Mirosława Dylewska

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 Śmreczyński (1936, 1950), Szymczakowski (1959) and Plisko (1962) contains also some data on the Lubiicidae, 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 endemics, 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 pyrenaicus Pép., 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 group 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 separate 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. Pawlowski 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 altitude of 1724,6 m above the sea level at Diabla. The latter mount together with Polica Range and Jalowieckie 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 Kościeleck (1620 m a.s.l.) and Diablik, then from the top of the range the crest descends gradually through smaller tops as Główniak (1617 m a.s.l.), Kępka (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 streams 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-Widly. 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 floric regions marked](image)

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 lish. 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 Krałowa, 8 — Gubernasówka, 9 — Hala Śmietanowa, 10 — Hala Śmietanowa Zubrzycka, 11 — Krowiarki, 12 — Diablak; Places of nesting: I — Barańcowa, II — Ryzowana, III — Palechówka, IV — Widelki, V — Zawoja Wileńska; 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 erosive 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 of the corries, there are the scree 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 fine-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 preferring 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 Góra, Kiezora, 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 incanum and the associations of tall-herbs and Betulo-Adenostyloetum and montainous meadows mown for grass (associations of Nardetum-Gladioloo-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 filicotetosum with Arthryrium 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 sylvatica 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 Śmietana, Hala Śmietanowa Zubrzycka, Gubenasówka, Kiczora and Przywarówka. Another hall, Hala Kalowa is situated at the altitude of about 1150 m a.s.l. In the spring mainly on the southern slopes flower Crocus siepusiensis 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 insulated places and among the stones removed from fields flower the wild strawberry (Fragaria vesca L.), Potentilla recta L. and Veronica L.

Above the timber line on the both slopes grow dense dwarf pine (association of Mugnetum carpathicum), which in the upper parts of this regio is limited to the small paths, 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 lawns 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 lawns with Pulsatilla alpina L., Sedum alpestre Vill., Polygonum bistorta L. and others ones.

Romer (1949) reconed the Babia Góra range among the country F, 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 southern slopes (Obrebska-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.
The moisture depends on the altitude and on the exposition. The year moisture 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 Pawlowski, 1962). Half of the total amount of the moisture 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 Pawlowski (1962) in the Kościółki carries 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 Jablonka 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>
<thead>
<tr>
<th>Locality</th>
<th>The quantity of the moisture in mm</th>
</tr>
</thead>
<tbody>
<tr>
<td>Zawoja</td>
<td>1142</td>
</tr>
<tr>
<td>Stańcowa</td>
<td>1086</td>
</tr>
<tr>
<td>Markowe Szczawiny</td>
<td>1409</td>
</tr>
<tr>
<td>Diablak</td>
<td>1509</td>
</tr>
</tbody>
</table>

Table II

<table>
<thead>
<tr>
<th>Locality</th>
<th>I</th>
<th>II</th>
<th>III</th>
<th>IV</th>
<th>V</th>
<th>VI</th>
<th>VII</th>
<th>VIII</th>
<th>IX</th>
<th>X</th>
<th>XI</th>
<th>XII</th>
</tr>
</thead>
<tbody>
<tr>
<td>Zawoja</td>
<td>-5-5</td>
<td>-5-4</td>
<td>-2-9</td>
<td>6-5</td>
<td>9-9</td>
<td>13-4</td>
<td>14-6</td>
<td>14-8</td>
<td>11-5</td>
<td>7-0</td>
<td>3-3</td>
<td>-5-4</td>
</tr>
<tr>
<td>Jablonka</td>
<td>-8-8</td>
<td>-8-5</td>
<td>-5-5</td>
<td>6-1</td>
<td>10-0</td>
<td>13-9</td>
<td>14-6</td>
<td>14-7</td>
<td>10-9</td>
<td>5-9</td>
<td>3-7</td>
<td>-7-8</td>
</tr>
<tr>
<td>Stańcowa</td>
<td>-6-5</td>
<td>-6-1</td>
<td>-3-7</td>
<td>4-7</td>
<td>8-7</td>
<td>12-8</td>
<td>14-2</td>
<td>14-3</td>
<td>10-7</td>
<td>6-3</td>
<td>3-8</td>
<td>-6-2</td>
</tr>
<tr>
<td>Markowe Szczawiny</td>
<td>-7-2</td>
<td>-7-7</td>
<td>-4-9</td>
<td>3-3</td>
<td>7-0</td>
<td>10-8</td>
<td>12-0</td>
<td>12-3</td>
<td>8-7</td>
<td>4-8</td>
<td>3-5</td>
<td>-6-8</td>
</tr>
<tr>
<td>Top region</td>
<td>-9-3</td>
<td>-7-6</td>
<td>-5-4</td>
<td>-1-8</td>
<td>4-5</td>
<td>7-3</td>
<td>8-6</td>
<td>7-5</td>
<td>5-6</td>
<td>2-9</td>
<td>-4-0</td>
<td>-6-0</td>
</tr>
</tbody>
</table>

It can be seen from the table II that the period from April to November is at the meteorological stations in Zawoja and Jablonka close to each another in the temperatures, however, Jablonka 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 Jablonka 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 Jablonka markedly cooler at the Stańcowa than at Zawoja and Jablonka, 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 Jablonka, 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-vernial period — from 0°C—5°C
- spring — from 5°C—15°C
- summer — above 15°C
- autumn — from 15°C—5°C
- late autumn — from 5°C—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>
<thead>
<tr>
<th>Season</th>
<th>Top area</th>
<th>Markowe Szczawiny</th>
<th>Stańcowa</th>
<th>Jablonka</th>
<th>Zawoja</th>
</tr>
</thead>
<tbody>
<tr>
<td>Early spring</td>
<td>10. V</td>
<td>1. V.</td>
<td>9. IV</td>
<td>5. IV.</td>
<td>1. IV.</td>
</tr>
<tr>
<td>Autumn</td>
<td>8. VIII.</td>
<td>15. VIII.</td>
<td>26. VIII.</td>
<td>26. VIII.</td>
<td></td>
</tr>
<tr>
<td>Late autumn</td>
<td>13. IX.</td>
<td>10. X.</td>
<td>20. X.</td>
<td>20. X.</td>
<td>21. X.</td>
</tr>
<tr>
<td>Winter</td>
<td>30. X.</td>
<td>25. XI.</td>
<td>30. XI.</td>
<td>27. XI.</td>
<td>28. XI.</td>
</tr>
</tbody>
</table>

In the top area (after OBRĘBSKA-STARKŁOWA, 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 begins 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 begins 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 begins the late autumn here. In the regio montana inferior at the southern slopes, the spring begins about the 15th April, the summer in first decade of July and lasts about 40 days. The late autumn begins here similarly as in the stations in Zawoja and Jablonka 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 Jablonka 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 systematically 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 lower mountain forest zone), northern slopes
IIa. The lower parts of the southern slopes of the lower 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 Góra 21. IV. 1964, ♂ on *Salix caprea L.*

Genus: *Prosopis* JURINE

1. *P. confusa* (NYLANDER)
   I. 18. VIII. 1879, ♀ leg. S. Stobięcki
   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)
   IIa. Hala Śmiertanowa 5. VII. 1963, ♀♀ on *Bellis L.*

4. *P. difformis* (EYERSMANN)
   I. Barańcowa 1. VII. 1963, ♀ ♂ on *Adenostyles alliarae* (GOUAN); 11. VIII. 1962, ♂♀ on *Campanula L.* — Zawoja Wilecza 25. VI. 1963, ♂ on *Echium vulgare L.*
5. P. hyalinata (Smith)

I. Markowe Rówieńki 17. VII. 1962, ♀ on Hieracium L.

Family: Andrenidae

Genus: Andrena Fabricius

1. A. pubescens baltica Alfken


IV. Izdebczyka 5. V. 1964, ♀ on Salix silesiaca Willd. — Kościółki 5. VI. 1964, ♀ on Salix silesiaca Willd.

2. A. tibialis (Kirby)

I. Widelki 30. IV. 1963, ♂ ♀ on Salix L.

IV. Izdebczyka 5. VI. 1964, ♀ ♀ on Salix silesiaca Willd.

3. A. haemorrhoea (Fabricius)


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. — Izdebczyka 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.


5. A. humilis (Imhoff)

I. This species nests 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., Ranunculus acer L., Leonotodon 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., Leonotodon L., Ranunculus 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 sylvaticum* L. Second generation from first decade of July to first days of September, on *Campanula* L. and *Echium vulgare* L.


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.


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 Szcawiny.

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 Mala 19. V. 1964, ♀ on *Vaccinium myrtillus* L.

II. IIIa. 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 have 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. Gubernaősówka 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. Zabrzecka 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.


