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The ants (Hymenoptera, Formicidae) of Poland

WARSZAWA 2002

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To the memory of Professor Bohdan Pisarski,
the Father of modern Polish myrmecology

The authors

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INTRODUCTION

Myrmecological studies are flourishing nowadays. On the one hand, this is due to rapidly developing sociobiology, the origin of which dates back to the 1970s, and on the other, to an unprecedented popularity of ecology. Ants, constituting about 70% of all known species of eusocial animals, are the source of most data for thought about the organization of animal communities, about their genesis and evolution, and about the biological basis for social phenomena in general.

Ecologically, ants have a very great and multiple biotic impact on entire local biocoenoses simply because they belong to animals dominating, in respect of abundance and biomass, in most terrestrial habitats in the world. Thanks to polyphagy (most species are nonspecialized predators whose diets are greatly varied), but mainly to pantophagy [many species utilize both protein, animal and plant, food and carbohydrate food (mainly honeydew of homopterans)] ants are able to modify their diet according to the resources available in their habitat. On the other hand, ants have a tendency to utilize, first and foremost, food sources which are the richest and easily approchable at a given moment. This in turn makes them an essential element in the homeostasis of biocoenoses. Moreover, the impact ants have on processes of soil formation is quite significant. While building and incessantly rebuilding their nests ants replace a lot of soil and plant matter, thus enriching the soil and influencing the composition of its microflora. So, ants play one of the key roles in the functioning of nature. And even from the point of view of human needs they have gained importance – varied and, admittedly, positive and negative; this importance has steadily been increasing.

Thanks to their nesting and eusocial habits ants can survive virtually independently of weather changes and they are protected, to a great extent, from any unfavourable impact of other habitat factors. This guarantees (in comparison with solitary invertebrates) a considerable stability of ant communities in time – when considered both for the growing season and for periods of many years. Moreover, since ants lead a resident (nest) life, their occurrence in a given place is not accidental. All this and the commonness of their occurrence may make ants a useful bioindicator of the state of the environment during ecological monitoring and a model group when the local biodiversity is being evaluated. However, this is possible only on condition that taxonomic and faunistic myrmecological knowledge is profound and reliable.

The number of the extant ant species recorded from the whole world is close to 10,000[1]. However, bearing in mind the fact that many tropical and mountainous regions have been studied insufficiently, some myrmecologists estimate the total number of species as reaching even 20,000. The myrmecofauna of Europe is generally known very well; the number of ant species, nearly 600, recorded from the continent may increase only insignificantly, and probably not due to discoveries of new forms in the field, but as a result of taxonomic revisions. However, the myrmecofaunas of particular European countries have been studied very unevenly. The ants of Poland are known very well, at least when the entire country is considered.

[1] The latest register (on 31 December 1993; Bolton 1995a, see also Bolton 1995b) gives 9,538 species. Quite recently, in just one paper (Radchenko and Elmes 1999) there have been described 10 new species of the genus *Myrmica* alone recorded from the Himalayas.

The first mention of ants in the Polish literature appeared very early, namely in an eighteenth century work by Kluk (1780). Yet for the first half of the 19th century, a period when European myrmecology enjoyed a rapid development, there are few and only general lists of ants from the territory of Poland (Weigel 1806, Schilling 1830, 1839, Siebold 1844), and they include species names that in many cases cannot be identified now (see Pisarski 1975). Only in the second half of the 19th century were some more detailed faunistic lists compiled (Nowicki 1864, Wierzejski 1873, Brischke 1888b, Nasonov 1892).

The true development of Polish myrmecology began in the first half of the 20th century, after World War I. Many faunistic lists covering large parts of the country were published (Kulmatycki 1920a,b, 1922, J. Łomnicki 1931, Nowotny 1931a–c, 1937, Begdon 1932b). The first papers on taxonomy (J. Łomnicki 1925) and on biology and ethology of ants (Minkiewicz 1939a–d) were published just then. Most studies were discontinued during World War II, but already in the first years after the war several faunistic (Jakubisiak 1948, Koehler 1951, Pisarski 1953) and ecological myrmecological papers (Kaczmarek 1953, Begdon 1954, Karpiński 1956) were published. The period from the end of the 1950s through the 1960s was a time of a rapid development of Polish myrmecology. The output of this period included numerous papers on ant faunistics (J. Pętal, B. Pisarski, J. Stawarski), on ant taxonomy (B. Pisarski), ethology (J. Dobrzańska, J. Dobrzański) and ecology (J. Pętal), on the role of ants in forest protection (W. Koehler, J. Burzyński, J. Wiśniewski) and on their parasites and myrmecophiles (J. Wiśniewski).

The scope of myrmecological studies in Poland expanded even further in the 1970s and 1980s. Apart from continued regional faunistic (B. Pisarski et al., W. Czechowska, M. Woyciechowski) and ecological studies (J. Pętal et al.) there were begun investigations into the organization of ant societies (B. Pisarski et al.), into the composition, structure and development of ant assemblages in different natural and anthropogenic habitats (B. Pisarski, W. Czechowski), into bionomics and competition (B. Pisarski, W. Czechowski) and into socially parasitic relations (W. Czechowski). At the turn of the 1980s and the 1990s, the Polish myrmecological literature dealt not only with the still prevailing questions about the role and occurrence of wood ants (J. Wiśniewski et al.), but also with other issues, such as the theoretical and practical aspects of their artificial colonization (B. Pisarski, W. Czechowski) and mixed colonies (W. Czechowski) as well. The threads of breeding behaviour of ants and their reproductive strategies (M. Woyciechowski), as well as new ethological questions (E. J. Godzińska et al.) also appeared then.

The most recent taxonomic and faunistic investigations (A. Radchenko, W. Czechowski, W. Czechowska) – based on freshly collected and on (revised) museum material – contributed to verification and to explosive enrichment of the knowledge of the myrmecofauna of Poland, but the hitherto comprehensive reports have become outdated. This process has been largely influenced by a general development of the taxonomy of the ants of the Palaearctic, a development which took place mainly in the 1980s and the 1990s and yielded identifications of new species, not separated from collective taxa before (e.g. *Lasius platythorax* Seifert, *L. psammophilus* Seifert, *L. paralienus* Seifert, *L. jensi* Seifert).

The catalogue of the ants of Poland (part of Katalog Fauny Polski) compiled by Pisarski (1975) contained 85 species recorded from Poland (within the present borders)

and found in the literature up to 1972. In the opinion of the author of the catalogue the occurrence in Poland of 77 of these species was unquestionable or at least credible, but that of eight species impossible (in most cases mentions of their occurrence in Poland are sheer errors). A chapter in "Wykaz Zwierząt Polski" ("Checklist of Animals of Poland") (Czechowski and Czechowska 1997) was a successive synthetic work. 97 ant species were listed there; the occurrence in Poland of 87 of these species was considered certain, of three dubious (although not unlikely), and of seven as recorded erroneously.

The present monograph of the ants of Poland contains 98 species of 25 genera and four subfamilies whose occurrence in Poland has been either confirmed by the authors or at least considered probable. Thus in comparison with the state of faunistic knowledge in the mid-1970s, summmed up in Pisarski's catalogue (1975), the number of ant species reliably recorded from Poland has increased by 27%. This is not just a direct consequence of adding new items (as, for instance, *Myrmica hellenica* Finzi, *M. lonae* Finzi, *Doronomyrmex kutteri* Busch., *Leptothorax albipennis* Curt., *L. nadigi* Kutter, *Lasius nitidigaster* Seifert) to the old list. Some of the earlier-recorded species have been replaced with others – either as a result of verification of their old designation [(e.g. *Tetramorium guineense* (F.) → *T. insolens* (F. Sm.), *T. simillimum* (F. Sm.) → *T. caldarium* (F. Sm.)] or due to a taxonomic revision carried out in the meantime [e.g. *Stenamma westwoodi* Westw. → *S. debile* (Först.), *Leptothorax nylanderi* (Först.) → *L. crassispinus* Karav.]. It has happened, in a few cases, that a species which Pisarski had considered one found in Poland by mistake was later recorded beyond the shadow of a doubt [e.g. *Messor structor* (F.), *Lasius bicornis* (Först.)]. Moreover, a species whose occurrence had been considered probable may have been crossed out from the list of the Polish myrmecofauna [as was the case with *Camponotus aethiops* (Latr.)], or just the opposite happened [as was the case with *Aphaenogaster subterranea* (Latr.)].

The present publication consists of three parts. The first is a catalogue of the ants of Poland, which provides a taxonomic review of the species together with information about their geographical ranges, their distribution in Poland and their biology. The second part characterises the Polish myrmecofauna, including its zoogeographical and ecological compositions. The third part consists of keys for identification of the ants of Poland (these are the first complete sets of keys to the Polish myrmecofauna).

The catalogue has been prepared by compiling all literature data (from the first publication of the year 1780 up to the end of the year 2000) on the occurrence of particular species in Poland (in the case of the old literature, within the borders of present-day Poland). These have been supplemented by (revised) data from ant collections in the Museum and Institute of Zoology of the Polish Academy of Sciences in Warsaw, and by some other unpublished data available to the authors.

The division of the country into geographical regions (Fig. 1) has been adopted, with some simplifications, after "Katalog Fauny Polski" ("Catalogue of the Fauna of Poland"; see Pisarski 1975). For an analysis of the differentiation of the myrmecofauna within the country, particular regions were grouped into three geographical zones: lowland, upland and mountainous ones (Fig. 2).

The taxonomic system and nomenclature used in the publication are after Bolton (1995a), but the division of the genus *Formica* L. into subgenera (traditional for

European myrmecology) has been maintained. Synonyms cited are those used in the Polish faunistic literature; as regards other synonyms, only most important ones have been quoted. Information on the biology of particular ant species has been based on the authors' own observations from Poland and adjacent regions, and on numerous literature data.

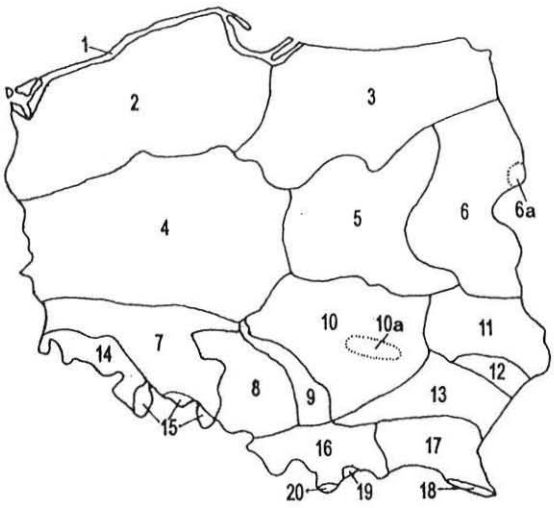


Fig. 1. Division of Poland into geographical regions: 1 – Baltic Coast (Pobrzeże Bałtyku), 2 – Pomeranian Lake District (Pojezierze Pomorskie), 3 – Masurian Lake District (Pojezierze Mazurskie), 4 – Wielkopolsko-Kujawska Lowland (Nizina Wielkopolsko-Kujawska), 5 – Mazovian Lowland (Nizina Mazowiecka), 6 – Podlasie Lowland (Podlasie), 6a – Białowieska Forest (Puszcza Białowieska), 7 – Lower Silesia (Śląsk Dolny), 8 – Upper Silesia (Śląsk Górny), 9 – Krakowsko-Wieluńska Upland (Wyżyna Krakowsko-Wieluńska), 10 – Małopolska Upland (Wyżyna Małopolska), 10a – Świętokrzyskie Mts (Góry Świętokrzyskie), 11 – Lubelska Upland (Wyżyna Lubelska), 12 – Roztocze Upland (Roztocze), 13 – Sandomierska Lowland (Nizina Sandomierska), 14 – Western Sudeten Mts (Sudety Zachodnie), 15 – Eastern Sudeten Mts (Sudety Wschodnie), 16 – Western Beskidy Mts (Beskidy Zachodnie), 17 – Eastern Beskidy Mts (Beskidy Wschodnie), 18 – Bieszczady Mts (Bieszczady), 19 – Pieniny Mts (Pieniny), 20 – Tatra Mts (Tatry).

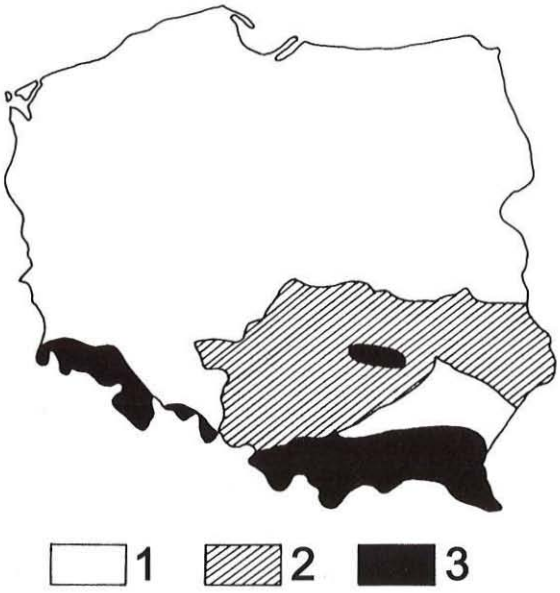


Fig. 2. Division of Poland into geographical zones (following the boundaries of the geographical regions; see Fig. 1): 1 – lowlands, 2 – uplands, 3 – mountains.

SURVEY OF SPECIES

Subfamily PONERINAE Lepeletier

Tribe PONERINI

Genus *Ponera* Latreille, 1804

Ponera Latreille, 1804. Type species: *Formica coarctata* Latreille, 1802a, by subsequent designation of Westwood 1840a.

This genus comprises about 40 species distributed in the Oriental and Australasian regions, in the southern parts of the Palaearctic (5–6 species), in the Nearctic, and on Pacific islands; one species lives in Poland. They are small hypogeic predatory forms.

Ponera coarctata (Latreille, 1802)

Formica coarctata Latreille, 1802a.
Ponera coarctata: Latreille 1804.
Ponera contracta: Brischke 1888b. Synonymy by Roger 1863b.

General distribution (Fig. 3). Central and Southern Europe (the northern range limit runs across southern England), southern part of Eastern Europe, north-western part of Africa, Asia Minor, Lebanon, Israel, Caucasus, Kopet-Dag Mts.

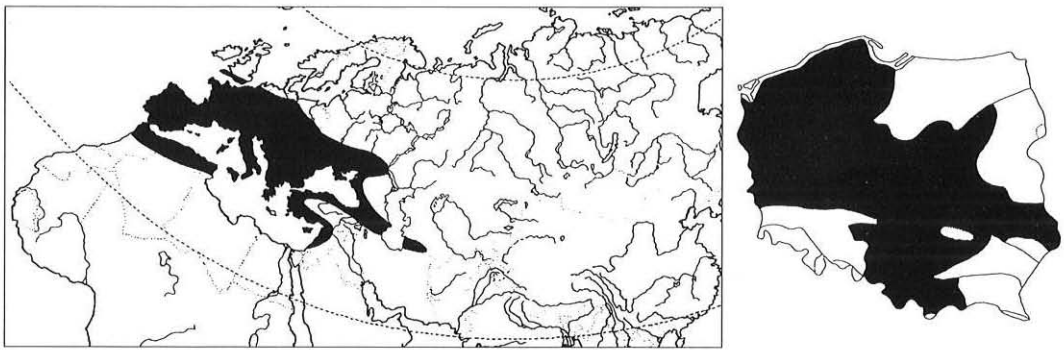


Fig. 3. Distribution of *Ponera coarctata* (Latr.) in Palaearctic and in Poland.

Distribution in Poland (Fig. 3, Table VI). Pomeranian Lake District: Szczecin (coll. MIZ PAS[2]); Wielkopolsko-Kujawska Lowland (Kulmatycki 1922); Mazovian Lowland (Pisarski 1982); Upper Silesia (Nowotny 1931a); Krakowsko-Wieluńska Upland: Ojcowski National Park (W. Czechowska, unpubl. data); Małopolska Upland (Czechowski and Czechowska 1999b); Lubelska Upland (Pętal 1961, Czechowski and Czechowska 1999b); Western Beskidy Mts (Czechowski 1992b, Czechowski and Czechowska 1999b); Pieniny Mts (Woyciechowski 1985, Czechowski and Czechowska 1999b); «Western and Eastern Prussia» (Brischke 1888b).

Biology. Mesoxerophilous species, living mainly in open habitats, especially in dry and semi-dry grasslands on limy or sandy subsoil, also found in light forests. It builds

[2] Museum and Institute of Zoology, Polish Academy of Sciences, Warsaw.

simple nests in humus soil, under moss and stones. Colonies, usually monogynous, number from about a dozen to a few score adults. Inconspicuous, slowly moving ants, mainly carnivorous; they forage singly in the soil and litter. Sexuals emerge in August and September.

In Poland, *P. coarctata* is known from dispersed, exclusively dry sites, particularly in the southern part of the country.

Genus *Hypoponera* Santschi, 1938

Hypoponera Santschi, 1938 (as subgenus of *Ponera*). Type species: *Ponera abeillei* André, 1881, by original designation.
Hypoponera: Taylor 1967.

This genus includes about 150 species, distributed mainly in the tropics and subtropics. Over ten species occur in the Palaearctic (in the southern parts of the region). All the species are geo- or stratobiotic predators, bionomically similar to those of the former genus. One species (an introduced greenhouse denizen) is reported from Poland.

Hypoponera punctatissima (Roger, 1859)

Ponera punctatissima Roger, 1859.
Ponera punctatissima: Nowotny 1937, Stitz 1939, Pisarski 1957.
Hypoponera punctatissima: Taylor 1967.

General distribution. Cosmopolitan species of tropical origin.

Distribution in Poland (Fig. 4, Table VI). Mazovian Lowland: Warszawa (Pisarski 1957, 1982, Pisarski and Czechowski 1978, Czechowski and Czechowska 1999b); Upper Silesia: Rudy – type locality (Roger 1859, Stitz 1939)[3], Bytom (Nowotny 1937); Małopolska Upland: Rokitno-Załącze ad Włoszczowa (Czechowski and Czechowska 1999b), Łódź (B. Pisarski, unpubl. data).

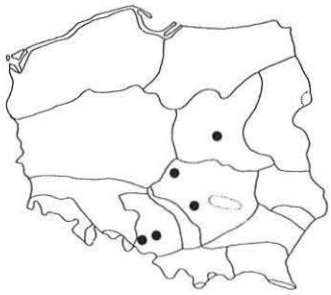


Fig. 4. Localities of *Hypoponera punctatissima* (Rog.) in Poland.

Biology. A thermophilous and mesohygrophilous species. It nests in the ground, under stones, in wall crevices. In the temperate zone of the Holarctic, it occurs synanthropically in heated quarters, most frequently in hothouses (with brought plant material); in hot years, its temporary outdoor occurrence is possible, particularly in such places as fermenting rubbish dumps, waste tips and sawdust heaps. Like the majority of Ponerini, *H. punctatissima* is a highly predatory ant (preying on small arthropods), which fact probably significantly limits the possibility of its synanthropic occurrence. The mating period lasts from June to September (apterous ergatoid males remain in the nests).

In Poland within its present borders, *H. punctatissima* has so far been recorded (only in hothouses) from two sites in Upper Silesia, from the Botanical Garden in

[3] The type locality of *H. punctatissima* is "Rauden" (Roger 1859), now Rudy near Racibórz, province Opole. Pisarski (1957, 1975) mistakenly recognized "Rauden" as Ruda Śląska – a locality situated in the same region of Poland, about 40 km from Rudy. Bolton (1995a) has erroneously considered the type locality to be in Germany, since in 1859 this region belonged to Germany.

Warsaw (records based on nests), and from Warsaw and the Małopolska Upland (records based on single outdoor winged queens). (Concrete data on a finding in Łódź are lacking).

Subfamily DOLICHODERINAE Forel

Tribe DOLICHODERINI

Genus *Dolichoderus* Lund, 1831

Dolichoderus Lund, 1831. Type species: *Formica attelaboides* Fabricius, 1775, by monotypy.
Hypoclinea Mayr, 1855. Type species: *Formica quadripunctata* Linnaeus, 1771, by subsequent designation of Wheeler 1911. Synonymy by Shattuck 1992b.

This genus consists of about 140 species distributed mainly through the tropics (with exception of the Ethiopian and Malagassy regions). Only two species occur in the Palaearctic and one of these is known from Poland. Majority of species are arboreal predators or scavengers; they also utilize honey-dew of different homopterans.

Dolichoderus quadripunctatus (Linnaeus, 1771)

Formica quadripunctata Linnaeus, 1771.
Hypoclinea quadripunctata: Mayr 1855, Wierzejski 1873, Brischke 1888b.
Dolichoderus quadripunctatus: Emery and Forel 1879.
Formica quatuorpunctata: Kluk 1780. Synonymy by Pisarski 1975.

General distribution (Fig. 5). Central and Southern Europe (absent from British Isles), central part of Eastern Europe, Crimean mountains, Caucasus, southern part of Western Siberia, Tien-Shan, and Altai Mts.

Distribution in Poland (Fig. 5, Table VI). Wielkopolsko-Kujawska Lowland (Stitz 1939); Mazovian Lowland (Nasonov 1892, Jakubisiak 1948, Głowacki 1953, Pisarski and Czechowski 1978, Pisarski 1982, Czechowski, Czechowska and Palmowska 1990); Białowieska Forest (Czechowski et al. 1999); Lower Silesia (Stawarski 1966); Upper Silesia (Nowotny 1931a, 1937); Krakowsko-Wieluńska Upland (Wierzejski 1873, Kulmatycki 1920a); Małopolska Upland (Kulmatycki 1920b, Kowalczyk and Watała 1987); Świętokrzyskie Mts (Kowalczyk 1988); Lubelska Upland (Kulmatycki 1920b, Minkiewicz 1935, Pisarski 1953, Begdon 1959, Pętal 1961); Roztocze Upland (Kulmatycki 1920b); Sandomierska Lowland (Czechowska and Czechowski 1998);

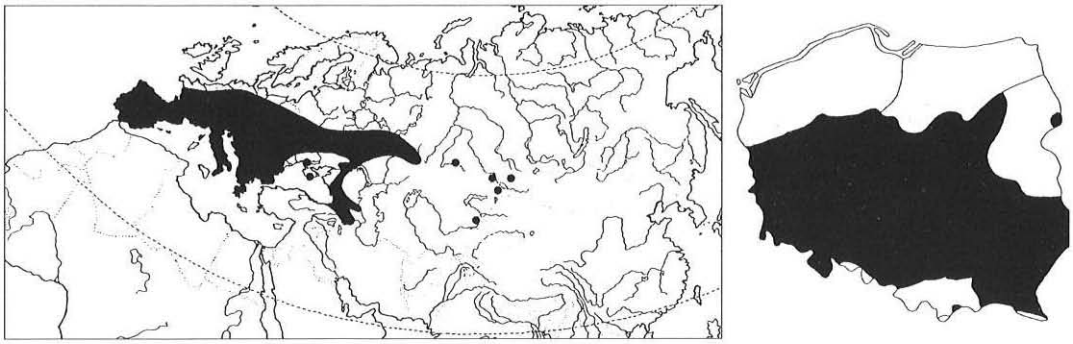


Fig. 5. Distribution of *Dolichoderus quadripunctatus* (L.) in Palaearctic and in Poland.

Western Sudeten Mts (Begdon 1959); Eastern Beskidy Mts (Czechowski et al. 1999); Pieniny Mts (Koehler 1951); «Western and Eastern Prussia» (Brischke 1888b).

Biology. Dendrophilous species – it nests in dead parts of living deciduous trees or in dead tree trunks up to a height of several metres, and also in wooden constructions. It occurs in warm and sun exposed wooded places – on forest edges, in parks, in orchards, etc. It forages almost exclusively on trees. Colonies, usually monogynous, consist of 150–200 (rarely up to 500) adults. Predatory ants, they also attend homopterans for honey-dew. Nuptial flight in July.

In Poland, *D. quadripunctatus* is known mainly from the southern and central parts of the country; everywhere rare.

Tribe TAPINOMINI

Genus *Tapinoma* Förster, 1850

Tapinoma Förster, 1850. Type species: *Tapinoma collina* Förster, 1850, by monotypy.

This is a world-wide genus incorporating about 100 species. There are more than 20 Palaearctic species living in the southern parts of the region. Two species are reported from Poland. All Palaearctic representatives of the genus are ground-nesting forms inhabiting mainly open habitats: grasslands, steppes, open mountain slopes, etc.

Tapinoma erraticum (Latreille, 1798)

Formica erratica Latreille, 1798.
Tapinoma collina Förster, 1850: Brischke 1888b. Synonymy by Schenck 1852.
Tapinoma erraticum: F. Smith 1855.

General distribution (Fig. 6). Europe [to the north up to southern Sweden (islands of Gothland and Öland) and southern England], southern part of Eastern Europe, north-western part of Africa, Asia Minor, Lebanon, Israel, Caucasus, and central Asia.

Distribution in Poland (Fig. 6, Table VI). Pomeranian Lake District: Bielinek ad Chojna (Griep 1940); Wielkopolsko-Kujawska Lowland: Wola Chróścińska ad Kutno (Kulmatycki 1920b); Mazovian Lowland: Warszawa (Nasonov 1892, Koehler 1951, Pisarski and Czechowski 1978), Ząbki-Drewnica ad Wołomin, Warka ad Grójec (Czechowski et al. 1999); Upper Silesia: Ligota Dolna ad Strzelce Opolskie (Nowotny 1937); Krakowsko-Wieluńska Upland: Dubie ad Krzeszowice, Ojców ad Olkusz, Ujazd

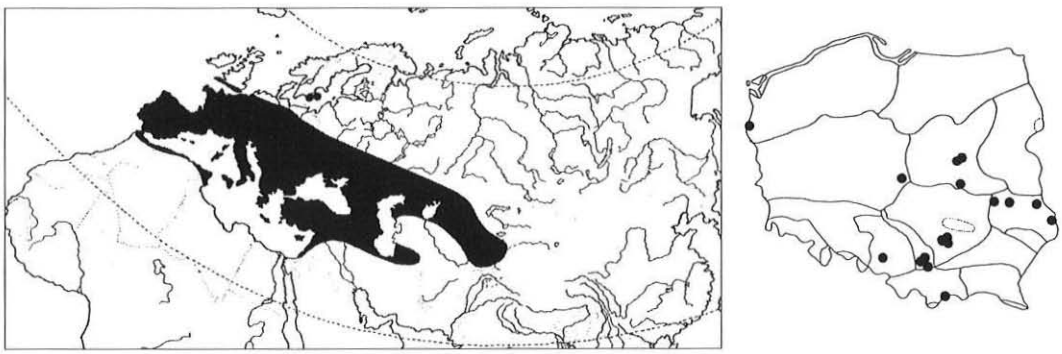


Fig. 6. Distribution of *Tapinoma erraticum* (Latr.) in Palaearctic and its localities in Poland.

ad Kraków (Kulmatycki 1920a); Małopolska Upland: reserves "Skotniki", "Krzyżanowice" and "Grabowiec" ad Pińczów (Czechowski et al. 1999); Lubelska Upland: Kazimierz Dolny ad Puławy (Pisarski 1953), Gródek ad Hrubieszów, Stawska Góra ad Chełm, Żuków ad Lublin (Pętal 1961); Pieniny Mts (Kuntze 1934); «Western and Eastern Prussia» (Brischke 1888b).

Biology. A thermophilous and semixerophilous species living in open, sunny and relatively dry habitats (steppes, meadows, open mountain slopes), especially with limy subsoil. It usually builds nests in the soil, occasionally with small mineral or organic mounds, under stones, rarely in dry empty plant stems. Colonies are mainly polygynous (up to 20 queens) and usually contain several hundred (sometimes several thousand) workers. The ants are partly aphidicolous and partly scavenging and carnivorous. Their nuptial period falls in June and July.

In Poland, the species is reported from a few xerothermal sites in different regions of the country.

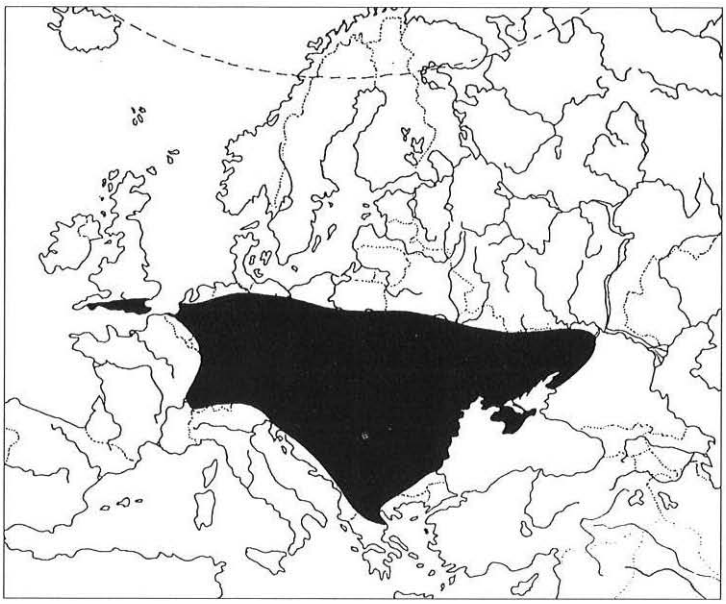
Tapinoma ambiguum Emery, 1925

Tapinoma erraticum subsp. *ambiguum* Emery, 1925a.
Tapinoma ambiguum: Kutter 1977.

General distribution (Fig. 7). Central and Southern Europe, southern England, Ukraine, and Moldova.

Distribution in Poland (Fig. 7, Table VI). Mazovian Lowland (with no concrete locality; Pisarski 1982); Małopolska Upland: reserves "Krzyżanowice" (Pisarski 1975) and "Skowronno" ad Pińczów (Czechowski et al. 1999); Lubelska Upland: Kazimierz Dolny ad Puławy (Czechowski et al. 1999); Pieniny Mts (Czechowska 1976, Czechowski et al. 1999).

Biology. Ecological requirements and biology similar to those in the former species. Nuptial flight in June.



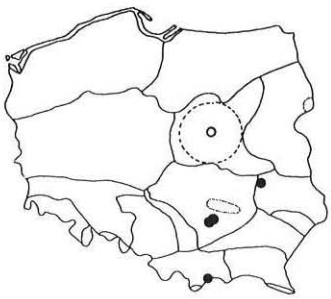


Fig. 7. Distribution of *Tapinoma ambiguum* Em. in Europe and its localities in Poland (○ – vaguely reported from the region).

In Poland, *T. ambiguum* is relatively abundant only in the Pieniny Mts, where it inhabits xerothermal grasslands.

Genus *Linepithema* Mayr, 1866

Linepithema Mayr, 1866. Type species: *Linepithema fuscum* Mayr, 1866, by monotypy.
Iridomyrmex Mayr, 1862 (part.). Type species: *Formica detecta* F. Smith, 1858, by subsequent designation of Bingham 1903; Pisarski 1975. Synonymy by Shattuck 1992a (see also Shattuck 1992b, 1994).

This genus includes more than 50 species; most of them inhabit the Neotropical region. There are no native *Linepithema* forms in the Palaearctic. One now cosmopolitan species is reported from Poland as a greenhouse denizen.

Linepithema humile (Mayr, 1868)

Hypoclinea humilis Mayr, 1868.
Hypoclinea (*Iridomyrmex*) *humilis*: Mayr 1870.
Iridomyrmex humilis: Emery 1888, Pax 1915, 1921, Goetsch 1936, 1942, Herzig 1937, Stitz 1939, Pisarski 1957, 1975.
Linephithema humile: Shattuck 1992a, Czechowski and Czechowska 1997.

General distribution. Originally Neotropical species, at present spread throughout the world. In the tropics, subtropics and the southern part of the temperate zone it lives outdoors, but is a synanthropic form everywhere else.

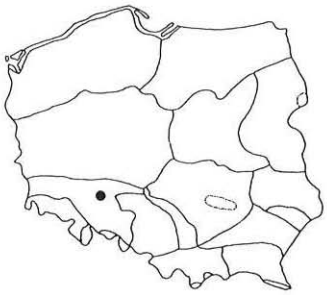


Fig. 8. Locality of *Linepithema humile* (Mayr) in Poland.

Distribution in Poland (Fig. 8, Table VI). Lower Silesia: Wrocław (Pax 1915, 1921, Goetsch 1936, 1942, Herzig 1937, Stitz 1939, Pisarski 1957).

Biology. Nowadays, this is a cosmopolitan species known as the "Argentine ant". Introduced into Southern Europe, it has become an established and notorious crop pest along the Mediterranean coast. It nests in the ground and forms very abundant polygynous colonies. The species is very aggressive and strongly competitive towards native ants. It is a nuisance in agriculture because it protects harmful homopterans attended and reared for honeydew. In the rest of Europe, Argentine ants can survive only in hothouses. In Poland, found only once in a greenhouse of the Botanical Garden in Wrocław.

Subfamily MYRMICINAE Lepeletier

Tribe MYRMICINI

Genus *Myrmica* Latreille, 1804

[after (Radchenko et al. 1997); up-dated]

Myrmica Latreille, 1804. Type species: *Formica rubra* Linnaeus, 1758, by subsequent designation of Latreille 1810.
Sifolinia Emery, 1907. Type species: *Sifolinia laurae* Emery, 1907, by monotypy. Synonymy by Bolton 1988 (see also Seifert 1994, 1996).

The genus *Myrmica* comprises about 150 described species. These ants are mainly Holarctic forms: more than 110 species and infraspecific forms occur in the Palaearctic

and 22 in the Nearctic (10 species are known from the Oriental and one from the Neotropical regions). Most species inhabit more or less humid habitats, both forest and open ones, including mountain environments. Also, there are a few semixerophilous steppe forms. Certain species have ranges extending far north – to the forest-tundra natural zone; some occur in the tundra mountain strata where they are found at 3600 m above sea level (in the Pamirs) or even at 4500–4800 m a.s.l. (in the Himalayas and in Tibet).

Myrmica ants are stocky, deliberate moving; they are predatory forms foraging mainly on the ground surface, rarely in the litter or on herbs; moreover, many species are trophobiotically associated with aphids. They nest in the ground, frequently under stones and pieces of old wood, in rotting tree stumps, in logs and branches lying on the ground, under moss, in tufts of grass, and in litter. Their colonies generally number from several hundred to more than one thousand (sometimes up to ten thousand) workers. They are either monogynous or polygynous (the latter may contain several score or even more than 100 queens). Some species are social parasites (inquilines) living in colonies of other species of the same genus.

Up till now, no recent complete revision of the genus has been presented, even though myrmecologists are greatly interested in this group of ants, and several papers (including taxonomic ones) have been published about them. Recently, however, there have appeared taxonomic reviews and revisions of *Myrmica* species from certain regions of the Palaearctic (Seifert 1988a, Radchenko 1994a,b,d–g, Radchenko and Elmes 1998, 1999).

So far, 14 species of this genus have been recorded from Poland.

Myrmica rubra (Linnaeus, 1758)

Formica rubra Linnaeus, 1758.
Myrmica rubra: Begdon 1954 (part.), Pętal et al. 1970, Czerwiński et al. 1971, Jakubczyk et al. 1972, Woyciechowski 1987, 1990a,b,c, Radchenko et al. 1997.
Myrmica laevinodis Nylander, 1846. Synonymy by Yarrow 1955.
Myrmica rubra laevinodis: Kulmatycki 1920a,b, 1922, Bischoff 1925, Scholz 1926, Nowotny 1931a, Griep 1938.
Myrmica loevinodis: Jakubisiak 1948 (misprinting).
Myrmica laevinodis var. *europea* Finzi, 1926; first available name for *Myrmica rubra* subsp. *champlaini* var. *europea* Forel, 1911 (unavailable name); Koehler 1951, **syn. nov.**

Note. In his catalogue, Pisarski (1975) disagreed with Yarrow's (1955) opinion that the name *Myrmica laevinodis* Nylander, 1846 is a junior synonym of *Myrmica rubra* (Linnaeus, 1758), and therefore *M. rubra*, a very common and widely distributed species, is referred to as *M. laevinodis* in most of the Polish myrmecological literature (and practically nowhere else now).

General distribution (Fig. 9). A species known from almost entire Europe and Palaearctic Asia: from Portugal to Eastern Siberia and from northern Italy to the forest-tundra natural zone. Rare in Caucasus and in mountains of central Asia. The eastern limit of this species' range probably runs in Eastern Siberia; a report on the occurrence of *M. rubra* in Japan (Onoyama 1989) is based on misidentification. Introduced into North America.

Distribution in Poland (Fig. 9, Table VI). Baltic Coast (Kulmatycki 1922, Mazur 1983); Pomeranian Lake District (Kulmatycki 1922, Begdon 1932b, Griep 1938, Jacobson 1940, Będziak 1956, Szujecki et al. 1978, 1983, Mazur 1983); Masurian Lake

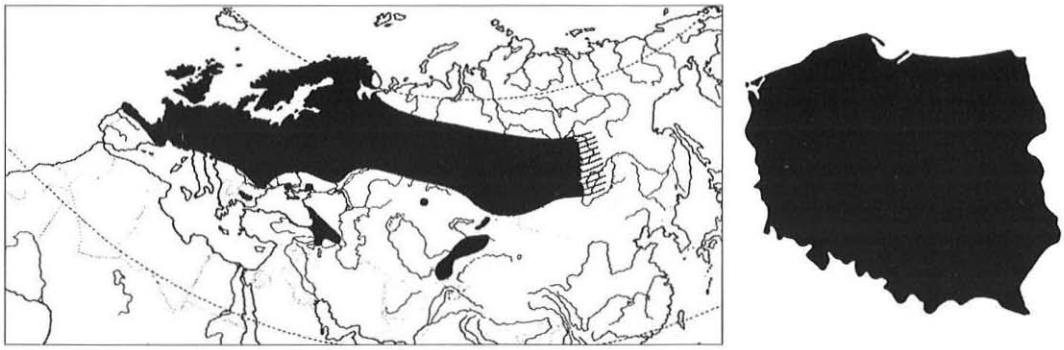


Fig. 9. Distribution of *Myrmica rubra* (L.) in Palaearctic and in Poland.

District (Begdon 1932b, Wengris 1962, 1963, 1977, Mazur 1983, Krzysztofiak 1985); Wielkopolsko-Kujawska Lowland (Kulmatycki 1922, Begdon 1932b, Stawarski 1966, Kiełczewski and Wiśniewski 1971, Pawlikowski and Sobieszczyk 1980); Mazovian Lowland (Nasonov 1889, 1892, 1894, Kulmatycki 1920b, Jakubisiak 1948, Kaczmarek 1963, Pętal 1967, 1968b, 1976, 1980b, 1981, Pętal and Breymeyer 1969, Pętal et al. 1970, 1971, Czerwiński et al. 1971, Jakubczyk et al. 1972, Czechowski 1976b, 1984a,b, 1985, 1990a, 1991, Pisarski and Czechowski 1978, 1991, Czechowski, Czechowska and Palmowska 1990, Czechowski and Pisarski 1990a,b, Czechowski, Pisarski and Czechowska 1990), Pisarski and Czechowski 1978, 1991, Pisarski 1981, 1982, Vepsäläinen and Pisarski 1982, Bańkowska et al. 1984; Podlasie Lowland (Kulmatycki 1920b, Wiąckowski 1957, Pętal 1963b, 1968a, Pętal et al. 1992); Białowieska Forest (Bischoff 1925, Karpiński 1956, Czechowski et al. 1995); Lower Silesia (Stawarski 1961b, 1966); Upper Silesia (Scholz 1926, Nowotny 1931a, Stawarski 1966); Krakowsko-Wieluńska Upland (Wierzejski 1868, 1873, Kulmatycki 1920a, Kaczmarek 1953); Małopolska Upland (Kulmatycki 1920b, Puszkar 1982); Świętokrzyskie Mts (Kulmatycki 1920b, Krzysztofiak 1984); Lubelska Upland (Kulmatycki 1920b, Pisarski 1953, Pętal 1961, Honczarenko 1964, Puszkar 1978, 1982); Roztocze Upland (Kulmatycki 1920b, Pętal 1961, 1964, Mazur 1983); Sandomierska Lowland (Kulmatycki 1920b, Stawarski 1966, Puszkar 1979, 1982, Mazur 1983); Western Sudeten Mts (Scholz 1912, Pax 1937, Stawarski 1966, Dominiak 1970, Banert and Pisarski 1972); Eastern Sudeten Mts (Stawarski 1966, Banert and Pisarski 1972); Western Beskidy Mts (Kulmatycki 1920b, Dominiak 1970, Woyciechowski and Miszta 1976); Eastern Beskidy Mts (Kulmatycki 1920b, Pętal et al. 1970); Bieszczady Mts (Parapura and Pisarski 1971, Pisarski 1971, 1973, 1983, Czechowski 1977a); Pieniny Mts (Koehler 1951, Pętal 1974, 1980b, Czechowska 1976, Woyciechowski 1985, 1987, 1990a,b, 1992); Tatra Mts (Kulmatycki 1920b, J. Łomnicki 1931, Woyciechowski 1990c); «Western and Eastern Prussia» (Brischke 1888b).

Biology. A eurytope, the most hygrophilous and yet the most tolerant species of all Central-European *Myrmica*, one of the commonest in the Palaearctic. It occurs in very diverse habitats (from mesophilous to very wet), especially in lowlands. Particularly numerous in meadows with a high level of ground water. The species frequently occurs in anthropogenic habitats (gardens, agrocoenoses). It is rarer in forests (substituted there by *Myrmica ruginodis*). It nests in the ground, in tufts of grass and moss, under

stones, in rotting wood, under bark; nests often with a small mound of soil or of plant remnants. Colonies, generally polygynous, number several thousand (occasionally over 10,000) individuals and may form polycalic systems. Very aggressive ants (even towards man); they frequently wage fierce intra- and interspecific combats. They utilize honeydew of aphids and scale insects (even those on trees) more than do other *Myrmica*; they also drink nectar (they are seen mainly on the inflorescence of umbellifloraе). Nuptial flights take place in August and September (in the mountains even in October) and are directed towards elevations (swarming sites).

The species is common all over Poland.

Myrmica microrubra Seifert, 1993

Myrmica microrubra Seifert, 1993: Czechowski, Woyciechowski and Czechowska 1999.
Myrmica microgyna Pearson, 1981: Buschinger 1990.[4]
Myrmica rubra microgyna: Elmes and Keller 1993.

Note. This form, recently-described by Seifert (1996) as a separate socially parasitic species, used to be considered a microgyne morph of its host, *M. rubra*. However, its species status is still under discussion (Buschinger 1997). Recent genetic investigations, based on the sequencing of DNA, do not confirm the separateness of *M. microrubra* from *M. rubra* in this respect (R. Savolainen, unpubl. data).

General distribution. In the literature, there are many reports on the presence of microgynes in colonies of *M. rubra*. If all these data are assumed to refer to *M. microrubra*, the range of this species will cover at least the entire European part of the range of its host species. Nevertheless, *M. microrubra* as a separate species has so far been reported only from England, Germany, Finland, and Poland – everywhere from separate sites.

Distribution in Poland (Fig. 10, Table VI). Krakowsko-Wieluńska Upland: Bolechowice ad Kraków, Czajowice ad Ojców (Czechowski, Woyciechowski and Czechowska 1999).

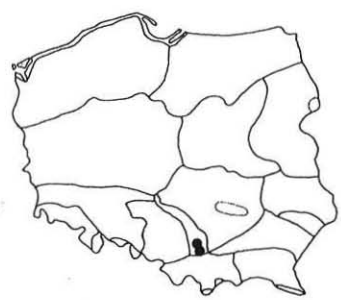


Fig. 10. Localities of *Myrmica microrubra* (Seifert) in Poland.

Biology. An inquiline workerless social parasite of *M. rubra*. *M. microrubra* queens ("microgynes") generally co-occur in their host colonies with *M. rubra* queens ("macrogynes"), and they produce nearly forty times as many queens as do the host queens (probably due to physiological manipulation).

From Poland, this form has only just been reported basing on two infested *M. rubra* colonies and a common mating place (seen in late August) of these two species.

Myrmica ruginodis Nylander, 1846

Myrmica ruginodis Nylander, 1846: Radchenko et al. 1997.
Myrmica rubra r. *ruginodis*: Kulmatycki 1920a,b, 1922, Pongrácz 1924, Bischoff 1925.

[4] Pearson (1981) was the first who suggested species separateness of microgynes found in *M. rubra* nests. Buschinger (1990) ascribed the authorship of the species "*M. microgyna*" to him, yet Pearson himself never used this name.

Myrmica rubra subsp. *ruginodis*: Nowotny 1931c, Griep 1938.
Myrmica rubra var. *ruginodo-laevinodis* Forel, 1874: Kulmatycki 1920a,b, 1922. Synonymy by Bernard 1967.
Myrmica ruginodis var. *ruginodo-laevinodis*: Nasonov 1892, Koehler 1951, Stawarski 1966.
Myrmica ruginodo-laevinodis: Jacobson 1940.
Myrmica rubra (Linnaeus, 1758): Begdon 1954 (part.), Kaczmarek 1963, Pisarski 1975, nec Linnaeus 1758 et auct., Puszkar 1978, Szujecki et al. 1978, 1983, Pawlikowski and Sobieszczyk 1980, Mazur 1983.
Myrmica rubra var. *microgyna* Brian et Brian, 1949: Kaczmarek 1963. Synonymy by Bolton 1995a.

Note. In his catalogue, Pisarski (1975) wrongly ascribed the name *Myrmica rubra* (Linnaeus, 1758) to this species. Nevertheless, the correct name is used in most of the later Polish literature (including the papers of Pisarski himself).

General distribution (Fig. 11). The compact range of this species extends from Western Europe (the British Isles, Iberian peninsula, France) across Central, Northern and Eastern Europe to Siberia and to the Far East and Japan. Very common in Caucasus, absent from mountains of central Asia.

Distribution in Poland (Fig. 11, Table VI). Baltic Coast (Kulmatycki 1922, Jacobson 1940, Mazur 1983); Pomeranian Lake District (Begdon 1932b, Griep 1938, Jacobson 1940, Będziak 1956, Szujecki et al. 1978, 1983, Mazur 1983, Czechowski et al. 1995); Masurian Lake District (Begdon 1932b, Wengris 1962, 1963, 1977, Mazur 1983, Krzysztofiak 1985); Wielkopolsko-Kujawska Lowland (Kulmatycki 1922, Begdon 1932b, Kiełczewski and Wiśniewski 1966, 1971, Stawarski 1966, Pawlikowski and Sobieszczyk 1980, Mazur 1983); Mazovian Lowland (Nasonov 1889, 1892, Jakubisiak 1948, Wiąckowski 1957, Kaczmarek 1963, Pętal 1967, 1976, 1980b, 1981, Pętal and Breymeyer 1969, Pętal et al. 1970, 1971, Czerwiński et al. 1971, Jakubczyk et al. 1972, Pisarski and Czechowski 1978, 1991, Pisarski 1981, 1982, Mazur 1983, Bańkowska et al. 1984, Czechowski 1990a, 1991, Czechowski and Pisarski 1990a,b, Czechowski, Pisarski and Czechowska 1990, Czechowski et al. 1995); Podlasie Lowland (Pętal 1968a, Pętal et al. 1970, Mazur 1983, Pętal et al. 1992); Białowieska Forest (Bischoff 1925, Karpiński 1956, Czechowski et al. 1995, Czechowski 1998b); Lower Silesia (Kotzias 1930a, Stawarski 1966, Mazur 1983); Upper Silesia (Nowotny 1931a, Stawarski 1966, Pętal 1980a); Krakowsko-Wieluńska Upland (Wierzejski 1868, 1873, Kulmatycki 1920a, Kaczmarek 1953); Małopolska Upland (Puszkar 1982, Mazur 1983); Świętokrzyskie Mts (Kulmatycki 1920b, Pongrácz 1924, Krzysztofiak 1984); Lubelska Upland (Kulmatycki

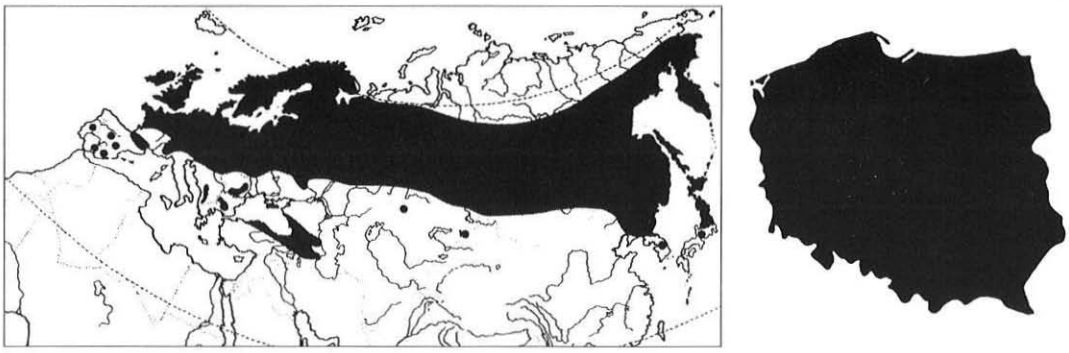


Fig. 11. Distribution of *Myrmica ruginodis* Nyl. in Palaearctic and in Poland.

1920b, Pisarski 1953, Puszkar 1978, 1982, Mazur 1983); Roztocze Upland (Kulmatycki 1920b, Pętal 1961, 1964, Mazur 1983); Sandomierska Lowland (Kulmatycki 1920a, Stawarski 1966, Puszkar 1979, 1982, Mazur 1983); Western Sudeten Mts (Harnisch 1924, Pax 1937, Stawarski 1966, Dominiak 1970, Banert and Pisarski 1972, Pętal 1994); Eastern Sudeten Mts (Stawarski 1966, Banert and Pisarski 1972); Western Beskidy Mts (Kulmatycki 1920a, Czechowski 1989); Eastern Beskidy Mts (Czechowski, Czechowska and Radchenko 1998a); Bieszczady Mts (Parapura and Pisarski 1971, Pisarski 1971, 1973, 1983); Pieniny Mts (Koehler 1951, Pętal 1974, 1980b, Czechowska 1976, Woyciechowski 1985, 1987, 1990a, 1992); Tatra Mts (Kulmatycki 1920a, J. Łomnicki 1931, A. Łomnicki 1963, Woyciechowski 1990c); «Western and Eastern Prussia» (Brischke 1888b).

Biology. A polytopic species of moist forests, where it replaces *M. rubra* (in mountains, *M. ruginodis* inhabits also open habitats above 1000 m a.s.l.); the least thermophilous species of the European *Myrmica*. It avoids dry and sun exposed places and, unlike *M. rubra*, highly anthropogenized habitats. Nests as in the previous species. It occurs in two social forms: mono- and polygynous (the latter potentially polycalic). These ants are seen tending aphids and feeding on flower nectar. Nuptial flights (directed at swarming sites) in August or September.

The species is common throughout Poland; it finds optimum conditions in moist coniferous and mixed forests. In the mountains, it reaches the crag stratum; particularly abundant in mountain pastures.

Myrmica sulcinodis Nylander, 1846

Myrmica sulcinodis Nylander, 1846: Radchenko et al. 1997.
Myrmica sulcinodis var. *sulcinodo-scabrinodis* Forel, 1915: Kulmatycki 1922. Synonymy by Bernard 1967.

General distribution (Fig. 12). This species occurs from the British Isles to the Far East and from the forest-tundra natural zone to the southern limit of the coniferous forest zone in European plains, and in the eastern part of the Palaearctic to Mongolia and North Korea. It also occurs in the mountains of Europe and in the Caucasus; absent from mountains of Central Asia.

Distribution in Poland (Fig. 12, Table VI). Western Sudeten Mts (Banert and Pisarski 1972, Czechowski et al. 1997); Western Beskidy Mts (Kulmatycki 1920a);

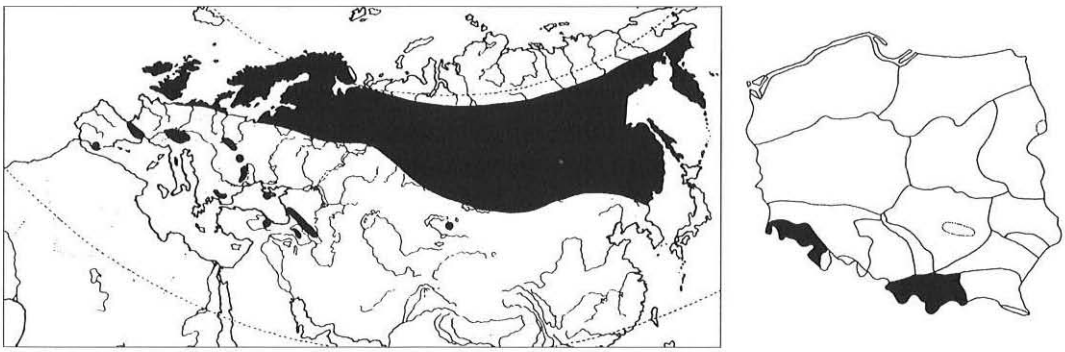


Fig. 12. Distribution of *Myrmica sulcinodis* Nyl. in Palaearctic and in Poland.

