♂ on *Calluna vulgaris* Sal.

Boczań 17. IX. 1955, ♀♀ near the nest.

Kalackie Turnie 17. IX. 1956, ♀♀ on *Aconitum* sp.

Skupniowy Upłaz 5. V. 1956, ♀♀ on *Silene acaulis* L.

IV. Kasprowe Uhrocie 8. VII. 1955, ♀♀ and ♀♀ on *Vaccinium myrthillus* L.

Kasprowe Uhrocie 13. VIII. 1955, ♀♀ on *Delphinium oxysepalum* Borb. et Pax.

Dolina Pięciu Stawów 18. VIII. 1956, ♀♀ on *Aconitum* sp.

Małołączniak 3. IX. 1956, ♀♀ on *Campanula alpina* Jacq.

Ciemniak 3. IX. 1956, ♂♂ and ♀♀ on *Aconitum callibotryon* Rchb.

Siwe Sady 6. IX. 1956, ♀♀ on *Gentiana asclepiadea* L. and *Aconitum* sp.

Kominy Tylkowe 10. IX. 1956, ♀♀ on *Carduus* sp. and *Aconitum* sp.

Dolina Gąsienicowa 13. IX. 1955, ♀♀ on *Calluna vulgaris* Sal.

Kasprowe Uhrocie 13. IX. 1956, ♀♀ on *C. vulgaris* Sal.

V. Krzyżne 28. VIII. 1956, ♀♀ on *Campanula alpina* Jacq., *Sempervivum montanum* L. and *Polygonum* sp.

20. *B. (Alpigenobombus) mastrucatus* Gerst.

Occurring in all altitudes. Very common in the Tatry Mountains, visiting en masse *Aconitum* sp. All collected ☿☿ and ♀♀ belong to m. *mastrucatus* Gerst., colouration of ♂♂ is that f. *cinctus* Pitt.

I. Łosiówki 14. VI. 1956, ☿☿ on *Vaccinium myrtillus* L.
Gubałówka 14. VI. 1955, ☿☿ on *V. myrtillus* L.
Bukowina 15. VI. 1955, ☿☿ on *V. myrtillus* L.
Zakopane 17. VIII. 1955, ♂♂ on *Salvia verticillata* L.
Bukowina 28. VIII. 1955, ♀♀ and ♂♂ on *Carduus* sp.

II. Dolina Małej Łąki 13. VI. 1955, ☿☿ on *Crocus scepusiensis* Rchb.
Przysłop Miętusi 13. V. 1955, ☿☿ on *C. scepusiensis* Rchb.
Droga Hawiarska in Dolina Miętusia 13. V. 1955, ☿☿ on *C. scepusiensis* Rchb.
Kalatówki 14. V. 1955, ☿☿ on *C. scepusiensis* Rchb.
Dolina Chochołowska 15. V. 1956, ☿☿ on *Primula officinalis* Hill.
Przysłop Miętusi 9. V. 1956, ☿☿ on *Crocus scepusiensis* Rchb.
Dolina Kościeliska 22. V. 1956, ☿☿ on *Primula officinalis* Hill.
Żleb Staników 14. VI. 1955, ☿☿ on *Vaccinium myrtillus* L.
Kopieniec Wielki 9. VI. 1955, ☿☿ on *V. myrtillus* L.
Czoła Jaworzyńskie 13. V. 1955, ☿☿ on *V. myrtillus* L.
Dolina Białej Wody 18. VI. 1956, ☿☿ and ♀♀.
Meadow near Forestry Morskie Oko 18. VI. 1956, ♀♀ on *Alectorolophus* sp.
Dolina Suchej Wody 13. VIII. 1955, ♂♂ on *Thymus* sp., *Brunella* sp. and *Campanula* sp.
Sarnia Skała 17. VIII. 1955, ♂♂ on *Thymus* sp. and *Geranium robertianum* L.
Droga pod Reglami 17. VIII. 1955, ♂♂ on *Carduus* sp., *Cirsium* sp., *Thymus* sp. and *Brunella* sp.
Dolina Filipki 21. VIII. 1955, ♀♀ on *Brunella* sp.
Kuźnice 14. VIII. 1955, ♀♀ *Delphinium* sp.

Dolina Ku Dziurze 20. VIII. 1955, 1 ♀ on *Geranium robertianum* L.

Dolina Białego VIII, 1955, a nest in the ground.

Dolina Białej Wody 24. VIII. 1956, ♂♂ and ♀♀ on *Gentiana asclepiadea* L.

Czuba Roztocka 24. VIII. 1956, ♂♂ and ♀♀ on *Gentiana asclepiadea* L.

Żar 5. IX. 1956, ♀♀ on *Chamenerion angustifolium* (L.) Scop.

Żar 7. IX. 1956, ♂♂ and ♀♀ on *Carlina acaulis* L. and *Aconitum* sp.

III. Kalacka Turnia 23. V. 1956, ♀♀ on *Dentaria glandulosa* W. K. and *Gentiana verna* L.

Path to Karczmisko 11. VI. 1956, ♀♀ on *Vaccinium myrtillus* L.

Path to Przełęcz Iwaniacka 16. VI. 1955 ♀♀.

Karczmisko 9. VII. 1955, ♀♀ on *Vaccinium myrtillus* L.

Kalacka Turnia 7 and 17. VIII. 1955, ♀♀ on *Lamium purpureum* L.

Droga pod Reglami 17. VIII. 1955, ♀♀ on *Brunella* sp.

Przełęcz Iwaniacka 18. VIII. 1955, ♀♀ on *Aconitum* sp.

Rusinowa Polana 28. VIII. 1955, ♀♀ ♂♂ and ♀♀ on *Aconitum* sp.

Path to Przełęcz Iwaniacka 18. VIII. 1955, ♂♂ and ♀♀ on *Aconitum* sp., *Brunella* sp. and *Thymus* sp.

Pod Rówienkami 31. VIII. 1956, ♀♀ on *Carduus sp.* and *Chamenerion angustifolium* (L.) Scop.

Ciemniak 3. IX. 1956, ♂♂ on *Aconitum* sp.

Dolina Tomanowa 2 and 5. IX. 1956, ♀♀ on *Aconitum* sp.

Żar 5. IX. 1956, ♀♀ on *Chamenerion angustifolium* (L.) Scop.

Siwe Sady 6. IX. 1956, ♀♀ on *Aconitum cellibotryon* Rchb.

IV. Beskid 8. VIII. 1955, ♀♀ on *Campanula alpina* Jacq.

Małołączniak 3. IX. 1956, ♀♀ on *Aconitum callibotryon* Rchb.

Krzesanica 3. IX. 1956, ♀♀ on *Aconitum callibotryon* Rchb.

Ciemniak 3. IX. 1956, ♂♂ and ♀♀ on *Aconitum* sp. and *Delphinium* sp.

2. Genus: *Psithyrus* Lep.

1. *P. (Ashtonipsithyrus) vestalis* Fourcr.
Rare in the Tatry Mountains. Occurring in two colour forms. Inquiline of *Bombus terrestris* L.
1. m. *vestalis* Fourcr.
2. m. *bluethgeniellus* (Pop.).
I. Zakopane 20. VII. 1919, (ex coll. Łoziński).
Gubałówka VI. and VIII. 1951 and 1952 and VIII 1953, ♂♂ on *Hypericum* sp., *Thymus* sp., *Carlina acaulis* L. and *Centaurea* sp. (coll. Wojtusiak).
II. Czuba Roztocka 24. VII. 1956, ♂♂ on *Gentiana asclepiadea* L.
Dolina Strążyska 18. VIII. 1955, ♂♂ on *Cirsium* sp. and *Carduus* sp.
Dolina Filipki 25. VIII. 1955, ♂♂ on *Brunella* sp.

2. *P. (Ashtonipsithyrus) distinctus* Pér.
New for the Polish part of the Tatry Mountains. Members of this species are inquilines in nests of *B. lapidarius* L. First reported from the Tatry Mountains by J. Fudakowski. Occurring in two colour forms.
1. f. *flavidus* Blüthgen. (♀♀).
2. f. *arrhenoides* Blüthgen.
I. Łosiówki 8. VI. 1955, 1 ♀.
Bukowina 28. VIII. 1955, ♂♂ on *Carlina acaulis* L. and *Trifolium repens* L.
Gubałówka VIII. 1952 and 1953, ♀♀ and ♂♂ on *Carduus* sp. and *Centaurea* sp. (coll. Wojtusiak).
Przysłop Miętusi 13. V. 1955, 1 ♀ on *Crocus scepusiensis* Rchb.
II. Dolina Strążyska 8. VIII. 1927, 2 ♀♀ (leg. Fudakowski).
Dolina Strążyska 18. VIII. 1957, ♂♂ on *Cirsium* sp. and *Carduus* sp.
Droga pod Reglami 17. VIII. 1955, ♂♂ on *Cirsium* sp. and *Carduus* sp.
Dolina Kościeliska 19. VIII. 1955, ♀♀ on *Carduus* sp.
Dolina Filipki 21. VIII. 1955, ♂♂ on *Carduus* sp.
Dolina Kościeliska 9. IX. 1956, ♂♂ on *Carduus* sp.

Dolina Suchej Wody 13. VIII. 1956, ♂♂ on *Gentiana asclepiadea* L.

Czuba Roztocka 24. VIII. 1956, ♂♂ on *Gentiana asclepiadea* L.

III Dolina Tomanowa 5. IX. 1956, 1 ♂ on *Aconitum* sp.

Kalacka Turnia 17. IX. 1955, 1 ♂ on *Carlina acaulis* L.

IV. Pośrednia Turnia 23. VIII. 1955, 1 ♂ on *Campanula alpina* JACQ.

Ciemniak 3. IX. 1956, 2 ♂♂ on *Aconitum callibotryon* RCHB.

3. *P. (Psithyrus) rupestris* F.

New species for the Polish part of the Tatry Mountains. Inquline of *Bombus lapidarius* L.

I. Gubałówka VII and VIII. 1953, ♂♂ on *Carlina acaulis* L. and *Trifolium* sp.

II. Wołoszyn 14. VI. 1956, 1 ♀ on *Vaccinium vitis idea* L.

4. *P. (Metapsithyrus) campestris* PZ.

Rare in the Tatry Mountains. Inquiline of subgenera *Hortobombus* VOGT., *Agrobombus* VOGT. and *Pratobombus* VOGT. Occurring in three colour forms:

1. f. *campestris* PZ. ♀♀.
2. f. *rossiellus* K., majority of ♂♂.
3. f. *panzeri* PITT. 1 ♂.

I. Bukowina 28. VIII. 1955, ♂♂.

Gubałówka VIII. 1953, ♀♀ and ♂♂ on *Carlina acaulis* L. and *Trifolium* sp.