IV. Izdebkowska 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* 1mh.

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. Zabrzecka 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 Zabrzecka 21. V. 1964, ♀ on *Salix* L. — Gubernasowska 20. IV. 1964, ♀ on *Tussilago farfara* L.

13. *A. alfenkella* (Perkins)


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

IIa. Gubernasowska 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.


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

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


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)


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

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

18. **A. hattoriifana** (FABRICIUS)

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

I. Baranówka 22. VII. 1962, ♀♂ ♀♂ on *Knautia kitaibelli* BORB.; 25. VI. 1963, ♀ — Ryżowana 20. VIII. 1962, ♂ on *Knautia kitaibelli* BORB.

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


20. **A. chrysoceles** (KIRBY)


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


II. Zawoja Góra 23. VII. 1962, ♀.

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


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


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

II. Hala Czarnego 11. VII. 1963, ♂.

24. **A. albofasciata** THOMSON

I. Baranówka 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)


Genus: *Panurgus* Panzer

1. *P. banksianus* (Kirby)

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


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

Family: *Halictidae*

Genus: *Halictus* (Latreille)

1. *H. quadricinctus* (Fabricius)


2. *H. rubicundus* (Christ)


3. *H. tumulum* (Linnaeus)


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


4. *H. xanthopus* (Kirby)


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.

IIa. 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
7. H. leucopus (Kirby)

I. In valleys of streams and on slopes to third decade of May on Taraxacum officinale Web., Hieracium L., Rumuneculus L. and Potentilla erecta L.


8. H. minutus (Kirby)

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


9. H. rufitarsis Zetterstedt


II. Czarna Cyrlha 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 dug up from a gravel (leg. J. Pawlowski), during hibernation. The species visits Salix L. Taraxacum officinale Web., Doronicum austriacum Jacq. and Hieracium L.


IIa. Glaides, sides of ways and forest clearings 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)


II. Sulowa Cyrlha 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 Kratowa 20. V. 1964, ♀♀ on Vaccinium myrtillus L.
12. *H. continentalis* Blüthgen

I. Zawojka Wilcza 25. VI. 1963, ♀♀ on *Hieracium* L.

13. *H. calceatus* (Scopoli)


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.


14. *H. alibipes* (Fabricius)


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., *Ranunculus acer* L., *Bellis perennis* L., *Potentilla erecta* (L.), *Cirsium Mill.*., *Rubus idaeus* L. and *Vaccinium myrtillus* L.

**Genus: Dufourea** Lepeletier

1. *D. vulgaris* Schenk


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

**Genus: Halictoides** Nylander

1. *H. dentiventris* (Nylander)


**Genus: Rhophites** Schenk

1. *R. quinquiespinosus* Spinola

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

Family: *Melittidae*

Genus: *Melitta* KIRBY

1. *M. haemorrhoidalis* (FABRICIUS)
I. Barańcowa 11 and 19. VIII. 1962, ♀♀ on *Campanula* L.

Family: *Megachiliidae*

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)

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.
II. Sulowa Cyrla 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.
IIa. Zubrzyca Górna 5. VII. 1963, ♂♂ on *Knautia Kitaibelli* BORB.; 6. VIII. 1962, ♂ on *Campanula* L.
II. Sulowa Cyrla 10. VII. 1963, ♀ on *Campanula* L.
Genus: _Osmia_ Panzer

1. _O. rufa_ (Linnaeus)

II. Sulowa Czarna 26. V. 1964, ♀ on the wall of wooden hut.

2. _O. parietina_ Curtis


3. _O. fulvicentrifus_ (Panzer)
   I. Zawoja Wilczna 1. VI. 1964, ♀ on _Syringa vulgaris_ L. — Palechówka 20. VII. 1962, ♀ ♀ on _Orium Mill._; 23. VII. 1962, ♀ on _Centaurea_ L.

4. _O. leianthus_ (Kirby)
   I. Palechówka 20. VII. 1962, ♀ on _Orium Mill._

5. _O. coerulescens_ (Linnaeus)
   Ia. Lipnica Mała 19. V. 1964, ♀♂ on the old tree.
   II. Czarna Czarna 24. VII. 1962, ♀ on the wooden wall hut.

6. _O. bicolor_ (Schrank)
   I. Barańcowa 7. V. 1964, ♀ on _Salix_ L.

7. _O. leucomeleana_ (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)

Genus: _Megachile_ Latreille

1. _M. willoughbiella_ (Kirby)
   I. Palechówka 20. and 25. VII. 1962, ♀♂ on _Lotus corniculatus_ L.

2. _M. lapponica_ Thomson
   New species for Polish Carpathians.
3. *M. ericetorum* LEPELETIER

I. Zawoja Wilczna 29. V. 1963, ♂ on *Geranium sylvaticum* 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* PANTZER

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

2. *N. hillana* (KIRBY)

I. Palechówka 25. VII. 1962, ♀.


II. Sulowa Cyrlha 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 Cyrlha 18. IV. 1964, ♂ on *Crocus scepusiensis* BORB.

4. *N. glabella* THOMSON

II. Sulowa Cyrlha 8. V. 1964, ♀♀ on *Salix* L. — Dejakowe Szczawiny 27. V. 1964, ♂ 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 Diabłąk 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, ♀.


II. Sulowa Cyrlha 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)

7. *N. bifida* Thomson


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


III. Markowe Szczawiny Niżne 4. VI. 1963, ♀ on Potentilla aurea L.

8. *N. flavoguttata* (Kirby)


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.


9. *N. fabriciana* (Linnaeus)


**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.


2. *A. plagiata* (Illiger)


3. *A. quadrimaculata* (Panzer)

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


**Genus: Clisodon Patton**

1. *C. furcatus* (Panzer)

Genus: *Thyreus* Panzer

1. *T. orbatus* Lepeletier

1. Barańcowa 11. VIII. 1962, ♀ on *Campanula* L.

Genus: *Ceratina* Latreille

1. *C. cyanea* (Kirby)


Genus: *Bombus* Latreille

1. *B. terrestris* (Linnaeus)

Babia Góra J. Kiss and K. Ołasz (1907).


IIa. The border of the forest near Lipnica Mala 8. VIII. 1962, ♂.


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.

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.


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

3. *B. lapidarius* (Linnaeus)

Babia Góra, J. Kiss and K. Ołasz (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.

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 scopusiensis Borr., 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 scopusiensis Borr., 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 Góra 6. VIII. 1962, ♀ ♂ on Trifolium L. — border of the forest near Lipnica Mała 8. VIII. 1962, ♀ on Rubus L.


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. pyrenaicus 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. Ia. 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.


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


IVa. Diabłąk 20. VII. 1960, ♀ ♀ (leg. J. Pawlowski); 4. VII. 1963, ♂ ♀ on Rubus L.

IV. Diabłąk 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 Plaj 18. V. 1964, ♀ — Czarna Cyrhla 19. VI. 1963, ♀ ♀ on Hieracium L.


III. Sokoliczka 5. VI. 1963, ♀ on Vaccinium myrtillus L.


8. B. mastrucatus Gerstaecker

Babia Góra J. Kiss and Olsz (1907)

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


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

IV. Sokolićzka 2. VIII. 1962, ♀ ♀ ♀ on Vaccinium myrtillus L.

9. B. soroensis soroensis (Fabricius)

Babia Góra, J. Kiss and K. Olsz (1907).

Babia Góra 4. VII. 1895, ♂ ♀ leg. S. Stobiecki.


9a. B. soroensis proteus Gerstaecker


10. B. hortorum (Linnaeus)


II. Cyl 31. V. 1963, ♀ on Vaccinium myrtillus L.

11. B. subterraneus (LINNAEUS)

II. Hala Czarnego 12. VIII. 1962, ♂.
III. Hala Mędrzalowa 10. VIII. 1962, ♂ on Doronicum austriacum JACQ.
IV. Kościółki 5. VI. 1964, ♀ on Salix spinosa L.; 11. IX. 1962, ♂♂ on Adenostyles alliariae KERN. — Sokolica 2. VIII. 1962, ♂ on Vaccinium myrtillus L.

12. B. distinquendus MORAWITZ

IIa. Gubranowicka 9. VIII. 1962, ♂ on Centaurea L.

13. B. elegans SEIDL

Babia Góra J. Kiss and K. OLSZ (1907)

14. B. agrorum (FABRICIUS)

Babia Góra J. Kiss and K. OLSZ (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 BORK., Primula elatior (L.), Vaccinium myrtillus L., Rubus idaeus L. and etc.
II. Ia. 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. OLSZ (1907)

16. B. silvarum (LINNAEUS)

I. Barańcowa 23. IV. 1963, ♀ on Primula elatior (L.); 22. VII. 1962, ♀.
IIa. Gubranowicka 8. VIII. 1962, ♀♀ on Centaurea L.