Pieniny Mts (Koehler 1951, Pętal 1974, 1980b, Woyciechowski 1990a, 1992); Tatra Mts (J. Łomnicki 1931, Woyciechowski 1990c).

Questionable data: Mazovian Lowland (Nasonov 1892); Lubelska Upland (Pętal 1961); Roztocze Upland (Pętal 1961).

Mistakenly reported from the Wielkopolsko-Kujawska Lowland by Kulmatycki (1922) basing on misidentification of *Myrmica specioides*.

Biology. A boreo-montane species; in Southern Europe and in the Caucasus it occurs at 1400–2600 m a.s.l., in Central Europe at 800–1800 m a.s.l., but farther to the north it lives in lowland habitats – open and sun exposed (well-drained peat-bogs, moorlands, sandy patches). It nests in the ground, occasionally under stones; nests generally without mounds (in moister places sometimes with small mounds of plant remnants, for brood incubation). It forms fairly small colonies (a few hundred individuals), usually monogynous. *M. sulcinodis* are typical predators and scavengers. Nuptial flights take place in August and September, mating takes place in the air, over elevations.

The species is very rare in Poland; certain sites are only in the mountains.

Myrmica lobicornis Nylander, 1846

Myrmica lobicornis Nylander, 1846: Radchenko et al. 1997.
Myrmica scabrinodis var. *lobicornis*: Griep 1938.
Myrmica schencki: J. Łomnicki 1931 (misidentification; see Woyciechowski 1990c).

General distribution (Fig. 13). Distribution similar to that of the previous species, but the compact range in Europe extends farther south (to the deciduous forest zone), whereas in Asia it extends only to Transbaykal.

Distribution in Poland (Fig. 13, Table VI). Baltic Coast (Czechowski, Czechowska and Radchenko 1998a); Pomeranian Lake District (Begdon 1932b, Griep 1938, 1940, Szujecki et al. 1978, 1983, Mazur 1983, Czechowski et al. 1995); Masurian Lake District (Begdon 1932b, Wengris 1977, Mazur 1983); Wielkopolsko-Kujawska Lowland (Kulmatycki 1922, Pawlikowski and Sobieszczyk 1980, Mazur 1983); Mazovian Lowland (Kaczmarek 1963, Pisarski and Czechowski 1978, Pisarski 1981, 1982, Mazur 1983, Czechowski 1990a, Czechowski, Pisarski and Czechowska 1990, Czechowski et al. 1995); Podlasie Lowland (Mazur 1983); Białowieska Forest (Karpiński 1956, Czechowski et al. 1995); Lower Silesia (Mazur 1983); Upper Silesia (Nowotny 1931a, 1937); Krakowsko-Wieluńska Upland (Kulmatycki 1920a, Kaczmarek 1953); Małopols-

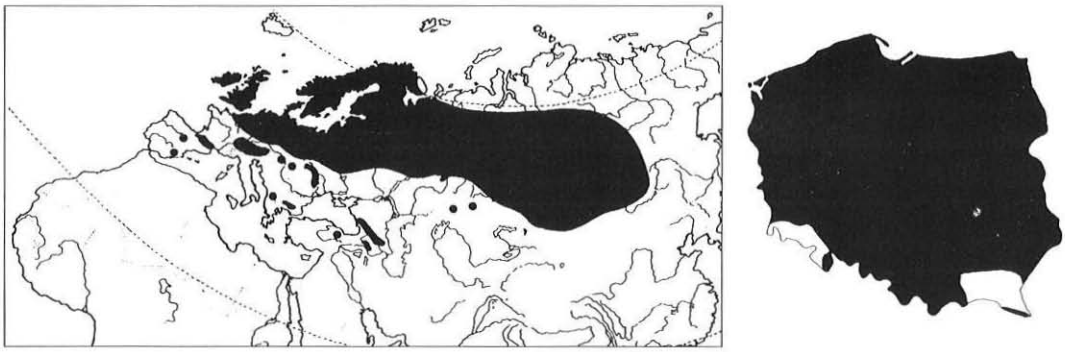


Fig. 13. Distribution of *Myrmica lobicornis* Nyl. in Palaearctic and in Poland.

ka Upland (Puszkar 1982, Mazur 1983); Świętokrzyskie Mts (Kulmatycki 1920b, Mazur 1983, Krzysztofiak 1984); Lubelska Upland (Minkiewicz 1935, Pisarski 1953, Puszkar 1978, 1982, Mazur 1983); Roztocze Upland (Pętal 1961, Mazur 1983); Sandomierska Lowland (Puszkar 1982, Mazur 1983); Eastern Sudeten Mts (Banert and Pisarski 1972); Western Beskidy Mts (Kulmatycki 1920a, Woyciechowski and Miszta 1976, Czechowski and Pisarski 1988); Bieszczady Mts (Parapura and Pisarski 1971); Pieniny Mts (Koehler 1951, Czechowska 1976, Woyciechowski 1985, 1987, 1990a, 1992); Tatra Mts (Woyciechowski 1990c); «Western and Eastern Prussia» (Brischke 1888b).

Biology. An oligotope of coniferous forests (but enters mixed ones, too), also recorded from meadows and pastures, including xerothermal sites. Nowhere very abundant. Nests in the ground, litter, moss, under stones, in rock crevices. The species forms monogynous colonies with a few hundred individuals at most. Workers forage individually; they belong to the least aggressive *Myrmica* ants. Nuptial flights in July and August.

In Poland, the species probably occurs all over the country (not recorded only from the Western Sudeten Mts and the Eastern Beskidy Mts); in the mountains, it reaches up to the upper subalpine forests.

Myrmica rugulosa Nylander, 1849

Myrmica rugulosa Nylander, 1849: Radchenko et al. 1997.
Myrmica scabrinodis var. *rugulosa*: Kulmatycki 1920a.
Myrmica scabrinodis r. *rugulosa*: Kulmatycki 1922.
Myrmica clandestina Förster, 1850: Brischke 1888b. Synonymy by Mayr 1855.
Myrmica rugulosa var. *scabrinodo-rugulosa* Nasonov, 1892, nomen nudum.

General distribution (Fig. 14). This species occurs from Western Europe (France), across Central and Eastern Europe, the Middle Ural Mts, the southern part of Western Siberia, northern Kazakhstan to the Altai Mts. In Europe, the northern limit of its range extends across southern Sweden and southern Finland, and the southern limit across northern Italy. The species also inhabits the Pyrenees, the Balkans and the Caucasus.

Distribution in Poland (Fig. 14, Table VI). Baltic Coast (Kulmatycki 1922); Pomeranian Lake District (J. Łomnicki 1924, Begdon 1932b, Jacobson 1940, Szujecki et al. 1978, 1983, Mazur 1983); Masurian Lake District (Begdon 1932b, Wengris 1977, Mazur 1983, Krzysztofiak 1985); Wielkopolsko-Kujawska Lowland (Begdon 1932b, Pawlikowski and Sobieszczyk 1980); Mazovian Lowland (Nasonov 1892, Jakubisiak

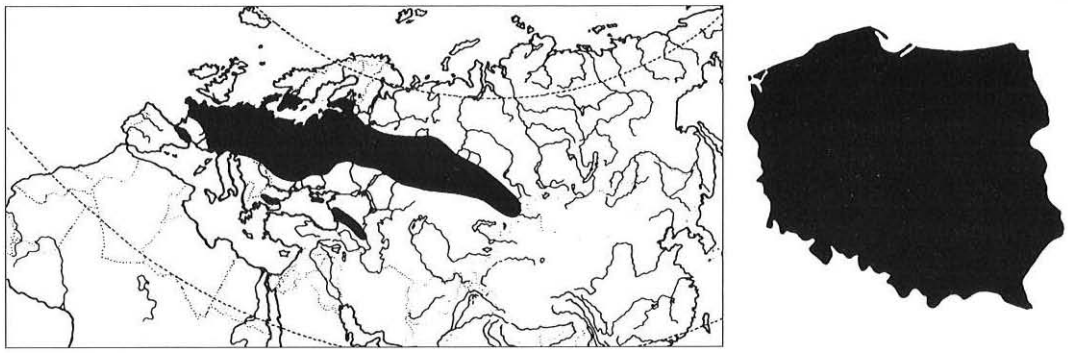


Fig. 14. Distribution of *Myrmica rugulosa* Nyl. in Palaearctic and in Poland.

1948, Kaczmarek 1963, Banaszak et al. 1978, Pisarski and Czechowski 1978, Czechowski 1979, 1985, 1990a, 1991, Czechowski, Czechowska and Palmowska 1990, Czechowski and Pisarski 1990a, Czechowski, Pisarski and Czechowska 1990, Czechowski et al. 1979, Pisarski 1981, 1982); Podlasie Lowland (Mazur 1983); Białowieska Forest (Czechowski 1994e); Lower Silesia (Stawarski 1966); Upper Silesia (Nowotny 1931a); Krakowsko-Wieluńska Upland (Nowicki 1864, 1865, Wierzejski 1873, Kulmatycki 1920a, Kaczmarek 1953); Małopolska Upland (Puszkar 1982); Świętokrzyskie Mts (Krzysztofiak 1984); Lubelska Upland (Minkiewicz 1935, Pisarski 1953, Honczarenko 1964); Roztocze Upland (Czechowski, Czechowska and Radchenko 1998a); Sandomierska Lowland (Puszkar 1982); Western Sudeten Mts (Harnisch 1924, Banert and Pisarski 1972, Pętal 1994); Eastern Sudeten Mts (Stawarski 1966); Western Beskidy Mts (Kulmatycki 1920a, Czechowski and Pisarski 1988); Eastern Beskidy Mts (Czechowski, Czechowska and Radchenko 1998a); Bieszczady Mts (Parapura and Pisarski 1971, Pisarski 1971, Czechowski 1977a, 1979); Pieniny Mts (Koehler 1951, Pętal 1974, 1980b, Czechowska 1976, Woyciechowski 1985, 1990a, 1992); Tatra Mts (Nowicki 1864, 1865, Wierzejski 1868, 1873, J. Łomnicki 1931, Woyciechowski 1990c); «Western and Eastern Prussia» (Brischke 1888b).

Biology. An oligotopic thermophilous species of dry habitats. Frequent in sunny open habitats with not very lush vegetation, in mid-forest clearings and in fallow land; in the mountains, it occurs on river terraces and on dry slopes. Tolerant to human pressure – in Central Europe, no other *Myrmica* inhabits urban lawns more abundantly. It nests in the ground; nest entrances are frequently surrounded by circular sand embankments. Societies are polygynous (occasionally polycalic) and very numerous – a single colony may comprise several thousand individuals. *M. rugulosa* is primarily a scavenger; it also utilizes honeydew of aphids on herbaceous plans. Unlike most other *Myrmica* species this species forages in groups. It is a typical non-aggressive opportunistic species – in the presence of superior ants (e.g. *Lasius niger*) it withdraws without fight. Nuptial flights from August to October.

In Poland, abundant all over the country; in the mountains, it reaches up to the lower subalpine forest (in the Tatra Mts even to the upper subalpine forest).

Myrmica gallienii Bondroit, 1920

Myrmica gallienii Bondroit, 1920: Radchenko et al. 1997.
Myrmica rolandi: Jacobson 1940 (misidentification).
Myrmica jacobsoni Kutter, 1963: Pisarski 1975, Pętal et al. 1992, Pętal 1994. Synonymy by Collingwood 1979.
Myrmica lemanica subsp. *jacobsoni*: Pętal 1980b (misprinting).
Myrmica limanica subsp. *jacobsoni*: Pętal 1981, Pisarski 1982, Uchmański and Pętal 1982.

General distribution (Fig. 15). The species is widely distributed in the deciduous-forest and mixed-forest zones; it occurs in Central and Eastern Europe and in Western Siberia, in the north extending to Sweden (island of Gothland), southern Finland and the Nizhegorodsky district in Russia, in the south – to Bulgaria and the steppe zone where it lives in intrazonal habitats. Recorded also from Dagestan.

Distribution in Poland (Fig. 15, Table VI). Baltic Coast (Czechowski et al. 1997); Pomeranian Lake District (Jacobson 1940); Wielkopolsko-Kujawska Lowland (Czechowski et al. 1997); Mazovian Lowland (Pętal 1980b, 1981, Uchmański and Pętal

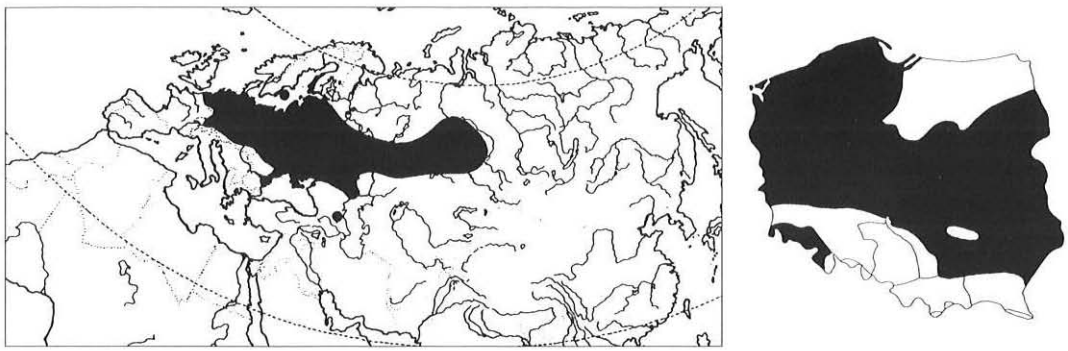


Fig. 15. Distribution of *Myrmica gallienii* Bondr. in Palaearctic and in Poland.

1982, Czechowski et al. 1997); Podlasie Lowland (Pętal et al. 1992, Czechowski et al. 1997); Białowieska Forest (Czechowski et al. 1997); Małopolska Upland (Czechowski et al. 1997); Lubelska Upland (coll. MIZ PAS); Roztocze Upland (Czechowski et al. 1997), Sandomierska Lowland (Czechowska and Czechowski 1998); Western Sudeten Mts (Pętal 1994).

Biology. A hygrophilous, thermophilous and facultatively halophilous species. Its typical habitats are moist meadows and swamps, frequently (but not obligatorily) saline ones; on the Baltic coast, it occurs in periodically flooded silty coastal meadows or even in sand dunes. In moist habitats, it builds shallow nests with a soil mound, but in dunes the nests are situated deep in the sand. Colonies are large, with thousands of individuals. In its lifestyle *M. gallienii* resembles *M. rubra* – the ants ascend plants and are rather aggressive. Nuptial flights in August and September.

In Poland, *M. gallienii* populations were recorded, among others, in the meadow reserve "Łąki Strzeleckie" (Stellario-Deschampsietum) in the Kampinoski National Park in the Mazovian Lowland and in drained peat-bogs, utilized as meadows, in the Narew and Biebrza valleys in Podlasie Lowland, and in wet meadows in the Sandomierska Lowland. In the Western Sudeten Mts, the species was recorded from different successional stages of spruce forest in the Karkonosze Mts as well as from a mountain grassland in the Izerskie Mts.

Myrmica hellenica Finzi, 1926

Myrmica rugulosa var. *hellenica* Finzi, 1926, first available name for *Myrmica scabrinodis* r. *rugulosa* var. *hellenica* Forel, 1913a (unavailable name).
Myrmica hellenica: Radchenko et al. 1997. Raised to species by Seifert 1988.

General distribution (Fig. 16). Widely but locally spread in Southern and Central Europe; known from Greece, Bulgaria, northern Italy, Switzerland, Austria, Germany, Bohemia, Poland and southern Finland.

Distribution in Poland (Fig. 16, Table VI). Baltic Coast: island of Wolin (Radchenko et al. 1997), Gdańsk-Sobieszewo Island (W. Czechowska, unpubl. data); Podlasie Lowland: Siedlce (Czechowski, Radchenko and Czechowska 1998a); Eastern Beskidy Mts: Międzygrodzie ad Sanok (Czechowski, Radchenko and Czechowska 1998a); Pieniny Mts: Sromowce Wyżne (Czechowski, Radchenko and Czechowska 1998a).

Biology. A little-known species, probably of pioneer character. It lives in xerothermal habitats (only superficially dry) with sandy soils, scantily covered with vegetation:

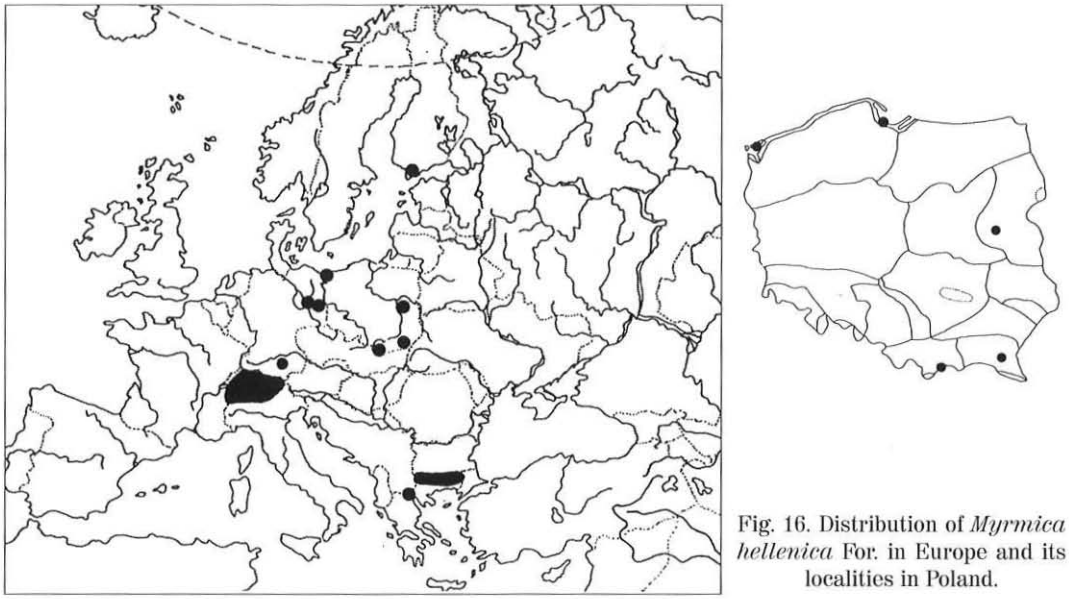


Fig. 16. Distribution of *Myrmica hellenica* For. in Europe and its localities in Poland.

river terraces, banks of stagnant waters, exposed slopes. Nests in the ground – among grass roots or deep in sand; occasionally under stones. Colonies are fairly big (a few hundred to 1600 individuals), there may be several queens.

In Poland, most of the *M. hellenica* nests recorded were situated on an open sunny mountain slope in the Eastern Beskidy Mts and on sandy or stony terraces of the river Dunajec, covered with sparse herb vegetation (Pieniny Mts); on the Baltic Coast, the species inhabits dunes covered with herbaceous and shrubby vegetation.

Myrmica specioides Bondroit, 1918

Myrmica specioides Bondroit, 1918: Radchenko et al. 1997.
Myrmica scabrinodis subsp. *rugulosoides* Forel, 1915: Kulmatycki 1920a (part.), Nowotny 1937 (part.) (misidentification).
Myrmica scabrinodis: Pisarski 1953 (part.) (misidentification)
Myrmica sulcinodis ?var. *sulcinodo-scabrinodis* Forel, 1915: Kulmatycki 1922 (misidentification).

Note. For a long time, many authors considered *M. specioides* to be a junior synonym of different species (see Bolton 1995a). Seifert (1988a) considered it to be a good species. We approve of Seifert's taxonomic interpretation and will follow it until special studies have been carried out.

General distribution (Fig. 17). Western and Central Europe, northern part of Balkan Peninsula. Despite Collingwood's information (1979), absent from Finland (Saaristo, personal comm.)

Distribution in Poland (Fig. 17, Table VI). Wielkopolsko-Kujawska Lowland: Gądki ad Śrem (Kulmatycki 1922); Upper Silesia (Nowotny 1937); Małopolska Upland (Puszkar 1982, Czechowski et al. 1997); Lubelska Upland (Pisarski 1953); Sandomierska Lowland (Puszkar 1982, Czechowski et al. 1997); Western Beskidy Mts (Kulmatycki 1920a); Pieniny Mts (Woyciechowski 1990a, 1992).

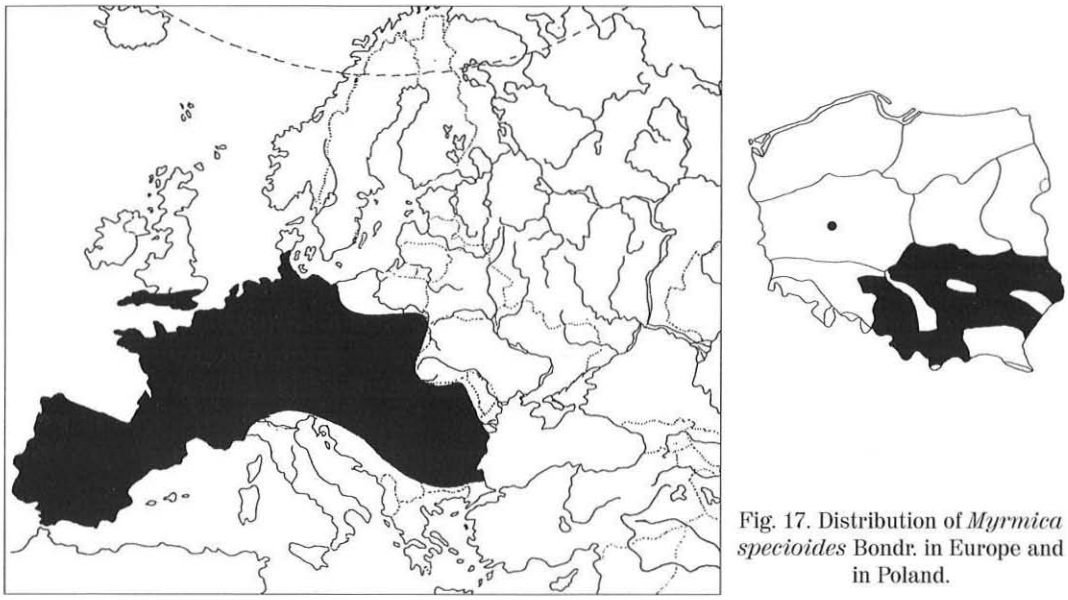


Fig. 17. Distribution of *Myrmica specioides* Bondr. in Europe and in Poland.

Biology. The most xerophilous species of all Central European *Myrmica*. It mainly inhabits open areas with scanty and low herbaceous vegetation. It builds inconspicuous nests in the ground with one or a few simple entrance holes. Colony size hardly exceeds a thousand individuals; generally, there is one or several queens in the nest, but there are clearly polygynous colonies too. *M. specioides* are very aggressive and predatory ants; it happens that they prey on workers and brood of *Lasius flavus*, their frequent neighbours. They have been recorded ascending herbaceous plants to reach the inflorescens and aphids. Nuptial flights in August and September.

In Poland, the species is recorded from few sites, mainly in the southern and south-eastern part of the country, where it has been found in dry patches, mainly with calcareous or gypseous subsoil.

Myrmica scabrinodis Nylander, 1846

Myrmica scabrinodis Nylander, 1846: Radchenko et al. 1997.
Myrmica scabrinodis var. *rugulosoides* Forel, 1915: Wengris 1965 (unavailable name).
Myrmica scabrinodis subsp. *rugulosoides*: Kulmatycki 1920a (part.), Nowotny 1937 (part.), Stawarski 1966.
Myrmica rugulosoides Forel, 1915: Begdon 1954, 1956, Pętal 1963a,b, 1964, 1968a. Synonymy by Mayr 1855. (See also Seifert 1984).

General distribution (Fig. 18). A Euro-Siberian species which in the north reaches beyond of the Polar Circle and in the east to East Siberia and to the mountains in central Asia. The southern limit of its range in Europe is difficult to determine because there have been many misidentifications.

Distribution in Poland (Fig. 18, Table VI). Baltic Coast (Czechowski, Czechowska and Radchenko 1998a); Pomeranian Lake District (Begdon 1932b, Engel 1938, Griep 1938, Jacobson 1940, Będziak 1956, Szujecki et al. 1983, Mazur 1983, Czechowski et al. 1995); Masurian Lake District (Begdon 1932b, Wengris 1962, 1963, 1965, 1977, Szujecki et al. 1978, Mazur 1983, Krzysztofiak 1985); Wielkopolsko-Kujawska Lowland

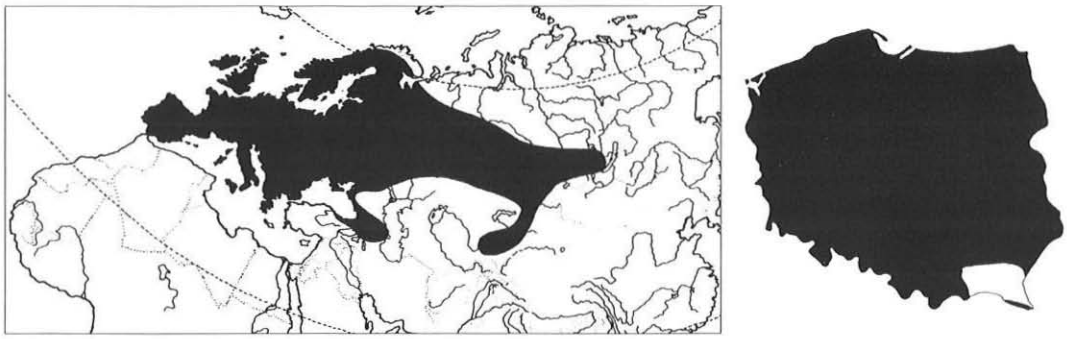


Fig. 18. Distribution of *Myrmica scabrinodis* Nyl. in Palaearctic and in Poland.

(Kuhlgatz 1909, Begdon 1932b, Kiełczewski and Wiśniewski 1966, Stawarski 1966, Pawlikowski and Sobieszczyk 1980, Mazur 1983); Mazovian Lowland (Jakubisiak 1948, Kaczmarek 1963, Pętal 1967, 1976, 1980b, Pętal and Breymeyer 1969, Pętal et al. 1970, Czerwiński et al. 1971, Jakubczyk et al. 1972, Pisarski and Czechowski 1978, Pisarski 1981, 1982, Mazur 1983, Czechowski 1990a, 1991, Czechowski and Pisarski 1990b, Czechowski, Pisarski and Czechowska 1990, Czechowski et al. 1995); Podlasie Lowland (Pętal 1963b, 1968a, Pętal et al. 1992, Mazur 1983); Białowieska Forest (Bischoff 1925, Karpiński 1956, Czechowski et al. 1995); Lower Silesia (Letzner 1877, Stawarski 1966, Mazur 1983); Upper Silesia (Nowotny 1931a, Stawarski 1966); Wyżyna Krakowsko-Wieluńska (Nowicki 1864, 1865, Wierzejski 1868, 1873, Kulmatycki 1920a, Kaczmarek 1953); Małopolska Upland (Puszkar 1982, Mazur 1983); Świętokrzyskie Mts (Kulmatycki 1920b, Mazur 1983, Krzysztofiak 1984); Lubelska Upland (Pisarski 1953, Pętal 1961, 1963a, Puszkar 1978, 1982, Mazur 1983); Roztocze Upland (Kulmatycki 1920a, Pętal 1961, 1963a, 1964, Mazur 1983); Sandomierska Lowland (Stawarski 1966, Puszkar 1982, Mazur 1983); Western Sudeten Mts (Stawarski 1966, Banert and Pisarski 1972, Pętal 1994); Eastern Sudeten Mts (Stawarski 1966, Banert and Pisarski 1972); Western Beskidy Mts (Kulmatycki 1920a, Woyciechowski and Miszta 1976, Czechowski and Pisarski 1988); Bieszczady Mts (Parapura and Pisarski 1971, Pisarski 1973, 1983); Pieniny Mts (Koehler 1951, Pętal 1974, 1980b, Czechowska 1976, Woyciechowski 1985, 1990a, 1992); Tatra Mts (Nowicki 1864, 1865, Wierzejski 1868, 1873, Woyciechowski 1990c); «Western and Eastern Prussia» (Brischke 1888b).

Biology. A polytopic mesothermophilous species of humid habitats. It requires great insolation but is very tolerant of soil moisture; it only avoids definitely xerothermal places (there are many false reports about *M. scabrinodis* occurring in such habitats, reports based on misidentification of *M. specioides* or *M. sabuleti*). The species occurs both in open areas (meadows, pastures) and in forests as well (but only in sunny patches); it frequently occurs in peat-bogs (specimens from peat-bogs, which are smaller and have a less curved antennal scape, have often been identified as *M. rugulosoides*). Nests are built in the ground, in tufts of grass or moss (these nests sometimes have small mounds), in dry spots under stones, and also in rotten wood. Colonies are monogynous or with a few queens; they contain several hundred to 2500 workers. *M. scabrinodis* are highly predatory ants; their nests often are next to mounds of *Lasius niger*, whose kidnapped brood serves as a source of easily available protein food. They also utilize honeydew of aphids on roots and shoots of herbaceous plants. Nuptial flights from July to October.

In Poland, common almost all over the country (not recorded only from the Eastern Beskidy); in the mountains, it reaches the upper subalpine forests.

Myrmica sabuleti Meinert, 1861

Myrmica sabuleti Meinert, 1861: Radchenko et al. 1997.
Myrmica scabrinodis var. *sabuleti*: Kulmatycki 1920a, 1920b, Begdon 1932b.
Myrmica scabrinodis subsp. *sabuleti*: Nowotny 1937.
Myrmica scabrinodis f. *sabuleti*: Begdon 1954.

General distribution (Fig. 19). It occurs in Europe up to southern Norway and Sweden and to the Sankt-Petersburg district in Russia, in Western Siberia to the Altai Mts, and in the Caucasus.

Distribution in Poland (Fig. 19, Table VI). Baltic Coast (Czechowski, Czechowska and Radchenko 1998a); Pomeranian Lake District (Begdon 1932b, Szujecki et al. 1978, 1983, Mazur 1983, Czechowski et al. 1995); Masurian Lake District (Mazur 1983); Wielkopolsko-Kujawska Lowland (Mazur 1983); Mazovian Lowland (Kaczmarek 1963, Pisarski 1981, 1982, Pisarski and Czechowski 1978, Mazur 1983, Czechowski and Pisarski 1990b, Czechowski et al. 1995); Podlasie Lowland (Mazur 1983); Białowieska Forest (Czechowski et al. 1995); Lower Silesia (Mazur 1983); Upper Silesia (Nowotny 1937); Krakowsko-Wieluńska Upland (Kulmatycki 1920a, Kaczmarek 1953); Małopolska Upland (Puszkar 1982, Mazur 1983); Świętokrzyskie Mts (Kulmatycki 1920b, Mazur 1983, Krzysztofiak 1984); Lubelska Upland (Pisarski 1953, Puszkar 1978, 1982, Mazur 1983); Roztocze Upland (Pętal 1961, Mazur 1983); Sandomierska Lowland (Mazur 1983); Western Sudeten Mts (Banert and Pisarski 1972); Eastern Sudeten Mts (Banert and Pisarski 1972); Western Beskidy Mts (Kulmatycki 1920a); Eastern Beskidy Mts (Czechowski, Czechowska and Radchenko 1998a); Bieszczady Mts (Parapura and Pisarski 1971); Pieniny Mts (Koehler 1951, Czechowska 1976, Pętal 1974, 1980b, Woyciechowski 1985, 1987, 1990a, 1992, Czechowska and Radchenko 1997); Tatra Mts (Kulmatycki 1920a).

Biology. A moderately xerothermophilous species, which generally prefers habitats slightly drier and warmer than those inhabited by *M. scabrinodis* (yet in Poland, it is also found in wet areas, even in peat-bogs). It occurs both in open habitats and in forests as well. Nests are built in the ground, in tufts of grass and moss, under stones. Colonies generally number a few hundred (maximum up to 2000) workers and several queens. Workers very frequently (and occasionally in great numbers) forage in herbaceous vegetation (or

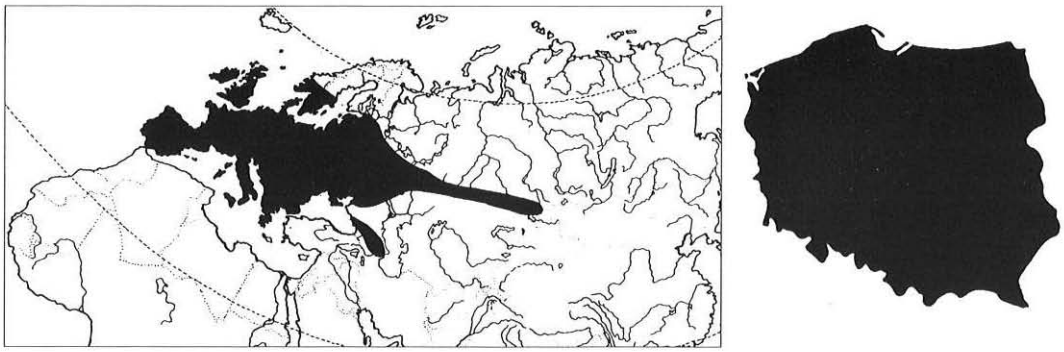


Fig. 19. Distribution of *Myrmica sabuleti* Mein. in Palaearctic and in Poland.

even in shrubs) in search of nectar and honeydew. They are not aggressive; in encounters with other ants they avoid conflict. Nuptial flights in August and September.

In Poland, the species is common all over the country; in the mountains, it reaches the lower subalpine forests (in the Bieszczady Mts, even the upper ones).

Myrmica lonae Finzi, 1926

Myrmica scabrinodis subsp. *lonae* Finzi, 1926.
Myrmica scabrinodis var. *lonae*: Karavaiev 1929.
Myrmica sabuleti st. *lonae*: Santschi 1931.
Myrmica sabuleti var. *lonae*: Stitz 1939, Czechowska 1976.
Myrmica sabuleti subsp. *lonae*: Weber 1948.
?*Myrmica rubra* var. *scabrinodo-lobicornis* Forel, 1874: Sadil 1952 (see Note below).
Myrmica sabuleti Meinert, 1860. Synonymy by Bernard 1967, Arnoldi 1970, Seifert 1988a, Atanassov and Dlussky 1992, Radchenko 1994d. Revived from synonymy and raised to species by Seifert 1994.
Myrmica lonae: Czechowski et al. 1997, Radchenko et al. 1997.

Note. During many years this species was treated as a subspecies or variety of *M. scabrinodis* or *M. sabuleti*, or as a synonym of the latter. Santschi (1931) recognized var. *scabrinodo-lobicornis* Forel, 1874 to be an infrasubspecific form of *M. sabuleti lonae* Finzi, 1926; however, this combination is unacceptable from the viewpoint of the modern zoological nomenclature. Later, Sadil (1952) synonymized *M. lonae* with *M. rubra* var. *scabrinodo-lobicornis* and treated *M. lonae* as a senior synonym, although the name *scabrinodo-lobicornis* had priority. Seifert (1994) revived *M. lonae* from synonymy and raised it to species. We agree with this opinion and also consider *M. lonae* to be a good species.

General distribution (Fig. 20). The species is known from southern Finland (originally reported as *M. sabuleti*; see Saaristo 1995) and from separate sites in the Netherlands, southern Germany, Poland, western Ukraine, Austria, northern Italy, Croatia, Romania, Sankt-Petersburg district in Russia, southern part of Western Siberia and northern Kazakhstan.

Distribution in Poland (Fig. 20, Table VI). Białowieska Forest: Białowieża ad Hajnówka (Czechowski et al. 1997); Małopolska Upland: Starachowice (Czechowski et al. 1997); Lubelska Upland: Kazimierz Dolny (Czechowski et al. 1997); Western Sudeten Mts: Pilchowice ad Jelenia Góra (Czechowski et al. 1997); Pieniny Mts (Czechowska 1976); Tatra Mts (M. Woyciechowski, unpubl. data).

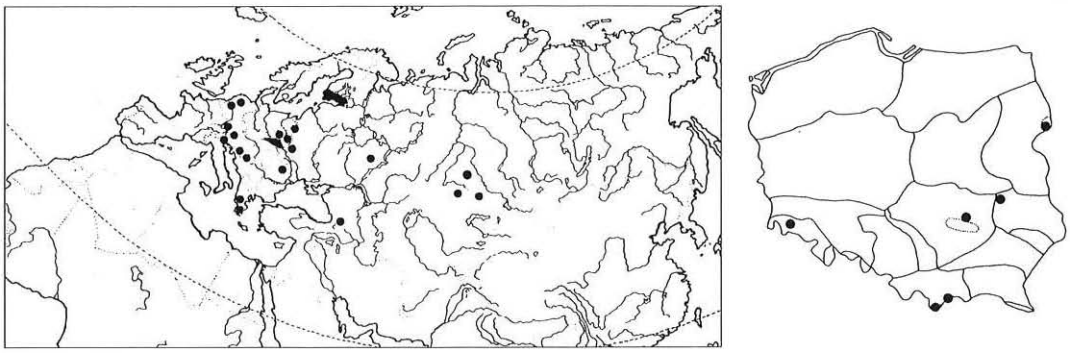


Fig. 20. Localities of *Myrmica lonae* Finzi in Palaearctic and in Poland.

Biology. The ecological preferences of this species are poorly known; the (few) data seem to suggest its stenotopic character; in Northern Europe, *M. lonae* occurs in plains, in southern Germany – in swamp habitats, and in Central Europe it inhabits mountain meadows and humid patches in xerothermal grasslands. Nests in the ground, frequently under stones, also in moss. Its colonies contain several queens and generally up to a thousand workers, occasionally even more.

In Poland, *M. lonae* readily lives in warm and dry habitats, mainly on sun exposed rocky slopes, scantily overgrown with herbaceous vegetation.

Myrmica hirsuta Elmes, 1978

Myrmica hirsuta Elmes, 1978: Collingwood 1979, Bolton 1988, Seifert 1988a, Vepsäläinen and Pisarski 1982, Elmes 1994, worker, Bolton 1995a, Saaristo 1995, Seifert 1994, 1996, Czechowska and Radchenko 1997, Radchenko et al. 1997.

Note. *M. hirsuta* has been described by Elmes (1978) from southern England basing on females and males found in a nest of *M. sabuleti*. At first, the species was considered to be a workerless social parasite but later also workers were found (Elmes 1994). In southern Finland, host species to *M. hirsuta* is *M. lonae* (*M. sabuleti* is absent from Finland; Saaristo 1995).

General distribution (Fig. 21). The species is known from separate sites in southern England, Germany, Austria, Denmark, Sweden, southern Finland, southern Poland, former Czechoslovakia and former Yugoslavia.

Distribution in Poland (Fig. 21, Table VI): Pieniny Mts (Czechowska and Radchenko 1997).

Biology. Obligatory social parasite (with the worker caste disappearing) of *M. sabuleti* and *M. lonae*.

In Poland, found in four nests of *M. sabuleti* in the Pieniny Mts. All the host nests were situated on xerothermal grasslands on south and south-west slopes of Mt Trzy Korony at 650–680 m a.s.l.

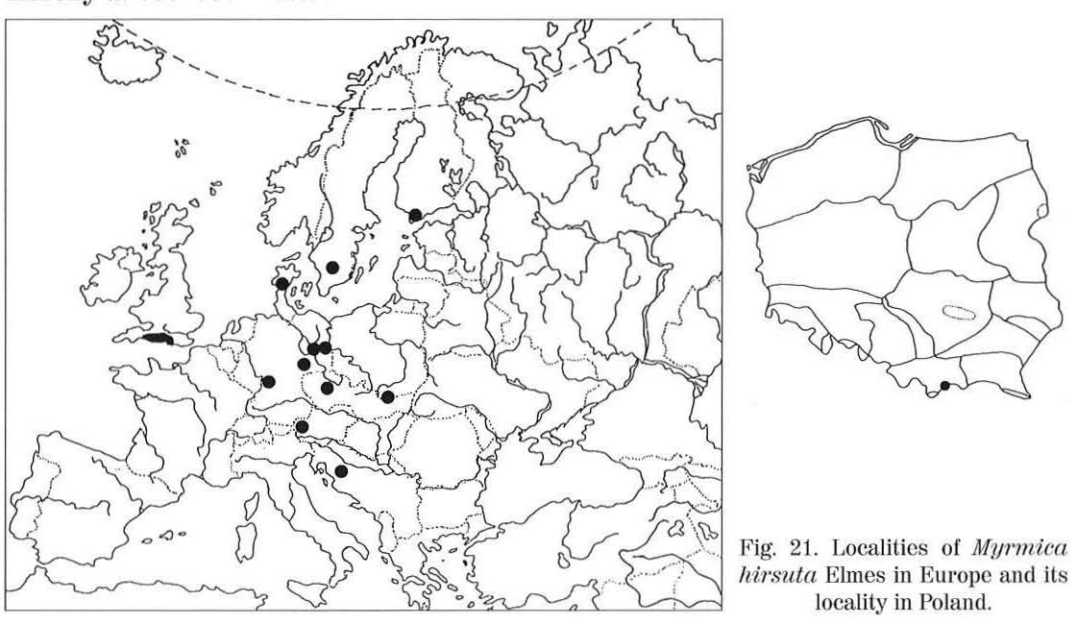


Fig. 21. Localities of *Myrmica hirsuta* Elmes in Europe and its locality in Poland.

Myrmica schencki Emery, 1895

Myrmica rubra subsp. *scabrinodis* var. *schencki* Emery, 1895 (unavailable name).
Myrmica rugulosa r. *schencki*: Kulmatycki 1922.
Myrmica scabrinodis subsp. *schencki*: Nowotny 1931a.
Myrmica schencki: Bondroit 1911, Radchenko et al. 1997.

General distribution (Fig. 22). A transpalaearctic species of the southern type of distribution; the northern limit of its range in Europe runs across southern Norway, Sweden and Finland, whereas the southern limit across Spain and Italy; in Asia, in the east, it reaches North Korea and the southern limit runs across the Tien Shan and central Kazakhstan.

Distribution in Poland (Fig. 22, Table VI): Baltic Coast (Czechowski, Czechowska and Radchenko 1998a); Pomeranian Lake District (Begdon 1932b, 1954, Jacobson 1940, Szujecki et al. 1978, 1983, Mazur 1983); Masurian Lake District (Wengris 1977, Mazur 1983, Krzysztofiak 1985); Wielkopolsko-Kujawska Lowland (Kulmatycki 1922, Begdon

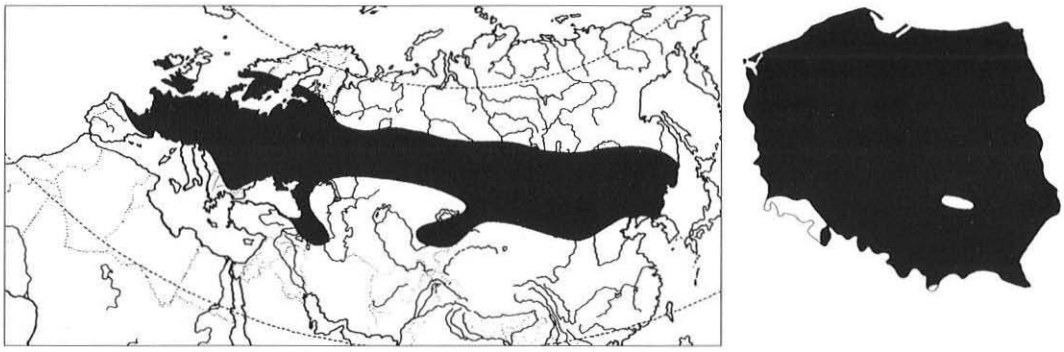


Fig. 22. Distribution of *Myrmica schencki* Em. in Palaearctic and in Poland.

1932b, Stawarski 1966, Kiełczewski and Wiśniewski 1971, Pawlikowski and Sobieszczyk 1980, Mazur 1983); Mazovian Lowland (Jakubisiak 1948, Kaczmarek 1963, Pisarski and Czechowski 1978, Pisarski 1981, 1982, Mazur 1983, Czechowski 1990a, Czechowski et al. 1995); Podlasie Lowland (Pętal 1968a, Mazur 1983); Białowieska Forest (Karpiński 1956, Czechowski et al. 1995); Lower Silesia (Stawarski 1966, Mazur 1983); Upper Silesia (Nowotny 1931a, Stawarski 1966); Krakowsko-Wieluńska Upland (Kaczmarek 1953); Małopolska Upland (Mazur 1983); Lubelska Upland (Pisarski 1953, Pętal 1961, 1962, Puszkar 1978, 1982, Mazur 1983); Roztocze Upland (Pętal 1961); Sandomierska Lowland (Czechowska and Czechowski 1998); Eastern Sudeten Mts (Czechowski, Czechowska and Radchenko 1998a); Western Beskidy Mts (Radchenko et al. 1997); Eastern Beskidy Mts (Czechowski, Czechowska and Radchenko 1998a); Bieszczady Mts (Parapura and Pisarski 1971); Pieniny Mts (Koehler 1951, Begdon 1954, Czechowska 1976, Woyciechowski 1985, 1987, 1990a, 1992).

Biology. An oligotopic species of dry habitats; one of the most thermophilous species among the Central-European *Myrmica* and yet quite tolerant of habitat temperature. Found both in open areas and in forests as well – in the latter only in sunny patches, on light podsolized soils with poor herbaceous vegetation. Nests are built in the ground, with singular entrance holes, frequently encircled by collar-like embankments of small

plant remnants; occasionally nests are in tufts of grass or moss. Colonies are small – they number a few hundred (to 1000) workers and several (up to five) queens. *M. schencki* are mainly nocturnal ants; they utilize flower nectar more than do other *Myrmica*, but they are very predatory (a high proportion of their food frequently consists of other ants). Nuptial flights in August and September; mating is on the ground near the nest.

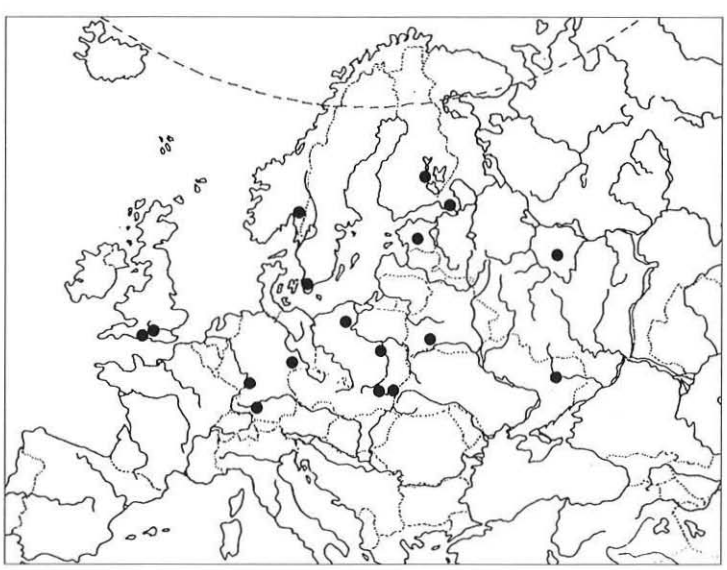
In Poland, it occurs almost all over the country (not recorded from the Świętokrzyskie Mts and the Western Sudeten Mts); nowhere numerous. Mistakenly reported from the Tatra Mts by J. Łomnicki (1931) basing on misidentification of *M. lobicornis*.

Myrmica karavajevi (Arnoldi, 1930)

Symbiomyrma karavajevi Arnoldi, 1930: Seifert 1994.
Sifolinia pechei Samšiňák, 1957: Pisarski 1962b, 1970. Synonymy by Samšiňák 1964.
Sifolinia karavajevi: Samšiňák 1964, Parapura and Pisarski 1971, Pisarski 1975, Czechowska 1976, Szujecki et al. 1978, 1983, Mazur 1983, Woyciechowski 1985, Czechowski 1990a.
Myrmica karavajevi: Bolton 1988. Revived from synonymy by Seifert 1994 (as *Symbiomyrma karavajevi*), **syn.n.**

Note. Originally, *Symbiomyrma* was described as a new genus by Arnoldi (1930), and then Samšiňák (1964) synonymized this name with *Sifolinia* Emery, 1907. Then, Bolton (1988) synonymized *Sifolinia* (and its junior synonym *Symbiomyrma*) with *Myrmica*, but later Seifert (1994) revived *Symbiomyrma* from synonymy, considering it a valid generic name and including one species, *S. karavajevi*, into this genus; he regarded *Sifolinia* as a junior synonym of *Myrmica*. Most recent investigations, based on the sequencing of DNA, showed the genetic groundlessness of separating *Symbiomyrma* from the genus *Myrmica* (R. Savolainen, unpubl. data).

General distribution (Fig. 23). Central and Eastern Europe, southern parts of England, Norway, Sweden and Finland.



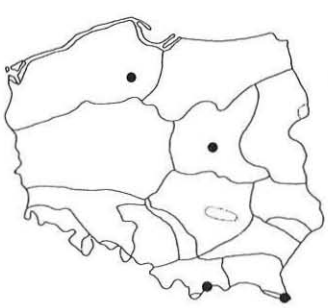


Fig. 23. Localities of *Myrmica karavajevi* (Arn.) in Europe and in Poland.

Distribution in Poland (Fig. 23, Table VI). Pomeranian Lake District: Bory Tucholskie (Szujecki et al. 1978, 1983, Mazur 1983); Mazovian Lowland: Warszawa (Czechowski 1990a); Bieszczady Mts: Ustrzyki Górne (Pisarski 1962b, 1970, Parapura and Pisarski 1971); Pieniny Mts (Czechowska 1976, Woyciechowski 1985).

Biology. A little-known, everywhere rare workerless inquiline of *Myrmica* colonies; so far found in nests of *M. rugulosa*, *M. scabrinodis* and *M. sabuleti*. The parasite queen coexists with the host queen(s), and broods of both species are produced in infested nests. Nuptial flight occurs in July or August.

In Poland, the species is found sporadically, among the recordings two were in the Bieszczady Mts and two in the Pieniny Mts.

Genus *Manica* Jurine, 1807

Manica Jurine, 1807. Type species: *Formica rubida* Latreille, 1802b, by subsequent disignation of Wheeler 1911. Junior synonym of *Myrmica*: Forel 1915. As subgenus of *Myrmica*: Emery 1921. Revived from synonymy: Weber 1947.

Neomyrma Forel, 1914 (as subgenus of *Aphaenogaster*). Type species: *Aphaenogaster* (*Neomyrma*) *calderoni* Forel, 1914, by monotypy. Synonymy by Emery 1921.

Oreomyrma Wheeler, 1914 (as subgenus of *Myrmica*). Type species: *Myrmica rubida* Wheeler, 1914, by original designation. Junior synonym of *Neomyrma*: Wheeler 1915.

This Holarctic genus includes only six species of which four occur in the Nearctic and two in the Palaearctic: one in Europe and one in Japan. The European species lives in Poland. In respect of biology and ethology, *Manica* ants are generally similar to species of the genus *Myrmica*, but they are more primitive. One of the North American species is a social parasite (an inquiline).

Manica rubida (Latreille, 1802)

Formica rubida Latreille, 1802b.

Manica rubida: Jurine 1807.

Formica rubida: Schilling 1839.

Myrmica rubida: Wierzejski 1868, 1873, Nasonov 1892, Kulmatycki 1920a, 1922, Pongrácz 1924, J. Łomnicki 1931, Nowotny 1931a, 1937, Stitz 1939, Koehler 1951, Noskiewicz 1957, Begdon 1959, Staręga 1966, Stawarski 1966.

General distribution (Fig. 24). Mountains of Central and partly Southern Europe, Asia Minor, Crimea, and Caucasus.