II. Dolina Kościeliska 17. VIII. 1953, ♀♀ (coll. WOJTUSIAK).

Staw Toporowy 20. VII. 1920, 1 ♀ (leg. FUDAKOWSKI).

III. Boczań. 17. IX. 1955, 1 ♂ on *Calluna vulgaris* SAL.

5. *P. (Allopsithyrus) barbutellus* K.

Specimens from H. WOJTUSIAK'S collection belong to m. *barbutellus* K. Members of this species are inquilines of *B. elegans* PANZ.

I. Gubałówka VIII. 1952 and 1953, several ♂♂ on *Calluna vulgaris* SAL., *Centaurea* sp. and *Carlina acaulis* L.

II. Dolina Białego VIII. 1920, 1 ♂ (NOSKIEWICZ 1920).

6. *P. (Fernaldaepsithyrus) silvestris* (LEP.).

New for the Polish part the Tatry Mountains. Inquiline of *Pratobombus* VOGT. Occurring in three colour forms:

1. f. *silvestris* (LEP.) ♀♀.
2. f. *albicans* RICH. ♂♂.
3. f. *citrinus* SCHMDK. ♂♂.

I. Gubałówka 7. VII. 1951, several ♂♂ on *Senecio* sp. (coll. WOJTUSIAK).
Droga pod Reglami 17 and 19. VIII. 1955, 1 ♂ on *Carduus* sp. and *Brunella* sp.
Bukowina 28. VIII. 1955, 1 ♂ on *Carduus* sp.

II. Dolina Strążyska 18. VIII. 1955, 1 ♀ and several ♂♂ on *Cirsium* sp.
Dolina Filipki 21. VIII. 1955, 1 ♂ on *Brunella* sp.
Czuba Roztocka 24. VIII. 1956, 1 ♂ on *Gentiana asclepiadea* L.

IV. Ciemniak 3. IX. 1956, 1 ♂ on *Aconitum* sp.

7. *P. (Fernaldaepsithyrus) quadricolor* LEP.

Rare in the Tatry Mountains.

I. Bukowina 28. VIII. 1955, 2 ♂♂ on *Carduus* sp.

II. Droga pod Reglami 17. VIII. 1955, 3 ♂♂ on *Carduus* sp. and *Cirsium* sp.

III. Dolina Gąsienicowa VII. 1920, 1 ♂ ex coll. J. NOSKIEWICZ.

2. Characteristics of quantitative and qualitative distribution of *Bombus* LATR. and *Psithyrus* LEP. species in the Tatry Mountains

From the 20 above mentioned bumble-bee species 17 have been found in the Tatry Mountains (Table I). Some Tatric species, such as *B. silvarum* L. and *B. ruderarius* MÜLL. were reported only by WIERZEJSKI (1864). *B. distinguendus* MOR. by DALLA TORRE (1882) from POKORNY'S collection and *B. elegans* SEIDL. and *B. jonellus* K. by J. NOSKIEWICZ (1920). Since the representatives of these species were wanting in the collections available to me I can take under consideration their occurrence in the Tatry Mountains only on the ground of J. NOSKIEWICZ'S work from 1920. In works which were published up to now (WIERZEJSKI 1868, 1874, NOSKIEWICZ 1920) *B. soroeensis* ssp. *proteus* GERST. was reported from the Tatry

Mountains. In my collection, however, I have ♀♀, ♀♀ and ♂♂ belonging to ssp. *soroeensis* F.; ssp. *proteus* GERST., on the other hand, has been found at Szaflary. I am unable to check if the determinations of previous investigators were right since their collections had been either destroyed or are insufficiently labelled. I suppose, however, that the workers of *B. lapidarius* L. which in the Tatry Mountains are much commoner than the representatives of the species *B. soroeensis* F. were wrongly determined.

Table I

No.	Name	per cent.
1.	*B. hortorum* L.	8
2.	*B. subterraneus* L.	0,4
3.	*B. distinguendus* MOR.	?
4.	*B. pomorum* PANZ.	0,1
5.	*B. elegans* SEIDL.	?
6.	*B. agrorum* F.	2
7.	*B. ruderarius* MÜLL.	?
8.	*B. silvarum* L.	?
9.	*B. lapidarius* L.	1
10.	*B. soroeensis* F.	0,8
11.	*B. jonellus* K.	?
12.	*B. pyrenaeus* PÉR.	22
13.	*B. pratorum* L.	16
14.	*B. hypnorum* L.	1
15.	*B. terrestris* L.	28
16.	*B. lucorum* L.	6
17.	*B. mastrucatus* GERST.	14

In Table I there is a systematic list of *Bombus* LATR. species from the Tatry Mountains and their proportional abundance based on specimens from my collection (about 2000 specimens). For species not represented in collections available to me, very rare in the Tatry Mountains, instead of this number there is an interrogation mark (?).

Data of Table I should not be regarded as quite exact ones since within years or even months the quantitative occurrence of respective species is subject to considerable fluctuations. These data, however, point out to the proportional quantitative composition of bumble-bees inhabiting the Tatry Mountains. On the ground of these as common in the Tatry Mountains can be regarded: *B. terrestris* L., *B. pyrenaeus* PÉR., *B. pra-*

torum L. and *B. mastrucatus* Gerst. since each of these species makes more than 10 per cent of the collection. Fairly common in the Tatra Mountains are: *B. hortorum* L., *lucorun* L. since they make more than 5 per cent of the collection. Rare are; *B. agrorum* F., *B. hypnorum* L. and *B. lapidarius* L. since they do not surpass 2 per cent of the collection. The remaining species are very rare. I was successful in collecting one or more specimens and they together do not surpass 3 per cent of the total number of bumble-bees collected.

The number of bumble-bees collected in respecitive localities in the Tatry Mountains depends on the amount of flowering plants. It does not depend on altitude. In a small area abundant with flowers one can observe hundreds of bumble-bees during a very short time whilst in large areas sparsely covered with flowering plants one observes during the same time only several bumble-bees. This is why on the northern slopes, in dense forests of zone II and III and in rocky valleys almost no bumble-bees appear. Thus in the West Tatry Mountains, abundant in plants, there is a greater number of bumble-bees than in less florid High Tatry Mountains. The proportional quantitative composition of the respective species is, however, very similar in the West and High Tatry Mountains.

The qualitative and quantitative relations of *Psithyrus* Lep. species in the Tatry Mountains are given in Table II.

Table II

No.	Name	Number of specimens
1.	*P. vestalis* Fourcr.	6
2.	*P. distinctus* Pér.	22
3.	*P. rupestris* F.	1
4.	*P. campestris* P.	5
5.	*P. barbutellus* K.	?
6.	*P. silvestris* (Lep.)	17
7.	*P. quadricolor* Lep.	3

It is evident from data in Table II that the commonest in the Tatry Mountains are *P. distinctus* Pér. and *P. silvestris* (Lep.). The very rare occurrence of *Psithyrus* Lep. species in the Tatry Mountains allows to assume that still other species, hitherto not observed may be found in this area.

3. The distribution of *Bombus* LATR. and *Psithyrus* LEP. species in the Polish part of the Tatry Mountains in dependence of the altitude

The proportional composition of species given in Table I does not represent real relations. The data given in it have been calculated on the ground of the whole collection. On the other hand in the same way one obtains for respective plant zones data shown in Table III.

Table III

No	Name	sub-Alpine zone I	II	III	Alpine zone IV	V	VI
1.	*B. hortorum* L.	8,2	10,1	7	4,5	1,3	
2.	*B. subterraneus* L.	0,4	0,4	0,7		1,3	
2.	*B. distinguendus* MOR.	0,4	?				
4.	*B. pomorum* PANZ.	?	0,1				
5.	*B. elegans* SEIDL.	0,8	?		?		
7.	*B. ruderarius* MÜLL.	2	?				
8.	*B. silvarum* L.	6,6	?				
9.	*B. lapidarius* L.	1,7	1,5	0,8			
10.	*B. soroeensis* F.	3	1	0,7			
11.	*B. jonellus* K.			?			
12.	*B. pyrenaeus* PÉR.	15,5	12,5	17	58	56	100
13.	*B. pratorum* L.	31,7	21	18	10	2,5	
14.	*B. hypnorum* L.	6,5	3				
15.	*B. terrestris* L.	5	31,5	15	6	2,5	
16.	*B. lucorum* L.	3,8	3	9	14	1,4	
17.	*B. mastrucatus* GERST.	6,5	12,3	31,7	7,5	35	

In plate III the numbers are written in files from I to VI denoting respective plant-zones in the Tatry Mountains. The interrogation mark (?) was given at species reported by previous investigators; these species are not represented in collections available to me.

It follows from comparison of Table I with Table II that the proportional composition of species shows differences first of all in *B. pyrenaeus* PÉR., *B. pratorum* L. and *B. terrestris* L. In zone I and II the number of *B. pratorum* L. and *B. terrestris* L. surpass quantitatively that of *B. pyrenaeus* PÉR. In zone III, however, the proportional number of *B. pyrenaeus* PÉR. increases considerably and in Alpine zones it surpasses that of *B. pratorum* L. and *B. terrestris* L. which are in these zones relatively rare.

Nine species given in Table II have been hitherto not found in the Alpine zone. If they are not occurring in the regio mugheti it should be assumed that the different climate causes, that they cannot spread upwards. Among remaining forms two groups can be distinguished; in the first one I place *B. subterraneus* L., *B. pyrenaeus* Pér. and *B. mastrucatus* Gerst. the proportional composition of which in respective plant zones increases with the altitude, and to the second one *B. hortorum* L., *B. pratorum* L. and *B. terrestris* L. the number of representatives of which decreases with the increase of the altitude. The proportional quantitative composition of *B. lucorum* L. is still different. Values concerning this species increase up to zone IV (regio mugheti), then a sudden decrease occurs.

The number of specimens of bumble-bees (in per cent) collected in respective plant zones is given in Table IV.

Table IV

plant zone	per cent
I	16,5
II	42,6
III	19,6
IV	16,0
V	5,3
VI	—

The quantitavive differences between zone I and II given in Table IV do not represent real relations since I took more detailed investigations within the Tatry Mountains in comparison with zone I. Nevertheless there is a quantitative difference between zone I and II, magnified in Table IV, caused by the amount of plants visited by bumble-bees. Zone I (Podhale) is converted in major part into farmland. The quantitative differences between the bumble-bees fauna of zone II and higher plant zones can be explained by the same factor. The major part of meadows rich in plants appears in the Tatry Mountains in the valleys and thus there is the greatest number of bumble-bees. On larger accumulations of plants on the Tatry Mountains summits one can observe the same number of bumble-bees as in similar accumulations of plants in zone II.