17. B. equestris (FABRICIUS)

I. Markowa 31. V. 1963, ♀ on Taraxacum officinale WEB.
Ia. Zabrzyca Górna 6. VIII. 1962, ♀ ♀♀; 29. VII. 1962, ♀ on Trifolium L.

18. B. ruderarius (MÜLLER)

Southern slope of Babia Góra 4. VII. 1895, ♀ leg. S. STOBIECKI.
Genus: *Psithyrus* LEPETETIER

1. *P. rupestris* (Fabricius)

   Babia Góra J. Kiss and K. Ołasz (1907).

   I. Markowa 10. IX. 1962, ♂♂.


   IV. Kościołki 11. IX. 1962, ♂♂ on *Adenostyles alliariae* Kern.

2. *P. campestris* (Pantzer)


3. *P. barbutellus* (Kirby)

   Babia Góra J. Kiss and K. Ołasz (1907).


   II. Czarna Cyryła 31. V. 1963, ♀ on *Taraxacum officinale* Web.

   IIa. Hała Śmietanowa 27. VII. 1962, ♂♂ on *Trifolium L.* — Forest clearing 8. VIII. 1962, ♀ on *Cirsium L.*

   IV. Kościołki 11. IX. 1962, ♂.

4. *P. bohemicus* (Seidl)


   II. Dolny Płaj 18. V. 1964 ♀ — Czarna Cyryła 24. VII. 1962, ♀ on *Hieracium L.*


5. *P. silvestris* (Lepeletier)


   II. Dolny Płaj 18. V. 1964, ♀ on *Vaccinium myrtillus* L.


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 Pawlowski. 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**
**Andrenidae 26**
**Halictidae 19**
**Melittidae 1**
**Megachilidae 18**
**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>
<thead>
<tr>
<th>Floristic region</th>
<th>Colletidae</th>
<th>Andrenidae</th>
<th>Halictidae</th>
<th>Melittidae</th>
<th>Megachilidae</th>
<th>Apidae</th>
<th>Totally</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>6</td>
<td>24+2</td>
<td>16+3</td>
<td>1</td>
<td>16+2</td>
<td>37+3</td>
<td>110</td>
</tr>
<tr>
<td>II</td>
<td>3</td>
<td>19+2</td>
<td>13</td>
<td>—</td>
<td>6</td>
<td>30+1</td>
<td>74</td>
</tr>
<tr>
<td>III</td>
<td>—</td>
<td>8+2</td>
<td>1</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>15</td>
</tr>
<tr>
<td>IV</td>
<td>—</td>
<td>5</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>13</td>
</tr>
<tr>
<td>V</td>
<td>—</td>
<td>1</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>6</td>
<td>7</td>
</tr>
</tbody>
</table>

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 decrees 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 rupestris (Nyl.) A. minutula (K.), A. chrysoseceles (K.), A. jacobi Perk., A. hattorjiana (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 hattorjiana (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 Im., A. clarkella (K.), A. alfkenella Perk. and A. coitana (K.). The species Andrena albofasciata Thoms. (13) 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 Cyrha (cultivated meadow at the altitude of about 850 m a. s.l.) on the northern slope. Three species, namely Andrena ovata (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 the limit of the forest. They are: Andrena pubescens baltica ALFKEN, A. tibialis (K.), A. haemorrhhoa (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 haemorrhhoa (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 quadripectus* (F.) *H. rubicundus* (Christ), *H. continentalis* Blüthgen *Halictoides dentiventris* (Nyl.), *Rhophites quinquespinosus* Spin. and *Sphecodes punctipes* Thoms.

First of these 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 dentiventris* (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 Mala, 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 tumiturum* (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 leucocorinius* (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.), *Dufoura vulgaris* Schenck and *Sphecodes hyalinatus* Hâg. *Halictus leucopus* (K.) occurs in the Babia Góra most probably to the lower parts of the cultivated meadows on the both sides. *Halictus rufovaris* 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 florisomone* (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 Czyhla (900 m a. s. l., northern slope). The specimens of *Chelostoma florisomone* (L.) have been realised at the same place during great swarming of the males, while the remaining species have been collected in the singular 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. leiana* (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 coerulea* (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 cyannea* (K.).

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

*Anthophora acerorum* (L.) and *Anthophora quadriraculata* (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 bumble-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 pyreneckus PÉR. has been collected in the areas of the cultivated fields but only near the forest to one kilometer 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. aequorstris (F.) and Psithyrus campestris (PZ.).

Bombus soroecensis (F.) has been only collected in the southern slopes in regio montana inferior in several places to the forest's limit and Bombus soroecensis soroecensis (F.) in the foot region in the lower 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. pyreneckus 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. lower 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 Noskiwick 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%).

![Graph of the vertical distribution of the Apoidea on the Babia Góra](image)

![Graph of the vertical distribution of the Aculeata of the Tatra Mts. after Noskiwick](image)

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>
<thead>
<tr>
<th>No.</th>
<th>Name</th>
<th>Babia Góra Mt.</th>
<th>Tatra Mts.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>I</td>
<td>II</td>
</tr>
<tr>
<td>1.</td>
<td><em>Panurgus banksianus</em> (K.)</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>2.</td>
<td><em>Trachusa byssina</em> (Pz.)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.</td>
<td><em>Chelostoma nigricorne</em> NTL.</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>4.</td>
<td><em>Chelostoma florissone</em> (L.)</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>5.</td>
<td><em>Chelostoma maxillosum</em> (L.)</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>6.</td>
<td><em>Osmia ruja</em> (L.)</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>7.</td>
<td><em>Osmia villosa</em> Schenck</td>
<td>+</td>
<td></td>
</tr>
<tr>
<td>8.</td>
<td><em>Osmia adunca</em> (Pz.)</td>
<td>+</td>
<td></td>
</tr>
<tr>
<td>9.</td>
<td><em>Osmia fulviceps</em> (Pz.)</td>
<td>+</td>
<td></td>
</tr>
<tr>
<td>10.</td>
<td><em>Bombus terrestris</em> (L.)</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>11.</td>
<td><em>Bombus lucorum</em> (L.)</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>12.</td>
<td><em>Bombus lapidarius</em> (L.)</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>13.</td>
<td><em>Bombus pratorum</em> (L.)</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>14.</td>
<td><em>Bombus jonellus</em> (K.)</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>16.</td>
<td><em>Bombus hypnorum</em> (L.)</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>18.</td>
<td><em>Bombus soroeensis</em> (F.)</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>19.</td>
<td><em>Bombus hortorum</em> (L.)</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>20.</td>
<td><em>Bombus subterraneus</em> (L.)</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>21.</td>
<td><em>Bombus distinguendus</em> Mor.</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>22.</td>
<td><em>Bombus agrorum</em> (F.)</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>23.</td>
<td><em>Bombus silvarum</em> (L.)</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>24.</td>
<td><em>Bombus equestris</em> (F.)</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>26.</td>
<td><em>Psithyrus rupestris</em> (F.)</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>27.</td>
<td><em>Psithyrus campestris</em> (Pz.)</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>28.</td>
<td><em>Psithyrus barbutellus</em> (K.)</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>29.</td>
<td><em>Psithyrus bohemicus</em> (SEIDL)</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>30.</td>
<td><em>Psithyrus silvestris</em> (Lep.)</td>
<td>+</td>
<td>+</td>
</tr>
</tbody>
</table>
The table V clearly shows that the majority of the species of the genera *Bombus* L. 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 pyranaeus* Pér. 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.

![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.](image)

*Bombus pyranaeus* 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: \textit{Halictus quadricinctus} (F.), \textit{Chelostoma maxillosum} (L.), \textit{Osmia villosa} (Schenck) and \textit{O. fulvicincta} (Pz.).

A quite different phenomenon has been observed in the regio montana inferior on the cultivated meadows. So, 19 species enter only to lower 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 \textit{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: \textit{Panurgus banksianus} (K.), \textit{Bombus silvarum} (L.), \textit{B. equestris} (F.) and \textit{Halictus villosus} (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 \textit{Megachilidae}: \textit{Chelostoma florisomme} (L.), \textit{Chelostoma nigricorne} Nyl., \textit{Osmia rufa} (L.), \textit{O. coerulescens} (L.) and \textit{Eucera longicornis} (L.).

