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The *Apoidea* of the Babia Góra Mountain

***Apoidea* Babiej Góry**

***Apoidea* Бабьей Горы**

INTRODUCTION

The studies of the fauna of the Babia Góra Mountain began in the XIX-th Century. First papers dealing with that fauna were published by the coleopterologists namely by ROTTENBERG (1867), KIESENWETTER (1869), KOTULA (1873), NOWICKI (1873), STOBIECKI (1880, 1881, 1883) and ŁOMNICKI (1893). They gave the lists of the *Coleoptera* and some records on the *Rhynchota*, *Orthoptera*, fishes, birds and mammalia of the Babia Góra. KULCZYCKI (1881, 1882, 1883) published his papers on the spiders *(Arachnida)*, WIERZEJSKI (1896) worked out the fauna of the small lakes of the Babia Góra. STOBIECKI has collected some specimens of the *Apoidea* of the Babia Góra and its closest surroundings. At last NIEZABITOWSKI (1889) published his materials of the fauna of the *Phytophaga* and KULMATYCKI (1920) those of the ants *(Formicidae)*.

In the present century several papers dealing with this region have been published. First records on the Apoidea are included in the lists given by KISS and OLASZ (1907), who have collected their material in Polhora Orawska and Babia Góra, but chiefly on the southern slope of the latter during their excursion in September 1905. The species belonging to the *Hymenoptera*, *Lepidoptera*, *Coleoptera*, *Orthoptera*, *Neuroptera* and *Hemiptera* were recorded by those authors. They have collected 9 species of bumble-bees (*Bombus* LATR.) and 2 species of the genus *Psithyrus* LEP. in the Babia Góra, but these are without any particular places of the collecting and any altitudes in labels. Some more recent publications contain the data on the *Apoidea*. These are the papers

of URBAŃSKI (1932) on the *Mollusca*, RIABININ (1962) on the birds, PAWŁOWSKI (1964) on the *Coleoptera* new to Babia Góra. The papers of the SMRECZYŃSKI (1936, 1950), SZYMCZAKOWSKI (1959) and PLISKO (1962) contains also some data on the *Lubricidae*, *Orthoptera* and *Coleoptera*.

In the collective publication entitled „The Babia Góra National Park" published under the redaction of W. SZAFER in 1963, several authors gathered the existing records on the fauna of this mountain. They did not find any endemic species but they realised that in this area there are some carpathian endemits, the alpine species and the boreo-alpine species that have been also found in the Tatry Mountains, but their number is smaller in the Babia Góra than in Tatras. In the above mentioned publications in the chapter dealing with the *Invertebrata* Pawłowski lists three species of the *Apoidea*, for example *Bombus pyrenaeus* PÉR. an alpine element, *B. lucorum* (L.) a tychoalpine element and *Andrena lapponica* ZETT. species characterised by him as a boreo-alpine element in the fauna of the Babia Góra.

In the Babia Góra the *Apoidea* were collected by the present author in the years 1962—1964 during all the months of the vegetation and so, starting from April and finishing in September, or even in October. About 3600 specimens of this groupe have been collected by the present author and this allowed to give the lists of the species, to realise the vertical reaches of these species, to precise the times of the flight of the species in particular plant-zones, as well as to show how the periods of the appearance of the species are depending on the periods of the flowering of their host plants. Some zoogeographis problems are solved in the seperate chapter of the present paper. It contains a comparison of the lists of the species found in Tatry Mountains and in Pieniny Mountains already published by NOSKIEWICZ (1920), DYLEWSKA (1958, 1962), and DYLEWSKA and NOSKIEWICZ (1964) with the material of the Babia Góra, and with the data concerning the *Apoidea* of the other parts of the Western Carpathians. The particular biological, ecological and zoogeographical data allowed the author to give an analysis test of the descending and directions of the aboding of the Babia Góra by the Apoidea.

I am very thankful to Prof. Dr. J. STACH for his great help and I also owe my thanks to Ing. J. ZAREMBA the director of the Babia Góra National Park who enabled my researches and to Dr. J. PAWŁOWSKI and Mag. T. PAWŁOWSKA who helped me by their experience in this terrain. Mag. T. PAWŁOWSKA have also kindly determined the plants on which the *Apoidea* have been found.

I. THE CHARACTERISTICS OF THE TERRAIN

The Babia Góra is the highest top of the Beskid Wysoki Range in the Western Carpathians reaching the altidude of 1724,6 m above the sea level at Diablak. The latter mount together with Polica Range and Jałowieckie Range

is called the group of the Babia Góra. The Babia Góra massif extends parallelly from Jałowiecka pass at the north to Liptowska (Krowiarki) — pass at the east. The 10 km long crest of mountain is slightly arched towards the south. These are the tops of the mentioned crest starting from Jałowiecka pass (1017 m a. s. l.): Mała Babia Góra called also Cyl (1517 m a. s. l.) from which one can descend to Idebczyska-pass (Brona, Brama), at the altitude of 1408 m a. s. l., then Garb Kościółek (1620 m a. s. l.) and Diablak, then from the top of the range the crest descends gradually through smaller tops as Główniak (1617 m a. s. l.), Kępa (1521 m a. s. l.) and Sokolica (1367 m a. s. l.) and from there terminates through steep slope at the altitude of 986 m a. s. l. at Krowiarki.

The northern slopes decline steeply (the angle 30—70°) to 900 m a. s. l. and beyond that altitude are divided by small dales of the steams into parallelly situated crests. These are as follows: Norczak, Stonów Groń, Ryzowana, and Burdylowy Groń. The streams of the northern slopes are connected at the altitude of 600 m a. s. l., in Zawoja-Widły. The slopes are flat in upper parts to the altitude of 1400 m a. s. l., but steep below 900 m a. s. l. and at last in the foot parts area spread towards Kotlina Orawska at the altitude of about 750 m a. s. l. The inclination of the southern slopes varies from 20° to 45°. The chief mount has both from Zawoja village and Kotlina Orawska a rather great relative altitude, namely 1000 m at the north and about 900 m at the south. The outline of the Babia Góra is given in figure 1.

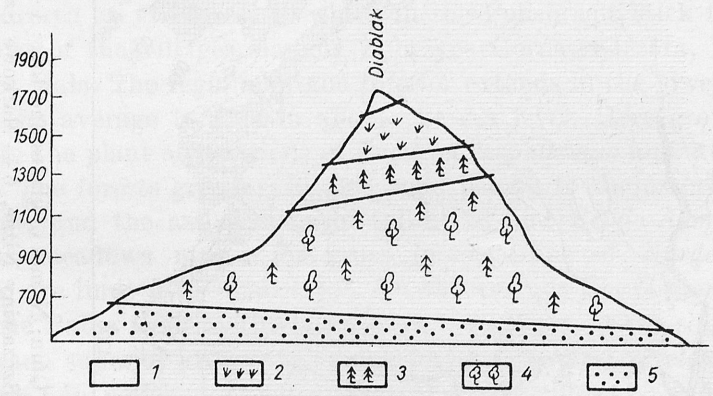
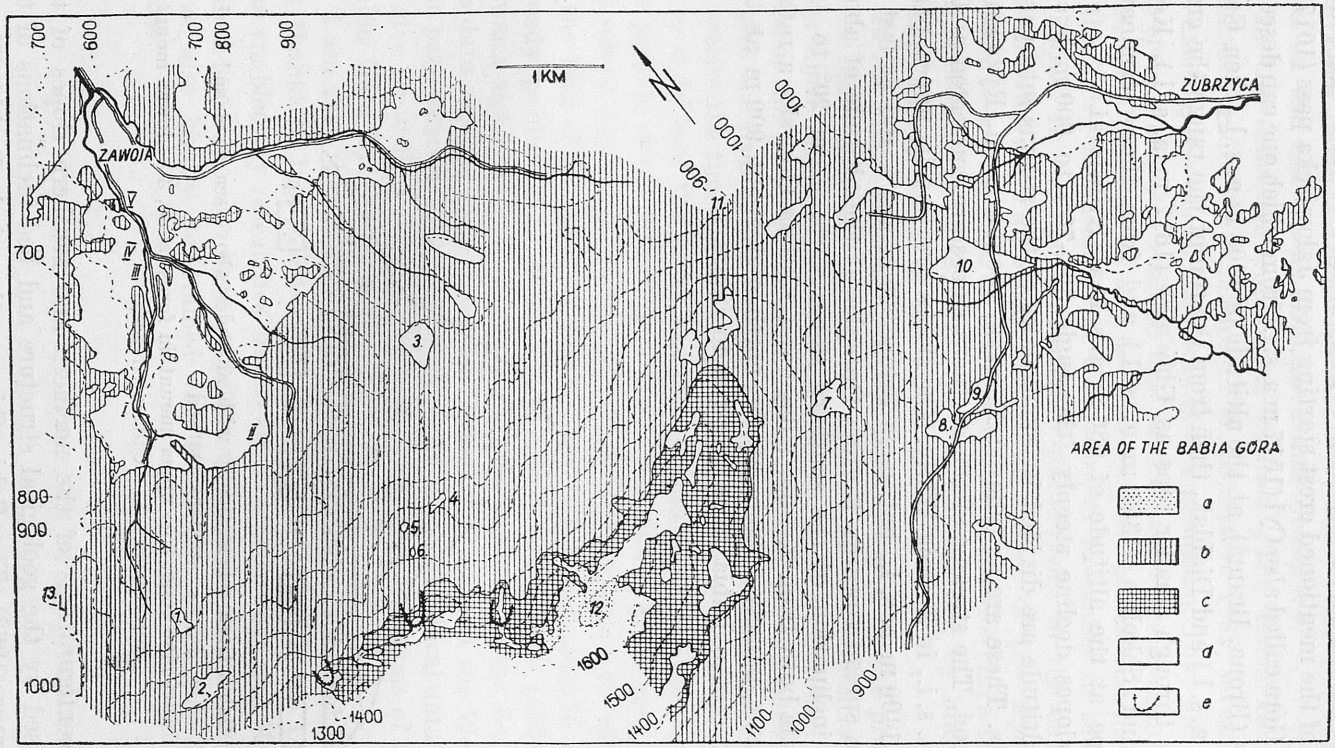


Fig. 1. Profile of the Babia Góra schematically with altitudes above sea level and floristic regions marked
1 — alpine zone, 2 — dwarf pine zone, 3 — upper mountain forest zone, 4 — lower mountain forest zone, 5 — cultivated area

The different configurations of the northern and southern slopes of the Babia Góra is caused by the geological structure and bed inclinations of the mount (Książkiewicz, 1962). The Babia Góra as the whole Beskid Wysoki consists of a flish. The top parts are constitute of the Magura sandstone with the slate insertions lying in the Hieroglyphic beds. The Magura sandstone



Map. 1. The area of the Babia Góra; Names of glades and tops: 1 — Czarna Cyrhla, 2 — Hala Czarnego, 3 — Sulowa Cyrhla, 4 — Dejakowe Szczawiny, 5 — Markowe Szczawiny Niżne, 6 — Markowe Szczawiny, 7 — Hala Kralowa, 8 — Gubernasówka, 9 — Hala Śmietanowa, 10 — Hala Śmietanowa Zubrzycka, 11 — Krowiarki, 12 — Diablak; Places of nestling: I — Barańcowa, II — Ryzowana, III — Palechówka, IV — Widełki, V — Zawoja Wilczna; a — regio alpina, b — regio montana (mountain forest zone), c — regio mugheti (dwarf pine zone), d — meadows, e — corries

in the oblique beds are directed rather to the south, and therefore the southern slopes are more resistant to the erosy and less damaged than the northern slopes. The present appearance of the slopes is caused by a glacier activity but mainly by the atmospheric agents and the mass movements. Under the steep rocks of the top parts of the northern slopes and also along the gills and at the bottom og the corries, there are the screes and heaps of the big stones. The localisation of the corries is given in the map No. 1. The Kościółki-corry 200 m deep, is the biggest one among those. It is hidden from the wind and grown up with a rich tall-herb flora. The soils of the northern slopes are strongly differentiate, consisting chiefly of fain-grained Magura sandstone which comprises calcium carbonate, of sandstones with no calcium contents and of acid soils with the beds of the moulder. That is a reason that the flora of the northern slopes is well differentiate (WOJTERSKI, 1963). The calcifilous and granit prefering species known from different parts of Tatry Mts. are also recorded from here.

A rather high altitude above the sea level causes the characteristic distribution of the plants in the Babia Góra. The plant zones of the Babia Góra in the comparison with those of the Tatry Mts. are lowered by about 200 m. The vertical reaches of the plant associations in the Babia Góra are worked out by CELIŃSKI and WOJTERSKI (1961, 1963). This vertical plant distribution is shown in fig. 1. And so, in the lowest foot parts of the northern side of the Babia Góra the forests cover small areas only (Pl. XII fig. 1) and the majority of that slope is taken under the cultivation. On the southern slope the foot parts are covered by the forest to which in the Polish side stick the fields and the meadows of the villages, namely Zubrzyca Górna, Kiczora, Przywarówka and Lipnica Mała. The regio montana inferior extends in the lowest part of the massif on the average to 1150 m above the sea level. Here grow the forests belonging to the plant associations of *Fagetum carpathicum* and *Abieti-Piceetum montanum*. The forests growing in this zone belong to the associations of *Alnetum incane* and the associations of tall-herbs and *Betulo-Adenostyletae* and montainous meadows mown for grass (associations of *Nardetum-Gladiolo-Agrostetum*) are limited to small areas. On the average the border in the forest passes in the Babia Góra at the altitude of 1390 m above the sea level. In the regio montana superior grows the spruce forest *(Piceetum excelsae carpathicum myrtilletosum)* in which dominates *Vaccinium myrtillus* L. and there is the association of *Piceetum excelsae filicetosum* with *Arthyrium alpestre* (HOPPE) and *Dryopteris austriaca* (L.) as the dominants. In the mountain palustres of this zone grows characteristically *Rumex alpinus* L. Along the ways, streams, small glades and other uncovered by the forest areas in the tall-herb associations flower in the spring *Petasites* MILL., *Primula* L., *Taraxacum* ZINN., later on *Doronicum austriacum* JACQ., *Adenostyles alliariae* GOUAN and *Aconitum callibotryon* RCHB. At the forest borders there are small sorb-tree brush-woods and the tall-herb pathes.

In the regio montana inferior and the regio montana superior are markedly separate from each other on the northern slope only. The southern slopes are

rather uniformly covered by the spruce forest reaching at the average 70 m higher altitude than on the northern slopes. In the lower parts of that forest there are also solitary beech-trees (*Fagus silvatica* L.), fir-trees (*Abies alba* MILL.). *Dentaria* L., a plant characteristic of the regio montana inferior is here rather common. Because of that in the list of the species collected on the southern slopes the lower parts of the spruce forest to about 1200 m above the sea level is distinguished.

The meadows of the both mountain regions are situated at nearly same altitudes on the southern and northern slopes of the Babia Góra (RALSKI, 1933). On the northern slopes of the regio montana inferior at the altitude of about 900 m above the sea level there are two large glades, namely Czarna Cyrhla (Pl. XII fig. 2) and Sulowa Cyrhla (map No. 1) and above them at the altitude of 1000 m a. s. l. there are two meadows, viz., Hala Czarnego and Dejakowe Szczawiny. The glade Markowe Szczawiny (Pl. XIII fig. 3) is the biggest one in the regio montana superior. At the altitude of 900 m a. s. l. on the southern slopes along the way from Zubrzyca Górna to Przywarówki there are several meadows mown for grass, namely: Hala Śmietanowa, Hala Śmietanowa Zubrzycka, Gubernasówka, Kiczora and Przywarówka. Another hall, Hala Kralowa is situated at the altitude of about 1150 m a. s. l. In the spring mainly on the southern slopes flower *Crocus scepusiensis* Borb. and *Primula elatior* L., any later on, in June the yellow flowering species of the genus *Hieracium* L., and *Trifolium* L., *Coronilla varia* L., and in the autumn flower *Carduus* L. and *Centaurea* L. In dry insolated places and among the stones removed from fields flower the wild strawberry (*Fragaria vesca* L.), *Potentilla erecta* L. and *Veronica* L.

Above the timber line on the both slopes grow dense dwarf pine (association of *Mughetum carpathicum*), which in the upper parts of this regio is limited to the small pathes, becoming smaller and smaller towards the top. A rich tall-herb flora with *Adenostyles alliariae* SONAN., *Doronicum austriacum* JACQ. and *Vaccinium myrtillus* L. and *Vaccinium vitis-idea* L. grows among those bushes. Also grows here the grasses and rock lowns in which flower *Rodiola rosea* L. and *Salix silesiaca* WILLD.

The regio alpina is limited to small area (Pl. XIII fig. 4) between the altitudes of 1650 and 1725 m a. s. l. and is covered mostly with high mountainous lowns with *Pulsatilla alpina* L., *Sedum alpestre* VILL., *Polygonum bistorta* L. and others ones.

ROMER (1949) reconed the Babia Góra range among the country F_7 of the sub-mountain regions and of the mountains of Śląski Beskid and West Beskids with are characterised by the mountains climate. Mild winters, cool summers, the springs warmer than the autumns and a marked amplitude between day and night are observed here. The southern winds appear very often during the winter. The southern and south-west winds predominate on the northern slopes and west and south-west winds predominate on the sounthern slopes (OBRĘBSKA-STARKLOWA, 1963). The number of fine days is not larger than 20 % in the Babia Góra. There are about 15 days with the moisure in every month.

Table 1

Locality	The quantity of the moisure in mm
Zawoja	1142
Stańcowa	1086
Markowe Szczawiny	1409
Diablak	1509

The moisure depends on the altitude and on the exposition. The year moisure noted at Zawoja (the foot area, 700 m a. s. l.), Stańcowa (regio montana inferior, 850 m a. s. l.), in Markowe Szczawiny (regio montana superior, 1180 m. a. s. l.) and at the top of Diablak (1725 m a. s. l.) are shown table I (after Pawłowski, 1962). Half of the total amount of the moisure occur in the summer, and half in the winter. In the period of pending of my researches the larger snow cover were: in Zawoja 105 cm, in Stańcowa 138 cm and in Markowe Szczawiny 138 cm (these data are received from the PIHM). The biggest snow cover (400 cm) was found by Pawłowski (1962) in the Kościółki corries at the altitude of 1950 m. In the regio mugheti the snow lasts till July or even till August. The climate of the Babia Góra is also characterised by the mean monthly temperature. The data referring to above mentioned places and in the meteorological station in Jabłonka in the Nowotarska Valley (a place nearest to the southern foot of the Babia Góra (taken in the years 1962—1964 are illustrated in table II.

Table II

Locality	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII
Zawoja	—5·5	—5·4	—2·9	6·5	9·9	13·4	14·6	14·8	11·5	7·0	3·3	—5·4
Jabłonka	—8·8	—8·5	—5·5	6·1	10·0	13·9	14·6	14·7	10·9	5·9	3·7	—7·8
Stańcowa	—6·5	—6·1	—3·7	4·7	8·7	12·8	14·2	14·3	10·7	6·3	3·8	—6·2
Markowe Szczawiny	—7·2	—7·7	—4·9	3·3	7·0	10·8	12·0	12·3	8·7	4·8	3·5	—6·8
Top region	—9·3	—7·6	—5·4	—1·8	4·5	7·3	8·6	7·5	5·6	2·9	—4·0	—6·0

It can be seen from the table II that the period from April to November is at the meteorological stations in Zawoja and Jabłonka close to each another in the temperatures, however, Jabłonka is lower than Zawoja by 80 m. The differences are in the tenth parts of the Celsius degree. The months IV, IX and X are cooler in Jabłonka than in Zawoja, but the months V and VI respectively warmer. In summer (VII, VIII) in the years of researches the mean temperatures in the both stations were nearly the same. The winter months XII, I, II and III are in Jabłonka markedly cooler at the Stańcowa than at Zawoja and Jabłonka, by about 1·2°C, mainly in the months IV, V and VI, but in the months VII, VIII and IX only by 0·4°C, probably because of a strong

insolation of the south faced slopes. The winter period is warmer at Stańcowa and even at Markowe Szczawiny than in Jabłonka, where the cool masses of the air are descending from the Tatra Mts. and the Babia Góra. In the period from IV to IX Markowe Szczawiny are cooler than Stańcowa by 1·4°C in spring and by 2·0°C in summer.

The seasons are on the Babia Góra designated by mean day temperatures as follows:

winter — mean temperature below 0°C
prae-vernal period — from 0°—5°C
spring — from 5°C—15°C
summer — above 15°C
autumn — from 15°—5°C
late autumn — from 5°—0°C

Table III shows the mean dates of the beginning of the year seasons noted during the period of the researches in the meteorological stations mentioned above.

Table III

Season	Top area	Markowe Szczawiny	Stańcowa	Jabłonka	Zawoja
Early spring	10. V	1. V.	9. IV	5. IV.	1. IV
Spring	20. V	6. V.	13. IV.	11. IV.	10. IV.
Summer		2. VIII—7. VIII. 18. VII—25. VII.	9. VII.	18. VI.	18. VI.
Autumn		8. VIII.	15. VIII.	26. VIII.	26. VIII.
Late autumn	13. IX.	10. X.	20. X.	20. X.	21. X.
Winter	30. X.	25. XI.	30. XI.	27. XI.	28. XI.

In the top area (after OBRĘBSKA-STARKLOWA, 1963) of the Babia Góra there is no summer in the temperature meaning. The spring starts at about 10th May and passes into the autumn. The late autumn beginns about the 13th September, the winter lasts about five and half months. At Markowe Szczawiny (regio montana superior) the winter lasts less than five months, the spring beginns in first decade of May. The warm summer days have been realised chiefly in August, or in the second half of the July (6—8 days earlier) at this station. In first half of October beginns the late autumn here. In the regio montana inferior at the southern slopes, the spring beginns about the 15th April, the summer in first decade of July and lasts about 40 days. The late autumn beginns here similarly as in the stations in Zawoja and Jabłonka about 20th October. The beginning of the spring was in these three stations between 10th and 13th April. The summer at the stations in Zawoja and Jabłonka lasts about 69 days, between 18th June and 26th August.

II. THE LISTS OF THE SPECIES

The species of the *Apoidea* collected at the Babia Góra, are sytematicaly listed in this chapter. Besides of the exact places of the collecting of the species, the dates of the collecting and the sex of the specimens and often the plants on which those species have been found the plant zones are added. Those are marked with the following symbols:

I. The foot parts of the northern slopes
Ia. The foot parts of the southern slopes
II. The regio montana inferior (the lover mountain forest zone), northern slopes
IIa. The lover parts of the southern slopes of the lover mountain forest zone
III. The regio montana superior (the upper mountain forest zone), northern slopes
IIIa. The upper parts of the southern slopes of the upper forest zone
IV. The regio mugheti (the zone of dwarf pine), northern slopes
IVa. The zone of dwarf pine of the southern slopes
V. The regio nivalis (the alpine zone).

Family: *Colletidae*

Genus: *Colletes* LATREILLE

1. *C. cunicularius* (LINNAEUS)

I. Palechówka 22. IV. 1963, ♂ on *Salix* L.
Ia. Zubrzyca Górna 21. IV. 1964, ♂ on *Salix caprea* L.

Genus: *Prosopis* JURINE

1. *P. confusa* (NYLANDER)

I. 18. VIII. 1879, ♀ leg. S. STOBIECKI
IIa. The way from Gubernasówka to Przywarówki 2. VII. 1963, ♀ on *Rubus idaeus* L.; 30. VII. 1962, ♂; 4. VIII. 1962, ♂; 9. VIII. 1963, ♀ on *Potentilla erecta* (L.).

2. *P. sinuata* (SCHENCK)

I. Palechówka 23. VII. 1962, ♂ — Barańcowa 1. VII. 1963, ♂♂ on *Achillea* L.; 8. VII. 1963, ♀♀ ♂♂ on *Achillea* L.

3. *P. communis* (NYLANDER)

Ia. Border line forest by Lipnica Mała 8. VIII. 1962, ♀.
IIa. Hala Śmietanowa 5. VII. 1963, ♀♀ on *Bellis* L.

4. *P. difformis* (EVERSMANN)

I. Barańcowa 1. VII. 1963, ♀ ♂ on *Adenostyles alliarae* (GOUAN); 11. VIII. 1962, ♂♂ on *Campanula* L. — Zawoja Wilczna 25. VI. 1963, ♂ on *Echium vulgare* L.

5. ***P. hyalinata*** (SMITH)

I. Markowe Równienki 17. VII. 1962, ♀ on *Hieracium* L.

IIa. Hala Śmietanowa 5. VII. 1963, ♂ on *Bellis perennis* L. — The way from Gubernasówka to Przywarówki 6. VI. 1963, ♂ on *Bellis perennis* L.; 2 and 4. VII. 1963, ♀♀ ♂♂ on *Rubus* L. and *Hieracium* L.