The assertion that the main factor controlling the quantitative occurrence of bumble-bees in respective plant zones of the Tatry Mountains depends on the amount of flowering plants and their accumulation within the investigated area seems to me to be the more exact since the bumble-bees are insects having good flying ability. It is not known hitherto how far from the nest the workers of the bumble-bees wander to collect food, but this distance may amount to some kilometres (MOLITOR 1937) since bees (*Apis mellifica* L.) are looking for food in a distance of even 12 km from the hive (FRISCH). Therefore it would be best define the distribution of bumble-bees in dependence on the altitude on the ground of found nesting places. Within the Tatry Mountains I have found myself or I have literature data concerning only a few nests. In Table V the nesting places of bumble-bees according to plant zones are given.

Table V

No.	Name	I	II	III
1.	*B. hortorum* L.	+		
2.	*B. hypnorum* L.	+		
3.	*B. terrestris* L.		+	+
4.	*B. mastrucatus* GERST.		+	

Because of too fragmentary data it is, however, not possible to define the distribution of bumble-bees in dependence on the altitude. From the descriptions of the behaviour of male bumble-bees (A. HAAS 1946, 1948, 1949, A. FRANK 1941) it follows that they do not fly very far from the nest. Thus it seems very probable that the presence of males in a given plant zone several hundred metres wide in the Tatry Mountains points out simultaneously to nesting at that altitude. In Table VI the presence of males in respective plant zones is given.

The comparison of Table II with Table VI allows to draw the following conclusions;

1. In zone IV (regio mugheti) four bumble-bee species are nesting: *B. hortorum* L., *B. elegans* SEIDL., *B. terrestris* L. and *B. lucorum* L.
2. In zone V (regio alpina) three species are nesting; *B. pyrenaeus* PÉR., *B. pratorum* L. and *B. mastrucatus* GERST.

Table VI

No.	Name	sub-Alpine zone I	II	III	Alpine zone IV	V	VI
1.	*B. hortorum* L.	+	+	+	+		
2.	*B. subterraneus* L.	+		+			
3.	*B. distinguendus* Mor.						
4.	*B. pomorum* Panz.						
5.	*B. elegans* Seidl.				+		
6.	*B. agrorum* F.	+	+				
7.	*B. ruderarius* Müll.	+					
8.	*B. silvarum* L.						
9.	*B. lapidarius* L.		+				
10.	*B. soroeensis* F.	+		+			
11.	*B. jonellus* K.						
12.	*B. pyrenaeus* Pér.		+	+	+	+	
13.	*B. pratorum* L.	+	+	+	+	+	
14.	*B. hypnorum* L.		+				
15.	*B. terrestris* L.	+	+	+	+		
16.	*B. lucorum* L.	+	+	+	+		
17.	*B. mastrucatus* Gerst.	+	+	+	+	+	

3. Species nesting above alpine zone are, except *B. elegans* Seidl. the commonest bumble-bees in the Tatry Mountains.
4. Females and workers occur one plant zone higher than the males.
5. Since the males of *B. pratorum* L. and *B. mastrucatus* Gerst. have been found in zone V (regio Alpina) it may be supposed that females and workers of these species can be found in zone VI (regio subnivalis).

• The distribution of *Psithyrus* Lep. species in dependence on the altitude is more difficult to determine because of their rarity in the Tatry Mountains and, following from this, the small number of specimens collected.

In Table VII the number of specimens of *Psithyrus* Lep. species collected in respective plant zones is given.

In Table VII the interrogation mark (?) denotes places where insects were found by J. Noskiewicz (1920). It follows from data given in this table that all species known from zone I (Podhale) have been found in the Tatry Mountains, too, but their number generally decreases with the increase of altitude.

The knowledge of the distribution of bumble-bees, the

Table VII

No.	Name	sub-Alpine zone I	II	III	Alpine zone IV	V	VI
1.	*P. vestalis* Fourcr.	12	6				
2.	*P. distinctus* Pér.	15	16	3	2	1	
3.	*P. rupestris* F.	3	1				
4.	*P. campestris* P.	14	1	1			
5.	*P. barbutellus* K.	11	?				
6.	*P. silvestris* (Lep.)	3	13		1		
7.	*P. quadricolor* Lep.	2	3		?		

hosts of *Psithyrus* Lep. species, in dependence on the altitude, and first of all the knowledge of their probable nesting places allows to determine the maximal limits of the distribution of *Psithyrus* Lep. species in dependence on the altitude.

Table VIII

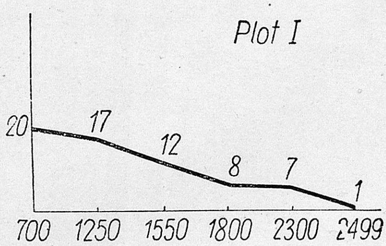
No.	Name	sub-Alpine zone I	II	III	Alpine zone IV	V	VI	Host
1.	*P. vestalis* Fourcr.	+	+	0	0			*B. terrestris* L.
2.	*P. distinctus* Pér.	+	+	+	+	+		*B. lucorum* L.
3.	*P. rupestris* F.	+	+					*B. lapidarius* L.
4.	*P. campestris* P.	+	+	+	0			*Horto-*, *Agro-* and *Pratobombus* Vogt.
5.	*P. barbutellus* K.	+	+		0			*B. elegans* Pz.
6.	*P. silvestris* (Lep.)	+	+	0	+	0		*Pratobombus* Vogt.
7.	*P. quadricolor* Lep.	+	+	0	+			

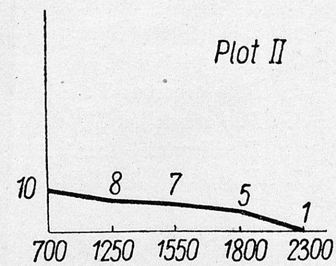
In Table VIII mark + denotes zones where respective species were found and mark 0 zones where their occurrence is probable. The hosts are given in this Table too; the highest places of their nesting are given in Table V.

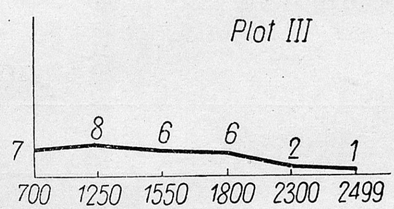
It follows from the above table that the major part of *Psithyrus* Lep. species of the Tatry Mountains is distributed up to above the border of the Alpine zone; *P. rupestris* F. only is an exception here.

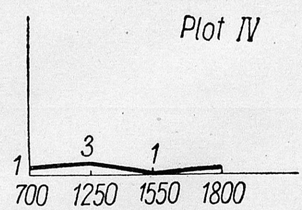
The results of my investigation of the *Bombus* Latr. and *Psithyrus* Lep. group and their distribution in the Tatry Mountains in dependence on the altitude are given in plots I and II. In plots II and IV there are data concerning *Bombus*

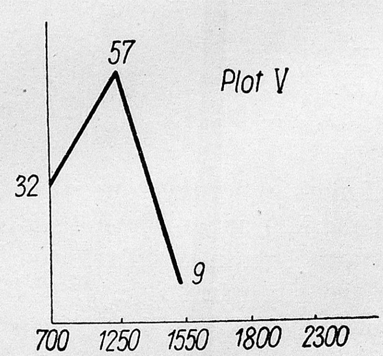
LATR. and *Psithyrus* LEP. species of the Tatry Mountains according to J. NOSKIEWICZ's work (1920). In plot V there are hitherto known data (NOSKIEWICZ 1920) concerning the











distribution of *Aculeata*, without *Bombus* LATR. and *Psithyrus* LEP. species, in dependence on the altitude.

On the axis of ordinates of plots I—V the altitudes above sea level according to the accepted division into plant zones and on axis of abcisse the number of species known from a given zone are given.

The differences between plots I and III as well as between II and IV point out to the improved knowledge of the *Bombus* LATR. and *Psithyrus* LEP. fàuna of the Tatry Mountains. Plot V shows the faunistic border found for the *Aculeata* in the Tatry Mountains by J. NOSKIEWICZ (1920). The comparison of plots I and II with plot I, however, shows that there is no distinct faunistic border for *Bombus* LATR. and *Psithyrus* LEP. species since curves characterizing their distribution in dependence on the altitude fall down with the increase of the altitude. Plot V shows also that all *Aculeata* except *Bombus* LATR. and *Psithyrus* LEP. are not distributed in the Tatry Mountains higher that the border of the Alpine zone (1600 m above sea level) and that only *Bombus* LATR. and *Psithyrus* LEP. species surpass that border reaching up to the highest summits.

Bombus LATR. and *Psithyrus* LEP. are not, however, the sole representatives of the *Aculeata* group in the alpine zone of the Tatry Mountains. In Prof. Dr. R. WOJTUSIAK'S collections and in materials collected by myself there are following species presented below according to accepted plant zones:

IV. *Vespa norvegica* F. 1 ♀ Krzyżne, 29. VIII. 1956 on *Campanula* sp.

V. silvestris SCOP. 1 ♀ New for the Polish part of the Tatry Mountains. Krzesanica 3. IX. 1956 on *Aconitum* sp.

V. saxonica F. 2 ♀♀. New for the Polish part of the Tatry Mountains Dolina Gąsienicowa 6. VII. 1955 on *V. myrtillus* L. It nests in *Pinus mughus* L.

V. rufa L. 1 ♀. Kominy Tylkowe 10. IX. 1956.

Andrena lapponica ZETT. 3 ♀♀ Dolina Gąsienicowa 6. VII. 1955 on *V. myrtillus* L. and Kasprowe Uhrocie 9. VIII. 1955 on *Thymus* sp.

V. *Apis mellifica* L. 1 ♀. Ciemniak 3. IX. 1956.

II. ZOOGEOGRAPHICAL CONSIDERATIONS ON *BOMBUS* LATR. AND *PSITHYRUS* LEP. GROUP OF THE TATRY MOUTAINS

Results of investigations of *Bombus* LATR. and *Psithyrus* LEP. species of the Polish part of the Tatry Mountains present almost a complete faunistic outline of the discussed area. Some supplements may still be expected in the *Psithyrus* LEP.

group which, because of their rarity are difficult to work out. The obtained data concerning discussed genera provide an abundant material suitable for comparative studies on *Bombus* LATR. and *Psithyrus* LEP. species distributed in the Polish part of the Tatry Mountains the Czechoslovak part of these mountains, in Polish and Czechoslovak Lowlands and in mountains of Central Europe.

1. Distribution of *Bombus* LATR. and *Psithyrus* LEP. species in the Polish and Czechoslovak Tatry Mountains

There is no separate publication concerning *Bombus* LATR. and *Psithyrus* LEP. species in the Czechoslovak Tatry Mountains as yet. Among faunistic papers of Czechoslovak, Polish, Hungarian, and German authors (DALLA-TORRE 1878, MAY J. 1938, 1948, SNIEŻEK J. 1894, 1910, WIERZEJSKI A. 1868, 1874, NOSKIEWICZ J. 1920, MOSCARY H. 1918) there are very fragmentary data concerning the occurrence of groups discussed here on the southern slopes of the Tatry Mountains. In Table IX there are hitherto known data concerning *Bombus* LATR. and *Psithyrus* LEP. species of the Polish and Czechoslovak Tatry Mountains.