Distribution in Poland (Fig. 24, Table VI). Lower Silesia (Nowotny 1937); Upper Silesia (Nasonov 1892, Nowotny 1931a, Stitz 1939, Stawarski 1966); Krakowsko-Wieluńska Upland (Wierzejski 1873, Noskiewicz 1957); Świętokrzyskie Mts (Pongrácz 1924); Western Sudeten Mts (Stitz 1939, Begdon 1959, Stawarski 1966, Banert and Pisarski 1972, Pętal 1994); Eastern Sudeten Mts (Schilling 1839, Stitz 1939, Stawarski 1966); Western Beskidy Mts (Kulmatycki 1920a, Czechowski and Pisarski 1988, Czechowski 1996b); Bieszczady Mts (Staręga 1966, Parapura and Pisarski 1971); Pieniny Mts (Kulmatycki 1920a, Koehler 1951, Czechowska 1976, Woyciechowski 1985); Tatra Mts (Wierzejski 1868, 1873, Kulmatycki 1920a, J. Łomnicki 1931).

Biology. *M. rubida* is a typical montane species occurring at 500–2000 m a.s.l. (usually above 700–800 m). It inhabits sunlit stony open areas overgrown with low xerophilous vegetation – mainly riverside terraces, meadows and pastures. Nests are

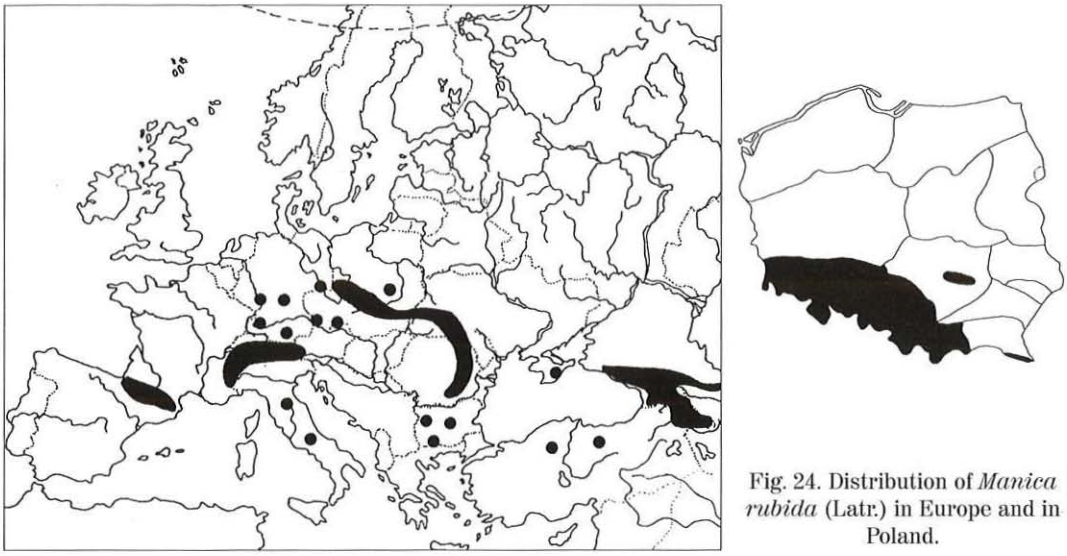


Fig. 24. Distribution of *Manica rubida* (Latr.) in Europe and in Poland.

built in the ground, often under big stones. Colonies are not large, usually polygynous and containing several hundred workers, but they often form vast polycalic systems. These slowly moving ants prey on small and soft invertebrates and also attend aphids. Their stings are very painful. Nuptial flights occur in spring (April) or in autumn (August to September).

In Poland, *M. rubida* occurs in the southern, mainly mountainous and upland part of the country (yet it has never been recorded from the Eastern Beskidy Mts).

Tribe PHEIDOLINI

Genus *Aphaenogaster* Mayr, 1853

Aphaenogaster Mayr, 1853. Type species: *Aphaenogaster sardoa* Mayr, 1853, by subsequent designation of Bingham 1903.
Stenamma subg. *Aphaenogaster*: Emery 1895.
Aphaenogaster: Emery 1908.
Brunella Forel, 1917. Type species: *Aphaenogaster belti* Forel, 1895, by monotypy. Synonymy by Bolton 1982.
Novomessor Emery, 1915b. Type species: *Aphaenogaster* (*Ischnomyrmex*) *cockerelli* André, 1893, by original designation. Synonymy by Bolton 1982.
Aphenogaster: Pisarski 1975 (misprinting).

This is a world-wide genus (unknown only from the Afrotropical region) comprising about 150 described species. Most of them (about 100) are Palaearctic forms, inhabiting mainly the southern parts of the region. One species is reported from Poland. Most species are strato- or dendrobionts; their nests are built in the ground, leaf litter, in dead fallen wood or in dry tree branches.

Aphaenogaster subterranea (Latreille, 1798)

Formica subterranea Latreille, 1798: Schilling 1839.
Myrmica subterranea: Siebold 1844, Nylander 1856.
Atta subterranea: Mayr 1855.

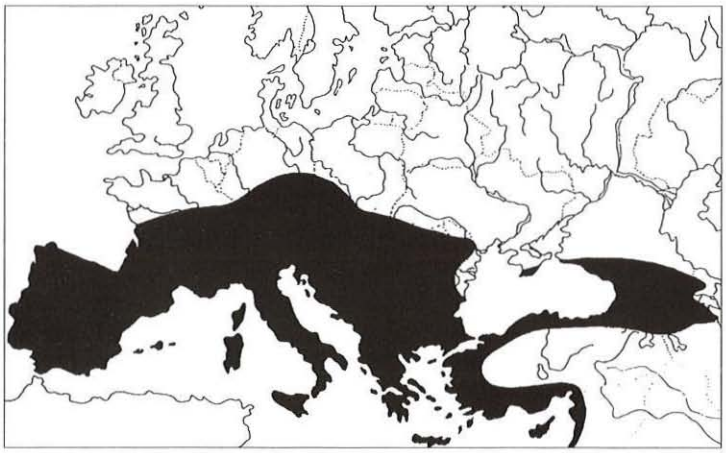
Aphaenogaster subterranea: Roger 1863a.
Aphenogaster subterranea: Pisarski 1975 (misprinting).

General distribution (Fig. 25). Southern and Central Europe, Moldova, southern Ukraine, Crimea, Caucasus, Asia Minor.

Distribution in Poland (Fig. 25, Table VI). «Lower Silesia and Kłodzka Land» (Schilling 1839).

Questionable datum: «Western and Eastern Prussia» (Siebold 1844).

Biology. This species mainly inhabits moderately wet and warm deciduous forests, nesting in the ground, under stones, in rotten wood, rarely in litter. In Germany, where it is recorded only to the south of 51°30'N, *A. subterranea* is found only in warm river valleys, in particular on forest edges and in warm deciduous forests, but also amongst



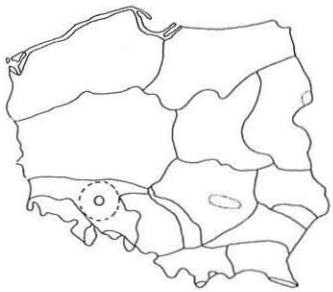


Fig. 25. Distribution of *Aphaenogaster subterranea* (Latr.) in Europe and its locality (vaguely reported) in Poland.

shrubs in dry grasslands. It forms fairly numerous colonies (from several hundred to several thousand individuals). These ants are active at night.

From the area of present-day Poland, the species was only vaguely reported twice in the 19th century from southern and northern Poland, and it has not been recorded since. Pisarski (1975) called in question the possibility of its occurring to the north of the Carpathians. Later, however, in the 1970s and 1980s, it was recorded several times from Saxony and Thuringia. Therefore, its occurrence in southern Poland cannot be ruled out.

Genus *Messor* Forel, 1890

Aphaenogaster subg. *Messor* Forel, 1890. Type species: *Formica barbara* Linnaeus, 1767, by subsequent designation of Bingham 1903.
Stenamma subg. *Messor*: Emery 1895.
Messor: Bingham 1903.
?*Veromessor* Forel, 1917 (as subgenus of *Novomessor*). Type species: *Aphaenogaster andrei* Mayr, 1886, by subsequent designation of Emery 1921. Synonymy by Bolton 1982.

This genus consists of about 100 species of which over 80 are Palaearctic forms distributed in the southern parts of the region; the remaining species live in arid and semi-arid regions of Africa, Saudi Arabia, Pakistan and India. All the species are phytophagous (granivorous) forms. One species is occasionally met in Poland.

Note. Bolton (1982) considered the genus *Veromessor* to be a junior synonym of *Messor*. This opinion, based only on morphological features, does not correspond with zoogeographical data. Species of *Messor* occur in arid and semiarid regions of the Old World. On the other hand, species of *Veromessor* are distributed in arid regions of the south-western part of the USA and of the north-western part of Mexico. These parts of the Old and New Worlds have never been connected since ants appeared on the Earth. Thus, while accepting Bolton's synonymy, we must consider *Messor* a polyphyletic group. However – and this seems more probable – the morphological similarity between *Messor* and *Veromessor* forms may be an expression of convergence resulting from adaptation to similar habitat conditions.

Messor structor (Latreille, 1798)

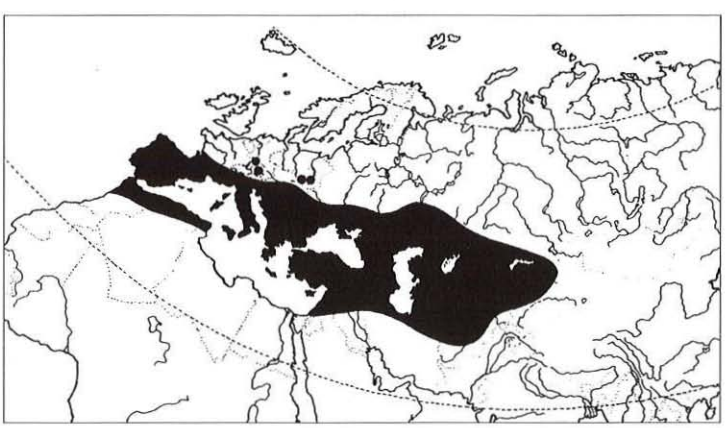
Formica structor Latreille, 1798: Schilling 1839.
Atta structor: Mayr 1855.
Myrmica structor: Nylander 1856.
Aphaenogaster structor: Roger 1863a.
Messor structor: Emery 1897.
Formica rufitarsis Fabricius, 1804.
Messor rufitarsis Fabricius, 1804. Synonymy by Agosti and Collingwood 1987a.
Messor structor subsp. *rufitarsis*: Pisarski 1975.
Formica aedificator Schilling, 1839. Synonymy by Mayr 1855.

General distribution (Fig. 26). Southern Europe and southern parts of Central and Eastern Europe, north-western part of Africa, Asia Minor, Lebanon, Israel, Syria, Iraq, Iran, Caucasus, and central Asia.

Distribution in Poland (Fig. 26, Table VI). Świętokrzyskie Mts: Belno ad Kielce (Krzysztofiak 1984); «Silesia and Kłodzka Land» – terra typica! of *Formica aedificator* Schilling, 1839 (Schilling 1839, Emery 1921, Stitz 1939).

Biology. This granivorous and frugivorous species inhabits xerothermal grasslands with rich seed vegetation. Its colonies often are polygynous with polymorphic queens.

In the Świętokrzyskie Mts, the species was reported on the basis of a single worker found on the edge of an oak forest. Pisarski (1975), having at his disposal only unascertainable data, called in question the possibility of its occurring to the north of the Carpathians. Occasional records of *M. structor* in Poland most probably are based on incipient colonies established by airborn females that come from the south of Europe



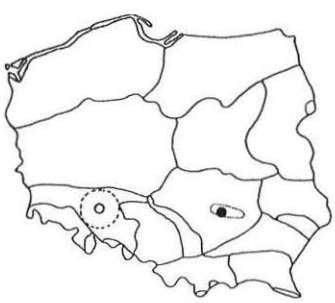


Fig. 26. Distribution of *Messor structor* (Latr.) in Palaearctic and its localities in Poland (o – vaguely reported from the region).

and sporadically succeed in nest founding. It may be assumed that such colonies do not survive winter.

Genus *Stenamma* Westwood, 1839

Stenamma Westwood, 1839. Type species: *Stenamma westwoodi* Westwood, 1839, by monotypy.

This genus comprises more than 40 described species distributed in the Holarctic (mainly), Neotropical and Oriental regions. About 20 species live in the Palaearctic; one species is known from Poland. Ants of this genus inhabit mainly deciduous forests where they nest in the ground or in litter. Colonies usually consist of several score individuals.

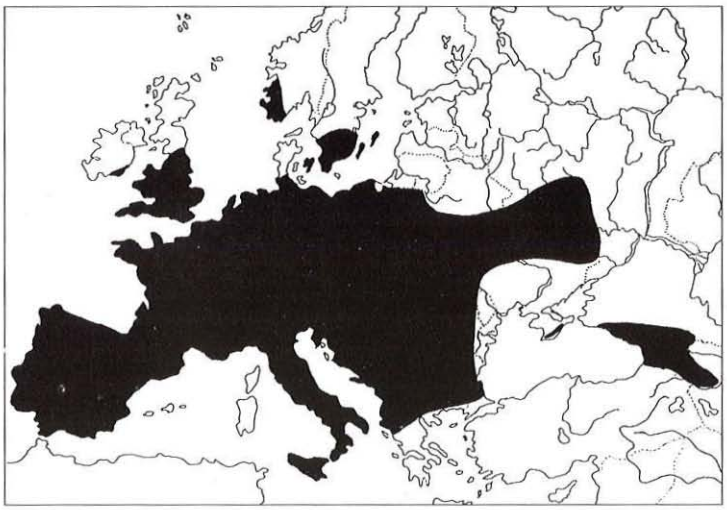
Stenamma debile (Förster, 1850)

Myrmica debilis Förster, 1850.
Myrmica minkii Förster, 1850. Synonymy by DuBois 1993 (provisional).
Stenamma westwoodi polonicum Begdon, 1932a. Synonymy by DuBois 1993 (provisional).
Stenamma debile: Mayr 1863 (as junior synonym of *S. westwoodi*), DuBois 1993 (revived from synonymy).
Leptothorax Minkii: Brischke 1888b.
Stenamma westwoodi Westwood, 1839: all the hitherto Polish literature.

Note. For a long time, every *Stenamma* ant found in Northern and Central Europe was identified as *S. westwoodi* Westwood. In 1993, DuBois' revision of the genus limited the range of *S. westwoodi* to England, Wales and Belgium. The species occurring outside this range turned out to be *S. debile* (earlier regarded as a junior synonym of *S. westwoodi*).

General distribution (Fig. 27). Europe (to the north up to northern England and southern Norway and Sweden), Crimea, Caucasus.

Distribution in Poland (Fig. 27, Table VI). Pomeranian Lake District – terra typica! of *Stenamma westwoodi polonicum* Begdon, 1932a (Begdon 1932a,b, Stitz 1939, Jacobson 1940, Griep 1940, Szujecki et al. 1978, Mazur 1983); Masurian Lake District (Wiąckowski 1957, Mazur 1983); Wielkopolsko-Kujawska Lowland (Kiełczewski and



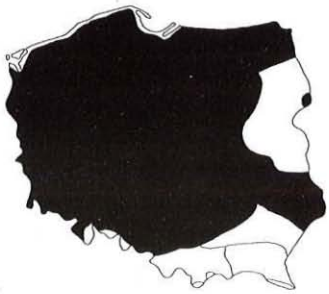


Fig. 27. Distribution of *Stenamma debile* (Först.) in Europe and in Poland.

Wiśniewski 1966, Mazur 1983); Mazovian Lowland (Kaczmarek 1953, Pisarski and Czechowski 1978, Pisarski 1981, 1982, Mazur 1983, Bańkowska et al. 1984, Czechowski 1990a, Czechowski and Pisarski 1990a,b, Czechowski et al. 1995); Białowieska Forest (Czechowski et al. 1995); Lower Silesia (Mazur 1983); Upper Silesia (Scholz 1926, Nowotny 1931a, 1937, Stawarski 1966): Krakowsko-Wieluńska Upland (Pongrácz 1924, Kaczmarek 1953, Begdon 1959); Małopolska Upland (Wiąckowski 1957, Mazur 1983); Świętokrzyskie Mts (Mazur 1983); Lubelska Upland (Pisarski 1953, Pętal 1961, Mazur 1983); Roztocze Upland (Pętal 1961, Mazur 1983); Western Sudeten Mts (Begdon 1959); «Western and Eastern Prussia» (Brischke 1888b).

Biology. *S. debile*, an oligotope of deciduous forests, requires a well-formed layer of litter in which it forages; the species occurs in shaded forests of all types, but reaches the highest nest density in deciduous forests. These are ants not aggressive to other ant species, slowly-moving, scavenging and partly predatory on small invertebrates. They are active mainly in the early morning and during warm, overcast days. They form not very numerous (up to 150 workers) and generally monogynous colonies. They nest in litter and in the soil under litter, among roots and under stones almost buried in the ground. Their nuptial flight is in September and October.

In Poland, the species is known from almost the whole country, but due to its cryptic habits it is rarely found.

Tribe FORMICOXENINI

[after Radchenko, Czechowski and Czechowska (1999b); up-dated]

Genus *Formicoxenus* Mayr, 1855

Formicoxenus Mayr, 1855. Type species: *Myrmica nitidula* Nylander, 1846, by monotypy.
Symmyrmica Wheeler, 1904. Synonymy by Francoeur et al. 1985.
Formicotenus: Brischke 1988b (misprinting).

This genus includes seven species; five of them occur in North America, two live in the Palaearctic; one of the latter is a Transpalaearctic form, the other is known from Eastern Siberia. All the species are xenobionts or guest ants living in nests of species of a different subfamily; Nearctic species coexist with *Myrmica* ants, whereas hosts to the Palaearctic forms belong to the genus *Formica* (Francoeur et. al. 1985).

Formicoxenus nitidulus (Nylander, 1846)

Myrmica nitidula Nylander, 1846.
Formicoxenus nitidulus: Mayr 1855, Radchenko, Czechowski and Czechowska 1999b.

General distribution (Fig. 28). A Transpalaearctic species of the northern type of distribution.

Distribution in Poland (Fig. 28, Table VI). Baltic Coast (Urbański 1956, Wiśniewski 1987); Pomeranian Lake District (Griep 1940, Wiśniewski 1987); Masurian Lake District (Wiąckowski 1957, Wiśniewski 1987); Wielkopolsko-Kujawska Lowland (Wiśniewski

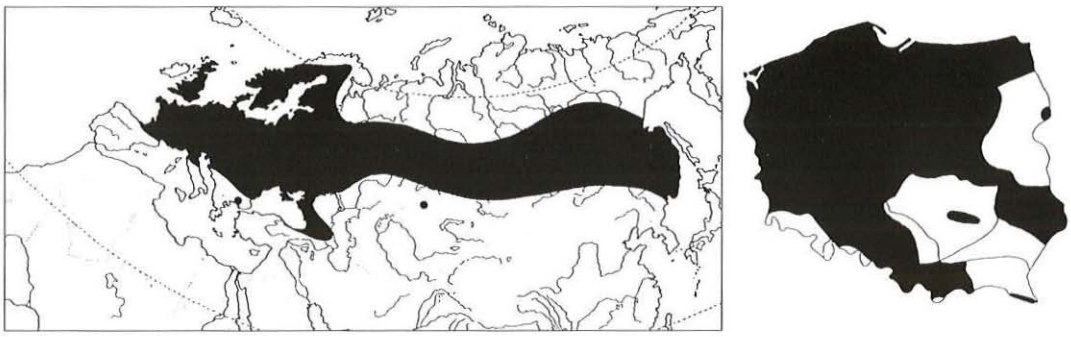


Fig. 28. Distribution of *Formicoxenus nitidulus* (Nyl.) in Palaearctic and in Poland.

1967a, 1987); Mazovian Lowland (Pisarski 1982, Czechowski and Czechowska 1999a); Białowieska Forest (Czechowski and Czechowska 1999a); Lower Silesia (Wiśniewski 1987); Upper Silesia (Nowotny 1931a, 1937, Stawarski 1966; Świętokrzyskie Mts (Krzysztofiak 1984); Lubelska Upland (Minkiewicz 1935, Pisarski 1953); Roztocze Upland (Pętal 1961); Western Beskidy Mts (Wiśniewski 1987) Bieszczady Mts: (Parapura and Pisarski 1971, Wiśniewski 1987); Pieniny Mts (Koehler 1951); «Western and Eastern Prussia» (Brischke 1888b).

Biology. The commonest xenobiotic ant species; it co-exists with ants of the genus *Formica*, mainly with red wood ants, by entering into a «compound-nest» relationship with them. Sometimes several guest ant colonies inhabit one host mound. The dependency is trophic in character; guests either beg for regurgitated food from host workers or intercept their food exchange. *F. nitidulus* colonies are functionally monogynous; they comprise up to about 150 adults and generally contain a number of intermorphic females. Nuptial period in July and August. Males are ergatoid; mating takes place on the surface of the host nest.

In Poland, *F. nitidulus* has been recorded from about 50 sites dispersed in different regions. It probably occurs throughout the country but has been underreported due to its cryptic habits. Its host species known so far from Poland are: *Formica truncorum*, *F. pratensis*, *F. rufa*, *F. polyctena*, and *F. pressilabris*.

Genus *Leptothorax* Mayr, 1855

Leptothorax Mayr, 1855. Type species: *Formica acervorum* Fabricius, 1793, by subsequent designation of Bingham 1903.

Temnothorax Mayr, 1861. Synonymy by Forel 1890, Baroni Urbani 1971, Bolton 1982.

This genus incorporates about 320 species distributed almost all over the world. Most species (about 170) occur in the Palaearctic (*Leptothorax* is the most speciose ant genus in this region). Sixteen species are known from Poland. European species live in small colonies (from several score to a few hundred adults) nesting in the ground, under stones, in rock crevices, under bark, in twigs or in peat. Colonies are usually monogynous or functionally monogynous, rarely containing several fertile queens. Workers forage individually, predating small invertebrates or scavenging dead insects; as a rule, they do not tend aphids.

Subgenus ***Leptothorax*** s.str.

Leptothorax s.str. (as subgenus of *Leptothorax*). Type species: *Formica acervorum* Fabricius, 1793, by subsequent designation of Bingham 1903.

Mychothorax Ruzsky, 1904 (as subgenus of *Leptothorax*). Type species: *Formica acervorum* Fabricius, 1793, by original designation. Synonymy by M. R. Smith 1950.

Leptothorax acervorum (Fabricius, 1793)

Formica acervorum Fabricius, 1793.

Myrmica acervorum: Zetterstedt 1838.

Leptothorax acervorum: Mayr 1855, Radchenko, Czechowski and Czechowska 1999b.

Leptothorax (subg. *Mychothorax*) *acervorum*: Ruzsky 1904, Kulmatycki 1920a, Begdon 1932b, 1954, Jakubisiak 1948, Koehler 1951, Parapura and Pisarski 1971, Banert and Pisarski 1972, Pisarski 1975, 1981, 1982, Pisarski and Czechowski 1991, Czechowska 1976, Czechowski and Pisarski 1990b.

Leptothorax (subg. *Leptothorax* s.str.) *acervorum*: M. R. Smith 1950, Czechowski and Czechowska 1999a.

Mychothorax acervorum: Kulmatycki 1920b, Jacobson 1940.

Leptothorax acervorum var. *nigrescens* Ruzsky, 1905: Koehler 1951, Stawarski 1961a, 1966. Synonymy by Collingwood 1971, Radchenko 1995a.

Leptothorax acervorum subsp. *nigrescens*: Pętal 1964, 1968a, Banert and Pisarski 1972.

Leptothorax (subg. *Mychothorax*) *nigrescens*: Pętal 1963a, Pisarski 1975, Czechowska 1976.

General distribution (Fig. 29). Boreal zone of the Palaearctic, mountains of Southern Europe, Caucasus, Tien-Shan.

Distribution in Poland (Fig. 29, Table VI). Baltic Coast (Kulmatycki 1922); Pomeranian Lake District (Begdon 1932b, Griep 1940, Jacobson 1940, Szujecki et al.

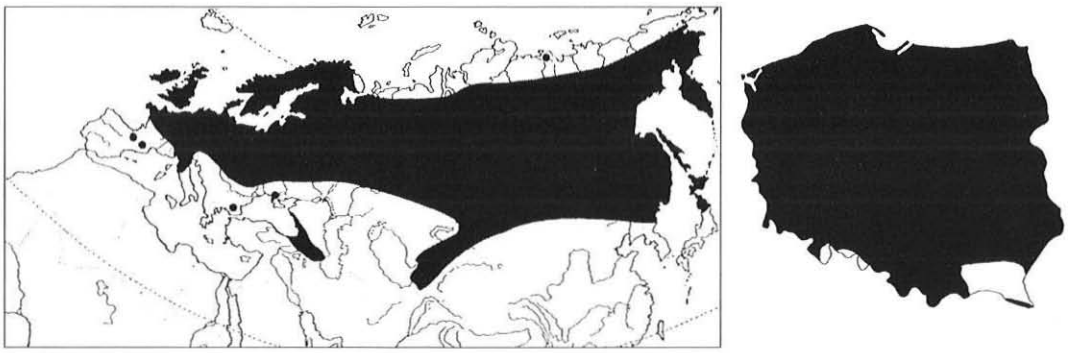


Fig. 29. Distribution of *Leptothorax acervorum* (F.) in Palaearctic and in Poland.

1978, 1983, Mazur 1983, Czechowski et al. 1995); Masurian Lake District (Begdon 1959, Wengris 1962, 1963, 1977, Mazur 1983, Krzysztofiak 1985); Wielkopolsko-Kujawska Lowland (Begdon 1932b, Wiąckowski 1957, Pawlikowski and Sobieszczyk 1980, Mazur 1983); Mazovian Lowland (Jakubisiak 1948, Wiąckowski 1957, Kaczmarek 1963, Dobrzański[5] 1966, Pisarski and Czechowski 1978, Pisarski 1981, 1982, Mazur 1983, Czechowski and Pisarski 1990b, Czechowski et al. 1995, Pętal 1992); Podlasie Lowland

[5] The ethological papers by J. Dobrzańska and J. Dobrzański contain no data on the locality of their field studies. These localities were established by Pisarski (1975) on the basis of personal communications of the authors.

(Pętal 1964, 1968a, Mazur 1983); Białowieska Forest (Karpiński 1956, Czechowski et al. 1995, Czechowski 1998b); Lower Silesia (Kotzias 1930a, Stawarski 1966, Mazur 1983); Upper Silesia (Scholz 1926, Nowotny 1931a, Stawarski 1966); Krakowsko-Wieluńska Upland (Kaczmarek 1953); Małopolska Upland (Kulmatycki 1920b, Mazur 1983); Świętokrzyskie Mts (Pongrácz 1924, Mazur 1983, Krzysztofiak 1984); Lubelska Upland (Pisarski 1953, Dobrzańska 1958, Puszkar 1978, 1982, Mazur 1983); Roztocze Upland (Kulmatycki 1920b, Pętal 1961, 1963a, 1964, Mazur 1983); Sandomierska Lowland (Mazur 1983, Czechowski and Czechowska 1999a); Western Sudeten Mts (Stawarski 1961a, 1966, Banert and Pisarski 1972, Pętal 1994); Western Beskidy Mts (Kulmatycki 1920a); Bieszczady Mts (Parapura and Pisarski 1971, Pisarski 1973); Pieniny Mts (Nowicki 1864, Wierzejski 1868, 1873, Koehler 1951, Czechowska 1976, Woyciechowski 1985, 1990a, 1992); Tatra Mts (Kulmatycki 1920a, J. Łomnicki 1931, Woyciechowski 1990a,c); «Western and Eastern Prussia» (Brischke 1888b).

Biology. This species is most abundant in dry and light coniferous (mainly pine) forests with poor undergrowth. It is also met in open habitats, ranging from moist peat-bogs to xerothermal grasslands. In the mountains, it reaches the subalpine meadow and the tundra zones. Nests are built, depending on habitat, in rotten logs or stumps, in fallen branches, under bark and, more rarely, under stones or in rock crevices, also under moss; in bogs they are found in peat. The species forms mono- or polygynous colonies, usually with a few dozen workers. Workers forage individually, predating small insects or scavenging dead invertebrates; they are non-aggressive, avoiding intra- and interspecific combats with other ants. Nuptial flights usually in July and August.

In Poland, this species very probably is common throughout the country (there are no records from the Eastern Sudeten Mts and the Eastern Beskidy Mts only).

Leptothorax muscorum (Nylander, 1846)

Myrmica muscorum Nylander, 1846.

Leptothorax muscorum: Mayr, 1855, Radchenko, Czechowski and Czechowska 1999b.

Leptothorax (subg. *Mychothorax*) *muscorum*: Ruzsky 1905, Begdon 1932b, 1954, Jakubisiak 1948, Koehler 1951, Parapura and Pisarski 1971, Banert and Pisarski 1972, Pisarski 1975, 1981, 1982, Pisarski and Czechowski 1991, Czechowska 1976, Czechowski 1990a, Czechowski, Czechowska and Palmowska 1990, Czechowski, Pisarski and Czechowska 1990.

Leptothorax (subg. *Leptothorax* s.str.) *muscorum*: Czechowski et al. 1995, Czechowski and Czechowska 1999a.

General distribution (Fig. 30). Boreal zone of Palaearctic (in general, in more southern parts than *L. acervorum*), mountains of Southern Europe, Caucasus.

Distribution in Poland (Fig. 30, Table VI). Baltic Coast: island of Wolin and Słowiński National Park (W. Czechowska, unpubl. data); Pomeranian Lake District (Begdon 1932b, Czechowski et al. 1995); Masurian Lake District (Mazur 1983, Krzysztofiak 1985, Wengris 1977); Wielkopolsko-Kujawska Lowland (Mazur 1983); Mazovian Lowland (Nasonov 1892, Jakubisiak 1948, Kaczmarek 1963, Pisarski and Czechowski 1978, Pisarski 1981, 1982, Czechowski 1990a, 1991, Czechowski and Pisarski 1990a, Czechowski, Czechowska and Palmowska 1990, Czechowski, Pisarski and Czechowska 1990, Czechowski et al. 1995); Białowieska Forest (Czechowski et al. 1995); Lower Silesia (Stawarski 1966, Mazur 1983); Upper Silesia (Nowotny 1931a,b, 1937);

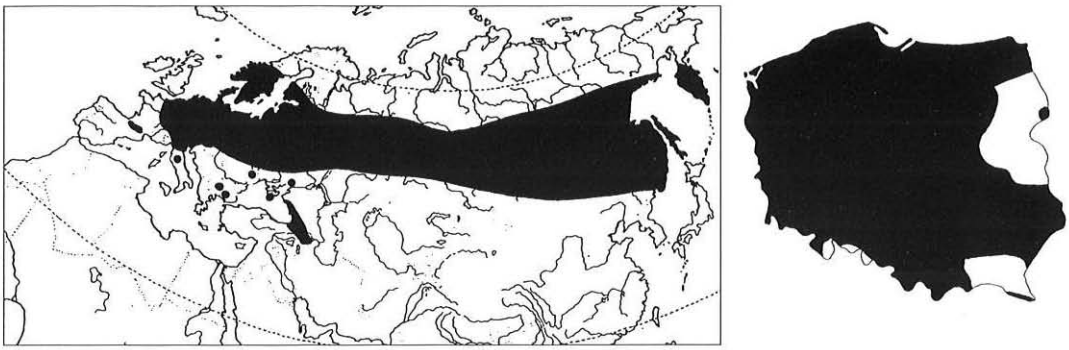


Fig. 30. Distribution of *Leptothorax muscorum* (Nyl.) in Palaearctic and in Poland.

Krakowsko-Wieluńska Upland (Kaczmarek 1953); Małopolska Upland (Mazur 1983); Świętokrzyskie Mts (Krzysztofiak 1984); Lubelska Upland (Pisarski 1953, Puszkar 1978, 1982, Mazur 1983); Roztocze Upland (Pętal 1961, 1964, Mazur 1983); Sandomierska Lowland (Mazur 1983, Czechowski and Czechowska 1999a); Western Sudeten Mts (Banert and Pisarski 1972); Western Beskidy Mts: Babia Góra ad Maków Podhalański (coll. MIZ PAS); Bieszczady Mts (Parapura and Pisarski 1971); Pieniny Mts (Koehler 1951, Czechowska 1976); Tatra Mts (J. Łomnicki 1931, Woyciechowski 1985, 1990c).

Biology. The ecological requirements and habits of this species are similar to those of *L. acervorum*, but with a preference for drier and warmer habitats (it does not inhabit bogs). In the mountains, it lives in meadows. The colonies are usually smaller than in *L. acervorum*, with one or occasionally two queens. Nests are built under small stones, under bark, in rotten wood, sometimes in litter. Nuptial flights from July to September.

In Poland, the species probably occurs throughout the country, but so far it has not been recorded from Podlasie Lowland (except the Białowieska Forest), the Eastern Sudeten Mts and the Eastern Beskidy Mts. However, it is generally much less common than *L. acervorum*.

Leptothorax gredleri Mayr, 1855

Leptothorax gredleri Mayr, 1855: Radchenko, Czechowski and Czechowska 1999b.
Leptothorax muscorum var. *gredleri*: Stitz 1939.
Leptothorax (subg. *Mychothorax*) *gredleri*: Begdon 1932b, Pisarski 1975, Pisarski and Czechowski 1991.

Note. *L. gredleri* is closely related to *L. muscorum* and is hardly distinguishable from the latter. For many years after it had been described, *L. gredleri* was considered to be a subspecies or a variety of *L. muscorum* until Buschinger (1966) confirmed its species status. Many authors (e.g. Kutter 1977, Agosti and Collingwood 1987b) used the shape of the petiole as the most important character for the separation of these two species. However, this character is very variable and Seifert (1996) proposed other characters, particularly the sculpture of the head. We agree with his opinion.

General distribution (Fig. 31). Recorded from southern Sweden, Poland, Germany, Czech Republic, Switzerland, Austria, northern Italy, former Yugoslavia, and Greece.

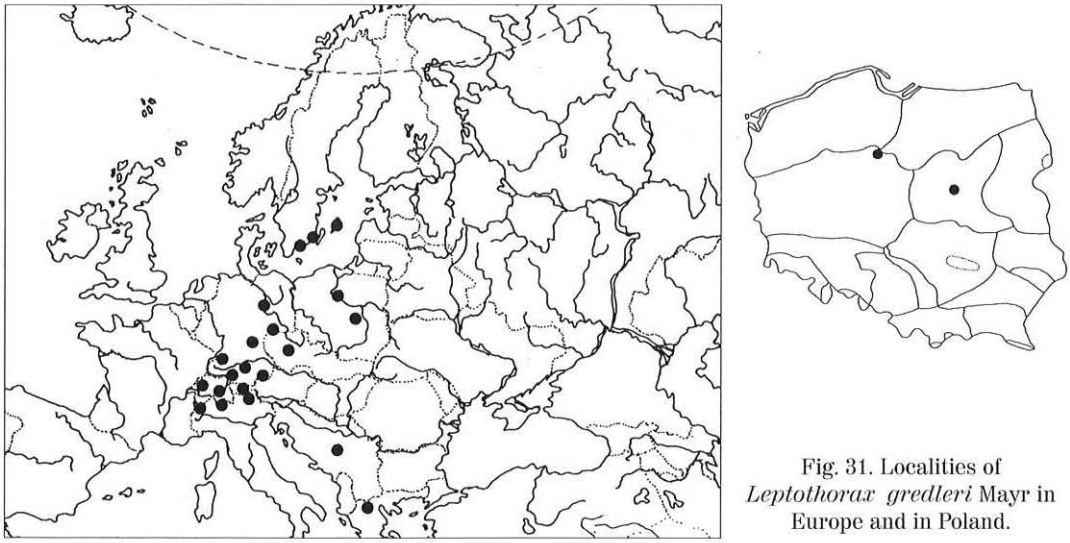


Fig. 31. Localities of *Leptothorax gredleri* Mayr in Europe and in Poland.

Distribution in Poland (Fig. 31, Table VI). Wielkopolsko-Kujawska Lowland: Toruń (Begdon 1932b, Stitz 1939); Mazovian Lowland: Kampinoska Forest (Czechowski, Czechowska and Radchenko 1998b).

Biology. A relatively poorly known species, found mainly in shaded and moist deciduous or mixed forests. It nests in the ground, in rotten fallen branches and under the lowest parts of the bark of living trees. Functionally monogynous.

In Poland, it is reported only from two sites where its nests were at the foot of or under the bark of alder trees.

Subgenus ***Myrafant*** M. R. Smith, 1950

Myrafant M. R. Smith, 1950 (as subgenus of *Leptothorax*). Type species: *Leptothorax curvispinosus* Mayr, 1866, by original designation.
Leptothorax s.str.: Pisarski 1975 et auct., nec Bingham 1903, M. R. Smith 1950 et auct.

Leptothorax tuberum (Fabricius, 1775)

Formica tuberum Fabricius, 1775.
Myrmica tuberum: Nylander 1846.
Leptothorax tuberum: Mayr 1855, Radchenko, Czechowski and Czechowska 1999b.
Leptothorax tuberum var. *tubero-affinis* Forel: Kulmatycki 1920a,b (misidentification).
Leptothorax (subg. *Leptothorax* s.str.) *tuberum*: Pisarski 1975, Pisarski and Czechowski 1991, Czechowska 1976.
Leptothorax corticalis: Pisarski 1982 (misidentification).

Note. Very variable species, especially in respect of the length of the propodeal spines, sculpture of the body and colour. For a long time, it was hardly ever distinguished from the related species (*L. albipennis*, *L. nigriceps*, etc.). Orledge (1998) has shown that all records of *L. tuberum* for the British Isles refer to *L. albipennis*. So, all previous data on the distribution of this species (especially in Southern Europe; Baroni Urbani 1971) need verification.

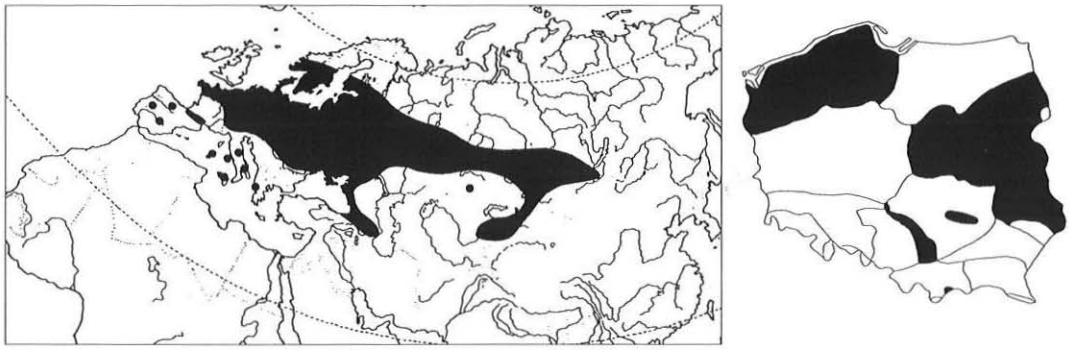


Fig. 32. Distribution of *Leptothorax tuberum* (F.) in Palaearctic and in Poland.

General distribution (Fig. 32). Almost all of Europe (except its northernmost parts and British Isles), Crimea, Caucasus, southern part of Siberia up to Lake Baykal and Tien-Shan. It is one of the commonest *Leptothorax* species in the deciduous forest zone.

Distribution in Poland (Fig. 32, Table VI). Pomeranian Lake District (Griep 1940); Mazovian Lowland (Pisarski 1982, Czechowski and Pisarski 1990a, Czechowski 1991); Podlasie Lowland (Czechowski, Czechowska and Radchenko 1998b); Krakowsko-Wieluńska Upland (Kulmatycki 1920a, Czechowski, Czechowska and Radchenko 1998b); Świętokrzyskie Mts (Kulmatycki 1920b); Lubelska Upland (Pętal 1961); Pieniny (Nowicki 1864, Wierzejski 1868, 1873, Koehler 1951, Woyciechowski 1985).

Biology. A mesothermophilous forest species. It occurs also in warm and moderately dry stony open places, nesting in the ground, often around a plant root, under moss, under small stones or in rock crevices, sometimes in rotten wood. Colonies are mainly monogynous (facultatively polygynous), usually consisting of about one hundred workers. Nuptial flights in July and August.

In Poland, found locally in dry, sunny habitats.

Leptothorax unifasciatus (Latreille, 1798)

Formica unifasciata Latreille, 1798.
Myrmica unifasciata: Nylander 1849.
Leptothorax unifasciatus: Mayr 1855, Radchenko, Czechowski and Czechowska 1999b.
Leptothorax tuberum unifasciatus: Kulmatycki 1920a, Nowotny 1931a, 1937.
Leptothorax tuberum (F.) var. *unifasciata*: Stawarski 1966 (unavailable name).
Leptothorax unifasciatus var. *staegeri* Bondroit: Czechowska 1976 (misidentification).
Leptothorax (subg. *Leptothorax* s.str.) *unifasciatus*: Banert and Pisarski 1972, Pisarski 1975, Pisarski and Czechowski 1991, Czechowska 1976.
Leptothorax interruptus: Koehler 1951 (part., material examined) (misidentification).
Leptothorax clypeatus (Mayr): Pisarski 1953 (material examined) (misidentification).

General distribution (Fig. 33). Southern, Western and Central Europe, island of Gothland, Channel Islands (absent from Great Britain), steppe, forest-steppe and southern part of forest zones of Eastern Europe (up to Ural Mts), Crimea, Caucasus, Kopet-Dag Mts, Morocco.

Distribution in Poland (Fig. 33, Table VI). Lower Silesia (Stawarski 1966); Upper Silesia (Nowotny 1931a, 1937); Krakowsko-Wieluńska Upland (Wierzejski 1873,

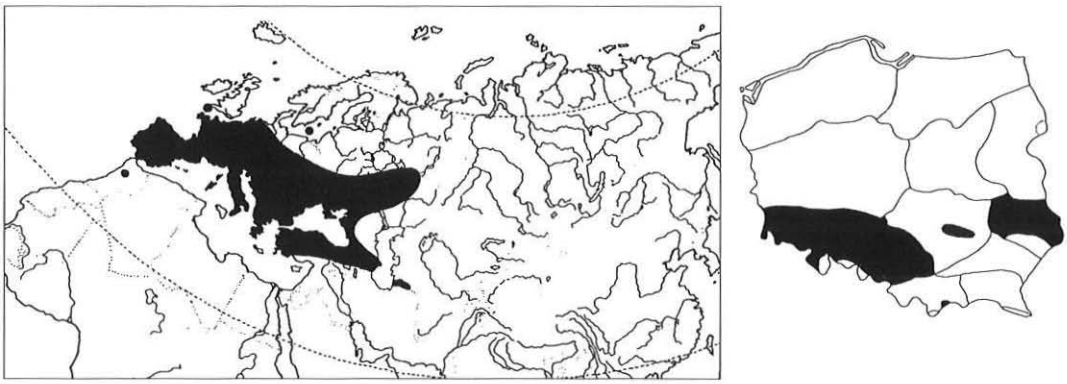


Fig. 33. Distribution of *Leptothorax unifasciatus* (Latr.) in Palaearctic and in Poland.

Czechowski, Czechowska and Radchenko 1998b); Świętokrzyskie Mts (Krzysztofiak 1984, Czechowski, Czechowska and Radchenko 1998b); Lubelska Upland (Pisarski 1953, Czechowski, Czechowska and Radchenko 1998b); Western Sudeten Mts (Banert and Pisarski 1972, Czechowski, Czechowska and Radchenko 1998b); Pieniny (Koehler 1951, Czechowska 1976, Woyciechowski 1985, Czechowski and Czechowska 2000a); «Western and Eastern Prussia» (Brischke 1888b).

Biology. A xerothermophilous species, which inhabits mainly light deciduous forests; met also in dry open habitats of different types. Nests are built mainly in dead dry branches of trees and in empty stems of herbaceous plants, under bark, in rock crevices, under stones and patches of lichenaceous vegetation. A monogynous form; colonies are numerically relatively large, consisting of 200 or more workers. Nuptial flights in July and August.

Rare in Poland, found only in xerothermal sites, mainly with lime subsoil; known from a few regions in southern part of the country.

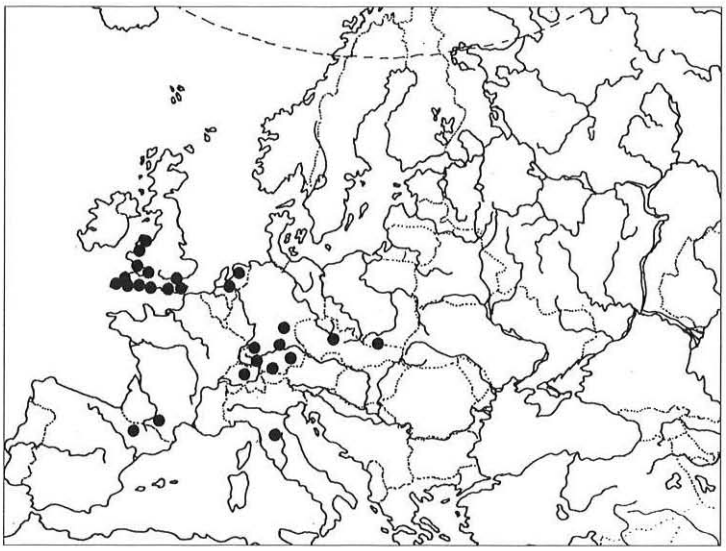
Leptothorax albipennis (Curtis, 1854)

Stenamma albipennis Curtis, 1854.

Leptothorax tuberointerruptus Bondroit, 1918, first available use of name for *Leptothorax tuberum* var. *tuberointerruptus* Forel, 1874 (nomen nudum). Synonymy by Orlege 1998.

Leptothorax albipennis: Czechowska and Czechowski 1999a, Radchenko, Czechowski and Czechowska 1999b.

Note. *L. albipennis* was a forgotten name, which since the middle of 19th century was considered to be a synonym of a different species. However, Orlege (1998), who has investigated rich material, including type specimens of *L. albipennis*, has shown that it is a senior synonym of *L. tuberointerruptus* Bondr. This species is closely related to *L. tuberum* and *L. unifasciatus*, and sometimes it is hardly distinguishable from them. Moreover, due to cross-breeding in the *L. tuberum*-group certain hybrid forms cannot be told either from one another or from *L. tuberum* (Douwes and Stille 1991). Despite this, some authors (including us) have tried to distinguish *L. albipennis* (=*L. tuberointerruptus*) from *L. tuberum* and *L. unifasciatus* by the sculpture of the head and the alitrunk dorsum, by the colour of the head and funiculus, etc. (Douwes and Stille 1991, Seifert 1996).



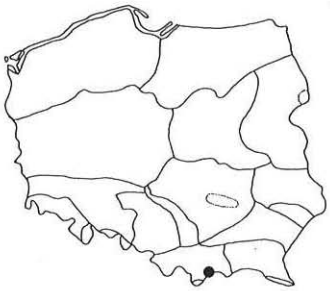


Fig. 34. Localities of *Leptothorax albipennis* (Curt.) in Europe and its locality in Poland.

General distribution (Fig. 34). This species is reported from southern England and Wales, the Netherlands, Germany, Switzerland, the Czech Republic, the French and Spanish Pyrenees, Italy, and Poland; everywhere rare.

Distribution in Poland (Fig. 34, Table VI). Pieniny Mts (Czechowska and Czechowski 1999a, Czechowski and Czechowska 2000a).

Biology. A xerothermophilous species, inhabiting grasslands and light scrub, especially on lime subsoil; in the northern Netherlands, it is common in dunes. It nests in rock crevices and rubble or in tree stumps and in dry fallen branches. Colonies are monogynous, numbering about 200 workers, and may form temporary polydomous systems.

In Poland, *L. albipennis* occurs only in the Pieniny Mts, where it inhabits mainly xerothermal grasslands and, more rarely, lichenaceous grasslands, nesting in the upper layer of rocky soil, under moss and, sometimes, inside dry empty stems of herbaceous plants. Sexual forms were seen in June.

Leptothorax nigriceps Mayr, 1855

Leptothorax nigriceps Mayr, 1855: Radchenko, Czechowski and Czechowska 1999b.
Leptothorax tuberum Mayr, 1855. Synonymy by Collingwood 1971, Radchenko 1995b. Revived from synonymy: Seifert 1996.
Leptothorax tuberum var. *nigriceps*: Kulmatycki 1920b.
Leptothorax tuberum nigriceps: Nowotny 1931a.
Leptothorax (subg. *Leptothorax* s.str.) *nigriceps*: Pisarski 1975, Pisarski and Czechowski 1991, Czechowska 1976.

General distribution (Fig. 35). Southern and Central Europe.

Distribution in Poland (Fig. 35, Table VI). Upper Silesia: Kielcza ad Strzelce Opolskie (Nowotny 1931a); Krakowsko-Wieluńska Upland: Ojców (Czechowski, Czechowska and Radchenko 1998b); Roztocze Upland: Krasnobród ad Zamość (Kulmatycki 1920b); Pieniny (Koehler 1951, Czechowska 1976, Woyciechowski 1985); Tatra Mts (Radchenko et al. 1999b).

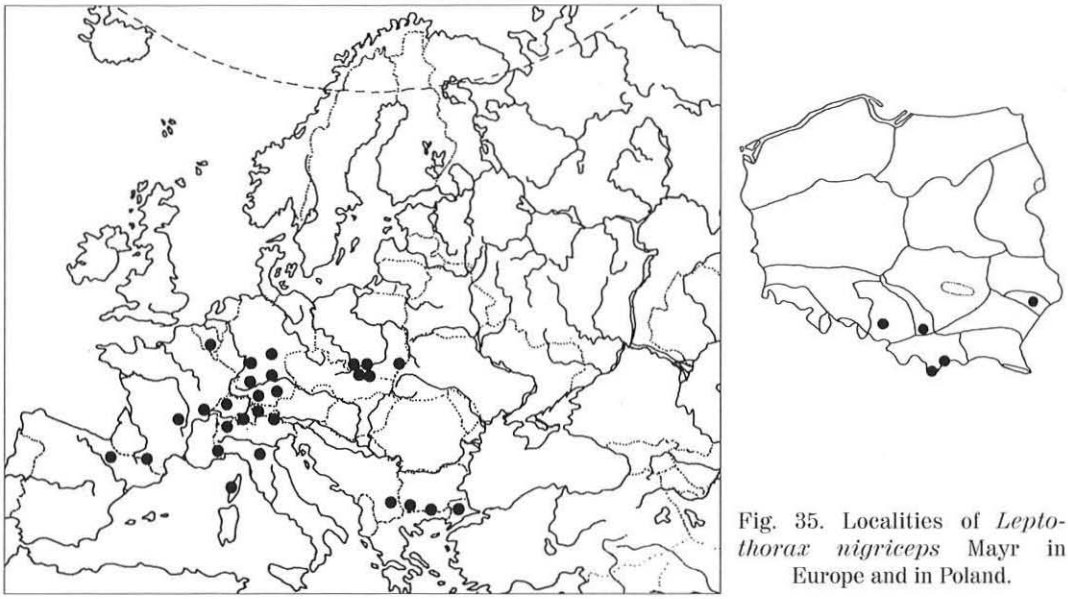


Fig. 35. Localities of *Leptothorax nigriceps* Mayr in Europe and in Poland.

Biology. A xerothermophilous local species, inhabiting dry and sun exposed rocky habitats with sparce vegetation; nests in rock crevices and rubble or under stones. Monogynous.

In Poland, known from a few separate xerothermal sites in the southern part of the country. In the Pieniny Mts, sexuals were observed from mid July to mid October.

Leptothorax interruptus (Schenck, 1852)

Myrmica interrupta Schenck, 1852.
Leptothorax interruptus: Mayr 1855, Radchenko, Czechowski and Czechowska 1999b.
Leptothorax tuberum interruptus: Nowotny 1931a.
Leptothorax (subg. *Leptothorax* s.str.) *interruptus*: Pisarski 1975, Czechowska 1976.

General distribution (Fig. 36). Southern and Central Europe, southern parts of British Isles, Sweden and Finland.

Distribution in Poland (Fig. 36, Table VI). Baltic Coast: Słowiński National Park (W. Czechowska, unpubl. data); Upper Silesia: Ligota Dolna ad Strzelce Opolskie (Nowotny 1931a).

Mistakenly reported from the Pieniny Mts by Koehler (1951) basing on misidentification of *L. unifasciatus*.

Biology. A xerothermophilous species, inhabiting dry grasslands and lichenaceous surfaces. It nests in the ground, in dry moss, under stones and in rock crevices. Colonies are monogynous (with one macrogyne) or polygynous (with several microgynes), numbering to a few hundred workers.

In Poland, the species is known only from two distant sites.

Leptothorax nylanderi (Förster, 1850)

Myrmica nylanderi Förster, 1850.
Leptothorax nylanderi: Mayr 1861, Radchenko, Czechowski and Czechowska 1999b.