Family: *Andrenidae*

Genus: *Andrena* FABRICIUS

1. ***A. pubescens baltica*** ALFKEN

I. Palechówka 10. VI. 1963, ♀ on *Bellis perennis* L.; 17. VI. 1963, ♀ on *Hieracium* L.; 21. VI. 1963, ♀ on *Polygonum* L.; 26. VI. 1963, ♀ on *Rubus* L.

IV. Izdebczyska 5. V. 1964, ♀ on *Salix silesiaca* WILLD. — Kościółki 5. VI. 1964, ♀ on *Salix silesiaca* WILLD.

2. ***A. tibialis*** (KIRBY)

I. Widełki 30. IV. 1963, ♂♂ on *Salix* L.

IV. Izdebczyska 5. VI. 1964, ♀ ♂ on *Salix silesiaca* WILLD.

3. ***A. haemorrhoa*** (FABRICIUS)

I, Ia. Common species (about 80% of the vernal *Apoidea*). Collected in valleys of streams and on slopes. Males appear about mid-April and fly till third decade of May, females from end of 2-nd decade of April to third decade of May. They visit *Crocus scepusiensis* BORB., *Salix* L. *Tussilago farfara* L., *Petasites albus* L. and *Taraxacum officinale* WEB.

II. Sulowa Cyrhla 18. IV. 1964, ♂♂ on *Crocus scepusiensis* BORB.; 8. V. 1964, ♀♀ ♂♂ on *Salix* L.; 26. V. 1964, ♀♀ on *Taraxacum officinale* WEB. — Czarna Cyrhla 19. VI. 1963, ♀ on *Potentilla erecta* (L.); Dejakowe Szczawiny 27. V. 1964, ♀ on *Salix* L.

IIa. Gubernasówka 20. IV. 1964, ♂♂ on *Tussilago farfara* L.; 14. V. 1964, ♂ on *Salix* L.; 19. V. 1964, ♀♀ ♂♂ on *Salix* L. and *Vaccinium myrtillus* L.

III. Markowe Szczawiny 25. V. 1964, ♀ on *Salix* L.; on the green touristic way below Markowe Szczawiny 18. V. 1964, ♀ on *Salix* L.

IV. Kościółki 21. V. 1964, ♀ on *Salix silesiaca* WILLD.; 5. VI. 1964, ♀♀ on *Salix silesiaca* WILLD. — Izdebczyska 5. VI. 1964, ♀♀ on *Salix silesiaca* WILLD.

4. ***A. fulvago*** (CHRIST)

I. Markowa 11. VII. 1963, ♀.

II. Czarna Cyrhla 19. VI. 1963, ♂ on *Hieracium* L.

IIa. Gubernasówka 6. VI. 1963, ♂ on *Taraxacum officinale* WEB.

5. ***A. humilis*** (IMHOFF)

I. This species nestles in colonies in the soil in valleys of streams and on the slopes protected from the wind. Males during two weeks of June, mainly on *Taraxacum officinale* WEB., females from first decade of June to second decade of July on *Hieracium* L., *Rannunculus acer* L., *Leontodon* L.

Ia. Lipnica Mała 3. VII. 1963, ♀. — Hala Kralówka 3. VII. 1963, ♀♀ on *Hieracium* L.

II. Sulowa Cyrhla 26. VI. 1963, ♀♀ ♂♂ on *Hieracium* L.; 10. VII. 1964, ♀♀ on *Hieracium* L. — Czarna Cyrhla 11. VII. 1963, ♀ on *Hieracium* L.; 19. VI. 1963, ♂♂ on *Hieracium* L.

IIa. On glades and along ways in the forests to the altitude of 900 m. It appear during first decade of June till last decade of July on *Taraxacum officinale* WEB., *Hieracium* L., *Leontodon* L., *Rannunculus acer* L.

6. *A. bicolor* (Fabricius)

I. In the valleys of the streams and on the slopes, in two generations. First generation in early spring from about 10 April till first days of June on *Crocus scepusiensis* Borb. *Tussilago farfara* L., *Petasites albus* L., *Salix* L., *Primula elatior* L., *Taraxacum officinale* Web., *Geranium silvaticum* L. Second generation from first decade of July to first days of September, on: *Campanula* L. and *Echium vulgare* L.

Ia. Lipnica Mała 23. IV. 1964, ♀♀ on *Crocus scepusiensis* Borb.; 19. V. 1964, ♀♀ on *Tussilago farfara* L. and *Salix* L.; 3. VII. 1963, ♀ ♂ on *Echium vulgare* L. — Zubrzyca Górna 21. IV. 1964, ♀ ♂.

II. On glades, forest clearings and along ways from the end of second decade of April, till about second half of May and in the end of first decade of July on *Petasites albus* L., *Crocus scepusiensis* Borb. and *Taraxacum officinale* Web.

IIa. First generation from second decade of April, till first decade of June on *Tussilago farfara* L., *Salix* L., *Vaccinium myrtillus* L. and *Dentaria grandulosa* W. K.. Second generation in first decade of August.

III. Only one generation. On glades and along ways from first decade of May to first decade of June on *Salix* L. *Tussilago farfara* L. *Taraxacum officinale* Web., *Primula elatior* L., *Vaccinium myrtillus* L. The nests have been observed on path on the glade Markowe Szczawiny.

7. *A. ruficrus* (Nylander)

Ia. New for Polish Carpathians. Collected (2 ♀♀) in Zubrzyca Górna on *Salix caprea* L.

8. *A. lapponica* (Zetterstedt)

I. In valleys of streams and on slopes in first decade of April (♂♂). The females from the end of first decade of April to the end of the second decade of May. The males have been observed till the end of second decade of May on *Tussilago farfara* L., *Salix* L., and *Vaccinium myrtillus* L.; females visit *Vaccinium myrtillus* L.

Ia. The forest near Lipnica Mała 19. V. 1964, ♀ on *Vaccinium myrtillus* L.

II, IIa. Observed in not dense woods, near ways, in forest clearings and glades. Males from the end of first decade of May till the end of second decade of same month on *Salix* L., and *Petasites albus* L. Females from mid-May to first days of July on *Vaccinium myrtillus* L. In 1962, after wet and cold spring they were on wing still in first days of August.

III. From first decade of May to the end of June on *Salix* L., *Vaccinium myrtillus* L. and *Taraxacum officinale* L. Males to first days of June; females from third decade of May.

IV. Males visit *Salix silesiaca* Willd., between May and June (about two weeks). Females from the end of May to the end second decade of July. In 1962 to the first days of August on *Salix silesiaca* L., *Vaccinium myrtillus* L. and *Vaccinium vitis idea* L. The rutting flights and copulation have also been observed. Males are flying on about half to one meter along the tracts resembling the parabolas. These flights hase been observed every year at the same well insolated, protected from the wind places. Near these places on *Vaccinium myrtillus* L. the copulation have been noticed. Similar rutting flights have also been realised in other floristic regions.

IVa. Diablak 30. V. 1964, ♀♀ on *Vaccinium myrtillus* L.

V. Diablak 1. and 2. VIII. 1962, ♀♀ on *Vaccinium vitis idea* L.

9. *A. praecox* (Scopoli)

I, Ia. In stream valleys, on slopes, glades and near ways in the forests. Males in first decade of April to commencing of May. Females from mid-April to the end of second decade of May on *Tussilago farfara* L., *Salix* L., *Petasites albus* L.

II. Sulowa Cyrhla 8. V. 1964, ♀♀ on *Salix* L.

IIa. Gubernasówka 20. IV. 1964, ♀♀ ♂♂ on *Tussilago farfara* L.; 14. V. 1964, ♀♀ on *Tussilago farfara* L.

III. Below Markowe Szczawiny 25. V. 1964, ♀♀ on *Salix* L.; by Markowe Szczawiny 30. V. 1963, ♂♂ on *Salix caprea* L.

10. ***A. apicata*** (SMITH)

I. In valleys of streams and on slopes from mid-April to the end of May on *Salix* L. and *Petasites albus* L.

Ia. Zubrzyca Górna 21. IV. 1964, ♂ on *Petasites albus* L.

II. Sulowa Cyrhla 8. V. 1964, ♀ on *Salix* L. — above Dolny Płaj 7. V. 1964, ♀ on *Salix* L.

IIa. Below limit of National Park 20. V. 1964, ♀ on *Salix* L.

III. Below Markowe Szczawiny 18. and 25. V. 1964, ♀♀ on *Salix* L. — Markowe Szczawiny 25., 27. and 29. V. 1964, ♀♀ on *Salix* L. — above Markowe Szczawiny 25. V. 1964, ♀ near the way.

IV. Izdebczyska 25. and 29. V. 1964, ♀♀ on *Salix silesiaca* WILLD.: 5. VI. 1964, ♀♀ on *Salix silesiaca* WILLD.

The species is also known from Pieniny Mountains, where it was reported (DYLEWSKA, NOSKIEWICZ, 1964) erroneously under name *A. nycthemera* IMH.

11. ***A. fucata*** (SMITH)

I. In valleys of streams and on slopes. Males from mid-May to mid-June; females from first days of June till first days of July. In 1962 after cold and wet spring the females were observed by the end of second decade of July. They were collected on *Rubus idaeus* L., *Rosa* L., *Taraxacum officinale* WEB. and *Polygonum* L.

II. Sulowa Cyrhla 26. VI. 1963, ♂ on Rubus idaeus L. — way above Sulowa Cyrhla 8. VI. 1963, ♂ on *Rubus idaeus* L.

IIa. Glades, forest clearings and way's sides in the forests at the altitude of about 1200 m above sea level. Males from first days of June till mid-July; females from commencing of July till first days of August on *Rubus idaeus* L., *Rosa* L., *Potentilla erecta* L.

12. ***A. clarkella*** (KIRBY)

Ia. Zubrzyca Górna 21. IV. 1964, ♀ on *Petasites albus* (L.) and *Galanthus* L.; 17. V. 1964, ♀ on *Ribes vulgare* LAM.

II. Sulowa Cyrhla 8. V. 1964, ♀♀ on *Salix* L. — above Dolny Płaj 8. V. 1964, ♀ on *Salix* L.

IIa. The way from Hala Śmietanowa to Hala Śmietanowa Zubrzycka 21. V. 1964, ♀ on *Salix* L. — Gubernasówka 20. IV. 1964, ♀ on *Tussilago farfara* L.

13. ***A. alfkenella*** (PERKINS)

I. Ryzowana 4. VI. 1963, ♀♀ on *Fragaria* L. and *Ribes vulgare* LAM. — Palechówka 3. VI. 1963, ♀ on *Taraxacum officinale* WEB.

II. Czarna Cyrhla 4. VI. 1963, ♀ on *Fragaria* L.

IIa. Gubernasówka 6. VI. 1963, ♀♀ on *Potentilla erecta* L., *Fragaria* L., and near their nests; 5. VII. 1963, ♀, — Hala Śmietanowa 8. VI. 1963, ♀ on *Potentilla erecta* L.

14. ***A. subopaca*** (NYLANDER)

I. In the valeys of the streams and on the slopes from mid-May to the end of first decade of July on *Tussilago farfara* L., *Taraxacum officinale* WEB., *Veronica chamaedris* L., *Potentilla erecta* L. and *Hieracium* L. In 1962 after cold and wet spring females were collected in second decade of August.

Ia. Zubrzyca Górna 6. VIII. 1962, ♀. — Lipnica Mała 19. V. 1964, ♂ on *Taraxacum officinale* WEB.

II. On the glades to the altitude of about 1000 m above sea level from the end of May till the end of first decade of July (♂♂ till the end of June) visiting *Potentilla erecta* L., *Fragaria vesca* L., *Veronica chamaedris* L., *Hieracium* L. and *Potentilla aurea* L.

IIa. On glades, forest clearings and borders of forest ways to the altitude of 1100 m above sea level, from the second decade of May till the first days of August. In 1962 still in

first decade of August visiting *Potentilla erecta* L., *Bellis perennis* L., *Ranunculus acer* L., *Rubus idaeus* L., *Veronica chamaedris* L., *Euphrasia* L.

15. ***A. saundersella*** (PERKINS)

I. Palechówka 10. VI. 1963, ♀♀ on *Veronica chamaedris* L. — Ryzowana 10. VII. 1963, ♀ on *Campanula* L. — Barańcowa 3. VI. 1963, ♀♀ on *Taraxacum officinale* WEB.; 1. VII. 1963, ♀.

II. Puszcza Czatożańska 12. V. 1962, ♂ on *Petasites albus* (L). — Sulowa Cyrhla 26. VI. 1963, ♂ on *Veronica chamaedris* L. — Czarna Cyrhla 11. VII. 1963, ♀.

IIa. Gubernasówka 6. and 7. VI. 1963, ♀♀ ♂♂ on *Hieracium* L. and *Potentilla erecta* L.; 2. VII. 1963, ♀ — Hala Śmietanowa 5. VII. 1963, ♀ on *Bellis perennis* L. — Hala Kralowa 4. VII. 1963, ♀ on *Potentilla erecta* L.

16. ***A. minutula*** (KIRBY)

I. Barańcowa 24. IV. 1963, ♀♀ on *Salix* L.: 4. V. 1964, ♂ on *Tussilago farfara* L.; 3. VI. 1963, ♀ on *Fragaria* L.; 6. IX. 1962, ♀ — Policzne 19. V. 1964, ♀ on *Crocus scepusiensis* BORB. Single generation (in low land two generations).

17. ***A. minutuloides*** (PERKINS)

II. Czarna Cyrhla 19. VI. 1963, ♀ on *Hieracium* L.

18. ***A. hattorfiana*** (FABRICIUS)

Babia Góra 27. VII. 1949, ♀ (leg. M. BIELEWICZ.)

I. Barańcowa 22. VII. 1962, ♀♀ ♂ on *Knautia Kitaibelli* BORB.; 25. VI. 1963, ♀ — Ryzowana 20. VIII. 1962, ♂ on *Knautia Kitaibelli* BORB.

19. ***A. jacobi*** (PERKINS)

I. Zawoja Wiczna 1. VI. 1964, ♂ — Widełki 17. IV. 1964, ♂; 20. IV. 1963, ♂♂ on *Salix* L. — Palechówka 22. IV. 1963, ♂♂ on *Salix* L. — Barańcowa 19. IV. 1963, ♂♂ on *Salix caprea* L.; 24. IV. 1963, ♂♂ on *Salix* L. — Burdylowy Groń 20. IV. 1963, ♀ on *Salix caprea* L.

20. ***A. chrysosceles*** (KIRBY)

I. Widełki 31. V. 1964, ♂ on *Salix* L. (leg. J. PAWŁOWSKI).

21. ***A. coitana*** (KIRBY)

I. Markowa 24. VII. 1879, ♀ (leg. S. STOBIECKI). — Zawoja Wilczna 25. VI. 1963, ♀ on *Echium vulgare* L. — Barańcowa 11. VIII. 1962, ♀ ♂ on *Campanula* L.; 4. IX. 1962, ♀ — Markowe Rówienki 9. IX. 1962, ♀.

Ia. Zubrzyca Górna 23. VII. 1962, ♀.

II. Sulowa Cyrhla 10. VII. 1963, ♀♀ on *Campanula* L.

IIa. Forest clearing 4. VIII. 1962, ♂ — below Gubernasówka 9. VIII. 1962, ♀ on *Euphrasia* L.— Hala Śmietanowa 3. VII. 1963, ♂.

22. ***A. lathyri*** (ALFKEN)

I. Zawoja Wilczna 29. V. 1963, ♂ on *Geranium silvaticum* L.; 1. VI. 1964, ♂.

23. ***A. ovatula*** (KIRBY)

II. Hala Czarnego 11. VII. 1963, ♂.

24. ***A. albofasciata*** THOMSON

I. Barańcowa 10. VI. 1963, ♂ on *Euphrasia* L. — Markowa 11. VII. 1963, ♂♂ on *Rubus idaeus* L.

IIa. Gubernasówka 7. VI. 1963, ♂ on *Hieracium* L.

25. *A. wilkella* (KIRBY)

I. Zawoja Wilczna 1. VI. 1964, ♂ on *Syringa vulgaris* L. — Palechówka 10. VI. 1963, ♀ on *Lotus corniculatus* L. — Barańcowa 22. VII. 1962, ♀; 8. VII. 1963, ♀ on *Trifolium* L. — Ryzowana 20. VIII. 1962, ♂ on *Trifolium pretense* L.

IIa. Gubernasówka 2. VII. 1963, ♀♀ on *Trifolium* L.; 8. VIII. 1962, ♀.

Genus: *Panurgus* PANZER

1. *P. banksianus* (KIRBY)

I. Barańcowa 9. VII. 1963, ♂; 13. VII. 1962, ♀♀ on *Hieracium* L. and *Leonthodon hispidus* L.

Ia. Zubrzyca Górna 29. VII. 1962, ♀♀ ♂♂, near nests and on *Hieracium* L. — Hala Kralówka 3. VII. 1963, ♀, near nests.

IIa. Kiczora 30. VII. 1962, ♀ — Gubernasówka 2. and 3. VII. 1963, ♀♀ ♂♂ on *Hiracium* L. and about nestles — Forest clearing 30. VII. 1962, ♂; 8. VIII. 1962, ♂, — Hala Śmietanowa Zubrzycka 10. VIII. 1963, ♂ near nests.

IVa. Diablak 4. VII. 1963, ♂ on *Doronicum austriacum* JACQ.

Family: *Halictidae*

Genus: *Halictus* (LATREILLE)

1. *H. quadricinctus* (FABRICIUS)

I. Barańcowa 10. VI. 1963, ♀ on *Hieracium* L.; 22. VII. 1962, ♀♀ on *Hieracium* L. — Burdylowy Groń 14. VI. 1963, ♀ on *Hieracium* L.

2. *H. rubicundus* (CHRIST)

Ia. Lipnica Mała 19. V. 1964, ♀♀ on *Taraxacum officinale* WEB.

3. *H. tumulorum* (LINNAEUS)

I. Widełki 1. VI. 1964, ♀ — Palechówka 10. VI. 1963, ♀♀ — Barańcowa 25. VI. 1963, ♀; 22. VII. 1962, ♀♀ on *Hieracium* L.; 4. IX. 1962, ♀ — Ryzowana 4. VI. 1963, ♀♀ on *Ribes vulgare* LAM. and *Potentilla erecta* L.

II. Czarna Cyrhla 19. VI. 1963, ♀ on *Hieracium* L. — Sulowa Cyrhla 26. VI. 1963, ♀ on *Hieracium* L.

IIa. Gubernasówka 6. VI. 1963, ♀ on *Potentilla erecta* L.; 2. and 5. VII. 1963, ♀♀ on *Hieracium* L. — Hala Kralowa 19. V. 1964, ♀ on *Euphorbia* L.

4. *H. xanthopus* (KIRBY)

IIa. Forest clearing 8. VIII. 1962, ♀.

5. *H. leucozonius* (SCHRANK)

II. 18. VIII. 1879, ♀, leg. S. STOBIECKI.

6. *H. villosulus* (KIRBY)

I. In stream valleys and at borders of forest ways; females from first days of June, the males in first decade of October. They presumably are on the wing till the end of autumn. They are visiting *Taraxacum officinale* WEB., *Hieracium* L., *Veronica chamaedris* L., *Doronicum austriacum* JACQ. and *Scrophularia nodosa* L.

Ia. Zubrzyca Górna 29. VII. 1962, ♀ — Hala Kralówka 3. VII. 1963, ♀ on *Hieracium* L.

IIa. On glades and borders of forest ways to the altitude of 900 m above sea level, females

in the first decade of May till the end of August on *Taraxacum officinale* WEB., *Hieracium* L., *Rannunculus* L. and *Potentilla erecta* L.

7. *H. leucopus* (KIRBY)

I. In valleys of streams and on slopes to third decade of May on *Taraxacum officinale* WEB., *Hieracium* L., *Fragaria vesca* L., *Scrophularia nodosa* L. One male have been found at the beginning of October.

II. Sulowa Cyrhla 26. VI. 1963, ♀ on *Veronica* L.; 10. VII. 1963, ♀ on *Hieracium* L.

IIa. Forest clearing 4. and 9. VIII. 1962, ♀♀ on *Potentilla erecta* L. — Gubernasówka 6. VI. 1963, ♀♀ on *Taraxacum officinale* WEB., *Potentilla eracta* L. and near their nests; 2. and 5. VII. 1963, ♀♀ on *Potentilla erecta* L.; 31. VII. 1962, ♀.

8. *H. minutus* (KIRBY)

I. Zawoja Wilczna 29. V. 1963, ♀♀ near nests; 1. VI. 1964, ♀ — Barańcowa 1. VII. 1963, ♀ on *Scrophularia nodosa* L.

IIa. Gubernasówka 6. VI. 1963, ♀ near nest.

9. *H. rufitarsis* ZETTERSTEDT

I. Zawoja Wilczna 29. V. 1963, ♀♀ near nests — Palechówka 3. VI. 1963, ♀ on *Taraxacum officinale* WEB. — Barańcowa 24. V. 1964, ♀ on *Taraxacum officinale* WEB.; 10., 14. and 25. VI. 1963, ♀♀ on *Veronica chamaedris* L., *Doronicum austriacum* JACQ. and *Scrophularia nodosa* L; 1. VII. 1963, ♀♀ on *Hieracium* L. and *Scrophularia nodosa* L.; 3. IX. 1962 ♂; 4. IX. 1964, ♂ on *Hieracium* L.

II. Czarna Cyrhla 11. VII. 1963, ♀.

10. *H. niger* VIERECK

I. In valleys of streams and on slopes from the end of second decade of April to the end of second decade of July. 17. IV. 1964 a single female digged up from a gravel (leg. J. PAWŁOWSKI), during hibernation. The species visits *Salix* L. *Taraxacum officinale* WEB., *Doronicum austriacum* Jacq. and *Hieracium* L.

Ia. Zubrzyca Górna 21. IV. 1964, ♀♀ on *Petasites albus* (L.).

II. Sulowa Cyrhla 8. V. 1964, ♀ on *Salix* L.; 4. VI. 1963, ♀ on *Vaccinium vitis idea* L. — above Dolny Płaj 27. V. 1964, ♀ on *Salix* L. — Czarna Cyrhla 19. V. 1963, ♀ on *Hieracium* L. — Hala Czarnego 30. V. 1963, ♀ on *Vaccinium myrtillus* L.

IIa. Glades, sides of ways and forest clearins to the altitude of 1200 m above sea level. Females in first half of May; one male in first decade of August. The species visits *Vaccinium myrtillus* L.

III. Below Markowe Szczawiny 5. VI. 1964, ♀ on *Vaccinium myrtillus* L.

11. *H. fulvicornis* (KIRBY)

I. Widełki 1. VI. 1964, ♀ on *Taraxacum officinale* WEB. — Palechówka 10. VI. 1963, ♀♀ on *Potentilla erecta* (L.) — Zawoja Wilczna 1. VI. 1964, ♀; 17. IV. 1964, ♀ on *Crocus scepusiensis* BORB. — Barańcowa 17. and 19. IV. 1964, ♀♀ on *Petasites albus* (L.) and *Salix caprea* L.; 24. IV. 1963, ♀♀ on *Salix* L.; 24. and 31. V. 1964, ♀♀ on *Taraxacum officinale* WEB.; 3. IX. 1962, ♂ on *Hieracium* L. — Markowe Równienki 10. VI. 1963, ♀ — Ryzowana 4. VII. 1964, ♀; 20. VIII. 1962, ♀.

Ia. Zubrzyca Górna 21. IV. 1964, ♀♀ on *Petasites albus* L. and *Salix caprea* L.; 17. V. 1964, ♀ on *Salix* L.

II. Sulowa Cyrhla 8. V. 1964, ♀♀ on *Salix* L. — Hala Czarnego 30. V. 1963 ♀ on *Potentilla erecta* (L.).

IIa. The way from Gubernasówka to Przywarówki 5. VII. 1963, ♀ — Hala Kralowa 20. V. 1964, ♀♀ on *Vaccinium myrtillus* L.

12. ***H. continentalis*** BLÜTHGEN

I. Zawoja Wilczna 25. VI. 1963, ♀♀ on *Hieracium* L.

13. ***H. calceatus*** (SCOPOLI)

I. In stream valleys and on slopes from mid-April (♀♀). Males in first days of October. The active life takes place presumably till the end of autumn (in the temperature meaning). The species visits *Tussilago farfara* L., *Salix* L., *Taraxacum officinale* WEB., *Petasites albus* (L.), *Hieracium* L. *Doronicum austriacum* JACQ., *Leonthodon hispidus* L., *Adenostyles alliariae* KERN., *Vaccinium myrtillus* L. and *Cardamine pratensis* L.

Ia. Zubrzyca Górna 21. IV. 1964, ♀♀ on *Petasites albus* (L.); 29. VII. 1962, ♀ — Lipnica Mała 22. IV. 1964, ♀ on *Tussilago farfara* L.; 19. V. 1964, ♀♀ on *Tussilago farfara* L. and *Salix* L.