In Table IX mark + denotes reported occurrence of respective species, mark? the probable occurrence of it, since nothing speaks against assuming their distributions in the Czechoslovak part of the Tatry Mountains as they are species widely distributed in Europe.

It follows from Table IX that all species occurring in the Polish part of the Tatry Mountains occur in the Czechoslovak part as well. *Psithyrus meridionalis* RICH. known only from the southern slopes of the Tatry Mountains should be in future also found in the Polish part of these mountains or in zone I (Podhale).

I have found no data concerning the distribution of *Bombus* LATR. and *Psithyrus* LEP. in the Czechoslovak part of the Tatry Mts. in dependence on the altitude in any materials available to me. It is possible, however, to define on ground of the knowledge of the distribution of respective species in the Polish part of the Tatry Mountains and their connection

Table IX

No.	Name	Polish Tatry Mts.	Czechoslovak Tatry Mts.
1.	*B. hortorum* L.	+	?
2.	*B. subterraneus* L.	+	+
3.	*B. distinguendus* Mor.	+	+
4.	*B. pomorum* Panz.	+	?
5.	*B. elegans* Seidl.	+	+
6.	*B. agrorum* F.	+	+
7.	*B. ruderarius* Müll.	+	+
8.	*B. silvarum* L.	+	+
9.	*B. lapidarius* L.	+	?
10.	*B. soroeensis* F.	+	+
11.	*B. jonellus* K.	+	?
12.	*B. pyrenaeus* Pér.	+	?
13.	*B. pratorum* L.	+	?
14.	*B. hypnorum* L.	+	+
15.	*B. terrestris* L	+	+
16.	*B. lucorum* L.	+	?
17.	*B. mastrucatus* Gerst.	+	+
18.	*P. vestalis* Fourcr.	+	+
19.	*P. distinctus* Pér.	+	?
20.	*P. rupestris* F.	+	+
21.	*P. campestris* P.	+	?
22.	*P. barbutellus* K.	+	?
23.	*P. silvestris* (Lep.)	+	?
24.	*P. quadricolor* Lep.	+	+
25.	*P. meridionalis* Rich.	?	+

with plant zones the altitude limits of these forms in the Czechoslovak part of these mountains. Similarly as in the Polish part of the Tatry Mountains *Bombus distinguendus* Mor., *B. pomorum* Panz., *B. ruderarius* Müll., *B. silvarum* L., *B. lapidarius* L., *B. soroeensis* F., *B. jonellus* K., *B hypnorum* L., *Psithyrus vestalis* Fourcr., *P. rupestris* F. and *P. barbutellus* K. are distributed in zones II and III. The remainig species, *B. hortorum* L., *B. elegans* Seidl., *B. pyrenaeus* Pér., *B. pratorum* L., *B. terrestris* L., *B. lucorum* L., *B. mastrucatus* Gerst., *P. distinctus* Pér., *P. campestris* P., *P. silvestris* (Lep.) and *P. quadricolor* Lep. in the Alpine zone. In addition it may be supposed that in the Czechoslovak part of the Tatry Mountains some species may spread higher than in the Polish part

Table X

No.	Name	Polish Lowland	Tatry Mts.	Czechoslovak Lowland
1.	*B. hortorum* L.	—	—	—
2.	*B. ruderatus* F.	—		—
3.	*B. subterraneus* L.	—	—	—
4.	*B. distinguendus* MOR.	—	—	—
5.	*B. fragrans* PALL.	—		
6.	*B. pomorum* PANZ.	—	—	—
7.	*B. elegans* SEIDL.		—	
8.	*B. agrorum* F.	—	—	—
9.	*B. humilis* ILL.	—		—
10.	*B. muscorum* F.	—		—
11.	*B. laesus* Mor.	—		
12.	*B. ruderarius* MÜLL.	—	—	—
13.	*B. silvarum* L.	—	—	—
14.	*B. equestris* F.	—		—
15.	*B. schrenki* MOR.	—		
16.	*B. confusus* SCHENCK.	—		……
17.	*B. lapidarius* L.	—	—	—
18.	*B. sicheli* RAD.	—		
19.	*B. soroeensis* F.	—	—	—
20.	*B. jonellus* K.		—	
21.	*B. pyrenaeus* PÉR.		—	
22.	*B. pratorum* L.	—	—	—
23.	*B. hypnorum* L.	—	—	—
24.	*B. terrestris* L.	—	—	—
25.	*B. lucorum* L.	—	—	—
26.	*B. mastrucatus* GERST.		—	
27.	*P. vestalis* FOURCR.	—	—	—
28.	*P. distinctus* PÉR.	—	—	—
29.	*P. rupestris* F.	—	—	—
30.	*P. campestris* PZ.	—	—	—
31.	*P. barbutellus* (K.)	—	—	—
32.	*P. maxilosus* (KLUG.)			—
33.	*P. silvestris* (Lep.)	—	—	—
34.	*P. norvegicus* SP.-SCHN.	—		—
35.	*P. quadricolor* LEP.	—	—	—
36.	*P. meridionalis* RICH.			—

on account that the former part has southern exposure and more fine days in comparison with the colder and more clouded Polish part.

2. *Bombus* LATR. and *Psithyrus* LEP. species of the Polish and Czechoslovak Lowland

In Table X the distribution of the members of the discussed genera in the Polish and Czechoslovak Lowland is given (continuous line). Species the occurrence of which is very probable on acount of their wide distribution in Europe are taken under consideration too (interrupted line).

It follows from this table that some species such as *B. elegans* SEIDL., *B. jonellus* K., *B. pyrenaeus* PÉR. and *B. mastrucatus* GERST. occur only in the Tatry Mountains and do not occur in the Lowlands of both countries.

Thirteen *Bombus* LATR. and six *Psithyrus* LEP. species from those given in Table X inhabit all parts of Poland, Tatry Mountains and Czechoslovakia. The remaining species may be divided into such which occur in the Polish and Czechoslovak Lowland, but do not reach the Tatry Mountains (*B. muscorum* F., *B. confusus* SCHENK. and *P. norvegicus* SP.-SCHN.) and such which are known only either from the Polish or Chechoslowak Lowland. To the later group belong *B. fragrans* PALL., *B. laesus* MOR., *B. schrenki* MOR. and *B. sicheli* RAD. found only in Poland and *P. maxillosus* (KLUG.) observed in Czechoslovakia. *Psithyrus quadricolor* LEP. occurs in the Polish Lowland as well as in the Tatry Mountains in the Polish as well as in the Czechoslovak part, but besides Tatry Mountains it does not occur in Czechoslovakia (May 1943).

3. *Bombus* LATR. and *Psithyrus* LEP. species of the Tatry Mountains and the Carpathians

In order to illustrate the relations of distribution of the discussed groups within the whole Carpathians in Table XI the occurrence of respective species in the Tatry Montains, Western and Eastern Beskid and the Romanian Carpathians is presented. In this table, as in the previous one, areas in which the mentioned species were found are marked with the continuous line and the probable distribution limits — by the interrupted one.

It follows from this table that 18 *Bombus* LATR. and 4 *Psithyrus* LEP. species inhabit the whole area of the Carpat-

Table XI

No.	Name	Tatry Mts.	W. Beskid	E. Beskid	Rom. Car.
1.	*B. hortorum* L.	——	——	——	——
2.	*B. ruderatus* F.	····	——	····	——
3.	*B. subterraneus* L.	——	——	····	——
4.	*B. distinguendus* Mor.	——	——	····	——
5.	*B. argilaceus* Scop.				——
6.	*B. gerstaeckeri* Mor.				——
7.	*B. pomorum* Panz.	——	——	——	——
8.	*B. elegans* Seidl	——	——	——	——
9.	*B. agrorum* F.	——	——	——	——
10.	*B. humilis* Ill.	····	——	····	——
11.	*B. muscorum* F.			····	——
12.	*B. laesus* Mor.		——	····	——
13.	*B. ruderarius* Müll.	——	——	——	——
14.	*B. silvarum* L.	——	——	——	——
15.	*B. equestris* F.		——	····	——
16.	*B. confusus* Schenck.			——	——
17.	*B. lapidarius* L.	——	——	——	——
18.	*B. soroeensis* F.	——	——	——	——
19.	*B. jonellus* K.	——			——
20.	*B. pyrenaeus* Pér.	——	——	····	——
21.	*B. pratorum* L.	——	——	——	——
22.	*B. hypnorum* L.	——	——	——	——
23.	*B. terrestris* L.	——	——	——	——
24.	*B. lucorum* L.	——	——	····	——
25.	*B. mastrucatus* Gerst.	——	——	——	——
26.	*B. vestalis* Fourcr.	——	——	——	——
27.	*B. distinctus* Pér.	——	——	——	——
28.	*P. rupestris* F.	——	——	····	——
29.	*P. campestris* Pz.	——	——	——	——
30.	*P. barbutellus* (K.)	——	——	——	
31.	*P. maxillosus* (Klug.)			——	——
32.	*P. silvestris* (Lep.)	——	——	····	——
33.	*P. norvegicus* Sp.-Schn.		····	····	——
34.	*P. quadricolor* Lep.	——	····		
35.	*P. meridionalis* Rich.	——			

hians. Here belong species very widely distributed (*B. hortorum* L., *B. ruderatus* F., *B. subterraneus* L., *B. agrorum* F., *B. ruderarius* Müll., *B. silvarum* L., *B. soroeensis* F., *B. terrestris* L., *B. lucorum* L., *B. lapidarius* L., *B. pratorum* L., *B. hypnorum* L., *B. distinguendus* Mor., *B. pomorum* Panz., *P. vestalis* Fourcr., *P. distinctus* Pér., *P. rupestris* F. and P. *campestris* P.) living in lowlands as well as in mountains and in addition montane species such as *B. elegans* Seidl., *B. pyrenaeus* Pér. and *B. mastrucatus* Gerst., *B. jonellus* K. is hitherto observed in the Tatry Mountains and in the Carpathians in the Romanian People's Republic, *B. confusus* Schenck. only in the Eastern Beskid and the Romanian Carpathians, *B. laesus* Mor. in the Western Beskid and the Romanian Carpathians, it is therefore very probable that the last one occurs also in the Eastern Beskid. *B. gerstaeckeri* Mor. and *B. argilaceus* Scop. are reported thus far only from the Carpathians. The occurrence of *B. alpinus* L. in Romania needs confirmation since it was reported (Pittioni B. 1938) as only one specimen from Mehadia.