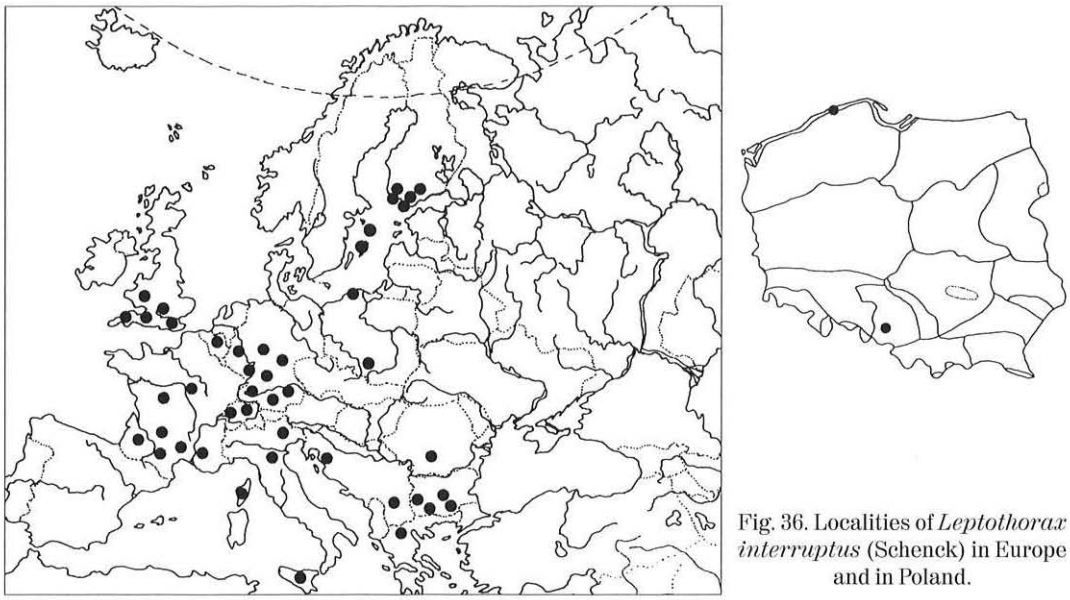


Fig. 36. Localities of *Leptothorax interruptus* (Schenck) in Europe and in Poland.

Leptothorax (subg. *Leptothorax* s.str.) *nylanderi*: Seifert 1995, 1996, nec Begdon 1932b, 1954, Parapura and Pisarski 1971, Pisarski 1975, 1981, 1982, Czechowska 1976, Pisarski and Czechowski 1991, Czechowski 1990a, Czechowski and Pisarski 1990b, Radchenko et al. 1999b (misidentifivation).

Leptothorax parvulus: Czechowski, Czechowska and Radchenko 1998b (misidentification).

Note. *L. nylanderi* was described by Förster (1850) basing on a male from north-western Germany (Aahen). Later, Mayr (1855) described workers and females and redescribed males of this species. According to Mayr's description, workers of *L. nylanderi* have a yellow or light reddish-yellow body, a brownish head dorsum and entirely yellow antennae; the first gastral segment has a brownish band on its tergite and sternite, which reaches the hind margin of the segment; of the other gastral segments only the tergites are with brownish bands; "in other respects [the species] is like *L. unifasciatus*" (Mayr 1855: 175) (i.e. propodeal spines are not long and not curved down!). In the description of females, "metanotal spines quite short" is the most important character (loc. cit.).

From the end of the 19th century up to recent times, all Western European myrmecologists (e.g. Emery 1916b, Stitz 1939, Kutter 1977, Collingwood 1979, Agosti and Collingwood 1987b, Seifert 1995, 1996) treated *L. nylanderi* more or less in accordance with Mayr's description, and in particular pointed out that propodeal spines of workers are relatively short, acute, not wide at the base and not curved down (see Plate XI, *9*), and propodeal spines of females also are quite short (spine length 2.5–3 times shorter than distance between their tips; see Plate XI, *11*). However, all Russian and Soviet ant taxonomists and those from the former Soviet republics (Karavaiev 1927, 1934, Arnoldi and Dlussky 1978, Radchenko 1994c, 1995c) followed Ruzsky's (1905) opinion and recognized another form as *L. nylanderi*. This mainly differs from *L. nylanderi* by relatively long, wide at the base and curved down propodeal spines of workers (see Plate XI, *8*), and quite long propodeal spines of females (spine length only 1.5–2 times shorter than distance between their tips seen from above; see Plate XI, *10* and also the text in the Key to species of *Leptothorax*).

Karavaiev (1926a), basing on workers and females, described *L. nylanderi* var. *crassispina* from the vicinity of Kiev, Ukraine. Workers of this form have "propodeal spines wider than in the typical form, gradually narrowing to the tips and slightly curved down" (Karavaiev 1926a: 51). Karavaiev's description was based on a comparison with figures of *L. nylanderi* in Emery 1916b: 181. But later, and with no comments, Karavaiev (1934) synonymized var. *crassispina* with *L. nylanderi*, and this synonymy has been confirmed by Radchenko (1995c).

Seifert was the first contemporary author who paid attention to the differences in the shape of the propodeal spines in the western and eastern populations of the species generally determined as *L. nylanderi*. Basing on representatives of the eastern population of this form, at first he described the subspecies *slavonicus* (Seifert 1995) and then raised it to species status (Seifert 1996). Seifert's *L. slavonicus* undoubtedly is the species earlier identified as *L. nylanderi* by "Russian" authors. Reinvestigation of the lectotype and paralectotypes of *L. nylanderi* var. *crassispina* (kept in the Institute of Zoology, UNAS, Kiev) clearly showed that *L. slavonicus* Seifert was a junior synonym of *L. crassispinus* Karav., and that the latter might be considered a good species (Radchenko 2000).

Till now, all Polish myrmecologists, including us (see Radchenko et al. 1999b), erroneously determined a *Leptothorax* species commonly found in Poland as *L. nylanderi* (Först.). Yet in fact, at least in a vast majority of cases, it was *L. crassispinus*. Recently, W. Czechowska has collected some samples of the genuine *L. nylanderi* on the island of Wolin (the north-westernmost part of Poland). This finding, and a report based on erronously determined (as *L. parvulus*) museum specimens of *L. nylanderi* (Czechowski, Czechowska and Radchenko 1998b) from the same region, are the only confirmed data on this species' occurrence in Poland.

L. nylanderi and *L. crassispinus* are allopatric species: the former is distributed in the western part of Europe, whereas the latter in the eastern part of Europe and in the Caucasus. The narrow zone of their possible co-occurrence runs, it its northern part, more or less meridionally along eastern Germany and westernmost Poland. The distribution of both species in former Yugoslavia, in the Balkans and in Greece requires additional investigations (see also Seifert 1995).

General distribution (Fig. 37). Western Europe and the western part of Central Europe (see also Note above).

Distribution in Poland (Fig. 37, Table VI). Baltic Coast (island of Wolin): Międzyzdroje ad Kamień Pomorski (Czechowski, Czechowska and Radchenko 1998b) and Woliński National Park ad Wapnica (W. Czechowska, unpubl. data).

Biology. Data on ecology of this species are very scant. It seems to be a mesothermophilous form inhabiting light deciduous (mainly oak) or mixed forests.

In Poland, the species is known only from two neighbouring sites in the north-westernmost part of the Baltic Coast.

Leptothorax crassispinus Karavaiev, 1926

Leptothorax (*Leptothorax*) *nylanderi* var. *crassispina* Karavaiev, 1926a,b.
Leptothorax tuberum var. *nylanderi*: Ruzsky 1905.
Leptothorax nylanderi: Ruzsky 1902b, Karavaiev 1927, 1934, Arnoldi and Dlussky 1978, Radchenko 1994c, 1995c, Radchenko et al. 1999b (and all the earlier Polish literature) (misidentifications).

Leptothorax crassispinus: Radchenko 2000 (revived from synonymy and raised to species).
Leptothorax nylanderi slavonicus Seifert, 1995.
Leptothorax slavonicus: Seifert 1996. Synonymy by Radchenko 2000.

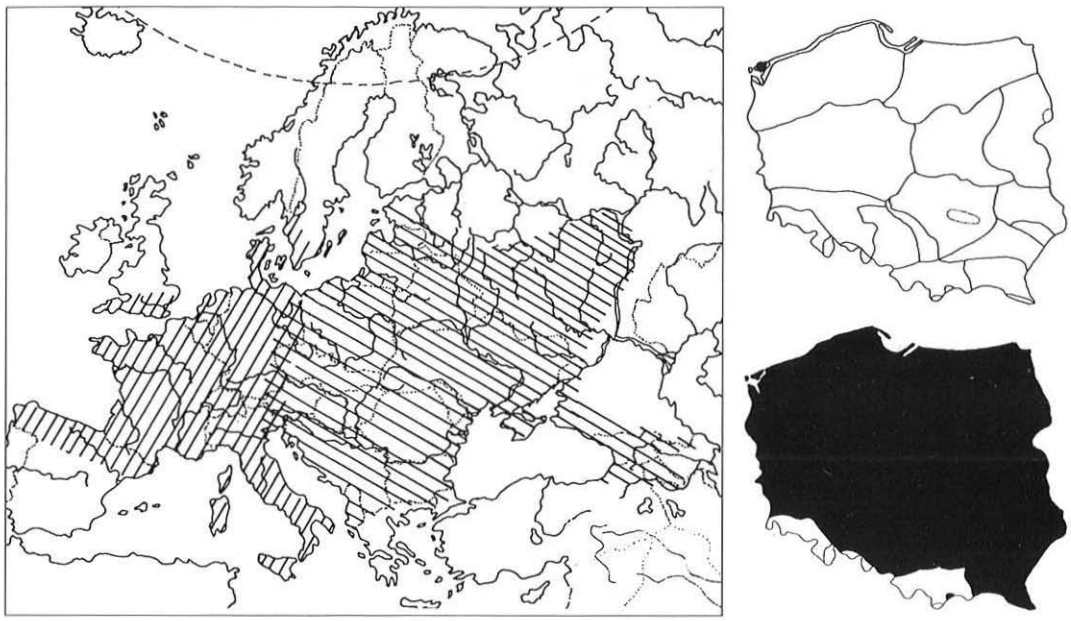


Fig. 37. Distribution of *Leptothorax nylanderi* (Först.) (left lined area) and of *Leptothorax crassispinus* Karav. (right lined area) in Europe (acc. Radchenko 2000, slightly changed) and in Poland (top: *L. nylanderi*, bottom: *L. crassispinus*).

Note. See Note to *L. nylanderi*.

General distribution (Fig. 37). Eastern part of Central Europe, Eastern Europe (to the east up to Ural Mts), Crimea, Caucasus.

Distribution in Poland (Fig. 37, Table VI; see Note to *L. nylanderi*). Baltic Coast: island of Wolin (W. Czechowska, unpubl. data); Pomeranian Lake District (Begdon 1932b, 1954, Griep 1940, Mazur 1983); Masurian Lake District (Begdon 1954, Mazur 1983); Wielkopolsko-Kujawska Lowland (Kulmatycki 1922, Jakubisiak 1948, Mazur 1983); Mazovian Lowland (Jakubisiak 1948, Pisarski and Czechowski 1978, Pisarski 1981, 1982, Mazur 1983, Bańkowska et al. 1984, Czechowski 1990a, 1991, Czechowski and Pisarski 1990a); Podlasie Lowland (Pętal 1961); Białowieska Forest (Karpiński 1956); Lower Silesia (Mazur 1983); Upper Silesia (Scholz 1926, Nowotny 1931a, 1937); Krakowsko-Wieluńska Upland (Kaczmarek 1953); Małopolska Upland (Mazur 1983); Świętokrzyskie Mts (Nasonov 1892); Lubelska Upland (Pisarski 1953, Pętal 1961, Mazur 1983); Roztocze Upland (Pętal 1961); Sandomierska Lowland (Begdon 1954, Mazur 1983); Eastern Beskidy Mts: Lesko (coll. MIZ PAS); Bieszczady Mts (Parapura and Pisarski 1971); Pieniny Mts (Koehler 1951).

Biology. A mesothermophilous species that inhabits mainly moderately dry coniferous (pine) and mixed forests, found also in deciduous forests; relatively less thermophilous than *L. nylanderi*. One of the most common *Leptothorax* species in temperate Eastern European woodlands. Nests are in dead tree branches and dry fallen

branches, rotten logs, stumps, under bark, under moss, in litter, in empty acorns. Colonies consist of 100–200 workers; normally monogynous. A relatively aggressive species, able to attack and sting freely. Nuptial flights in July and early August.

Widely distributed in Poland, records lack only from some southernmost regions. It lives in different habitats, finding optimum conditions in mixed coniferous-deciduous forests.

Leptothorax parvulus (Schenck, 1852)

Myrmica parvula Schenck, 1852.
Leptothorax parvulus: Mayr 1855, Radchenko, Czechowski and Czechowska 1999b.
Leptothorax nylanderi var. *parvulus*: Nowotny 1931a.
Leptothorax (subg. *Leptothorax* s.str.) *parvulus*: Pisarski 1975, Pisarski and Czechowski 1991.

General distribution (Fig. 38). Southern, Western and Central Europe, southern part of Eastern Europe, Crimea, Caucasus, and Kopet-Dag Mts.

Distribution in Poland (Fig. 38, Table VI). Mazovian Lowland: Rybienko ad Wyszków and Kampinoska Forest (Czechowski, Czechowska and Radchenko 1998b); Podlasie Lowland: Jata ad Łuków (Czechowski, Czechowska and Radchenko 1998b); Upper Silesia: Brynek ad Tarnowskie Góry (Nowotny 1931a); Pieniny: Mt. Sokolica (Koehler 1951); «Western and Eastern Prussia» (Brischke 1888b).

Mistakenly reported by Czechowski, Czechowska and Radchenko (1998b) from the Baltic Coast and the Krakowsko-Wieluńska Upland basing on misidentification of *L. nylanderi* and *L. sordidulus saxonicus* respectively.

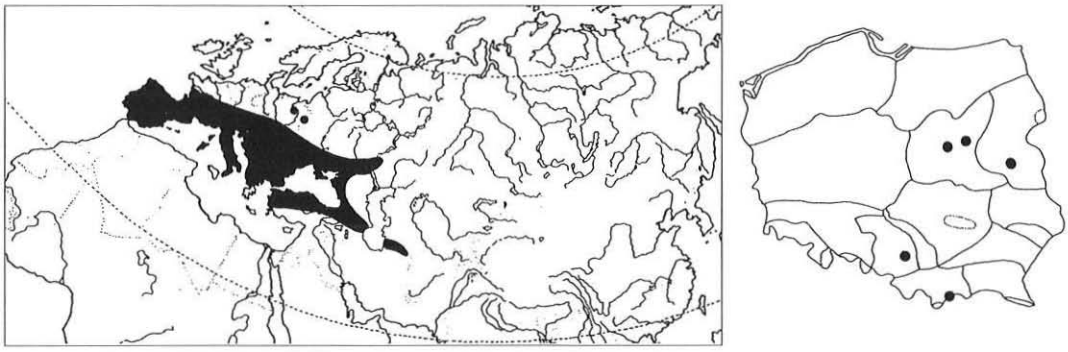


Fig. 38. Distribution of *Leptothorax parvulus* (Schenck) in Palaearctic and its localities in Poland.

Biology. Ecological requirements similar to that of the previous species, but *L. parvulus* prefers drier and lighter forests. It nests in the upper soil layer, in rotten wood, under stones, in litter, moss, empty galls, etc. Monogynous.

Very rare in Poland, found in dry habitats only. Sexuals were caught in August and September.

Leptothorax sordidulus saxonicus Seifert, 1995

Leptothorax sordidulus saxonicus Seifert, 1995.
Leptothorax parvulus: Czechowski, Czechowska and Radchenko 1998b (misidentification).

General distribution (Fig. 39). *L. sordidulus* Müller, 1923 occurs locally in the northern, central and eastern parts of Southern Europe and in the southern part of

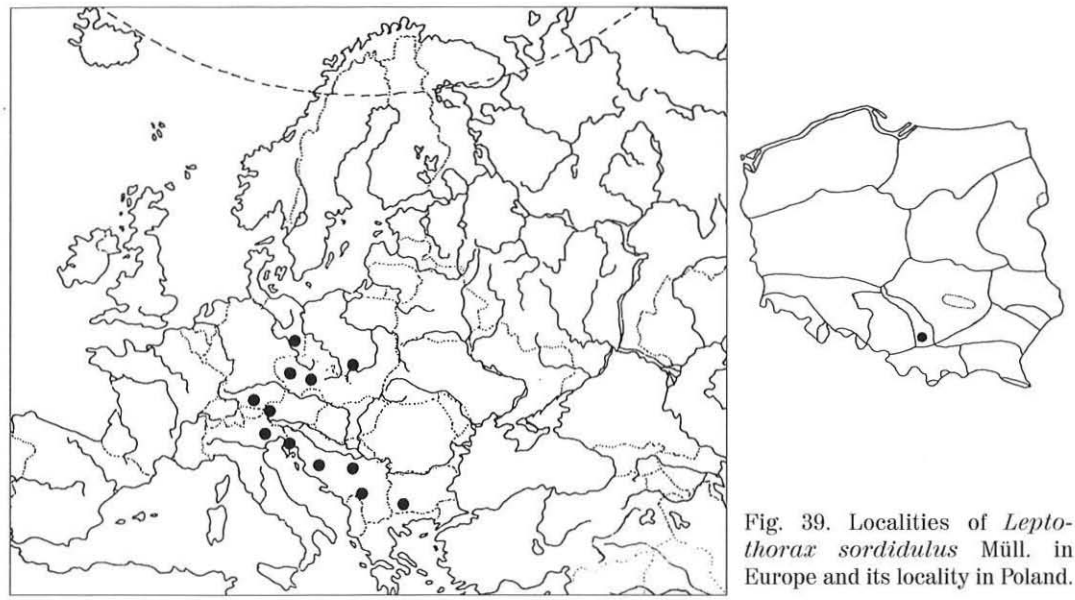


Fig. 39. Localities of *Leptothorax sordidulus* Müll. in Europe and its locality in Poland.

Central Europe (known from Bulgaria, former Yugoslavia, northern Italy, Austria, the Czech Republic, southern and eastern Germany, and southern Poland); *saxonicus* is its northern subspecies (see also Seifert 1995).

Distribution in Poland (Fig. 39). Krakowsko-Wieluńska Upland: Ojców ad Olkusz (Czechowski, Czechowska and Radchenko 1998b, W. Czechowska, unpubl. data).

Biology. Xerothermophilous form of dry grasslands overgrowing with shrubs and trees; met also in dry and light deciduous forests. It nests mainly in rock crevices and in wood of dead trees.

In Poland, this very rare and little known subspecies of the very rare and little known species is recorded twice, only from one site in the Ojcowski National Park; it lives there on a limy rocky slope of southern exposure.

Leptothorax affinis Mayr, 1855

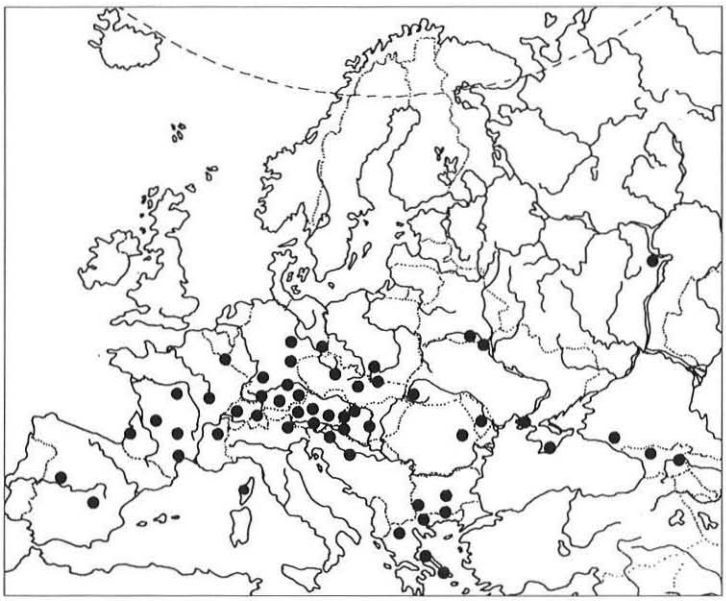
Leptothorax affinis Mayr, 1855: Radchenko, Czechowski and Czechowska 1999b.
Leptothorax tuberum affinis: Kulmatycki 1920a.
Leptothorax (subg. *Leptothorax* s.str.) *affinis*: Pisarski 1975, Pisarski and Czechowski 1991, Czechowska 1976.

General distribution (Fig. 40). Southern, Central and Eastern Europe (the southern border of the mixed forest zone is the northern limit of the species range), Crimea and Caucasus.

Distribution in Poland (Fig. 40, Table VI). Krakowsko-Wieluńska Upland: Ujazd ad Kraków (Kulmatycki 1920a); Pieniny Mts: Zawiesy, Trzy Korony (Koehler 1951).

Biology. A xerothermophilous arboreal species inhabiting mainly dry light oak forests and nesting in dead tree branches or, more rarely, in fallen dry wood. Monogynous.

The species is very rare in Poland, found in xerothermal sites with lime subsoil only.



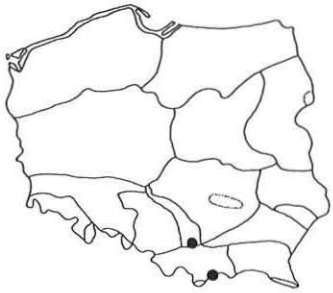


Fig. 40. Localities of *Leptothorax affinis* Mayr in Europe and in Poland.

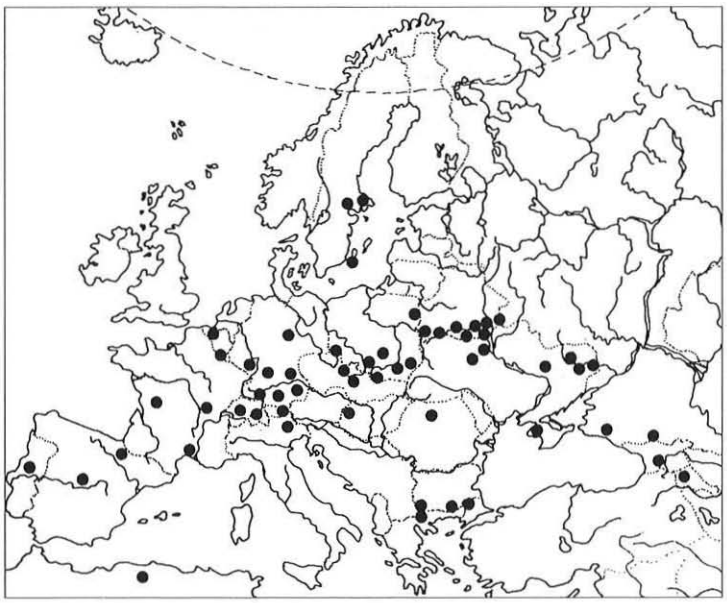
Leptothorax corticalis (Schenck, 1852)

Myrmica corticalis Schenck, 1852.

Leptothorax corticalis: Mayr 1855, Radchenko, Czechowski and Czechowska 1999b.

Leptothorax corticalis var. *nylandero-corticalis* Forel: Kulmatycki 1920a, Koehler 1951, Czechowska 1976 (misidentifications).

Leptothorax (subg. *Leptothorax* s.str.) *corticalis*: Kulmatycki 1920a, Pisarski 1975, Czechowska 1976.



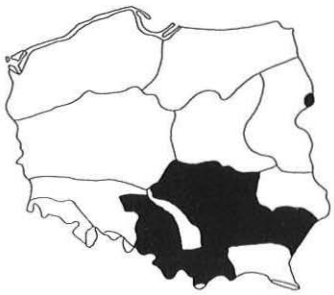


Fig. 41. Localities of *Leptothorax corticalis* (Schenck) in Europe and its distribution in Poland.

General distribution (Fig. 41). Southern and Central Europe, central part of Eastern Europe, southern Sweden, Crimea, Caucasus and Algeria; everywhere rare.

Distribution in Poland (Fig. 41, Table VI). Białowieska Forest (Czechowski, Czechowska and Radchenko 1998b); Upper Silesia (Nowotny 1931a, 1937); Małopolska Upland (Czechowski, Czechowska and Radchenko 1998b); Świętokrzyskie Mts (Krzysztofiak 1984); Roztocze Upland (Kulmatycki 1920b, Pętal 1961); Sandomierska Lowland (Czechowska and Czechowski 1998); Western Beskidy Mts (Kulmatycki 1920a); Pieniny Mts (Koehler 1951, Woyciechowski 1985).

NB. At least some of specimens from the Pieniny Mts, collected and determined by Koehler (1951) as *L. corticalis*, are in fact, *L. nadigi*.

Mistakenly reported from the Mazovian Lowland by Pisarski (1982) basing on misidentification of *L. tuberum*.

Biology. A little known and rare arboreal species; it inhabits dry and light deciduous forests, nesting in dead tree branches (mainly on oaks), in bark crevices and in dry fallen wood. Polymorphic queens (macro- and microgynes).

The species is very rare in Poland, found only in xerothermal sites.

Leptothorax nadigi Kutter, 1925

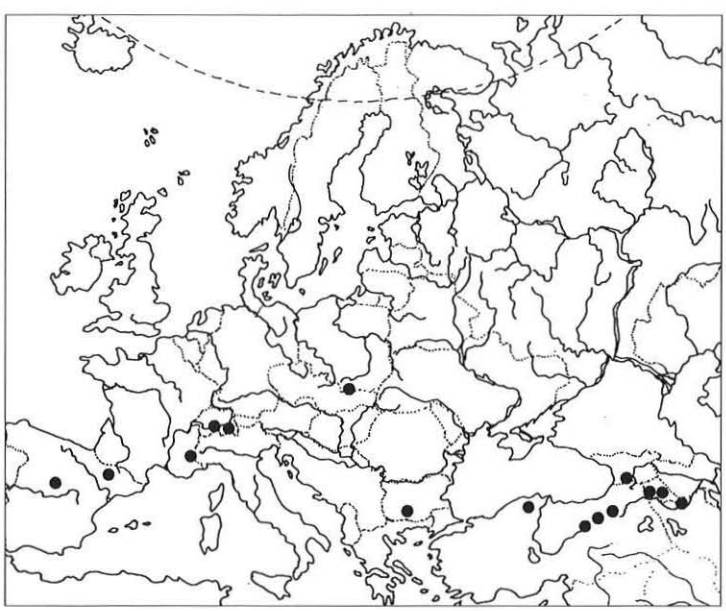
Leptothorax nadigi Kutter, 1925: Czechowska et al. 1998, Radchenko, Czechowski and Czechowska 1999b.

Leptothorax caucasicus Arnoldi, 1977; Arakelian 1994, Radchenko 1994c, 1995c. Synonymy by Schulz (in prep.).

Leptothorax corticalis (Schenck, 1852): Koehler 1951 (part., examined) (misidentification).

Leptothorax bulgaricus Forel, 1892: Czechowska 1976, Woyciechowski 1985, Pisarski et al. 1992 (misidentifications).

General distribution (Fig. 42). A Mediterranean species known from separate sites in Pyrenees and in Castile (Spain), and also from Alps (France, Switzerland), Western Carpathians (Pieniny Mts, Poland), Rodopy Mts (Bulgaria), Asia Minor and Caucasus.



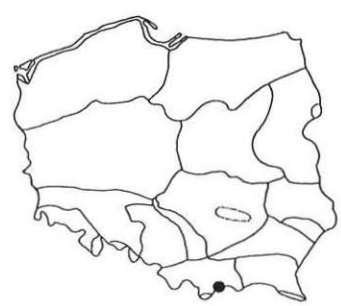


Fig. 42. Localities of *Leptothorax nadigi* Kutter in Europe and its locality in Poland.

Distribution in Poland (Fig. 42, Table VI). Pieniny Mts (Koehler 1951, Czechowska 1976, Woyciechowski 1985, Czechowska et al. 1998, Czechowski and Czechowska 2000a).

Biology. Data on the ecology and biology of this species are very scant. In Switzerland, it was found in dry stalks of *Laserpitium* sp. (Umbelliferae). In Spain, colonies were collected from under the bark of decaying pine stumps and under that of a living pine tree in a dense pine forest. In Bulgaria, nests were situated in the bark of pine stumps on a semi-dry grassland on limestone; the largest colony consisted of about 250 workers. The species seems to be either functionally monogynous or facultatively polygynous.

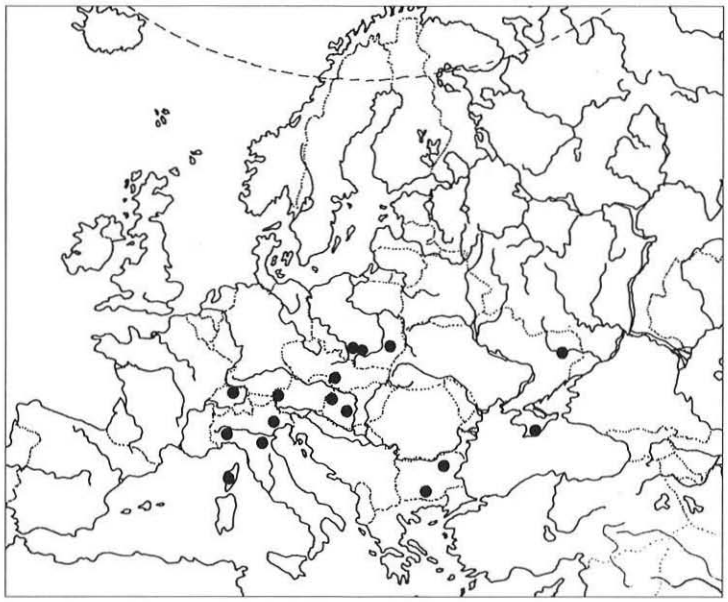
The Pieniny Mts in Poland are the northernmost locality for *L. nadigi*. It occurs there in xerothermal grasslands (Origano-Brachypodietum), which develop on warm and dry slopes with a south-facing aspect, on soil rich in calcium carbonate. Nests are inside dry empty stems of various herbaceous plants, most frequently in *Cynanchum vincetoxicum* (=*Vincetoxicum hirudinaria*) (Asclepiadaceae). Colonies are monogynous and number from several score to about 100 workers. Sexuals (in the nests) were observed during August.

Leptothorax clypeatus (Mayr, 1853)

Myrmica clypeata Mayr, 1853.
Leptothorax clypeatus: Mayr 1855, Radchenko, Czechowski and Czechowska 1999b.
Leptothorax (subg. *Leptothorax* s.str.) *clypeatus*: Pisarski 1975.

General distribution (Fig. 43). Southern and Central Europe, in Eastern Europe found in Crimea and south-eastern Ukraine; everywhere rare.

Distribution in Poland (Fig. 43, Table VI). Upper Silesia: Zimna Wódka ad Strzelce Opolskie, Murcki ad Tychy (Nowotny 1937); Lubelska Upland: Kazimierz Dolny ad Puławy (Minkiewicz 1935, 1939a,d).



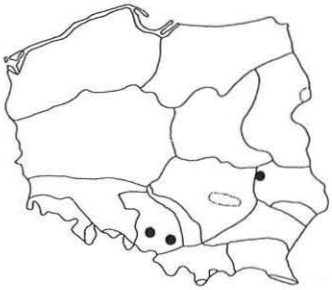


Fig. 43. Localities of *Leptothorax clypeatus* (Mayr) in Europe and in Poland.

Biology. A xerothermophilous species which inhabits mainly dry light oak forests, nesting in dry tree branches, mainly in oaks. Colonies consist of several score individuals.

The occurrence of this species in Poland needs confirmation. It is possible that all reports are based on misidentification. Specimens collected in the Lubelska Upland by Pisarski and identified by him as *L. clypeatus* (Pisarski 1953) are in fact *L. unifasciatus*. There is no proof material for the remaining reports.

Genus *Doronomyrmex* Kutter, 1945

Doronomyrmex Kutter, 1945. Type species: *Doronomyrmex pacis* Kutter, 1945, by monotypy.
Leptothorax Mayr, 1855: Buschinger 1965 (part.), Kutter 1967 (part.).

Four species of this genus are known at present; three occur in Central and Northern Europe, one is reported only from North America. Recently, an unidentified species of *Doronomyrmex* was found in Western Siberia (Kemerovskaya Distr., Russia, leg. S. Sorokina) (A. Radchenko, unpubl. data). All the European species are workerless permanent social parasites of *Leptothorax acervorum*. *D. pacis* Kutter and *D. kutteri* (Buschinger) are typical inquilines; their queens coexist with the host queens. *D. goesswaldi* (Kutter) queens, however, kill host queens and, as a result, the duration of mixed colonies is limited by the longevity of host workers (3–4 years); therefore it may be termed a "murder parasite" (see Faber 1969). In North American species, *D. pocahontas* Buschinger, a vestigial worker caste is present (Buschinger and Heinze 1993).

Doronomyrmex kutteri (Buschinger, 1965)

Leptothorax (*Mychothorax*) *kutteri* Buschinger, 1965.
Doronomyrmex kutteri: Buschinger 1981, Radchenko and Czechowski 1997, Radchenko, Czechowski and Czechowska 1999b.

General distribution (Fig. 44). Southern Germany, Switzerland, Austria, Italian Alps, Poland, Sweden, Estonia, Finland, and north of European part of Russia.

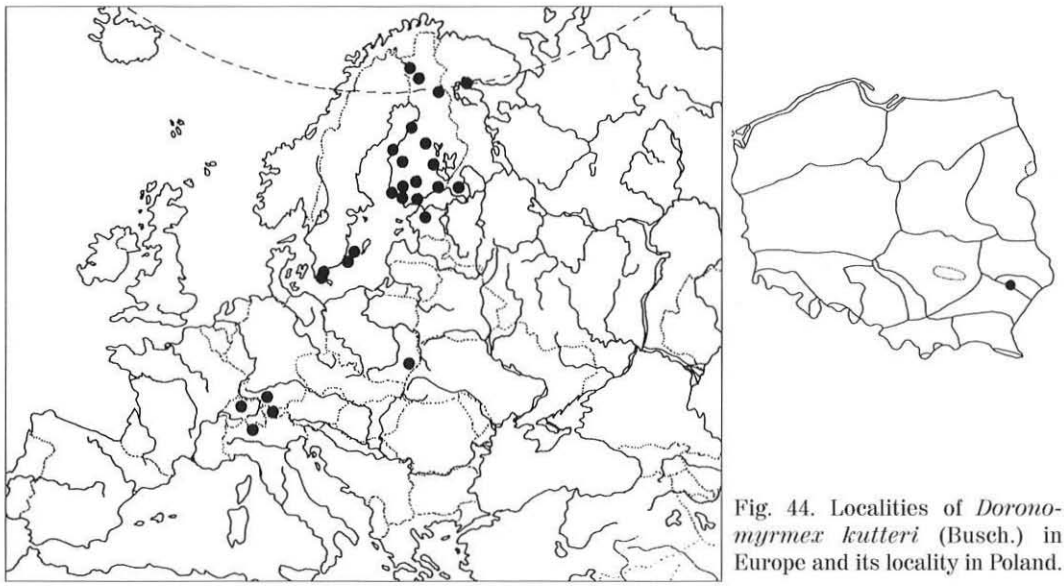


Fig. 44. Localities of *Doronomyrmex kutteri* (Busch.) in Europe and its locality in Poland.

Distribution in Poland (Fig. 44, Table VI). Roztocze Upland: reserve "Rakowskie Bagno" ad Frampol (Radchenko and Czechowski 1997).

Biology. Workerless inquiline of *Leptothorax acervorum*.

The only record from Poland is based upon a single specimen found in the collection of the Museum and Institute of Zoology, PAS in Warsaw.

Genus *Harpagoxenus* Forel, 1893

Harpagoxenus Forel, 1893, replacement name for *Tomognathus* Mayr, 1861 (Formicidae), junior homonym of *Tomognathus* Agassiz, 1850 (Pisces). Type species: *Myrmica sublaevis* Nylander, 1849, by monotypy.

This genus includes three species: two Palaearctic and one Nearctic. Of the two Palaearctic forms one inhabits the boreal zone of the region, and the other occurs in the south of Siberia and in northern Mongolia. The Nearctic species is known from the boreal zone of North America. All the species are slave-makers, parasitising colonies of *Leptothorax* s.str. species.

Harpagoxenus sublaevis (Nylander, 1849)

Myrmica sublaevis Nylander, 1849.
Tomognathus sublaevis: Mayr 1861.
Harpagoxenus sublaevis: Forel 1893, Radchenko, Czechowski and Czechowska 1999b.

General distribution (Fig. 45). Boreal zone of Palaearctic, mountains of Central and Southern Europe, Caucasus.

Distribution in Poland (Fig. 45, Table VI). Białowieska Forest: reserve "Sitki" (W. Czechowski, unpubl. data); Upper Silesia (Nowotny 1931a); Sandomierska Lowland (Czechowska and Czechowski 1998, Czechowski and Czechowska 1999a); Western Sudeten Mts (Stawarski 1961a, 1966, Banert and Pisarski 1972); Bieszczady Mts (Parapura and Pisarski 1971); Tatra Mts (J. Łomnicki 1931, Czechowski and Czechowska 1999a).

Biology. Slave-maker co-existing with *Leptothorax acervorum*, *L. muscorum* and *L. gredleri*; it is also a temporary social parasite of these two species during colony founding. Mature mixed colonies, in which slaves as a rule greatly predominate (usually >80%), comprise from a few score to several hundred adults. *H. sublaevis* enslaves both host workers and females, the latter by depriving them of their wings. The species is highly polymorphic; among females there are ergatomorphs (workers and ergatoid gynes), apterog-

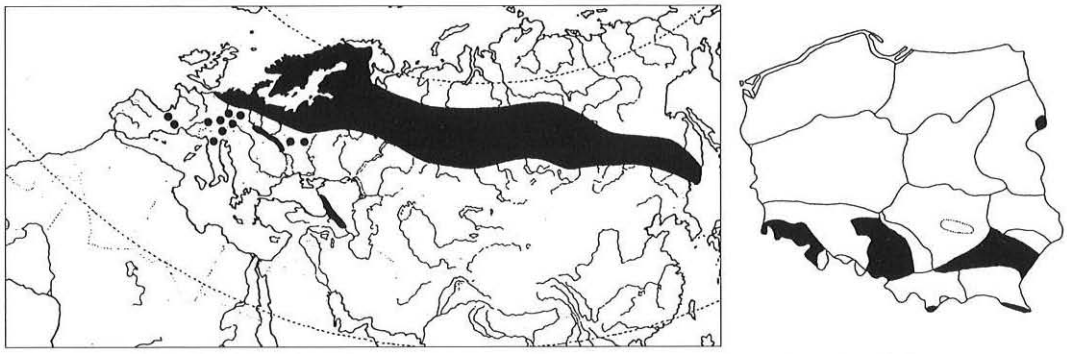


Fig. 45. Distribution of *Harpagoxenus sublaevis* (Nyl.) in Palaearctic and in Poland.

ynes (wingless gynes) and gynomorphs (alate gynes). Colonies are strictly monogynous. Nests are found in rotten twigs on the ground, in stumps and under bark, but in the mountains of Central Europe they are usually under stones. Nuptial flight in July.

In Poland, *H. sublaevis* is known from few regions in the southern part of the country. It has been found in mixed colonies with *Leptothorax acervorum* and (or) *L. muscorum*.

Genus *Epimyrma* Emery, 1915

Epimyrma Emery, 1915a. Type species: *Epimyrma kraussei* Emery, 1915a, by original designation.
Myrmetaerus Soudek, 1925. Synonymy by Buschinger et al. 1984 (junior synonym of *Myrmoxenus*).
Myrmoxenus Ruzsky, 1902a. Synonymy by Bolton 1994.

This is a Palaearctic genus including 11 species distributed in Southern and Central Europe, North-West Africa, Crimea, Caucasus, Kazakhstan, Kirgizstan. One species is recorded from Poland. Species of this genus exibit an evolutionary transition from active slavery to a special kind of workerless permanent parasitism (so-called degenerate dulosis or murder-parasitism, since unlike in typical inquilinism the parasite queen kills the host queens). Their hosts are species of the genus *Leptothorax* (subgenera *Myrafant* and *Temnothorax*).

Epimyrma ravouxi (E. André, 1896)

Formicoxenus ravouxi E. André, 1896.
Epimyrma ravouxi: Emery 1915a, Czechowski and Czechowska 1997, Radchenko, Czechowski and Czechowska 1999b.
Epimyrma goesswaldi Menozzi, 1931: Czechowska 1976, Woyciechowski 1985. Synonymy by Buschinger 1982.

General distribution (Fig. 46). A Mediterranean species that occurs extensively in the mountainous regions of South, Western and Central Europe (known from Spain, France, Germany, Poland, Switzerland, Austria, Italy, Bulgaria, former Yugoslavia, Greece, Sardinia and Corsica).

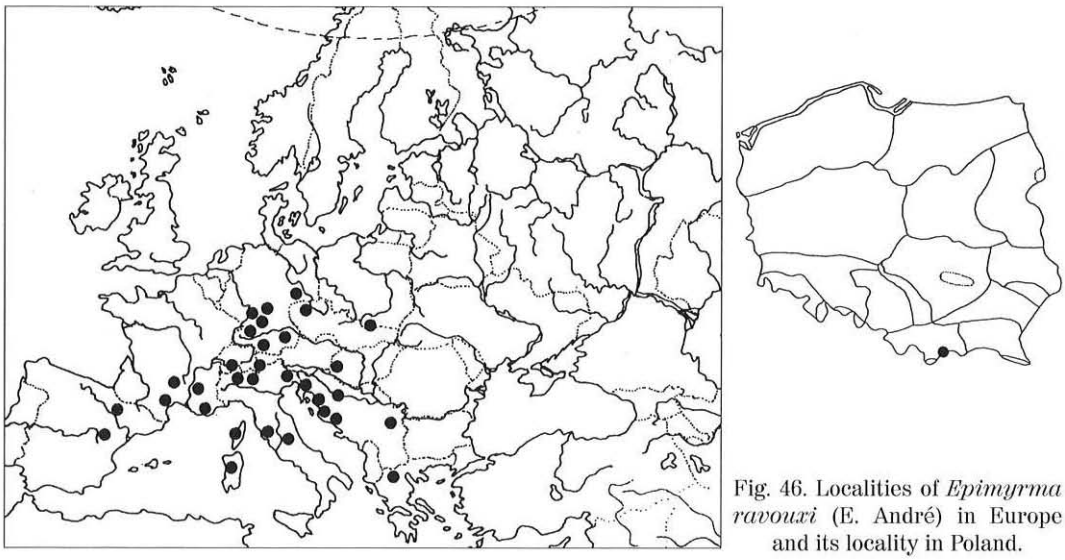


Fig. 46. Localities of *Epimyrma ravouxi* (E. André) in Europe and its locality in Poland.

Distribution in Poland (Fig. 46, Table VI). Pieniny Mts (Czechowska 1976, Woyciechowski 1985, Czechowski and Czechowska 2000a).

Biology. A xerothermophilous species; typical slave-maker which conducts well-organized raids. Colonies of different *Leptothorax* (*Myrafant*) species are its hosts (sources of both slaves and victims of dependent colony founding).

In Poland, *E. ravouxi* occurs only in the Pieniny Mts where it nests in xerothermal and lichenaceous grasslands inside dry empty stems of various herbaceous plants or under stones; its hosts are *Leptothorax albipennis*, *L. nadigi*, *L. nigriceps* and *L. unifasciatus*.

Tribe SOLENOPSIDINI

Genus *Solenopsis* Westwood, 1840

Solenopsis Westwood, 1840b. Type species: *Solenopsis mandibularis* Westwood, 1840b (junior synonym of *Solenopsis geminata* Fabricius, 1804), by monotypy.

Diplorhoptrum Mayr, 1855. Type species: *Formica fugax* Latreille, 1798, by monotypy. Synonymy by Mayr 1862. Revived from synonymy by Baroni Urbani 1968; again synonymized by Kempf 1972, synonymy confirmed by Bolton 1987.

This is a world-wide genus incorporating about 200 species mainly distributed in the Neotropical (about 90 species) and Palaearctic (about 45 species) regions. Only one species occurs in Poland.

Solenopsis fugax (Latreille, 1798)

Formica fugax Latreille, 1798: Schilling 1839.

Solenopsis fugax: Mayr 1862.

Diplorhoptrum fugax: Mayr 1855, Pisarski 1975, 1981, Pisarski and Czechowski 1978, 1991, Banaszak et al. 1978, Mazur 1983, Czechowski 1990a.

General distribution (Fig. 47). Europe (to the north it reaches up to the southern parts of England and Sweden), North-Western Africa, Caucasus, Middle East, Asia Minor and central Asia, southern part of Western Siberia.

Distribution in Poland (Fig. 47, Table VI). Baltic Coast (Urbański 1956); Pomeranian Lake District (Griep 1940); Mazovian Lowland (Nasonov 1892, Banaszak et al. 1978, Pisarski and Czechowski 1978, Pisarski 1981, 1982, Czechowski 1990a); Podlasie Lowland (Pętal 1968a, Mazur 1983); Białowieska Forest (W. Czechowski,

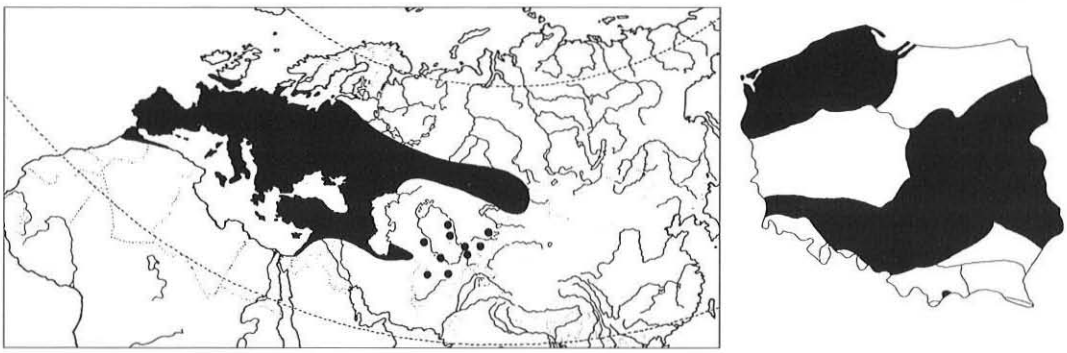


Fig. 47. Distribution of *Solenopsis fugax* (Latr.) in Palaearctic and in Poland.

unpubl. data); Lower Silesia (Stawarski 1966); Upper Silesia (Scholz 1926, Nowotny 1931a, Stawarski 1966); Krakowsko-Wieluńska Upland (Kulmatycki 1920a, Pongrácz 1924); Małopolska Upland: reserve "Krzyżanowice" ad Pińczów (coll. MIZ PAS); Świętokrzyskie Mts (Kulmatycki 1920b); Lubelska Upland (Minkiewicz 1935, Pisarski 1953, Pętal 1961); Roztocze Upland (Pętal 1961); Pieniny Mts (Woyciechowski 1985); «Kłodzka Land» (Schilling 1839).

Biology. It is a xerothermophilous species occurring in sunny open habitats, mainly on soils of limy, gypsum or loessal substratum; also on sands. It forms abundant colonies nesting in the ground and under stones, frequently in lestobiosis with other ant species (e.g. of the genera *Tapinoma*, *Myrmica*, *Tetramorium*, *Formica*, *Camponotus*, and *Lasius*). *S. fugax* are predatory ants, which also attend root aphids, and rarely come into view; aggressive towards other ant species. Nuptial flight in September.

In Poland, the species is found relatively seldom, mainly because of its cryptic behaviour. However, it is reported from most of the country.

Genus *Monomorium* Mayr, 1855

Monomorium Mayr, 1855. Type species: *Monomorium minutum* Mayr, 1855 [junior secondary homonym of *Atta minuta* Jerdon, 1851 = *Monomorium pharaonis* (Linnaeus, 1758); replacement name: *Monomorium monomorium* Bolton, 1987], by monotypy.

This world-wide genus, including about 300 species known so far, is one of the most speciose ant genera. Afrotropical forms (more than 140 described species) prevail. In the Palaearctic, there occur about 50 species native to this region. There also are several cosmopolitan tramp species; one of them is introduced and well-established in synanthropic habitats in Central and Northern Europe.

Monomorium pharaonis (Linnaeus, 1758)

Formica pharaonis Linnaeus, 1758: Kluk 1780.
Monomorium pharaonis: Mayr 1862.

General distribution. Nowadays it is a cosmopolitan species. In the temperate zone, it lives only synanthropically in heated premises; widespread especially in towns.

Distribution in Poland (Fig. 48, Table VI). Baltic Coast (Wengris 1964, Myjak et al. 1970, Wiśniewski 1970a); Pomeranian Lake District (Wiśniewski 1970a); Wielkopolsko-Kujawska Lowland (Nowotny 1937, Wiśniewski 1970a); Mazovian Lowland (Nasonov 1892, Pisarski 1957, Wiśniewski 1970a, Eichler 1978, Pisarski and Czechowski 1978, Brodniewicz et al. 1979, Czajkowska 1979, Pisarski 1982, Vepsäläinen and Pisarski 1982); Podlasie Lowland (Eichler 1978); Lower Silesia (Stawarski 1963, 1966, Wiśniewski 1970a, Eichler 1978); Upper Silesia (Kotzias 1929, 1930b, Nowotny 1931a, Wiśniewski 1970a, Eichler 1978); Krakowsko-Wieluńska Upland (Eichler 1978) Świętokrzyskie Mts (Krzysztofiak 1984); Eastern Sudeten Mts (Wiśniewski 1970a); Western Beskidy Mts (Wiśniewski 1970a, Eichler 1978).

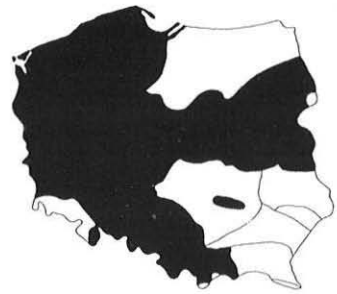


Fig. 48. Distribution of *Monomorium pharaonis* (L.) in Poland (only in towns).

Biology. An expansive species which probably comes from southern Asia where it lives as a lestobiont in termitaria. Passively distributed by commerce, it has invaded the whole world. In the tropics and sub-tropics it occurs in nature, but in the temperate zone – where it has come from North Africa (hence its common name "pharaoh ant") – it lives synanthropically in premises heated during winter (in flats, bakeries, restaurants, hospitals, laundries and the like). It utilizes all kinds of food (dead insects, any products and left-overs in flats). These ants form very numerous colonies (often with several million workers), generally polygynous (up to 2000 queens) and polydomous. They nest in all manner of nooks, mainly in wall crevices (large-panel construction has provided them with particularly favourable conditions for living and spreading). They are very sensitive to cold and die at 0°C; in Central Europe they may temporarily occur outdoors during warm years; in dumping grounds with fermenting rubbish they may even survive the winter. Sexuals emerge in September and October; intranidal mating. In Poland, *M. pharaonis* occurs commonly in towns – most probably all over the country. It is recognized as a sanitary pest, dangerous mainly in hospitals.

Tribe MYRMECININI

Genus *Myrmecina* Curtis, 1829

Myrmecina Curtis, 1829. Type species: *Myrmecina latreillei* Curtis, 1829 (junior synonym of *Formica graminicola* Latreille, 1802b; synonymy by Mayr 1855), by monotypy.

The genus includes about 30 described and a number of yet undescribed species distributed in most of the zoogeographical regions (with the exception of the Afrotropical region and Madagascar). Most species occur in south-eastern Asia; eight species are known from the Palaearctic, one occurs in Poland. The taxonomy of the genus is still poorly-studied, but recently Terayama (1996) has revised the Japanese species, and Rigato (1999) – the European and North African forms. All known *Myrmecina* species have hypogaeic and cryptic habits, they live mainly in deciduous forests and semi-dry habitats overgrown with shrubs.

Myrmecina graminicola (Latreille, 1802)

Formica graminicola Latreille, 1802b
Myrmecina latreillei Curtis, 1829: Minkiewicz 1935.
Myrmecina graminicola: Mayr 1855.

General distribution (Fig. 49). *M. graminicola* is regarded as an amphi-Palaearctic form, but it can not be ruled out that another, closely related species lives in the Far East. It is known from Europe (to the north it reaches southern Sweden and England), the north-western part of Africa, Caucasus, southern parts of the Russian Far East and Korea.