II. Sulowa Cyrhla 19. and 26. VI. 1963, ♀♀ on *Hieracium* L. and *Veronica chamaedris* L. — Czarna Cyrhla 31. V. 1963, ♀ on *Taraxacum officinale* WEB.; 19. VI. 1963, ♀♀ on *Potentilla erecta* (L.) 11. VII. 1963, ♀ — Hala Czarnego 30. V. 1963, ♀ on *Vaccinium myrtillus* L.

IIa. The way from Gubernasówka to Przywarówki 20. V. 1964, ♀; Gubernasówka 14. V. 1964, ♀♀ on *Vaccinium myrtillus* L.; 6 and 7. VI. 1963, ♀♀ on *Hieracium* L.; 2 and 5. VII. 1963, ♀♀ on *Hieracium* L. — Hala Kralowa 19. V. 1964, ♀♀ on *Euphrasia* L. — Hala Śmietanowa 8. VI. 1963, ♀♀ on *Hieracium* L.; 3. VII. 1963, ♀; 27. VII. 1962, ♀ on *Hieracium* L.

14. ***H. albipes*** (FABRICIUS)

I. In valleys of streams and on slopes. Females from the end of second decade of April; males at the beginning of September . The active life presumably till the end of autumn in the temperature meaning). The species visits *Petasites albus* (L.), *Salix* L., *Taraxacum officinale* WEB., *Geranium silvaticum* L., *Hieracium* L., *Doronicum austriacum* JACQ. and *Adenostyles alliariae* KERN.

Ia. Zubrzyca Górna 29. VII. 1962, ♀♀ — Lipnica Mała 19. V. 1964, ♀ on *Taraxacum officinale* WEB.

II. Sulowa Cyrhla 10. VII. 1963, ♀♀ on *Hieracium* L.; 26. VI. 1963, ♀♀ on *Hieracium* L. and *Rubus idaeus* L. — Czarna Cyrhla 30. V. 1963, ♀♀ on *Potentilla erecta* (L.); 4. VI. 1963, ♀ on *Bellis* L.; 19. VI. 1963, ♀♀ on *Hieracium* L., *Potentilla erecta* (L.) and *Veronica chamaedris* L.; 10. and 11. VII. 1963, ♀♀ on *Hieracium* L.; 24. VII. 1962, ♀.

IIa. On glades, sides of ways and forest clearings to the altitude of about 1200 m above sea level, from mid-May (females) to August on *Salix* L., *Taraxacum officinale* WEB., *Hieracium* L., *Rannunculus acer* L., *Bellis perennis* L., *Potentilla erecta* (L.), *Cirsium* MILL., *Rubus idaeus* L. and *Vaccinium myrtillus* L.

Genus: ***Dufourea*** LEPELETIER

1. ***D. vulgaris*** SCHENCK

Ia. Zubrzyca Górna 6. VIII. 1962, ♀♀ on field.

IIa. The way from Gubernasówka to Przywarówka 9. VIII. 1962, ♀♀ on *Hieracium* L.

Genus: ***Halictoides*** NYLANDER

1. ***H. dentiventris*** (NYLANDER)

I. Barańcowa 8. and 9. VII. 1963, ♂♂; 13. VIII. 1962, ♂ on *Hieracium* L. — Markowa 9. VII. 1963, ♂♂.

Ia. Zubrzyca Górna 6. VIII. 1962, ♂.

Genus: ***Rhophites*** SCHENCK

1. ***R. quinquespinosus*** SPINOLA

Ia. Lipnica Mała 3. VII. 1963, ♂.

Genus: *Sphecodes* LATREILLE

1. ***S. punctipes*** THOMSON

I. Barańcowa 4. and 25. VI. 1963, ♀♀ on *Matricaria* L. and *Fragaria vesca* L.

2. ***S. hyalinatus*** HAGENS

I. Barańcowa 10. VI. 1963, ♀. — Markowa 9. VII. 1963, ♀ — Zawoja Wilczna 25. VI. 1963, ♀.
IIa. Forest clearing 4. VIII. 1962, ♀♀ — Gubernasówka 6. VI. 1963, ♀.

Family: *Melittidae*

Genus: *Melitta* KIRBY

1. ***M. haemorrhoidalis*** (FABRICIUS)

I. Barańcowa 11 and 19. VIII. 1962, ♀♀ on *Campanula* L.

Family: *Megachilidae*

Genus: *Stelis* PANZER

1. ***S. phaeoptera*** (KIRBY)

I. Barańcowa 8. VIII. 1963, ♂ on the wall of wooden house. — Markowa 26. VII. 1879, ♀ leg. S. STOBIECKI.

2. ***S. minuta*** LEPELETIER & SERVILLE

I. Barańcowa 8. VII. 1963, ♀♀ on *Campanula* L.

Genus: *Chelostoma* SPINOLA

1. ***Ch. maxillosum*** (LINNAEUS)

I. Barańcowa 1. IV. 1964, ♂ on *Taraxacum officinale* WEB. — Markowa 4. VI. 1963, ♀ on the wall of wooden house — Markowe Rówienki 30. IV. 1879, ♀ (leg. S. STOBIECKI).

2. ***Ch. florisomne*** (LINNAEUS)

I. Palechówka 24. VII. 1962, ♂♂ — Barańcowa 11 and 15. VIII. 1962, ♀♀ ♂♂ on *Campanula* L. — Markowa 11. VII. 1963, ♀♀ on *Campanula* L.
Ia. Zubrzyca Górna 4. VIII. 1962, ♂.
II. Sulowa Cyrhla 10. VII. 1963, ♂♂ by the wall of hut.

3. ***Ch. nigricorne*** NYLANDER

I. In walleys of streams and on slopes, near wooden houses from the end of first decade of June to the end of July visiting *Campanula* L., *Echium vulgare* L. and *Adenostyles alliariae* KERN.
Ia. Zubrzyca Górna 5. VII. 1963, ♂♂ on *Knautia Kitaibelli* BORB.; 6. VIII. 1962, ♂ on *Campanula* L.
II. Sulowa Cyrhla 10. VII. 1963, ♀ on *Campanula* L.

Genus: *Osmia* PANZER

1. *O. rufa* (LINNAEUS)

I. Zawoja Wilczna 4. V. 1964, ♂ on *Tussilago farfara* L.; 29. V. 1963, ♀ on *Geranium silvaticum* L.; 1. VI. 1964, ♀ on *Syringa vulgaris* L.; 25. VI. 1963, ♀♀ on *Echium vulgare* L. — Barańcowa 24. V. 1964, ♂ on *Taraxacum officinale* WEB.; 1. VI. 1964, ♂ on *Taraxacum officinale* WEB. — Ryzowana 26. V. 1964, ♂ on *Taraxacum officinale* WEB.

Ia. Zubrzyca Górna 24. IV. 1964, ♂♂ on *Galanthus* L. and *Salix caprea* L.; 17. V. 1964, ♀ on *Salix* L. — Lipnica Mała 23. IV. 1964, ♀ on *Crocus scepusiensis* BORB.; 19. V. 1964, ♂♂.

II. Sulowa Cyrhla 26. V. 1964, ♂ on the wall of wooden hut.

2. *O. parietina* CURTIS

IIa. Gubernasówka 6. VI. 1963, ♂ on *Potentilla erecta* (L.).

3. *O. fulviventris* (PANZER)

I. Zawoja Wilczna 1. VI. 1964, ♂ on *Syringa vulgaris* L. — Palechówka 20. VII. 1962, ♀ ♂♂ on *Crisium* MILL.; 23. VII. 1962, ♀ on *Centaurea* L.

4. *O. leaiana* (KIRBY)

I. Palechówka 20. VII. 1962, ♀ on *Cirsium* MILL.

5. *O. coerulescens* (LINNAEUS)

Ia. Lipnica Mała 19. V. 1964, ♂♂ on the old tree.

II. Czarna Cyrhla 24. VII. 1962, ♂ on the wooden wall hut.

6. *O. bicolor* (SCHRANK)

I. Barańcowa 7. V. 1964, ♂ on *Salix* L.

7. *O. leucomelaena* (KIRBY)

I. Zawoja Wilczna 25. VI. 1963, ♀ on *Lotus corniculatus* L.

8. *O. adunca* (PANZER)

I. In walleys of streams and on slopes by their nests and near wooden houses in first decade of June to the end of second decade of August on *Echium vulgare* L.

Ia. Lipnica Mała 3. VIII. 1963, ♀ ♂ on *Echium vulgare* L.

9. *O. villosa* (SCHENCK)

I. Zawoja Wilczna 1. VI. 1964, ♀ on *Taraxacum officinale* WEB. — Palechówka 10. VI. 1963, ♂ on *Hieracium* L.; 3. VI. 1963, ♂ on *Taraxacum officinale* WEB.; 26. VI. 1963, ♂ on *Hieracium* L.; 1. VII. 1963 ♀♀ on *Adenostyles alliariae* KERN. — Barańcowa 11. VII. 1963, ♀♀ on *Centaurea* L. and *Hieracium* L.

Genus: *Megachile* LATREILLE

1. *M. willoughbiella* (KIRBY)

I. Palechówka 20. and 25. VII. 1962, ♂♂ on *Lotus corniculatus* L.

Ia. Zubrzyca Górna 5. VII. 1963, ♀ on *Medicago falcata* L. — Lipnica Mała 3. VII. 1963, ♂ on *Vicia* L.

2. *M. lapponica* THOMSON

IIa. Forest clearing 4 and 9. VIII. 1962, ♀♀ on *Chamaenerion angustifolium* (L.).
New species for Polish Carpathians.

3. *M. ericetorum* LEPELETIER

I. Zawoja Wilczna 29. V. 1963, ♂ on *Geranium silvaticum* L.

Genus: *Coelioxys* LATREILLE

1. *C. rufescens* LEPELETIER

Ia. Lipnica Mała 3. VII. 1963, ♀ on *Echium vulgare* L.

Family: *Apidae*

Genus: *Nomada* SCOPOLI

1. *N. sexfasciata* PANZER

I. Palechówka 20. VII. 1962, ♂♂ on *Echium vulgare* L.

2. *N. hillana* (KIRBY)

I. Palechówka 25. VII. 1962, ♀.
Ia. Hala Kralówka 9. VII. 1963, ♀.
II. Sulowa Cyrhla 19. VI. 1963, ♀ on *Rubus idaeus* L.
IIa. The way from Gubernasówka to Przywarówki 2. VII. 1963, ♀ on *Rubus idaeus* L.

3. *N. flava* PANZER

I. Barańcowa 18. IV. 1964, ♂ on *Petasites albus* (L.); 19. IV. 1964, ♂ on *Salix caprea* L.; 17. IV. 1964, ♂ on *Rubus idaeus* L.
IIa. Gubernasówka 20. IV. 1964, ♂ on *Tussilago farfara* L.
II. Sulowa Cyrhla 18. IV. 1964, ♂ on *Crocus scepusiensis* BORB.

4. *N. glabella* THOMSON

II. Sulowa Cyrhla 8. V. 1964, ♀♀ on *Salix* L. — Dejakowe Szczawiny 27. V. 1964, ♂ on *Salix* L.
IIa. Gubernasówka 14. V. 1964, ♂ on *Vaccinium myrtillus* L.; 6. VI. 1963, ♀; park limit 14. V. 1964, ♀ ♂ near nests; 20 and 30. V. 1964, ♀♀ ♂♂ on *Vaccinium myrtillus* L.; 7. VI. 1963, ♀ on *Salix* L.
III. Markowe Szczawiny 18. V. 1964, ♂ on *Salix* L.; 22. V. 1964, ♀ on *Salix* L.
IV. Kościółki 5. VI. 1964, ♂♂.
IVa. Slopes of Diablak 30. V. 1964, ♂ on *Vaccinium myrtillus* L.

5. *N. leucophtalma* (KIRBY)

I. Barańcowa 17. and 18. IV. 1964, ♀♀ ♂ on *Petasites albus* (L.); 19. IV. 1963, ♀♀ on *Salix caprea* L.; 31. V. 1964, ♀.
Ia. Zubrzyca Górna 21. IV. 1964, ♂ on *Salix Caprea* L. — Lipnica Mała 19. V. 1964, ♂ near nests of *Halictus calceatus* (L.).
II. Sulowa Cyrhla 18. IV. 1964, ♂ on *Crocus scepusiensis* BORB. — below Markowe Szczawiny by the limit of regio montana superior 18. V. 1961, ♂ on *Salix* L.
IIa. Gubernasówka 20. and 22. IV. 1964, ♀♀ ♂♂ on *Tussilago farfara* L. — Krowiarki 19. IV. 1964, ♂ on *Crocus scepusiensis* BORB.

6. *N. ferruginata* (LINNAEUS)

I. Barańcowa 10. VI. 1963, ♀.

7. ***N. bifida*** THOMSON

I. Widełki 30. IV. 1963, ♂ — Palechówka 22. IV. 1963, ♂ on *Salix L.*; 19. IV. 1963, ♀ on *Salix caprea* L.; 24. IV. 1963, ♂ on *Salix* L.; 7. V. 1964, ♂ on *Salix* L.

Ia. Zubrzyca Górna 21. IV. 1964, ♂ on *Salix caprea* L. — Lipnica Mała 23. IV. 1964, ♂ on *Crocus scepusiensis* BORB.

II. Sulowa Cyrhla 8. V. 1964, ♂♂ on *Salix* L.

IIa. Gubernasówka 14. V. 1964, ♂ on *Salix* L.; 20. IV. 1964, ♂ on *Tussilago farfara* L.

III. Markowe Szczawiny Niźne 4. VI. 1963, , ♂ on *Potentilla aurea* L.

8. ***N. flavoguttata*** (KIRBY)

I. Ryzowana 4. VI. 1963, ♂ on *Fragaria vesca* L. — Fickówka 14. VI. 1963, ♂ on *Hieracium* L.

II. Czarna Cyrhla 30. V. 1963, ♀♀ on *Potentilla erecta* (L.); 31. V. 1963, ♂♂ on *Fragaria vesca* L.; 4. VI. 1963, ♀ ♂ on *Fragaria vesca* L. and *Bellis perennis* L. — Sulowa Cyrhla 26. VI. 1963, ♀ on *Hieracium* L.

IIa. Forest clearing 4. VIII. 1962, ♀ — way from Gubernasówka to Przywarówka 8. VIII 1962, ♀ on *Hieracium* L. — Gubernasówka 6. VI. 1963, ♀ ♂♂ on *Bellis perennis* L.; 2. VII. 1963, ♀.

III. Markowe Szczawiny 18. V. 1964, ♂ on *Tussilago farfara* L. — Markowe Szczawiny Niźne 4. VI. 1963, ♂ on *Potentilla aurea* L.

9. ***N. fabriciana*** (LINNAEUS)

I. Zawoja Wilczna 4. V. 1964, ♂ on *Tussilago farfara* L. — Barańcowa 24. V. 1964, ♀.

IIa. Gubernasówka 20. IV. 1964, ♀ on *Tussilago farfara* L. — Hala Śmietanowa Zubrzycka 21. IV. 1964, ♀ on *Crocus scepusiensis* BORB.

Genus: ***Eucera*** SCOPOLI

1. ***E. longicornis*** (LINNAEUS)

II. Czarna Cyrhla 24. VII. 1962, ♂ on *Brunella* L.

Genus: ***Anthophora*** LATREILLE

1. ***A. acervorum*** (LINNAEUS)

I. Barańcowa 7. V. 1964, ♂♂ on *Primula elatior* (L.); 12. V. 1962, ♂ on *Primula* L.; 17. V. 1964, ♂ on *Primula* L.

Ia. Zubrzyca Górna 17. V. 1964, ♀ on *Ribes vulgare* LAM. — Lipnica Mała 19. V. 1964, ♂ on *Primula elatior* (L.).

2. ***A. plagiata*** (ILLIGER)

Ia. Zubrzyca Górna 6. VII. 1963, ♀.

3. ***A. quadrimaculata*** (PANZER)

Ia. Zubrzyca Górna 5. VII. 1962, ♀♀ on *Medicago falcata* L.

I. Barańcowa 8. and 9. VII. 1963, ♀♀ ♂♂; 11. VIII. 1962, ♀ ♂♂; 4. IX. 1962, ♀.

Genus: ***Clisodon*** PATTON

1. ***C. furcatus*** (PANZER)

Ia. Zubrzyca Górna 6. VIII. 1962, ♀♀.

Genus: *Thyreus* PANZER

1. *T. orbatus* LEPELETIER

I. Barańcowa 11. VIII. 1962, ♂ on *Campanula* L.

Genus: *Ceratina* LATREILLE

1. *C. cyanea* (KIRBY)

I. Zawoja Wilczna 29. V. 1963, ♀.

Genus: *Bombus* LETREILLE

1. *B. terrestris* (LINNAEUS)

Babia Góra J. KISS and K. OLASZ (1907).

I. Policzne 19. V. 1964, ♀♀ — Ryzowana 18. IV. 1964, ♀; 9. V. 1962, ♀ on *Vaccinium myrtillus* L.; 19. VI. 1963, ♂ — Fickówka 11. V. 1962, ♀ on *Vaccinium myrtillus* L. — Barańcowa 14. VI. 1963, ♀ on *Rosa pendulina* L. — Markowe Równienki 11. V. 1962, ♀ — Ryzowana 9. V. 1962, ♀; 18. IV. 1964, ♀; 19. VI. 1963, ♂.

Ia. The border of the forest near Lipnica Mała 8. VIII. 1962, ♀.

II. Czarna Cyrhla 24. VII. 1962, ♀ on *Hieracium* L. — Jałowiecka-pass 12. V. 1962, ♀ on *Rubus* L. — Cyl 31. V. 1962, ♀ on *Vaccinium myrtillus* L. — Below Markowe Szczawiny by the forest way 30. IV. 1963, ♀.

IIa. The way from Gubernasówka to Przywarówki 9. VIII. 1962, ♂; 6. VI. 1963, ♀ — Gubernasówka 28. IV. 1961, ♀ (leg. J. PAWŁOWSKI); 20. IV. 1964, ♀ on *Crocus scepusiensis* BORB.; 21. IV. 1964, ♀ on *Salix* L.; 14. V. 1964 ♀♀ on *Vaccinium myrtillus* L.; 26. VII. 1962, ♀ on *Lotus corniculatus* L.; 8. and 9. VIII. 1962, ♀♀ on *Centaurea* L.

III. Markowe Szczawiny Niżne 8. V. 1964, ♀.

IV. Izdebczyska 29. V. 1964, ♀ on *Salix silesiaca* L.

V. Diablak 2. VIII. 1962, ♀♀ on *Vaccinium vitis-idea* L.; 5. VI. 1963, ♀.

2. *A. lucorum* (LINNAEUS)

I., Ia. In valleys of streams and on slopes in first decade of April ♀♀, ♀♀ by the end of May, ♂♂ in last decade of June. Active live till mid-October.

II., IIa. In not dense forests, on glades at sides of ways and forest clearings; females from mid-April, ♀♀ from beginning of June; males from beginning of July.

III. Markowe Szczawiny 27. VI. 1963, ♀ on *Geranium* L. — above Markowe Szczawiny 4. VI. 1963, ♀♀ on *Vaccinium myrtillus* L. — Sokolica 5. VI. 1963, ♀ on *Vaccinium myrtillus* L.; 2. VIII. 1962, ♀♀ on *Vaccinium myrtillus* L. and *Vaccinium vitis-idea* L.

IV. Females by the end of May, ♀♀ by the end of June, males by the end of second decade of September visiting *Salix silesiaca* L., *Vaccinium myrtillus* L., *Vaccinium vitis-idea* L., *Adenostyles alliariae* KERN., *Mulgedium alpinum* LESS. and *Gentiana asclepisdea* L. Active life finishes in mid-September.

IVa. Slopes of Diablak 20. VII. 1960, ♀♀ (leg. J. PAWŁOWSKI).

V. Diablak 5. VI. 1963, ♀♀ on *Sempervivum montanum* L.

3. *B. lapidarius* (LINNAEUS)

Babia Góra, J. KISS and K. OLASZ (1907).

I. In all the terrain from mid-April (♀♀), ♀♀ by the end of May, ♂♂ in the first decade of July. On glades, near ways and forest clearings; females from the end of April; workers from the beginning of June; males at the beginning of July. The species visits *Hieracium* L. and *Gentiana asclepiadea* L.

Ia. Zubrzyca Górna 6. VIII. 1962, ♀♀ on *Trifolium* L. — Lipnica Mała 22. IV. 1964, ♀ on *Crocus scepusiensis* Borb. — the border of the forest near Lipnica Mała 8. VIII. 1962, ♀.

IIa. On glades, forest clearings and by the forest ways. Females from the end of April, workers from the beginning of June and males at the beginning of July. They visit *Crocus scepusiensis* Borb., *Salix* L., *Vaccinium myrtillus* L., *Lotus corniculatus* L., *Trifolium* L., and *Cirsium* L.

III. Sokolica 5. VI. 1963, ♀ on *Vaccinium myrtillus* L.

IV. Sokolica 2. VIII. 1962, ♀ on *Vaccinium vitis-idea* L.

4. *B. pratorum* (Linnaeus)

I., Ia. Females in the first decade of April; workers in May; males at the beginning of July.

II. In not dense forests, near ways glades and forest clearings. Females from the end of April; workers in May; males in the end of first decade of July on *Salix* L., *Dentaria glandulosa* W. K., *Pulmonaria officinalis* L. *Crocus scepusiensis* Borb., *Vaccinium myrtillus* L., *Rubus idaeus* L.

IIa. Females by the end of second decade of April; workers by the end of second decade of May; males from the beginning of July.

III. Females from mid-May; workers in June; males in first decade of July visiting *Salix* L., *Lonicera* L., *Vaccinium myrtillus* L., and plants of rocks.

IV. Females by the end of May; workers by the end of June; males by the end of second decade of July visiting *Salix silesiaca* L., *Vaccinium myrtillus* L., *Vaccinium vitis-idea* L., and plants of rocks.

IVa. Slopes of Diablak 1 and 2. VIII. 1962, ♀♀ on *Vaccinium myrtillus* L. and *Vaccinium vitis-idea* L.

V. Diablak 1 and 2. VIII. 1962, ♀♀ on *Vaccinium vitis-idea* L. and *Sempervivum montanum* L.

5. *B. jonellus* (Kirby)

Ia. Zubrzyca Górna 6. VIII. 1962, ♀♀ on *Trifolium* L. — border of the forest near Lipnica Mała 8. VIII. 1962, ♀ on *Rubus* L.

II. Sredni Bór 18. V. 1964, ♀ on *Vaccinium myrtillus* L. — Czarna Cyrhla 19. VI. 1963, ♀ on *Potentilla erecta* (L.).

IIa. Gubernasówka 9. VIII. 1962, ♀ on *Centaurea* L. — Surroundings of Gubernasówka 28. VII. 1962, ♀ on *Rubus idaeus* L.; 4. VIII. 1962, ♀.

IIIa. Above the limit of National Park near the tourist path 4. VI. 1963, ♀ on *Vaccinium myrtillus* L.

IV. Sokolica 2. VIII. 1962, ♀♀ on *Vaccinium myrtillus* L. and *Vaccinium vitis-idea* L.

IVa. Diablak 1. VIII. 1962, ♀ on *Vaccinium vitis-idea* L.

V. Diablak 1. VIII. 1962, ♀ on *Vaccinium vitis-idea* L.

6. *B. pyrenaeus* Pérez

I., Ia. At the beginning of May; workers at the beginning of June; males in the first half of July. The specimens have been collected in forest and near them to the distance of one kilometer.

II., IIa. In not dense forests, near borders of ways, on glades and forest clearings. Females in first decade of May, workers at the beginning of June; males from mid-July.

III. Sokolica 5. VI. 1963, ♀ on *Vaccinium myrtillus* L. — Markowe Szczawiny 29. V. 1964, ♀♀ on *Salix* L.; 27. VI. 1963, ♀♀ ♂ on *Geranium silvaticum* L. and *Rumex alpinus* L.; 21. VII. 1962, ♀♀ on *Geranium silvaticum* L. and *Lonicera* L.; — Hala Mędralowa 10. VIII. 1962, ♂ — Cyl 31. V. 1963, ♀ on *Vaccinium myrtillus* L.; 27. VI. 1963, ♀ ♂.

IIIa. Above the Park limit 4. VI. 1963, ♀ on *Vaccinium myrtillus* L.