In the regio montana superior on the both slopes live 26 species. Of this amount only \textit{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 \textit{Bombus Latr.} known from the regio mugheiti 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 \textit{Andrena F.}, \textit{Nomada Scop.} and \textit{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 mountain 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 seepusiensis* BORR. (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* WARB., *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* BORR., *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>
<thead>
<tr>
<th>Floristic region</th>
<th>Vernal species</th>
<th>Late spring species</th>
<th>Summer species</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>number</td>
<td>%</td>
<td>number</td>
</tr>
<tr>
<td>Foot area</td>
<td>41</td>
<td>100</td>
<td>28</td>
</tr>
<tr>
<td>Regio montana inferior</td>
<td>32</td>
<td>78</td>
<td>15</td>
</tr>
<tr>
<td>Regio montana superior</td>
<td>22</td>
<td>54</td>
<td>3</td>
</tr>
<tr>
<td>Regio mugheti</td>
<td>18</td>
<td>44</td>
<td></td>
</tr>
<tr>
<td>Regio nivalis</td>
<td>7</td>
<td>17</td>
<td></td>
</tr>
</tbody>
</table>

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 points are for the regio montana inferior interrupte to distinguish from the constant lines concerning remaining floristic regions. The period of active life 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 mugheiti 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 comparison 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 Lepe., 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 largeness 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 reaechest 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. ruderarius (MÜLL.), B. silvarum (L.), B. distinctusus 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 carpathicum, 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. pyrenaicus 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 myrtiletosum, 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 Mugnetum 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 Mugnetum 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 hirsutii, Caricetalia fuscæ and Caricetalia davallianæ are visited by following bumbles only: B. lucorum (L.), B. pratorum (L.), B. pyrenaicus 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. Aconitenum 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 kabikiani*, the tall-herb associations of the upper parts of the regio mugheti. Only the *Bombus*-species known from the regio nivalis of the Babia Górá have been observed here.

4. *Rumicetum alpini* known from the mountain forest zones accumulate the *Bombiniace* fauna of those regions, mentioned for the association of *Abieti-Piceetum montanum*. Alsó *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 *Petasisites 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. *Calamangrosteteum villosoae*, known from the regio mugheti is visited by bumblebees of the top parts of the Babia Górá.

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

1. *Versicoloreteum babiogorense*, growing on the rock shelves and crevices of the northern steep slopes of the Babia Górá, is visited by the bumble-bees of the regio nivalis.

2. *Umbilicariceetum cylindricae*, the association of the rock algae is completely dispossessed of the *Apoidea* fauna; only accidentally the bumblebees have been observed.

3. *Vaccinietum myrtilli* is inhabited by the species known from the regio nivalis of the Babia Górá and *Nomada glabella* THOMS. and the species of the genus *Andrena* F. known from the regio mugheti of the northern slopes.

4. *Erperto-vaccinietum* agglomerates the *Bombiniace* 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 Górá.

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), because of the very small areas in the territory of the Babia Górá 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:


Halictus villosulus (K.), H. leucopus (K.), H. niger Vier., H. fulvicornis (K.), H. calacatus (Scop.), H. albipes (F.), Sphecodes hyalinatus Hag., Dufourca vulgaris Schenck., Nomada flavoguttata (K.), Apis mellifica and Bombus Latr. from mountain forest zones.

3. The species collected on Rubus idaeus L. [Andrena fuscata Smith, Nomada hillana (K.), Apis mellifica L. and Bombus Latr. from mountain forest 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 Thom. collected on Chamaenerion angustifolium (L.).