Distribution in Poland (Fig. 49, Table VI). Pomeranian Lake District (Griep 1938, 1940); Wielkopolsko-Kujawska Lowland (Pawlikowski and Sobieszczyk 1980); Mazovian Lowland (Pisarski 1982); Upper Silesia (Nowotny 1931a, 1937); Krakowsko-Wieluńska Upland: Ojcowski National Park (W. Czechowska, unpubl. data); Małopolska Upland: Pieprzowe Mts (coll. MIZ PAS); Lubelska Upland (Minkiewicz 1935, Pisarski

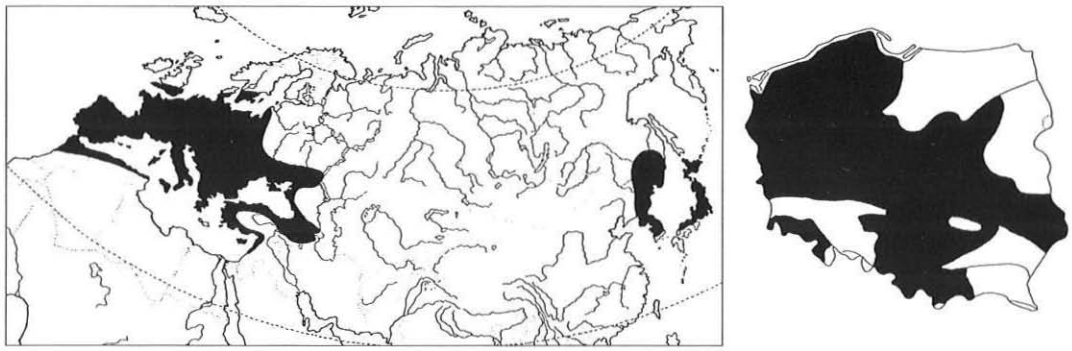


Fig. 49. Distribution of *Myrmecina graminicola* (Latr.) in Palaearctic and its localities in Poland.

1953); Roztocze Upland (Pętal 1961); Western Sudeten Mts (Banert and Pisarski 1972); Western Beskidy Mts (Czechowski 1992b), Pieniny Mts (W. Czechowska, unpubl. data).

Biology. It is a thermophilous species, mainly inhabiting light deciduous forests and gardens, but it may also occur in open habitats, for instance in stony pastures. Colonies are small, consisting of several score workers, usually monogynous, occasionally with a few fertile queens. Simple nests are built in the soil, litter, moss, under stones, in rotten wood, etc. The ants forage on the ground and in litter, scavenging and preying on small invertebrates; they do not tend aphids. When disturbed, workers and females curl into a ball and look, as if they were dead. Nuptial flight in August or September.

In Poland, the species is known from about a dozen sites dispersed all over the country. Most probably it is underrecorded because of its small-sized colonies and cryptic habits.

Tribe TETRAMORIINI

Genus *Tetramorium* Mayr, 1855

[after Radchenko et al. (1998)]

Tetramorium Mayr, 1855. Type species: *Formica caespitum* Linnaeus, 1758, by subsequent designation of Girard, 1879.

Lobomyrmex Kratochvíl, 1941 (as subgenus of *Tetramorium*). Type species: *Tetramorium ferox silhavyi* Kratochvíl, 1941, by monotypy. Synonymy by Bolton 1976.

Tetrogmus Roger, 1857. Type species: *Tetrogmus caldarius* Roger, 1857, by monotypy. Synonymy by Roger 1862.

The genus *Tetramorium* belongs to the most species-rich ant genera: it includes more than 400 described species, distributed mainly in the tropics and subtropics (205 species are known from the Afrotropical region). Fifty-five species occur in the Palaearctic, mostly in the southern parts of the region. Modern taxonomic revisions of this genus were carried out by Bolton (1976, 1977, 1979, 1980) for all zoogeographical regions except the Palaearctic. A review by Wang et al. (1988) included species from China, and that by Radchenko (1992a,b) – species from the former Soviet Union. In general, however, the taxonomy of the Palaearctic *Tetramorium* species is still far from complete.

While numerous tropical *Tetramorium* forms are strongly differentiated in respect of their biology, habitat requirements, food preferences, nest types, etc. (see Bolton 1977, 1980), the bionomics of the European species is more or less uniform. The

European species build mainly ground nests, often with quite large soil mounds; they also nest under stones or, rarely, in rotten wood. Most are predators or scavengers; their diet also contains grass seeds, especially in warm and relatively dry regions of Southern Europe. Colonies are fairly large, sometimes including tens of thousands of workers.

Five *Tetramorium* species: three native, outdoor forms and two exotic, introduced ones are reported from Poland.

Tetramorium caespitum (Linnaeus, 1758)

Formica caespitum Linnaeus, 1758.
Tetramorium caespitum: Mayr, 1855, Radchenko et al. 1998.

Note. For a long time, all Polish outdoor *Tetramorium* ants were considered to be *T. caespitum*. After a detailed investigation of rich material from different parts of Poland, we distinguished three outdoor *Tetramorium* species: *T. caespitum*, *T. impurum* and *T. moravicum* (Czechowski, Radchenko and Czechowska 1998b). *T. impurum* is the closest relative of *T. caespitum*. Workers and females of these two species are very similar and very difficult to distinguish; an examination of the male genitalia structure (see Keys for Identification) is indispensable for correct discrimination between these species.

General distribution (Fig. 50). A widespread Palaearctic species that has been introduced into North America. In the Palaearctic, its range extends from Spain and the north-western African Mediterranean coast up to the Baykal region of Russia, to the north it reaches central Norway and Sweden, southern Finland and the spring of the river Pechora. In Siberia, its distribution does not extend north beyond the Omsk–Tomsk–Angara line although it occurs sporadically in the Murmansk District close to the Polar Circle, but only in intrazonal, man-made habitats (embankments of roads and railroads). The species is fairly common in the Caucasus and Turkey, and in central Asia where it inhabits not very dry, intrazonal biotopes. Data on the occurrence of *T. caespitum* in Japan most probably refer to *T. jacoti* Wheeler.

Distribution in Poland (Fig. 50, Table VI). Baltic Coast (Kulmatycki 1922, Jacobson 1940, Koehler 1958, Wengris 1964); Pomeranian Lake District (Kulmatycki 1922, Begdon 1932b, Engel 1938, Jacobson 1940, Będziak 1956, Szujecki et al. 1978, 1983, Mazur 1983, Pisarski et al. 1995); Masurian Lake District (Begdon 1932b, Wengris 1977,

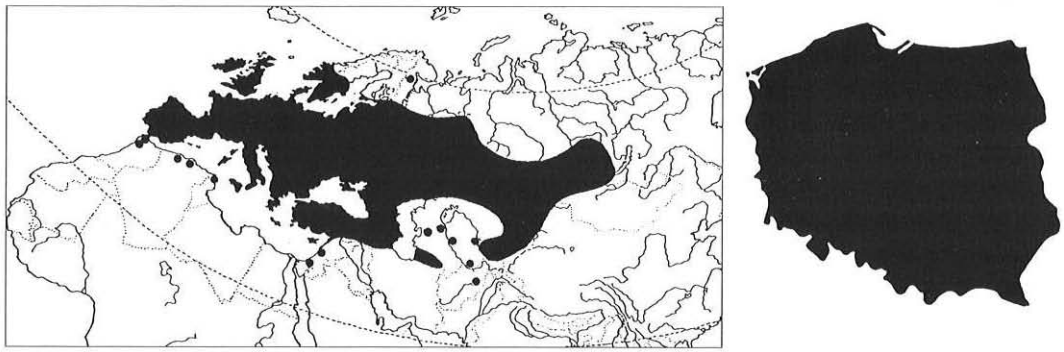


Fig. 50. Distribution of *Tetramorium caespitum* (L.) in Palaearctic and in Poland.

Mazur 1983, Krzysztofiak 1985); Wielkopolsko-Kujawska Lowland (Kulmatycki 1922, Begdon 1932b, Stawarski 1966, Kiełczewski and Wiśniewski 1971, Pawlikowski and Sobieszczyk 1980, Mazur 1983); Mazovian Lowland (Nasonov 1892, 1894, Kulmatycki 1920b, Jakubisiak 1948, Kaczmarek 1963, Czechowski 1975a,b, 1976b, 1990a, 1991, Czechowski et al. 1979, 1990, 1995, Czechowski and Pisarski 1990a, Banaszak et al. 1978, Pisarski and Czechowski 1978, Pisarski 1981, 1982, Mazur 1983); Podlasie Lowland (Wiąckowski 1957, Pętal 1968a, Mazur 1983); Białowieska Forest (Czechowski et al. 1995, Czechowski 1998b); Lower Silesia (Goetsch 1942, Stawarski 1961b, 1966); Upper Silesia (Scholz 1926, Nowotny 1931a, Stawarski 1966); Krakowsko-Wieluńska Upland (Wierzejski 1873, Kulmatycki 1920a, Kaczmarek 1953); Małopolska Upland (Kulmatycki 1920a, Puszkar 1982, Mazur 1983); Świętokrzyskie Mts (Kulmatycki 1920a, Begdon 1959, Krzysztofiak 1984); Lubelska Upland (Minkiewicz 1935, Pisarski 1953, Dobrzańska 1958, Pętal 1961, Honczarenko 1964, Puszkar 1978, Mazur 1983, Czechowski and Rotkiewicz 1997b); Roztocze Upland (Pętal 1961, 1964); Sandomierska Lowland (Kulmatycki 1920a, 1920b, Stawarski 1966, Puszkar 1982, Mazur 1983); Western Sudeten Mts (Scholz 1912, Stawarski 1966, Banert and Pisarski 1972); Eastern Sudeten Mts (Stawarski 1966); Western Beskidy Mts (Kulmatycki 1920a, Czechowski 1979, 1989, Czechowski and Pisarski 1988); Eastern Beskidy Mts (coll. MIZ PAS); Bieszczady Mts (Parapura and Pisarski 1971, Czechowski 1977a); Pieniny Mts (Koehler 1951, Czechowska 1976, Pętal 1974, 1980b, Woyciechowski 1985); Tatra Mts (Wierzejski 1873, J. Łomnicki 1931); «Lower Silesia and Kłodzka Land» (Schilling 1839); «Silesia» (Weigel 1806); «Western and Eastern Prussia» (Brischke 1888b).

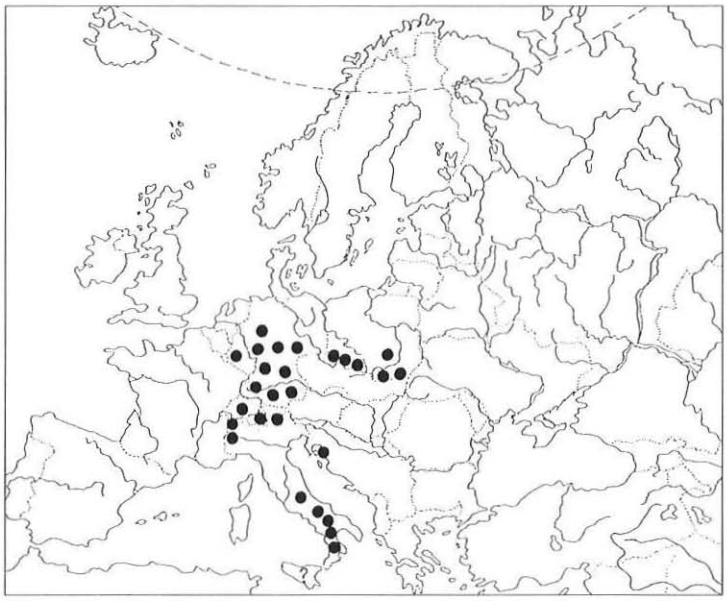
Biology. Despite its wide distribution *T. caespitum* is a semixerophilous species which inhabits mainly open, sun exposed and dry places, sparingly covered with herb vegetation; it is especially common in sandy soils in plains. In the mountains, this species is replaced by *T. impurum*, and it is absent from high mountains. It avoids wet meadows and woodlands; in relatively humid habitats, it nests only in raised, dry and warm patches. In forests, *T. caespitum* lives only in open places. It shows a synanthropic inclination (is fairly abundant in some urban areas). Nests are usually built in the soil (these often have small earth mounds) or under stones. Colonies, seemingly monogynous, number from several thousand to tens of thousands of workers. The species is highly polyphagous. Its diet includes dead insects and other invertebrates, and even carcasses of small vertebrates (birds, mice, frogs, etc.), but this fairly aggressive species can also prey on living soil arthropods; it has permanent underground foraging routes. Herb seeds and honeydew of root aphids are an essential supplement for its diet. Nuptial flights take place in June and July; in early August at the latest; usually in the morning.

The species is common all over Poland (with the exception of the higher parts of the mountains).

Tetramorium impurum (Förster, 1850)

Myrmica impura Förster, 1850.
Tetramorium impurum: Mayr 1855 (as junior synonym of *T. caespitum*). Revived from synonymy by Kutter 1977; Czechowski, Radchenko and Czechowska 1998b, Radchenko et al. 1998.

Note. This species was not separated from *T. caespitum* for more than 120 years. First Kutter (1977) and then Seifert (1996) correctly recognized it as a good species, mainly on the basis of the structure of male genitalia (see also Note to *T. caespitum*).



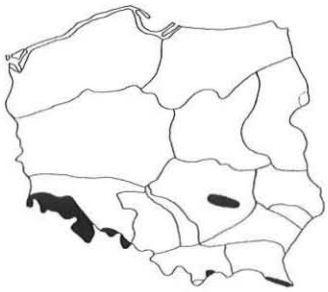


Fig. 51. Localities of *Tetramorium impurum* (Först.) in Europe and its distribution in Poland.

General distribution (Fig. 51). The distribution of this species is still poorly known. So far, it has been recorded from Switzerland, former Yugoslavia (the Adriatic Sea coast) (Kutter 1977), Germany (Seifert 1996), Italy (Sanetra et al. 1999), and southern Poland (Czechowski, Radchenko and Czechowska 1998b). Most probably, *T. impurum* is a fairly common species in Central and part of Southern Europe.

Distribution in Poland (Fig. 51, Table VI). Świętokrzyskie Mts (Czechowski, Radchenko and Czechowska 1998b); Western Sudeten Mts (Czechowski, Radchenko and Czechowska 1998b); Eastern Sudeten Mts (Czechowski et al. 1998); Bieszczady Mts (Czechowski, Radchenko and Czechowska 1998b); Pieniny Mts (Czechowski, Radchenko and Czechowska 1998b).

Biology. This species seems to be more xerophilous than *T. caespitum*; it lives in open and dry habitats of different types, especially in clay soils. Occurs mainly in upland and mountainous regions; in lowlands superseded by *T. caespitum*. Probably monogynous. In Poland, alate sexuals were caught from late May(!) till late September (most). Nuptial flights usually late in the afternoon.

In Poland, the species is known from some mountainous regions in the southern part of the country.

Tetramorium moravicum Kratochvíl, 1941

Tetramorium moravicum Kratochvíl, in Novák et Sadil 1941: Kratochvíl, in Kratochvíl et al. 1944, Agosti and Collingwood 1987a, 1987b, Seifert 1996 (revived from synonymy), Czechowski, Radchenko and Czechowska 1998b, Radchenko et al. 1998.

Tetramorium forte Forel: Bernard 1967, Radchenko 1992b, Atanassov and Dlussky 1992 (misidentifications).

Note. *T. moravicum* was described by Kratochvíl [in Novák et Sadil (1941); in the key] from Moravia (the Czech Republic), basing on workers. Later Kratochvíl et al. (1944) also described females and males and pointed out that workers of this species

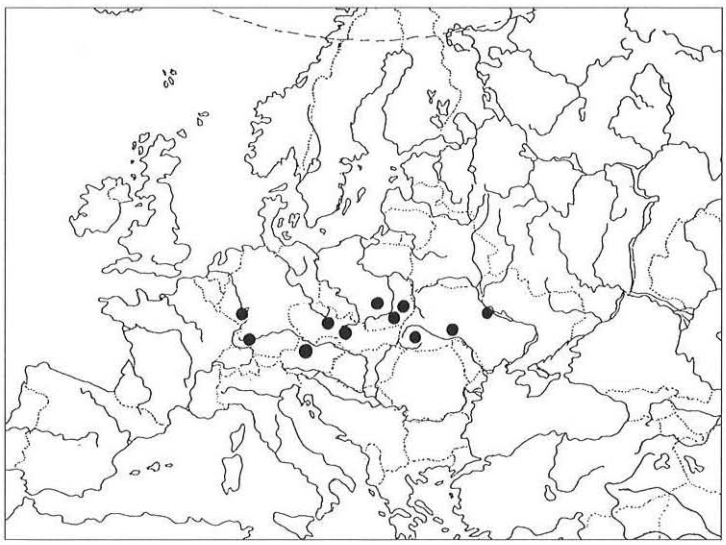
were very similar to those of *T. forte* For., and that these two species differed in the structure of male genitalia. However, the problem was that females and males of *T. forte* sensu Forel 1904a were, in fact, females and males of *T. caespitum*. This error of Forel's was discussed and corrected by Radchenko (1992b) who considered *T. moravicum* (and *T. taurocaucasicum* Arnoldi, 1968) junior synonyms of *T. forte*. Recent investigations, based not only on syntype worker specimens of *T. moravicum* but also on ample material from different regions of southern Poland and from Ukraine, clearly revealed that *T. moravicum* is a good species. Its workers are similar to those of *T. forte* in the sculpture of the petiolar and postpetiolar node dorsum, but females differ in the non-flattened scutum, and males differ by the shape of stipeses of the genitalia (male genitalia in *T. forte* are like those in *T. caespitum*; see Keys for Identification). Agosti and Collingwood (1987a) recorded this species from Bulgaria and former Yugoslavia. But it is evident from their key (Agosti and Collingwood 1987b) that *T. moravicum* sensu Agosti and Collingwood may be *T. forte* (*T. forte* itself has been treated by these authors incorrectly). This problem can only be solved after an examination of suitable material and a complete taxonomic revision of the European *Tetramorium* forms.

General distribution (Fig. 52). Until now, *T. moravicum* was known with certainty only from the Czech Republic, Austria (Seifert 1996) and Poland (Czechowski, Radchenko and Czechowska 1998b). It has also been found in Ukraine (A. Radchenko, unpubl. data).

Distribution in Poland (Fig. 52, Table VI). Świętokrzyskie Mts (Czechowski, Radchenko and Czechowska 1998b); Lubelska Upland (Czechowski, Radchenko and Czechowska 1998b); Sandomierska Lowland (Czechowski, Radchenko and Czechowska 1998b).

Biology. Xerophilous species, inhabiting sunny, dry open places with low and scarce herb vegetation (its biology is poorly known). In Poland, alate sexuals were caught from mid August till late September.

In Poland, it is recorded only from a few south-eastern regions of the country.



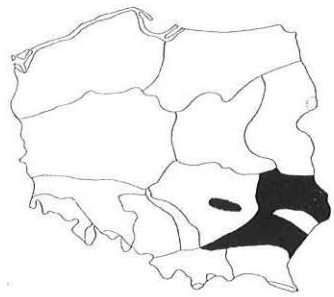


Fig. 52. Localities of *Tetramorium moravicum* Krat. in Europe and its distribution in Poland.

Tetramorium insolens (F. Smith, 1861)

Myrmica insolens F. Smith, 1861.
Tetramorium insolens: Emery 1901, Radchenko et al. 1998.
Tetramorium guineense Fabricius, 1793: Pisarski 1957, Czechowski and Czechowska 1997, Wiśniewski 1976a (misidentifications).
Tetramorium guinense: Pisarski 1975 (misprinting, misidentification).

Note. The species described by Fabricius (1793) as *Formica guineensis* was transferred to *Tetramorium* by Mayr (1862), and this combination has been used by all subsequent authors. Bolton (1977), who studied Fabricius's type specimens of *F. guineensis*, has established that this species belongs to the genus *Pheidole* Westw., and that Mayr's transference of *F. guineensis* to *Tetramorium* was an error. The first available replacement name for *Tetramorium guineense* sensu Mayr 1862 (not for *Formica guineensis* sensu Fabricius 1793) is *Tetramorium bicarinatum* (Nylander, 1846) (originally described as *Myrmica bicarinata*). Hence, *Tetramorium* specimens reported from hothouses in the temperate zone and called *T. guineense* in all publications are, in fact – at least in part – *T. bicarinatum*. Another problem connected with this issue is that a species closely related to *T. bicarinatum*, namely *T. insolens* (F. Smith, 1861), is also found in European and North American hothouses. Redescription of the latter and its differentiation from *T. bicarinatum* was given by Bolton (1977) (see Keys for Identification). In Poland, only *T. insolens* (*T. guineense* sensu Pisarski 1957, 1975, Wiśniewski 1976a, Czechowski and Czechowska 1997) has been found so far, yet the possibility of the occurrence of *T. bicarinatum* cannot be excluded.

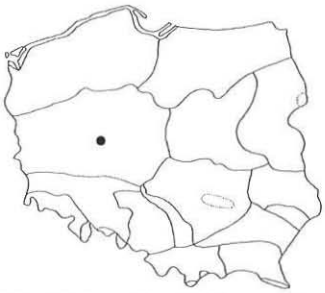


Fig. 53. Locality of *Tetramorium insolens* (F. Sm.) in Poland.

Distribution and biology. Both *T. insolens* and *T. bicarinatum* are extremely widespread tropicopolitan tramp-species originating in all probability from the Oriental Region. In the temperate zone, they inhabit only heated premises (mainly in botanical and zoological gardens) and are of no particular economic importance.

In Poland (Fig. 53, Table VI), *T. insolens* (reported as *T. guineense*: Pisarski 1957, Wiśniewski 1976a; see Radchenko, Czechowski and Czechowska 1999a) is known only from the palm house in Poznań (Wielkopolsko-Kujawska Lowland).

Tetramorium caldarium (Roger, 1857)

Tetrogmus caldarius Roger, 1857.
Tetramorium caldarium: Bolton 1979, Radchenko et al. 1998.
Tetramorium simillimum: Pisarski 1957, 1975, Czechowski and Czechowska 1997 (misidentifications).

Note. Roger (1862) synonymized his previously described species *Tetrogmus caldarius* with *Tetramorium simillimum* (F. Smith, 1851), and since then all subsequent authors have used the name *T. simillimum* for this species. Bolton (1979) has revived *T. caldarium* from synonymy and has indicated the differences between this species and the closely related *T. simillimum*. The type locality of *T. caldarium* is "Rauden" (Roger 1857), now Rudy near Racibórz, province Opole, Upper Silesia, Poland. Pisarski (1957, 1975) mistakenly recognized its type locality as Ruda Śląska, a locality situated

in the same region of Poland, about 40 km from Rudy. Bolton (1979, 1980, 1995a) has erroneously ascribed the type locality to Germany, since in 1857 this region belonged to Germany.

Distribution and biology. Both *T. caldarium* and *T. simillimum* are widespread tropicopolitan tramp-species of African origin. In the temperate zone they inhabit hothouses and greenhouses where they are of no economic importance.

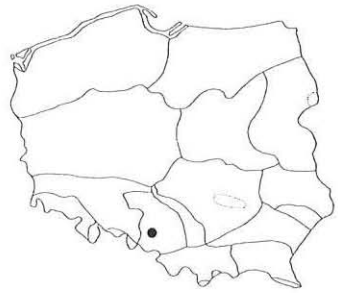


Fig. 54. Locality of *Tetramorium caldarium* (Rog.) in Poland.

In Poland (Fig. 54, Table VI), *T. caldarium* (reported as *T. simillimum*; see above, and Radchenko, Czechowski and Czechowska 1999a) is known only from the type locality in Upper Silesia, and its occurrence has not been confirmed since 1857. So far, *T. simillimum* has not been found in Poland, though its occurrence here is conceivable.

Genus *Anergates* Forel, 1874

Anergates Forel, 1874. Type species: *Myrmica atratula* Schenck, 1852, by monotypy.

This workerless socially parasitic genus is represented only by one species that locally occurs in the Holarctic (mainly throughout Euro-Siberia).

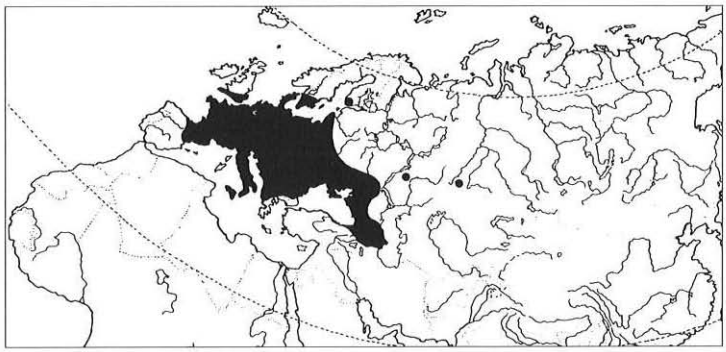
Anergates atratulus (Schenck, 1852)

Myrmica atratula Schenck, 1852.
Tetramorium atratulus: Mayr 1855.
Anergates atratulus: Forel 1874.

General distribution (Fig. 55). Europe, Caucasus, the south of Western Siberia, the eastern part of USA; everywhere rather rare.

Distribution in Poland (Fig. 55, Table VI). Baltic Coast: Gdańsk-Sobieszewo Island (Koehler 1958); Pomeranian Lake District: Bory Tucholskie (Szujecki et al. 1978, 1983, Mazur 1983); Mazovian Lowland: Łąck ad Gostynin (Mazur 1983); Pieniny Mts: Małe Pieniny (M. Woyciechowski, unpubl. data); «Western and Eastern Prussia» (Brischke 1888b).

Biology. Workerless inquiline specializing on exploitation of orphaned *Tetramorium* (*T. caespitum*, *T. impurum*) colonies. In a parasitized nest usually



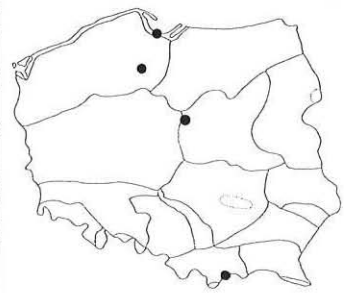


Fig. 55. Distribution of *Anergates atratulus* (Schenck) in Palaearctic and its localities in Poland.

occur a few physogastric queens and up to one thousand young sexuals. Males are wingless (ergatoid), mating is intranidal.

In Poland, reported only from few separate sites.

Genus *Strongylognathus* Mayr, 1853

Strongylognathus Mayr, 1853. Type species: *Eciton testaceum* Schenck, 1852, by monotypy; replacement name for *Myrmus* Schenck, 1853, junior homonym of *Myrmus* Hahn, 1832 (Hemiptera).

This Palaearctic genus includes about 30 socially parasitic species, which are true slave-makers or degenerate slave-makers dependant on *Tetramorium* colonies. One species occurs in Central and Northern Europe.

Strongylognathus testaceus (Schenck, 1852)

Eciton testaceum Schenck, 1852.
Strongylognathus testaceus: Mayr 1853.
Myrmus testaceus: Brischke 1888b.

General distribution (Fig. 56). Europe, Caucasus, northern Kazakhstan.

Distribution in Poland (Fig. 56, Table VI). Baltic Coast (Jacobson 1940); Pomeranian Lake District (Begdon 1932b, Szujecki et al. 1978, 1983, Mazur 1983); Masurian Lake District (Mazur 1983); Wielkopolsko-Kujawska Lowland (Mazur 1983); Mazovian Lowland (Pisarski 1981, 1982); Białowieska Forest (Czechowski et al. 1995, Czechowski 1998b); Upper Silesia (Nowotny 1931a); Małopolska Upland (Mazur 1983); Świętokrzyskie Mts (Begdon 1959); Lubelska Upland (Pisarski 1953, Mazur 1983); Sandomierska Lowland (Puszkar 1982, Mazur 1983); «Western and Eastern Prussia» (Brischke 1888b).

Biology. Social parasite, so called degenerate slave-maker, of *Tetramorium caespitum*. The parasite queen does not kill the host queen, but it pheromonally inhibits production of the host sexual brood. The share of parasite workers in mixed colonies seldom exceeds 1%; under natural conditions, they rarely raid foreign colonies of the host species to get more slave pupae. Nuptial flights take place from July to September.

In Poland, the species probably occurs throughout the country, but due to its cryptic habits it is rarely found.

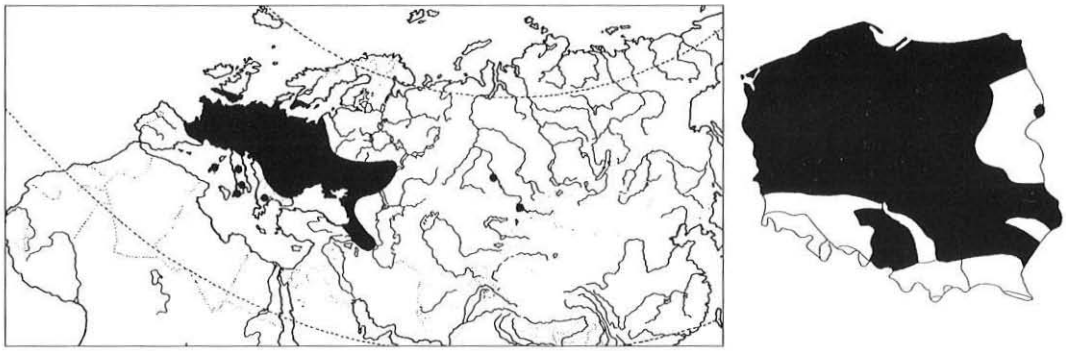


Fig. 56. Distribution of *Strongylognathus testaceus* (Schenck) in Palaearctic and in Poland.

Subfamily FORMICINAE Lepeletier

Tribe FORMICINI

Genus *Formica* Linnaeus, 1758

Formica Linnaeus, 1758. Type species: *Formica rufa* Linnaeus, 1761, by subsequent designation of Curtis 1829.
Formicina Shuckard (in Swainson and Shuckard 1840). Synonymy by Wheeler 1911.

This genus comprises about 160 species which are distributed mainly in the Holarctic; only a few species are known from the mountains of Mexico and Burma; one species, *F. fusca*, was introduced into some tropical regions (Indonesia, Cuba). In the Palaearctic, there occur more than 50 species; 19 species occur in Poland. Similarly to the genera *Lasius* and *Myrmica*, it is a "keystone" ant genus in the myrmecofauna of the temperate zone of the Holarctic.

Note. In the myrmecological literature, a tendency has appeared recently to suppress the division of many genera into subgenera. In accordance with this, Agosti (1994) synonymized all the subgenera of *Formica* with the nominal genus. In our opinion, however, the question has not been resolved definitively, and in this book we maintain the traditional approach.

Subgenus *Formica* s.str.

Formica s.str. (as subgenus of *Formica*). Type species: *Formica rufa* Linnaeus, 1761, by subsequent designation of Müller 1923.

Formica rufa Linnaeus, 1761

Formica rufa Linnaeus, 1761.
Formica rufa rufopratensis major Gösswald, 1942 (unavailable name, material referred to *F. rufa* by Dlussky 1967).
Formica piniphila Schenck, 1852: Mokrzecki 1928. Synonymy by Betrem 1953.
Formica rufa var. *piniphila*: Kulmatycki 1920a,b, 1922, Begdon 1932b, Nowotny 1937.
Formica rufa rufopratensis Forel, 1874: Mokrzecki 1928, Koehler 1956. Synonymy by Karavaiev 1936, Dlussky 1967.
Formica rufo-pratensis: Jacobson 1940.

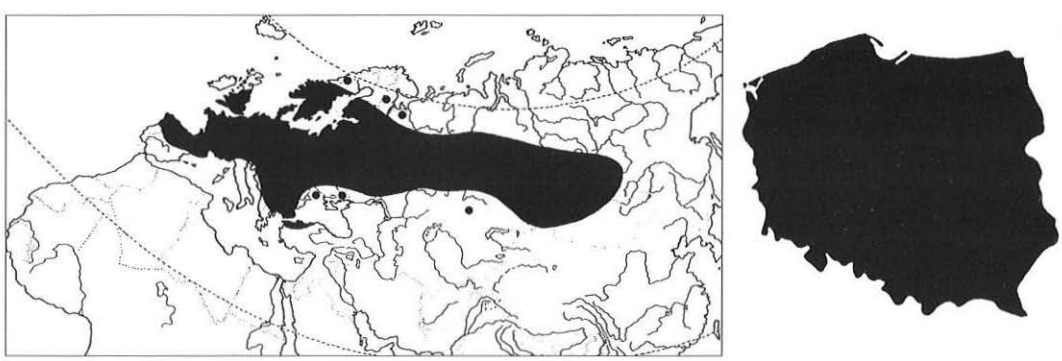


Fig. 57. Distribution of *Formica rufa* L. in Palaearctic and in Poland.

General distribution (Fig. 57). A North-Palaearctic species, distributed in the forest zone; to the east it reaches the Baykal region.

Distribution in Poland (Fig. 57, Table VI). Baltic Coast (Brischke 1988a, Kulmatycki 1922, Jacobson 1940, Urbański 1956, Dlussky and Pisarski 1971, Wiśniewski et al. 1981, 1982, Wiśniewski and Sokołowski 1983a); Pomeranian Lake District (Kulmatycki 1922, Begdon 1932b, Jacobson 1940, Będziak 1956, Cieplik 1967, Dlussky and Pisarski 1971, Wiśniewski 1981, 1987, Mazur 1983); Masurian Lake District (Begdon 1932b, Minkiewicz 1935, Wengris 1962, 1963, 1977, Czechowski 1976b, Wiśniewski 1978, Wiśniewski and Sokołowski 1983a, Mazur 1983, Krzysztofiak 1985); Wielkopolsko-Kujawska Lowland (Kulmatycki 1922, Mokrzecki 1928, Begdon 1932b, Kiełczewski et al. 1959, Wiśniewski 1959, 1961, 1963a,b, 1966a, 1976b,d, 1978, 1980b, 1987, Luterek 1961, 1964, Kiełczewski and Wiśniewski 1962, 1966, 1971, Bałazy 1965, Stawarski 1966, Dlussky and Pisarski 1971, Wiśniewski et al. 1979, Wiśniewski and Sokołowski 1983a, Pawlikowski and Sobieszczyk 1980, Mazur 1983); Mazovian Lowland (Nasonov 1889, 1892, 1894, Kulmatycki 1920b, Koehler 1936, Jakubisiak 1948, Wiąckowski 1957, Bobiński 1963, 1969, 1970, Dobrzański 1968, 1970, 1971, Dlussky and Pisarski 1971, Czechowski 1975c, 1976b, Czechowski and Pisarski 1990a,b, Czechowski, Pisarski and Czechowska 1990, Czechowski et al. 1995, Pisarski and Czechowski 1978, Pisarski 1981, 1982, Mazur 1983); Podlasie Lowland (Pętal 1968a, Dlussky and Pisarski 1971, Mazur 1983, Godzińska 1986, 1989, Godzińska et al. 1990); Białowieska Forest (Bischoff 1925, Tenenbaum 1931, Karpiński 1956, Dlussky and Pisarski 1971, Czechowski et al. 1995, Czechowski 1998b); Lower Silesia (Nowotny 1937, Stawarski 1966, Wiśniewski 1969a,b,c, 1970b, 1978, 1987); Upper Silesia (Nowotny 1931a, 1937, Burzyński 1956, Koehler 1957, Stawarski 1966, Wiśniewski 1970b, 1978, 1980b, Wiśniewski and Dudek 1974); Krakowsko-Wieluńska Upland (Kotula 1873, Wierzejski 1873, Kulmatycki 1920a, Kaczmarek 1953, Majlert and Wojtusiak 1962, Dlussky and Pisarski 1971); Małopolska Upland (Koehler 1936); Świętokrzyskie Mts (Ruzsky 1905, Kulmatycki 1920b, Krzysztofik 1962, Krzysztofiak 1984); Lubelska Upland (Wierzejski 1873, Kulmatycki 1920b, Pisarski 1953, Dobrzańska 1958, 1959, Dlussky and Pisarski 1971, Mazur 1983); Roztocze Upland (Tenenbaum 1913, Kulmatycki 1920b, Pętal 1961, 1964, Dlussky and Pisarski 1971); Sandomierska Lowland (Kulmatycki 1920a, Koehler 1965, Stawarski 1966, Puszkar 1982); Western Sudeten Mts (Scholz 1912, Dominiak 1970, Dlussky and Pisarski 1971, Wiśniewski and Moskaluk 1975); Eastern Sudeten Mts (Stawarski 1966, Wiśniewski 1970b, Dlussky and Pisarski 1971, Wiśniewski and Sokołowski 1983a); Western Beskidy Mts (Kotula 1873, Wierzejski 1873, Kulmatycki 1920a, Nunberg 1946, Dlussky and Pisarski 1971, Wiśniewski 1987, Pisarski and Czechowski 1990a,b, Czechowski 1992a,b, 1993a,b,c, 1994a,b, 1996b, 1998a, Mabelis 1994, Czechowski and Douwes 1996); Eastern Beskidy Mts (Kulmatycki 1920a); Bieszczady Mts (Dlussky and Pisarski 1971, Parapura and Pisarski 1971, Pisarski 1973, 1983, Czechowski 1976a); Pieniny Mts (Wierzejski 1873, Kulmatycki 1920a, Koehler 1951, Woyciechowski 1985, 1990a, 1992); Tatra Mts (Wierzejski 1873); «Silesia» (Weigel 1806); «Silesia and Kłodzka Land» (Schilling 1839); «Western and Eastern Prussia» (Siebold 1844, Brischke 1888b); «whole Poland» (Burzyński 1969).

Biology. A wood ant species associated mainly with coniferous and mixed forests, though it occurs also in deciduous ones. It nests mainly in sunny places, in glades, on

forest edges, along forest vistas, but is also found in shaded places. Nests are with big mounds of tiny sticks and coniferous-needle litter (diameter often more than 1 m); the nest centre usually consists of a rotting tree stump that has been completely built over. From the nest there radiate wide and long (up to 100 m, sometimes even longer) foraging trails orientated toward aphid-bearing trees. Although these ants collect honeydew, a great proportion of their foraging consists in scavenging and in non-selective predation on the ground and in tree canopies (all available invertebrates fall prey). Colonies with up to several hundred thousand workers are monogynous (mainly in continental Eurasia) or polygynous (up to ca. 100 queens; generally in the British Isles); the latter may form polycalic systems. New colonies are initiated through temporary social parasitism of young queens in *Serviformica* species nests, mainly in those of *F. fusca* (as in all *Formica* s.str. species) or by colony fission (in the case of the polygynous form). Nuptial flights in spring (May to early June).

In Poland, the species common all over the country; in the mountains, it occurs up to the lower boundary of the lower prealps.

Formica polyctena Förster, 1850

Formica polyctena Förster, 1850.
Formica minor Gösswald, 1951, first available use of name for *Formica rufa* subsp. *pratensis* var. *minor* Gösswald, 1942 (unavailable name). Synonymy by Betrem 1960.
Formica rufa rufo-pratensis minor: Wiśniewski 1959, Bogucki 1960 (unavailable name).
Formica rufa polyctena: Krzemieniewski 1927.

General distribution (Fig. 58). A North-Palaearctic species; its distribution is similar to that of *F. rufa* (see above), but generally it is somewhat more northern.

Distribution in Poland (Fig. 58, Table VI). Baltic Coast (Dlussky and Pisarski 1971, Wiśniewski 1978, 1980a, Wiśniewski et al. 1981, 1982, Wiśniewski and Sokołowski 1983a,b, Mazur 1983); Pomeranian Lake District (Dlussky and Pisarski 1971, Wiśniewski and Sokołowski 1983a,b, Wiśniewski 1987, Czechowski et al. 1995); Masurian Lake District (Krzemieniewski 1927, Wengris 1962, 1977, Wiśniewski 1978, 1980a, 1987, Wiśniewski and Sokołowski 1983a,b, Mazur 1983, Krzysztofiak 1985); Wielkopolsko-Kujawska Lowland (Wiśniewski 1959, 1961, 1963a,b, 1965a–e, 1966a,b, 1967a,b,c, 1968a,b, 1976b, 1979, 1980a,b, 1987, Bogucki 1960, Kiełczewski and Wiśniewski 1962, 1966, 1971, Stawarski 1966, Kiełczewski et al. 1971, Wiśniewski et al. 1979, Bałazy and Wiśniewski 1982,

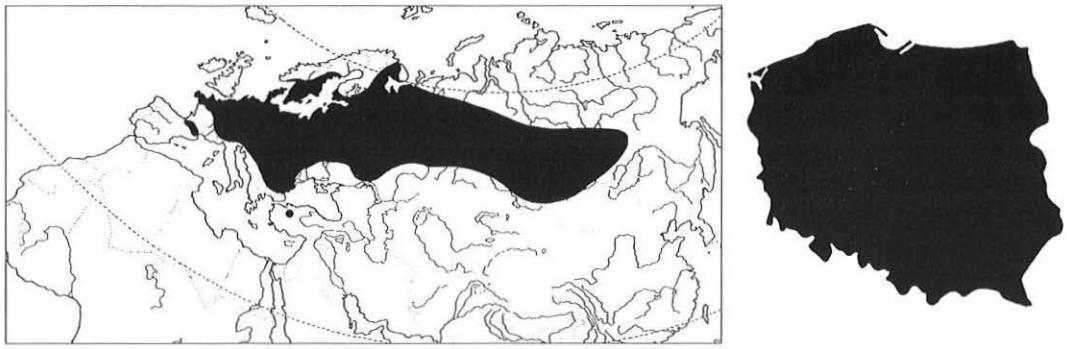


Fig. 58. Distribution of *Formica polyctena* Först. in Palaearctic and in Poland.

Wiśniewski and Sokołowski 1983a,b, Mazur 1983, Sokołowski and Magiera 1987); Mazovian Lowland (Dlussky and Pisarski 1971, Koehler 1976, Pisarski and Czechowski 1978, Pisarski 1981, 1982, Mazur 1983, Hirschmann and Wiśniewski 1985, Czechowski, Pisarski and Czechowska 1990, Czechowski et al. 1995); Podlasie Lowland (Dlussky and Pisarski 1971, Mazur 1983, Wiśniewski and Sokołowski 1983a, Godzińska 1986, 1989, Godzińska et al. 1990, 1999, Szczuka and Godzińska 1997); Białowieska Forest (Dlussky and Pisarski 1971, Czechowski et al. 1995, Czechowski 1993d, 1994c,d, 1996a,b, 1998b); Lower Silesia (Kiełczewski and Wiśniewski 1963, Stawarski 1966, Wiśniewski 1969a,b,c, 1970b, 1978, 1987, Mazur 1983, Wiśniewski and Sokołowski 1983b); Upper Silesia (Koehler 1965, Stawarski 1966, Wiśniewski 1970b, 1973, 1978, 1980a,b, Wiśniewski and Dudek 1974, Wiśniewski and Sokołowski 1983a,b, Podkówka 1983, 1984a,b); Krakowsko-Wieluńska Upland (Dlussky and Pisarski 1971, Wiśniewski and Sokołowski 1983a); Małopolska Upland (Dlussky and Pisarski 1971, Burzyński 1976, Koehler and Burzyński 1976, Puszkar 1982, Wiśniewski and Sokołowski 1983a); Świętokrzyskie Mts (Wiśniewski and Sokołowski 1983a,b, Krzysztofiak 1984); Lubelska Upland (Dlussky and Pisarski 1971, Puszkar 1982, Mazur 1983); Roztocze Upland (Dlussky and Pisarski 1971, Mazur 1983); Sandomierska Lowland (Stawarski 1966, Dlussky and Pisarski 1971, Puszkar 1982); Western Sudeten Mts (Dominiak 1970, Dlussky and Pisarski 1971, Wiśniewski 1975, 1976c, Wiśniewski and Moskaluk 1975, Wiśniewski and Sokołowski 1983a,b); Eastern Sudeten Mts (Stawarski 1966, Wiśniewski 1970b, Dlussky and Pisarski 1971, Wiśniewski and Sokołowski 1983a); Western Beskidy Mts (Wiśniewski 1987, Czechowski 1989, 1990b,c, 1992a,b, 1993a,b,c, 1994a,b, 1996b, 1998a, Pisarski and Czechowski 1990a,b, Mabelis 1994, Yamauchi et al. 1994, Czechowski and Douwes 1996); Eastern Beskidy Mts (Dlussky and Pisarski 1971, Wiśniewski and Sokołowski 1983b); Bieszczady Mts (Dlussky and Pisarski 1971, Parapura and Pisarski 1971, Czechowski 1976a, Pisarski 1983, Wiśniewski and Sokołowski 1983a); Pieniny Mts (Dlussky and Pisarski 1971, Czechowska 1976, Woyciechowski 1985); Tatra Mts (Wiśniewski and Sokołowski 1983a); «Western and Eastern Prussia» (Brischke 1888b); «whole Poland» (Burzyński 1969).

Biology. A wood ant species of the so-called *F. rufa* group whose habitat requirements and biology are similar to those of the previous species although this one is found deep in the forest more often than *F. rufa*. Nests are with mounds similar to those in *F. rufa* (see above) but usually bigger (diameter even more than 3 m) and of finer plant material. Colonies, generally highly polygynous (even up to a few thousand queens), frequently number over one million workers; in most cases they form polycalic systems which sometimes cover large extents of forest. New colonies are started as those in *F. rufa* (however, rather in queenless *Serviformica* colonies), though in this case nest splitting is far more important. Nuptial flights in spring (May to early June).

In Poland, the species common all over the country; in the mountains, it occurs up to the lower boundary of the lower prealps.

Formica lugubris Zetterstedt, 1838

Formica lugubris Zetterstedt, 1838.

General distribution (Fig. 59). A boreo-montane species, distributed mainly in the zone of coniferous forests; common also in coniferous forests in mountains of Central and Southern Europe.

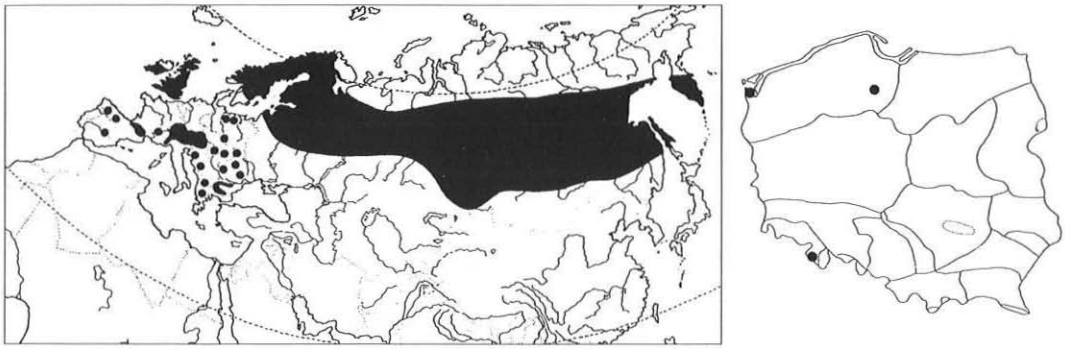


Fig. 59. Distribution of *Formica lugubris* Zett. in Palaearctic and its localities in Poland.

Distribution in Poland (Fig. 59, Table VI). Baltic Coast: Trzebież ad Szczecin (Dlussky and Pisarski 1971); Pomeranian Lake District: Bory Tucholskie (Mazur 1983); Western Sudeten Mts: Mt Zieleniec in Bystrzyckie Mts (Stawarski 1966).

Biology. A wood ant species of the *F. rufa* group typical of coniferous forest and with habits similar to those of *F. rufa* (see above), but it is less thermophilous. Colonies are mainly monogynous, but polygynous ones are also recorded, and these can form vast polygynous systems (so-called supercolonies). New colonies are founded through temporal parasitism of queens (mainly in nests of *F. lemani*) or through colony fission.

In Poland, the species has been recorded merely from three separate sites: two in the northern part of the country (in pine forest) and one in the Western Sudeten Mts (in a peatbog).

Formica aquilonia Yarrow, 1955

Formica aquilonia Yarrow, 1955.

General distribution (Fig. 60). A boreo-Transpalaearctic species; its range is similar to that of *F. lugubris*, but it is more rare in mountains of Central and Southern Europe.

Distribution in Poland (Fig. 60, Table VI). Masurian Lake District: Augustowska Forest (Krzysztofiak 1985); Mazovian Lowland: Kampinoska Forest (Dlussky and

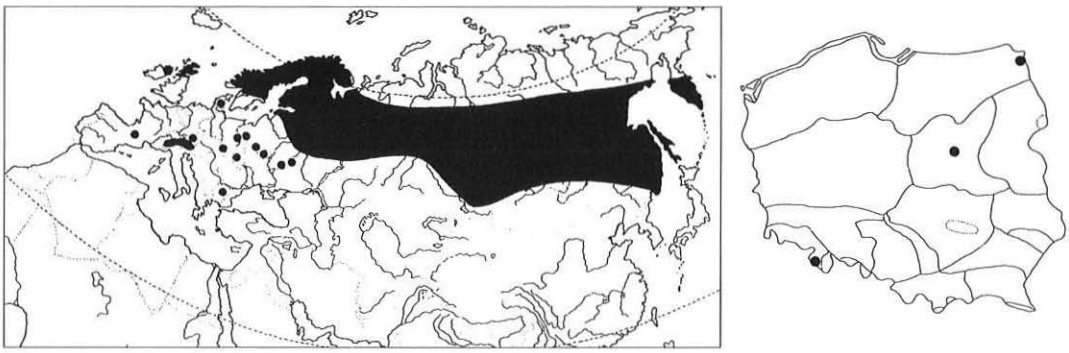


Fig. 60. Distribution of *Formica aquilonia* Yarr. in Palaearctic and its localities in Poland.

Pisarski 1971, Pisarski and Czechowski 1978, Pisarski 1982); Western Sudeten Mts: Mt Zieleniec in Bystrzyckie Mts (Stawarski 1966).

Biology. A wood ant species of the *F. rufa* group typical of coniferous forest, its habits are similar to those of *F. polyctena* (see above) but it is less thermophilous; the commonest wood ant in Fennoscandia. Colonies generally are highly polygynous and can form polygynous systems.

In Poland, the species has been recorded merely from three separate sites: in the Masurian Lake District, in the Mazovian Lowland (in both cases in a pine forest) and in the Western Sudeten Mts (in a peatbog).

Formica truncorum Fabricius, 1804

Formica truncorum Fabricius, 1804.
Formica truncicola: Wierzejski 1873, Brischke 1888b, Scholz 1912, 1926, Nowotny 1931c.
Formica pratensis var. *truncicolo-pratensis*: Nasonov 1892. Synonymy by Dlussky 1967.
Formica rufa truncicola var. *truncicolo-pratensis*: Kulmatycki 1920a, 1922 (unavailable name).
Formica truncorum var. *truncicolo-pratensis*: J. Łomnicki 1931, Koehler 1951.
Formica truncicolo-pratensis: Nowotny 1931a.
Formica rufa pratensis var. *truncicolo-pratensis*: Nowotny 1937 (unavailable name).

General distribution (Fig. 61). A Transpalaearctic species of the northern type of distribution; it is distributed mainly in the forest zone and in the mountains of Southern Europe, central Asia, Asia Minor, and in the Caucasus.

Distribution in Poland (Fig. 61, Table VI). Baltic Coast (Dlussky and Pisarski 1971, Wiśniewski et al. 1981); Pomeranian Lake District (Begdon 1932b, Jacobson 1940, Dlussky and Pisarski 1971, Mazur 1983); Masurian Lake District (Wiąckowski 1957, Wengris 1977, Mazur 1983, Krzysztofiak 1985); Wielkopolsko-Kujawska Lowland (Kulmatycki 1922, Begdon 1932b, Dlussky and Pisarski 1971, Wiśniewski 1976b,d, Wiśniewski et al. 1979, Pawlikowski and Sobieszczyk 1980, Mazur 1983, Wiśniewski and Sokołowski 1983a); Mazovian Lowland (Nasonov 1892, Dlussky and Pisarski 1971, Pisarski and Czechowski 1978, Pisarski 1982, Mazur 1983, Czechowski 1990a, Czechowski et al. 1995); Podlasie Lowland (Pętal 1968a, Mazur 1983); Białowieska Forest (Karpiński 1956, Dlussky and Pisarski 1971, Czechowski et al. 1995, Czechowski 1994d, 1996b, 1998b,c); Lower Silesia (Wiśniewski 1969a,b,c); Upper Silesia (Scholz 1926, Nowotny 1931a,c, 1937, Wiśniewski and Dudek 1974, Wiśniewski 1978); Krakowsko-Wieluńska Upland (Kulmatycki 1920a, Dlussky and Pisarski 1971);

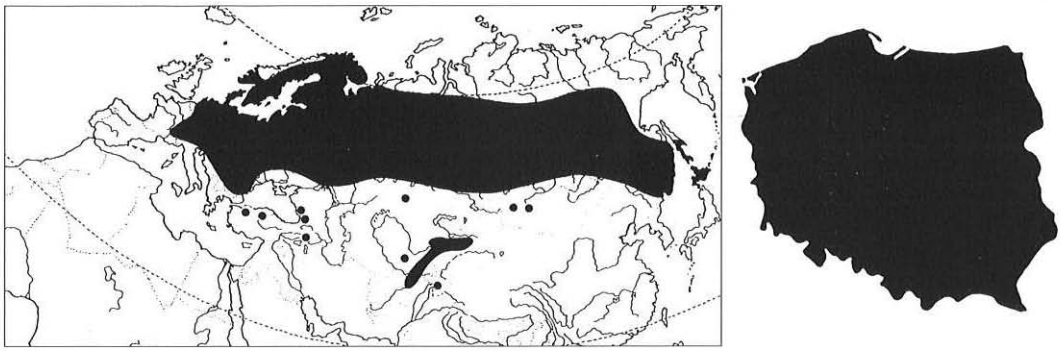


Fig. 61. Distribution of *Formica truncorum* F. in Palaearctic and in Poland.