IV. Sokolice 5. VI. 1963, ♀♀ ♀♀ on *Vaccinium myrtillus* L.; 2. VIII. 1962, ♀♀ ♀♀ ♂♂ on *Vaccinium myrtillus* L. — Kościółki 19. V. 1960, ♀ (leg. J. Pawłowski); 5. VI. 1963, ♀ on *Vaccinium myrtillus* L.; 7. VI. 1963, ♀♀ on *Salix silesiaca* L., *Geranium* L. and *Rhodiola*

rosea L.; 21. VII. 1962, ♀ ♀♀ on *Vaccinium vitis-idea* L.; 11. IX. 1962, ♀♀ ♀♀ ♂♂ on *Adenostyles alliariae* KERN. — Diablak 29. V. 1964, ♀♀ on *Salix silesiaca* L.; 2. VIII. 1962, ♀ ♂♂ on *Vaccinium myrtillus* L. and *Vaccinium vitis-idea* L.

IVa. Diablak 20. VII. 1960, ♀♀ ♂ (leg. J. PAWŁOWSKI); 4. VII. 1963, ♂♂ on *Rubus* L.

V. Diablak 5. VI. 1963, ♀♀ on *Rhodiola rosea* L.; 1 and 2. VIII. 1962, ♀♀ ♀♀ ♂♂ on *Vaccinium vitis-idea* L. and *Polygonum* L.

7. *B. hypnorum* (LINNAEUS)

II. Near Dolny Płaj 18. V. 1964, ♀ — Czarna Cyrhla 19. VI. 1963, ♀♀ on *Hieracium* L.

IIa. Krowiarki 19. IV. 1964, ♀ on *Crocus scepusiensis* BORB. — Hala Śmietanowa 3. VII. 1963, ♀ — surroundings of Gubernasówka 30. VII. 1962, ♀ on *Rubus* L.; 8 and 9. VIII. 1962, ♀ ♂ on *Rubus* L. and *Cirsium* L. — Gubernasówka 26. VII. 1962, ♀♀ on *Trifolium* L.; 3. VIII. 1962, ♀.

III. Sokolica 5. VI. 1963, ♀ on *Vaccinium myrtillus* L.

IV. Sokolica 2. VIII. 1962, ♀♀ on *Vaccinium myrtillus* L. and *Vaccinium vitis-idea* L. — Kościółki 21. VIII. 1962, ♀ on *Vaccinium vitis-idea* L. — Izdebczyska 27. VI. 1963, ♀ on *Vaccinium myrtillus* L.

8. *B. mastrucatus* GERSTAECKER

Babia Góra J. KISS and OLASZ (1907)

I. Barańcowa 12. V. 1962, ♀ on *Taraxacum officinale* WEB.; 17. V. 1964, ♀ on *Vaccinium myrtillus* L.

II. Sulowa Cyrhla 5. VI. 1963, ♀♀ on *Vaccinium myrtillus* L. — Dolny Płaj 30. IV. 1963, ♀ — Czarna Cyrhla 24. VII. 1962, ♀ — Hala Czarnego 9. IX. 1962, ♀.

IIa. Hala Śmietanowa 27. VII. 1962, ♀ ♀♀ on *Lotus corniculatus* L. and *Cirsium* L. — Gubernasówka 22. IV. 1964, ♀; 14. V. 1964, ♀♀ on *Vaccinium myrtillus* L.; 11. V. 1962, ♀ on *Vaccinium myrtillus* L.; 6 and 7. VI. 1963, ♀ ♀; 26 and 27. VII. 1962, ♀♀ on *Trifolium* L. 2 and 31. VII. 1963, ♀♀; 9. VIII. 1962, ♀ on *Centaurea* L. — surroundings of Gubernasówka 28. VII. 1962, ♀ on *Trifolium* L.; 1, 2 and 9. VIII. 1962, ♀♀ on *Rubus* L. — Kiczora 30. VII. 1962 ♀ ♀♀.

III. Markowe Szczawiny 27. VI. 1963, ♀ on *Geranium* L.

IV. Sokolica 2. VIII. 1962, ♀♀ on *Vaccinium myrtillus* L.

9. *B. soroeensis soroeensis* (FABRICIUS)

Babia Góra, J. KISS and K. OLASZ (1907).

Babia Góra 4. VII. 1895, ♀♀ leg. S. STOBIECKI.

IIa. Hala Śmietanowa 27. VII. 1962, ♀♀ on *Lotus corniculatus* L. — Gubernasówka 14. V. 1964, ♀ on *Vaccinium myrtillus* L.; 26, 27 and 28. VII. 1962, ♀♀ on *Trifolium* L.; 9. VIII. 1962, ♀♀ on *Centaurea* L. — above Gubernasówka 28. VII. 1962, ♀♀ on *Rubus* L.; 9. VIII. 1962, ♀ — Forest clearing 30. VII. 1962, ♀ on *Rubus* L.; 8. VIII. 1962, ♀♀ on *Cirsium* L.

IIIa. Above Park limit 20. V. 1964, ♀♀ on *Vaccinium myrtillus* L.; 4. VI. 1963, ♀ on *Vaccinium myrtillus* L. — at the timber line 30. V. 1964, ♀ on *Vaccinium myrtillus* L.

9a. *B. soroeensis proteus* GERSTAECKER

Ia. Zubrzyca Górna 5. VII. 1963, ♀♀.

IIa. Gubernasówka 27. VII. 1962, ♀; 9. VIII. 1962, ♀♀ on *Centaurea* L. — Forest clearing 4. VIII. 1962, ♂.

10. *B. hortorum* (LINNAEUS)

I. Zawoja Wilczna 20. VII. 1962, ♀ — Barańcowa 23. IV. 1963, ♀ on *Primula elatior* (L.); 25. VI. 1963, ♀ — Ryzowana 19. IV. 1964, ♀ on *Primula elatior* (L.) — Markowe Równienki 9. IX. 1962, ♀♀ on *Gentiana asclepiadea* L.

Ia. Zubrzyca Górna 6. VIII. 1962, ♀♀ on *Trifolium* L. — The border of the forest near Lipnica Mała 8. VIII. 1962 ♀.

II. Cyl 31. V. 1963, ♀ on *Vaccinium myrtillus* L.
IIa. Gubernasówka 6. VI. 1963, ♀; 26 and 31. VII. 1962, ♀♀ on *Lotus corniculatus* L.; 8. VIII. 1962, ♀ — the way from Gubernasówka to Przywarówka 1. VII. 1962, ♂; 9. VIII. 1962, ♂♂ on *Rubus* L. — Forest clearing 30. VII. 1962, ♀ on *Rubus* L. — Kiczora 30. VII. 1962, ♀♀ on *Trifolium* L.

11. ***B. subterraneus*** (LINNAEUS)

II. Hala Czarnego 12. VIII. 1962, ♂.
IIa. Gubernasówka 8 and 9. VIII. 1962, ♂♂ on *Centaurea* L. — Park limit 28. VII. 1963, ♂.
III. Hala Mędralowa 10. VIII. 1962, ♂ on *Doronicum austriacum* JACQ.
IV. Kościółki 5. VI. 1964, ♀ on *Salix silesiaca* L.; 11. IX. 1962, ♂♂ on *Adenostyles alliariae* KERN. — Sokolica 2. VIII. 1962, ♂ on *Vaccinium myrtillus* L.

12. ***B. distinquendus*** MORAWITZ

Ia. Zubrzyca Górna 6. VIII. 1962, ♀.
IIa. Gubernasówka 9. VIII. 1962, ♂ on *Centaurea* L.

13. ***B. elegans*** SEIDL

Babia Góra J. KISS and K. OLASZ (1907)

14. ***B. agrorum*** (FABRICIUS)

Babia Góra J. KISS and K. OLASZ (1907)
I., Ia. In valleys of streams and on slopes; females in mid-April; ♀♀ by the end of May, ♂♂ in first half of July visiting *Petasites albus* (L.), *Salix* L., *Crocus scepusiensis* BORB., *Primula elatior* (L.), *Vaccinium myrtillus* L., *Rubus idaeus* L. and etc.
II., IIa. In not dense forest, near ways, on glades and forest clearings; females in second half of April; ♀♀ by the end of June; ♂♂ in mid-July visiting *Hieracium* L., *Trifolium* L., *Lotus corniculatus* L., *Dentaria glandulosa* W. K., *Cirsium* L. etc.
III. Markowe Szczawiny 21. VII. 1962, ♀ on *Geranium* L.
IV. Izdebczyska 21. VII. 1962, ♀♀ on *Vaccinium vitis-idea* L. — Sokolica 2. VIII. 1962, ♀ on *Vaccinium myrtillus* L.

15. ***B. muscorum*** (LINNAEUS)

Babia Góra J. KISS and K. OLASZ (1907)

16. ***B. silvarum*** (LINNAEUS)

I. Barańcowa 23. IV. 1963, ♀ on *Primula elatior* (L.); 22. VII. 1962, ♀.
Ia. Zubrzyca Górna 17. V. 1964, ♀.
IIa. Gubernasówka 8. VIII. 1962, ♀♀ on *Centaurea* L.

17. ***B. equestris*** (FABRICIUS)

I. Markowa 31. V. 1963, ♀ on *Taraxacum officinale* WEB.
Ia. Zubrzyca Górna 6. VIII. 1962, ♀ ♀♀; 29. VII. 1962, ♀ on *Trifolium* L.
IIa. Gubernasówka 14. VII. 1962, ♀♀ ♀♀ ♂♂ in nests; 26. VII. 1962, ♀♀ on *Lotus corniculatus* L. and *Trifolium* L.; 8. VIII. 1962, ♀ — Hala Śmietanowa 27. VII. 1962, ♀ on *Lotus corniculatus* L.

18. ***B. ruderarius*** (MÜLLER)

Southern slope of Babia Góra 4. VII. 1895, ♀ leg. S. STOBIECKI.
I. Zawoja Wilczna 20. VII. 1962, ♀ — Palechówka 29. V. 1963, ♀; 3. VI. 1963, ♀ on *Taraxacum officinale* WEB.; 20, 23 and 25. VII. 1962, ♀♀ ♀♀ on *Vicia* L. — Barańcowa 12. V. 1962, ♀ on *Taraxacum officinale* WEB.; 1. VII. 1963, ♀ on *Trifolium* L.; 22. VII. 1962, ♀♀ — Ryzowana 20. VIII. 1962, ♀ ♀ on *Trifolium* L.
Ia. Zubrzyca Górna 5. VII. 1963, ♀; 29. VII. 1962, ♀; 6. VIII. 1962, ♀♀ on *Trifolium* L. — the border of forest near Lipnica Mała 8. VIII. 1962, ♀♀.

II. Hala Czarnego 10. IX. 1962, ♂.
IIa. Hala Śmietanowa Zubrzycka 21. V. 1964, ♀♀ on *Salix* L.; Hala Śmietanowa 27. VII. 1962, ♀♀ on *Trifolium* L.; Hala Kralowa 4. VII. 1963, ♀ — Gubernasówka 6. VI. 1963, ♀♀; 26. VII. 1962, ♀♀ on *Trifolium* L. and *Lotus corniculatus* L.; 8 and 9. VIII. 1962, ♀ ♀♀ ♂♂ on *Centaurea* L. — Kiczora 30. VII. 1962, ♀♀ on *Trifolium* L.

B. laesus Mor. was mistakely reported by the present author (1958) from Babia Góra on basis of S. Stobiecki's collection.

Genus: *Psithyrus* Lepeletier

1. *P. rupestris* (Fabricius)

Babia Góra J. Kiss and K. Olasz (1907).
I. Markowa 10. IX. 1962, ♂♂.
IIIa. Above the Park limit 28. IV. 1959, ♀ (leg. J. Pawłowski).
IV. Kościółki 11. IX. 1962, ♂♂ on *Adenostyles alliariae* Kern.

2. *P. campestris* (Pantzer)

I. Barańcowa 14. VI. 1963, ♀ — Ryzowana 20. VIII. 1962, ♀ — Fickówka 20. VII. 1962, ♀.
IIa. Gubernasówka 6. VI. 1963, ♀.

3. *P. barbutellus* (Kirby)

Babia Góra J. Kiss and K. Olasz (1907).
I. Zawoja Wilczna 25. VI. 1963, ♀.
II. Czarna Cyrhla 31. V. 1963, ♀ on *Taraxacum officinalis* Web.
IIa. Hala Śmietanowa 27. VII. 1962, ♀♀ on *Trifolium* L. — Forest clearing 8. VIII. 1962, ♀ on *Cirsium* L.
IV. Kościółki 11. IX. 1962, ♂.

4. *P. bohemicus* (Seidl)

I. Markowe Równienki 21. VII. 1962 ♀ on *Rubus idaeus* L. — Markowa 31. V. 1963, ♀♀ on *Taraxacum officinale* Web.
II. Dolny Płaj 18. V. 1964 ♀ — Czarna Cyrhla 24. VII. 1962, ♀ on *Hieracium* L.
IIa. Gubernasówka 14. V. 1964, ♀ on *Vaccinium myrtillus* L.; 6. VI. 1963, ♀; 26. VII. 1962, ♀ on *Lotus corniculatus* L.; 9. VIII. 1962 ♀ ♂♂ on *Centaurea* L. — The way from Gubernasówka to Przywarówka 20. V. 1964, ♀♀; Forest clearing 8. VIII. 1962, ♂ on *Cirsium* L. — Droga Partyzantów, 1. VIII. 1962, ♀ — Hala Śmietanowa 27. VII. 1962, ♀♀ on *Cirsium* L.

5. *P. silvestris* (Lepeletier)

I. Markowa 31. V. 1963, ♀ on *Taraxacum officinale* Web. — Markowe Równienki 4. VI. 1963, ♀.
II. Dolny Płaj 18. V. 1964, ♀ on *Vaccinium myrtillus* L.
IIa. Gubernasówka 7. VI. 1962, ♀ — above Gubernasówka 31. V. 1963, ♀.

Genus: *Apis* Linnaeus

1. *A. mellifica* Linnaeus

In the all floristic zones; at the top of Diablak and in the regio mugheti in July and August on *Vaccinium myrtillus* L. and *V. vitis-idaea* L. These are most probably the examples flown from the apiaries of the foot parts, as no beehive has been found in the mountain forest zones till now.

III. VERTICAL DISTRIBUTION OF THE *APOIDEA* ON BABIA GÓRA

One hundred six species of the *Apoidea* were collected during three years of my research in the Babia Góra. Another species new to this terrain has been found in the collection of S. STOBIECKI, namely *Halictus leucozonius* (SCHRANK). Of nine species of bumble-bees and two species of *Psithyrus* LEP. recorded from Babia Góra by KISS OLASZ, only two species e. g. *Bombus elegans* SEIDL and *B. muscorum* (L.) have not been found by the present author. *Andrena chrysosceles* KIRBY has been collected by PAWŁOWSKI. The total number of the *Apoidea* of the Babia Góra is 110 species. The table included below shows a list of the families and the numbers of the species belonging in these known from Babia Góra.

Colletidae 6 — *Melittidae* 1
Andrenidae 26 — *Megachilidae* 18
Halictidae 19 — *Apidae* 40

In the table No. IV the species belonging in the families cited above in particular floristic regions (I—V) according to the scheme adopted in the chapter entitled „List of the species", is shown.

Table IV

Floristic region	*Colletidae*	*Andrenidae*	*Halictidae*	*Melittidae*	*Megachilidae*	*Apidae*	Totally
I	6	24+2	16+3	1	16+2	37+3	110
II	3	19+2	13	—	6	30+1	74
III	—	8+2	1	—	—	15	26
IV	—	5	—	—	—	13	18
V	—	1	—	—	—	6	7

First figure given in this table (IV) shows the number of the species collected by the author in the floristic region, the second one separated with mark + shows the number of the species, which most probably are living in this region, but which have not been collected. Ten species known from some lower places in the Carpathians and collected in small numbers (one to several specimens) have not been found in the foot region. They are: *Andrena minutuloides* PERK., *A. ovatula* (K.), *Halictus rubicundus* (CHRIST), *H. xanthopus* (K.), *H. leucozonius* (SCHRANK), *Osmia parietina* CURT. and *Eucera tuberculata* (F.).

Moreover, *Megachile lapponica* THOMS. found in the lower part of the southern slopes can be found also in the foot region. *Nomada glabella* THOMS. a parasite of *Andrena lapponica* ZETT. is most probably in this region, as its host species has been recorded from there. *Bombus subterraneus* (L.) and *B. hypnorum* (L.) are distributed throughout the Carpathians and therefore they should be found in the foot region of the Babia Góra. Totally 110 species in foot area.

In the regio montana inferior (II), and so in the proper massif of the Babia Góra the number of the species recorded decreses to 71. To this amount *Andrena*

tibialis (K.) and *A. pubescens baltica* ALFKEN must be added, however, the two species have been recorded from the foot region and in the lower part of dwarf pine zone (IV) as well as *Psithyrus rupestris* (F.) collected in regions I, III and IV. Therefore the number of the species in the regio montana inferior reaches 74. In the regio montana superior the number of the species decreases to 26 and the family under the consideration is represented mainly by the species of the *Andrenidae* (10) and *Apidae* (15). The upper limit of the forest is passed through by 18 species. Seven of those reaches the alpine region.

In the foot region of the Babia Góra lives seemingly 6 species of the family *Colletidae*. In the regio montana inferior, in its lower part (about 900 m above sea level), in the area of cultivated meadows three species of this family are recorded. They are only the representatives of the genus *Prosopis* JUR.: *P. confusa* (NYL.), *P. communis* (NYL.) and *P. hyalinata* (SMITH). Those species enter in the massif of the Babia Góra only its southern slopes. Remaining species have been recorded on the both sides of foot region (*Colletes cunicularis* (L.) or only at the northern side [*Prosopis sinuata* SCHRANK and *P. difformis* (NYL.)].

Only five species of the *Andrenidae* recorded from the foot region have not been found in the Babia Góra, they are: *Andrena ruficrus* (NYL.) *A. minutula* (K.), *A. chrysosceles* (K.), *A. jacobi* PERK., *A. hattorfiana* (F.).

First species of the list given above has been recorded from the cultivated fields on the southern slopes. Three further species have been collected in small amounts (one to several specimens) in the northern part of the foot region. *Andrena hattorfiana* (F.) lives in this terrain on the both slopes of the massif in the cultivated area. At the northern side it reaches the top Ryzowana (about 900 m a. s. l.), at the southern side it reaches about 750 m a. s. l. In the regio montana inferior lives probably 21 species of the *Andrenidae*. Some of them have been collected flying to the lower limit of the cultivated meadows at the both slopes, and so: *Andrena fulvago* (CHRIST.), *A. humilis* IMH., *A. clarkella* (K.), *A. alfkenella* PERK. and *A. coitana* (K.). The species *Andrena albofasciata* THOMS. (1♂) and *Panurgus banksianus* K. have been collected on the southern slopes to the lower limit of the cultivated meadows (900 m a. s. l.). *Andrena minutuloides* PERK. is recorded from a single female collected at Czarna Cyrhla (cultivated meadow at the altitude of about 850 m a. s. l.) on the northern slope. Three species, namely *Andrena ovatula* (K.) *A. saundersella* PERK. and *A. subopaca* NYL. reach the upper part of cultivated meadows at the coombs (1100 m a. s. l.). First of these species has been collected at the northern slope, the two remaining ones in the both sides of the Babia Góra. *Andrena bicolor* F. have been found in the regio montana inferior on the both slopes and in the fields of the regio montana superior at the northern slope.

Five species pass through the limit of the forest. They are: *Andrena pubescens baltica* ALFKEN, *A. tibialis* (K.), *A. haemorrhoa* (FABR.), *A. apicata* SMITH, and *A. lapponica* ZETT. Two first species listed above are recorded from above the limit of the forest but only at the northern slopes. The particular data dealing with those species are given before. *Andrena haemorrhoa* (F.) lives to the cultivated meadows

of the southern slopes, while at the northern slopes it have been collected in all the regions to loose splits of the dwarf mountain pine. *Andrena apicata* SMITH is known from the regio montana inferior from the southern slopes from only few examples. Either in the foot region of these slopes it has not been recorded. On the other hand it has been collected in first four regions to loose splits of the dwarf mountain pine on the northern slopes. Only *Andrena lapponica* ZETT. has been collected in the whole mughetum region on the both slopes and also at the top of Diablak. *Panurgus banksianus* (K). has been found in the fourth region on the southern slopes, but this is probably an accidental case.

Halictidae are represented in the foot part most probably by 19 species. Six of these have not been recorded from the massif of Babia Góra. They are: *Halictus quadricinctus* (F.) *H. rubicundus* (CHRIST), *H. continentalis* BLÜTHGEN *Halictoides dentiventris* (NYL.), *Rhophites quinquespinosus* SPIN. and *Sphecodes punctipes* THOMS.

First of these species have been collected in singular specimens on the northern side, *Halictus continentalis* BLÜTHGEN reaches simingly a limit of its vertical distribution also in the foot region. It has been collected at the altitude of 650 m a. s. l. but only at the northern slope. *Halictoides dentriventris* (NYL.) appears in the cultivated regions of the both sides of Babia Góra. *Halictidus rubicundus* (CHRIST) and *Rhophites quinquespinosus* SPIN. are only recorded from Lipnica Mała, the village situated at the southern foot area. The last of the species mentioned above has been collected only at the northern foot region, but its host species *Halictus villosulus* (K.) and, however, rarely *H. fulvicornis* (K.) and *H. minutus* (K.) enter the Babia Góra area.

The representatives of the family *Halictidae* live rather only in the regio montana inferior of the Babia Góra. Only *Halictus niger* VIER. reaches the lower part of the regio montana superior (found in northern slopes). The upper parts of the cultivated meadows reaches following species: *Halictus fulvicornis* (K.), *H. calceatus* (SCOP.) and *H. albipes* (F.). *Halictus tumulorum* (L.) is recorded in lower part of the cultivated meadows on the both slopes, and moreover, from Hala Kralowa (1150 m a. s. l.) on the southern slopes. The remaining species have been collected in lower parts of the regio montana inferior: *Halictus leucozonius* (SCHRANK) (1 ♀) at northern slope, *H. xanthopus* (K.) at the southern slope (clearing in a wood at the altitude of 850 m a. s. l.). The following species reach the lower parts of the cultivated meadows on the southern slopes only: *Halictus villosulus* (K.), *H. minutus* (K.), *Dufourea vulgaris* SCHENCK and *Sphecodes hyalinatus* HAG. *Halictus leucopus* (K.) occurs in the Babia Góra most probably to the lower parts of the cultivated meadows on the both sides. *Halictus rufitarsis* ZETT. is recorded only from the foot parts of the northern slopes and from Sulowa Cyrhla at the altitude of about 900 m a. s. l.

Melitta haemorrhoidalis (F.) the only representative of the family *Melittidae* in this terrain has been found only at the northern foot region.

Megachilidae are represented probably by 18 species in the foot region of the Babia Góra. The majority of these species have been collected in singular

specimens (one or several specimens). More common are the following species: *Chelostoma florisomne* (L.), *Ch. nigricorne* NYL., *Osmia rufa* (L.), *O. adunca* (PZ.) and *O. villosa* (SCHENCK). The both species of the genus *Chelostoma* SPIN. and *Osmia rufa* (L.) have been recorded from the region of the cultivated fields at the both sides of the Babia Góra. Moreover, they have been collected at Sulowa Cyrhla (900 m a. s. l., northern slope). The specimens of *Chelostoma florisomne* (L.) have been realised at the same place during great swarming of the males, while the remaining species have been collected in the sinuglar specimens, also at that place. *Osmia adunca* (PZ.) lives in the region of cultivated fields at the both slopes in the foot regions, and *Osmia villosa* (SCHENCK) in the northern foot area only. The following species are bound to the northern foot region: *Stelis pheoptera* (K.), *S. minuta* LEP.-SERV., *Chelostoma maxillosum* (L.), *Osmia fulviventris* (PZ.), *O. leaiana* (K.), *O. bicolor* (SCHRANK). *O. leucomelaena* (K.) and *Megachile ericetorum* LEP. At the cultivated fields on the both slopes lives *Megachile wiloughbiella* (K.) and *Coelioxys rufescens* LEP. (1 ♂) lives only at the southern slope. Three remaining species enter into the massif of Babia Góra. So, *Osmia parietina* CURT. has been found in the cultivated meadow (at 900 m a. s. l.) on the southern slope, *Megachile lapponica* THOMS. in the lowest parts of the massif in the southern slope and *Osmia coerulescens* (L.) found in the area of cultivated field in the southern slope and in the northern slope in the cultivated meadow (900 m a. s. l.).

Apidae is the most numerous family (40 species), and enter the foot region of the Babia Góra with 32 species. The following species have been found in singular examples. In the foot region in the cultivated fields of the northern slopes only: *Nomada sexfasciata* P., *N. ferruginata* (L.), *Thyreus orbatus* LEP. and *Ceratina cyanea* (K.).

Anthophora plagiata ILL. and *Clisodon furcatus* PZ. have been found only in the southern slopes in the cultivated field in one or two examples.

Antophora acervorum (L.) and *Anthophora quadrimaculata* (P.) have been realised as more common species in the both slopes than the two species mentioned before.