Among *Psithyrus* Lep. species interesting are the following species: *P. maxillosus* (Klug.) and *P. barbutellus* (K.), the former of which is distributed in the Romanian Carpathians and in the Eastern Beskid and the other in the Eastern and Western Beskid and in the Tatry Mountains. From the remaining species *P. norvegicus* Sp.-Schn. is known only from the Romanian Carpathians, but it may be found in Beskid, and *P. meridionalis* Rich. and *P. quadricolor* Lep. reported from the Tatry Mountains, both of which are probably distributed also in the Western Beskid.

4. The fauna of *Bombus* LATR. and *Psithyrus* LEP. species of the Tatry and Sudeten Mountains

The list of species known from the Tatry and Sudeten Mountains is given in Table XII. In it the mark + denotes the attested occurrence and mark ? the probable distribution of the forms in question.

It is evident from Table XII that the major part of mentioned species occurs in the Tatry as well as in the Sudeten Mountains. Only one species of bumble-bee, *B. pyrenaeus* Pér. and one of *Psithyrus* Lep., *P. quadricolor* Lep. are known only from the Tatry Mountains. *B. ruderatus* F. and *P. norvegicus* Sp.-Schn. belong to forms living in the Sudeten and not found in the Tatry Mountains; these, however, may be still found in the Tatry Mountains. The distribution of *B. confusus* Schenck., *B. mucsorum* F. and *P. maxillosus* (Klug.) does not extend beyond the Tatry Foreland.

Table XII

No.	Name	Tatry Mts.	Sudeten Mts.
1.	*B. hortorum* L.	+	+
2.	*B. ruderatus* F.	?	+
3.	*B. subterraneus* L.	+	+
4.	*B. distinguendus* MOR.	+	+
5.	*B. pomorum* PANZ.	+	+
6.	*B. elegans* SEIDL.	+	+
7.	*B. agrorum* F.	+	+
8.	*B. humilis* ILL.		+
9.	*B. muscorum* F.		+
10.	*B. silvarum* L.	+	+
11.	*B. ruderarius* MÜLL.	+	+
12.	*B. equestris* F.	?	+
13.	*B. confusus* SCHENCK.		+
14.	*B. lapidarius* L.	+	+
15.	*B. soroeensis* F.	+	+
16.	*B. jonellus* K.	+	+
17.	*B. pyrenaeus* PÉR.	+	
18.	*B. pratorum* L.	+	+
19.	*B. hypnorum* L.	+	+
20.	*B. terrestris* L.	+	+
21.	*B. lucorum* L.	+	+
22.	*B. mastrucatus* GERST.	+	+
23.	*P. vestalis* FOURCR.	+	+
24.	*P. distinctus* PÉR.	+	+
25.	*P. rupestris* F.	+	+
26.	*P. campestris* PZ.	+	+
27.	*P. maxillosus* (KLUG.).		+
28.	*P. barbutellus* (K.).	+	+
29.	*P. silvestris* (LEP.)	+	+
30.	*P. norvegicus* SP.-SCHN.		+
31.	*P. quadricolor* LEP.	+	+ (?)
32.	*P. meridionalis* RICH.	+	+

5. The fauna of *Bombus* LATR. and *Psithyrus* LEP. species of the Tatry and Balkan Mountains

The list of species known from the Tatry and Balkan Mountains is given in Table XIII. In it the mark + denotes the attested occurrence and mark ? the probable distribution in both areas.

Only five species given in Table XIII, viz. *B. distinguendus*

Table XIII

No.	Name	Tatry Mts.	Balkan Mts.
1.	*B. gerstaeckeri* Mor.		+
2.	*B. hortorum* L.	+	+
3.	*B. ruderatus* F.	?	?
4.	*B. argillaceus* Scop.		+
5.	*B. subterraneus* L.	+	+
6.	*B. distinguendus* Mor.	+	
7.	*B. pomorum* Pz.	+	?
8.	*B. elegans* Seidl.	+	+
9.	*B. alboluteus* Pall.		+
10.	*B. armeniacus* Rad.		+
11.	*B. scytes* (Skor.)		+
12.	*B. agrorum* F.	+	+
13.	*B. humilis* Ill.	?	+
14.	*B. muscorum* F.		+
15.	*B. ruderarius* Müll.	+	+
16.	*B. silvarum* L.	+	+
17.	*B. equestris* F.	?	+
18.	*B. zonatus* Sm.		+
19.	*B. laesus* Mor.		+
20.	*B. mucidus* Gerst.		+(?)
21.	*B. soroeensis* F.	+	+
22.	*B. terrestris* L.	+	+
23.	*B. lucorum* L.	+	+
24.	*B. alpinus* L.		?
25.	*B. lapidarius* L.	+	+
26.	*B. alticola* Kriechb.		+
27.	*B. jonellus* K.,	+	+
28.	*B. pyrenaeus* Pér.	+	+
29.	*B. pratorum* L.	+	+
30.	*B. hypnorum* L.	+	+
31.	*B. haematurus* Kriechb.		+
32.	*B. lapponicus* ssp. *hypsophilus* Skor.		+
33.	*B. mastrucatus* Gerst.	+	+
34.	*B. vorticosus* Gerst.		+
35.	*B. niveatus* Kriechb.		+
36.	*P. vestalis* Fourcr.	+	+
37.	*P. distinctus* Pér.	+	+
38.	*P. rupestris* F.	+	+
39.	*P. campestris* P.	+	+
40.	*P. maxillosus* (Klug.)		+
41.	*P. barbutellus* K.	+	
42.	*P. silvestris* (Lep.)	+	+
43.	*P. norvegicus* Sp.-Schn.	?	
44.	*P. quadricolor* Lep.	+	
45.	*P. meridionalis* Lep.	+	?

MOR., *B. ruderatus* F. (?), *P. barbutellus* K., *P. meridionalis* LEP. (?) and *P. quadricolor* LEP. do not occur in the Balkan Mountains. On the other hand thirteen species known from the Balkan Mountains do not inhabit the Tatry and Beskid Mountains (Table XI). These are: *B. gerstaeckeri* MOR., *B. argillaceus* SCOP., *B. alboluteus* PALL., *B. armeniacus* RAD., *B. scytes* (SKOR.), *B. zonatus* SM., *B. mucidus* GERST., *B. alticola* KRIECHB. *B. haematurus* KRIECHB., *B. lapponicus* ssp. *hypsophillus* SKOR., *B. vorticosus* GERST., *B. niveatus* KRIECHB. and *P. maxillosus* (KLUG.). Besides the two species, viz. *B. muscorum* F. and *B. laesus* MOR., known from the Balkan and Beskid Mountains do not occur in the Tatry Mountains.

6. The fauna of *Bombus* LATR. and *Psithyrus* LEP. species of the Tatry Mountains and the Alps

In table XIV a list of species of *Bombus* Latr. and *Psithyrus* LEP. inhabiting the Tatry Mountains and the Alps is given. In it the mark + denotes the attested occurrence and mark ? their probable distribution.

The comparison of the Tatric and Alpine species is as follows. All species known from the Tatry Mountains are reported also from the Alps; *B. ruderatus* F. and *quadricolor* LEP. are reported from the Alps only by DALLA-TORRE (1878). Many species on the other hand do not occur in the Tatry Mountains. These species may be divided into three groups; in the first one I place forms distributed also in the Beskid Mountains, viz. *B. muscorum* F., *B. laesus* MOR., *B. equestris* F. and *B. confusus* SCHENCK. To the second group belong species not occurring in the Beskid Mountains, viz. *B. gerstaeckeri* MOR., *B. argilaceus* SCOP., *B. mucidus* GERST., *B. alpinus* L., *B. alticola* KRIECHB., *B. lapponicus* F. and *B. mendax* GERST. To the thirs group belong *P. maxillosus* (KLUG.) distributed in the Alps, the Carpathians and in the Eastern Beskid.

The maximal altitude limits of the respective species in the Alps are known from papers by PITTIONI (1938, 1940). The comparison of the distribution of the species in question in dependence on the altitude is given in Table XV.

In order to determine the difference in distribution of

Table XIV

No.	Name	Tatry Mts.	the Alps
1.	*B. gerstaeckeri* Mor.		+
2.	*B. hortorum* L.	+	+
3.	*B. ruderatus* F.	?	+
4.	*B. argillaceus* Scop.		+
5.	*B. subterraneus* L.	+	+
6.	*B. distinguendus* Mor.	+	+
7.	*B. fragrans* Pall.		+
8.	*B. pomorum* Panz.	+	+
9.	*B. elegans* Seidl.	+	+
10.	*B. agrorum* F.	+	+
11.	*B. humilis* Ill.	?	+
12.	*B. muscorum* F.		+
13.	*B. ruderarius* Müll.	+	+
14.	*B. silvarum* L.	+	+
15.	*B. equestris* F.	?	+
16.	*B. laesus* Mor.		+
17.	*B. mucidus* Gerst.		+
18.	*B. soroeensis* F.	+	+
19.	*B. terrestris* L.	+	+
20.	*B. lucorum* L.	+	+
21.	*B. alpinus* L.		+
22.	*B. lapidarius* L.	+	+
23.	*B. alticola* Kriechb.		+
24.	*B. jonellus* K.	+	+
25.	*B. pyrenaeus* Pér.	+	+
26.	*B. pratorum* L.	+	+
27.	*B. hypnorum* L.	+	+
28.	*B. lapponicus* F.		+
29.	*B. lugubris* Sp.-Schn.		+
30.	*B. mastrucatus* Gerst.	+	+
31.	*B. confusus* Schk.		+
32.	*B. mendax* Gerst.		+
33.	*P. vestalis* Fourcr.	+	+
34.	*P. distinctus* Pér.	+	+
35.	*P. rupestris* F.	+	+
36.	*P. campestris* Pz.	+	+
37.	*P. maxillosus* (Klug.)		+
38.	*P. barbutellus* K.	+	+
39.	*P. silvestris* Lep.	+	+
40.	*P. norvegicus* Sp.-Schn.	?	
41.	*P. quadricolor* Lep.	+	+
42.	*P. flavidus* (Eversm.)		+
43.	*P. meridionalis* Lep.	+	+