The meadow association Gladiolo-agrostetum the most abundant 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. afkenella Perk., A. minutuloides Perk., Halictus tumulorum (L.), H. minutus (K.), H. rufitarsis Zett., Nomada flavca Pr., N. bifida Thom., N. fabriciana (L.), Andrena humulis Imm. 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. albifasciata Thom. 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 differentiatiated. 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 occurrence 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 Baraćowa valley at the altitude of 700 m a. s. l. That small area is hidden from the vest by the crest of Burdyłow 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 (Dy-lewiska, 1958) are active at the temperature of 13°C, while some species of the genera *Andrena* F. and *Nomada* Scop. appear when the temperature increases to 21°C. All the species observed in that time are visiting the willows 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 Widelki (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 Jalowieckie 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 an agglomeration of the *Apoidea* (No. V) has been observed in Zawoja Wilezna, at the bottom of the Jalowiecki 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 occurring 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 warmest 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 Cyrla 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* LmH. 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 *Vaccinium 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 unveiled, 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 (Obrebska-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 bumble-
s 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 myr-
tillus 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. Paw-
lowksi (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., Gubalówka Hills, Sądecki Beskid, Bory Nowotarskie, Niski Beskid, loess-Pogórze and flish-Pogórze. Non of these subdistricts except for the Babia Góra have been worked out in details. In several publication (Wierzejski, 1868, 1874; Śnieżek, 1910; Niskiewicz, 1920; Krysiński, 1957; Dylewska, 1958) there are, however, some data concerning the mentioned subdistricts. Because of too scarce 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 Niskiewicz, 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>
<thead>
<tr>
<th>No.</th>
<th>Name</th>
<th>Babia Góra Mt.</th>
<th>Foot part of Babia Góra</th>
<th>Tatra Mts.</th>
<th>Pieniny Mts.</th>
<th>The remaining ridges</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Colletes daviesanus Sm.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>+</td>
</tr>
<tr>
<td>2.</td>
<td>Colletes cunicularius (L.)</td>
<td></td>
<td></td>
<td>+</td>
<td></td>
<td>+</td>
</tr>
<tr>
<td>3.</td>
<td>Colletes nasutus Sm.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>+</td>
</tr>
<tr>
<td>5.</td>
<td>Prosopis confusa (Nyl.)</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td></td>
<td>+</td>
</tr>
<tr>
<td>6.</td>
<td>Prosopis variegata (F.)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>+</td>
</tr>
<tr>
<td>7.</td>
<td>Prosopis brevicornis (Nyl.)</td>
<td></td>
<td></td>
<td>+</td>
<td></td>
<td>+</td>
</tr>
<tr>
<td>8.</td>
<td>Prosopissinuata Schenck</td>
<td></td>
<td></td>
<td>+</td>
<td></td>
<td>+</td>
</tr>
<tr>
<td>9.</td>
<td>Prosopis annulata (L.)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>+</td>
</tr>
<tr>
<td>10.</td>
<td>Prosopis communis (Nyl.)</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td></td>
<td>+</td>
</tr>
<tr>
<td>11.</td>
<td>Prosopis angustata Schenck</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>+</td>
</tr>
<tr>
<td>12.</td>
<td>Prosopis nigrita (F.)</td>
<td></td>
<td></td>
<td>+</td>
<td></td>
<td>+</td>
</tr>
<tr>
<td>13.</td>
<td>Prosopis difformis Ev.</td>
<td></td>
<td></td>
<td>+</td>
<td></td>
<td>+</td>
</tr>
<tr>
<td>14.</td>
<td>Prosopis annularis (K.)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>+</td>
</tr>
<tr>
<td>15.</td>
<td>Prosopis cornuta (Curt.)</td>
<td></td>
<td></td>
<td>+</td>
<td></td>
<td>+</td>
</tr>
<tr>
<td>16.</td>
<td>Prosopis hyalinata (Sm.)</td>
<td>+</td>
<td>+</td>
<td></td>
<td></td>
<td>+</td>
</tr>
</tbody>
</table>
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 unknown 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 (Krysinski, 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. oevatula (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 Alffken 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 Alffken, which besides the foot part of the Babia Góra has been collected in Rabia 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 Ska-wica 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 approximately 60% of the Polish fauna of this group.
<table>
<thead>
<tr>
<th>No.</th>
<th>Name</th>
<th>Babia Góra Mt.</th>
<th>Foot part of Babia Góra</th>
<th>Tatra Mts.</th>
<th>Pieniny Mts.</th>
<th>The remaining ridges</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td><em>Andrena morio</em> Brullé</td>
<td>+</td>
<td></td>
<td>+</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.</td>
<td><em>Andrena carbonaria</em> (L.)</td>
<td>+</td>
<td></td>
<td>+</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.</td>
<td><em>Andrena cineraria</em> (L.)</td>
<td>+</td>
<td></td>
<td>+</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4.</td>
<td><em>Andrena agilissima</em> (Scop.)</td>
<td>+</td>
<td></td>
<td>+</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5.</td>
<td><em>Andrena vaga</em> Pz.</td>
<td>+</td>
<td></td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>6.</td>
<td><em>Andrena thoracina</em> (F.)</td>
<td>+</td>
<td></td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>7.</td>
<td><em>Andrena pubescens</em> (Oliv.)</td>
<td></td>
<td></td>
<td>+</td>
<td>+</td>
<td></td>
</tr>
<tr>
<td>8.</td>
<td><em>Andrena libialis</em> (K.)</td>
<td>+</td>
<td></td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>9.</td>
<td>*Andrena haemorrhoid (F.)</td>
<td>+</td>
<td></td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>10.</td>
<td><em>Andrena fulvago</em> (Christ)</td>
<td>+</td>
<td></td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>12.</td>
<td><em>Andrena nudigaster</em> Alfken</td>
<td></td>
<td></td>
<td>+</td>
<td></td>
<td></td>
</tr>
<tr>
<td>13.</td>
<td><em>Andrena taraxaci</em> Gir.</td>
<td>+</td>
<td></td>
<td>+</td>
<td>+</td>
<td></td>
</tr>
<tr>
<td>14.</td>
<td><em>Andrena bicolor</em> F.</td>
<td>+</td>
<td></td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>15.</td>
<td>*Andrena rufius * Nyl.</td>
<td></td>
<td></td>
<td>+</td>
<td></td>
<td>+</td>
</tr>
<tr>
<td>16.</td>
<td><em>Andrena helvola</em> (L.)</td>
<td>+</td>
<td></td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>17.</td>
<td><em>Andrena lapponica</em> Zett.</td>
<td>+</td>
<td></td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>18.</td>
<td><em>Andrena praeceps</em> Scop.</td>
<td>+</td>
<td></td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>19.</td>
<td><em>Andrena fusca</em> Sm.</td>
<td>+</td>
<td></td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>20.</td>
<td><em>Andrena clarkella</em> (K.)</td>
<td>+</td>
<td></td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>21.</td>
<td><em>Andrena apicata</em> Sm.</td>
<td>+</td>
<td></td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>22.</td>
<td><em>Andrena nova</em> (K.)</td>
<td>+</td>
<td></td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>25.</td>
<td><em>Andrena subopaca</em> Nyl.</td>
<td>+</td>
<td></td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>27.</td>
<td><em>Andrena minutula</em> (K.)</td>
<td>+</td>
<td></td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>29.</td>
<td><em>Andrena marginata</em> F.</td>
<td>+</td>
<td></td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>31.</td>
<td><em>Andrena halltorfiana</em> (F.)</td>
<td>+</td>
<td></td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>32.</td>
<td><em>Andrena jakobi</em> Perk.</td>
<td>+</td>
<td></td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>33.</td>
<td><em>Andrena rosae</em> Pz.</td>
<td>+</td>
<td></td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>34.</td>
<td><em>Andrena curvungula</em> Thoms.</td>
<td>+</td>
<td></td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>35.</td>
<td><em>Andrena pauquisquama</em> Nosk.</td>
<td>+</td>
<td></td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>36.</td>
<td><em>Andrena rufizona</em> Imh.</td>
<td>+</td>
<td></td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>37.</td>
<td><em>Andrena liabialis</em> (K.)</td>
<td>+</td>
<td></td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>38.</td>
<td><em>Andrena schencki</em> Mör.</td>
<td>+</td>
<td></td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>39.</td>
<td><em>Andrena flavipes</em> Pz.</td>
<td>+</td>
<td></td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>40.</td>
<td><em>Andrena nigriceps</em> (K.)</td>
<td>+</td>
<td></td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>41.</td>
<td><em>Andrena fusipes</em> (K.)</td>
<td>+</td>
<td></td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>42.</td>
<td><em>Andrena denticulata</em> (K.)</td>
<td>+</td>
<td></td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>43.</td>
<td><em>Andrena nitidiuiscula</em> Schenck</td>
<td>+</td>
<td></td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>44.</td>
<td><em>Andrena chrysocephelis</em> (K.)</td>
<td>+</td>
<td></td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>45.</td>
<td><em>Andrena coliana</em> (K.)</td>
<td>+</td>
<td></td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
</tbody>
</table>
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. tumultorum (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 (FAIR.) 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 occurring 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 lower 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>
<thead>
<tr>
<th>No.</th>
<th>Name</th>
<th>Babia Góra Mt.</th>
<th>Foot part of Babia Góra</th>
<th>Tatra Mts.</th>
<th>Pieniny Mts.</th>
<th>The remaining ridges</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td><em>Halictus quadricinctus</em> (F.)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>+</td>
</tr>
<tr>
<td>2.</td>
<td><em>Halictus rubicundus</em> (CHRIST)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>+</td>
</tr>
<tr>
<td>3.</td>
<td><em>Halictus eurygnatus</em> Blüthgen</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>+</td>
</tr>
<tr>
<td>4.</td>
<td><em>Halictus simplex</em> Blüthgen</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>+</td>
</tr>
<tr>
<td>5.</td>
<td><em>Halictus maculatus</em> Sm.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>+</td>
</tr>
<tr>
<td>6.</td>
<td><em>Halictus tumulorum</em> (L.)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>+</td>
</tr>
<tr>
<td>7.</td>
<td><em>Halictus xanthopus</em> (K.)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>+</td>
</tr>
<tr>
<td>8.</td>
<td><em>Halictus nitidus</em> (Pz.)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>+</td>
</tr>
<tr>
<td>9.</td>
<td><em>Halictus quadrirotatus</em> (K.)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>+</td>
</tr>
<tr>
<td>10.</td>
<td><em>Halictus lativentris</em> (SCHENCK)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>+</td>
</tr>
<tr>
<td>11.</td>
<td><em>Halictus leucozonius</em> (SCHRANK)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>+</td>
</tr>
<tr>
<td>12.</td>
<td><em>Halictus villosulus</em> (K.)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>+</td>
</tr>
<tr>
<td>13.</td>
<td><em>Halictus leucopus</em> (K.)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>+</td>
</tr>
<tr>
<td>14.</td>
<td><em>Halictus tarsatus</em> SCHENCK</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>+</td>
</tr>
<tr>
<td>15.</td>
<td><em>Halictus intermedius</em> SCHENCK</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>+</td>
</tr>
<tr>
<td>16.</td>
<td><em>Halictus lucidulus</em> (SCHENCK)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>+</td>
</tr>
<tr>
<td>17.</td>
<td><em>Halictus minutus</em> (K.)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>+</td>
</tr>
<tr>
<td>18.</td>
<td><em>Halictus rufilarsis</em> ZETT.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>+</td>
</tr>
<tr>
<td>19.</td>
<td><em>Halictus niger</em> VIER.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>+</td>
</tr>
<tr>
<td>20.</td>
<td><em>Halictus julicornis</em> (K.)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>+</td>
</tr>
<tr>
<td>21.</td>
<td><em>Halictus laticeps</em> SCHENCK</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>+</td>
</tr>
<tr>
<td>22.</td>
<td><em>Halictus continentalis</em> Blüthgen</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>+</td>
</tr>
<tr>
<td>23.</td>
<td>*Halictus aeneidorsum ALFKEN</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>+</td>
</tr>
<tr>
<td>24.</td>
<td><em>Halictus calcatus</em> (SCOP.)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>+</td>
</tr>
<tr>
<td>25.</td>
<td><em>Halictus albipes</em> (F.)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>+</td>
</tr>
<tr>
<td>26.</td>
<td><em>Halictus laevis</em> (K.)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>+</td>
</tr>
<tr>
<td>27.</td>
<td><em>Halictus cupromicans</em> PÉR.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>+</td>
</tr>
<tr>
<td>28.</td>
<td><em>Sphaecodes gibbus</em> (L.)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>+</td>
</tr>
<tr>
<td>29.</td>
<td><em>Sphaecodes monilicornis</em> (K.)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>+</td>
</tr>
<tr>
<td>30.</td>
<td><em>Sphaecodes pellucidus</em> Sm.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>+</td>
</tr>
<tr>
<td>31.</td>
<td><em>Sphaecodes divisus</em> (K.)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>+</td>
</tr>
<tr>
<td>32.</td>
<td><em>Sphaecodes punctipes</em> THOMS.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>+</td>
</tr>
<tr>
<td>33.</td>
<td><em>Sphaecodes ferruginatus</em> HAG.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>+</td>
</tr>
<tr>
<td>34.</td>
<td><em>Sphaecodes hyalinatus</em> HAG.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>+</td>
</tr>
<tr>
<td>35.</td>
<td><em>Sphaecodes miniatus</em> HAG.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>+</td>
</tr>
<tr>
<td>36.</td>
<td><em>Sphaecodes fasciatus</em> HAG.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>+</td>
</tr>
<tr>
<td>37.</td>
<td><em>Dufouria vulgaris</em> SCHENCK</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>+</td>
</tr>
<tr>
<td>38.</td>
<td><em>Halictoides dentiventris</em> (NYL.)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>+</td>
</tr>
<tr>
<td>39.</td>
<td><em>Rophites quinquespinosus</em> SPIN.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>+</td>
</tr>
<tr>
<td>40.</td>
<td><em>Rophites hartmani</em> FIESE</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>+</td>
</tr>
<tr>
<td>41.</td>
<td><em>Rophites canus</em> EV.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>+</td>
</tr>
<tr>
<td>No.</td>
<td>Name</td>
<td>Babia Góra Mt.</td>
<td>Foot part of Babia Góra</td>
<td>Tatra Mts.</td>
<td>Pieniny Mts.</td>
<td>The remaining ridges</td>
</tr>
<tr>
<td>-----</td>
<td>-----------------------------------------------</td>
<td>----------------</td>
<td>--------------------------</td>
<td>------------</td>
<td>--------------</td>
<td>---------------------</td>
</tr>
<tr>
<td>1.</td>
<td><em>Trachusa serrata</em> (Pz.)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>+</td>
</tr>
<tr>
<td>2.</td>
<td><em>Anthidium punctatum</em> LATR.</td>
<td></td>
<td></td>
<td>+</td>
<td></td>
<td>+</td>
</tr>
<tr>
<td>3.</td>
<td><em>Anthidium montanum</em> MOR.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>+</td>
</tr>
<tr>
<td>4.</td>
<td><em>Anthidium manicatum</em> (L.)</td>
<td></td>
<td></td>
<td>+</td>
<td></td>
<td>+</td>
</tr>
<tr>
<td>5.</td>
<td><em>Anthidium strigatum</em> Pz.</td>
<td></td>
<td></td>
<td>+</td>
<td></td>
<td>+</td>
</tr>
<tr>
<td>6.</td>
<td><em>Stellis signata</em> (LATR.)</td>
<td></td>
<td></td>
<td>+</td>
<td></td>
<td>+</td>
</tr>
<tr>
<td>7.</td>
<td><em>Stellis punctulatissima</em> (K.)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>+</td>
</tr>
<tr>
<td>8.</td>
<td><em>Stellis phaeoptera</em> K.</td>
<td></td>
<td></td>
<td>+</td>
<td></td>
<td>+</td>
</tr>
<tr>
<td>9.</td>
<td><em>Stellis minuta</em> LEP. et SEV.</td>
<td></td>
<td></td>
<td>+</td>
<td></td>
<td>+</td>
</tr>
<tr>
<td>10.</td>
<td><em>Stellis ornata</em> (KLUtg)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>+</td>
</tr>
<tr>
<td>11.</td>
<td><em>Hercides trunculorum</em> (L.)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>+</td>
</tr>
<tr>
<td>12.</td>
<td><em>Chelostoma maxillosum</em> (L.)</td>
<td></td>
<td></td>
<td>+</td>
<td></td>
<td>+</td>
</tr>
<tr>
<td>13.</td>
<td><em>Chelostoma florisomne</em> (L.)</td>
<td></td>
<td></td>
<td>+</td>
<td></td>
<td>+</td>
</tr>
<tr>
<td>14.</td>
<td><em>Chelostoma distinctum</em> (STOECKL.)</td>
<td></td>
<td></td>
<td>+</td>
<td></td>
<td>+</td>
</tr>
<tr>
<td>15.</td>
<td><em>Chelostoma ventralis</em> SCHLETT.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>+</td>
</tr>
<tr>
<td>16.</td>
<td><em>Chelostoma nigricorne</em> NYL.</td>
<td></td>
<td></td>
<td>+</td>
<td></td>
<td>+</td>
</tr>
<tr>
<td>17.</td>
<td><em>Osmia rufa</em> (L.)</td>
<td></td>
<td></td>
<td>+</td>
<td></td>
<td>+</td>
</tr>
<tr>
<td>18.</td>
<td><em>Osmia coerulea</em> (L.)</td>
<td></td>
<td></td>
<td>+</td>
<td></td>
<td>+</td>
</tr>
<tr>
<td>19.</td>
<td><em>Osmia inermis</em> ZETT.</td>
<td></td>
<td></td>
<td>+</td>
<td></td>
<td>+</td>
</tr>
<tr>
<td>20.</td>
<td><em>Osmia bicolor</em> (SCHRANK)</td>
<td></td>
<td></td>
<td>+</td>
<td></td>
<td>+</td>
</tr>
<tr>
<td>21.</td>
<td><em>Osmia villosa</em> SCHENCK</td>
<td></td>
<td></td>
<td>+</td>
<td></td>
<td>+</td>
</tr>
<tr>
<td>22.</td>
<td><em>Osmia andrenoides</em> SPIN.</td>
<td></td>
<td></td>
<td>+</td>
<td></td>
<td>+</td>
</tr>
<tr>
<td>23.</td>
<td><em>Osmia atrocoerulea</em> SCHILL.</td>
<td></td>
<td></td>
<td>+</td>
<td></td>
<td>+</td>
</tr>
<tr>
<td>24.</td>
<td><em>Osmia parietina</em> CURT.</td>
<td></td>
<td></td>
<td>+</td>
<td></td>
<td>+</td>
</tr>
<tr>
<td>25.</td>
<td><em>Osmia cerinthidis</em> MOR.</td>
<td></td>
<td></td>
<td>+</td>
<td></td>
<td>+</td>
</tr>
<tr>
<td>26.</td>
<td><em>Osmia fulviceps</em> (Pz.)</td>
<td></td>
<td></td>
<td>+</td>
<td></td>
<td>+</td>
</tr>
<tr>
<td>27.</td>
<td><em>Osmia mitsis</em> NYL.</td>
<td></td>
<td></td>
<td>+</td>
<td></td>
<td>+</td>
</tr>
<tr>
<td>28.</td>
<td><em>Osmia parvula</em> DUP. et PÉR.</td>
<td></td>
<td></td>
<td>+</td>
<td></td>
<td>+</td>
</tr>
<tr>
<td>29.</td>
<td><em>Osmia leucana</em> (K.)</td>
<td></td>
<td></td>
<td>+</td>
<td></td>
<td>+</td>
</tr>
<tr>
<td>30.</td>
<td><em>Osmia leucomelaena</em> (K.)</td>
<td></td>
<td></td>
<td>+</td>
<td></td>
<td>+</td>
</tr>
<tr>
<td>31.</td>
<td><em>Osmia adunca</em> (Pz.)</td>
<td></td>
<td></td>
<td>+</td>
<td></td>
<td>+</td>
</tr>
<tr>
<td>32.</td>
<td><em>Osmia spinola</em> SCHENCK</td>
<td></td>
<td></td>
<td>+</td>
<td></td>
<td>+</td>
</tr>
<tr>
<td>33.</td>
<td><em>Osmia spinulosa</em> (K.)</td>
<td></td>
<td></td>
<td>+</td>
<td></td>
<td>+</td>
</tr>
<tr>
<td>34.</td>
<td><em>Osmia ononidis</em> FERT.</td>
<td></td>
<td></td>
<td>+</td>
<td></td>
<td>+</td>
</tr>
<tr>
<td>35.</td>
<td><em>Megachile circumcincta</em> (K.)</td>
<td></td>
<td></td>
<td>+</td>
<td></td>
<td>+</td>
</tr>
<tr>
<td>36.</td>
<td><em>Megachile nigriventris</em> SCHENCK</td>
<td></td>
<td></td>
<td>+</td>
<td></td>
<td>+</td>
</tr>
<tr>
<td>37.</td>
<td><em>Megachile aricetorum</em> LEP.</td>
<td></td>
<td></td>
<td>+</td>
<td></td>
<td>+</td>
</tr>
<tr>
<td>38.</td>
<td><em>Megachile logopoda</em> (L.)</td>
<td></td>
<td></td>
<td>+</td>
<td></td>
<td>+</td>
</tr>
<tr>
<td>39.</td>
<td><em>Megachile maritima</em> (K.)</td>
<td></td>
<td></td>
<td>+</td>
<td></td>
<td>+</td>
</tr>
<tr>
<td>40.</td>
<td><em>Megachile willoughbiella</em> (K.)</td>
<td></td>
<td></td>
<td>+</td>
<td></td>
<td>+</td>
</tr>
<tr>
<td>41.</td>
<td><em>Megachile ligniseca</em> (K.)</td>
<td></td>
<td></td>
<td>+</td>
<td></td>
<td>+</td>
</tr>
<tr>
<td>42.</td>
<td><em>Megachile centuncularis</em> (L.)</td>
<td></td>
<td></td>
<td>+</td>
<td></td>
<td>+</td>
</tr>
<tr>
<td>43.</td>
<td><em>Megachile versicolor</em> SM.</td>
<td></td>
<td></td>
<td>+</td>
<td></td>
<td>+</td>
</tr>
</tbody>
</table>
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 florissomne (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 occurring 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 leiana (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