Of remaining species of this family live in the regio montana inferior 7 species of the genus *Nomada* SCOP., *Eucera tuberculata* (F.) (collected on the northern slope in the cultivated meadow at about 850 m a. s. l.), most probably 18 species of bumle-bees, 5 species of the genus *Psithyrus* LEP. and *Apis mellifica* L. (in cultivated meadows). *Nomada hillana* (K.), *N. flava* PZ., and *N. fabriciana* (L.) finish their vertical reaches in the regio montana inferior. It is worth adding that the two first species have been collected on the both slopes, while latter species on the southern slopes only.

In the regio montana superior but only on the northern slopes are flying the following species: *Nomada glabella* THOMS., *N. leucophtalma* (K.), *N. bifida* THOMS., *N. flavoguttata* (K.).

Only one species of the genus *Nomada* SCOP. occurs above the timber line on Babia Góra Mountain; it is *N. glabella* THOMS., a parasite of *Andrena*

lapponica ZETT. It was found on both slopes in the dense montain dwarf pine area.

All species of the genera *Bombus* LATR. and *Psithyrus* LEP. recorded from Babia Góra live most probably in the foot region. *Bombus pyrenaeus* PÉR. has been collected in the areas of the cultivated fields but only near the forest to one kilometre from them.

Bombus hortorum (L.), *B. ruderarius* (MÜLL.) and *Psithyrus bohemicus* (SEIDL) flies to the upper parts of the fields of the regio montana inferior on the both slopes.

The following species occur only on the southern slopes in the lower parts of the cultivated meadows: *Bombus silvarum* (L.) *B. aquestris* (F.) and *Psithyrus campestris* (PZ.).

Bombus soroeensis (F.) has been only collected in the southern slopes in regio montana inferior in several places to the forest's limit and *Bombus soroeensis soroeensis* (F). in the foot region in the lover parts on the regio montana inferior.

The remaining species belonging to these genera are passing the forest's limit. The list of the species the vertical distribution of which finishes in the dwarf mountain pine is as follows: *Bombus lapidarius* (L.), *B. hypnorum* (L.), *B. mastrucatus* GERST., *B, subterranaeus* (L.), *B. agrorum* (F.), *Psithyrus rupestris* (F.), *P. barbutellus* (K.). These species have been realised on the northern side. In the top area of Sokolica (regio alpina) the following species have been found: *Bombus terrestris* (L.), *B. lucorum* (L.), *B. jonellus* (K.), *B. pyrenaeus* PÉR., *B. pratorum* (L.). *Apis mellifica* L. reaches even the top of Diablak, most probably from the apiaries situated in the cultivated fields on the both slopes.

From the above discussed vertical distribution of the *Apoidea* in the Babia Góra we judge that there are several faunistic limits in this terrain. These are:

1. cultivated area
2. lover part of cultivated meadows of the regio montana inferior (800—900 m a. s. l.)
3. upper part of cultivated meadows and meadows in the regio montana inferior (1100 m a. s. l.)
4. small and large glades, by-ways in upper parts of the regio montana superior
5. small and large glades and by-ways of the upper parts of the regio montana superior
6. dense dwarf mountains pine area
7. the top.

The fig. 2 points out the number of the species of the *Apoidea* reaching particular, mentioned above faunistic limits. At x-axle of this graph the particular limits are given (1—7), and at y-axle the number of the species is given. This curve resembles the curve of NOSKIEWICZ (fig. 3) done in the same way for the *Aculeata* of the Polish Tatra Mountains (1920). On basis of his graph NOSKIEWICZ stated that the main faunistic limit in Tatra Mountains is between

upper part of cultivated areas and the lowest part of the regio montana inferior. The results of the investigations in the Babia Góra agree with those of NOSKIEWICZ and more accurately collected material allows the exacte designation of the faunistic limits for the *Apoidea* of the Babia Góra. It can be seen from the outline No. 1 that it is necessary to accept three main limits. These are:

1. The limit of the cultivated field area (36 species and about 33% of the fauna of the Babia Góra finish their vertical distribution).

2. The meadows of the regio montana inferior, mainly these of its lower parts (39 species finish their vertical distribution; over 50%), and also its upper parts in which further 15% of the species is missing.

3. Dense dwarf mountain pine area, where there live 18 species; the region of lose areas of the dwarf mountain pine and coombs enter 7 species only (it lacks about 60%).

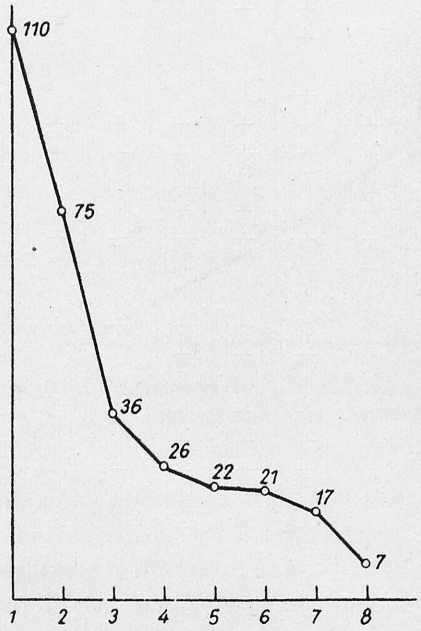


Fig. 2. Graph of the vertical distribution of the *Apoidea* on the Babia Góra

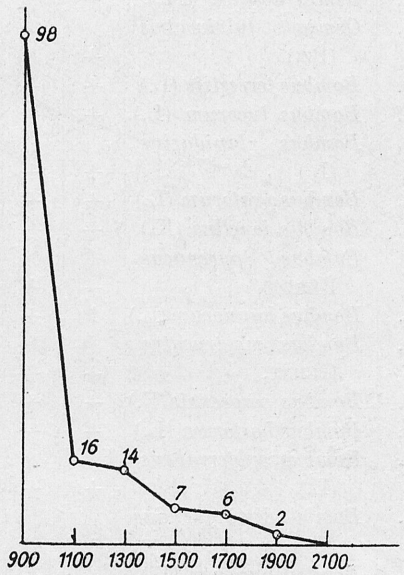


Fig. 3. Graph of the vertical distribution of the *Aculeata* of the Tatra Mts. after NOSKIEWICZ

The reaches of the vertical distribution of the species living in Babia Góra and Tatra Mts. are comparable for the genera *Bombus* LATR. *Psithyrus* LEP., and some species, chiefly belonging to the family *Megachilidae*, of which the vertical distributions are in the Tatra Mts. rather well worked out. The table V shows a comparison of the reaches of the vertical distribution of the species living of the Babia Góra and in the Tatra Mts. The numbers I—VI used in this table indicate the floristic regions, according to before accepted scheem (chapter II).

Table V

No.	Name	Babia Góra Mt.					Tatra Mts.					
		I	II	III	IV	V	I	II	III	IV	V	VI
1.	*Panurgus banksianus* (K.)	+	+				+					
2.	*Trachusa byssina* (Pz.)						+					
3.	*Chelostoma nigricorne* Nyl.	+	+					+				
4.	*Chelostoma florisomne* (L.)	+	+				+	+				
5.	*Chelostoma maxillosum* (L.)	+					+					
6.	*Osmia rufa* (L.)	+	+									
7.	*Osmia villosa* Schenck	+					+	+				
8.	*Osmia adunca* (Pz.)	+					+					
9.	*Osmia fulviventris* (Pz.)	+					+					
10.	*Bombus terrestris* (L.)	+	+	+	+	+	+	+	+	+	+	
11.	*Bombus lucorum* (L.)	+	+	+	+	+	+	+	+	+	+	
12.	*Bombus lapidarius* (L.)	+	+	+			+	+	+			
13.	*Bombus pratorum* (L.)	+	+	+	+	+	+	+	+	+	+	
14.	*Bombus jonellus* (K.)	+	+	+	+	+			+			
15.	*Bombus pyrenaeus* Pér.	+	+	+	+	+		+	+	+	+	+
16.	*Bombus hypnorum* (L.)	?	+	+	+		+	+	+			
17.	*Bombus mastrucatus* Gerst.	+	+	+	+		+	+	+	+		
18.	*Bombus soroeensis* (F.)	+	+	+			+	+	+			
19.	*Bombus hortorum* (L.)	+	+				+	+	+	+		
20.	*Bombus subterraneus* (L.)	+	+	+	+		+	+	+		+	
21.	*Bombus distinguendus* Mor.	+	+				+	?				
22.	*Bombus agrorum* (F.)	+	+	+	+		+	+	+			
23.	*Bombus silvarum* (L.)	+	+				+	+				
24.	*Bombus equestris* (F.)	+	+				+					
25.	*Bombus ruderarius* Müll.	+	+				+					
26.	*Psithyrus rupestris* (F.)	+	+	+	+		+	+				
27.	*Psithyrus campestris* (Pz.)	+	+				+	+	+			
28.	*Psithyrus barbutellus* (K.)	+	+		+		+	+				
29.	*Psithyrus bohemicus* (Seidl)	+	+				+	+	+	+		
30.	*Psithyrus silvestris* (Lep.)	+	+		+		+	+				

The table V clearly shows that the majority of the species of the genera *Bombus* LATR. and *Psithyrus* LEP. are distributed in the Tatra Mts. and on the Babia Góra on the same altitudes, except for *Bombus hypnorum* (L.), *B. agrorum* (F.), *Psithyrus rupestris* (F.), *P. barbutellus* (K.) and *P. silvestris* (LEP.). These species have been found in the Babia Góra even in the regio mugheti, while in Tatra Mts. in regio montana inferior and superior only. *Bombus pyrenaeus* PER. has not been recorded from foot parts of the Tatra Mts. *Psithyrus bohemicus* (SEIDL) has been collected on the Babia Góra in the regio montana inferior only, while in Tatra Mts. still in the regio mugheti.

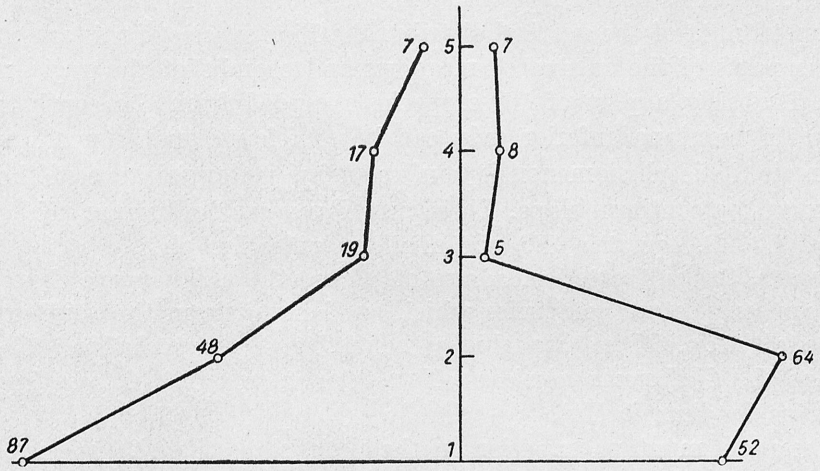


Fig. 4. Graph of the vertical distribution of the *Apoidea* on the southern slope (right side) and on the northern slope (left side) of the Babia Góra.

Bombus pyrenaeus PÉR. has a lower vertical reach in the Babia Góra, what can be explained by a lowering of floristic regions on the Babia Góra in the comparison with those in the Tatra Mts. The species of *Megachilidae* are distributed in the same floristic regions in the both mountains, except for *Osmia villosa* SCHENCK which can be observed in the Tatra Mts. still in the regio montana inferior, while in the Babia Góra it lives in the foot parts only. Moreover, *Trachusa byssina* (PZ.) has been found in the foot parts of the Tatra Mts., while this species has never been recorded from Babia Góra. *Panurgus banksianus* (K.) has been recorded from the Babia Góra from the regio montana inferior, while in Tatra Mts. from the foot parts.

However, the vertical limits of the distribution of the *Apoidea* on Babia Góra are not the same at its both slopes (fig. 4). The area of cultivated fields of the northern slopes is reacher in species (23) than the southern ones, however, in the southern slopes six species unkown from that regio in the northern foot area have been recorded. At the foot parts of the both slopes still six species have been recorded. These numbers deals with the species which in the foot

region finish their vertical reaches. Some of the species found in the northern foot region could be found in the area of cultivated fields of the southern slopes and also in the Nowotarska valley, but first of all the species recorded by NOSKIEWICZ (1920) from the northern slopes of Tatra Mts. These are: *Halictus quadricinctus* (F.), *Chelostoma maxillosum* (L.), *Osmia villosa* (SCHENCK) and *O. fulviventris* (PZ.).

A quite different phenomenon has been observed in the regio montana inferior on the cultivated meadows. So, 19 species enter only to lover parts of cultivated meadows of the southern slopes. On the northern slopes there are 9 species which have not been found in southern slopes. On the both slopes there are 17 species of the *Apoidea*, which in the regio montana inferior reach their upper limits of the vertical distribution. Five species of this amount reach the upper parts of the cultivated meadows and coombs of the regio montana inferior. Probably a part of these species recorded from the southern slopes of the regio montana inferior only can be still found in the northern slopes of this regio. This phenomenon is confirmed by the appearance of the species common on the southern slope. These are: *Panurgus banksianus* (K.), *Bombus silvarum* (L.), *B. equestris* (F.) and *Halictus villosulus* (K.).

However, the cultivated meadows of the northern slopes are characterized by the appearance of the species which are lacking from the southern slopes on same altitude. These are chiefly belonging to *Megachilidae*: *Chelostoma florisomne* (L.),*Chelostoma nigricorne* NYL., *Osmia rufa* (L.), *O. coerulescens* (L.) and *Eucera longicornis* (L.).

In the regio montana superior on the both slopes live 26 species. Of this amount only *Bombus soroeensis* F. has only been recorded from the southern slopes, while 6 species have been collected on the northern slope.

Seven species of genus *Bombus* LATR. known from the regio mugheti have not been recorded from the upper part of the southern slopes of the regio montana superior. Above the forest limit in dense dwarf mountain pine areas live the species of the genus *Andrena* F., *Nomada* SCOP. and *Psithyrus* LEP. only. Four species are recorded from the northern slopes of this regio, and moreover, 13 species which have been collected on the both slopes in dense dwarf mountain pine areas. Seven species of this amount have been collected in the top in the regio alpina. The diagram in fig. 4 show that inequal number of the species on the northern and southern slopes of the Babia Góra. At x-axle the number of the species which have been recorded from particular floristic regions is marked, counting them for the northern slopes to the left from x-axle and for the southern slopes to the right from it. The particular points on the y-axle indicate as follows:

1. The cultivated fields region
2. Regio montana inferior
3. Regio montana superior
4. Dense dwarf mounatain pine area
5. The top area.

This irregular distribution of the *Apoidea* in the Babia Góra is caused by the climate conditions and habitats. It also could be explained on the way of zoogeographic analisiz.

IV. PHENOLOGY

The *Apoidea* of the Babia Góra can be divided according to the time of their flight, into three groups, videlicet, vernal, late spring and summer species. To first group belong small number of the species which appear in first half of April, in the spring in the temperature meaning, when the maximal day temperature overpasses 8° C. In that time flower *Crocus scepusiensis* BORB. (PAWŁOWSKA, 1963), *Petasites albus* (L.), *Salix* L., and other plants. The remaining vernal species have been collected in second half of April, in the days in which the maximal temperature was 14·5° C. The species of second group have been observed from mid-May on *Rubus idaeus* L., *Potentilla erecta* (L.), *Taraxacum officinale* WEB., *Hieracium* L., *Campanula* L., *Geranium* L., etc. The species of the third group appear in this terrain in July and August, in the summer in the temperature meaning. These species visit *Knautia kitaibelli* BORB., *Hieracium* L., *Leontodon* L., *Campanula* L., the species of the *Papilionaceae*, etc.

All the mentioned groups are realized in the foot area and in regio montana inferior. In the regio montana superior the late spring species finish their altitudinal distribution. The plate VI shows a numeral and percental data of the above mentioned groups of species in the floristic regions.

Table VI

Floristic region	Vernal species		Late spring species		Summer species	
	number	%	number	%	number	%
Foot area	41	100	28	100	27	100
Regio montana inferior	32	78	15	54	7	26
Regio montana superior	22	54	3	10·7		
Regio mugheti	18	44				
Regio nivalis	7	17				

The distribution and times of the flight of the three mentioned groups are not the same on the northern and southern slopes. The data dealing with this problem are shown in fig 5. On axle x the floristic regions (with southern and northern slopes of the foot area and regio montana are respected) are indicated. On axle y the months from April to November are given. The transverse lines connect the points which designate the beginnings of spring, summer, autumn

and late autumn (all in the temperature meaning). The probable times of the beginnings of the year seasons (in temperature meaning) are designated, as there are no meteorological data from the northern slopes of the regio montana inferior. The lines connecting these pints are for the regio montana inferior interrupte to distinguish from the constant lines concerning remaining floristic regions. The period of active live of the *Apoidea* in particular floristic regions is enclosed among those lines.

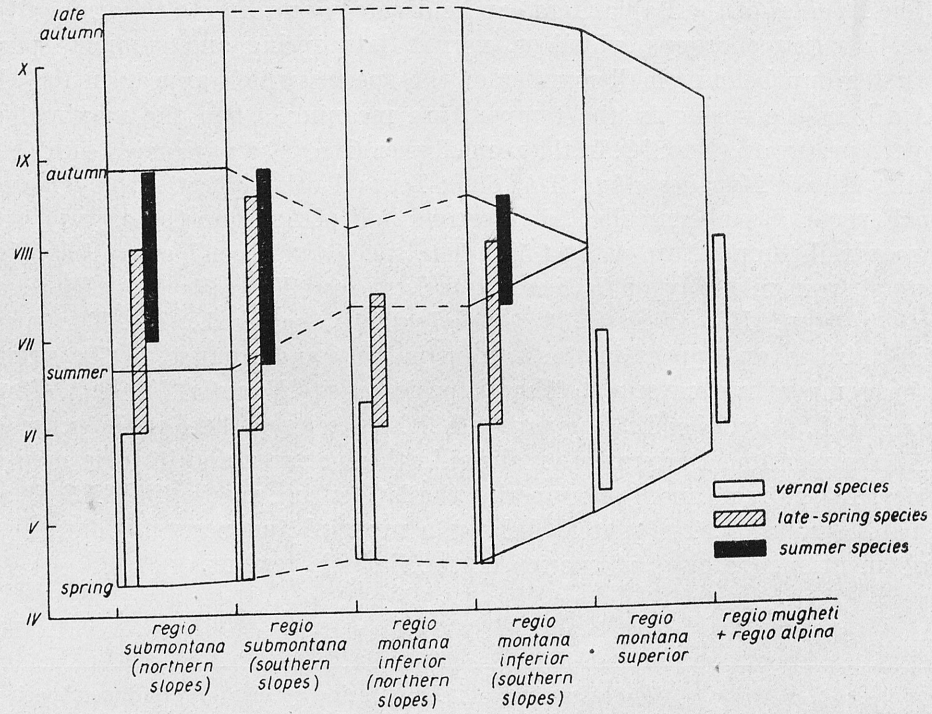


Fig. 5. Graph presenting the time of flight of the *Apoidea* on the Babia Góra.

It follows from the fig. 5, that in the foot area and in the regio montana inferior the appearing of the vernal species takes part in the beginning of the climatic spring and that mean delay of the appearing of the species is in the regio montana inferior 7 days. In the regio montana superior and in top area (regio mugheti and regio nivalis) the apidological spring begins 8 days later than the beginning of the climatic spring. The delay of the appearing of the vernal *Apoidea* in the regio montana superior in the ccmparison with foot area is four weeks, while in the top area it reaches 6 weeks. The end of active life of vernal *Apoidea* is between end of May in foot area and end of June in regio montana superior. It lasts about 50 days in the foot area and in both mountain forest zones, against 60 days in the top area. This prolongation of the flight time beyond the timber line is most probably caused by the climatic conditions in which the activity of those insects is limited to the warm sunny and not windy days or even hours.

The late spring species have been observed in the foot area and regio montana inferior in the beginning of June. On the northern slopes of the foot area and in the regio montana inferior on the southern slopes the time of their active life is 8 weeks, while on the southern slopes of the foot parts this period lasts 16 days longer and in the regio montana inferior (the northern slopes) it lasts 44 longer. On the southern foot area the prolongation of the active life of the summer species, which appear in here at the beginning of third decade of June (and on the northern foot area at the beginning of July) have also been realized. It can be said that the living conditions for the late spring species are on the northern slopes of the foot area and on the southern slopes of the regio montana inferior similar to each other, while on the southern slope of the foot area are different, causing the prolongation of the period of active life both of the late spring and summer species.

The summer species have been observed in the regio montana inferior during 36 days of July and August. The period of their active life is coincident with the summer in temperature meaning, and therefore there are not these species in the regio montana superior, where only few summer days are during the year. Moreover, these species are lacking above the timber line, where there is no summer in the temperature meaning. On the northern slopes of the regio montana inferior the summer is presumably too short to emerge the summer species.

In the autumn (in temperature meaning) only the species of the genera *Bombus* LATR., *Psithyrus* LEP., *Halictus* LATR. and *Apis mellifica* L. have been found. The males of *Halictus* LATR. were on wing between summer and autumn in the foot area and in the regio montana inferior on the southern slopes. On the northern slopes of the regio montana inferior only the females have been observed.

In the beginning of the late autumn the active life of the *Apoidea* finishes.

V. THE HABITATS AND LIVING CONDITIONS OF THE *APOIDEA* IN THE BABIA GÓRA

The majority of the areas of the Babia Góra are covered by the forest. Only the top part (fig. 1) and some glades (map No. 1) are uncovered. In the dense forest there are no species of the *Apoidea*. The *Apoidea* live below the timber line on the open areas of the cultivated fields and on the glades in the forests. Moreover, the *Apoidea* have been observed in less dense forests, on small glades, sides of ways, tracts, wood clearings and also along the streams, everywhere where the flowering plants enter. The number of the species living in such a habitats depends on the largerness of the area, its insolation, humidity of the soil and the plant association. Even on the smallest areas like those the bumble-bees can be found.

In the forest association of the Babia Góra the bumble-bees have been observed almost exclusively. The reachest forest association is that of *Abieti-piceetum-montanum*, where mainly *Vaccinium myrtillus* L. accumulates the discussed insects. In that association all the bumble-bee species known from the Babia Góra except for *Bombus hortorum* (L.), *B. equestris* (F.), *B. ruderiarius* (MÜLL.), *B. silvarum* (L.), *B. distinguendus* MOR., and *B. subterraneus* (L.) have been found. The habitats of two species listed by KISS and OLASZ (1907) namely of *B. muscorum* (F.) and *B. elegans* SEIDL. are unknown till now. Moreover, in that associations the singular specimens of *Andrena lapponica* ZETT. have been collected. The remaining forest associations of the regio montana inferior of the Babia Góra, namely *Fagetum carpaticum*, *Alnetum incanae* and *Sorboaceretum carpaticum* are very poor in the *Bombinae* fauna. Only in the spring, mainly on the flowering species of the genus *Dentaria* L. the solitary bumble-bees have been collected. There are: *B. lucorum* (L.), *B. pratorum* (L.), *B. pyrenaeus* PÉR. and *B. agrorum* (F.). The regio montana superior of the Babia Góra is covered by the *Piceetum excelsae carpaticum*, which forms there two subassociations. Similarly as in the regio montana inferior only in scarce-tree forests, the *Apoidea* have been found but only in the sub-association *Piceetum excelsae myrtilletosum*, where *Vaccinium myrtillus* L. dominates. All the bumble-bee species known from the association of *Abieti piceetum montanum* are recorded from here. Another sub-association, namely *Piceetum excelsae filicetosum* with the ferns *Athyrium alpestre* (HOPPE) and *Dryopteris austriaca* (JACQ.) is completely dispossessed of the *Apoidea* fauna and only the flying over bumble-bees can be observed.

In the shrubs associations of the Babia Góra the species of the *Bombinae* are also dominating. In the *Mughetum carpaticum* all the species known from the regio nivalis of the Babia Góra, and moreover *Nomada glabella* THOMS. and in the lover parts in sub-association of *Mughetum carpaticum calcicolum*, also the species of genus *Andrena* F., *Bombus* LATR. and *Psithyrus* LEP., known from the dwarf pine zone of the north-faced slopes. The flowering plants of the associations of *Monti-cardaminetalia*, *Chaerophylletum hirsuti*, *Caricetalia fuscae* and *Caricetalia davallianae* are visited by following bumbles only: *B. lucorum* (L.), *B. pratorum* (L.), *B. pyrenaeus* PÉR. and *B. agrorum* (F.).

In the tall-herb associations and grass associations occuring in the Babia Góra both in the mountain forest zones and in the regio mugheti the bumble-bee species have been collected almost exclusively. The above mentioned associations are here abundant:

1. *Aconitetum firmi* agglomerates the bumble-bee fauna of the regio montana superior. *Andrena bicolor* (F.) visiting in this association *Primula elatior* (L.) has been also recorded here.
2. *Adenostyletum alliariae* recorded from the regio mugheti accumulates the *Bombinae* fauna known from the regio nivalis of the Babia Góra and the *Bombinae* of the dense dwarf pine zone, discussed in the chapter III.