Table XV

No.	Name	The maximal altitude in the		The difference of the vertical distribution in the Alps and the Tatry Mts
		Tatry	Alps	
		2300		100
1.	*B. hortorum* L.	1800	2400	600*
2.	*B. subterraneus* L.	2300	2000	—300
3.	*B. distinguendus* MOR.	950	500	—450
4.	*B. elegans* SEIDL.	1800	2500	700
5.	*B. agrorum* F.	1550	2000	450*
6.	*B. humilis* JLL.	950	2000	1050
7.	*B. muscorum* F.		1200	
8.	*B. ruderarius* MÜLL.	1250	2200	950
9.	*B. silvarum* L.	1250	1600	350
10.	*B. equestris* F.		800	
11.	*B. laesus* MOR.		300	
12.	*B. soroeensis* F.	1550	2600	1050
13.	*B. lapidarius* L.	1550	2000	450*
14.	*B. jonellus* F.	1550	1700	150
		2499		201
15.	*B. pyrenaeus* PÉR.	2300	2700	400*
16.	*B. pratorum* L.	2300	2500	200*
17.	*B. hypnorum* L.	1550	2000	450*
		2300		250
18.	*B. terrestris* L.	1800	2550	750*
		2300		300
19.	*B. lucorum* L.	1800	2600	800*
20.	*B. mastrucatus* GERST.	2300	2700	400*
21.	*B. confusus* SCHENCK.		820	
22.	*P. vestalis* FOURCR.	1550	1100	—450
23.	*P. distinctus* PÉR.	2300	1600	—700
24.	*P. rupestris* F.	1250	2500	1250
25.	*P. campestris* L.	1550	1600	50
26.	*P. barbutellus* K.	1250	1600	350
27.	*P. silvestris* LEP.	1800	1298	—602

species occuring in the Tatry Mountains as well as in the Alps in dependence on the altitude, the common forms are most useful since data concerning them are most exact. These species are marked in the table by an asterisk. They are *B. hortorum* L., *B. agrorum* F., *B. lapidarius* L., *B. pyrenaeus* PÉR., *B. pratorum* L., *B. hypnorum* L., *B. terrestris* L., *B. lucorum* L., and *B. mastrucatus* GERST. The difference of the distribution of these species in the Alps and Tatry Mountains in dependence on the altitude is about 500 m above sea level and therefore it approaches the value of the difference between the Alpine zone in the Alps and in the Tatry Mountains. This assumption is supported by observations presented in the faunistic part of this paper, viz. that respective apecies do not occur beyond limits or defined plant zones (Table III and IV). The least values of the difference of distribution in dependence on the altitude (150 and 200) appear for *B. jonellus* F. and *B. pratorum* L. I have given two altitudes for *B. hortorum* L., *B. terrestris* L., *B. lucorum* L. and *B. pyrenaeus* Pér. since these species are fairly common up to 1800 m (2300 m) above sea level and up to 2300 m (2499 m) above sea level a few specimen have been found as yet.

To species rarely occuring in the Tatry Mountains, marked in Table VI belong *B. elegans* Seidl., *B. ruderarius* Mull., *B. silvarum* L., *B. soroeensis* F., *B. jonellus* F. and *B. hypnorum* L. Among these *B. soroeensis* F., *B. humilis* Jll. and *P. rupestris* F. present differences in the distribution in dependence on the altitude of about 1000 m above sea level. This points out to the possibility of finding these species above the limit of the Alpine zone. Faunistic data confirm this assumption only in case of *B. soroeensis* F. the males of which are known from zone III (Regiel górny). The too low values of the differences of distribution of *B. jonellus* F. and *B. silvarum* L. in the Alps and in the Tatry Mountains allow to assume that *B. jonellus* F. is distributed in the Tatry Mountains even in zone IV (regio mugheti) and *B. silvarum* L. in zone III (Regiel górny). For the remaining species (mainly *Psithyrus* Lep.) occurring very rarely in the Tatry Mountains and in the Alps the differences are generally negative, i. e. from the Tatry Mountains they are reported from greater altitudes than from the Alps. This is caused probably by the very detailed investigations having been performed in the Tatry Mountains region. Therefore one can assume that these species will be found in the Alps in much greater altitudes than up to now since their hosts were found in such altitudes already.

In Table XV are given also species reported from the Alps and Beskid Mountains but not occurring in the Tatry Mountains, viz. *B. muscorum* F., *B. equestris* K., *B. laesus* Mor. and *B. confusus* Schenck. It follows from the altitudes which they reach in the Alps that they will not be found in the Tatry Mountains since in the Alps they occur in too low altitudes.

7. The fauna of *Bombus* Latr. and *Psithyrus* Lep. species of the Tatry Mountains and Central Europe Mountains

Almost all *Bombus* Latr. and *Psithyrus* Lep. species occurring in the Tatry Mountains are known also from other Central European mountains (*B. distinguendus* Mor. does not occur in the Balkans and *B. meridionalis* Lep. is not known thus far from the Beskid Mountains) since they are forms inhabiting large areas in Europe. The species occurring in the Tatry Mountains belong to the following zoogeographical groups (According to Pittioni 1948, 1942):

1. Palearctic group:
   B. rupestris F., *P. campestris* Panz., *P. distinctus* Pér., *P. barbutellus* K.
2. European-Siberian group:
   B. hortorum L., *B. subterraneus* L., *B. distinguendus* Mor., *B. pomorum* Panz., *B. humilis* Ill., *B. silvarum* L., *B. equestris* F., *B. jonellus* K. *B. soroeensis* F., *B. pratorum* L., *B. hypnorum* L., *B. lucorum* L. *P. silvestris* Lep., *P. quadricolor* Lep.
3. European-Mediterranean group:
   B. terrestris L., *P. vestalis* Fourcr.
4. European group:
   B. ruderarius Müll., *B. lapidarius* L.
5. Montane group:
   B. elegans Seidl., *B. mastrucatus* Gerst., *B. pyrenaeus* Pér., *P. meridionalis* Lep.

Bombus Latr. and *Psithyrus* Lep. species known from the mountains of Central Europe but not occuring in the Tatry Mountains, can be divided into two groups. In the first one I place those which are known also from the Beskid Mountains and the Polish Lowland. They belong to the following zoogeographical groups:

6. Holopalearctic group:
   B. laesus Mor.

7. Holoeuropean-Siberian group:
   B. muscorum F.
8. Central European group:
   B. confusus Schenck.

The second group of species consits of forms not known from the Tatry and Beskid Mountains. These species belong to the following zoogeographical groups:

9. Pontic group:
   B. argillaceus Scop., *B. scytes* (Skor.), *B. zonatus* Sm., *P. maxillosus* (Klug.).
10. Ponto-Turkenian group:
    B. fragrans Pall.
11. Eastern Mediterranean group:
    B. alboluteus Pall., *B. bureschi* Pitt., *B. armeniacus* Rad., *B. haematurus* Kriechb. *B. vorticosus* Gerst., *B. niveatus* Kriechb.
12. Montane group:
    B. gerstaeckeri Mor., *B. alticola* Kriechb., *B. mucidus* Gerst., *B. mendax* Gerst.
13. Boreal-Alpine group:
    B. lapponicus F., *B. lugubris* Sp.-Schn., *B. alpinus* L., *P. flavidus* (Eversm.).

The causes why the above mentioned species do not occur in the Tatry Mountains should be regarded separately for both previously mentioned groups of species. The lack of forms belonging to the first group of species can be explained taking under considerations the climatic conditions prevailing in the Tatry Mountains. These species are not distributed in the Tatry Mountains as well as in the Alps above zone III (Regiel) (Table XV). The Pontic, Ponto-Turkmenian and Eastern-Mediterranean species which are placed in the second group are distributed in South Easter Europe. These limits run south of the parallel-running part of the Carpathians. The montane species occurring in the Tatry Mountains (*B. pyreneus* Pér., *B. elegans* Seidl. and *B. mastrucatus* Gerst. as well as *P. meridionalis* Lep.) are distributed in all of Central and Southern Europe and in the Caucassus. The montane species not known from the Tatry Mountains are distributed only in the Alps, the Pyrenees and the Balkan. The boreal Alpine species not distributed in the Tatry Mountains, viz. *B. alpinus* L. occurring beyond the boreal regions only in the Alps, *B. lapponicus* ssp. *hapsophilus* Skor. only in the Alps and high mountains of the Balkan Peninsula, *P. flavidus* ssp. *alpium* Rich. only in the Alps and the Pyrenees (the occurrence of this species in the Balkan Peninsula is doubtful). It follows from these considerations that in the Tatry Mountains there occur only these montane species which are very widely distributed in the European mountains reaching to the Caucasus. The remaining montane and boreal-Alpine forms, not known from the Tatry Mountains do not pass over the faunistic border.

The poorness of the *Bombus* Latr. and *Psithyrus* Lep. fauna in the Tatry Mountains comes then from the geographical position of these mountains. The Tatry Mountains are the coldest mountain region in the Central Europe. The south-eastern faunistic elements do not reach them since they are separated from the South-Eastern Europe by the parallel-running Carpathian ranges. The montane species occurring in the Alps and the high mountains of the Balkan not known from the Carpathians, belong to montane forms connected with the Mediterranean region. On the other hand incomprehensible is the fact of the lack of the boreal-Alpine elements in the Carpathians (*B. alpinus* L.) needs not to be considered here as the occurrence of this species in Mehadia was not confirmed since about 100 years. It can be neither explained by the contemporaneous climatic conditions nor by the influence of the Glacial age.

III. THE BIOLOGICAL AND PHENOLOGICAL OBSERVATIONS ON THE GENUS *BOMBUS* Latr. IN THE POLISH PART OF THE TATRY MOUNTAINS

1. The nourishing of bumble-bees

The observations concerning the nourishing of bumble-bees in the sub-Alpine and Alpine zones of the Tatry Mountains are presented in tables XVI and XVII. Data taken under consideration in the two tables are: 1. season, 2. time of duration of seasons, 3. plants often visited by the bumble-bees,

Table XVI

Sub-Alpine Zone

Season		Duration	Main plants	Plants rarely visited	Kind of food taken	Sexual forms	Remarks
Spring	1st. div.	End of March 1st. half of April	*Crocus scepusiensis* Rchd. *Petasites glabratus* Borb.	*Salix*	nectar only	♀♀	*B. terrestris* L. and *B. pratorum* L. appear first. Then *B. hortorum* L. and then other species.
	2nd div.	2nd. half of April — 1st. half of May.	*Primula elatior* L. *Vaccinium myrtillus* L.	*Gentiana verna* L.	nectar, very rarely pollen	♀♀	Full flowering of *Crocus scepusiensis* Rchb. and *Petasites glabratus* Borb. All *Bombus* Latr. species on flight.
	Spring proper	2nd. May — begining of June	*V. myrtillus* L. *Lamnium purpureum* L.	*Gentiana clusi* Perr. et Srng.	nectar and pollen	♀♀ and ☿☿	Full flowering of *Primula elatior* L. and *V. myrtillus* L. At the end of this period ☿☿ appear. *B. terrestris* L. and *B. mastrucatus* Gerst. bite through *Primula* flowers, *B. hortorum* L. does not visit *V. myrtillus* L.
Summer	Early Summer	June	*Rubus ideus* L. *V. vitis idea* L.		nectar and pollen	♀♀ and ☿☿	*V. myrtillus* L. flowering on shady slopes, especially when Spring is late.
	Summer proper	July August	*Aconitum* *Carlina acaulis* L. *Trifolium* *Brunella* *Pedicularis* *Geranium* *Cirsium* *Carduus* *Alectrolophus* *Campanula* *Gentiana asclepiadea* L. *Delphinium*	*Calluna vulgaris* L. *Poligonum*	nectar and pollen	♀♀ ☿☿ ♂♂	Jn July females and young queens appear. *Aconitum* and *Gentiana* biten through by *B. mastrucatus* Gerst. and *B. terrestris* L. *Electrolophus* visited only by *B. terrestris* L. Jn August *Gentiana asclepiadea* L. visited by ☿☿ and ♂♂ of *B. hortorum* L.
Autumn	Early autumn	September	*Aconitum* *Calluna vulgaris* L. *Carduus* *Cirsium*		nectar and pollen	♀♀, ☿☿ and ♂♂	
	Late Autumn	End of September and October					☿☿ and ♂♂ perish. Females start to hibernate.