<table>
<thead>
<tr>
<th>No.</th>
<th>Name</th>
<th>Babia Góra Mt.</th>
<th>Foot part of Babia Góra</th>
<th>Tatra Mts.</th>
<th>Pieniny Mts.</th>
<th>The remaining ridges</th>
</tr>
</thead>
<tbody>
<tr>
<td>44.</td>
<td><em>Megachile octosignata</em> Nyl.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>47.</td>
<td><em>Coelioxys alata</em> Först.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>49.</td>
<td><em>Coelioxys lanceolata</em> Nyl.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>50.</td>
<td><em>Coelioxys quadridentata</em> (L.)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
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**

<table>
<thead>
<tr>
<th>No.</th>
<th>Name</th>
<th>Babia Góra Mt.</th>
<th>Foot part of Babia Góra</th>
<th>Tatra Mts.</th>
<th>Pieniny Mts.</th>
<th>The remaining ridges</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td><em>Melitta leporina</em> (Pz.)</td>
<td></td>
<td>+</td>
<td></td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>2.</td>
<td><em>Melitta haemorrhoidalis</em> (F.)</td>
<td></td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>3.</td>
<td><em>Macropis fulvipes</em> (F.)</td>
<td></td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
</tbody>
</table>

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 noteworthy, that they have not been found on the northern slopes of the Pieniny Mts.