3. *Petasitetum kablikiani*, the tall-herb associations of the upper parts of the regio mugheti. Only the *Bombus*-species known from the regio nivalis of the Babia Góra have been observed here.
4. *Rumicetum alpini* known from the mountain forest zones accumulate the *Bombiniae* fauna of those regions, mentioned for the association of *Abieti-Piceetum montanum*. Also *Apis mellifica* (L.) flies here.
5. *Chaerophyllum hirsutum*, the association rare in the upper mountain forest zone is visited by numerous bumble-bee species.
6. The association with *Petasistes albus* (L.), mainly in the regio montana inferior is visited by *Bombus lucorum* (L.), *B. agrorum* (F.), and *Andrena bicolor* (L.) and *A. saundersella* PERK.
7. *Calamangrosteum villosae*, known from the regio mugheti is visited by bumble-bees of the top parts of the Babia Góra.

To the associations of the rock plants, alpine grasses and places of long snow lying in the alpine and subalpine zones belong:

1. *Versicoloretum babiogorense*, growing on the rock shelves and crevices of the northern steep slopes of the Babia Góra, is visited by the bumble-bees of the regio nivalis.
2. *Umbilicarietum cylindricae*, the association of the rock algae is completely dispossessed of the *Apoidea* fauna; only accidentally the bumblebees have been observed.
3. *Vaccinietum myrtylli* is inhabited by the species known from the regio nivalis of the Babia Góra and *Nomada glabella* THOMS. and the species of the genus *Andrena* F. known from the regio mugheti of the northern slopes.
4. *Emperto-vaccinietum* agglomerates the *Bombinae* fauna characteristic of the top parts and also the species of the genus *Andrena* F. known from the regio mugheti and *Nomada glabella* THOMS., *Apis mellifica* L. as well as the species of the genera *Bombus* LATR. and *Psithyrus* LEP. known from the dense dwarf pine of the subalpine zone of the Babia Góra.

The clearing wood associations of *Agropetalia*, appearing on larger areas in the lower parts of the regio montana inferior are not marked in the map of CELIŃSKI and WOJTERSKI (1961), becouse of the very small areas in the territory of the Babia Góra National Park, however, they are very important for the *Apoidea*. All the species of the above discussed plant association and several further species are living here. Another species, namely *Bombus hortorum* (L.) is known from here. Some other groups of the species have been recorded from this area:

1. The species visiting *Salix* L. [*Andrena haemorrhoa* (F.), *A. bicolor* (F.), *A. lapponica* ZETT., *A. praecox* (SCOP.), *A. clarkella* (K.), *A. apicata* SMITH, *Halictus xanthopus* (K.), *Nomada leucophtalma* (K.), *Bombus* LATR. known from montain forest zones and *Apis mellifica* L.]

3. The species visiting the group of small plants as: *Potentilla erecta* (L.), *Veronica chamaedris* L., *Fragaria vesca* L., *Geranium robertianum* L., *Hieracium* L., *Taraxacum officinale* WEB. These are: *Andrena subopaca* NYL., *A. coitana* (K.),

Halictus villosulus (K.), *H. leucopus* (K.), *H. niger* VIER., *H. fulvicornis* (K.), *H. calaeatus* (SCOP.), *H. albipes* (F.), *Spheocodes hyalinatus* HAG., *Dufourea vulgaris* SCHENCK., *Nomada flavoguttata* (K.), *Apis mellifica* and *Bombus* LATR. from mountain forest zones.

3. The species collected on *Rubus idaeus* L. [*Andrena fucata* SMITH, *Nomada hillana* (K.), *Apis mellifica* L. and *Bombus* LATR. from mountain fores zones.]

4. The species visiting *Vaccinium myrtillus* L.: *Halictus niger* VIER. the *Bombinae* and *Apis mellifica* L. have been collected on all listed above plants.

5. *Megachile lapponica* THOMS. collected on *Chamaenerion angustifolium* (L.).

The meadow association *Gladiolo-agrostetum* the most abunded in the *Apoidea* among the other associations. Originally it has been growing on glades of the mountain forest zones, but now it can only be found in the large and in not abundant pathes on the north-facing slopes (KOSTUCH, 1963). The meadows are less damaged on the southern slopes but also grazed and mown for grass. On these meadows occur all the *Apoidea* species known from the Babia Góra, except for *Megachile lapponica* ZETT., which has been collected only on a single clearing. Four species of the genus *Bombus* LATR., mentioned before, which are lacking in the association discussed above should be added. The fauna of the small plants, given for the clearing places association is richer in having the following species: *Andrena fulvago* (CHRIST), *A. alfkenella* PERK., *A. minutuloides* PERK., *Halictus tumulorum* (L.), *H. minutus* (K.), *H. rufitarsis* ZETT., *Nomada flava* PZ., *N. bifida* THOMS., *N. fabriciana* (L.), *Andrena humulis* IMH. and *Panurgus banksianus* (K.), collected on species of genera *Hieracium* L., *Leontodon* L. and *Taraxacum* ZINN growing commonly here. Also three species of the genus *Andrena* F. [*A. ovatula* (K.), *A. albofasciata* THOMS. and *A. wikella* (K.)] have been collected in same habitat. At last on those meadows lives the species of the family *Megachilidae* namely: *Chelostoma maxillosum* (L.), *Ch. nigricorne* NYL., *Osmia rufa* (L.), *O. parietina* CURT., *O. coerulescens* (L.) and a single specimen of *Eucera longicornis* (L.) has been collected.

The cultivating area as the lowest and warmest terrain gives the *Apoidea* the most suitable living conditions. On the northern foot part, where the largest number of the species have been found the terrain is well differantiated. The forest planted after the complete clearing out during the former years is here in small pathes only (Pl. XII fig. 2). This area is covered by the meadows and cultivated fields and is deeply cut by the valleys of the streams. Rough terrain allows the occurence of strong insolated solpes and small hidden exposed to the south or to west-southern valleys, and also the local microclimates, suitable for several species of *Apoidea*. In the map No. 1 the places of the nestling of the majority of the *Apoidea* of the terrain under the consideration are marked. Those places are situated near the bottom of the Barańcowa valley at the altitude of 700 m a. s. l. That small area is hidden from the vest by the crest of Burdylowy Groń and from the north by the spruce forest partially. The alpinarium existing at the house of the Direction of the Babia Góra National Park

is also the terrain of the nestling of many *Apoidea* species. The temperature of the bottom of that valley in the periods of the fine weather attained in April 26°C, while the maximal day temperature at the meteorological station reached 14·5°C.

The bumble-bees, as the investigations done in the Tatra Mts. show (DYLEWSKA, 1958) are active at the temperature of 13°C, while some species of the genera *Andrena* F. and *Nomada* SCOP. appear when the temperature increses to 21°C. All the species observed in that time are visiting the villows when the temperature was higher than 23°C. The further points in which the *Apoidea* agglomerate has been found in the Palechówka glade (map No. 1, II) and in the region called Widełki (III). That terrain is hidden from the west by the crest of Burdylowy Groń, from the east by Ryzowana and from the north-west by the Jałowieckie range. Under the top of Ryzowana (about 900 m above the sea level) on the north-faced slope another area agglomerating the *Apoidea* has been found (this is marked as No. IV). That area is situated in the place where the wall of the Babia Góra massif forest finishes at the south and hidden from the north with small spruce forest. Moreover, such a agglomeration of the *Apoidea* (No. V) has been observed in Zawoja Wilczna, at the bottom of the Jałowiecki stream. On those areas *Andrena humilis* IMH. is the most common species. The remaining areas of the foot parts are usually cooler and damaged by the cultivation. The singular species of the *Apoidea* are occuring there, as well as the bumble-bees, but also scarcely. The species of the *Megachilidae* [*Osmia rufa* (L.), *O. adunca* (PZ.), *Chelostoma nigricorne* NYL., *Ch. maxillosum* (L.), *Ch. florisomne* (L.)] find in the foot parts the suitable places of the nestling in the walls of the wooden houses, directed towards the south, south-west and south-east. Those species are limited in their distribution to the warmest habitats, which are marked in the map No. 1.

The ricks of the stones removed from the fields with small plants as *Potentilla erecta* (L.), *Fragaria vesca* (L.), *Veronica chamaedris* (L.) and also *Vaccinium myrtillus* (L.), *Rubus idaeus* (L.) etc. and often the solitary spruce trees are situated over the fields. These ricks of stones keep the warmth received by the insolation and therefore agglomerate several species usually unknown from the fields. However, those ricks situated in the warmests areas or near to them are the most abundant in the *Apoidea*.

The southern foot-part is in the majority grown with the forest. The species known from the mountain forest zones live here, but the species which need higher thermic conditions finish their vertical distribution in the cultivated field areas, near the timber line in the villages situated in the stream valleys. In those valleys of some rather small areas, hidden to 5 m, give the insects the minimum of the warmth needed. *Osmia villosa* (SCHENCK) is lacking in here, however, its occurs in the Tatra Mts. and many other species known from the northern foot parts have not been recorded from that area. The above mentioned species *Osmia villosa* (SCHENCK) nestles in the rock crevices (NOSKIEWICZ, 1920), and therefore cannot be found on the southern foot part at

the Polish side, as the terrain is rather flat and there are no naked rocks there.

The meadows of the mountain forest zone, rich in the *Apoidea* fauna, are differing on the northern and southern slopes. The degree of the insolation, as the first investigations have shown (OBRĘBSKA-STARKLOWA, 1963) is much stronger on the south-faced slopes. The difference in the temperature between the southern and northern slopes is in the sunny day about 8°C. The meadows of the mountain forest zone are bordered by the forests, which keep the warmth inside the glades (as the investigations on the microclimate of the clearings done by TOMANEK showed (1952). That is however, inadequate on the both slopes, and probably therefore on the meadows of the south-faced slopes more species of the *Apoidea* have been found than on the northern slopes. The nestling of the *Apoidea* on the meadows of the regio montana inferior is almost completely limited to the soil. The nestles of *Andrenidae*, *Halictidae* and *Megachilidae* have been observed at the dry places partially uncovered by plants, at the ricks of the stones removed from fields and most often on the rough terrain. In the outlines of the glades of the regio montana inferior the places of the nestling of the species belonging to the above mentioned genera are marked. These nestles are usually agglomerated on the north-western sides of those glades. Moreover, also at Gubernasówka on the eastern side, hidden from the north by the forest, they have been observed. On the north-faced slopes on the Czarna Cyrhla and on the Hala Czarnego, the agglomerations of the nestles on the south-east side occur. Beyond that, on the Hala Czarnego by the southern border of the valley *Andrena subopaca* NYL., nestling in here has been collected. On those terrains the number of the examples (for instance those of *Andrena humilis* IMH. reaches 3 or 4 for one square meter. The *Bombinae* fauna of the fields agglomerates in their medial and eastern parts where the *Papilionaceae* dominate, and mainly *Trifolium* L., but in the north-eastern par *Vaccinum myrtillus* L. is a dominant plant. On the latter places the number of the bumblebees (reaching 5 examples for one square meter) is the greatest. The number of the *Bombinae* population is smaller than those of the bumbles, and in the areas inhabited by *Andrena* F., *Panurgus* PZ. and *Halictus* LATR. reaches 1 to 5 specimens for each 5 square meters. Such floristic-apidological dependences are explained in the papers of TOMANEK (1952) and GEIGER (1935), which deals with the microclimatic conditions inside the wood clearings (those can be compared with the glades of the Babia Góra under the climatic respects). According to GEIGER in the summer period in the 48° of the northern geographical latitude (as this latitude the Babia Góra lies) the extreme parts of the clearings from the northern and western sides and the middle parts are the most strongly warmed. TOMANEK measured the temperature on the particular edges of the clearing, namely at the northern (N), on the southern (S), western (W), and eastern edges (E) as well in the middle of it (O). In the summer period during the noon, the edges N and W appeared to be the warmest, and the middle O, which warmths itself as the first after the sun-raising. The differences in the

warmth among the edges N and S, were 3°C in July, and 5·1°C in August. The time of the insolation in the particular sides of the clearing for the 48° of northern geographical latitude is in June as follows:

N — 9 hours
E — 8 hours
S — 3·5 hours
W — 8 hours

Moreover, the direction of the winds and the slope inclination can have, an influence on the nestling of the *Apoidea*. So on the glades of the north-faced slopes, where the southern and south-eastern winds dominate. The slopes NS, SE, WN are the less exposed for the wind activity, but the strongest wind blows towards the edges N and NE. On the southern slopes the western and SW winds are mainly observed, so they blows towards the edges E and NE. The edges W, WE and NE are the less exposed for the winds. Moreover, as the edge directed towards the wind gets the enlarged amount of the moisures with the comparison with the opposite edges, the borders of the glades heavily exposed for the wind action are also more humid. The south-faced slopes of the southern side are so inclined that the level lines elevate towards the edges E and therefore the edges W are lying in a concavity between the forest wall and the terrain raising towards the east. So they are well hidden from the wind and can accumulate the largest quantity of the warmth. The above theoretic discussion based on the papers of the mentioned microclimate investigators explains the distribution of the places of the nestling of the *Apoidea* in the glades of the regio montana inferior of the Babia Góra.

On the northern slopes of the upper mountain forest zone, more species of the *Apoidea* have been observed, than on the southern slopes of the upper parts of the regio montana inferior. It is noteworthy that several species of the genus *Andrena* F. are lacking from here. The absence of the suitable nestling places is the most probably cause of that phenomenon. The northern slopes of the upper mountain forest zone is crossed by several turistic ways and its small glades are also visited by the excursions. The soil is here very often unvoiled, so the nestling becomes possible.

A dense forest grows on the south-faced slopes of the mountain forest zones. Small glades, some few often marshy valleys of the streams, and only single tract in the dense forest are the bolt for many *Apoidea*. Only the bumbles are living here, and also *Andrena lapponica* ZETT., which has been observed on comparatively small areas. Above the timber line the northern slopes are also more abundant in the species of *Apoidea* than the southern ones. In the region of dense dwarf pine the abundant fauna of the *Apoidea* have been realised in July (about 1—3 specimens for each square meter) but in the corries only and in the concavities among the rocks, which are grown up with an abundant tall-herb flora. The species of *Andrena* F. are living in those places, but the bumblebees are dominating. The species do not reach the top; they neither have been observed in the other parts of dwarf pine zone nor on the southern slope of this

plant zone, except for the south-faced slopes of Sokolica. The corries of the northern slopes (map. 1) are deep up to 200 m a. s. l. The tall-herb flora, which is commonly visited by the bumbles grows up on near the bottoms of those corries. The north-faced slopes are the rocky ones and are grown by high-mountain lawn, the eastern and south-eastern ones are grassy, grown with *Vaccinium myrtillus* L. and with *Salix silesiaca* L., which enter these places. The slopes are covered by a dwarf pine towards the east and east-south. The *Andrenidae* have been collected in those corries on their east and south-east-faced slopes, except for *A. lapponica* ZETT. which is known from the top parts too. FABIJANOWSKI in his paper on the microclimate of the Alps and ERMICH in his publications based on the investigations which have been pending in the Tatra Mts. and in the Babia Góra point out the fact, that the naked or grassy slopes are warming faster than those covered with trees or bushes. That is the most remarkable on the southern slopes, but also can be easily relaised on the other expositions. The mentioned corries are hidden from the wind blowing mainly from the south-west. The places in which the *Andrenidae* live are the less exposed for the wind action ones. The strong winds (OBRĘBSKA-STARKLOWA, 1963) most probably causes the absence of the species of *Andrena* F., known from the corries of the northern slopes of the dwarf pine zone from the south-faced slopes.

The *Apoidea* are active in the top part only during the sunny days in the periods of slight wind, when the temperature does not surpass 20°C. The bumbles can flight, however, in worse weather too. During the strongest wind, when the sun is covered by clouds, the temperature decreases below 20°C and even *Andrena lapponica* ZETT. is awaiting the next weather clearing on the ground or plants. *Andrena lapponica* ZETT. appears rather in solitary specimens in the top parts, but the bumble-bees are commoner, and on the average on specimen can be found on each square meter on the pathes of *Vaccinium myrtillus* L.

VI. THE ZOOGEOGRAPHIC ANALYZIS

1. The comparison of the *Apoidea* of the Babia Góra with the *Apoidea* fauna of the West Beskids in the Polish Carpathians

The data concerning the *Apoidea* fauna in the West Beskids were already discussed in the papers dealing with the fauna of this family of the Pieniny Mts. (DYLEWSKA, 1962; DYLEWSKA and NOSKIEWICZ, 1963) and those of the Tatra Mts. (DYLEWSKA, 1958). The present researches on the Babia Góra allow the more serious analysis of this problem in the Polish West Beskids. PAWŁOWSKI (1959) distinguished three geobotanical districts in the West Beskids, namely: Tatra Mts., Pieniny Mts, and Beskids Mts. The latter is the biggest

district of the West Beskids and contains the following subdistricts: Babia Góra-Silesian, in which Babia Góra is the hinghest top, Gorce Mts., Gubałówka Hills, Sądecki Beskid, Bory Nowotarskie, Niski Beskid, loess-Pogórze and flish-Pogórze. Non of these sub-districts except for the Babia Góra have been worked out in details. In several publication (WIERZEJSKI, 1868, 1874; ŚNIEŻEK, 1910; NOSKIEWICZ, 1920; KRYSIŃSKI, 1957; DYLEWSKA, 1958) there are, however, some data concerning the mentioned subdistricts. Because of too scarse data in the discussion of the particular families of the *Apoidea* of the Polish West Beskids, the following ranges are taken under the consideration: I. Babia Góra, II. the foot part of the Babia Góra, III. Tatra Mts., IV. Pieniny Mts. and V. the remaining subdistricts of the Beskids.

It is evident from table VII that 16 species of the family *Colletidae* are known from the Polish West Beskids. It is noteworthy that 33 species of that group are recorded from Poland till now. So in the West Beskids lives about 48% of the Polish *Colletidae*. *Colletes cunicularius* (L.), found in the foot part of the Babia Góra is a new species for West Beskids. This species is known from the north and middle-north parts of Poland and from Upper and Lower Silesia (DYLEWSKA and NOSKIEWICZ, 1963). Basing on these data, *Colletes cunicularius* (L.) is spread all over Poland including the Carpathians in which it enter up to lower border of the regio montana inferior. Three species of the discussed family have been collected in the Babia Góra massif. One of them is known from the Tatra Mts. and also from the remaining mentioned before ridges of the West Beskids; two other species have not been recorded from

Table VII

No.	Name	Babia Góra Mt.	Foot part of Babia Góra	Tatra Mts.	Pieniny Mts.	The remaining ridges
1.	*Colletes daviesanus* SM.					+
2.	*Colletes cunicularius* (L.)		+			
3.	*Colletes nasutus* SM.					+
4.	*Colletes inexpectus* NOSK.					+
5.	*Prosopis confusa* (NYL.)	+	+	+	+	+
6.	*Prosopis variegata* (F.)					+
7.	*Prosopis brevicornis* (NYL.)				+	
8.	*Prosopis sinuata* SCHENCK		+		+	+
9.	*Prosopis annulata* (L.)			+		
10.	*Prosopis communis* (NYL.)	+	+		+	+
11.	*Prosopis angustata* SCHENCK					+
12.	*Prosopis nigrita* (F.)				+	+
13.	*Prosopis difformis* EV.		+		+	+
14.	*Prosopis annularis* (K.)					+
15.	*Prosopis cornuta* (CURT.)			+		
16.	*Prosopis hyalinata* (SM.)	+	+		+	

the Tatra Mts. till now, but there is a possibility to find them in there. The species discussed enter the lowest parts of the lower mountain forest zone. Those three species recorded exclusively from the foot part of the Babia Góra live probably in the Carpathians to the limit of the lower parts of the mountain forest zones. Moreover, 10 species unkown from the Babia Góra and its foot parts have been recorded from the West Beskids. Of those species two, namely *Prosopis annulata* (L.) and *P. cornuta* (CURT.) were recorded by NOSKIEWICZ (1920) but from the Tatra Mts. only. The remaining species are known from Pieniny Mts. and from other lower ridges of the West Beskids, and the upper limit of their vertical distribution lies in the submontainous region. Of those species two, namely *Colletes nasutus* SM. and *C. inexpectus* NOSK. are recorded only from loess Pogórze from the environs of Przemyśl (KRYSIŃSKI, 1957).

There are 59 species of the family *Andrenidae* in the West Beskids, and in the Babia Góra occur 21 species of this group, what gives about 36% (table VIII). Almost all the species recorded from the massif of the Babia Góra have been found in the foot parts, with exception of the species rare in this terrain, which have been collected in single or few examples only [*Andrena minutula* (K.), *A. minutuloides* PERK. and *A. ovatula* (K.)]. However, those species most probably occur in the foot parts too. Five species of this family have been found only in the foot part of the Babia Góra; these species are, however, unknown from the Tatra Mts. One can therefore suppose that the vertical distribution of those species finishes in the area of cultivated fields near the line of the mountain forest zone. The species reach different points along the valleys, and so *Andrena lathyri* ALFKEN and *A. chrysosceles* (K.) appear to the altitude of about 630 m a. s. l. to which enter also the narrow-leaved willow species; the remaining species have been collected up to 700 m a. s. l. and even up to 900 m a. s. l., to the end of the area of the cultivated fields. The species of the family *Andrenidae* recorded both from the massif of the Babia Góra and from its foot parts have been already listed from the other ridges of the Polish part of the West Beskids, with exception of *Andrena ruficrus* NYL., which has been found in the foot part area and of *A. lathyri* ALFKEN, which besides the foot part of the Babia Góra has been collected in Raba Wyżna in Gorce Mts. (leg. J. FUDAKOWSKI, det. NOSKIEWICZ). Thirty-four species known from the Polish part of the West Beskids have not been found neither in the Babia Góra massif nor in its foot part area. NOSKIEWICZ (1920) recorded two of those species but only from the Tatra Mts. The remaining four species live in the Pieniny Mts. and in the lower ridges of the West Beskids. Of those species only *Andrena ventralis* IMH. has been collected in Skawica Valley at the altitude of about 500 m above the sea level (leg. M. DYLEWSKA). The remaining species have been recorded from the whole West Beskids except for the Babia Góra, Tatra and Pieniny Mts. The fauna of the *Andrenidae* of the Polish part of the West Beskids counts aproximately 60% of the Polish fauna of this group.

