WEST-PALAEARCTIC BUMBLEBEES

P. Rasmont, J.C. Verhaeghe, R. Rasmont & M. Terzo

SUMMARY

The authors are currently preparing a comprehensive revision of the West Palaearctic Bumblebees. This revision mainly deals with taxonomy and biogeography. For each species, it will give a review of the ecological and ethological characters, emphasizing the flower choices. The authors provide keys down to the subspecific level and full synonymy. The book will be illustrated with drawings and scanning electronic microphotographs of all characters; colour plates with all subspecific patterns; original photographs of most species and original maps. Species lists and relevant literature for each country will be included. The present paper provides a comprehensive check list of the West-Palaearctic species.

There are several good papers that make it possible to identify the European bumblebees and to learn most of their natural history features. Very good local keys can be used to identify bumblebees in some regions, e. g. in Scandinavia (Löken, 1973, 1984), in the British Isles (Alford, 1975; Prys-Jones & Corbet, 1987, in Russia (Panfilov, 1978), in the Balkans (Pittioni, 1938, 1939), in the Iberian Peninsula (Ornosa Gallego, 1984), in the Netherlands (Boer, 1977; Blom, 1989), in Switzerland (Amiet, 1996), in Germany (Mauss, 1987), in Poland (Banaszak, 1993; Pawlikowski, 1997); in the Czech and Slovakian Republics (May, 1959) and in Turkey (Özbek, 1983, 1987, 1997, 1998). However, at the present time, no synthethic work for the whole continent is available.

Identification remains hard work, not only because the bumblebees taxonomy is instrinsically difficult but also because information is scattered in scores of papers. Also, the distribution of many species remains approximately known, with the biogeographical data atomized in hundreds of local or subregional studies.

The authors prepare a comprehensive revision of the group at the continental level. This revision mainly deals with taxonomy and biogeography. For each species, it also gives a review of the ethological characters, emphasizing the flower choices. The authors provide keys down to the subspecific level and full synonymy. The book is illustrated with drawings and scanning electronic microphotographs of all characters; colour plates with all subspecific patterns; original photographs of most

species and original maps. Species list and relevant literature are given for each country.

Here we give some of the most interesting traits of the whole West Palaearctic bumblebees fauna.

WHERE ARE THE LIMITS OF THE WEST PALAERACTIC REGION FOR THE BUMBLEBEES?

In the north, Novaya Zemlya is the last island where bumblebees can be found. We have no indication of their existence on Svalbard (Spitsbergen) or on Zemlya Frantsa Iosifa (the Franz Joseph Land).

To the south-east and to the south-west, bumblebees can be quite common in true steppes but never enter subdesert steppes. The Southern limits of the region pass througt the north of Morocco, Algeria, Tunisia and Lybia for the African continent and in N. Israel, Lebanon, north-west Syria, north Irak and north Iran, for the Middle-East.

To the west, Iceland and the Faeroes, Madeira, Azores and Canary archipelagos are inhabited by West-Palaearctic bumblebees.

To the north-east, the Ural Mts are an arbitrary limit. Indeed, west Siberia is a transition zone between Siberian and West-Palaearctic regions, with the fauna of the latter largely predominant. However, the closer you get to east Siberia, the more species you may encounter that are not included in the West-Palaearctic fauna.

HOW MUCH SPECIES OF BUMBLEBEES ARE THERE IN WEST PALAEARCTIC REGION?

At the present time, 86 species of bumblebees are recognized in the region (table I). The authors have tried to be conservative, avoiding a tendency to the splitting in bumblebee taxonomy. However, one of the most discussed features of the bumblebees systematics is the infra-specific variation; the authors give a large extent to its description and to its geographical distribution. The synonymy is extremely rich: we have recorded more than 1800 names for the West Palaearctic species. The highest number of synonyms is probably for *Bombus terrestris* which counts more than 120 differents names (including all the valid or invalid infra-specific names).