Małopolska Upland (Dlussky and Pisarski 1971); Świętokrzyskie Mts (Ruzsky 1905, Dlussky and Pisarski 1971, Krzysztofiak 1984); Lubelska Upland (Pisarski 1953, Dobrzańska 1958, 1959); Roztocze Upland (Pętal 1961, 1964, Dlussky and Pisarski 1971); Sandomierska Lowland (Kulmatycki 1920a, Stawarski 1966, Dlussky and Pisarski 1971, Mazur 1983); Western Sudeten Mts (Scholz 1912, Dlussky and Pisarski 1971, Wiśniewski and Moskaluk 1975, Wiśniewski and Sokołowski 1983a); Eastern Sudeten Mts (Wiśniewski 1970b, Dlussky and Pisarski 1971); Western Beskidy Mts (Kulmatycki 1920a, Dlussky and Pisarski 1971, Pisarski and Czechowski 1990a,b, Czechowski 1992b, 1996b, Mabelis 1994); Eastern Beskidy Mts (Kulmatycki 1920a, Dlussky and Pisarski 1971); Bieszczady Mts (Dlussky and Pisarski 1971, Parapura and Pisarski 1971); Pieniny Mts (Nowicki 1864, Wierzejski 1868, 1873, Kulmatycki 1920a, Koehler 1951, Dlussky and Pisarski 1971, Czechowska 1976, Woyciechowski 1985); Tatra Mts (Kulmatycki 1920a, J. Łomnicki 1931, Dlussky and Pisarski 1971); «Western and Eastern Prussia» (Brischke 1888b).

Biology. A wood ant species (outside the *F. rufa* group) associated mainly with coniferous and mixed forests though it is also found in deciduous ones; it frequently occurs in sunny places, namely in mid-forest glades, along vistas and in thinned tree stands. It usually nests in rotting tree stumps partly covered with loose dry plant material; in rocky areas it nests in rock crevices and in the mountains under stones and among rubble. Colonies usually number from over ten thousand to several score thousand adults and mostly are polygynous. New colonies are founded through nest splitting or parasitically in nests of *Serviformica* (*F. truncorum* queens have been observed in nests of *F. fusca*, *F. cinerea cinerea* and *F. cinerea fuscocinerea*). Nuptial flights in July or August.

In Poland, the species common all over the country; in the mountains, it occurs up to the lower boundary of the lower prealps.

Formica pratensis Retzius, 1783

Formica pratensis Retzius, 1783.
Formica congerens: Wierzejski 1873, Brischke 1888b (misidentifications).
Formica rufa pratensis: Kulmatycki 1920a,b, Jakubisiak 1948.
Formica rufa pratensis var. *nigricans*: Kulmatycki 1920a, Stitz 1939 (unavailable name).
Formica pratensis var. *nigricans* Bondroit, 1912, first available use of name for *Formica rufa* subsp. *pratensis* var. *nigricans* Emery, 1909 (unavailable name): Kulmatycki 1922, Nowotny 1931a, 1937. Synonymy by Dlussky 1967.
Formica nigricans: Pętal 1961, 1964, 1968a, Kaczmarek 1963, Stawarski 1966.
Formica rufa var. *nigrescens*: Kulmatycki 1920b.

General distribution (Fig. 62). A South-Palaearctic species; to the east it reaches Jakutia and the river Zeya, absent from the Far East.

Distribution in Poland (Fig. 62, Table VI). Baltic Coast (Jacobson 1940, Dlussky and Pisarski 1971); Pomeranian Lake District (Begdon 1932b, Jacobson 1940, Dlussky and Pisarski 1971, Wiśniewski 1978, 1987, Wiśniewski and Sokołowski 1983a, Mazur 1983, Szujecki et al. 1983, Czechowski et al. 1995); Masurian Lake District (Dlussky and Pisarski 1971, Wengris 1977, Wiśniewski 1978, 1981, Mazur 1983, Krzysztofiak 1985); Wielkopolsko-Kujawska Lowland (Kulmatycki 1922, Begdon 1932b, Stawarski 1966, Dlussky and Pisarski 1971, Wiśniewski 1976b,d, 1978, 1987, Wiśniewski et al. 1979,

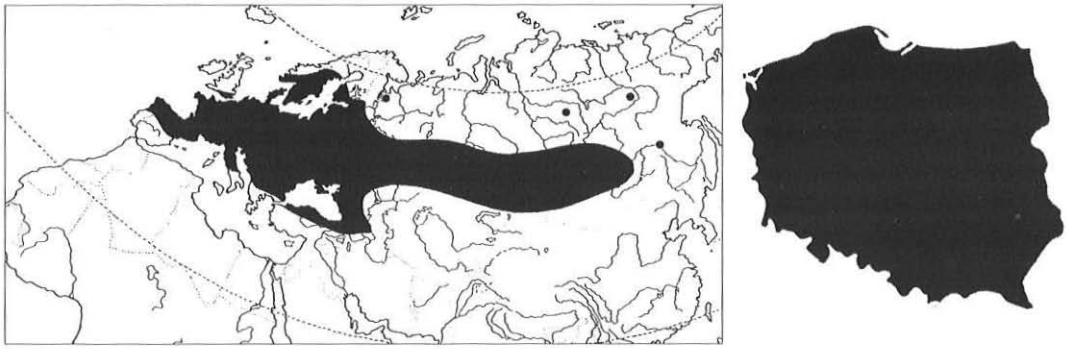


Fig. 62. Distribution of *Formica pratensis* Retz. in Palaearctic and in Poland.

Wiśniewski and Sokołowski 1983a, Mazur 1983); Mazovian Lowland (Nasonov 1892, Jakubisiak 1948, Kaczmarek 1963, Dlussky and Pisarski 1971, Pisarski and Czechowski 1978, Pisarski 1981, 1982, Mazur 1983, Czechowski 1990, Czechowski, Pisarski and Czechowska 1990, Czechowski et al. 1995); Podlasie Lowland (Pętal 1968a, Mazur 1983, Godzińska 1986, 1989, Godzińska et al. 1990); Białowieska Forest (Karpiński 1956, Czechowski 1996a,b); Lower Silesia (Stawarski 1966, Wiśniewski 1969a,b,c, 1970b); Upper Silesia (Nowotny 1931a, 1937, Stitz 1939, Stawarski 1966, Wiśniewski 1970b, 1978, Dlussky and Pisarski 1971, Wiśniewski and Dudek 1974,, Wiśniewski and Sokołowski 1983a, Czechowski 1994a, 1996b); Krakowsko-Wieluńska Upland (Wierzejski 1873, Kulmatycki 1920a, Dlussky and Pisarski 1971); Małopolska Upland (Dlussky and Pisarski 1971, Puszkar 1982, Mazur 1983); Świętokrzyskie Mts (Kulmatycki 1920a, Krzysztofiak 1984); Lubelska Upland (Minkiewicz 1935, Pisarski 1953, Dobrzańska 1958, 1959, Dlussky and Pisarski 1971, Puszkar 1982); Roztocze Upland (Kulmatycki 1920b, Pętal 1961, 1964); Sandomierska Lowland (Stawarski 1966, Dlussky and Pisarski 1971, Puszkar 1982, Mazur 1983); Western Sudeten Mts (Scholz 1912, Dlussky and Pisarski 1971); Eastern Sudeten Mts (Stawarski 1966, Wiśniewski 1970b, Dlussky and Pisarski 1971, Banert and Pisarski 1972); Western Beskidy Mts (Pisarski and Czechowski 1990a,b, Czechowski 1992a,b, 1996b, 1998a, Mabelis 1994, Czechowski and Douwes 1996); Eastern Beskidy Mts (Dlussky and Pisarski 1971); Bieszczady Mts (Dlussky and Pisarski 1971, Parapura and Pisarski 1971, Pisarski 1973, 1983, Czechowski 1976a, 1977b); Pieniny Mts (Koehler 1951, Woyciechowski 1985); «Western and Eastern Prussia» (Brischke 1888b).

Biology. A species included into wood ants (outside the *F. rufa* group) although in fact it is a polytope of dry habitats; it lives in open places in forests, in steppes, in meadows and pastures. Nests, with flat mounds (smaller than those of *F. rufa*) made of coarse plant material, are usually surrounded by a ring of tall herbage. Colonies number up to several score thousand adults; in Northern and Central Europe they generally are monogynyous and monocalic, but towards the south the polygynous and polycalic form is more and more frequent. Temporary social parasite of *Serviformica* species. Nuptial flights at the end of May or at the beginning of June, occasionally lasting until July.

In Poland, the species occurs commonly almost all over the country (not recorded only from the Tatra Mts); in the mountains, it occurs up to the lower boundary of the lower prealps.

Subgenus ***Serviformica*** Forel, 1913

Serviformica Forel, 1913b (as subgenus of *Formica*). Type species: *Formica fusca* Linnaeus, 1758, by original designation.

Formica fusca Linnaeus, 1758

Formica fusca Linnaeus, 1758.
Formica gagates Latreille, 1798: Siebold 1844, Wierzejski 1873 (part.), Minkiewicz 1935 (misidentifications).
?*Lasius gagates*: Brischke 1888b (misidentification).
"?*Lasius glebaria* Nylander": Brischke 1888b (misidentification).
"?*Lasius fusca* Förster": Brischke 1888b.
"?*Lasius nigra* Latreille": Brischke 1888b (misidentification).
Formica lemani: Minkiewicz 1935, Pętal 1961, 1968a (misidentifications).

General distribution (Fig. 63). A Transpalaearctic species of the northern type of distribution; it occurs mainly in the forest zone and in the mountains of Southern Europe and central Asia and in the Caucasus.

Distribution in Poland (Fig. 63, Table VI). Baltic Coast (Brischke 1888a, Kulmatycki 1922, Jacobson 1940, Dlussky and Pisarski 1971, Mazur 1983); Pomeranian Lake District (Kulmatycki 1922, Begdon 1932b, Engel 1938, Jacobson 1940, Będziak 1956, Dlussky and Pisarski 1971, Mazur 1983, Szujecki et al. 1983, Czechowski et al. 1995); Masurian Lake District (Begdon 1932b, Wengris 1962, 1977, Mazur 1983, Krzysztofiak 1985); Wielkopolsko-Kujawska Lowland (Kuhlgatz 1909, Kulmatycki 1922, Begdon 1932b, Stawarski 1966, Dlussky and Pisarski 1971, Kiełczewski and Wiśniewski 1971, Pawlikowski and Sobieszczyk 1980, Mazur 1983); Mazovian Lowland (Nasonov 1892, 1894, Jakubisiak 1948, Kaczmarek 1963, Dlussky and Pisarski 1971, Czechowski 1975b,c, 1977b, Pisarski and Czechowski 1978, Pisarski 1981, 1982, Mazur 1983, Czechowski 1990a, Czechowski, Czechowska and Palmowska 1990, Czechowski and Pisarski 1990a,b, Czechowski et al. 1995); Podlasie Lowland (Pętal 1968a, Dlussky and Pisarski 1971, Vepsäläinen and Pisarski 1982, Mazur 1983); Białowieska Forest (Bischoff 1925, Karpiński 1956, Dlussky and Pisarski 1971, Czechowski et al. 1995, Czechowski 1993d, 1994c,d, 1996a,b, 1997, 1998b); Lower Silesia (Schilling 1839, Stawarski 1961b, 1966, Mazur 1983); Upper Silesia (Scholz 1926, Nowotny 1931a,

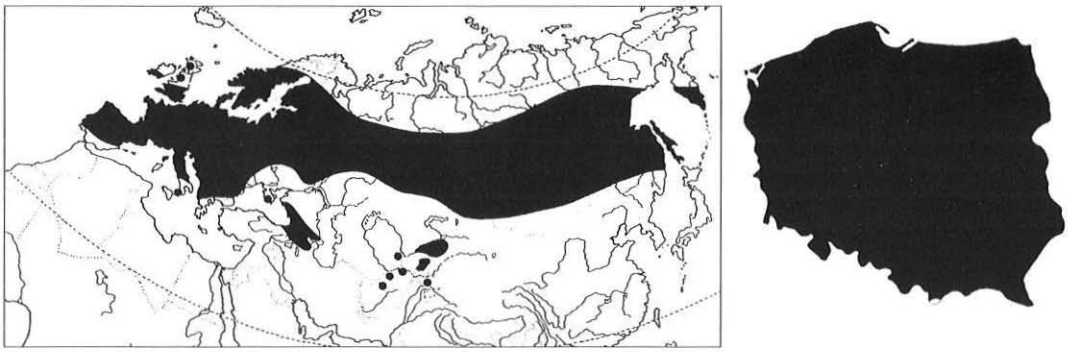


Fig. 63. Distribution of *Formica fusca* L. in Palaearctic and in Poland.

Stawarski 1966); Krakowsko-Wieluńska Upland (Wierzejski 1873, Kulmatycki 1920a, Kaczmarek 1953, Dlussky and Pisarski 1971); Małopolska Upland (Kulmatycki 1920b, Dlussky and Pisarski 1971, Mazur 1983); Świętokrzyskie Mts (Nasonov 1892, Dlussky and Pisarski 1971, Mazur 1983, Krzysztofiak 1984); Lubelska Upland (Minkiewicz 1935, Pisarski 1953, Puszkar 1982, Mazur 1983, Czechowski and Rotkiewicz 1997b); Roztocze Upland (Kulmatycki 1920b, Pętal 1961, 1964, Dlussky and Pisarski 1971); Sandomierska Lowland (Kulmatycki 1920a,b, Stawarski 1966, Dlussky and Pisarski 1971, Puszkar 1982); Western Sudeten Mts (Scholz 1912, Begdon 1959, Stawarski 1966, Dlussky and Pisarski 1971); Eastern Sudeten Mts (Stawarski 1966, Banert and Pisarski 1972); Western Beskidy Mts (Wierzejski 1873, Kulmatycki 1920a, Dlussky and Pisarski 1971, Czechowski and Pisarski 1988, Czechowski 1989, 1990b,c, 1992b, 1994a, 1996b, Pisarski and Czechowski 1990a,b, Mabelis 1994); Eastern Beskidy Mts (Kotula 1873, Kulmatycki 1920a); Bieszczady Mts (Dlussky and Pisarski 1971, Parapura and Pisarski 1971, Pisarski 1973, 1983, Czechowski 1977a); Pieniny Mts (Kulmatycki 1920a, Koehler 1951, Dlussky and Pisarski 1971, Pętal 1974, 1980b, Czechowska 1976, Woyciechowski 1985); «Silesia (Weigel 1806)»; «Kłodzka Land» (Schilling 1839); «Western and Eastern Prussia» (Siebold 1844, Brischke 1888b).

Mistakenly reported from the Tatra Mts by J. Łomnicki (1931) basing on misidentification of *F. lemani*.

Biology. A eurytopic species living in various habitats from dunes and dry sun exposed slopes of limestone hills through meadows, mid-forest glades and young growth to peatbogs and dense, humid forests with thick undergrowth. Nests, occasionally with soil mounds, are constructed in the ground, under stones, in rotten tree stumps, among decaying litter, even in very wet tufts of peat mosses. Colonies are monogynous or with a few queens and with several hundred workers. Typically opportunistic ants; timid and fast moving workers forage singly, preying on small insects, but also feeding on honeydew and extra floral nectaries. Of all *Serviformica* species, *F. fusca* is the most frequent victim of temporary social parasitism of ants of the subgenera *Formica* s.str. and *Coptoformica*, and of slavery practised by *Formica sanguinea* and *Polyergus rufescens*. Nuptial flights in late July and in August.

In Poland, one of the commonest species throughout the country except the Tatra Mts; in the mountains, it occurs up to the lower boundary of the lower prealps (higher up replaced by *F. lemani*).

Formica lemani Bondroit, 1917

Formica lemani Bondroit, 1917.

Formica gagates: Nowicki 1864, Wierzejski 1873 (part.) (misidentification).

Formica fusca: Wierzejski 1873 (part.), Kulmatycki 1920a (part.), J. Łomnicki 1931 (misidentifications).

Formica fusca var. *lemani*: Stawarski 1966 (unavailable name).

General distribution (Fig. 64). A boreo-montane species. The northern limit of the forest-tundra zone is the northern limit of its range. In Europe, southern England, Fennoscandia and the northern part of Russia form the southern limit of its range; to the east this line reaches the south of Siberia and North Korea. Locally, the species also occurs in the subalpine zones of the European mountains and in the Caucasus.

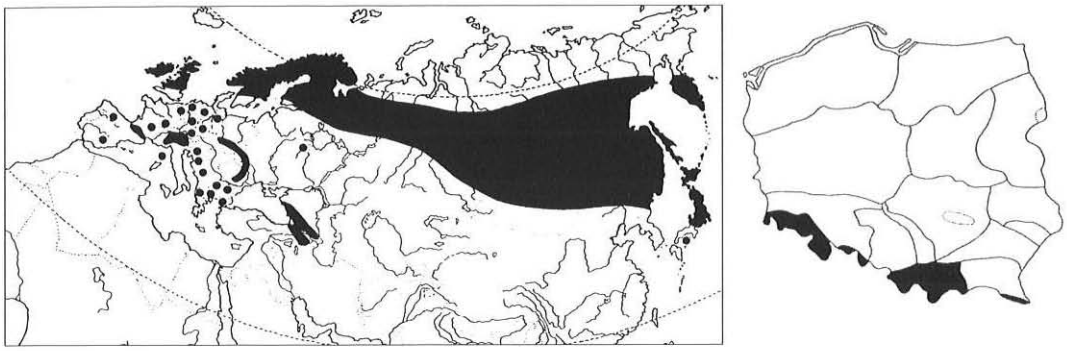


Fig. 64. Distribution of *Formica lemani* Bondr. in Palaearctic and in Poland.

Distribution in Poland (Fig. 64, Table VI). Western Sudeten Mts (Stawarski 1966, Dlussky and Pisarski 1971, Banert and Pisarski 1972); Eastern Sudeten Mts (Stawarski 1966, Dlussky and Pisarski 1971); Western Beskidy Mts (Czechowski and Pisarski 1988, Czechowski 1989, 1992b, Pisarski and Czechowski 1990a,b, Mabelis 1994); Bieszczady Mts (Dlussky and Pisarski 1971, Parapura and Pisarski 1971, Pisarski 1971); Pieniny Mts (Dlussky and Pisarski 1971, Czechowska 1976, Woyciechowski 1985); Tatra Mts (Nowicki 1864, Wierzejski 1873, Kulmatycki 1920a, J. Łomnicki 1931, Dlussky and Pisarski 1971, Woyciechowski 1990c).

Mistakenly reported from the Lubelska Upland by Pętal (1961, 1968a) basing on misidentification of *F. fusca*.

Biology. A boreo-montane species, mainly inhabiting open areas, mid-forest glades and mountain meadows, both dry and wet. Occasionally found in peatbogs or even (rarely) in shaded humid forests. It has habits similar to those of *F. fusca* (see above), though sometimes (in particularly favourable habitats) it establishes large polygynous colonies liable to fission. Nuptial flights in late July and in August.

In Poland, it occurs only in the mountains (both in the Sudeten Mts and in the Carpathians; not recorded only from the Eastern Beskidy Mts), from the lower boundary of the lower prealps to the upper boundary of glades.

Formica candida F. Smith, 1878

Formica candida F. Smith, 1878.

Formica picea Nylander, 1846. Synonymy by Dlussky 1967 (considered as senior synonym of *F. candida*; see Note below).

Formica fusca picea: Harnisch 1924.

Formica picea: Skwarra 1929, Kotzias 1930a, 1931, Röszler 1936, 1937, Nowotny 1937, Pax 1937, Karpiński 1956, Stawarski 1961a, 1966, Wengris 1962, 1965, 1977, Pętal 1963b, 1964, 1968a, Dlussky and Pisarski 1971, Pisarski 1975, Wengris 1962, 1965,1977, Woyciechowski 1990c.

Formica transcaucasica Nasonov, 1889. Synonymy by Emery 1909 (as junior synonym of *F. picea* Nylander, 1846).

Formica candida: Czechowski and Czechowska 1997.

Note. The taxonomic situation of this species is complicated and, in our opinion, it has not been satisfactorily resolved. The name *Formica picea* Nylander, 1846 is preoccupied (a junior primary homonym of *Formica picea* Leach, 1825, = *Camponotus*

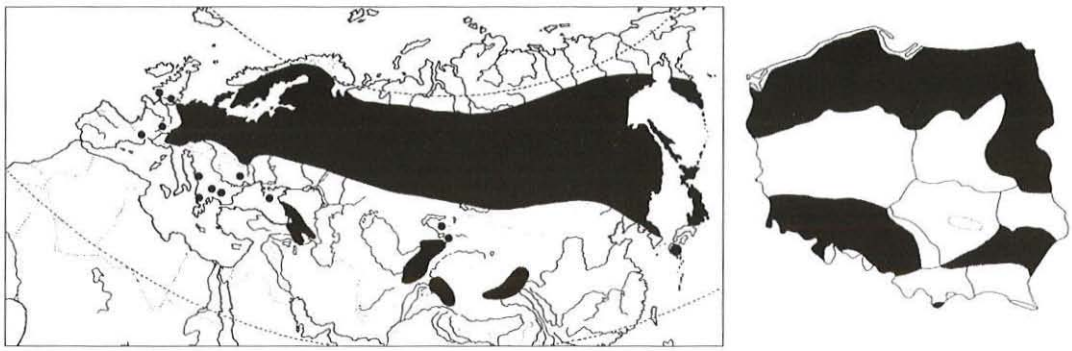


Fig. 65. Distribution of *Formica candida* F. Sm. in Palaearctic and in Poland.

piceus), and for this species the replacement name, *Formica transcaucasica* Nasonov, 1889 (a junior synonym of *F. picea* Nylander) was proposed. The latter had been used until Bolton's (1995a) Catalogue was published. Then Dlussky (1967), with no comments, synonymized *F. picea* Nylander with *F. candida* F. Smith, 1878 (the latter has priority before *F. transcaucasica* Nasonov, 1889), and Bolton (1995a) proposed to consider *F. candida* as the first available replacement name for *F. picea* Nylander. However, neither Dlussky nor Bolton has seen the type of *F. candida* F. Smith and the proposed synonymy is only provisional. It cannot be ruled out that *F. candida* is, in fact, a senior synonym of another species (e.g. *F. kozlovi* Dlussky) or even that it is a separate good species, different from *F. picea* Nylander.

General distribution (Fig. 65). A boreo-montane species. To the east of the Ural Mts, it is one of the commonest *Formica* species, especially in the steppes and forest-steppes of the southern part of Siberia and of Mongolia. In Europe, it is a rare relict species and inhabits only swamps and subalpine mountain meadows. Known also from Caucasus, mountains of central Asia and Tibet.

Distribution in Poland (Fig. 65, Table VI). Pomeranian Lake District (Dlussky and Pisarski 1971); Masurian Lake District (Skwarra 1929, Wengris 1962, 1965, 1977); Podlasie Lowland (Pętal 1963b, 1968a, Dlussky and Pisarski 1971); Białowieska Forest (Karpiński 1956); Lower Silesia (Kotzias 1930a, 1931, Röszler 1936, 1937, Nowotny 1937); Upper Silesia (Nowotny 1937); Roztocze Upland (Pętal 1964), Sandomierska Lowland (Czechowska and Czechowski 1998); Western Sudeten Mts (Harnisch 1924, Pax 1937, Stawarski 1961a, 1966); Tatra Mts (Woyciechowski 1990c).

Biology. A boreo-montane species, to the north and west of its compact range (see above) recorded from numerous relict sites dating back to the Pleistocene glaciation – in peatbogs and mountain meadows. Nests, with cones of plant fragments, are built in tufts of grass, moss and peat mosses. Sexual forms appear in August and fly off the nests (in Poland) in October.

In Poland, distributed at isolated sites and recorded only from peatbogs.

Formica cinerea Mayr, 1853

Formica cinerea Mayr, 1853.
Formica cinerea var. *fusco-cinerea* Forel, 1874: Kulmatycki 1920a (misidentification).
Formica cinerea var. *cinereo-fusca* Kulmatycki 1920b, 1922 (nomen nudum, attributed to Forel, 1874), nec Karavaiev, 1929.

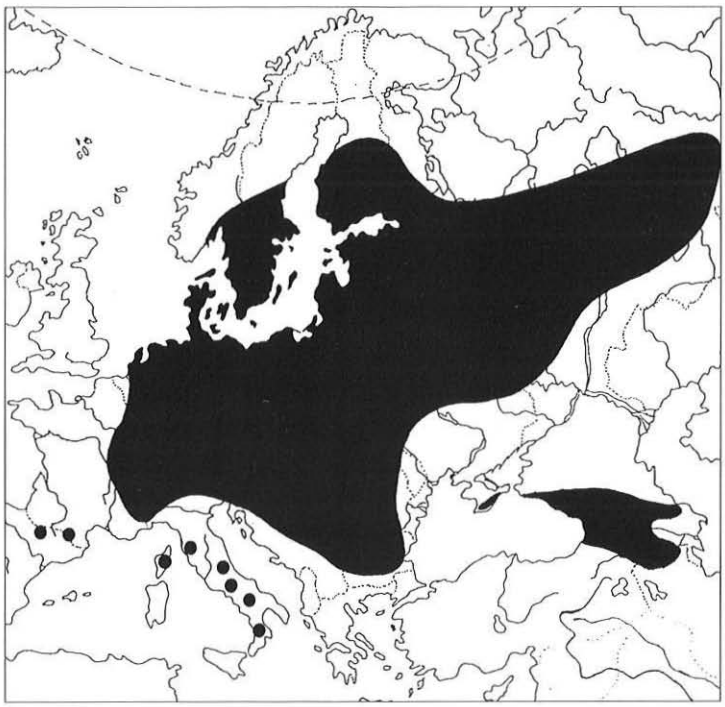
Formica cinerea var. *cinereo-glebaria* Kulmatycki, 1922, nomen nudum; material referred to *F. cinerea* by Dlussky and Pisarski 1971.

Formica cinerea var. *cinereo-rufibarbis* Forel, 1874: Kulmatycki 1920a, J. Łomnicki 1931, Koehler 1951 (misidentifications).

General distribution (Fig. 66). Europe (mainly the forest zone), mountains of Southern Europe, Crimea and Caucasus.

Distribution in Poland (Fig. 66, Table VI).

Nominal subsp.: Baltic Coast (Finzi 1928, Dlussky and Pisarski 1971, Pawlikowski and Pawłowicz 1984); Pomeranian Lake District (Begdon 1932b, Engel 1938, Griep 1940, Jacobson 1940, Mazur 1983, Szujecki et al. 1983, Czechowski et al. 1995); Masurian Lake District (Begdon 1932b, Wengris 1977, Mazur 1983, Krzysztofiak 1985); Wielkopolsko-Kujawska Lowland (Kuhlgatz 1902, Kulmatycki 1922, Begdon 1932b, Stawarski 1966, Dlussky and Pisarski 1971, Pawlikowski and Sobieszczyk 1980, Mazur 1983, Pawlikowski and Pawłowicz 1984); Mazovian Lowland (Nasonov 1889, 1892, Koehler 1936, Jakubisiak 1948, Dlussky and Pisarski 1971, Czechowski 1975a,b,d, 1976b, 1977b, 1990, Pisarski and Czechowski 1978, Pisarski 1981, 1982, Mazur 1983, Czechowski, Pisarski and Czechowska 1990); Podlasie Lowland (Mazur 1983); Białowieska Forest (Dlussky and Pisarski 1971, Czechowski 1998b,c); Lower Silesia (Mazur 1983); Upper Silesia (Nowotny 1931a, 1937, Koehler 1957, Stawarski 1966, Dlussky and Pisarski 1971); Krakowsko-Wieluńska Upland (Wierzejski 1873, Kulmatycki 1920a); Małopolska Upland (Dlussky and Pisarski 1971, Mazur 1983); Świętokrzyskie Mts (Krzysztofiak 1984); Lubelska Upland (Wierzejski 1873, Pisarski 1953, Begdon 1954, Puszkar 1982, Mazur 1983, Czechowski and Rotkiewicz 1997b);



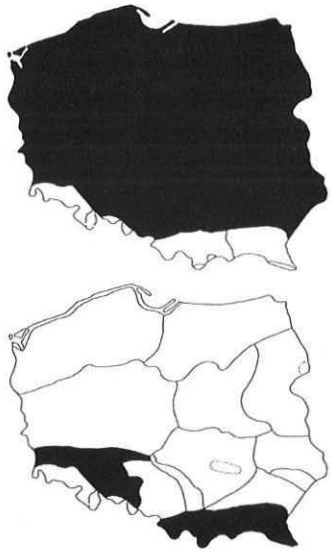


Fig. 66. Distribution of *Formica cinerea* Mayr in Europe and of its subspecies, *F. cinerea cinerea* (top) and *F. cinerea fuscocinerea* (bottom) in Poland.

Roztocze Upland (Kulmatycki 1920a, Dlussky and Pisarski 1971, Mazur 1983); Sandomierska Lowland (Puszkar 1982, Mazur 1983).

Subsp. *fuscocinerea* For.: Lower Silesia (Dlussky and Pisarski 1971); Western Beskidy Mts (Wierzejski 1873, Kulmatycki 1920a, Dlussky and Pisarski 1971, Pisarski and Czechowski 1990a,b, Czechowski 1992b); Eastern Beskidy Mts (Dlussky and Pisarski 1971); Bieszczady Mts (Dlussky and Pisarski 1971, Parapura and Pisarski 1971, Pisarski 1971, Czechowski 1977a); Pieniny Mts (Koehler 1951, Dlussky 1967, Dlussky and Pisarski 1971, Czechowska 1976, Woyciechowski 1985, Czechowski and Czechowska 2000b); Tatra Mts (Kulmatycki 1920a, J. Łomnicki 1931, Dlussky and Pisarski 1971).

Biology. *F. cinerea cinerea* occurs exclusively in sunny sandy habitats, from sea and inland dunes to sparse light pine forests. These aggressive ants live largely by predation. They build deep and widely-spread underground nests. Their colonies are monogynous or polygynous; the latter frequently develop into very populous and vast polydomous systems. Nuptial flights in late July or early August. *F. cinerea fuscocinerea* is a montane form, occurring mainly on stony and gravel river terraces where it constructs soil nests, frequently under stones; its biology is similar to that of the nominative subspecies. Nuptial flights in July and August.

In Poland, *F. cinerea cinerea* occurs throughout the country from the Baltic coast to the foothills, and *F. cinerea fuscocinerea* occurs in the foothills and mountains (yet it has not been recorded from the Sudeten Mts).

Formica rufibarbis Fabricius, 1793

Formica rufibarbis Fabricius, 1793.
Formica rufibarbis var. *piligera* J. Łomnicki, 1925. Synonymy by J. Łomnicki 1928.
Formica fusca rufibarbis: Nowotny 1931a.

General distribution (Fig. 67). Europe (to the north up to southern England and Fennoscandia), southern part of Western Siberia, Asia Minor, Caucasus.

Distribution in Poland (Fig. 67, Table VI). Baltic Coast: island of Wolin (W. Czechowska, unpubl. data); Pomeranian Lake District (Engel 1938, Jacobson 1940, Mazur 1983, Szujecki et al. 1983); Masurian Lake District (Wengris 1963, 1977, Krzysztofiak 1985); Wielkopolsko-Kujawska Lowland (Kulmatycki 1922, Stawarski 1966, Dlussky and Pisarski 1971, Mazur 1983); Mazovian Lowland (Nasonov 1892,

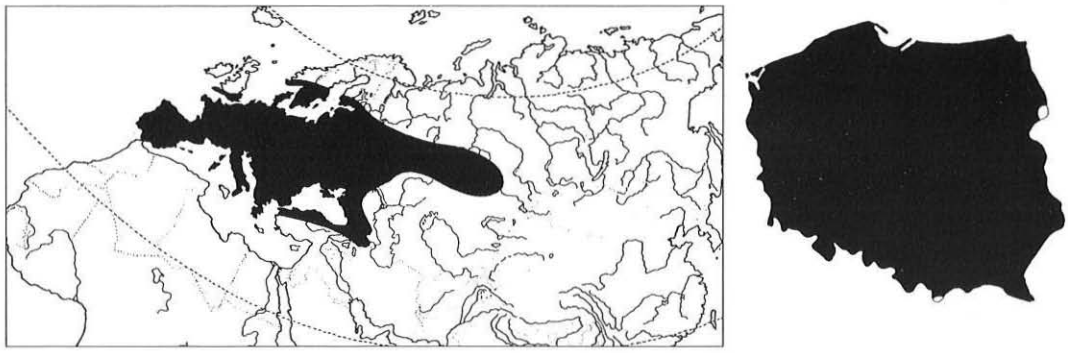


Fig. 67. Distribution of *Formica rufibarbis* F. in Palaearctic and in Poland.

Jakubisiak 1948, Dlussky and Pisarski 1971, Pisarski and Czechowski 1978, Pisarski 1981, 1982, Pętal 1981, Czechowski 1990a, Czechowski, Pisarski and Czechowska 1990); Podlasie Lowland (Pętal 1968a, Mazur 1983, Godzińska 1986, 1989, Godzińska et al. 1990); Lower Silesia (Stawarski 1961b, 1966); Upper Silesia (Scholz 1926, Nowotny 1931a, Stawarski 1966); Krakowsko-Wieluńska Upland (Kulmatycki 1920a, Dlussky and Pisarski 1971); Małopolska Upland (Dlussky and Pisarski 1971); Świętokrzyskie Mts (Ruzsky 1905, Krzysztofiak 1984); Lubelska Upland (Minkiewicz 1935, Pisarski 1953); Roztocze Upland (Kulmatycki 1920b, Pętal 1961); Sandomierska Lowland (Kulmatycki 1920a, Stawarski 1966); Western Sudeten Mts (Stawarski 1966), Eastern Sudeten Mts (Stawarski 1966); Western Beskidy Mts (Kulmatycki 1920a, Pisarski and Czechowski 1990a,b, Czechowski 1992b); Eastern Beskidy Mts (Dlussky and Pisarski 1971); Bieszczady Mts (Dlussky and Pisarski 1971, Parapura and Pisarski 1971); Pieniny Mts (Koehler 1951, Pętal 1974, 1980b, Woyciechowski 1985).

Biology. A species of open, dry and sun exposed habitats. It nests in the ground, frequently under stones. Colonies number up to several hundred workers; they are monocalic but may contain several queens. Ants predaceous and aggressive to other ant species. Nuptial flights in late June and in July.

In Poland, the species is known from almost all the country (not recorded only from the Białowieska Forest and the Tatra Mts), but it occurs rather locally.

Formica cunicularia Latreille, 1798

Formica cunicularia Latreille, 1798.
Formica fusca var. *fusco-rufibarbis* Forel, 1874: Nasonov 1892. Synonymy by Dlussky 1967.
Formica fusca glebaria var. *fusco-rufibarbis*: Kulmatycki 1920a, 1922 (unavailable name).
Formica rufibarbis var. *fusco-rufibarbis*: Stawarski 1966.
Formica fusca glebaria var. *rubescens*: Kulmatycki 1920a, 1922, Nowotny 1937, Jakubisiak 1948, nec Leach 1825 (unavailable name).
Formica rubescens Forel, 1904b: Begdon 1932b. Synonymy by Yarrow 1954.
Formica fusca glebaria Nylander, 1846: Kulmatycki 1920a,b, 1922, Bischoff 1925, Nowotny 1931a, 1937, Stawarski 1966. Synonymy by Bernard 1967.
Formica fusca-glebaria: Scholz 1926, nec Nylander 1846.

General distribution (Fig. 68). Europe (to the north up to southern England and Sweden), mountains of Crimea and Caucasia, Asia Minor.

Distribution in Poland (Fig. 68, Table VI). Baltic Coast (Kulmatycki 1922, Dlussky and Pisarski 1971); Pomeranian Lake District (Begdon 1932b, Dlussky and Pisarski

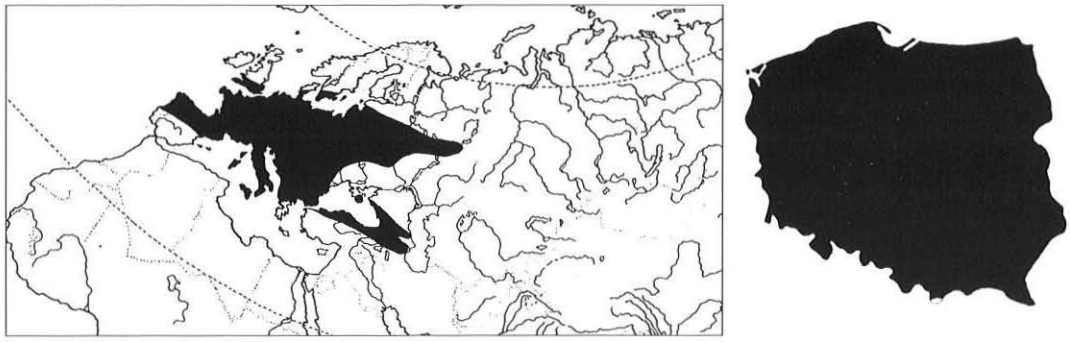


Fig. 68. Distribution of *Formica cunicularia* Latr. in Palaearctic and in Poland.

1971, Mazur 1983, Szujecki et al. 1983); Masurian Lake District (Begdon 1932b, Dlussky and Pisarski 1971, Wengris 1977, Krzysztofiak 1985); Wielkopolsko-Kujawska Lowland (Kulmatycki 1922, Begdon 1932b, Stawarski 1966, Mazur 1983); Mazovian Lowland (Nasonov 1892, Kulmatycki 1929b, Jakubisiak 1948, Czerwiński et al. 1971, Dlussky and Pisarski 1971, Czechowski 1975a, Pisarski and Czechowski 1978, Pisarski 1981, 1982, Mazur 1983, Czechowski 1990a, Czechowski and Pisarski 1990a, Czechowski, Pisarski and Czechowska 1990); Podlasie Lowland (Pętal 1968a, Dlussky and Pisarski 1971, Mazur 1983); Białowieska Forest (Bischoff 1925, Dlussky and Pisarski 1971, Czechowski and Rotkiewicz 1997b); Lower Silesia (Nowotny 1937, Stawarski 1966, Dlussky and Pisarski 1971); Upper Silesia (Scholz 1926, Nowotny 1931a, 1937, Stawarski 1966); Krakowsko-Wieluńska Upland (Wierzejski 1868, 1873, Kulmatycki 1920a, Dlussky and Pisarski 1971); Małopolska Upland (Kulmatycki 1920a, Dlussky and Pisarski 1971); Świętokrzyskie Mts (Kulmatycki 1920b, Dlussky and Pisarski 1971, Krzysztofiak 1984); Lubelska Upland (Pętal 1961, Dlussky and Pisarski 1971, Mazur 1983); Roztocze Upland (Pętal 1961, Dlussky and Pisarski 1971); Sandomierska Lowland (Kulmatycki 1920a,b, Stawarski 1966); Western Sudeten Mts (Dlussky and Pisarski 1971, Banert and Pisarski 1972); Eastern Sudeten Mts (Dlussky and Pisarski 1971); Western Beskidy Mts (Czechowski and Pisarski 1988, Mabelis 1994, Czechowski 1990c, 1992b, 1994a, 1996b, Pisarski and Czechowski 1990a,b); Eastern Beskidy Mts (Dlussky and Pisarski 1971); Bieszczady Mts (Dlussky and Pisarski 1971, Parapura and Pisarski 1971, Pisarski 1973, Czechowski 1977a); Pieniny Mts (Dlussky and Pisarski 1971, Pętal 1974, 1980b, Czechowska 1976, Woyciechowski 1985); «Western and Eastern Prussia» (Brischke 1888b).

Biology. A polytopic species of open areas from sandy dunes, limestone slopes and gypseous hills through meadows and pastures to mid-forest glades, forest edges and sparse brushwood. It occurs in more or less humid habitats, but is most abundant in sunny places. Nests, frequently with fairly big soil mounds, are built in the ground. Colonies are monocalic and single-queened as a rule. These hardly aggressive ants are mainly predaceous and scavenging. Nuptial flights in August (sexuals appear in the nests at the turn of June and July).

In Poland, not recorded only from the Tatra Mts.

Formica glauca Ruzsky, 1896

Formica rufibarbis var. *glauca* Ruzsky, 1896, first available use of name for *F. fusca* subsp. *rufibarbis* var. *glauca* Ruzsky, 1895 (unavailable name).

Formica cunicularia glauca: Dlussky 1965.

Formica glauca: Agosti and Collingwood 1987a, Czechowski and Radchenko 2000.

Synonym of *Formica cunicularia* Latreille, 1798: Atanassov and Dlussky 1992. Revived from synonymy by Seifert 1996.

General distribution (Fig. 69). The steppe and forest-steppe zones of Eurasia (to the east up to Baykal region), Asia Minor, Crimea, Caucasus, central Asia. In Europe, the northern limit of the species compact range runs across Bulgaria, Ukraine and the southern part of Russia. Isolated sites have been found in Germany and in Poland.

Distribution in Poland (Fig. 69, Table VI). Białowieska Forest: Topiło ad Hajnówka (Czechowski and Radchenko 2000).

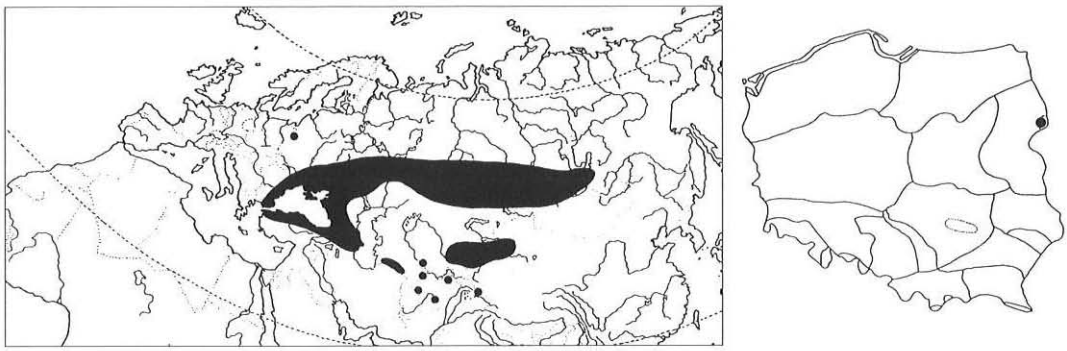


Fig. 69. Distribution of *Formica glauca* Ruzs. in Palaearctic (some localities vaguely reported from Germany omitted) and its locality in Poland.

Biology. A steppe species, only recently distinguished from *F. cunicularia*, more xerothermophilous than the latter.

Its record from Poland is based on one colony in the Białowieska Forest. The nest with a big soil mound was in a dry ecotone on the edge of an oak wood.

Formica uralensis Ruzsky, 1895

Formica uralensis Ruzsky, 1895.

General distribution (Fig. 70). A boreo-montane species whose distribution and the course of its range formation are similar to those of *F. candida*. To the east of the Ural Mts it inhabits biotopes of varying types, mainly grasslands, but in Europe, where it is very scarce and relict, it lives mainly in swamps and, more rarely, in mountain meadows.

Distribution in Poland (Fig. 70, Table VI). Roztocze Upland: reserve "Rakowskie Bagno" ad Frampol (Pętal 1963b, 1964, Dlussky and Pisarski 1971).

Biology. A boreo-montane species, to the north and south of its compact range (see above) recorded from relict sites dating back to the Pleistocene glaciations; found in peatbogs, more occasionally on drier heath. Nests, with small mounds of tiny plant fragments, are situated in tufts of peat mosses. Colonies generally are polygynous and may reproduce by fission, thus forming polydomous systems, but they are also started through temporary social parasitism of the foundatrices (an

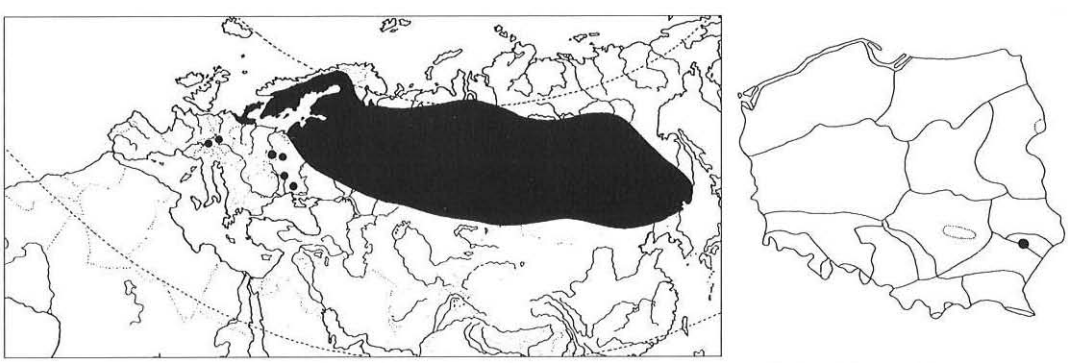


Fig. 70. Distribution of *Formica uralensis* Ruzs. in Palaearctic and its locality in Poland.

exceptional case within *Serviformica* species) in nests of *F. candida*. These ants feed mainly on honeydew of aphids from nearby trees (birches, pines). Sexuals appear (in the nests) in late June.

In Poland, the species is known only from one site (high bog in Roztocze Upland) where it occurs fairly abundantly together with *F. candida* and *F. forsslundi*.

Subgenus ***Raptiformica*** Forel, 1913

Raptiformica Forel, 1913b (as subgenus of *Formica*). Type species: *Formica sanguinea* Latreille, 1798, by original designation.

Formica sanguinea Latreille, 1798

Formica sanguinea Latreille, 1798.

General distribution (Fig. 71). A Transpalaearctic species of the southern type of distribution.

Distribution in Poland (Fig. 71, Table VI). Baltic Coast (Kulmatycki 1922, Begdon 1932b, Jacobson 1940, Dlussky and Pisarski 1971, Wiśniewski and Sokołowski 1983a); Pomeranian Lake District (Kulmatycki 1922, Begdon 1932b, 1954, Jacobson 1940, Mazur 1983, Szujecki et al. 1983, Wiśniewski and Sokołowski 1983a, Czechowski et al. 1995); Masurian Lake District (Wengris 1962, 1977, Mazur 1983, Krzysztofiak 1985); Wielkopolsko-Kujawska Lowland (Begdon 1932b, Stawarski 1966, Pawlikowski and Sobieszczyk 1980, Mazur 1983, Wiśniewski and Sokołowski 1983a); Mazovian Lowland (Jakubisiak 1948, Begdon 1954, Wiąckowski 1957, Kaczmarek 1963, Dlussky and Pisarski 1971, Czechowski 1975a,d, 1977b, Pisarski and Czechowski 1978, Pisarski 1981, 1982, Mazur 1983, Czechowski et al. 1995); Podlasie Lowland (Pętal 1968a, Dlussky and Pisarski 1971, Mazur 1983); Białowieska Forest (Bischoff 1925, Karpiński 1956, Dlussky and Pisarski 1971, Czechowski et al. 1995, Czechowski 1993d, 1994c,d, 1996a,b, 1997, 1998b,c); Lower Silesia (Stawarski 1966, Wiśniewski 1969a, 1970b, Mazur 1983); Upper Silesia (Scholz 1926, Nowotny 1931a, Stawarski 1966, Wiśniewski 1970b); Krakowsko-Wieluńska Upland (Wierzejski 1868, 1873, Kulmatycki 1920a, Kaczmarek 1953, Begdon 1954, Dlussky and Pisarski 1971); Małopolska Upland (Kulmatycki 1920b, Dlussky and Pisarski 1971, Mazur 1983); Świętokrzyskie Mts (Dlussky and Pisarski 1971, Krzysztofiak 1984); Lubelska Upland (Pisarski 1953,

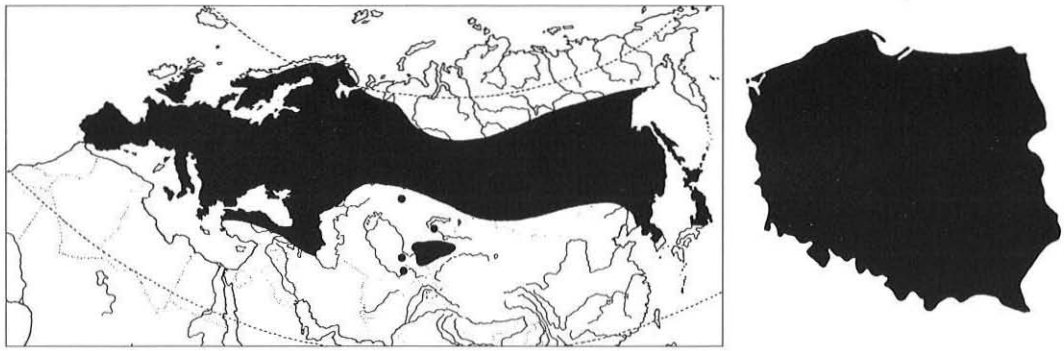


Fig. 71. Distribution of *Formica sanguinea* Latr. in Palaearctic and in Poland.

Dobrzańska 1958, Dobrzański 1961, Dlussky and Pisarski 1971, Puszkar 1982, Mazur 1983, Czechowski and Rotkiewicz 1997a,b); Roztocze Upland (Pętal 1961, 1964, Dlussky and Pisarski 1971, Mazur 1983); Sandomierska Lowland (Kulmatycki 1920a,b, Begdon 1954, Stawarski 1966, Dlussky and Pisarski 1971, Mazur 1983); Western Sudeten Mts (Scholz 1912, Stawarski 1966, Dlussky and Pisarski 1971, Banert and Pisarski 1972, Wiśniewski and Moskaluk 1975); Eastern Sudeten Mts (Stawarski 1966, Wiśniewski 1970b, Dlussky and Pisarski 1971, Wiśniewski and Sokołowski 1983a); Western Beskidy Mts (Kulmatycki 1920a, Dlussky and Pisarski 1971, Czechowski 1989, 1990b,c, 1994a, 1996b); Eastern Beskidy Mts (Dlussky and Pisarski 1971); Bieszczady Mts (Dlussky and Pisarski 1971, Parapura and Pisarski 1971, Czechowski 1977a,b); Pieniny Mts (Koehler 1951, Dlussky and Pisarski 1971, Woyciechowski 1985, 1990a, 1992); Tatra Mts (Nowicki 1864, Wierzejski 1868, 1873, J. Łomnicki 1931, Dlussky and Pisarski 1971); «Western and Eastern Prussia» (Siebold 1844, Brischke 1888b).

Biology. This is considered to be a forest species, but in fact it is more of a polytope of dry habitats. It occurs both in woodlands and in open areas of different kinds, on different types of soil. This species prefers sunny places, especially clearings and forest edges. It nests most readily in rotting tree stumps which it covers around with dry plant material. Nests, sometimes with a small mound of conifer-needle litter (and occasionally even with a soil mound), are also constructed in the ground, often under stones (especially in the mountains). Colonies numbering from several to over a dozen (rarely a few score) thousand adults are, as a rule, functionally monogynous; they may form several-nest impermanent polydomous systems. *F. sanguinea* is a facultative slave-maker. Its typical victims include different species of *Serviformica* (mainly *F. fusca*) that happen to occur in a given habitat (for instance, *F. candida* in peatbogs); slaves of other subgenera (*Formica* s.str., *Coptoformica*) are recorded sporadically. The proportion of slaves in a mixed colony seldom exceeds a few percent. New colonies are founded through temporary social parasitism of young queens in nests of *Serviformica* ants, through colony fission or through adoption of a queen by a queenless group of workers, particularly after a raid on a nest of a slave species. Very aggressive and predaceous ants. Sexuals fly off the nests in July or August, mating occurs inside or near the nest.