The list of the species of the *Apiidae* 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 *Apiidae* 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 *Psilthyrus* LEP. have been worked out, however, three other species, namely *Nomada flacopicta* (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 unknown 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>
<thead>
<tr>
<th>No.</th>
<th>Name</th>
<th>Babia Góra Mt.</th>
<th>Foot part of Babia Góra</th>
<th>Tatra Mts.</th>
<th>Pieniny Mts.</th>
<th>The remaining ridges</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Nomada goodeniana (K.)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>+</td>
</tr>
<tr>
<td>2.</td>
<td>Nomada lineola Pz.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>+</td>
</tr>
<tr>
<td>3.</td>
<td>Nomada marshamella (K.)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>+</td>
</tr>
<tr>
<td>4.</td>
<td>Nomada sexfasciata (Pz.)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>+</td>
</tr>
<tr>
<td>5.</td>
<td>Nomada errans LÉP.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>+</td>
</tr>
<tr>
<td>6.</td>
<td>Nomada flavopicta (K.)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>+</td>
</tr>
<tr>
<td>7.</td>
<td>Nomada emarginata MOR.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>+</td>
</tr>
<tr>
<td>8.</td>
<td>Nomada tormentillae ALFK.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>+</td>
</tr>
<tr>
<td>9.</td>
<td>Nomada montana MOR.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>+</td>
</tr>
<tr>
<td>10.</td>
<td>Nomada obtusifrons NYL.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>+</td>
</tr>
<tr>
<td>11.</td>
<td>Nomada hillana (K.)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>+</td>
</tr>
<tr>
<td>12.</td>
<td>Nomada guttulata SCHENCK</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>+</td>
</tr>
<tr>
<td>14.</td>
<td>Nomada ruficornis (L.)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>+</td>
</tr>
<tr>
<td>15.</td>
<td>Nomada flavata Pz.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>+</td>
</tr>
<tr>
<td>16.</td>
<td>Nomada glabella THOMS.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>+</td>
</tr>
<tr>
<td>17.</td>
<td>Nomada leucophtalma (K.)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>+</td>
</tr>
<tr>
<td>18.</td>
<td>Nomada ferruginata (L.)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>+</td>
</tr>
<tr>
<td>19.</td>
<td>Nomada bifida THOMS.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>+</td>
</tr>
<tr>
<td>20.</td>
<td>Nomada alboguttata H.-SCH.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>+</td>
</tr>
<tr>
<td>21.</td>
<td>Nomada flavoguttata (K.)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>+</td>
</tr>
<tr>
<td>22.</td>
<td>Nomada baeri STOECK.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>+</td>
</tr>
<tr>
<td>23.</td>
<td>Nomada conivincens H.-SCH.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>+</td>
</tr>
<tr>
<td>25.</td>
<td>Nomada fuscicornis NYL.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>+</td>
</tr>
<tr>
<td>26.</td>
<td>Nomada similis MOR.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>+</td>
</tr>
<tr>
<td>27.</td>
<td>Nomada armata H.-SCH.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>+</td>
</tr>
<tr>
<td>28.</td>
<td>Nomada fabriciana (L.)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>+</td>
</tr>
<tr>
<td>29.</td>
<td>Nomada mutabilis MOR.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>+</td>
</tr>
<tr>
<td>30.</td>
<td>Clisodon furcatus (Pz.)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>+</td>
</tr>
<tr>
<td>31.</td>
<td>Antophora acervorum (L.)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>+</td>
</tr>
<tr>
<td>32.</td>
<td>Antophora plaigita (ILL.)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>+</td>
</tr>
<tr>
<td>33.</td>
<td>Antophora aestivalis (Pz.)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>+</td>
</tr>
<tr>
<td>34.</td>
<td>Antophora quadrinuculata (Pz.)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>+</td>
</tr>
<tr>
<td>35.</td>
<td>Eucera longicornis (L.)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>+</td>
</tr>
<tr>
<td>36.</td>
<td>Thyreus orbatus LÉP.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>+</td>
</tr>
<tr>
<td>37.</td>
<td>Bombus lucorum (L.)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>+</td>
</tr>
<tr>
<td>38.</td>
<td>Bombus terrestris (L.)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>+</td>
</tr>
<tr>
<td>39.</td>
<td>Bombus lapidarius (L.)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>+</td>
</tr>
<tr>
<td>40.</td>
<td>Bombus pratorum (L.)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>+</td>
</tr>
<tr>
<td>41.</td>
<td>Bombus jonellus (K.)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>+</td>
</tr>
<tr>
<td>42.</td>
<td>Bombus pyrenaeus PÉR.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>+</td>
</tr>
<tr>
<td>43.</td>
<td>Bombus hypnorum (L.)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>+</td>
</tr>
<tr>
<td>44.</td>
<td>Bombus mastrucatus GERST.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>+</td>
</tr>
</tbody>
</table>
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 unknown 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* Pá.r., 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