The countries where the highest number of species can be found are European Russia (55 species), Turkey (50 species), continental France (46 species) and Austria (45 species). The zones where the highest species diversity can be observed are the Pyrenees, the Alps and the north-

Anatolian mountains. The bumblebees are absent from arctic and saharian deserts.

ARE ALL BUMBLEBEES EURYTOPIC?

At the generally studied level of countries, the phenological differences between the species is not often obvious. At the continental level, the adaptative differences are very significant, while the species are exposed to very different limiting factors as an ubiquist permafrost in the north and summer dryness in the south. Some species seem to live only in these extreme conditions, as e. g. *Bombus glacialis* in Novaya Zemlya. On the other hand, some species like *Bombus terrestris* seem to have a great ethological plasticity, allowing them to live from S. Finland to the sub-Saharian steppes (near Bouarfa, in Morocco).

ARE BUMBLEBEES EVERYWHERE POLYLECTIC?

Bumblebees are generally regarded as mostly polylectic. Some species are real opportunists, as is the case for *Bombus terrestris* or *Bombus pascuorum* (Rasmont, 1988). Oligolectic species are a minority among bumblebees: *Bombus consobrinus* and *B. gerstaeckeri* are related to, respectively *Aconitum septentrionale* Koelle and *Aconitum vulparia* Reichenbach (Löken, 1950, 1961, 1973; Delmas, 1976; Rasmont, 1988). At least one species, *Bombus brodmannicus*, seems to be oligolectic (on *Cerinthe* spp. flowers) in one part of its distribution (in the Alps: Delmas, 1976; Rasmont, 1988) and polylectic in another part (Anatolia: Özbek, 1998). Some species seem opportunistic concerning their flower choices at a local level. However, when comparing data from all the countries, a clear resource selection become obvious. A good example is *Bombus pyrenaeus*: it is difficult to distinguish a particular choice when seen at the local level (Pittioni, 1937; de Beaumont, 1958; Ruszkowski, 1970; Atanassov, 1972a, 1972b, 1974, 1975; Rasmont, 1988). Taking into account the data from all the countries, the females of *Bombus pyrenaeus* are related to *Vaccinium myrtillus* L. and *Rhododendron* spp., while the males choose *Epilobium angustifolium* L. wherever it is possible.

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Table I. Check-list of the West Palaearctic bumblebees
(with some minor differences, the classification follows Williams, 1998)