In Poland, the species is common throughout the country. In the mountains, it reaches mountain glades; in the prealps zone, it supersedes species of the subgenus *Formica* s.str.

Subgenus ***Coptoformica*** Müller, 1923

Coptoformica Müller, 1923 (as subgenus of *Formica*). Type species: *Formica exsecta* Linnaeus, 1758, by subsequent designation of Donisthorpe 1941.

Formica exsecta Nylander, 1846

Formica exsecta Nylander, 1846.
Formica exsecta var. *sudetica* Scholz, 1924: Stitz 1939. Synonymy by Dlussky and Pisarski 1971.
Formica kotuniemii Betrem, 1954. Synonymy by Dlussky 1967.
Formica exsecta var. *exsecto-pressilabris* Forel, 1874: Kulmatycki 1920b. Synonymy by Bernard 1967.
Formica exsecta var. *rubens* Forel, 1874: Kulmatycki 1922. Synonymy by Dlussky 1964.
Formica execta: Krzysztofiak 1985 (misprinting).

General distribution (Fig. 72). A Transpalaearctic species of the northern type of distribution.

Distribution in Poland (Fig. 72, Table VI). Pomeranian Lake District (Griep 1938, 1940, Jacobson 1940, Pisarski 1962a, Dlussky and Pisarski 1971, Mazur 1983, Czechowski 1996b); Masurian Lake District (Wengris 1977, Mazur 1983); Wielkopolsko-Kujawska Lowland (Nasonov 1892, Pisarski 1962a, Dlussky and Pisarski 1971, Pawlikowski and Sobieszczyk 1980; Krzysztofiak 1985); Mazovian Lowland (Nasonov 1892, Pisarski 1962a, Dlussky and Pisarski 1971, Pisarski and Czechowski 1978, Pisarski 1982); Podlasie Lowland (Pętal 1961, 1968a, Pisarski 1962a); Białowieska Forest (Bischoff 1925, Begdon 1954, Pisarski 1962a); Małopolska Upland (Pisarski 1962a); Świętokrzyskie Mts (J. K. Kowalczyk, unpubl. data); Lubelska Upland (Pętal 1961, Pisarski 1962a, Dobrzański 1968, 1970, 1971); Roztocze Upland (Kulmatycki 1920b, Mazur 1983); Sandomierska Lowland (Begdon 1954); Western Sudeten Mts: Mt. Orlica in Orlickie Mts – type locality of *Formica exsecta* var. *sudetica* Scholz, 1924 (Scholz 1912, 1924, Pax 1921); Western Beskidy Mts (Pisarski 1962a); Bieszczady Mts (Pisarski 1962a, 1970, 1971, 1972, 1973, 1983, Dlussky and Pisarski 1971, Parapura and Pisarski 1971, Parapura 1972, Czechowski 1975d, 1976a,b, 1977a,b, 1978, 1979); Pieniny Mts (Woyciechowski 1985, 1990a, 1992).

Biology. A typical ecotone species inhabiting forest clearings and borders, especially of coniferous and mixed woodland; also recorded from thinned young growth. Nests with mounds of dry tiny plant material are usually small (∅ 10–30cm), though big ones (∅ >1 m) have also been recorded. The species occurs in two, mono- and polygynous, social forms. Colonies with several to scores of thousands of adults. They are founded through temporary social parasitism of young queens in nests of *Serviformica* species (as is the case in all *Coptoformica* species), especially of *F. fusca*, or as a result of nest fission (in the case of the polygynous form). Polycalic colonies may even include over 100 nests. Aggressive and predaceous ants; they also utilize honeydew. Nuptial flights in late July and in August.

In Poland, the species is known from most of the country. It occurs most abundantly in the eastern part, locally in the central and north-western parts, and it is almost absent from the south-western part. In the mountains, it occurs up to the lower boundary of the lower prealps.

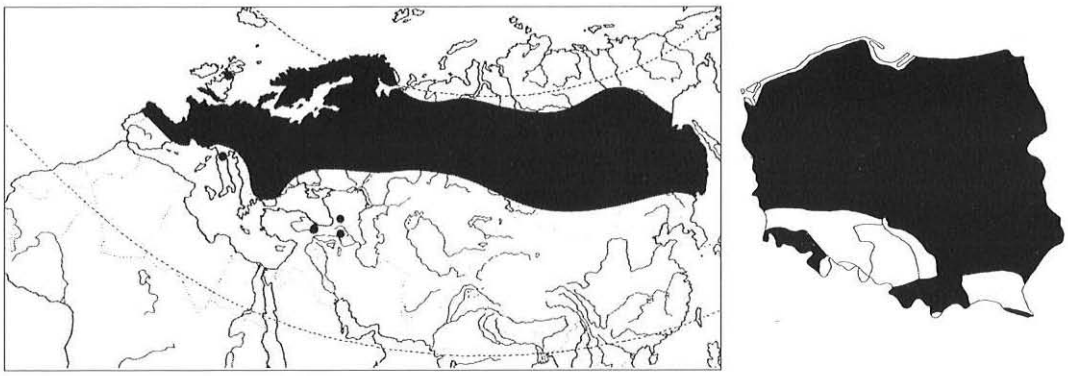


Fig. 72. Distribution of *Formica exsecta* Nyl. in Palaearctic and in Poland.

Formica pressilabris Nylander, 1846

Formica pressilabris Nylander, 1846.
Formica exsecta pressilabris: Kulmatycki 1920a.
Formica exsecta var. *pressilabris*: Jakubisiak 1948.
Formica exsecta var. *rufomaculata* Ruzsky, 1895. Synonymy by Seifert 2000a.

Note. Seifert (2000a) synonymized *Formica rufomaculata* Ruzsky with *F. pressilabris* and, basing on the distribution and ecological preferences of the latter, recognized it as a "boreo-alpine-continental" form. However, he did not take into consideration Dlussky's (1967) and Kupyanskaya's (1990) data on distribution of *F. rufomaculata* in the Russian Far East. Taking into account these data, *F. pressilabris* (if Seifert's synonymizing is correct) ought to be considered a Transpalaearctic species (see Fig. 139).

General distribution (Fig. 73). Transpalaearctic form of the northern type of distribution.

Distribution in Poland (Fig. 73, Table VI). Pomeranian Lake District (Begdon 1932b, Jacobson 1940, Dlussky and Pisarski 1971, Mazur 1983, Szujecki et al. 1983); Mazurian Lake District (Begdon 1932b, Wengris 1977, Mazur 1983); Wielkopolsko-Kujawska Lowland (Pawlikowski and Sobieszczyk 1980, Mazur 1983); Mazovian Lowland (Nasonov 1892, Jakubisiak 1948, Pisarski 1962a, 1982, Pisarski and Czechowski 1978); Podlasie Lowland (Pisarski 1962a, Pętal 1968a, Mazur 1983); Małopolska Upland (Koehler 1936, Dlussky and Pisarski 1971); Lubelska Upland (Minkiewicz 1935, Pisarski 1953, 1962a, Begdon 1954, Pętal 1961, Mazur 1983); Roztocze Upland (Pętal 1961); Sandomierska Lowland (Kulmatycki 1920a); Bieszczady Mts (Pisarski 1962a, 1970, 1971, 1973, 1983, Parapura and Pisarski 1971, Czechowski 1975d, 1976a,b, 1977a,b, 1978); Pieniny Mts (Pętal 1974, 1980b).

Biology. Ecological requirements similar to those of *F. exsecta*, but open and dry habitats (pastures, steppes, clearings within woodland, mountain meadows) are much more preferred. Biology as in *F. exsecta* (see above), yet less predation in foraging. Monocalic (monogynous?) colonies are more frequent in Russia and polycalic (polygynous) ones are more abundant in Central Europe. Direct data on concrete *Serviformica* species used for socially parasitic colony foundation are very sparse; the major host in mountains seems to be *F. lemani*. Nuptial flights usually in August.

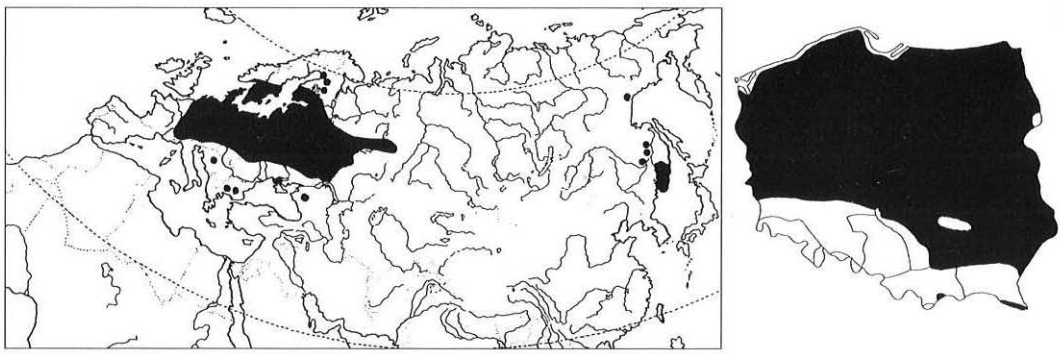


Fig. 73. Distribution of *Formica pressilabris* Nyl. in Palaearctic and in Poland.

In Poland, the species is known from most of the country, but it occurs rather locally. In the mountains, it is recorded only from the Pieniny and the Bieszczady where it reaches the lower boundary of the lower prealps.

Formica forsslundi Lohmander, 1949

Formica forsslundi Lohmander, 1949.
Formica forsslundi strawinskii Pętal, 1962; Pętal 1964. Synonymy by Dlussky and Pisarski 1971.
Formica brunneonitida Dlussky, 1964. Synonymy by Seifert 2000a.
Formica fossilabris Dlussky, 1965. Synonymy by Seifert 2000a.

Note. *Formica brunneonitida* Dlussky and *F. fossilabris* Dlussky, synonimized by Seifert (2000a) with *F. forsslundi*, are distributed in Southern Siberia, Mongolia and Tibet. The same, the distribution *F. forsslundi*, which previously had been known only from Europe, appeared to be similar to those of *F. candida* and *F. uralensis* (see above). Therefore, this species ought to be considered a boreo-montane Pleistocene relict.

General distribution (Fig. 74). A very rare boreo-montane species, which distribution and the course of the range formation are similar to those of *F. candida*.

Distribution in Poland (Fig. 74, Table VI). Roztocze Upland: reserve "Rakowskie Bagno" ad Frampol – type locality of *Formica forsslundi strawinskii* Pętal, 1962 (Pętal 1962, 1964, Dlussky and Pisarski 1971).

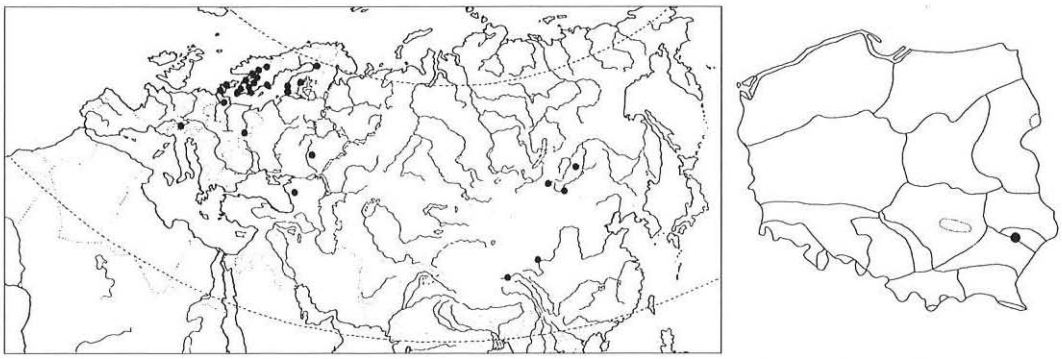


Fig. 74. Localities of *Formica forsslundi* Lohm. in Palaearctic and its locality in Poland.

Biology. A little-known species, relatively abundant in Fennoscandia where it occurs in wet heathlands and open forest mires. Nests are built with small mounds of fine plant material. New colonies are founded through temporary social parasitism in nests of *F. candida*.

In Poland, the species is known from one site (high bog in Roztocze Upland) where it occurs together with *F. candida* and *F. uralensis*; nests in tufts of peat mosses. No doubt the site is a relict from the Pleistocene glaciations.

Formica foreli Emery, 1909

Formica foreli Emery, 1909.

General distribution (Fig. 75). Rare species, sporadically found in Western and Eastern Europe (to the north it reaches southern Sweden), in Caucasus and in Asia Minor (see also Seifert 2000a).

Distribution in Poland (Fig. 75, Table VI). Mazurian Lake District: Lisie Jamy ad Pisz (Dlussky and Pisarski 1971); Podlasie Lowland: Bielsk Podlaski forest inspectorate (Mazur 1983).

Biology. It is a very little-known species that seems to prefer open and dry grasslands and light forests mainly (but not exclusively) on sand. New colonies are founded through temporary social parasitism in nests of *Serviformica* ants (mainly of *F. fusca*, *F. cunicularia* and *F. rufibarbis*).

In Poland, it is recorded from two sites in the north-eastern part of the country. The find in the Masurian Lake District is a polycalic colony of over 30 nests on the edge of pine young growth; nests are with mounds (∅ 10–50 cm) of dry grass blades.

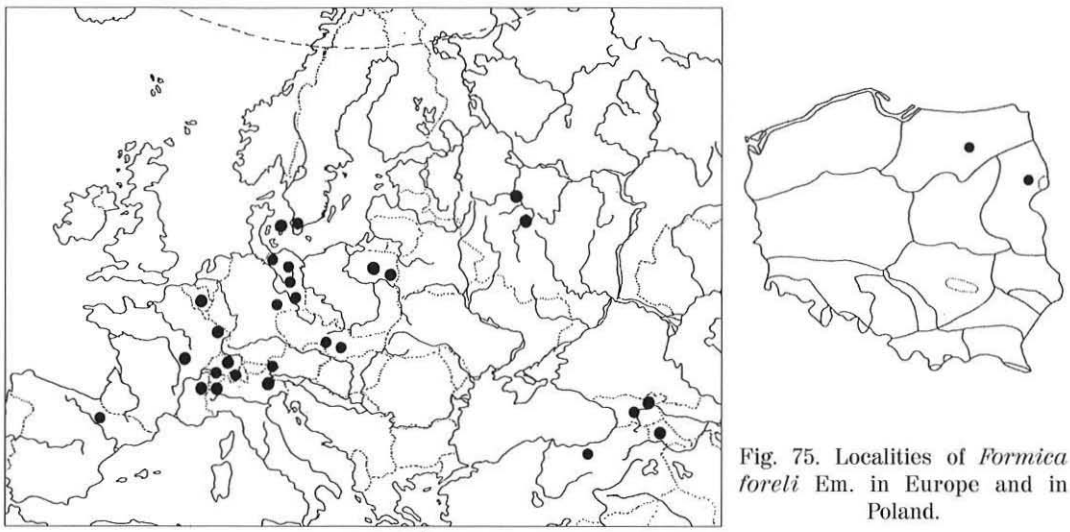


Fig. 75. Localities of *Formica foreli* Em. in Europe and in Poland.

Genus *Polyergus* Latreille, 1804

Polyergus Latreille, 1804. Type species: *Formica rufescens* Latreille, 1798, by monotypy.

This genus includes five species distributed in the Holarctic; three of them occur in the Palaearctic. One species is known from Europe. All the species are obligatory slave-makers; their hosts are representatives of the subgenus *Serviformica*.

Polyergus rufescens (Latreille, 1798)

Formica rufescens Latreille, 1798.
Polyergus rufescens: Latreille 1804.

General distribution (Fig. 76). Central and partly Southern Europe, southern part of Eastern Europe, Caucasus, southern parts of Western Siberia and northern Kazakhstan; to the east it reaches the Altai Mts.

Distribution in Poland (Fig. 76, Table VI). Pomeranian Lake District (Griep 1940); Masurian Lake District (Mazur 1983); Wielkopolsko-Kujawska Lowland (Torka 1914, Kulmatycki 1922); Mazovian Lowland (Czechowski 1975b,c, 1977b, Pisarski and Czechowski 1978, Pisarski 1982); Podlasie Lowland (Mazur 1983); Białowieska Forest (Bischoff 1925); Lower Silesia: Wrocław (M. Woyciechowski, unpubl. data); Krakowsko-

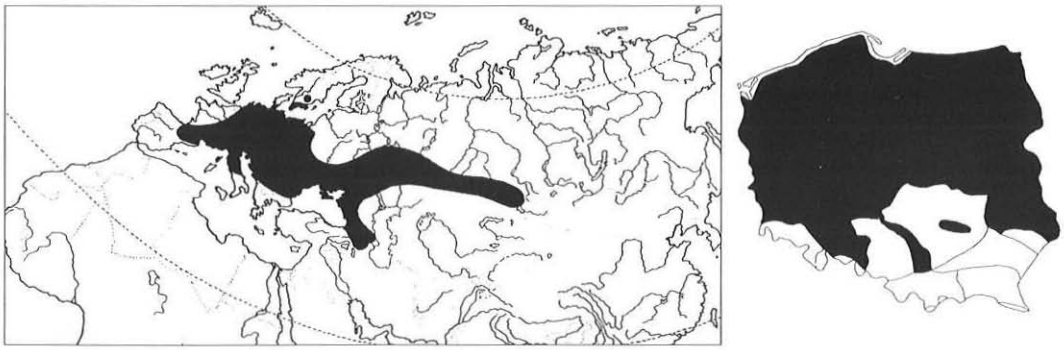


Fig. 76. Distribution of *Polyergus rufescens* (Latr.) in Palaearctic and in Poland.

-Wieluńska Upland (Kulmatycki 1920a, J. Łomnicki 1925); Świętokrzyskie Mts (Krzysztofiak 1984); Lubelska Upland (Minkiewicz 1935, Pisarski 1953, Dobrzańska and Dobrzański 1960, Czechowski and Rotkiewicz 1997a,b); «Western and Eastern Prussia» (Brischke 1888b).

Biology. An obligatory social parasite (slave-maker) totally dependent on its host which are ants of the subgenus *Serviformica* (in Poland: *Formica fusca*, *F. cinerea*, *F. ufibarbis*, and *F. cunicularia*). This species occurs in dry and sunny areas. Its nests are like those of the kept slave species. Monogynous species (queens normal or ergatoid); colonies with from several score to more than three thousand workers and a several-time-higher number of slaves. Well-organized raids on nests of slave species are conducted in July and in August; and only at this time do *P. rufescens* ants reveal their presence. Nuptial flights occur at that time too. New colonies are founded through temporary social parasitism in nests of the slave species; young *P. rufescens* queens, fertilized near their own nest, frequently enter the slave's nest together with the raiding column.

In Poland, the species is rarely found and, due to its cryptic habits, has not yet been recorded from many regions.

Tribe CAMPONOTINI

Genus *Camponotus* Mayr, 1861

Camponotus Mayr, 1861. Type species: *Formica ligniperda* Latreille, 1802b, by subsequent designation of Bingham 1903.

It is one of the largest cosmopolitan ant genera and a typical example of the "crux myrmecologorum". The genus comprises 46 subgenera and includes not less than 1000 species which reach their greatest abundance in the tropics. Eight subgenera and more than 100 species are known from the Palaearctic; five species occur in Poland[6]. Some of them mine in wood (in trunks or branches of living trees, in rotten stumps or in wooden constructions), others nest in the ground. The ants are both carnivorous and aphidicolous. Some species are nocturnal forms.

[6] Originally, two more species, *Camponotus aethiops* (Latr.) and *C. lateralis* (Ol.) were reported (see Pisarski 1975). However, their geographical range renders their occurrence in Poland impossible; the specimens must have been misidentified.

Subgenus *Camponotus* s.str.

Camponotus s.str. (as subgenus of *Camponotus*). Type species: *Formica herculeana* Linnaeus, 1758, by original designation.

The subgenus comprises 26 species distributed mainly in the Holarctic (only one species lives in the Oriental region). They inhabit mostly humid coniferous and mixed forests.

Camponotus herculeanus (Linnaeus, 1758)

Formica herculeana Linnaeus, 1758: Weigel 1806, Schilling 1839, Siebold 1844.
Camponotus herculeanus: Mayr 1861.
Camponotus herculeanus herculeanus: Kulmatycki 1920a,b, Pisarski 1961, Kiełczewski et al. 1970, Nawrot and Wiśniewski 1970.
Camponotus herculeanus ligniperda var. *herculeano-ligniperda*: Kulmatycki 1920a (part.) (unavailable name).
Camponotus ligniperda: Nowicki 1864 (part.), Wierzejski 1873 (part.), Bischoff 1925, Minkiewicz 1935 (misidentifications).

General distribution (Fig. 77). Northern and Eastern Europe, mountains of Central and Southern Europe, Asia Minor, Caucasus, northern Kazakhstan, Tien-Shan, Western and Eastern (subsp. *C. herculeanus sachalinensis* For.) Siberia. In the plains, the species reaches the southern limit of the forest natural zone, to the north it reaches beyond the Polar Circle.

Distribution in Poland (Fig. 77, Table VI). Masurian Lake District (Pisarski 1961, Wengris 1977, Mazur 1983, Krzysztofiak 1985); Mazovian Lowland (Nasonov 1892, 1894); Podlasie Lowland (Pisarski 1961); Białowieska Forest (Bischoff 1925, Karpiński 1956, Pisarski 1961, Pisarski and Blum 1988, Czechowski et al. 1995, Czechowski 1998b); Lower Silesia (Schilling 1839, Stawarski 1966); Upper Silesia (Nowotny 1931a); Krakowsko-Wieluńska Upland (Kulmatycki 1920a); Świętokrzyskie Mts (Krzysztofiak 1984); Western Sudeten Mts (Pisarski 1961, Stawarski 1966, Kiełczewski et al. 1970, Nawrot and Wiśniewski 1970, Banert and Pisarski 1972, Wiśniewski and Hirschmann 1983b); Eastern Sudeten Mts (Pisarski 1961, Stawarski 1966, Wiśniewski 1980c,d, 1982, Wiśniewski and Hirschmann 1983a); Western Beskidy Mts (Wierzejski 1873, Kulmatycki 1920a, Pisarski 1961, Pisarski and Czechowski 1990a,b, Czechowski 1992b); Bieszczady Mts (Pisarski 1961, Parapura and Pisarski 1971); Pieniny Mts (Koehler 1951, Pisarski 1961, Czechowska

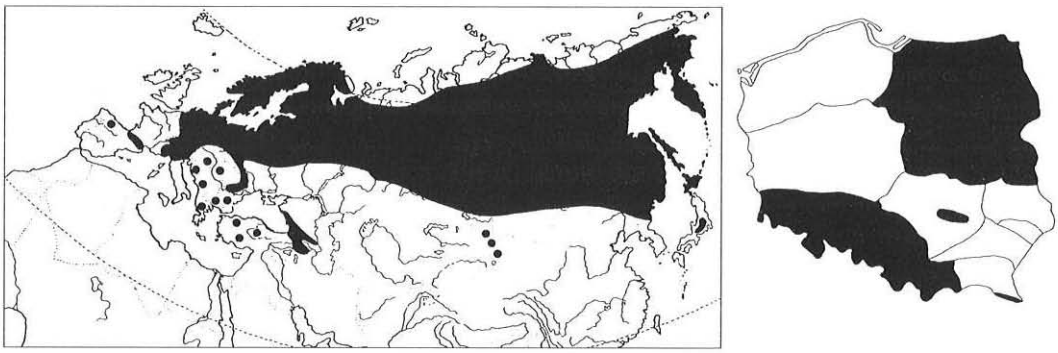


Fig. 77. Distribution of *Camponotus herculeanus* (L.) in Palaearctic and in Poland.

1976, Woyciechowski 1985); Tatra Mts (Nowicki 1864, Wierzejski 1873, Kulmatycki 1920a, J. Łomnicki 1931, Pisarski 1961, A. Łomnicki 1963, Woyciechowski 1990c); «Western and Eastern Prussia» (Siebold 1844, Brischke 1888b); «Silesia» (Weigel 1806).

Mistakenly reported from the Pomeranian Lake District by Begdon (1932b) and Jacobson (1940) basing on misidentification of *C. ligniperdus*.

Biology. A forest species that inhabits mainly shaded coniferous forests, but is also met in sunny clearings. It nests in rotten stumps and occasionally mines in living trees. Nuptial flight takes place in June (sexuals develop in the late summer and overwinter in maternal nests).

In Poland, it occurs mainly in north-eastern regions and in the mountains.

Camponotus ligniperdus (Latreille, 1802)

Formica ligniperda Latreille, 1802b: Schilling 1839.

Camponotus ligniperda: Brischke 1888a et auct., Donisthorpe 1950.

Camponotus herculeanus subsp. *ligniperda*: Mayr 1861, Kulmatycki 1920a,b, Pisarski 1961, Kiełczewski et al. 1970, Nawrot and Wiśniewski 1970.

Camponotus ligniperdus var. *herculeano-ligniperdus* Forel, 1874: Nasonov 1892. Synonymy by Bolton 1995a.

Camponotus herculeanus ligniperda var. *herculeano-ligniperda*: Kulmatycki 1920a (part.) (unavailable name).

Camponotus herculeanus: Wierzejski 1873 (part.), Nasonov 1892 (part.), Pongrácz 1924, Kuntze and Noskiewicz 1926, Begdon 1932b, Jacobson 1940 (misidentifications).

Camponotus herculeanus herculeanus: Kulmatycki 1920a (part.) (misidentification).

Camponotus ligniperdus: Parapura and Pisarski 1971, Banert and Pisarski 1972, Pisarski 1975, Bolton 1995a.

General distribution (Fig. 78). Europe (to the east up to Ural Mts), Caucasus, Asia Minor; in Eastern Europe, to the south it reaches the central part of the forest-steppe zone. Generally, the distribution of *C. ligniperdus* is more southern than that of *C. herculeanus*.

Distribution in Poland (Fig. 78, Table VI). Baltic Coast (Brischke 1888a, Jacobson 1940, Pisarski 1961); Pomeranian Lake District (Begdon 1932b, Griep 1938, 1939, 1940, Jacobson 1940); Masurian Lake District (Begdon 1932b, Wengris 1977); Wielkopolsko-Kujawska Lowland (Begdon 1932b, Pisarski 1961, Stawarski 1966, Pawlikowski and Sobieszczyk 1980); Mazovian Lowland: Wilga ad Garwolin (coll. MIZ PAS); Podlasie

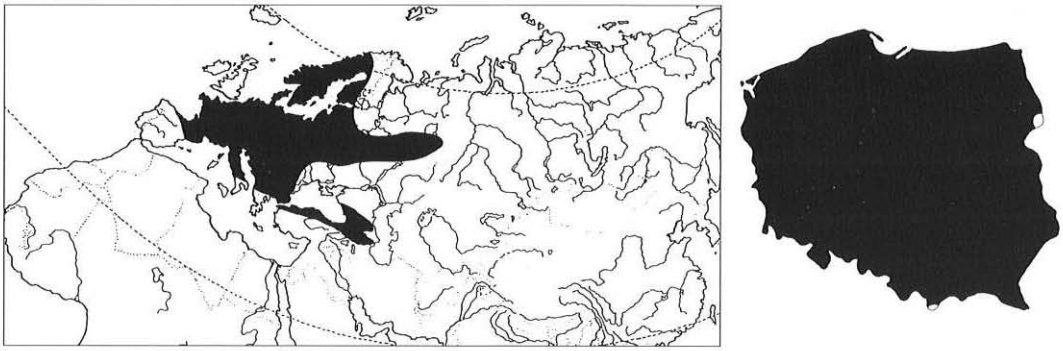


Fig. 78. Distribution of *Camponotus ligniperdus* (Latr.) in Palaearctic and in Poland.

Lowland (Godzińska et al. 1999); Lower Silesia (Pax 1921, Pisarski 1961, Stawarski 1966); Upper Silesia (Scholz 1926, Nowotny 1931a, Stawarski 1966); Krakowsko-Wieluńska Upland (Wierzejski 1868, 1873, Kulmatycki 1920a, Pisarski 1961); Małopolska Upland (Kulmatycki 1920a, Pisarski 1961); Świętokrzyskie Mts (Nasonov 1892, Kulmatycki 1920b, Pongrácz 1924, Kuntze and Noskiewicz 1926, Pisarski 1961, Krzysztofiak 1984, Pisarski and Blum 1988); Lubelska Upland (Nasonov 1892, Minkiewicz 1939d, Pisarski 1953, 1961); Roztocze Upland (Kulmatycki 1920b, Pętal 1961, Pisarski 1961); Sandomierska Lowland (Mazur 1983); Western Sudeten Mts (Pisarski 1961, Kiełczewski et al. 1970, Nawrot and Wiśniewski 1970, Banert and Pisarski 1972); Eastern Sudeten Mts (Pisarski 1961, Stawarski 1966); Western Beskidy Mts (Kulmatycki 1920a, Pisarski 1971, Czechowski and Pisarski 1988, Czechowski 1992b); Eastern Beskidy Mts (Pisarski 1961); Bieszczady Mts (Parapura and Pisarski 1971); Pieniny Mts (Nowicki 1864, Wierzejski 1868, 1873, Koehler 1951, Pisarski 1961, Czechowska 1976, Woyciechowski 1985); «Western and Eastern Prussia» (Brischke 1888b); «Silesia and Kłodzka Land» (Schilling 1839).

Biology. A forest species that inhabits mainly mixed and deciduous forests, met also in open habitats sparcely overgrown with shrubs or single trees. It is more thermophilous than *C. herculeanus*; the most typical places of these ants are stony banks and sun exposed borders of woodlands. They nest in dry stumps, in the ground under wood, stones or tree roots, but rarely mine in living trees. They are fairly aggressive ants that sometimes attack *Formica* and other *Camponotus* colonies. Nuptial flights take place in June.

In Poland, the species occurs throughout the country, and has not been recorded only from the Białowieska Forest and the Tatra Mts.

Camponotus vagus (Scopoli, 1763)

Formica vaga Scopoli, 1763.
Formica pubescens Fabricius, 1775.
Camponotus pubescens: Mayr 1861. Synonymy by Olivier 1792.
Camponotus vagus: Roger 1863b.
?*Lasius pubescens*: Brischke 1888b.
Camponotus herculeanus vagus: Bischoff 1925.

General distribution (Fig. 79). Europe (to the north up to southern Finland and Sweden), north-western part of Africa, Asia Minor, Caucasus, northern Kazakhstan (sporadically), to the east up to Altai Mts.

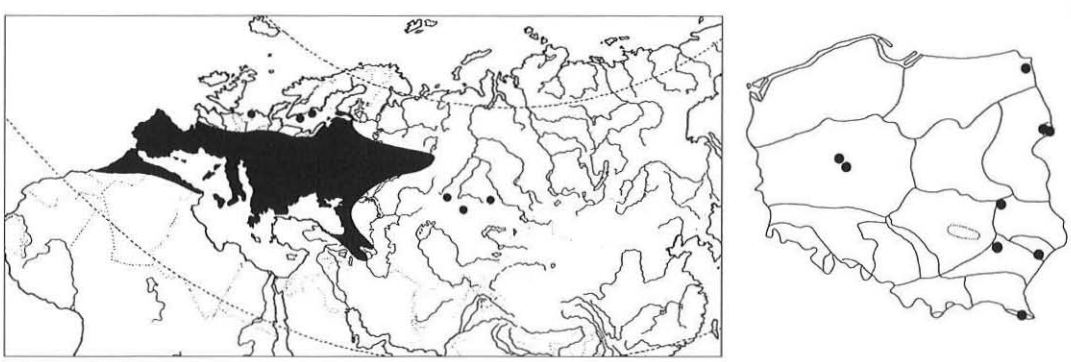


Fig. 79. Distribution of *Camponotus vagus* (Scop.) in Palaearctic and in Poland.

Distribution in Poland (Fig. 79, Table VI). Masurian Lake District: Augustowska Forest (Mazur 1983, Krzysztofiak 1985); Wielkopolsko-Kujawska Lowland: Poznań-Sołacz, Kórnik ad Śrem (Kulmatycki 1922); Białowieska Forest: Białowieża ad Hajnówka (Bischoff 1925, Pisarski 1961), Topiło ad Hajnówka (W. Czechowski, unpubl. data); Lubelska Upland: Puławy (Begdon 1954, Pisarski 1961); Roztocze Upland: Susiec ad Zamość (Mazur 1986); Sandomierska Lowland: Sandomierska Forest (Czechowska and Czechowski 1998); Bieszczady Mts: Wetlina (Pisarski 1970, Parapura and Pisarski 1971); «Western and Eastern Prussia» (Brischke 1888b).

Biology. A forest species that inhabits mainly light and warm pine, mixed and deciduous forests where it prefers open places, especially old clearings. It nests in dry rotten stumps, among roots, in and under fallen wood, under stones. Nuptial flights in July and August.

In Poland, it is a very rare species, recorded only from a few isolated sites, mainly in eastern regions.

Subgenus ***Myrmentoma*** Forel, 1912

Myrmentoma Forel, 1912 (as subgenus of *Camponotus*). Type species: *Formica lateralis* Olivier, 1792, by subsequent designation of Wheeler 1913.

The subgenus includes about 50 species distributed mainly in the southern part of the Holarctic. Three species are known from India and one species from Taiwan. In the Palaearctic, there are more than 30 species; three of them are reported from Poland.

Camponotus fallax (Nylander, 1856)

Formica fallax Nylander, 1856: Brischke 1888b.
Camponotus fallax: Mayr 1861.
Camponotus carye var. *fallax*: Nowotny 1931a,c, Stitz 1939, Głowacki 1953.
Formica marginata Latreille, 1798 (part.).
?*Lasius marginata*: Brischke 1888b, Nasonov 1892.
Camponotus marginatus: Mayr 1861. Synonymy by Bernard 1967.

General distribution (Fig. 80). Europe (to the north up to southern Sweden), north-western part of Africa, Asia Minor, Caucasus, north-western Kazakhstan; reported also from southern part of Western Siberia.

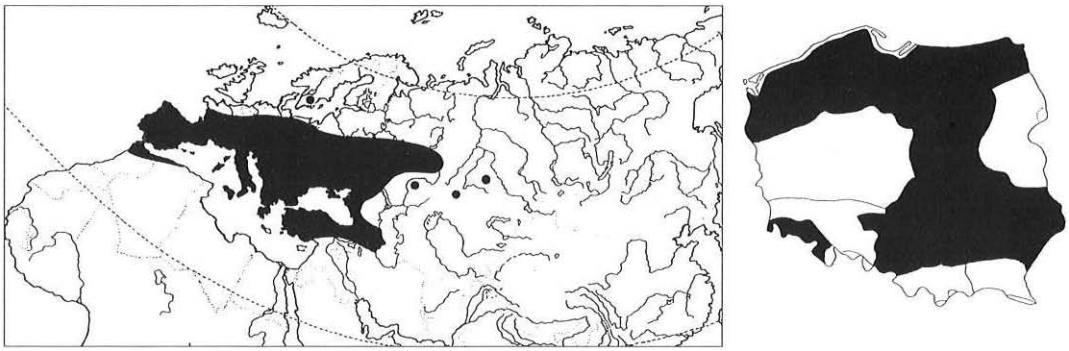


Fig. 80. Distribution of *Camponotus fallax* (Nyl.) in Palaearctic and in Poland.

Distribution in Poland (Fig. 80, Table VI). Pomeranian Lake District (Pisarski 1961); Masurian Lake District (Krzysztofiak 1985); Mazovian Lowland (Nasonov 1892, Kulmatycki 1920a, Głowacki 1953, Pisarski 1961, Pisarski and Czechowski 1978); Upper Silesia (Nowotny 1931a,c, Pisarski 1961); Krakowsko-Wieluńska Upland (Pisarski 1961); Małopolska Upland (Kowalczyk and Watała 1987); Świętokrzyskie Mts (Krzysztofiak 1984); Lubelska Upland (Pisarski 1961); Roztocze Upland (Pętal 1961, Pisarski 1961); Sandomierska Lowland (Czechowska and Czechowski 1998); Western Sudeten Mts (Pisarski 1961); «Western and Eastern Prussia» (Brischke 1888b).

Biology. The species inhabits mainly light and dry deciduous and mixed forests, and is also met in old parks and orchards. It nests in dead parts of living trees or in wooden constructions (fences, walls of buildings). Nuptial flights in May and June.

In Poland, the species is recorded from several regions; everywhere rare.

Camponotus piceus (Leach, 1825)

Formica picea Leach, 1825.
Camponotus piceus: Roger 1863b.
Formica merula Losana, 1834. Synonymy by Atanassov and Dlussky 1992.
Formica atricolor Nylander, 1849. Synonymy by Atanassov and Dlussky 1992.
Formica foveolata Mayr, 1853. Synonymy by Dalla Torre 1893.
Camponotus ebeninus Emery, 1869. Synonymy by Dalla Torre 1893.
Camponotus lateralis picea: Pisarski 1961.
Camponotus lateralis Olivier, 1792: Kostrowicki 1964 (misidentification).

General distribution (Fig. 81). Southern and Central Europe, southern part of Eastern Europe, north-western part of Africa, Asia Minor, Lebanon, Israel, Iran, Caucasus, and northern Kazakhstan.

Distribution in Poland (Fig. 81, Table VI). Małopolska Upland: reserve "Krzyżanowice" ad Pińczów (Pisarski 1961, Kostrowicki 1964).

Biology. It is a xerothermophilous species that inhabits steppes and open dry mountain slopes, rarely found also in light and dry forests. Nests are built in the ground, often under stones.

In Poland, it is known from only one site in the Małopolska Upland: a reserve of steppe vegetation on the south-facing slope of a gypsum hill overgrown with sparce xero- and thermophilous vegetation (an area of the present Nadnidziański Lanscape Park).

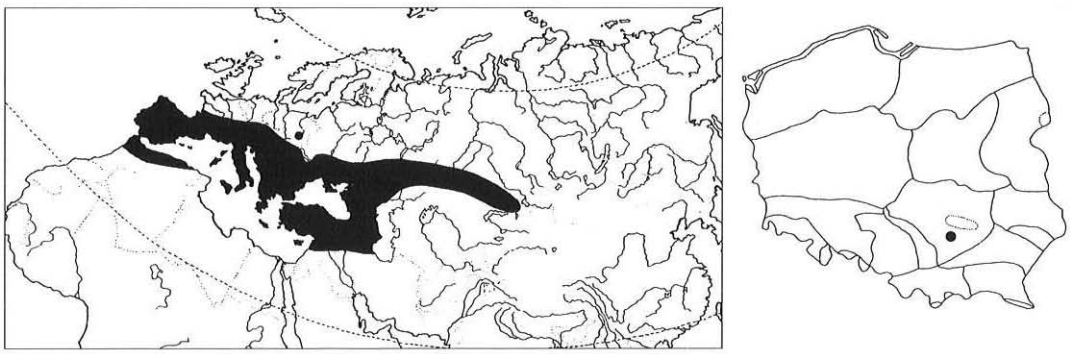


Fig. 81. Distribution of *Camponotus piceus* (Leach) in Palaearctic and its locality in Poland.

Tribe LASIINI

Genus *Lasius* Fabricius, 1804

Lasius Fabricius, 1804. Type species: *Formica nigra* Linnaeus, 1758, by subsequent designation of Bingham 1903. Junior synonym of *Formicina* Shuckard: Emery 1916a and of *Acanthomyops* Mayr: Forel 1916. Revived from synonymy by Wheeler 1916.
Donisthorpea Morice et Durrant, 1915. Synonymy by Wheeler 1916.

Note. The name *Lasius* Fabricius, 1804 (Formicidae) formally was a junior homonym of *Lasius* Jurine, 1801 (Apidae). Morice and Durrant (1915) resurrected the latter name and for *Lasius* Fabricius proposed a replacement name – *Donisthorpea*. A year later, Emery (1916a) and Forel (1916) proposed for *Lasius* Fabricius other replacement names – *Formicina* Shuckard and *Acanthomyops* Mayr respectively. However, the former is a junior synonym of *Formica* and, what is more, *Acanthomyops* and *Lasius* Fabricius are in fact two different ant genera of the tribe Lasiini. Later, the name *Lasius* Jurine was suppressed by an act of the Commission of Zoological Nomenclature, and Wheeler (1916) revived the name *Lasius* Fabricius from synonymy.

The genus *Lasius* includes about 80 Holarctic species; more than 50 of them are known from the Palaearctic, and 17 have been found in Poland. Many *Lasius* species are very common in the temperate zone of the Holarctic, and together with representatives of the genera *Myrmica* and *Formica* they form an essential part of the Palaearctic myrmecofauna. Recent revisions of the Palaearctic species of the subgenera *Lasius* s.str. and *Chthonolasius* Ruzsky were provided by Seifert (1988b, 1990, 1992).

Subgenus *Lasius* s.str.

Lasius s.str. (as subgenus of *Lasius*). Type species: *Formica nigra* Linnaeus, 1758, by subsequent designation of Bingham 1903.

Lasius niger (Linnaeus, 1758)

Formica nigra Linnaeus, 1758: Weigel 1806, Schilling 1830.
Lasius niger: Fabricius 1804.
Lasius niger lasioides (Emery, 1869): Kulmatycki 1920a, 1922 (misidentification).
Lasius niger emarginatus (Olivier, 1792): Bischoff 1925 (misidentification).

Note. For over two centuries after being first described by Linnaeus (1758), *L. niger*, due to its abundance in a wide variety of habitats, was considered to be one of the commonest Palaearctic ant species. It was considered to be a eurytope with an unusually wide ecological flexibility and a great biological plasticity. Consequently, in the faunistic and zoocoenological literature concerning ants from the central and northern Palaearctic, there is probably no paper without *L. niger* being mentioned as an element of the local myrmecofauna or a member of a particular ant community. In Wilson's (1955) revision of the genus *Lasius* made nearly two hundred years after the species had been first described, *L. niger* retained its taxonomic status. It was only in Seifert's (1991) revision that this hitherto unquestioned species was separated into two sibling species: *L. niger* (Linnaeus, 1758) and a new *L. platythorax* Seifert, 1991. This deci-

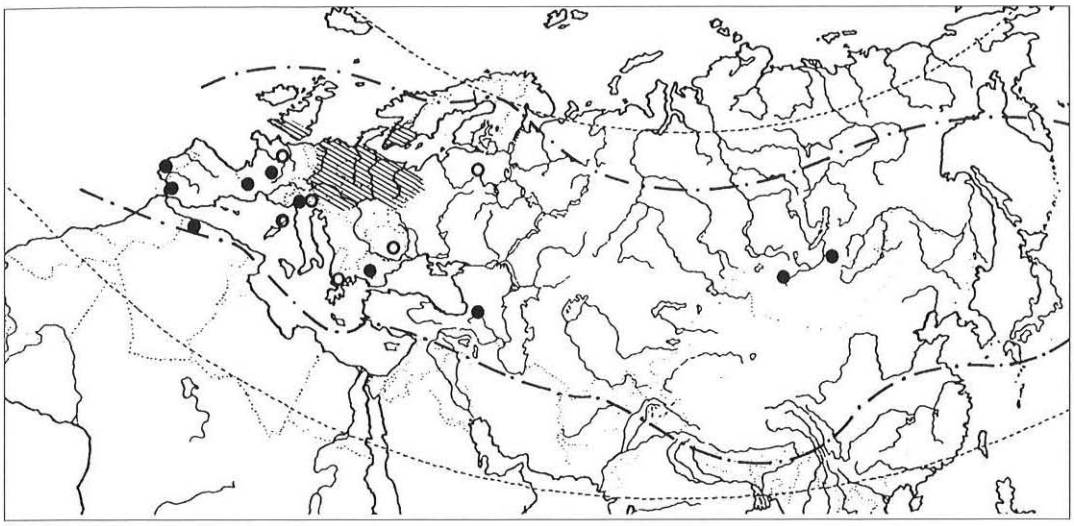


Fig. 82. Distribution of *Lasius niger* (L.) and *Lasius platythorax* Seifert in Palaearctic (● – confirmed localities of *L. niger*, O – localities of *L. platythorax*, lined area – area of confirmed co-occurrence of the two species; range of the "old" *L. niger* is marked with broken lines).

sion was made on the basis of morphological differences accompanied by a distinct ecological differentiation between the forms. After nearly a decade, it seems that the majority of myrmecologists still do not approve of Seifert's decision. However, basing on a review of the «*L. niger*» material from Poland found in the collection in the Museum and Institute of Zoology, PAS, Warsaw, we agree with Seifert's opinion: the Linnaean *L. niger* does include two species distinguishable morphologically (see Radchenko, Czechowska et al. 1999a). In the light of Seifert's data they appear to be polytopic competitive forms – *L. niger* better adapted to open habitats and *L. platythorax* to wooded habitats.[7]

General distribution (Fig. 82). Most probably, it is a Transpalaearctic form. However, after the division of the "old *L. niger*" into two species (see Note above) it may only be assumed that both are distributed from the Atlantic to the Pacific Ocean; their actual ranges, especially in the eastern parts of the Palaearctic, remain to be studied.

Distribution in Poland (Fig. 83, Table VI). Baltic Coast (Kulmatycki 1922, Mazur 1983, Radchenko, Czechowska et al. 1999a); Pomeranian Lake District (Kulmatycki 1922, Engel 1938, Griep 1938, Jacobson 1940, Będziak 1956, Szujecki et al. 1978, Mazur 1983, Szujecki et al. 1983, Czechowski et al. 1995, Radchenko, Czechowska et al. 1999a); Masurian Lake District (Begdon 1932b, Minkiewicz 1935, Wengris 1962, 1963, Mazur 1983, Krzysztofiak 1985, Pętal et al. 1992, Radchenko, Czechowska et al. 1999a);

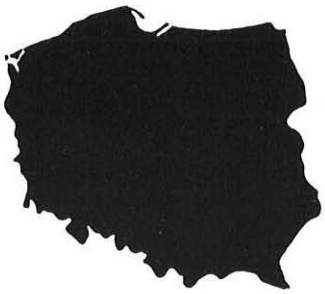


Fig. 83. Distribution of *Lasius* (*L.*) *niger* (L.) in Poland.

[7] Recent genetic investigations, based on the sequencing of DNA, confirmed the species separateness of *L. niger* and *L. platythorax* (R. Savolainen, unpubl. data).

Wielkopolsko-Kujawska Lowland (Kuhlgatz 1902, Kulmatycki 1920b, 1922, Begdon 1932b, Kiełczewski and Wiśniewski 1966, 1971, Stawarski 1966, Wengris 1977, Pawlikowski and Sobieszczyk 1980, Mazur 1983, Krzysztofiak 1991, Radchenko, Czechowska et al. 1999a); Mazovian Lowland (Nasonov 1892, 1894, Kulmatycki 1920b, Minkiewicz 1939a,d, Jakubisiak 1948, Kaczmarek 1963, Pętal 1967, 1980b, 1981, 1992, Pętal et al. 1970, Czerwiński et al. 1971, Jakubczyk et al. 1972, Czechowska and Czechowski 1976, Czechowski 1975a, 1976b, 1979, 1980, 1984a,b, 1985, 1990a, Czechowski et al. 1995, Banaszak et al. 1978, Pisarski and Czechowski 1978, 1991, Pisarski 1981, 1982, Vepsäläinen and Pisarski 1982, Mazur 1983, Bańkowska et al. 1984, Czechowski, Czechowska and Palmowska 1990, Czechowski and Pisarski 1990a,b, Czechowski, Pisarski and Czechowska 1990, Czechowski et al. 1995, Krzysztofiak 1991, Radchenko, Czechowska et al. 1999a); Podlasie Lowland (Kulmatycki 1920b, Pętal 1963b, 1968a, 1976, Pętal et al. 1970, Mazur 1983, Radchenko, Czechowska et al. 1999a); Białowieska Forest (Bischoff 1925, Karpiński 1956, Czechowski et al. 1995, Czechowski 1998b, Radchenko, Czechowska et al. 1999a); Lower Silesia (Letzner 1877, 1879, 1881, 1887, Herzig 1937, Goetsch 1942, Stawarski 1961b, 1966, Mazur 1983); Upper Silesia (Scholz 1926, Nowotny 1931a, Koehler 1951, Stawarski 1966); Krakowsko-Wieluńska Upland (Kotula 1873, Wierzejski 1873, Kulmatycki 1920a, Kaczmarek 1953, Śmigielska and Szymczakowski 1955, Radchenko, Czechowska et al. 1999a); Małopolska Upland (Kulmatycki 1920a, Puszkar 1982, Mazur 1983); Świętokrzyskie Mts (Kulmatycki 1920b, Mazur 1983, Krzysztofiak 1984, Radchenko, Czechowska et al. 1999a); Lubelska Upland (Kulmatycki 1920b, Minkiewicz 1935, Pisarski 1953, Dobrzańska 1958; Pętal 1961, Honczarenko 1962, Puszkar 1978, 1982, Mazur 1983, Czechowski and Rotkiewicz 1997b), Radchenko, Czechowska et al. 1999a); Roztocze Upland (Kulmatycki 1920b, Pętal 1961, 1964, Mazur 1983, Radchenko, Czechowska et al. 1999a); Sandomierska Lowland (Kulmatycki 1920a,b, Stawarski 1966, Puszkar 1979, 1982, Mazur 1983, Radchenko, Czechowska et al. 1999a); Western Sudeten Mts (Scholz 1912, Begdon 1959, Stawarski 1966, Dominiak 1970, Banert and Pisarski 1972, Pętal 1994, Radchenko, Czechowska et al. 1999a); Eastern Sudeten Mts (Schilling 1830, Stawarski 1966, Banert and Pisarski 1972, Radchenko, Czechowska et al. 1999a); Western Beskidy Mts (Kotula 1873, Wierzejski 1873, Kulmatycki 1920a, Czechowski and Pisarski 1988, Czechowski 1989, Radchenko al. 1999a); Eastern Beskidy Mts (Kulmatycki 1920a, Pętal et al. 1970); Bieszczady Mts (Parapura and Pisarski 1971, Pisarski 1972, 1973, Czechowski 1977a, 1979, Pisarski 1983, Radchenko, Czechowska et al. 1999a); Pieniny Mts (Kulmatycki 1920a, Kuntze 1934, Koehler 1951, Pętal 1974, 1980b, Czechowska 1976, Woyciechowski 1985, Radchenko, Czechowska et al. 1999a); Tatra Mts (Nowicki 1864, 1867, Wierzejski 1873, Kulmatycki 1920a, J. Łomnicki 1931, Woyciechowski 1990c); «Silesia» (Weigel 1806, Schilling 1830).

Biology. *L. niger* generally lives in moderately xerothermal open habitats (dry and semi-dry grasslands), and shows strong synanthropic tendencies (it is abundant in arable land, in urban and suburban green); it avoids shaded woodland and undisturbed bogs and fens. Nests are built in the ground, often under stones, and any above-ground constructions are built of mineral particles. Colonies are monogynous, they consist of several hundred to ten thousand workers, and are started by young queens in an independent manner; primary pleometrosis is frequent. Nuptial flights from July to August; it often happens that huge numbers of sexuals fly over a large area at the same time. (See also Seifert 1991, 1992, 1996).

In Poland, the presence of *L. niger* (sensu Seifert 1991) was confirmed almost throughout the territory (except Lower and Upper Silesia, the Eastern Beskidy Mts and the Tatra Mts, but its absence there is simply due to lack of material in the collection). Surely, the species occurs all over the country.

Lasius platythorax Seifert, 1991

Lasius platythorax Seifert, 1991; Radchenko, Czechowska et al. 1999a.
Lasius emarginatus: Radchenko, Czechowska et al. 1999b (misidentification).

Note. See Note to *L. niger*.

General distribution (Fig. 82). Most probably a Transpalaearctic species (see General distribution of *L. niger*).

Distribution in Poland (Fig. 84, Table VI). Baltic Coast (Radchenko, Czechowska et al. 1999a); Masurian Lake District (Radchenko, Czechowska et al. 1999a); Wielkopolsko-Kujawska Lowland (Radchenko, Czechowska et al. 1999a); Mazovian Lowland (Radchenko, Czechowska et al. 1999a); Podlasie Lowland (Radchenko, Czechowska et al. 1999a); Białowieska Forest (Radchenko, Czechowska et al. 1999a); Krakowsko-Wieluńska Upland (Radchenko, Czechowska et al. 1999a); Małopolska Upland (Radchenko, Czechowska et al. 1999a); Świętokrzyskie Mts (Radchenko, Czechowska et al. 1999a); Lubelska Upland (Radchenko, Czechowska et al. 1999a); Roztocze Upland (Radchenko, Czechowska et al. 1999a); Sandomierska Lowland (Radchenko, Czechowska et al. 1999a); Western Sudeten Mts (Radchenko, Czechowska et al. 1999a); Eastern Sudeten Mts (Radchenko, Czechowska et al. 1999a); Western Beskidy Mts (Radchenko, Czechowska et al. 1999a); Bieszczady Mts (Radchenko, Czechowska et al. 1999a); Pieniny Mts (Radchenko, Czechowska et al. 1999a).