Table XVII

Alpine Zone

Season		Duration	Main plants	Plants rarely visited	Kind of food taken	Sexual form	Remarks
Spring	1st. div.	May	*Silene acaulis* L.	*Barba*	nectar	♀♀	
	2nd. div.	beginning of June	*V. myrtillus* L.		nectar and pollen	♀♀	
	Spring proper	June	*V. myrtillus* L.		nectar and pollen	♀♀ and ♀♀	At the end of June first workers appear.
Summer	Early Summer	July	*Rubus idaeus* L. *Sempervivum* *Campanula* *Trifolium* *Delphinium*	*Aconitum* *Geranium* *Poligonum* *Brunella*	nectar and pollen	♀♀, ♀♀ and ♂♂	♂♂ at the 2nd. half of July.
Autumn	Early Autumn	August and beginning of September	*Aconitum* *Calluna*	*Trifolium* *Brunella*	nectar and pollen	♀♀, ♀♀ and ♂♂	In mid-September ♀♀ and ♂♂ perish.

4. plants rarely visited, 5. kind of food taken, 6. observed sexual forms, 7. remarks regarding detailed data of the occurrence of bumble-bees, their nourishing and the flowering of plants.

The plants presented in tables XVI and XVII can be divided into two groups. To the first one belong spring plants, flowering in masse and successively, which are the main nourishing plants (they are visited by all or almost all bumble-bee species). These are: 1. *Crocus scepusiensis* RICHB. and *Petasites glabratus* BORB., 2. *Primula elatior* L., 3. *Vaccinium myrtillus* L. The second group comprises the summer and autumn plants, visited by various species and various sexual forms of bumble-bees, belonging to families:

Geraniaceae	*Saxifragaceae*
Campanulaceae	*Caryophylaceae*
Labiatae	*Primulaceae*
Rosaceae	*Boraginaceae*
Papilionaceae	*Caprifoliaceae*
Tubiflorae	*Dipsaceae*
Ranunculaceae	*Liguliflorae*
Eriaceae	*Liliaceae*
Gentianaceae	*Cruciferae*
Scrophulariaceae	

It follows from this list that the bumble-bees visit the majority of flowering plants of the Tatry Mountains. They chose these which are flowering en masse. The importance of bumble-bees as pollinating insects in comparison with other *Hymenoptera* is in the Tatry Mountains very great since they are quantitatively very richly represented, whilst from the remaining *Aculeata* not only a few species but first of all a small number occurs in the Tatry Mountains. The bumble-bees are especially important as pollinating insects in the spring when there are still few butterflies *(Lepidoptera)* and *Diptera*. In addition the bumble-bees, being social insects visit flowers not only to feed themselves but also in order to store food (PITTIONI 1942, SKORIKOV 1923) belong to the most important pollinating insects in the Tatry Mountains.

2. The development stages of the bumble-bees in the Tatry Mountains, Podhale and the Polish Lowland

In the development cycle of bumble-bees several stages can be distinguished on ground of the descriptions of their life (Krüger 1907, Hoffer 1882) (Table XVI and XVII). These stages are:

1. the waking up of females and drinking the nectar,
2. the collecting of pollen and nectar (production of wax and feeding of young,
3. the appearance of young workers,
4. the dying off of males and workers,
5. the hibernation of queens.

The above mentioned stages take place in different altitudes in Poland in time given in Table XVIII.

Table XVIII

Area	Stage 1	Stage 2	Stage 3	Stage 4	Stage 5
Lowland	mid-March	April	May	End of June	November
Zone I (Podhale)	End of March	?	End of May	?	?
Sub-Alpine Zone	Beginning of April	End of May	Beginning of June	1st. half of July	1st. half of October
Alpine Zone	2nd. half of April	June	End of June	July	2nd. half of September

The dates presented in Table XVIII are given for early spring. Because of a late spring in 1955 stage 1 took place in the sub-Alpine zone only in the first fortnight of May. It follows from the data in this table that there is a difference of about a fortnight between the respective development stages of bumble-bees in the Lowland, Podhale, the sub-Alpine and the Alpine zones of the Tatry Mountains. In the spring the cycle starts earlier in the Lowland and the bumble-bees earlier attain their aim: the producing of young queens and males. The marriage flights take place here during July and the life period is extended to November, providing there are no frosts during October. In the mountains on the other hand the young queens and males occur only in July and in this month as well as in August the marriage time of the bumble-bees occurs. The males and workers are observed in the Tatry Mountains still only in September; thus the life period is there three months shorter than that in the Lowland. But six and sometimes five warm months in the mountains are, however, quite sufficient to complete the whole development cycle of the bumble-bees.

3. The correlation of the development stages of bumble-bees to the succession of flowering of plants in the Tatry Mountains

The awakening of bumle-bees in the spring takes place simultaneously with the appearance of first plants (Table XVI and XVII) since the same factor, viz. the melting of snow correspondingly high temperature cause the starting of life period in the world of bumble-bees as well as plants. In the Tatry Mountains the first bumble-bees are observed on *Crocus scepusiensis* Rchb., (Table XVII), on which the females, hungry after hibernation drink the nectar. During the flowering of *Primula elatior* L. the females very rarely start to collect the pollen. Therefore one may suppose that the outer nest is already built and the forming of the first wax cell commences. The intensive collecting of pollen takes place at the time of flowering of *Vaccinium myrtillus* L. that time therefore the extention of the inner nest and the feeding of young developing workers takes place. Thus the three spring divisions, the period of flowering of *C. scepusiensis* Rchb. (przedwiośnie), the flowering of *P. elatior L.* (pierwiośnie) and spring proper mark the three stages of development of bumble-bees. Between these divisions and the mentioned stages a close correlation occurs.

At the end of the spring and at the beginning of the summer the first workers leave the nests. At that time the flowering of *Vaccinium myrtillus* L. comes to an end in the Tatry Mountains. The mountain slopes begin to be covered with abundant plants on which next generations of workers, young queens and males find their food. The most numerous occurrence of bumble-bees is therefore closely connected with the period of rich vegetation in the summer.

The dying off of the world of plants and bumble-bees is caused by the first autumn frosts. The seeds, bulbs, rhizomes and the young inseminated queens of bumble-bees are hidden underground, whilst the males and workers not needed any more perish with flowers on which they still found some food.

4. The resistance of bumble-bees to the montane climate

Of all *Hymenoptera* the bumble-bees their are at best in the mountains. This is proved by the fact of their abundant occurrence in the Alpine zone and the small number of other *Hymenoptera* species.

So as all *Hymenoptera* the bumble-bees are sensitive to the wind. At the time of strong, and particularly cold winds, when *Hymenoptera* almost do not fly at all, one can, hovewer, find on flowers not numerous bumble-bees, first of all *B. terrestris* L. and *B. pratorum* L., i. e. these which occur first in the spring. In September during a hurricane I was inding on Kasprowe Uhrocie (1750 m. over sea level) specimens of males and workers.

During a cold and rainy, and for bumble-bees famine year 1955 the workers were leaving nests in Dolina Gąsienicowa (1650 m. over sea level) even in dense fog. Neither a shover prevents hem from collecting food; that I have observed in the Tatry Mountains several times.

The bumble-bees in the Tatry Mountains are already active at 8° centigrade (e. g. Beskid-zone V); at lower temperatures the bumble-bees rest on plants or stones in a stupor unable to fly; they aer awakened by warmer gusts of wind or by sunshine.

The observations presented above show that due to a high resistance to the low temperature, wind and humidity the bumble-bees in the Tatry Mountains have much more time for active life than other *Hymenoptera* and therefore their fauna is so abundant in mountains and in the far North.

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STRESZCZENIE

Grupa trzmieli (*Bombus* Latr.) i trzmielców (*Psithyrus* Lep.) nie była dotąd szczegółowo badana w Tatrach Polskich. W opublikowanych wykazach (A. Wierzejski 1868, 1874, J. Śnieżek 1910, J. Noskiewicz 1920) podano dla Tatr Polskich i Pod-hala 14 gatunków trzmieli i 4 gatunki trzmielców. Moje badania podjęte w ramach zespołowych prac Instytutu Zoologicznego P.A.N., Oddziału w Krakowie, poszerzyły ten wykaz do 20 gatunków trzmieli i 7 gatunków trzmielców. (Tabela I oraz wykresy I do IV).

W szczegółowym wykazie gatunków podałam odmiany barwne (morpha i forma), miejsca znalezienia, daty połowu, formy płciowe oraz rośliny, na których odławiałam poszczególne gatunki. Dane te zgrupowałam pod numerami od I do VI, które oznaczają piętra roślinne w Tatrach Polskich (str. 3).

Dla gatunku *Bombus pyrenaeus* PÉR. opisałam nową odmianę barwną m. *afasciatus* nov., różniącą się od znanych już z Tatr Polskich m. *pyrenaeus* PÉR. i m. *tenuifasciatus* PITT. brakiem żółtych włosów na pierwszym i drugim tergicie, lub posiadającą tylko nieliczne żółte włosy na podstawie pierwszego tergitu.

Z podanych 20 gatunków trzmieli 17 stwierdzono w obrębie Tatr (Tab. I). Z tego tylko 4 gatunki (*B. pyrenaeus* PÉR., *B. pratorum* L., *B. terrestris* L. i *B. mastrucatus* GERST.) są pospolite. Ponadto częste są w Tatrach Polskich: *B. hortorum* L., *B. lucorum* L., rzadkie zaś: *B. agrorum* F., *B. hypnorum* L. i *B. lapidarius* L. Pozostałe gatunki występują bardzo rzadko. Ilość trzmieli występująca w poszczególnych miejscach zależy od ilości kwitnącej roślinności, a nie od wysokości i od wielkości badanego obszaru. Dlatego też na północnych zboczach, w gęstym borze reglowym i w kamienistych dolinach ubogich w roślinność nie ma prawie zupełnie trzmieli. Z tego samego powodu Tatry Zachodnie są bogatsze w faunę trzmieli od uboższych florystycznie Tatr Wysokich. Wśród niezwykle rzadkich na badanym terenie gatunków trzmielców najczęstszymi były *Psithyrus distinctus* PÉR. i *P. silvestris* (LEP.).