1. *Bombus (Psithyrus) rupestris* (Lepeletier)
2. *B. (Ashtonipsithyrus) bohemicus* Seidl
3. *B. (Ashtonipsithyrus) vestalis* (Fourcroy)
4. *B. (Ashtonips.) perezi* (Schulthess-Rechberg)
5. *B. (Metapsithyrus) campestris* (Panzer)
6. *B. (Allopsithyrus) barbutellus* (Kirby)
7. *B. (Allopsithyrus) maxillosus* Klug
8. *B. (Fernaldaepsithyrus) quadricolor* (Lepeletier)
9. *B. (Fernaldaepsithyrus) sylvestris* (Lepeletier)
10. *B. (Fernaldaepsithyrus) flavidus* Eversmann
11. *B. (Fernaldaeps.) norvegicus* (Sparre Schneider)
12. *B. (Confusibombus) confusus* Schenck
13. *B. (Mendacibombus) mendax* Gerstaecker
14. *B. (Mendacibombus) handlirschianus* Vogt
15. *B. (Mendacibombus) shaposhnikovi* Skorikov
16. *B. (Bombus) terrestris* (L.)
17. *B. (Bombus) lucorum* (L.)
18. *B. (Bombus) cryptarum* (Fabricius)
19. *B. (Bombus) magnus* Vogt
20. *B. (Bombus) patagiatus* Nylander
21. *B. (Bombus) sporadicus* Nylander
22. *B. (Alpigenobombus) wurflenii* Radoszkowski
23. *B. (Alpinobombus) alpinus* (L.)
24. *B. (Alpinobombus) balteatus* Dahlbom
25. *B. (Alpinobombus) arcticus* Kirby
26. *B. (Alpinobombus) hyperboreus* Schönherr
27. *B. (Pyrobombus) hypnorum* (L.)
28. *B. (Pyrobombus) cingulatus* Wahlberg
29. *B. (Pyrobombus) jonellus* (Kirby)
30. *B. (Pyrobombus) modestus* Eversmann
31. *B. (Pyrobombus) monticola* Smith
32. *B. (Pyrobombus) lapponicus* (Fabricius)
33. *B. (Pyrobombus) glacialis* Friese
34. *B. (Pyrobombus) haematurus* Kriechbaumer
35. *B. (Pyrobombus) pratorum* (L.)
36. *B. (Pyrobombus) pyrenaeus* Pérez
37. *B. (Pyrobombus) brodmannicus* Vogt
38. *B. (Melanobombus) lapidarius* (L.)
39. *B. (Melanobombus) incertus* Morawitz
40. *B. (Melanobombus) sichelii* Radoszkowski
41. *B. (Melanobombus) alagesianus* Reinig
42. *B. (Melanobombus)* **sp.**
43. *B. (Melanobombus) erzurumensis* Özbek
44. *B. (Cullumanobombus) cullumanus* (Kirby)
45. *B. (Cullumanobombus) serrisquama* Morawitz
46. *B. (Cullumanobombus) apollineus* Skorikov
47. *B. (Cullumanobombus) semenoviellus* Skorikov
48. *B. (Sibiricobombus) vorticosus* Gerstaecker
49. *B. (Sibiricobombus) niveatus* Kriechbaumer
50. *B. (Sibiricobombus) sulfureus* Friese
51. *B. (Kallobombus) soroeensis* (Fabricius)
52. *B. (Megabombus) argillaceus* (Scopoli)
53. *B. (Megabombus) ruderatus* (Fabricius)
54. *B. (Megabombus) hortorum* (L.)

55. *B. (Megabombus) reinigiellus* (Rasmont)
56. *B. (Megabombus) portschinsky* Radoszkowski
57. *B. (Megabombus) saltuarius* (Skorikov)
58. *B. (Megabombus) consobrinus* Dahlbom
59. *B. (Megabombus) gerstaeckeri* Morawitz
60. *B. (Subterraneobombus) subterraneus* (L.)
61. *B. (Subterraneob.) distinguendus* Morawitz
62. *B. (Subterraneobombus) fragrans* (Pallas)
63. *B. (Subterraneobombus) melanurus* Lepeletier
64. *B. (Rhodobombus) pomorum* (Panzer)
65. *B. (Rhodobombus) brodmanni* Vogt
66. *B. (Rhodobombus) mesomelas* Gerstaecker
67. *B. (Rhodobombus) armeniacus* Radoszkowski
68. *B. (Eversmannibombus) persicus* Radoszkowski
69. *B. (Mucidobombus) mucidus* Gerstaecker
70. *B. (Laesobombus) laesus* Morawitz
71. *B. (Laesobombus) mocsaryi* Kriechbaumer
72. *B. (Thoracobombus) sylvarum* (L.)
73. *B. (Thoracobombus) mlokosievitzii* Radoszkowski
74. *B. (Thoracobombus) veteranus* (Fabricius)
75. *B. (Thoracobombus) ruderarius* (Müller)
76. *B. (Thoracobombus) inexspectatus* (Tkalcu)
77. *B. (Thoracobombus) velox* (Skorikov)
78. *B. (Thoracobombus) deuteronymus* Schulz
79. *B. (Thoracobombus) schrencki* Morawitz
80. *B. (Thoracobombus) zonatus* Smith
81. *B. (Thoracobombus) muscorum* (L.)
82. *B. (Thoracobombus) bannitus* (Popov)
83. *B. (Thoracobombus) pereziellus* (Skorikov)
84. *B. (Thoracobombus) humilis* Illiger
85. *B. (Thoracobombus) superequester* (Skorikov)
86. *B. (Thoracobombus) pascuorum* (Scopoli)

INSECT POLLINATION IN GREENHOUSES

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