Table VIII

No.	Name	Babia Góra Mt.	Foot part of Babia Góra	Tatra Mts.	Pieniny Mts.	The remaining ridges
1.	*Andrena morio* BRULLÉ					+
2.	*Andrena carbonaria* (L.)					+
3.	*Andrena cineraria* (L.)				+	
4.	*Andrena agilissima* (SCOP.)				+	
5.	*Andrena vaga* PZ.				+	
6.	*Andrena thoracina* (F.)				+	+
7.	*Andrena pubescens* (OLIV.)	+	+		+	+
8.	*Andrena tibialis* (K.)	+	+		+	
9.	*Andrena haemorrhoa* (F.)	+	+	+	+	+
10.	*Andrena fulvago* (CHRIST)	+	+		+	
11.	*Andrena humilis* IMH.	+	+	+	+	+
12.	*Andrena nudigastra* ALFKEN			+		
13.	*Andrena taraxaci* GIR.				+	+
14.	*Andrena bicolor* F.	+	+		+	+
15.	*Andrena ruficrus* NYL.		+			
16.	*Andrena helvola* (L.)				+	
17.	*Andrena lapponica* ZETT.	+	+	+		+
18.	*Andrena praecox* SCOP.	+	+		+	
19.	*Andrena fucata* SM.	+	+	+	+	
20.	*Andrena clarkella* (K.)	+	+		+	
21.	*Andrena apicata* SM.	+	+		+	
22.	*Andrena nana* (K.)				+	
23.	*Andrena floricola* EV.				+	
24.	*Andrena alfkenella* PERK.	+	+		+	
25.	*Andrena subopaca* NYL.	+	+	+	+	
26.	*Andrena saundersella* PERK.	+	+			
27.	*Andrena minutula* (K.)	+			+	+
28.	*Andrena minutuloides* PERK.	+			+	
29.	*Andrena marginata* F.				+	
30.	*Andrena ventralis* IMH.				+	+
31.	*Andrena hattorfiana* (F.)		+		+	+
32.	*Andrena jakobi* PERK.		+		+	
33.	*Andrena rosae* PZ.					+
34.	*Andrena curvungula* THOMS.				+	
35.	*Andrena paucisquama* NOSK.				+	
36.	*Andrena rufizona* IMH.			+		
37.	*Andrena liabialis* (K.)				+	
38.	*Andrena schencki* MOR.					+
39.	*Andrena flavipes* PZ.					+
40.	*Andrena nigriceps* (K.)			+		+
41.	*Andrena fuscipes* (K.)					+
42.	*Andrena denticulata* (K.)				+	+
43.	*Andrena nitidiuscula* SCHENCK					+
44.	*Andrena chrysosceles* (K.)		+			
45.	*Andrena coitana* (K.)	+	+	+	+	+

continued table VIII

No.	Name	Babia Góra Mt.	Foot part of Babia Góra	Tatra Mts.	Pieniny Mts.	The remaining ridges
46.	*Andrena tarsata* NYL.					+
47.	*Andrena barbilabris* (K.)				+	
48.	*Andrena proxima* (K.)				+	
49.	*Andrena propinqua* SCHENCK				+	
50.	*Andrena dorsata* (K.)				+	
51.	*Andrena combinata* (CHRIST)				+	+
52.	*Andrena ovatula*(K.)	+				+
53.	*Andrena albofasciata* THOMS.	+	+		+	
54.	*Andrena wilkella* (K.)	+	+		+	
55.	*Andrena lathyri* ALFKEN		+			+
56.	*Andrena ratisbonensis* STOECKH.					+
57.	*Panurgus banksianus* (K.)	+	+	+		+
58.	*Panurgus calcaratus* (SCOP.)				+	+
59.	*Panurginus labiatus* EV.					+

The species of the family *Halictidae* of the Polish part of the West Beskids is shown in the table IX. In the territory of the Babia Góra lives 13 species of this family and that is about 32% of the *Halictidae* fauna of the West Beskids. *Halictus xanthopus* (K.) and *H. minutus* (K.) are new for the fauna of the Polish part of the West Beskids, and they also can be found in the other ridges of the Polish Carpathians including the Tatra Mts. The Babia Góra species of the family under consideration live also in Pieniny Mts., and a part of them is known from the other, lower ridges of the West Beskids. *H. rufitarsis* ZETT., *H. niger* VIER. and *H. fulvicornis* (K.), known besides the massif and the foot part of the Babia Góra from the Pieniny Mts., could be recorded from the Tatra Mts. and from other lower ridges of the West Beskids, like *H. tumulorum* (L.) and *H. leucopus* (K.) which live probably in the Tatra Mts., as they have been recorded from the Babia Góra, Pieniny Mts. and from other ridges of the West Beskids. The species known only from the foot parts of the Babia Góra, have already been found in Pieniny Mts. and in other ridges except for the Tatra Mts. *H. quadricinctus* (FABR.) has not been recorded from Pieniny Mts. and *H. continentalis* BLÜTHGEN is a species new for the Polish part of the West Beskids. The species occuring in the foot parts of the Babia Góra most probably finish their vertical distributions below the mountain forest zone. Moreover, of 21 species known from West Beskids 15 ones were collected in the Pieniny Mts., 2 in the Pieniny Mts. and other lover ridges, 3 ones everywhere except for the Tatra Mts., Babia Góra and Pieniny Mts. J. NOSKIEWICZ recorded *Halictus cupromicans* PÉR. from the Tatra Mts.

Table IX

No.	Name	Babia Góra Mt.	Foot part of Babia Góra	Tatra Mts.	Pieniny Mts.	The remaining ridges
1.	*Halictus quadricinctus* (F.)		+			+
2.	*Halictus rubicundus* (CHRIST)		+		+	+
3.	*Halictus eurygnatus* BLÜTHGEN					+
4.	*Halictus simplex* BLÜTHGEN				+	
5.	*Halictus maculatus* SM.				+	+
6.	*Halictus tumulorum* (L.)	+	+		+	+
7.	*Halictus xanthopus* (K.)	+				
8.	*Halictus nitidus* (PZ.)					
9.	*Halictus quadrinotatus* (K.)				+	
10.	*Halictus lativentris* (SCHENCK)				+	
11.	*Halictus leucozonius* (SCHRANK)	+			+	+
12.	*Halictus villosulus* (K.)	+	+	+	+	+
13.	*Halictus leucopus* (K.)	+	+		+	+
14.	*Halictus tarsatus* SCHENCK					+
15.	*Halictus intermedius* SCHENCK				+	
16.	*Halictus lucidulus* (SCHENCK)				+	
17.	*Halictus minutus* (K.)	+	+			
18.	*Halictus rufitarsis* ZETT.	+	+		+	
19.	*Halictus niger* VIER.	+	+		+	
20.	*Halictus fulvicornis* (K.)	+	+		+	
21.	*Halictus laticeps* SCHENCK				+	+
22.	*Halictus continentalis* BLÜTHGEN		+			
23.	*Halictus aeneidorsum* ALFKEN				+	
24.	*Halictus calceatus* (SCOP.)	+	+	+	+	+
25.	*Halictus albipes* (F.)	+	+	+	+	+
26.	*Halictus laevis* (K.)				+	
27.	*Halictus cupromicans* PÉR.			+		
28.	*Sphaecodes gibbus* (L.)					+
29.	*Sphecodes monilicornis* (K.)				+	
30.	*Sphecodes pellucidus* SM.				+	
31.	*Sphecodes divisus* (K.)				+	
32.	*Sphecodes punctipes* THOMS.		+		+	+
33.	*Sphecodes ferruginatus* HAG.				+	
34.	*Sphecodes hyalinatus* HAG.	+	+		+	
35.	*Sphecodes miniatus* HAG.				+	+
36.	*Sphecodes fasciatus* HAG.				+	
37.	*Dufourea vulgaris* SCHENCK	+	+		+	+
38.	*Halictoides dentiventris* (NYL.)		+		+	+
39.	*Rophites quinquespinosus* SPIN.		+		+	+
40.	*Rophites hartmani* FEIESE					+
41.	*Rophites canus* EV.				+	

Table X

No.	Name	Babia Góra Mt.	Foot part of Babia Góra	Tatra Mts.	Pieniny Mts.	The remaining ridges
1.	*Trachusa serratule* (Pz.)				+	+
2.	*Anthidium punctatum* Latr.				+	
3.	*Anthidium montanum* Mor.			+	+	
4.	*Anthidium manicatum* (L.)				+	
5.	*Anthidium strigatum* Pz.				+	
6.	*Stellis signata* (Latr.)				+	
7.	*Stellis punctulatissima* (K.)					+
8.	*Stellis phaeoptera* K.		+			+
9.	*Stellis minuta* Lep. et Sev.		+			+
10.	*Stellis ornatula* (Klug)				+	
11.	*Heriades trunculorum* (L.)				+	
12.	*Chelostoma maxillosum* (L.)		+		+	+
13.	*Chelostoma florisomne* (L.)	+	+	+	+	+
14.	*Chelostoma distinctum* (Stoeckh.)				+	
15.	*Chelostoma ventralis* Schlett.				+	
16.	*Chelostoma nigricorne* Nyl.	+	+	+	+	+
17.	*Osmia rufa* (L.)	+	+		+	
18.	*Osmia coerulescens* (L.)	+	+		+	
19.	*Osmia inermis* Zett.			+		
20.	*Osmia bicolor* (Schrank)		+			+
21.	*Osmia villosa* Schenck		+	+	+	+
22.	*Osmia andrenoides* Spin.				+	
23.	*Osmia atrocoerulea* Schill.				+	+
24.	*Osmia parietina* Curt.	+			+	+
25.	*Osmia cerinthidis* Mor.				+	+
26.	*Osmia fulviventris* (Pz.)		+		+	+
27.	*Osmia mitis* Nyl.				+	
28.	*Osmia parvula* Duf. et Pér.				+	
29.	*Osmia leaiana* (K.)		+		+	
30.	*Osmia leucomelaena* (K.)		+		+	+
31.	*Osmia adunca* (Pz.)		+		+	+
32.	*Osmia spinole* Schenck				+	+
33.	*Osmia spinulosa* (K.)				+	
34.	*Osmia ononidis* Fert.					+
35.	*Megachile circumcineta* (K.)				+	
36.	*Megachile nigriventris* Schenck			+	+	+
37.	*Megachile aricetorum* Lep.		+		+	
38.	*Megachile lagopoda* (L.)					+
39.	*Megachile maritima* (K.)					+
40.	*Megachile willoughbiella* (K.)		+		+	+
41.	*Megachile ligniseca* (K.)			+	+	+
42.	*Megachile centuncularis* (L.)				+	
43.	*Megachile versicolor* Sm.				+	

continued table X

No.	Name	Babia Góra Mt.	Foot part of Babia Góra	Tatra Mts.	Pieniny Mts.	The remaining ridges
44.	*Megachile octosignata* NYL.					+
45.	*Megachile lapponica* ZETT.	+				
46.	*Coelioxys rufescens* LEP.		+	+	+	+
47.	*Coelioxys alata* FÖRST.				+	
48.	*Coelioxys aurolimbata* FÖRST.					+
49.	*Coelioxys lanceolata* NYL.				+	
50.	*Coelioxys quadridentata* (L.)				+	
51.	*Coelioxys elongata* LEP.				+	+

The *Megachilidae* fauna of the West Beskids counts 51 species, and that is 63% of the Polish fauna of this family. The list of the species recorded from the West Beskids is given in the table X. Only 6 species (that is about 12% of the fauna of West Beskids) is known from the Babia Góra. *Chelostoma florisomne* (L.) and *Ch. nigricorne* NYL. have been already found in Tatra Mts., in Pieniny Mts. and in other but lower ridges of the West Beskids. *Osmia rufa* (L.) and *O. coerulescens* (L.) occur also in Pieniny Mts. *O. parietina* CURT. in Pieniny Mts. and in other places in West Beskids, except for the Tatra Mts. These species reach in their distribution the lowest parts of the lower mountain forest zone. DYLEWSKA (1962) proved that *O. rufa* (L.) does not occur in the lower mountain forest zone as it never have been found in the northern slopes in Pieniny Mts. The occuring of this species in the regio montana inferior of the Babia Góra (a single male only), as well as of some other species of *Megachilidae* discussed above, is caused by the suitable microclimate conditions. *Megachile lapponica* ZETT., the species new to the Polish Carpathians is bound to the wood clearings, where the configuration of the terrain and the presence of *Epilobium angustifolium* L. give this species the living conditions. It is possible to discover this species in Tatra Mts. The species (11) recorded from the foot part of the Babia Góra are known from the other lower parts of the Carpathians. *Stellis pheoptera* K., *S. minuta* LEP. et SEV., are the examples of such a species; the remaining species have been recorded from Pieniny Mts. [*Osmia leaiana* (K.)] or from Pieniny Mts. and from the other lower parts of West Beskids [*Chelostoma maxillosum* (L.), *Osmia parietina* CURT., *O. fulviventris* (PZ.), *O. leucomelaena* (K.), *O. adunca* (PZ.)]. *O. bicolor* (SCHRANK), found in the foot area of the Babia Góra in the new species for the fauna of the Polish Carpathians; *O. villosa* SCHENCK and *Celioxys rufescens* LEP. are known from the whole of the West Beskids (see table XI). *Anthidium montanum* MOR., *Megachile nigriventris* SCHENCK, *M. ligniseca* (K.) and *Osmia inermis* ZETT., recorded from the Tatra Mts. and Pieniny Mts., have not been found in the

Babia Góra, however, here there are the conditions suitable for this species. Of the remaining 29 species recorded from West Beskids, 19 ones have been found in Pieniny Mts., 6 ones from Pieniny Mts. and from the other lower ridges and four ones from lower ridges of West Beskids only. Totally 10 species of the *Megachilidae* (it gives about 20% of the *Megachilidae* fauna of the West Beskids), are known from the mountain forest zone of West Beskids. The remaining species is bound most probably to the lowest and most warm habitats in the mentioned area.

Table XI

No.	Name	Babia Góra Mt.	Foot part of Babia Góra	Tatra Mts.	Pieniny Mts.	The remaining ridges
1.	*Melitta leporina* (Pz.)				+	+
2.	*Melitta haemorrhoidalis* (F.)		+		+	+
3.	*Macropis fulvipes* (F.)				+	+

Table XI lists the species belonging to the family *Melittidae* of the Polish part of West Beskids. Three species of this family have been recorded from the Polish Carpathians, and that is 30% of the Polish fauna of *Melittidae*. Only *Melitta haemorrhoidalis* (F.) reaches the line of the region of the cultivated fields. The two other species are most probably living in the lowest areas of the Carpathian Mts. in Poland. It is also noteworth, that they have not been found on the northern slopes of the Pieniny Mts.

The list of the species of the *Apidae* is given in table No. XII. Totally in the Polish part of West Beskids 66 species of this group have been found, and this is about 65% of the Polish *Apidae* fauna. Into mountain forest zones of the Babia Góra enter about 50% of the fauna of this family of the West Beskids. Among the *Apoidea* of the Tatra Mts., only the genera *Bombus* Latr. and *Psithyrus* Lep. have been worked out, however, three other species, namely *Nomada flavopicta* (K.), *N. emarginata* Mor. and *N. tormentillae* Alfk. are known from that terrain on basis of the paper of Noskiewicz (1920). The three species have not been found in the Babia Góra. Seven species finish their vertical distribution in the foot part of the Babia Góra. The remaining 16 species have up till now been recorded from Pieniny Mts. (13 species), from Pieniny Mts. and from other lower ridges (1) or only in the remaining terrains except for Babia Góra, Tatra Mts. and Pieniny Mts.

The *Apoidea* fauna of the Polish part of West Beskids, counts 236 species. In the massif of the Babia Góra live 76 species. There are 39 species common for this terrain and the Tatra Mts. There are 14 species unkown from the Babia Góra, which have been recorded from Tatra Mts., and 7 ones of this number are known only from Tatra Mts. In Pieniny Mts. 58 species unknown up till now

Table XII

No.	Name	Babia Góra Mt.	Foot part of Babia Góra	Tatra Mts.	Pieniny Mts.	The remaining ridges
1.	*Nomade goodeniana* (K.)				+	
2.	*Nomada lineola* Pz.				+	
3.	*Nomada marshamella* (K.)				+	
4.	*Nomada sexfasciata* (Pz.)		+		+	+
5.	*Nomada errans* Lép.					+
6.	*Nomada flavopicta* (K.)			+		
7.	*Nomada emarginata* Mor.				+	
8.	*Nomada tormentillae* Alfk.			+		+
9.	*Nomada montana* Mor.			+		
10.	*Nomada obtusifrons* Nyl.					+
11.	*Nomada hillana* (K.)	+	+			
12.	*Nomada guttulata* Schenck				+	
13.	*Nomada zonata* Pz.				+	
14.	*Nomada ruficornis* (L.)				+	
15.	*Nomada flava* Pz.	+	+		+	
16.	*Nomada glabella* Thoms.	+	+			
17.	*Nomada leucophtalma* (K.)	+	+		+	
18.	*Nomada ferruginata* (L.)		+		+	
19.	*Nomada bifida* Thoms.	+	+		+	
20.	*Nomada alboguttata* H.-Sch.				+	
21.	*Nomada flavoguttata* (K.)	+	+	+	+	
22.	*Nomada baeri* Stoeckh.				+	
23.	*Nomada coniungens* H.-Sch.				+	
24.	*Nomada furva* Pz.					+
25.	*Nomada fuscicornis* Nyl.				+	
26.	*Nomada sinilis* Mor.					+
27.	*Nomada armata* H.-Sch.				+	+
28.	*Nomada fabriciana* (L.)	+	+		+	
29.	*Nomada mutabilis* Mor.					+
30.	*Clisodon furcatus* (Pz.)		+		+	+
31.	*Antophora acervorum* (L.)		+		+	
32.	*Antophora plagiata* (Ill.)		+			
33.	*Antophora aestivalis* (Pz.)				+	
34.	*Antophora quadrimaculata* (Pz.)		+		+	+
35.	*Eucera longicornis* (L.)	+			+	+
36.	*Thyreus orbatus* Lép.		+			
37.	*Bombus lucorum* (L.)	+	+	+	+	+
38.	*Bombus terrestris* (L.)	+	+	+	+	+
39.	*Bombus lapidarius* (L.)	+	+	+	+	+
40.	*Bombus pratorum* (L.)	+	+	+	+	+
41.	*Bombus jonellus* (K.)	+		+		+
42.	*Bombus pyrenaeus* Pér.	+	+	+		
43.	*Bombus hypnorum* (L.)	+		+	+	+
44.	*Bombus mastrucatus* Gerst.	+	+	+	+	+

continued table XII

No.	Name	Babia Góra Mt.	Foot part of Babia Góra	Tatra Mts.	Pieniny Mts.	The remaining ridges
45.	*Bombus soroeensis* (F.)	+	+	+	+	+
46.	*Bombus confusus* SCHENCK				+	+
47.	*Bombus hortorum* L.	+	+	+	+	+
48.	*Bombus ruderatus* (F.)				+	+
49.	*Bombus subterranaeus* (L.)	+	+	+	+	+
50.	*Bombus distinguendus* MOR.	+	+	+	+	+
51.	*Bombus pomorum* PZ.			+	+	+
52.	*Bombus elegans* SEIDL.	+		+	+	+
53.	*Bombus agrorum* (F.)	+	+	+	+	+
54.	*Bombus muscorum* (L.)	+				+
55.	*Bombus humilis* ILL.				+	+
56.	*Bombus silvarum* (L.)	+	+	+	+	+
57.	*Bombus equestris* (F.)	+	+		+	+
58.	*Bombus ruderarius* MÜLL.	+	+	+	+	+
59.	*Psithyrus rupestris* (F.)	+	+	+	+	+
60.	*Psithyrus campestris* (PZ.)	+	+	+	+	+
61.	*Psithyrus barbutellus* (K.)	+	+	+	+	+
62.	*Psithyrus vestalis* (GEOF. and FOURC.)	+	+	+	+	+
63.	*Psithyrus bohemicus* (SEIDL.)	+	+	+	+	+
64.	*Psithyrus silvestris* (LEP.)	+	+	+	+	+
65.	*Psithyrus norvegicus* SP.-SCH.	+		+	+	
66.	*Apis mellifica* L.	+	+	+	+	+

from the other ridges of West Beskids have been found, as well as 18 other species already known from some lower ridges. In those lower ridges have been found 29 species, which are unkown from Pieniny Mts.

2. The zoogeographic elements in the *Apoidea* fauna of the Babia Góra

There are no endemic species found in the Babia Góra. The high mountainous fauna is here represented only by a single species namely *Bombus pyrenaeus* PÉR., which is also known from the Tatra Mts. (NOSKIEWICZ, 1920; DYLEWSKA, 1958). It lives from above the lower line of the mountain forest zone to the tops of Tatra Mts. It has not been found neither in the Pieniny Mts. nor in the lower parts of Polish Carpathians, however, the mountain zone in those ridges is present. Moreover, *Bombus elegans* SEIDL. is treated as the mountainous element but it has not been found during my researches in the Babia Góra. This species is common in Pieniny Mts., and it has also been recorded from south-faced slopes in the whole of Poland. It has been found even

in Tatra Mts. [NOSKIEWICZ (1920) — one female from Hala Gąsienicowa] from the upper line of the mountain forest zone, however, the researches which have been pending by the present author on that terrain did not confirm its appearance (DYLEWSKA, 1958). Seemingly, *Bombus elegans* SEIDL., occurs rather in the sub-mountainous regions of the Polish Carpathians.

Numerous species found in the Babia Góra, are treated by STOECKHERT (1933) and AERTS (1960) as the boreo-alpine species. These are *Andrena rufi-crus* NYL., *A. lapponica* ZETT., *A. praecox* (SCOP.), *A. clarkella* (K.), *Halictus niger* VIER., *H. rufitarsis* ZETT., *Osmia parietina* CURT., *Megachile lapponica* THOMS., *Nomada leucophtalma* (K.), *N. glabella* THOMS., *Bombus hypnorum* (L.), *B. jonellus* (K.) and *B. mastrucatus* GERST. The belongness of these species to the boreo-alpine ones is incertain. PITTIONI (1942) working out the boreo-alpine species of the genera *Bombus* LATR. and *Psithyrus* LEP. did not list any of the above listed species. Also HOLDHAUS (1954) in his general work, did not include any of these into the list of boreo-alpine species. AERTS (1960) after GRÜNNWALDT treates these species as belonging to the eurosiberian element characteristic of the coniferous forests. On basis of new found places of the collecting, these species should be confessed as the species characteristic of the taiga or north-mountain species. The present author (1957) gave the places of the collecting of *Bombus hypnorum* (L.). They are spread all over the country and therefore there is no disjunction in the distribution of the species. The new data given by KARCZEWSKI (1962) from the surroundings of Jędrzejów (district Kielce) for *Andrena lapponica* ZETT. also confirm the above suggestion, however, the further researches can solve the problem discussed.

The submediterranean and subpontic species are comparatively a large group. These are *Megachile ericetorum* LEP., *Nomada saxfasciata* PZ., *Anthophora plagiata* ILL., *Ceratina cyanea* (K.), *Thyreus orbatus* LEP., and *Rhophites quin-quespinosus* SPIN. The occurence of these species in the foot part of the Babia Góra points out a great resistance for the climate conditions. The above listed species appear in dry and warm habitats in the whole of Poland to its northern parts including, and therefore it is a question, whether these could be treated as the above mentioned elements.

The remaining eighty-eight species, which have been collected on the Babia Góra and its foot parts are characterised by the wide distribution either in Europe or in the Palearctic Region. The majority of them belong to the species widely spread in Europe and Asia. These are *Colletes cunicularius* (L.), *Prosopis confusa* (NYL.), *P. communis* (NYL.), *Andrena tibialis* (K.), *A. humilis* IMH. *Halictus xanthopus* (K.), *H. quadricinctus* F., *H. rubicundus* (CHRIST), *H. tumu-lorum* (L.), *H. fulvicornis* (K.), *H. leucozonius* (SCHRANK), *H. villosulus* (K.), *H. calcaeatus* (SCOP), *H. albipes* (F.), *H. leucopus* (K.), *Sphecodes punctipes* THOMS., *Osmia rufa* (L.), *O. fulviventris* (PZ.), *O. coerulesces* (L.), *Nomada fer-ruginata* (L.), *N. flavoguttata* (K.), *Bombus terrestris* (L.). *B. lucorum* (L.), *B. pra-torum* (L.), *B. soroeensis* (F.), *B. hortorum* (L.), *B. subterraneus* (L.), *B. distin-*

guendus MOR., *B. agrorum* (F.), *B. muscorum* (L.), *B. silvarum* (L.), *B. equestris* (F.), *B. ruderarius* (MÜLL.), *Psithyrus rupestris* (F.), *P. campestris* PZ., *P. barbutellus* (K.), *P. bohemicus* (SEIDL), *P. silvestris* (LEP.) and *Apis mellifica* L.

Great number of the *Apoidea* of the Babia Góra are the European species (a part of them lives in the North Africa too). These are: *Prosopis hyalinata* SM., *Andrena bicolor* F., *A. hattorfiana* (F.), *A. albofasciata* THOMS., *Stellis minuta* LEP. et SERV., *Chelostoma florisomne* (L.), *Ch. maxillosum* (L.), *Ch. nigricorne* NYL., *Coelioxys rufescens* LEP., *Panurgus banksianus* (K.), *Nomada hillana* (K.), *N. fabriciana* (L.), *Clisodon furcatus* (PZ.), *Anthophora acervorum* (L.), *A. quadrimaculata* (PZ.), *Eucera longicornis* (L.) and *Bombus lapidarius* (L.).

Twenty-two of the *Apoidea* species of the Babia Góra belong to these of the fauna of the Northern and Central Europe (to this number the species living in the Northern Asia are added: *Andrena haemorrhoa* (F.), *A. fulvago* (CHRIST), *A. fucata* PZ., *A. subopaca* NYL., *A. saundersella* PERK., *A. minutula* (K.), *A. minutuloides* PERK., *A. pubescens baltica* ALFK., *A. jacobi* PKRK., *A. coitana* (K.), *A. ovatula* (K.), *A. wilkella* (K.), *Melitta haemorrhoidalis* (F.), *Dufourea vulgaris* SCHENCK, *Halictoides dentiventris* (NYL.), *Sphecodes hyalinatus* HAG., *Osmia leucomelaena* (K.), *O. leaiana* (K.), *O. bicolor* (SCHRANK), *Megachile willoughbiella* (K.), *Nomada flava* PZ., and *N. bifida* THOMS.

Two species, namely *Andrena alfkenella* PERK., and *Osmia villosa* THOMS. are distributed in Central Europe. The latter of these is distributed mainly in the mountains.

The species known from the Southern and Central Europe are also entering the Babia Góra terrain. These are *Prosopis sinuata* SCHENCK, *P. difformis* EV., *Andrena chrysosceles* (K.), *A. lathyri* ALFK., *Halictus minutus* (K.), *Osmia adunca* (PZ.) and *Bombus ruderatus* (F.).

The number of the species of the particular zoogeographic elements in the respective plant zones is shown in table XIII.