<table>
<thead>
<tr>
<th>No.</th>
<th>Name</th>
<th>Babia Góra Mt.</th>
<th>Foot part of Babia Góra</th>
<th>Tatra Mts.</th>
<th>Pieniny Mts.</th>
<th>The remaining ridges</th>
</tr>
</thead>
<tbody>
<tr>
<td>45.</td>
<td><em>Bombus soroeensis</em> (F.)</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>46.</td>
<td><em>Bombus confusus</em> SCHEVCK</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>47.</td>
<td><em>Bombus hortorum</em> L.</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>48.</td>
<td><em>Bombus ruderatus</em> (F.)</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>49.</td>
<td><em>Bombus subterraneus</em> (L.)</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>50.</td>
<td><em>Bombus distinguendus</em> Mon.</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>51.</td>
<td><em>Bombus pomorum</em> Pz.</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>52.</td>
<td><em>Bombus elegans</em> SEIDL.</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>53.</td>
<td><em>Bombus agrorum</em> (F.)</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>54.</td>
<td><em>Bombus muscorum</em> (L.)</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>55.</td>
<td><em>Bombus humilis</em> ILL.</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>56.</td>
<td><em>Bombus silvarum</em> (L.)</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>57.</td>
<td><em>Bombus equestris</em> (F.)</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>58.</td>
<td><em>Bombus ruderarius</em> MÜLL.</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>59.</td>
<td><em>Psithyrus rupestris</em> (F.)</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>60.</td>
<td><em>Psithyrus compestris</em> (Pz.)</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>61.</td>
<td><em>Psithyrus barbutellus</em> (K.)</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>62.</td>
<td><em>Psithyrus vestalis</em> (Geof. and FOURC.)</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>63.</td>
<td><em>Psithyrus bohemicus</em> (SEIDL.)</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>64.</td>
<td><em>Psithyrus silvestris</em> (LEP.)</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>65.</td>
<td><em>Psithyrus norvegicus</em> SP.-SCH.</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>66.</td>
<td><em>Apis mellifica</em> L.</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
</tbody>
</table>
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 rufigravus Nyl., A. lapponica Zett., A. praecox (Scop.), A. clarkella (K.), Halictus niger Viér., H. rufigravus Zett., Osmia parietina Curt., Megachile lapponica Thoms., Nomada leucophtalma (K.), N. glabella Thoms., Bombus hypnorum (L.), B. jonellus (K.) and B. mastrucatus Gerst. The belongingness 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 Lepr. 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 Grünwaldt treats these species as belonging to the eurasiatic 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 Lepr., Nomada saxifraga (L.), Anthophora plagiata Ill., Ceratina cyanea (K.), Thyrses ortatus Lepr., and Rhophiles quinquaginis Spin. The occurrence 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 euniculareus (L.), Prosopis confusa (Nyl.), P. communis (Nyl.), Andrena tibialis (K.), A. humilis Imh. Halictus xanthopus (K.), H. quadricinctus F., H. rubicundus (Christ), H. tumulorum (L.), H. fulvicorns (K.), H. leveozonius (Schrank), H. villosus (K.), H. calcatus (Scop), H. albipes (F.), H. leucopus (K.), Sphecodes punctipes Thoms., Osmia ruja (L.), O. fulviventris (Pz.), O. coerulescens (L.), Nomada ferruginea (L.), N. flavoguttata (K.), Bombus terrestris (L.), B. lucorum (L.), B. pratetorum (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. barbutilus (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 minutula LEP. et SERY., Chelostoma florisonne (L.), Ch. maxillosum (L.), Ch. nigricorne NYL., Coelioxys rufescens LEP., Panurgus banksianus (K.), Nomada hillana (K.), N. fabriciana (L.), Clisodon furcatus (Pz.), Anthophora acerorum (L.), A. quadrifasciata (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 haemorrhhoa (F.), A. fulveago (CHRIST), A. fuscata Pz., A. subopaca NYL., A. saundersella PERK., A. minutula (K.), A. minutuloides PERK., A. pubescens baltica AFLK., A. jacobii PRRK., A. coitana (K.), A. ovata (K.), A. wilkella (K.), Melitta haemorrhoidalis (F.), Dufourca vulgaris SCHENCK, Halictoides dentiventris (NYL.), Sphecodes hyalinatus HAG., Osmia leucometelaena (K.), O. leitana (K.), O. bicolor (SCHRANK), Megachile willoughbiella (K.), Nomada flava Pz., and N. bijida 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. diiformis EV., Andrena chrysocceles (K.), A. lathyri AFLK., 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 spread 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 submediterraneen 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 thermophilous species, however, one south-central European species occurs in here (that gives about 1.4%). The remaininig 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>
<thead>
<tr>
<th>Element</th>
<th>The foot part</th>
<th>Lower mountain forest zone</th>
<th>Upper mountain forest zone</th>
<th>Dwarf pine zone</th>
<th>Alpine zone</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>number</td>
<td>%</td>
<td>number</td>
<td>%</td>
<td>number</td>
</tr>
<tr>
<td>Euro-Asiatic</td>
<td>39</td>
<td>35.4</td>
<td>33</td>
<td>44.6</td>
<td>15</td>
</tr>
<tr>
<td>European Central</td>
<td>18</td>
<td>16.4</td>
<td>11</td>
<td>14.9</td>
<td>1</td>
</tr>
<tr>
<td>South Central European</td>
<td>2</td>
<td>1.8</td>
<td>1</td>
<td>1.3</td>
<td></td>
</tr>
<tr>
<td>North-Central European</td>
<td>7</td>
<td>6.4</td>
<td>1</td>
<td>1.4</td>
<td></td>
</tr>
<tr>
<td>„Taiga“ Mountain</td>
<td>23</td>
<td>20.9</td>
<td>14</td>
<td>18.9</td>
<td>4</td>
</tr>
<tr>
<td>Submediterranean and subpontic</td>
<td>13</td>
<td>11.8</td>
<td>12</td>
<td>16.2</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>1.8</td>
<td>2</td>
<td>2.7</td>
<td>1</td>
</tr>
</tbody>
</table>

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%) decidedly 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 mughehtem 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 region 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 analysis of the plant-mote done for Zubrzyca Góra (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 ŚRÓDOŃ, 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 pyreneeus* Pép (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 (ŠRODOŇ, 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 occurring 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 thermophilous 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 analysiz 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 thermophilous flora and fauna could resist in small pathes of the terrain. From that time the entering of the more thermophilous species from the southern side is theoretically closed. The deep valleys of the
northern foot part of the Babia Góra descending towards the valleys 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 inhabit 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.

REFERENCES


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 Kiss


Stobiecki S. 1880. Spis mięczaków zebranych na Babiej Górze w r. 1879. Spraw. Kom. fizjogr., Kraków, 14: (75)—(78).


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 Kiss

Kiss...

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 reglu 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 parti, gromadzą się prawie wyłącznie w karach, znajdujących się na zboczach północnych. Zboże tych karów są osłonięte od wiatrów i zamurowane, stąd nagrzewają się silniej od połogich, narażonych na wiatry przestrzeni porośniętych zwartą kosodrzewiną na zboczech 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 podnózowym (graph No. 4).

Na Babiej Górze nie znaleziono gatunków endemicznych Apoidea. Wysoko-górską faunę reprezentuje 1 gatunek, Bombus pyrenaeus Pér. 13 gatunków jest pochodzenia tajgowego, 6 gatunków charakteryzuje się większymi wymaganiami termicznymi (zauważono je prawie wyłącznie na podnóz północnym). Ostatnia grupa gatunków nie wkracza w obręb masywu. Najwięcej gatunków bobiogórskich 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 zboczach północnych, a więc w piętrze zwartej kosodrzewiny kończą swoje zasięgi wysokościowe gatunki europejskie, krótko-środkowoeuropejskie, północno-środkowoeuropejskie; pozostałe (europejsko-azjatyckie, o pochodzeniu tajgowym i wysokogórskie) wkraczają w partię szeztyową Babiej Góry. Porównanie rozsiedlenia wysokościowego gatunków Apoidea Babiej Góry i Tatr wykazano w większości wypadków zgodność w po szczególne stracie roślinnych z uwzględnieniem plemienia grani 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 gatuneków, a w Tatras 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 śródlśńych i na ląkach reglowych, a drugą włącznie na ląkach w najniższych partiach regla dolnego. Pierwsza grupa mogła zasiedlać Babię Góre już od ostatnich zlodowaceń, natomiast drugą wprowadził najprawdopodobniej człowiek, wycinający polany dla wypasu bydła na tych terenach od XV—XVI w.

PEZIOME

Apoidea Бабьей Горы, самой высокой возвышенности (1724, 6 м. н. у. м.) в Бессида Высоком и Западных Карпатах не были обстоятельно исследованы. О рас пространённых 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 найдены только немногчисленные Bombinae, Apis mellifica L. Andrena lapponica Zett. В общем в ярусе нижней зоны обнаружено 76 видов. До верхней зоны доходит 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 (рафт. 1): 1. в обрабатываемой зоне верхнюю границу расселения характеризуют 33% видов, 2. нижнюю партию косых лугов нижнего лесного яруса на высоте приблизительно 900 м. н. у. м. не переходит 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 сильно 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 находит большие 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. Стени этих каров закрыты от ветра, густо обросли травяной растительностью и поэтому сильно 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.

Вся эта визионне период появления выделено 3 группы Apoidea: ранневесенние, поздневесенние 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 A poidea. Выше лесной границы существует только ранневесенняя фауна пчелой которой (приблизительно 3-я декада мая) наблюдается приблизительно на 5—6 недель позже, чем в подножной зоне.

На Бабьей Горе не найдено эндемических видов A poidea. Высокогорная фауна представлена одним видом, Bombus pyrenaeus Pék. 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 A poidea, 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 вышеуказанных групп Бабьей Горы принадлежат к фауне Центральной Европы, 7 видов, известных в Южной и Центральной Европе, в небольшом количестве частично входят в самые нижние части пояса гор. Лесная граница не является препятствием для видов группы A poidea. 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 A poidea Бабьей Горы и Татр в большинстве случаев обнаружено сходство в отдельных растительных зонах (зато во внимание обнажение флористических границ на Бабьей Горе по отношению к Татрам приблизительно на 150 м.). В общем в Западном Бескиде более кратко констатировано 236 видов A poidea. 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 нижних партиях, причем исключительно в Пенинах известно 58 видов.

Фауна A poidea поделена на 2 группы. 1.-это выделенная группа, распространенняя выше верхней границы леса, в редко разбросанных деревьях, на лесных вырубках и лугах, — 2-я группа охватывает исключительно луга и самые нижние партии нижней зоны гор. Первая группа могла заселить Бабьё Гору во время последнего ледникового 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 Cyrlha — a meadow in lower forest zone on the northern slope. The forest and top area partially above. Photogr. by J. PAWŁOWSKI.
Plate XIII

Fig. 3. Markowe Szczawiny — a meadow in upper forest zone on the northern slope with spruces of the *Piceetum excelsae carpaticum* association. Photogr. by J. Pawłowski.

Fig. 4. Top area of Babia Góra Mt. with dwarf pine and alpine zone. Photogr. by T. Wojterski.