Skład procentowy gatunków należących do badanych grup zmienia się w Tatrach wraz z wzrastającą wysokością nad poziomem morza. (Tab. III). Najpospolitsze w Tatrach gatunki *B. pratorum* L. i *B. terrestris* L. przeważają ilościowo nad *B. pyrenaeus* PÉR. w reglu dolnym. Natomiast w piętrze alpejskim stosunek ten jest odwrotny.

Z pośród 17 gatunków trzmieli Tatr Polskich 9 gatunków nie znaleziono dotąd ponad obszarem reglowym. Trzmiele znane z piętra kosodrzewiny, hal oraz turni (tylko *B. pyrenaeus* Pér.) podzieliłam na takie, których ilość wzrasta wraz z wysokością (*B. subterraneus* L., *B. pyranaeus* Pér. i *B. mastrucatus* Gerst.) oraz na posiadające w miarę zwiększania się wysokości coraz mniej przedstawicieli (*B. hortorum* L., *B. pratorum* L., *B. terrestris* L.).

Wysokościowy zasiąg gnieżdżenia się poszczególnych gatunków trzmieli w Tatrach Polskich nie jest znany; ja podaję jednak (tab. V.) kilka miejsc w Tatrach, gdzie znalazłam parę gniazd trzmieli. Jednakże stanowiska samców w poszczególnych strefach roślinnych można uważać równocześnie za miejsca gnieżdżenia się danych gatunków, ponieważ samce nie odlatują daleko od gniazda (A. Haas 1946, 1948, 1949, A. Frank 1941). Stąd więc przyjmuję, że 1. w piętrze kosodrzewiny kończy się zasiąg gnieżdżenia: *B. hortorum* L., *B. elegans* Panz., *B. terrestris* L., *B. lucorum* L.; 2. w piętrze hal można znaleźć gniazda tylko *B. pratorum* L., *B. pyrenaeus* Pér. i *B. mastrucatus* Gerst.; 3. gatunki trzmieli gnieżdżące się w strefie alpejskiej są najpospolitszymi gatunkami tatrzańskimi; 4. robotnice i samice występują o jedno piętro roślinne wyżej niż samce tego samego gatunku; 5. *B. pratorum* L. i *B. mastrucatus* Gerst. mogą być znalezione w piętrze turni, ponieważ samce tych gatunków stwierdzono w piętrze hal.

Z trzmielców stwierdzono w piętrze alpejskim: *P. distinctus* Pér., *P. silvestris* (Lep.) i *P. quadricolor* Lep. pozostałe gatunki mogą występować również ponad granicą lasów, gdyż tam gnieżdżą się ich żywiciele.

Trzmiele i trzmielce nie są jedynymi żądłówkami *(Aculeata)* strefy alpejskiej Tatr; w publikowanych materiałach znajdują się 4 gatunki os (*Vespa norvegica* F., *V. silvestris* Scop., *V. saxonica* F. i *V. rufa* L.), *Andrena lapponica* Zett. schwytano w piętrze kosodrzewiny oraz *Apis mellifica* L. z piętra hal.

W Tatrach Polskich i Czechosłowackich występują najprawdopodobniej te same gatunki trzmieli i trzmielców. Należą one głównie do następujących grup zoogeograficznych: palearktyczne (4 gatunki), europejsko-syberyjskie (13 gatunków), europejsko-mediterranejskie (2 gatunki), europejskie (2 gatunki). Pozostałe 4 gatunki (*B. elegans* Panz., *B. mastrucatus* Gerst., *B. pyrenaeus* Pér. i *P. meridionalis* Lep.) są to elementy górskie rozsiedlone poza Tatrami we wszystkich górach Europy Środkowej łącznie z Kaukazem.

Porównanie składu gatunkowego trzmieli i trzmielców w Tatrach, Karpatach, Sudetach, Górach Bałkańskich i w Alpach podałam na tabelach X—XIV. Wynika z nich, że Tatry mają najuboższą faunę trzmieli i trzmielców z wymienionych wyżej pasm górskich, ponieważ wszystkie gatunki tatrzańskie (za wyjątkiem *B. distinguendus* Mor., który nie występuje w Górach Bałkańskich) znane są również z pozostałych gór Europy Środkowej, natomiast brak w Tatrach 17 gatunków trzmieli i trzmielców. Są to: 1. gatunki pontyjskie, pontoturkmeńskie i wschodnio mediteranejskie, oraz 2. gatunki górskie i borealno-alpejskie. Granice rozsiedlenia ku północy wyżej wymienionych elementów zoogeograficznych przebiegają na południe od Tatr. Zasięg rozsiedlenia gatunków zaliczonych do grupy 1. obejmuje część Alp, Góry Bałkańskie, Alpy Transylwańskie i Ukrainę, zaś grupa 2. rozsiedlona jest tylko w Pirenejach, Alpach i Górach Bałkańskich.

Ubóstwo trzmieli i trzmielców w Tatrach jest spowodowane położeniem geograficznym tych gór, są one bowiem najzimniejszym pasmem górskim Europy Środkowej. Brak wielu gatunków górskich i borealno-alpejskich tłumaczy się tym, że są one związane z rejonem śródziemnomorskim.

Mimo ubóstwa gatunkowego trzmiele należą po muchówkach *(Diptera)* do najpospolitszych owadów odwiedzających kwitnące rośliny w Tatrach. Bogactwo ilościowe roślin tatrzańskich niewątpliwie wpływa na ich bujny rozwój. Wiosną wielkie przestrzenie w Tatrach pokrywają się kolejno kwitnącymi: 1. *Crocus scepusiensis* Richb., 2. *Primula elatior* L. i 3. *Vaccinium myrthilus* L. Rośliny te wyznaczają trzy pory wiosenne w Tatrach: przedwiośnie, pierwiośnie i wiosnę. Latem odwiedzają trzmiele większość roślin kwiatowych Tatr.

W cyklu rozwojowym rodziny trzmielowej wyróżniłam następujące etapy: 1. budzenie się samicy i picie nektaru, 2. zbieranie pyłku i nektaru (produkcja wosku i karmienie młodych larw), 3. pojawienie się młodych robotnic, 4. wylot z gniazd młodych samic i samców (pora godowa), 5. zamieranie samców i robotnic, 6. sen zimowy matek. Etapy te rozpoczynają się wcześniej na Niżu Polski, bo już w połowie marca, a następnie z około dwu-tygodniowymi opóźnieniami na Podhalu, strefie podalpejskiej i alpejskiej Tatr. W związku z tym na Niżu już w czerwcu trzmiele mają porę godową, a w Tatrach dopiero w lipcu. Jednakże życie aktywne trzmieli kończy się na Niżu znacznie później (listopad) niż w Tatrach (wrzesień), w związku z rozpoczynającymi się mrozami.

Etapy rozwoju rodziny trzmielowej są związane z okresami kwitnienia roślin w Tatrach, ponieważ te same czynniki (topnienie śniegów i odpowiednio wysoka temperatura) powodują rozpoczęcie się obu cyklów. Pierwszy etap rozwoju rodziny trzmielowej wypada na przedwiośnie, drugi na pierwiośnie a trzeci na wiosnę. W lecie występujący najliczniejszy rozwój trzmieli wiąże się ściśle z bogactwem roślin, które zakwitają wtedy na zboczach i w dolinach górskich.

Bujne życie trzmieli w Tatrach uwarunkowane jest również odpornością tych owadów na działanie klimatu górskiego. Trzmiele bowiem najlepiej ze wszystkich pszczowatych *(Apidae)* znoszą działanie silnych wiatrów, stosunkowo niskiej temperatury (8°C), mgłę i deszcz, i dzięki temu mają więcej czasu na życie aktywne w Tatrach niż inne pszczowate.

РЕЗЮМЕ

Разработку фауны шмелей из рода *Bombus* LATR. и *Psithyrus* LEP. Татр Польских я начала в рамах коллектива исследователей, организованного Отделом Зоологического Института П. А. Н. в Кракове. В моей работе я учла, кроме территории Польских Татр, также район предгорный, как Скальне и Подгале.

Из отмеченных 20 видов шмелей, 12 видов найдены мною в районе Татр. Количество шмелей, выступающих в местах моих сборов в Татрах, зависит от количества цветущих растений, а не от положения данного места над уровнем моря и от размеров исследуемого района. При этом, в субальпийской зоне, чаще всего встречаются *B. pratorum* L. и *B. terrestris* L., а в зоне альпийской — *B. pyrenaeus* PÉR. Остальные виды встречаются значительно реже.

Распределение гнезд шмелей по отношению к уровню моря, вследствие отсутствия достаточных данных о местах гнездовий, я определяла по расселению самцов над уровнем моря, так как они, как

известно, не отлучаются далеко от гнезда. Благодаря этому можно принять, что в альпийской зоне Татр гнездятся следующие виды: *B. elegans* Panz., *B. terrestris* L., *B. pratorum* L., *B. lucorum* L., *B. pyrenaeus* Pér., *P. distinctus* Pér., *P. silvestris* (Lep.), *P. quadricolor* Lep. и *P. rupestris* L.

В Польских и Чехословацких Татрах встречаются тоже виды шмелей. Принадлежат они к 22 видам, широко расселенным в Европе и к 4 видам альпийским, встречающимся в горах Средней Европы и Кавказа. Однако в некоторых других горах Средней Европы (Карпаты, Судеты, Альпы и Балканские горы), кроме видов, встречающихся в Татрах, живут еще 18 видов шмелей. Это виды, принадлежащие к понтийской, понтотуркменской и восточно средиземноморской фауне, ареал расселения которых охватывает часть Альп, Балканский полуостров и Украину, кроме того виды, принадлежащие к горной фауне, так называемые борео альпийские виды, связанные с средиземноморским ареалом.

Шмели находят в Татрах благоприятные условия для своего развития, о чем свидетельствует их численное богатство, тесно связанное с богатством флоры Татр и иммунитетом по отношению к альпийскому климату (летают при температуре 8°Ц., сильном ветре, тумане и мелком дожде).

Цикл развития шмелиной семьи, который я поделила на 7 этапов (1. Пробуждение самок и питание нектором, 2. собирание цветочной пыльцы и нектара — выделка воска и кормление первых личинок, 3. появление молодых работниц, 4. вылет из гнезда молодых самцов и самок — брачный период у шмелей, 6. отмирание самцов и работниц, 6. зимняя спячка самок), начинается приблизительно на один месяц раньше на низменности Польши, чем в Татрах, конец цикла на низменности завершается в конце октября, в Татрах же, в конце сентября. Этапы этого цикла тесно связаны с тремя временами года: весенним (1—3 этапы), летним (4 этап) и осенним (5 етап).

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