From table XIII it can be seen that in the foot part the majority of the species are those which are widely spreed in Europe and Asia (reaching about 35·4%). There is about 16·4% of the European species, 20% belongs to the fauna of the Northern and Central Europe, at last 11·8% of the species belong to the group called in the present paper as the „taiga species", the zoogeographic character of which is not fixed. The remaining elements are in small percent (by mean of few percent only). The species of the southern and south-eastern origin called in the table as submediterraean and subpontic ones are reaching about 5·5% (those species are limited to the north-faced slope in their distribution only). The species characteristic of the Southern and Central Europe reach about 6·4%, the Central European species about 2·7% and the mountain species 1·8%. In the lower mountain zone there is no termophilous species, however, one south-central European species occurs in here (that gives about 1·4%). The remainig elements appear here in rather similar percentage as in the foot part. In the lower mountain zone the most numerous are the euroasiatic species (about 44·6%). The percentage of these species increases

Table XIII

Element	The foot part		Lover mountain forest zone		Upper mountain forest zone		Dwarf pine zone		Alpine zone	
	number	%	number	%	number	%	number	%	number	%
Euro-Asiatic	39	35·4	33	44·6	15	60·0	9	50·0	4	57·1
European	18	16·4	11	14·9	1	3·8	1	5·6		
Central European	2	1·8	1	1·3						
South Central European	7	6·4	1	1·4						
North-Central European	23	20·9	14	18·9	4	16·0	3	16·6		
„Taiga"	13	11·8	12	16·2	4	15·3	4	22·2	2	28·6
Mountain	2	1·8	2	2·7	1	3·8	1	5·6	1	14·3
Submediterranean and subpontic	6	5·5								

usually with the altitude to the top part including, where reaches 57·1%. The European element, common in the lower mountain forest zone (about 14·9%) decidadly decreases its percentage to about 3·8% (a single species only). The North and Central European species, common in the lower mountain forest zone (14 species, about 18·9%), but in the upper mountain forest zone there are only 3 species (16·6%). Only 2 species live (about 11·0%) in the mughetum zone. One Central European species have been recorded from the mountain forest zone (1·3%) and only a single one from the dwarf pine region.

The percentage of the taiga and mountain species grows with the altitude. In the regio nivalis only three groups of the species are living viz., already discussed the euro-asiatic species, taiga species in about 28·6% and mountain species in about 14·3%.

VII. REMARKS ON THE HISTORY OF THE INHABITING THE BABIA GÓRA BY THE *APOIDEA*

The analyzis of the plant-mote done for Zubrzyca Górna (Stuchlikowa and Stuchlik, 1962) on the southern foot part of the Babia Góra and this done in other parts of the Polish Carpathians Mts. (Trela, 1928 and Środoń, 1959) as well as the history of the settlements (Broda, 1963) in the Babia

Góra terrains allow to give some theoretic claims dealing with the inhabiting of that terrain by the *Apoidea*.

The investigations done in the Carpathians shows the local distribution of *Bombus pyrenaeus* PÉR (NOSKIEWICZ, 1920; DYLEWSKA, 1958; KNECHTEL, 1939, 1954, 1955), in the highest parts in the ridges with the alpine zones. This species known also from the high European mountains most probably have had inhabited the Carpathians in the last or before last glaciation, so in Jungeror in Older Dryas, because in that period it was a possibility to surpass the terrains, which in the Holecen have had been inaccessible for it. The timber line in the Carpathians in those two glaciations have had been fixed at the altitude of 500 m above the sea level. REINING (1937) dealt with the history of the inhabiting of the Europe by the numerous bumble-bee species. As the conclusion of this theory one can suppose, that many species could enter the Carpathian Mts. in the Alleröd interstadial, because the timber line was fixed at the altitude of 1050 m above the sea level. In that period the pine tree (*Pinus silvestris* L.) and the willows (*Salix* L.) entered the Carpathians (ŚRODOŃ, 1959), and therefore the species visiting the willows (early spring species of the genus *Andrena* F.) could appear in the lowest parts of the Babia Góra. However, the majority of the *Apoidea* fauna entered the Babia Góra most probably in the Atlantic period (4000—2500 years before CHRIST). The timber line was occuring in that time higher than at present and the lower and upper mountain forest zones were established. It was a time of entering of the beech tree (*Fagus silvatica* L.) and fir tree (*Abies alba* MILL.). We can, however, suppose that the flora was poorer than that of to-day, as the mountain forest zone meadows were lacking and the foot parts were covered by the forests. So, many thermofilous species, known from the foot regions only, could not enter here before the general clearing, which happened about the middle of XIX century. Judging by the fact that the mown for grass meadows of the mountain forest zone are the most abundant in the *Apoidea* fauna of the Babia Góra, one can suppose that the fauna living only on those meadows could enter here after the settling of the man only, and before the beginning of the shepherds economy. The first traces of the man (on the terrain of present village Zubrzyca) have been realised on the base on the plant-mots analyzis for the beginning of the Subatlantic period (700 years before CHRIST), but strong development of that is started from XV and XVI centuries. That was a time in which the *Apoidea* could commonly enter the massif area.

It is noteworthy that the northern foot part is more abundant in the species of *Apoidea* than the southern one. As it is mentioned above, the *Apoidea* can find more suitable microclimatic conditions on the northern than on the southern slope, which is moister and boggy and cooling by the cold masses of the air descending mainly from Tatra Mts. This moisuring had come here in the subatlantic period, and then the thermofilous flora and fauna could resist in small pathes of the terrain. From that time the entering of the more thermofilous species from the southern side is theoreticaly closed. The deep valleys of the

northen foot part of the Babia Góra descending towards the walleys of the rivers Skawica and Raba to the lowest and warmest submountain regions of the Carpathians are now most probably the only way of entering the Babia Góra by the species.

Two groups of the *Apoidea* of the Babia Góra can be distinguished. The first is that which could inhabite this area since last glaciations and the second one entering here thanks to the results of the man economy from XVth or XVIth centuries. The first group lives in the whole of the examined territory, while the second only in the foot part and in the lowest parts of the meadows of the lower mountain forest mown for grass.

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STRESZCZENIE

Apoidea Babiej Góry, najwyższego wzniesienia (1724,6 m n. p. m.) Beskidu Wysokiego w Karpatach Zachodnich nie były dotąd szczegółowo badane. Wzmianki dotyczące żyjących tu gatunków znajdują się w pracach Kissa

i Olasza (1907) oraz Pawłowskiego (1963). Na podstawie pojedynczych okazów zebranych przez S. Stobieckiego, J. Bielewicza, J. Noskiewicza i J. Pawłowskiego oraz trzechletnich badań autorki wykazano 110 gatunków *Apoidea* na Babiej Górze. Cała podana liczba gatunków występuje w strefie podnóżowej objętej uprawą. W reglu dolnym Babiej Góry *Apoidea* prawie wyłącznie gromadzą się na polanach śródleśnych, porębach, przecinkach. W zespołach leśnych łowiono tylko nieliczne *Bombinae*, *Apis mellifica* L. i *Andrena lapponica* Zett. Ogółem w piętrze regla dolnego stwierdzono 76 gatunków. Do regla górnego wkracza 26 gatunków, które obserwowano prawie wyłącznie na polanach i przydrożach, a także w rzadszych drzewostanach. Ponad granicą lasu wykazano 18 gatunków, a w piętrze halnym 7 gatunków. Na badanym obszarze stwierdzono 3 wyraźnie zaznaczające się granice faunistyczne (graph No. 1): 1. w strefie uprawy znajduje się górna granica rozsiedlenia dla 33% gatunków znanych z Babiej Góry, 2. dolnej partii łąk kośnych regla dolnego na wysokości około 900 m n. p. m. nie przekracza ponad 50% gatunków, 3. na granicy między zwartą a płatową kosodrzewiną ubywa około 60% gatunków. Ponadto rozsiedlenie *Apoidea* na obu skłonach Babiej Góry jest różne. Piętro podnóżowe zboczy północnych jest bogatsze w gatunki od piętra podnóżowego zboczy południowych. Natomiast w reglu dolnym zboczy południowych zanotowano więcej gatunków, aniżeli w tej strefie zboczy północnych. W wyższych partiach wykazano znowu zjawisko odwrotne. Regiel górny i kosodrzewina zboczy północnych są bogatsze w faunę *Apoidea* od zboczy południowych.

Na podstawie analizy klimatu, środowisk oraz charakterystyki zoogeograficznej próbowano wytłumaczyć to skomplikowane rozsiedlenie *Apoidea* na Babiej Górze. Otóż z danych meteorologicznych wynika, że podnóże północne jest cieplejsze od podnóża południowego, łąki regli dolnych są natomiast silniej nagrzane na zboczach południowych niż na północnych. Skupienia gniazd na tych polanach obserwowano także na miejscach najcieplejszych, najlepiej nasłonecznionych i osłoniętych od wiatru ścianą lasu. Regiel górny zboczy południowych jest gęsto zarośnięty borem, a jego polany są zabagnione. Na zboczach północnych w tej strefie *Apoidea* znajdują więcej dogodnych miejsc do gnieżdżenia się na suchych polanach i przydrożach. *Apoidea* w strefie zwartej kosodrzewiny, nie znane z wyższych partii, gromadzą się prawie wyłącznie w karach, znajdujących się na zboczach północnych. Zbocza tych karów są osłonięte od wiatrów i zamurowione, stąd nagrzewają się silniej od połogich, narażonych na wiatry przestrzeni porośniętych zwartą kosodrzewiną na zboczach południowych. Górna partia kosodrzewiny zboczy północnych, piętro halne oraz kosodrzewina zboczy południowych charakteryzuje się obecnością tylko 7 gatunków *Apoidea*. Są to *Bombinae*, *Apis mellifica* L. i *Andrena lapponica* Zett.

Ze względu na porę pojawu wyróżniono trzy grupy *Apoidea* na Babiej Górze: wczesnowiosenne, późnowiosenne i letnie. W strefie podnóżowej Babiej Góry występują trzy grupy, w reglu dolnym podobnie, lecz ilość gatunków letnich spada o 74%, przy czym na zboczach północnych obserwowano tylko 1 gatunek

letni. W reglu górnym żyją prawie wyłącznie gatunki wczesnowiosenne, z późnowiosennych wykazano 3 gatunki w 1. lub 2. egzemplarzach. Lata w sensie klimatycznym w reglu górnym brak, nie ma tu także fauny letniej *Apoidea*. Powyżej granicy lasu występuje tylko fauna wczesnowiosenna *Apoidea*, której pojaw (około trzeciej dekady maja) obserwuje się około 5—6 tygodni później aniżeli w piętrze podnóżowym (graph No. 4).

Na Babiej Górze nie znaleziono gatunków endemicznych *Apoidea*. Wysokogórską faunę reprezentuje 1 gatunek, *Bombus pyrenaeus* Pér. 13 gatunków jest pochodzenia tajgowego, 6 gatunków charakteryzuje się większymi wymaganiami termicznymi (znaleziono je prawie wyłącznie na podnóżu północnym). Ostatnia grupa gatunków nie wkracza w obręb masywu. Najwięcej gatunków babiogórskich *Apoidea* ma szerokie rozsiedlenie w Europie i w Azji (39), w Europie (18), w Europie północnej i środkowej (22). Tylko 3 gatunki Babiej Góry z omawianej grupy należą do fauny Europy środkowej a 7 gatunków znanych z Europy południowej i środkowej częściowo wkracza w nielicznych egzemplarzach w najniższe partie regla dolnego. Granica lasu nie stanowi przeszkody dla gatunków z grupy *Apoidea*. W karach zboczy północnych, a więc w piętrze zwartej kosodrzewiny kończą swoje zasięgi wysokościowe gatunki europejskie, środkowoeuropejskie, północno-środkowoeuropejskie; pozostałe (europejsko-azjatyckie, o pochodzeniu tajgowym i wysokogórskie) wkraczają w partię szczytową Babiej Góry. Porównanie rozsiedlenia wysokościowego gatunków *Apoidea* Babiej Góry i Tatr wykazało w większości wypadków zgodność w poszczególnych strefach roślinnych z uwzględnieniem obniżenia granic florystycznych na Babiej Górze w porównaniu z Tatrami o około 150 m. Ogółem w Beskidzie Zachodnim Polski stwierdzono 236 gatunków *Apoidea*. W regle Babiej Góry wkracza 76 gatunków, a w Tatrach znaleziono w tej strefie jeszcze 14 gatunków, z czego 7 znane jest tylko z Tatr. W piętrze reglowym Beskidu Zachodniego żyje prawdopodobnie 90 gatunków. Pozostałe gatunki notowano z niższych partii, przy czym wyłącznie z Pienin wykazano 58 gatunków.

Faunę *Apoidea* Babiej Góry podzielono na dwie grupy. Pierwszą wykazano ponad granicą lasu, w rzadkich drzewostanach, na porębach śródleśnych i na łąkach reglowych, a drugą wyłącznie na łąkach w najniższych partiach regla dolnego. Pierwsza grupa mogła zasiedlać Babią Górę już od ostatnich zlodowaceń, natomiast drugą wprowadził najprawdopodobniej człowiek, wycinający polany dla wypasu bydła na tych terenach od XV—XVI w.

РЕЗЮМЕ

Apoidea Бабьей Горы, самой высокой возвышенности (1724,6 м. н. у. м.) в Бескиде Высоком в Западных Карпатах не были обстоятельно исследованы. О распространённых здесь видах вспоминает в своих работах Kiss & Olasz (1907), а также

Pawłowski (1963). На основании одиночных особей, найденных несколькими исследованиями (S. Stobiecki, M. Bielewicz, J. Noskiewicz и J. Pawłowski), а также на основании трёх личных исследований автора обнаружено на Бабьей Горе 110 видов *Apoidea*. Всё приведенное выше количество видов выступает в подножной обрабатываемой зоне. В нижнем лесном ярусе Бабьей Горы *Apoidea* почти всегда скапливаются на лесных полянах и вырубках. В лесистой части найденны только немногочисленные *Bombinae*,, *Apis mellifica* L. *Andrena lapponica* Zett. В общем в ярусе нижней зоны обнаружено 76 видов. До верхней зоны доходят 26 видов, которые были также обнаружены на полях, при дорогах а также в редколесье. За границей леса обнаружено также 18 видов, а в альпийской зоне 7 видов. На исследованной территории констатировано 3 ярко выраженных фаунистических границы (граф. 1): 1. в обрабатываемой зоне верхнюю границу расселения характеризуют 33% видов, 2. нижнюю партию косовых лугов нижего лесного яруса на высоте приблизительно 900 м. н. у. м. не переходят приблизительно 50% видов. 3. на границе между сомкнутыми и разбросанными зарослями карликовой сосны количество видов уменьшается приблизительно на 60%. Кроме того, расселение *Apoidea* на обоих склонах Бабьей Горы не одинаково. Подножная зона северных склонов богаче чем подножная зона южных склонов. Зато в нижней лесной зоне южных склонов обнаружено большее количество видов, чем в той же зоне южных склонов. В высших слоях обнаружено обратное явление. Фауна верхней лесной зоны и зоны карликовой сосны северных склонов богаче видами *Apoidea*, чем фауна южных склонов.

На основании анализа климата местоположений, а также зоогеографической характеристики пытались объяснить такое сложное размещение *Apoidea* на Бабьей Горе. На основании метеорологических данных северное подножье теплее южного, зато луга нижних лесных зон сильнее нагреты на южных склонах, чем на северных. Скопление гнезд наблюдалось в самых теплых местах, самых солнечных и закрытых от ветра лесной стеной. Верхняя лесная зона южных склонов гор густо обросла бором, а его поляны очень заболочены. На северных склонах в этой зоне *Apoidea* находят больше благоприятных условий для гнездования на сухих полянах и при дорогах. *Apoidea*, которые распространены в зоне карликовой сосны и которые известны в более высоких зонах скапливаются почти всегда в карах, находящихся на северных склонах. Стены этих каров закрыты от ветра, густо обросли травяной растительностью и поэтому сильнее нагреваются чем пологие, обросшие, карликовой сосной, которые подвержены ветрам на южных склонах. Верхний ярус карликовой сосны северных склонов, альпийская зона, а также зона карликовой сосны южных склонов характерны присутствием только 7 видов *Apoidea*. Это *Bombinae*, *Apis mellifica* L. и *Andrena lapponica* Zett.

Взявши во внимание период появления выделено 3 группы *Apoidea*: ранневесенние, поздневесенные и летние. В подножной зоне Бабьей Горы выступают все группы, в нижнем лесном ярусе также выступают почти все группы, только количество летних видов уменьшается на 74%, при чем на северных склонах наблюдается только 1 летний вид. В верхней лесной зоне находятся почти всегда ранневесенние виды, из поздневесенних обнаружено 3 вида по одному либо двум экзем-

плярам. В верхней лесной зоне почти нет лета (в климатическом смысле этого слова) и нет здесь летней фауны *Apoidea*. Выше лесной границы существует только ранневесенняя фауна появление которой (приблизительно 3-я декада мая) наблюдается приблизительно на 5—6 недель позже, чем в подножной зоне.

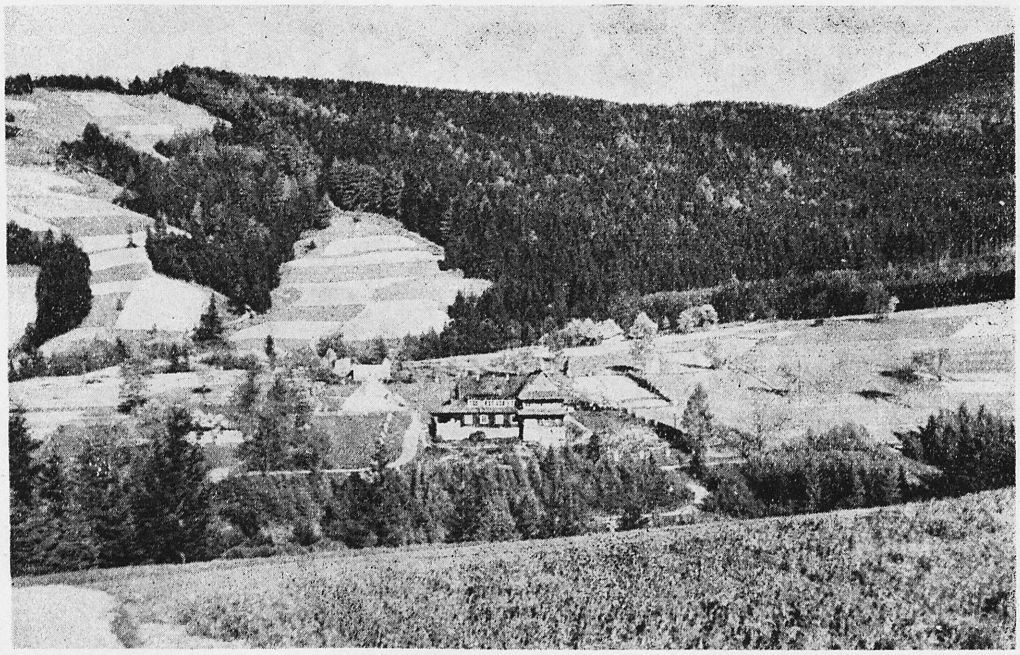
На Бабьей Горе не найдено эндемических видов *Apoidea*. Высокогорная фауна представлена одним видом, *Bombus pyrenaeus* PÉR. 13 видов являются видами таежного происхождения, 6 видов характеризуются увеличенными термическими требованиями, найдены они были почти исключительно в северной части подножья горы. Виды эти не входят в границы массива, Большинство видов *Apoidea*, найденных на Бабьей Горе, широко распространены также в Европе и Азии (39), в Европе (18), в Северной и Центральной Европе (22). Только 3 вида из вышеупомянутой группы Бабьей Горы пренадлежат к фауне Центральной Европы, 7 видов, известных в Южной и Центральной Европе, в небольшом количестве частично входят в самые низкие партии пояса гор. Лесная граница не является препятствием для видов группы *Apoidea*. В карах северных склонов в полосе сомкнутых карликовых сосен находится верхняя граница распространения европейских видов, центрально-европейских, северо-центрально-европейских, остальные (европейско-азиатские таежного происхождения и высокогорные) входят в вершинную полосу Бабьей Горы. Сравнение высотного распространения видов *Apoidea* Бабьей Горы и Татр в большинстве случаев обнаружило сходство в отдельных растительных зонах (взято во внимание обнижение флористических границ на Бабей Горе по отношению к Татрам прблизительно на 150 м.). В общем в Западном Бескиде Польши констатировано 236 видов *Apoidea*. В лесных зонах Бабьей Горы обнаружено 76 видов, в Татрах в таких же зонах найдено ещё 14 видов, 7 из которых известны только в Татрах, поэтому можно сказать, что в лесных зонах Западного Бескида распространено приблизительно 90 видов. Остальные виды были отмечены в более низких партиях, причем исключительно в Пенинах известно 58 видов.

Фауна *Apoidea* поделена на 2 группы. 1.-это выделенная группа, распространённая выше верхней границы леса, в редко разбросаных деревьях, на лесных вырубках и лугах, — 2-я группа охватывает исключительно луга и самые низкие партии нижней зоны гор. Первая группа могла заселить Бабью Гору во время последнего ледовикового периода, зато вторая группа вероятнее всего была внесена человеком при вырубке полян для пастбищ в XV—XVI веке.

Plate XII

Fig. 1. Foot area of the northern slopes. A fragment with House of Babia Góra National Park in Barańcowa Valley on the ground of Ryzowana. Photogr. by J. Zaremba.

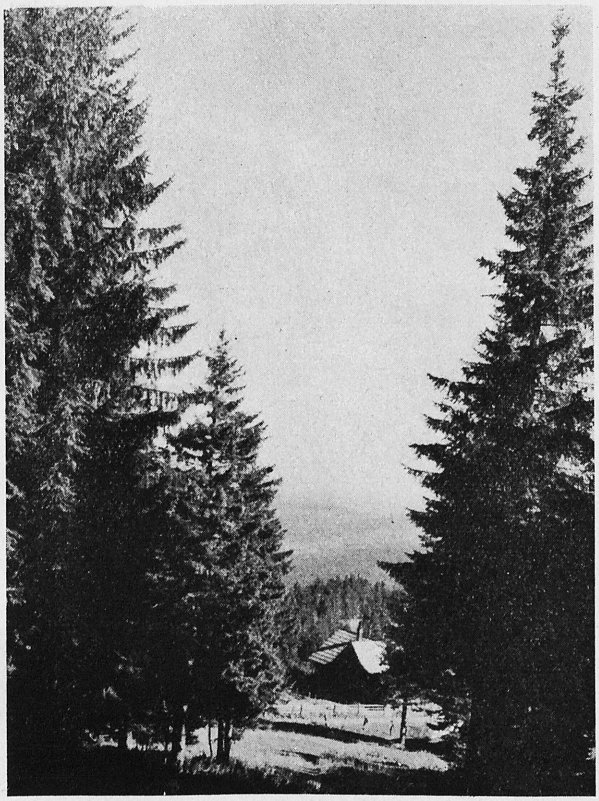
Fig. 2. Sulowa Cyrhla — a meadow in lower forest zone on the northern slope. The forest and top area partially above. Photogr. by J. Pawłowski.

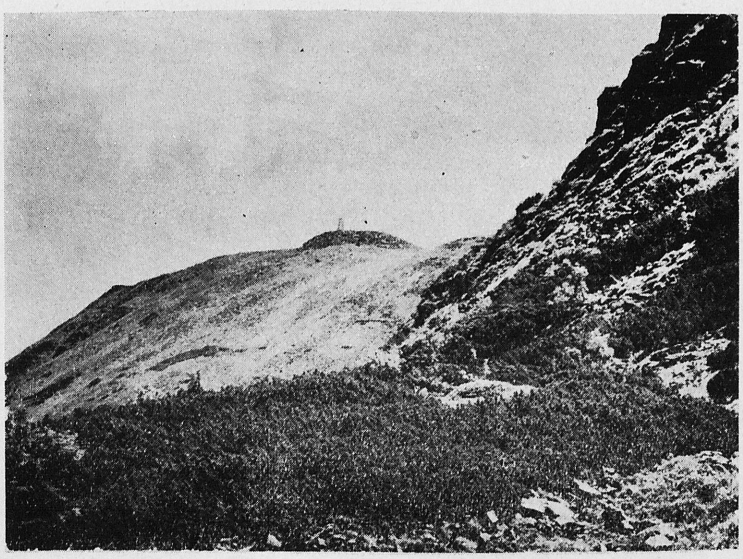


M. Dylewska

Plate XIII

Fig. 3. Markowe Szczawiny — a meadow in upper forest zone on the northern slope with spruces of the *Piceetum excelsae carpaticum* associacion. Photogr. by J. PAWŁOWSKI.
Fig. 4. Top area of Babia Góra Mt. with dwarf pine and alpine zone. Photogr. by T. WOJTERSKI.





M. Dylewska

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