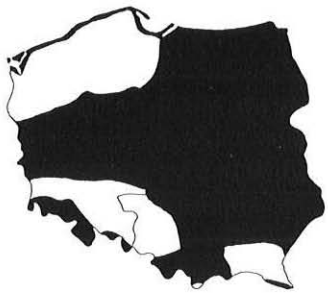


Fig. 84. Distribution of *Lasius platythorax* (L.) in Poland.

Biology. *L. platythorax*, in comparison with *L. niger* (see above), clearly prefers more humid sites. It inhabits all types of forest as well as bogs and fens, and avoids open sites, especially anthropogenized ones. This species usually builds its nests in organic substrate, most frequently in dead wood (particularly in rotten stumps), but also in vegetation pads, in grass tussocks with a humus root layer; it makes no above-ground mineral constructions. Nuptial flights generally at the same time as in *L. niger*. (See also Seifert 1991, 1992, 1996).

In Poland, *L. platythorax* is recorded (on the basis of museum specimens) from most regions (except the Pomeranian Lake District, Upper and Lower Silesia, the Eastern Beskidy Mts, and the Tatra Mts, but as in the case of *L. niger*, its absence in the collection probably does not mean that this species does not occur there).

Lasius emarginatus (Olivier, 1792)

Formica emarginata Olivier, 1792.
Lasius emarginatus: Fabricius 1804.
Lasius emarginatus var. *nigro-emarginata* Forel, 1874: Kulmatycki 1920a,b. Synonymy by Wilson 1955.

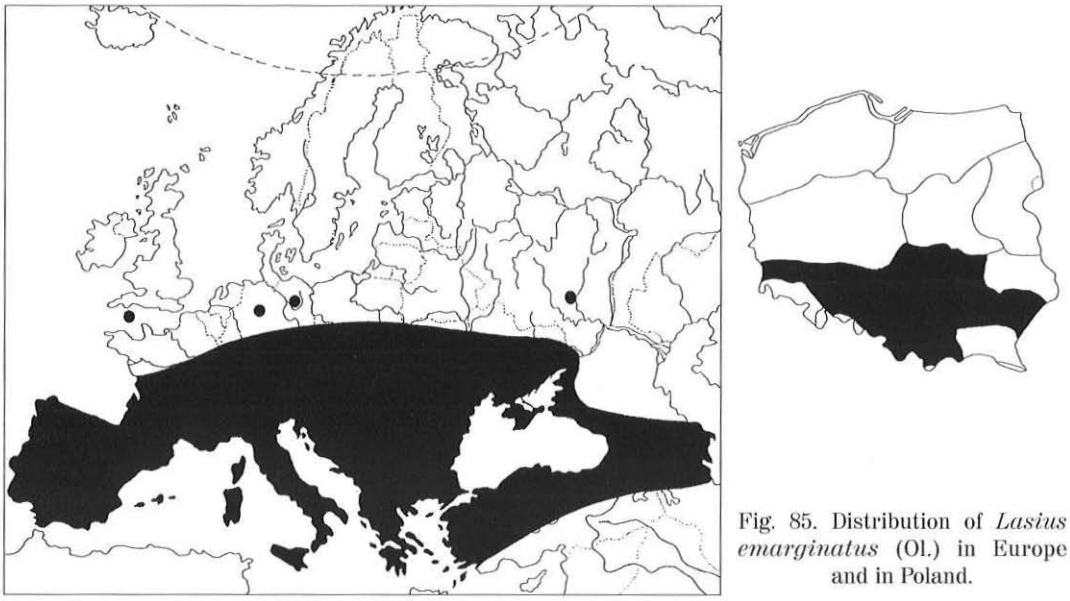


Fig. 85. Distribution of *Lasius emarginatus* (Ol.) in Europe and in Poland.

General distribution (Fig. 85). Southern and Central Europe, Causacus, Asia Minor.

Distribution in Poland (Fig. 85, Table VI). Lower Silesia (Stawarski 1966); Upper Silesia (Scholz 1926, Nowotny 1931a, Goetsch 1937, Stawarski 1966); Krakowsko-Wieluńska Upland (Wierzejski 1873, Kulmatycki 1920a); Małopolska Upland (Kulmatycki 1920b); Świętokrzyskie Mts (Kulmatycki 1920b); Roztocze Upland (Kulmatycki 1920b); Sandomierska Lowland (Kulmatycki 1920a, Stawarski 1966); Western Beskidy Mts (Kulmatycki 1920a); Pieniny Mts (Kuntze 1934, Urbański 1939, Koehler 1951, Czechowska 1976).

Mistakenly reported from the Baltic Coast by Radchenko, Czechowska et al. (1999b) basing on misidentification of *L. platythorax*.

Biology. The most thermophilous species of the subgenus *Lasius* s.str. in the Central-European myrmecofauna, typical especially of rocky sun exposed habitats with sparse vegetation. It most frequently nests in rock crevices and among stones, occasionally in dead trees or in wood; in towns it nests in wall crevices. Nests may contain elements of a carton-like construction of soil particles and bits of wood stuck together with honeydew. Colonies very populous, monogynous. Both predation and honeydew and nectar collecting play a great part in foraging. Nuptial flights in July and August.

In Poland, the species lives in xerothermal habitats in the south of the country.

Lasius brunneus (Latreille, 1798)

Formica brunnea Latreille, 1798.
Lasius brunneus: Mayr 1861.
Lasius timida (Förster, 1850): Brischke 1988b. Synonymy by F. Smith 1858, Seifert 1992.
Lasius brunneus var. *alieno-brunnea* Forel, 1874: Kulmatycki 1920a. Synonymy by Stärcke 1944.
Lasius brunneus var. *pallida* (Latreille, 1798): Kulmatycki 1920a, 1922 (unrecognisable taxon; see also Seifert 1992).
Lasius niger brunneus: Bischoff 1925.

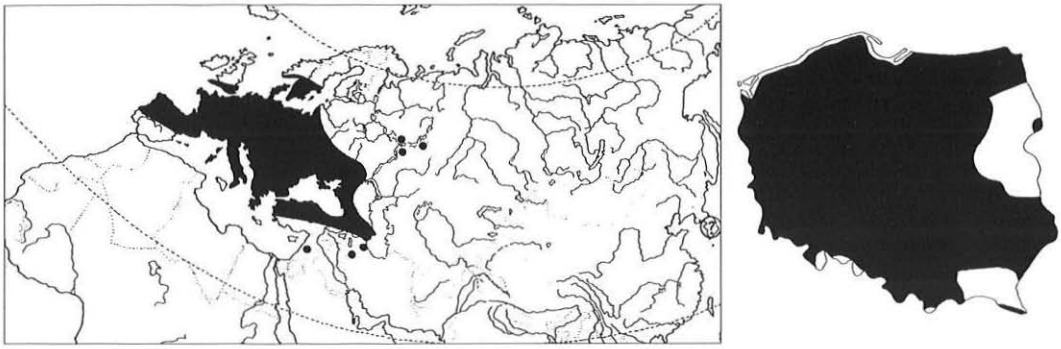


Fig. 86. Distribution of *Lasius brunneus* (Latr.) in Palaearctic and in Poland.

General distribution (Fig. 86). Europe (to the north it reaches southern England, Sweden and Norway, and in Eastern Europe it is spread to the southern border of the taiga zone), Caucasus, northern Turkey, north-western Iran, Israel.

Distribution in Poland (Fig. 86, Table VI). Pomeranian Lake District (Begdon 1932b, Griep 1940, Będziak 1956, Szujecki et al. 1978); Masurian Lake District (Begdon 1932b, Wengris 1977, Krzysztofiak 1985); Wielkopolsko-Kujawska Lowland (Kulmatycki 1922, Begdon 1932b, Stawarski 1966); Mazovian Lowland (Nasonov 1889, 1892, Kulmatycki 1920b, Jakubisiak 1948, Pisarski and Czechowski 1978, 1991, Pisarski 1981, Czechowski 1990a, Czechowski, Czechowska and Palmowska 1990, Czechowski and Pisarski 1990a,b, Czechowski, Pisarski and Czechowska 1990); Białowieska Forest (Bischoff 1925, Karpiński 1956); Lower Silesia (Herzig 1937, Stawarski 1966); Upper Silesia (Scholz 1926, Nowotny 1931a, Stawarski 1966); Krakowsko-Wieluńska Upland (Kotula 1873, Wierzejski 1873, Kulmatycki 1920a); Małopolska Upland (Kulmatycki 1920b); Świętokrzyskie Mts (Krzysztofiak 1984); Lubelska Upland (Pisarski 1953, Begdon 1954); Roztocze Upland (Pętal 1961); Sandomierska Lowland (Kulmatycki 1920a, Stawarski 1966); Western Sudeten Mts (Banert and Pisarski 1972); Western Beskidy Mts (Kulmatycki 1920a); Bieszczady Mts (Parapura and Pisarski 1971); Pieniny Mts (Koehler 1951, Czechowska 1976); «Silesia and Kłodzka Land» (Schilling 1839); «Western and Eastern Prussia» (Siebold 1844, Brischke 1888b).

Biology. A dendrophilous species of all manner of habitat with a proportion of deciduous trees in which (living or dead) it nests under bark and in the wood, from the underground parts of the trunk to the main boughs. It reveals synanthropic tendencies; occasionally found in the walls of wooden, brick or stone buildings. New colonies are started by single foundatrices and are monogynous as a rule; however, some data suggest a possibility of adoption of additional queens after their nuptial flight and, at least temporary polycaly. Honeydew of tree aphids is the main component of its diet, but the species also utilizes animal food. Very timid ants; foraging workers avoid open areas. Nuptial flights in June and July.

In Poland, occurs probably throughout the country (so far not recorded only from a few regions).

Lasius alienus (Förster, 1850)

Formica aliena Förster, 1850.
Lasius alienus: Mayr 1861.

Lasius niger r. *alienus*: Kulmatycki 1920a,b, Bischoff 1925, Griep 1938.
Lasius alieno-niger Forel, 1874: Jacobson 1940 (unrecognisable taxon; see also Seifert 1992).
Lasius niger alienus var. *alieno-nigra*: Kulmatycki 1920a (unavailable name).

Note. The taxonomic situation of the *L. alienus*-complex is similar to that of the *L. niger/platythorax* one (see Note to *L. niger*); Seifert (1992) has divided the former "*L. alienus*" into three species: *L. alienus* (the commonest western-Palaearctic member of the complex), *L. paralienus* and *L. psammophilus*. Therefore, the earlier published data on the occurrence of *L. alienus* in Poland most probably partly referred to one of its sibling species.

General distribution (Fig. 87). Probably a Transpalaearctic species; so far, after the taxonomic revision, its occurrence has been confirmed in Europe, Asia Minor and Caucasus (see Note above).

Distribution in Poland (Fig. 88, Table VI). Baltic Coast (Kulmatycki 1922); Pomeranian Lake District (Begdon 1932b, Engel 1938, Griep 1938, 1940, Jacobson 1940, Szujecki et al. 1978, 1983, Mazur 1983, Czechowski et al. 1995); Masurian Lake District (Begdon 1932b, Wengris 1977, Mazur 1983, Krzysztofiak 1985); Wielkopolsko-Kujawska Lowland (Kulmatycki 1922, Begdon 1932b, Kiełczewski and Wiśniewski 1966, 1971, Stawarski 1966, Pawlikowski and Sobieszczyk 1980, Mazur 1983); Mazovian Lowland (Nasonov 1892, Jakubisiak 1948, Pisarski and Czechowski 1978, Pisarski 1981, 1982); Podlasie Lowland (Pętal 1968a, Mazur 1983); Białowieska Forest (Bischoff 1925, Karpiński 1956, Czechowski et al. 1995); Lower Silesia (Nowotny 1931a, Stawarski 1961b, 1966); Upper Silesia (Nowotny 1931a, Stawarski 1966); Krakowsko-Wieluńska Upland (Wierzejski 1868, 1873, Kulmatycki 1920a, Kaczmarek 1953); Małopolska Upland (Radchenko, Czechowska et al. 1999b); Świętokrzyskie Mts (Kulmatycki 1920a, Krzysztofiak 1984); Lubelska Upland (Pisarski 1953, Pętal 1961); Roztocze Upland (Pętal 1961); Sandomierska Lowland (Kulmatycki 1920a, Stawarski 1966, Mazur 1983); Western Beskidy Mts (Kulmatycki 1920a); Eastern Beskidy Mts (Radchenko, Czechowska et al. 1999b); Bieszczady Mts (Parapura and Pisarski 1971); Pieniny Mts (Koehler 1951, Czechowska 1976, Woyciechowski 1985); Tatra Mts (Wierzejski 1863, 1873, Nowicki 1864, J. Łomnicki 1931); «Western and Eastern Prussia» (Brischke 1888b).

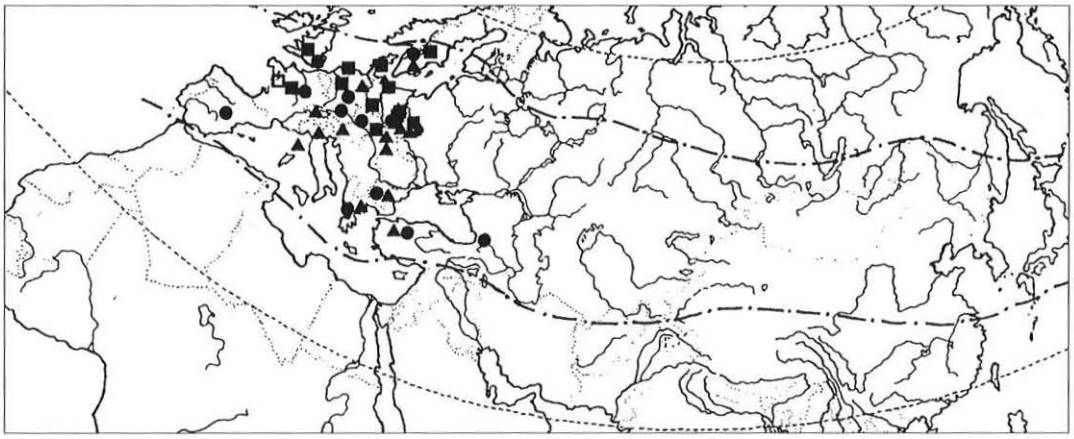


Fig. 87. Distribution of the *Lasius alienus* complex in Palaearctic [● – confirmed localities of *L. alienus* (Först.), ▲ – confirmed localities of *L. paralienus* Seifert, ■ – confirmed localities of *L. psammophilus* Seifert; range of the "old" *L. alienus* is marked with broken lines].

Biology. An oligotope of dry habitats; lives in open rocky areas, in grasslands, on sun exposed forest edges and in sparse warm forests, especially oak ones; prefers soils on limestone substratum. Nests, occasionally with small mounds, are built in the ground, under stones and pieces of wood. The species is strongly trophobiotically associated with aphids of all strata of vegetation – from roots to tree canopies – although to some extent it also is a zoophage. Colonies are monogynous, independently started by young queens. It is the main host to *Lasius jensi*. Nuptial flights in July.

Fig. 88. Distribution of *Lasius alienus* (Först.) in Poland.

In Poland, the species has been recorded throughout the country though some data may refer to its sibling species (see Note above). In the mountains, it reaches the lower limit of the lower prealps.

Lasius paralienus Seifert, 1992

Lasius paralienus Seifert, 1992; Radchenko, Czechowska et al. 1999b.

General distribution (Fig. 87). So far the species is known from Western and Central Europe and Asia Minor, but most probably its range is wider (see Note to *L. alienus*).

Distribution in Poland (Fig. 89, Table VI). Baltic Coast: island of Wolin (W. Czechowska, unpubl. data); Krakowsko-Wieluńska Upland: Trzebniów ad Zawiercie (Radchenko, Czechowska et al. 1999b); Western Beskidy Mts: Piwniczna ad Nowy Sącz (Radchenko, Czechowska et al. 1999b); Eastern Beskidy Mts: Lesko (Radchenko, Czechowska et al. 1999b); Pieniny (W. Czechowska, unpubl. data).

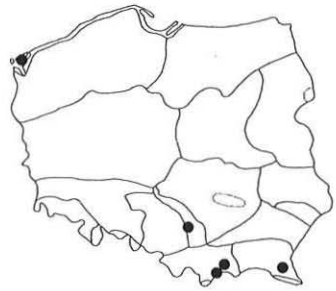


Fig. 89. Distribution of *Lasius paralienus* Seifert in Poland.

Biology. An oligotope of dry grasslands, especially those on limestone substratum, but also on sandy and loess substratum as well. Data on its biology are very scanty. Nuptial flights in August.

In Poland, the species is known from five sites only, but it undoubtedly is distributed more widely (until quite recently, it was not distinguished from *L. alienus*).

Lasius psammophilus Seifert, 1992

Lasius psammophilus Seifert, 1992; Radchenko, Czechowska et al. 1999b.

General distribution (Fig. 87). So far the species is known from Central and Northern Europe, but most probably its range is wider (see Note to *L. alienus*).

Distribution in Poland (Fig. 90, Table VI). Baltic Coast: island of Wolin (W. Czechowska, unpubl. data); Mazovian Lowland: Kampinoska Forest, Radość ad Warszawa (Radchenko, Czechowska et al. 1999b);

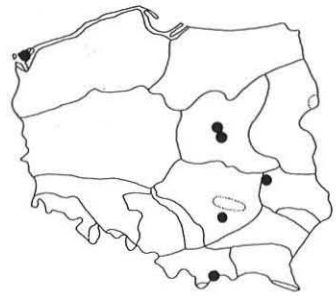


Fig. 90. Distribution of *Lasius psammophilus* Seifert in Poland.

Małopolska Upland: reserve "Skowronno" ad Pińczów (Radchenko, Czechowska et al. 1999b); Lubelska Upland: Kazimierz Dolny ad Puławy (Radchenko, Czechowska et al. 1999b); Pieniny (W. Czechowska, unpubl. data).

Biology. An oligotope of dry grasslands, particularly those on sandy substratum; one of the dominant ant species on dunes. Nests are constructed totally underground with single entrances on the bottom of crater-like hollows; the vertical galleries reach down to 120 cm in the soil, the horizontal ones stretch widely 10 to 30 cm under the surface. These ants feed mainly on honeydew of root aphids. It is the main host to *L. meridionalis*. Nuptial flights in July.

In Poland, the species has so far been reported from six sites only though it must be more common (until quite recently it was not distinguished from *L. alienus*).

Lasius neglectus Van Loon, Boomsma et Andrasfalvy, 1990

Lasius neglectus Van Loon, Boomsma et Andrasfalvy, 1990: Czechowska and Czechowski 1999b.
Lasius turcicus Santschi, 1921. Synonymy by Seifert 1992. Revived from synonymy: Seifert 2000b.

Note. *L. neglectus* has been reported from Budapest where it was introduced at the beginning of the 1970s; it had probably been brought with ornamental plants from some vaquely defined region. Hardly two decades had passed before Seifert (1992) synonymized *L. neglectus* with *L. turcicus* Santschi, considering it to be a polygynous form of the latter species. Later, however, he restored *L. neglectus* to species status, presuming – on the basis of morphological, genetic and zoogeographical data – that it had just been separated from *L. turcicus* (Seifert 1999).

General distribution (Fig. 91). It is a very expansive species for which Asia Minor is the most probable centre of radiation. It has spread to part of southern Asia and to the entire Mediterranean region, and even reached Central Europe. To date, it has been recorded from 38 sites (=polydomous colonies) scattered in Eurasia between 1°E and 74°E and 36°N and 52°N; as many as 14 sites are situated in Turkey (Seifert 2000b).

Distribution in Poland (Fig. 91, Table VI) Mazovian Lowland: Warszawa (Czechowska and Czechowski 1999b).

Biology. *L. neglectus* is one of the two known undoubtedly polygynous (and polycalic) ant species of the subgenus *Lasius* s.str. (the Japanese *L. sakagamii* Yamauchi et Hayashida is the other). At present, it is in a phase of singularly effective expansion

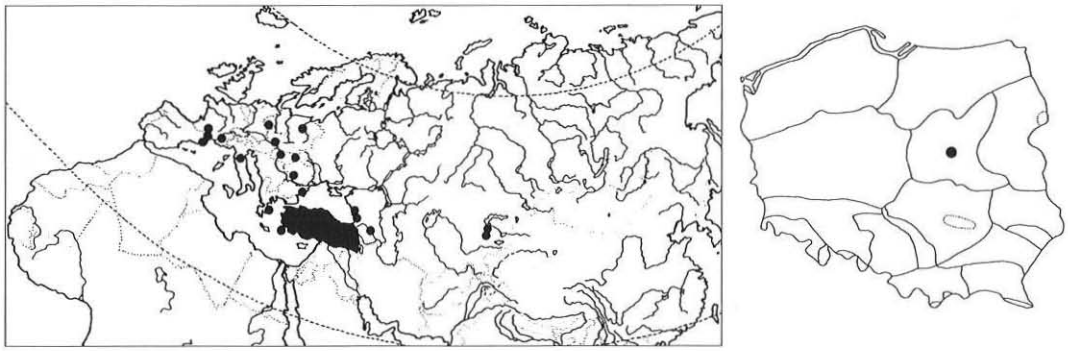


Fig. 91. Distribution of *Lasius neglectus* Van Loon, Boomsma et Andrasvalvy in Palaearctic and its locality in Poland.

although, in the absence of nuptial flights which have been substituted by intranidal mating, the species mainly enlarges its range passively. The type of its supposed carrier (exotic plants) is, at least for the time being, a restricting factor and therefore the species occurs only in urban green (mostly in botanical gardens). In newly invaded areas, *L. neglectus* is highly competitive with the local ant species, for it occupies all available nesting places and monopolizes trees with aphids.

In Poland, there are two recorded polydomous colonies of *L. neglectus*, both in Warsaw. Warsaw is the northernmost site of this species.

Subgenus ***Cautolasius*** Wilson, 1955

Cautolasius Wilson, 1955 (as subgenus of *Lasius*). Type species: *Formica flava* Fabricius, 1782, by original designation.

Lasius flavus (Fabricius, 1782)

Formica flava Fabricius, 1782: Schilling 1839, Siebold 1844.
Lasius flavus: Mayr 1861.
Lasius flavus var. *flavo-myops* Emery 1916b: Kulmatycki 1920a,b.
Lasius flavus var. *myops* Forel, 1894: Kulmatycki 1920b, Koehler 1951 (misidentification).

General distribution (Fig. 92). A Transpalaearctic species of the southern type of distribution.

Distribution in Poland (Fig. 92, Table VI). Baltic Coast (Wiśniewski 1980e); Pomeranian Lake District (Begdon 1932b, Engel 1938, Griep 1938, Jacobson 1940, Będziak 1956, Szujecki et al. 1978, 1983, Mazur 1983, Czechowski et al. 1995); Masurian Lake District (Begdon 1932b, Minkiewicz 1935, Wengris 1962, 1977, Bałazy and Wiśniewski 1982, Mazur 1983, Krzysztofiak 1985); Wielkopolsko-Kujawska Lowland (Kuhlgatz 1909, Kulmatycki 1920b, 1922, Begdon 1932b, Król 1957, Stawarski 1966, Pawlikowski and Sobieszczyk 1980, Wiśniewski 1980e, Bałazy and Wiśniewski 1982, Mazur 1983); Mazovian Lowland (Nasonov 1889, 1892, 1894, Jakubisiak 1948, Wiąckowski 1957, Kaczmarek 1963, Pętal 1967, 1980b, 1981, Pętal et al. 1970, Czerwiński et al. 1971, Jakubczyk et al. 1972, Czechowski 1976b, 1990a, Czechowski et al. 1995, Banaszak et al. 1978, Pisarski and Czechowski 1978, 1991, Pisarski 1981, 1982, Vepsäläinen and Pisarski 1982, Mazur 1983, Bańkowska et al. 1984, Czechowski, Czechowska and Palmowska 1990,

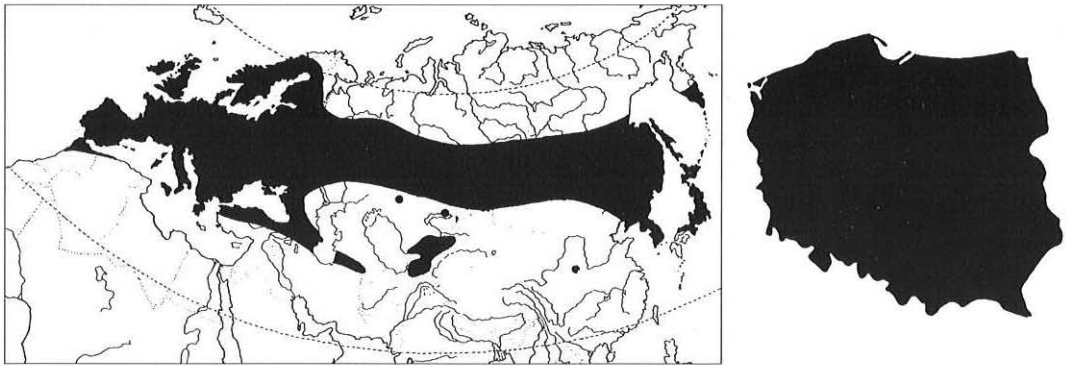


Fig. 92. Distribution of *Lasius flavus* (F.) in Palaearctic and in Poland.

Czechowski and Pisarski 1990a, Czechowski, Pisarski and Czechowska 1990, Czechowski et al. 1995); Podlasie Lowland (Pętal 1963b, 1968a, Pętal et al. 1970, Mazur 1983); Białowieska Forest (Bischoff 1925, Karpiński 1956, Czechowski et al. 1995, Czechowski 1998b); Lower Silesia (Goetsch 1942, Stawarski 1961b, 1966, Mazur 1983); Upper Silesia (Scholz 1926, Nowotny 1931a, Stawarski 1966); Krakowsko-Wieluńska Upland (Wierzejski 1873, Kulmatycki 1920a); Małopolska Upland (Kulmatycki 1920b, Puszkar 1982, Mazur 1983); Świętokrzyskie Mts (Kulmatycki 1920b, Mazur 1983, Krzysztofiak 1984); Lubelska Upland (Minkiewicz 1935, Pisarski 1953, Mazur 1983); Roztocze Upland (Kulmatycki 1920b, Pętal 1961, 1964, Mazur 1983); Sandomierska Lowland (Kulmatycki 1920a, Stawarski 1966, Puszkar 1982, Mazur 1983); Western Sudeten Mts (Letzner 1887, Scholz 1912, Stawarski 1966, Banert and Pisarski 1972); Eastern Sudeten Mts (Stawarski 1966, Banert and Pisarski 1972); Western Beskidy Mts (Kotula 1873, Wierzejski 1873, Kulmatycki 1920a, Czechowski 1990c); Eastern Beskidy Mts (Kulmatycki 1920a); Bieszczady Mts (Parapura and Pisarski 1971, Pisarski 1971, 1972, 1973, 1983, Czechowski 1975d, 1977a); Pieniny Mts (Koehler 1951, Pętal 1974, 1980b, Czechowska 1976, Woyciechowski 1985, Czechowski and Czechowska 2000b); Tatra Mts (Wierzejski 1873, Kulmatycki 1920a, J. Łomnicki 1931, Woyciechowski 1990c); «Lower Silesia and Kłodzka Land» (Schilling 1839); «Western and Eastern Prussia» (Siebold 1844, Brischke 1988b).

Biology. A ubiquistic (eurytopic) species yet preferring open and sunny habitats. The species occurs in great densities in meadows and pastures where its nests with big soil mounds render cultivation and mowing difficult. The mounds are overgrown with moss, thyme, grasses. The species also nests under stones, particularly in rocky areas. Colonies are monogynous, started independently by young queens; primary pleometrosis is frequent. *L. flavus* are entirely subterranean ants feeding mainly on the honeydew of specially raised root aphids. Nuptial flights in July and August.

In Poland, one of the commonest ant species throughout the country, including the upper prealps in the mountains.

Subgenus ***Chthonolasius*** Ruzsky, 1912

Chtonolasius Ruzsky, 1912 (as subgenus of *Lasius*). Type species: *Formica umbrata*, by subsequent designation of Emery 1925b.
Chthonolasius: Wheeler 1916 (justified emendation of spelling).

Lasius umbratus (Nylander, 1846)

Formica umbrata Nylander, 1846.
Lasius umbratus: Mayr 1861.
Lasius umbratus subsp. *umbratus*: Pisarski 1975, Czechowski 1990a, Czechowski and Pisarski 1990a, Czechowski et al. 1995.

General distribution (Fig. 93). A Transpalaearctic species of the southern type of distribution.

Distribution in Poland (Fig. 93, Table VI). Baltic Coast (Jacobson 1940); Pomeranian Lake District (Begdon 1932b, 1954, Griep 1940, Jacobson 1940, Mazur 1983, Czechowski et al. 1995); Masurian Lake District (Begdon 1932b, Wengris 1977,

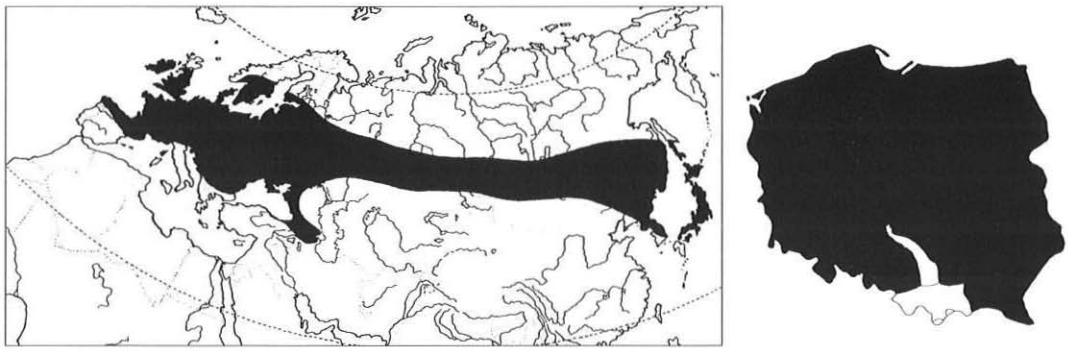


Fig. 93. Distribution of *Lasius umbratus* (Nyl.) in Palaearctic and in Poland.

Mazur 1983, Krzysztofiak 1985); Wielkopolsko-Kujawska Lowland (Kulmatycki 1932, Begdon 1932b, Stawarski 1966, Mazur 1983); Mazovian Lowland (Nasonov 1889, 1892, 1894, Jakubisiak 1948, Kaczmarek 1963, Pisarski 1981, 1982, Mazur 1983, Czechowski 1990a, Czechowski and Pisarski 1990a, Czechowski et al. 1995); Podlasie Lowland (Mazur 1983); Białowieska Forest (Karpiński 1956, Czechowski et al. 1995, Czechowski 1998b); Lower Silesia (Stawarski 1966, Mazur 1983); Upper Silesia (Scholz 1926, Nowotny 1931a, Stawarski 1966); Małopolska Upland (Mazur 1983); Świętokrzyskie Mts (Krzysztofiak 1984); Lubelska Upland (Pisarski 1953, Pętal 1961, Honczarenko 1962, Mazur 1983, Czechowski and Rotkiewicz 1997a); Roztocze Upland (Pętal 1961); Sandomierska Lowland (Stawarski 1966); Western Sudeten Mts (Stawarski 1966); Eastern Sudeten Mts (Stawarski 1966); Eastern Beskidy Mts (Radchenko, Czechowska et al. 1999b); Bieszczady Mts (Parapura and Pisarski 1971).

Biology. A politope of wet areas; lives in various habitats from forests, gardens and brushwood to moderately wet grasslands. Nests are usually built deep in the ground among the roots of trees and bushes; on the outskirts of towns it also nests at the foundations of buildings. As all the other species of this subgenus these are subterranean ants that open their nests only at the time their sexuals fly off. Nuptial flights from July to September. Temporary social parasite of species of the subgenus *Lasius* s.str., mainly of *L. niger*, more rarely of *L. alienus* and occasionally of *L. brunneus*.

In Poland, the species probably occurs throughout the country (yet so far not recorded from some southern regions); in the mountains, it reaches the lower prealps.

Lasius distinguendus (Emery, 1916)

Formicina umbrata subsp. *distinguenda* Emery, 1916a.
Formicina bicornis subsp. *distinguenda* Emery, 1916b.
Lasius umbratus subsp. *distinguenda*: Müller 1923.
Lasius umbratus subsp. *distinguendus*: Parapura and Pisarski 1971, Pisarski 1975.

General distribution (Fig. 94). Central and Southern Europe, southern part of Eastern Europe, Caucasus; data about the occurrence of this species in Siberia and the Far East need confirmation.

Distribution in Poland (Fig. 94, Table VI). Baltic Coast: Międzywodzie (island of Wolin) or Pustki ad Kamień Pomorski or Pomeranian Lake District: Pustkowie ad

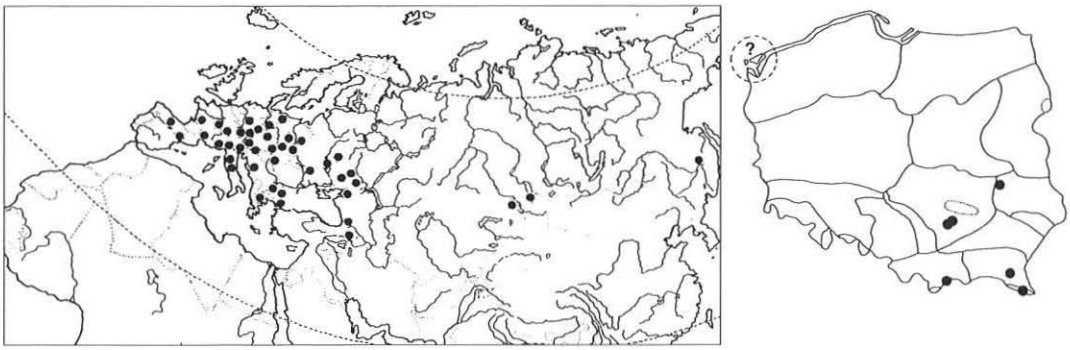


Fig. 94. Localities of *Lasius distinguendus* (Em.) in Palaearctic and in Poland (for "?" see the text).

Szczecin[8] (Radchenko, Czechowska et al. 1999b); Małopolska Upland: reserves "Grabowiec" and "Krzyżanowice" ad Pińczów (Radchenko, Czechowska et al. 1999b); Lubelska Upland: Kazimierz Dolny ad Puławy (Radchenko, Czechowska et al. 1999b); Eastern Beskidy Mts: Wułskie ad Sanok (Radchenko, Czechowska et al. 1999b); Bieszczady Mts: Wetlina (Parapura and Pisarski 1971); Pieniny Mts (Radchenko, Czechowska et al. 1999b).

Biology. An oligotope of dry grasslands, far more xerothermophilous than *L. umbratus*, its sibling species. Nests often are with high soil mounds. Temporary social parasite of species of the subgenus *Lasius* s.str., mainly of *L. alienus* abundantly co-occurring with *L. distinguendus* in its habitats. Nuptial flights in July and August.

In Poland, the species has been reported on the basis of individual finds.

Lasius meridionalis (Bondroit, 1920)

Formicina meridionalis Bondroit, 1920.
Lasius meridionalis: Emery 1922.
Lasius umbratus: Pisarski 1953 (part.) (misidentification).

General distribution (Fig. 95). A Transpalaearctic species of the southern type of distribution.

Distribution in Poland (Fig. 95, Table VI). Pomeranian Lake District: Bory Tucholskie (Szujecki et al. 1978, 1983, Mazur 1983), Gdańsk (Radchenko, Czechowska et al. 1999b); Masurian Lake District: Borecka Forest (Mazur 1983), Lisie Jamy ad Pisz (Radchenko, Czechowska et al. 1999b); Wielkopolsko-Kujawska Lowland: Krzystkowice forest inspectorate (Mazur 1983); Mazovian Lowland: Warszawa (Pisarski and Czechowski 1978, Pisarski 1981, 1982, Czechowski and Pisarski 1990a); Białowieska Forest (Czechowski et al. 1995); Lubelska Upland: Kazimierz Dolny ad Puławy (Pisarski 1953, 1975).

NB. At least some of the specimens from the Lubelska Upland, collected and determined by Pisarski (1953, 1975) as *L. meridionalis*, are in fact *L. jensi* (see Seifert 1988b).

[8] Precise identification of the locality is impossible now. "Heidebrink" given on the label is misleading because in the formerly German part of Poland there are three localities bearing that old name and these are: Międzywodzie and Pustki on the Baltic Coast and Pustkowie in the Pomeranian Lake District.

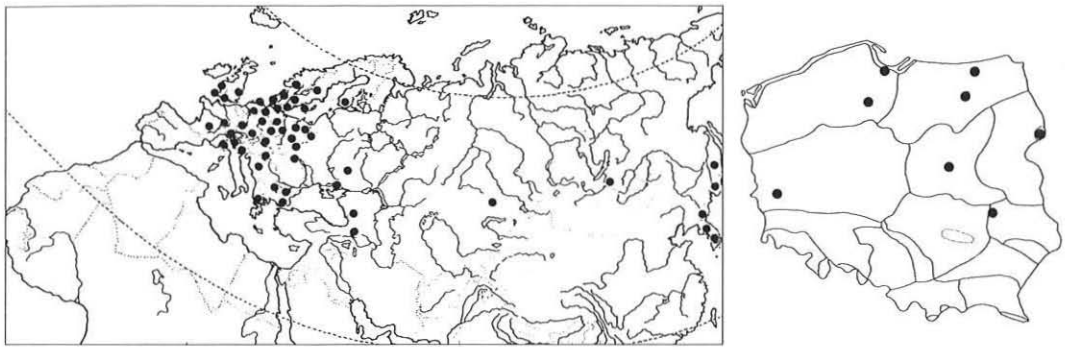


Fig. 95. Localities of *Lasius meridionalis* (Bondr.) in Palaearctic and in Poland.

Biology. An oligotope of dry grasslands. Nests are sometimes constructed with low soil mounds and with characteristic carton lined chambers. Temporary social parasite of species of the subgenus *Lasius* s.str., especially of *L. psammophilus*. Nuptial flights from mid July to early September.

In Poland, the species is recorded from isolated sites in several regions.

Lasius nitidigaster Seifert, 1996

Lasius nitidigaster Seifert, 1996, 1997.
Lasius rabaudi (Bondroit, 1917): Seifert 1988b, 1990 (part.), Radchenko, Czechowska et al. 1999b.

Note. Seifert (1988b) ascertained that queens and workers of *Lasius rabaudi* differ well from those of other species of *Chthonolasius* in very sparce decumbent pubescence of gastral tergites. Later, however, basing on morphometric differences of the holotype queen of *L. rabaudi* from queens that he had earlier recognized as *L. rabaudi*, he described a new species, *Lasius nitidigaster*, and noted that "*Lasius rabaudi* is so far known only by the type queen from Amélie-les-Bains/E Pyrenees" (Seifert 1997: 202). This type specimen is stored in the Royal Institute of Natural Sciences of Belgium in Brussels. In fact, it can not be excluded that these two closely related southern-European forms are distributed in the south-western (*rabaudi*) and in the south-eastern (*nitidigaster*) part of their common range. In our opinion, however, more data are indispensable (especially queens and males of "true" *L. rabaudi*) to solve this problem finally.

The formal description of *L. nitidigaster* was published in 1997, but this name (with diagnosis of workers and queens in a key) had appeared earlier in a book by the same author (Seifert 1996). So, the name of the species has to be cited as *L. nitidigaster* Seifert, 1996.

General distribution (Fig. 96). Southern Europe and southern parts of Central Europe (apart from Poland, the species is known from some localities in Bulgaria, Austria, Slovakia, and Moravia).

Distribution in Poland (Fig. 96, Table VI). Lubelska Upland: Kazimierz Dolny ad Puławy (Radchenko, Czechowska et al. 1999b).

Biology. A little known species, an oligotope of dry grasslands. Nests, frequently with earth mounds of different size, without carton-like inner structures seen in some other *Chthonolasius* species. Alates (in the nests) were found from mid June till early September with the bulk between mid July and late August.

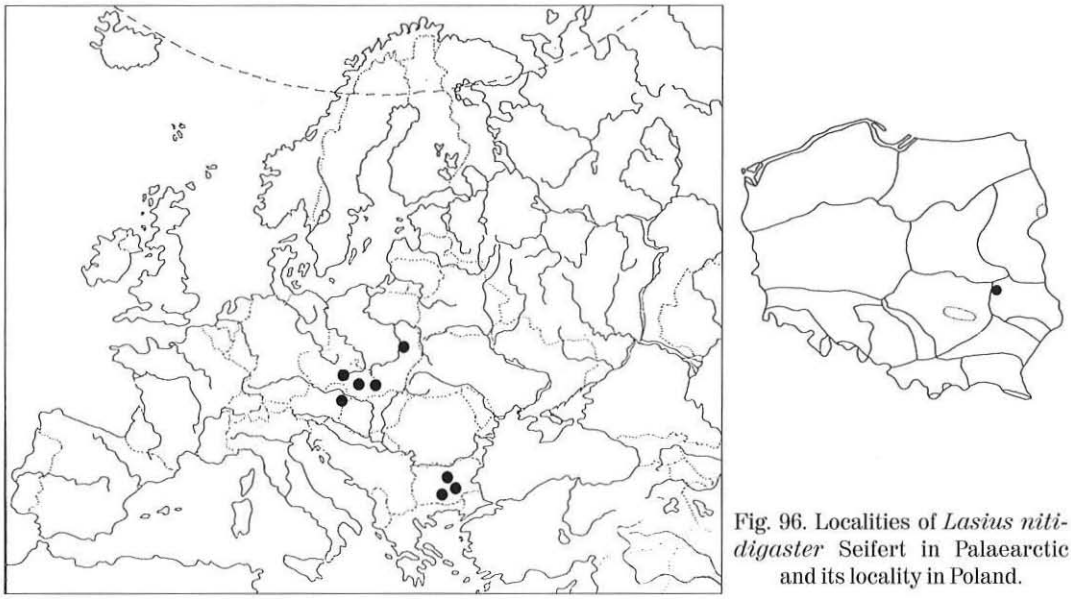


Fig. 96. Localities of *Lasius nitidigaster* Seifert in Palaearctic and its locality in Poland.

From Poland, *L. nitidigaster* is reported basing on one series of workers collected in the Lubelska Upland. This locality is the northernmost one for this species.

Lasius jensi Seifert, 1982

Lasius jensi Seifert, 1982: Radchenko, Czechowska et al. 1999b.
Lasius meridionalis: Pisarski 1953, 1975 (part.) (misidentification, material examined).

General distribution (Fig. 97). Central Europe, Balkans, southern part of Eastern Europe, northern Kazakhstan.

Distribution in Poland (Fig. 97, Table VI). Baltic Coast: Gardno (island of Wolin) (Radchenko, Czechowska et al. 1999b); Lubelska Upland: Kazimierz Dolny ad Puławy (Pisarski 1953, 1975, Seifert 1988b, Radchenko, Czechowska et al. 1999b); Pieniny Mts (Radchenko, Czechowska et al. 1999b).

Biology. A stenotope of xerothermal habitats especially on limestone substratum, less frequently on sandy substratum. It is one of the most thermophilous species of the subgenus *Chthonolasius*. Nests are with carton lined chambers and occasionally with

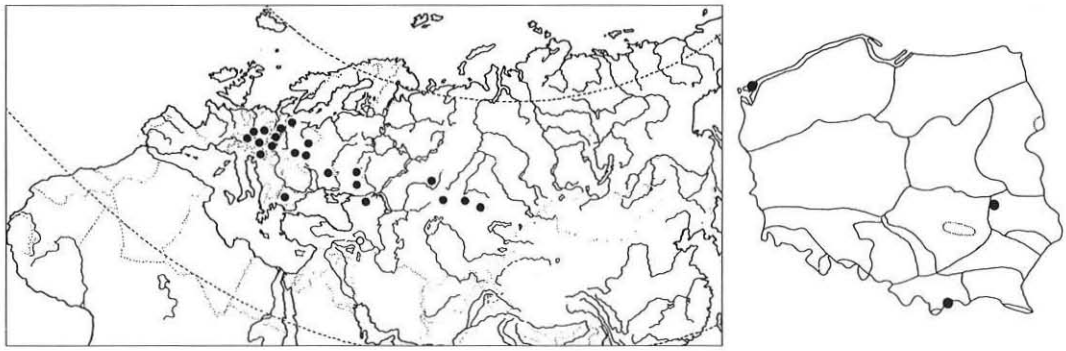


Fig. 97. Localities of *Lasius jensi* Seifert in Palaearctic and in Poland.

soil mounds. *L. alienus* is the main (or possibly the only) victim of its temporary social parasitism. Mating period from mid July to early September.

In Poland, the species has been recorded from three separate sites.

Lasius citrinus Emery, 1922

Lasius bicornis var. *citrina* Emery, 1922.
Lasius citrinus: Seifert 1990.
Lasius affinis (Schenck, 1852): Karpiński 1956, Pętal 1961, 1974, 1980b, Parapura, Pisarski 1971, Pisarski 1975, Radchenko, Czechowska et al. 1999b.

Note. Seifert (1990) synonymized *L. affinis* (Schenck, 1852) (originally described in the genus *Formica*) with *L. citrinus* Emery. Since the name *L. affinis* is preoccupied (a junior primary homonym of *Formica affinis* Leach, 1825), the first available replacement name is *L. citrinus* Emery (for details see Seifert 1990: 7).

General distribution (Fig. 98). A Transpalaearctic species of the southern type of distribution.

Distribution in Poland (Fig. 98, Table VI). Pomeranian Lake District: Wilczy Dół ad Gorzów Wielkopolski, Szczecin (Radchenko, Czechowska et al. 1999b); Białowieska Forest (Karpiński 1956); Małopolska Upland: reserve "Krzyżanowice" ad Pińczów (Radchenko, Czechowska et al. 1999b); Roztocze Upland: Bukowa Góra ad Zamość (Pętal 1961); Bieszczady Mts: Ustrzyki Górne (Parapura and Pisarski 1971); Pieniny Mts (Pętal 1974, 1980b).

Biology. An oligotope of deciduous forests. Thermophilous species mainly inhabiting sunny forest edges. The species nests in rotting logs and tree stumps, but also in the ground. Hardly anything is known about its biology. *L. brunneus* is a probable host species.

In Poland, *L. citrinus* has been reported from a few individual sites, in most cases on the basis of alate sexuals.

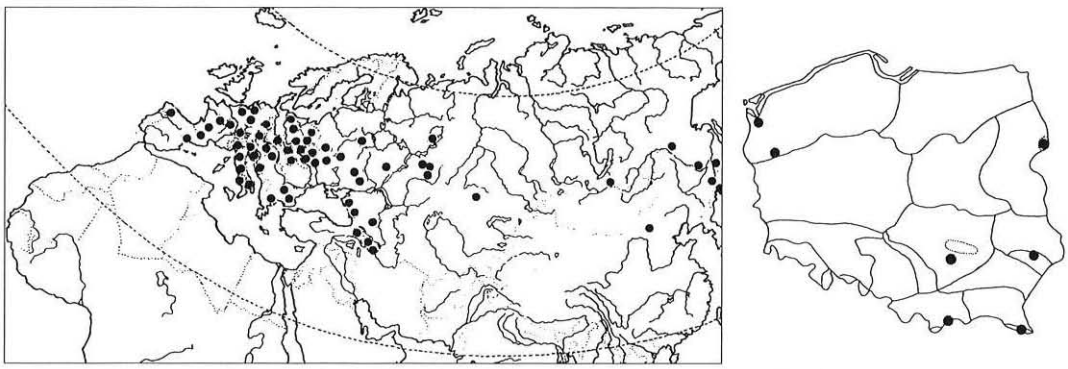


Fig. 98. Localities of *Lasius citrinus* Em. in Palaearctic and in Poland.

Lasius mixtus (Nylander, 1846)

Formica mixta Nylander, 1846.
Lasius mixtus: Mayr 1861.
Lasius umbratus r. *mixtus*: Kulmatycki 1920b.
Lasius umbratus mixtus var. *mixto-umbrata*: Kulmatycki 1922 (unavailable name).

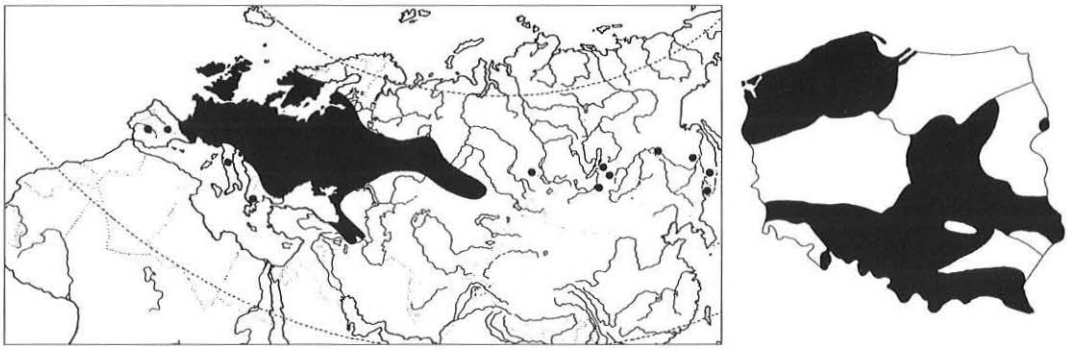


Fig. 99. Distribution of *Lasius mixtus* (Nyl.) in Palaearctic and in Poland.

General distribution (Fig. 99). A Transpalaearctic species, distributed mainly in the forest natural zone.

Distribution in Poland (Fig. 99, Table VI). Baltic Coast (Kulmatycki 1922); Pomeranian Lake District (Jacobson 1940); Mazovian Lowland (Nasonov 1892, Pisarski 1981, 1982); Białowieska Forest (Karpiński 1956, Czechowski et al. 1995); Lower Silesia (Stawarski 1966); Upper Silesia (Nowotny 1931a, Stawarski 1966); Krakowsko-Wieluńska Upland: Ojcowski National Park (W. Czechowska, unpubl. data); Małopolska Upland (Kulmatycki 1920b); Lubelska Upland (Pisarski 1953); Eastern Sudeten Mts (Banert and Pisarski 1972); Western Beskidy Mts (Radchenko, Czechowska et al. 1999b); Eastern Beskidy Mts (Radchenko, Czechowska et al. 1999b); Bieszczady Mts (Parapura and Pisarski 1971, Radchenko, Czechowska et al. 1999b); Pieniny Mts (Koehler 1951); Tatra Mts (Radchenko, Czechowska et al. 1999b); «Western and Eastern Prussia» (Brischke 1988b).

Biology. The ecological requirements of this species are similar to those of *L. umbratus* though *L. mixtus* prefers open habitats (meadows, pastures). It nests just like *L. umbratus*, but its nests occassionally are with soil mounds. The species is a temporary social parasite of species of the subgenus *Lasius* s.str., especially (and maybe only) of *L. psammophilus*. Dealate queens appear in the field in September, but spend some time in hiding; they search for host nests on warm autumn days, or even on winter days (from November), and in early spring.

In Poland, the species is fairly rare but widely distributed; it does not occur in the upper parts of the mountains.

Lasius bicornis (Förster, 1850)

Formica bicornis Förster, 1850.
Lasius bicornis: Mayr 1861, Kulmatycki 1922, Radchenko, Czechowska et al. 1999b.

General distribution (Fig. 100). Central and Southern Europe, southern part of Eastern Europe, Caucasus; reported also from southern Sweden.

Distribution in Poland (Fig. 100, Table VI). Wielkopolsko-Kujawska Lowland: Brudzyń ad Żnin (Kulmatycki 1922); Mazovian Lowland: Nieborów ad Łowicz (Radchenko, Czechowska et al. 1999b); Małopolska Lowland: reserve "Krzyżanowice" ad Pińczów (Radchenko, Czechowska et al. 1999b).

Biology. An oligotope of deciduous forests. The species nests in rotting logs and in dead parts of living trees. Its biology is not known.

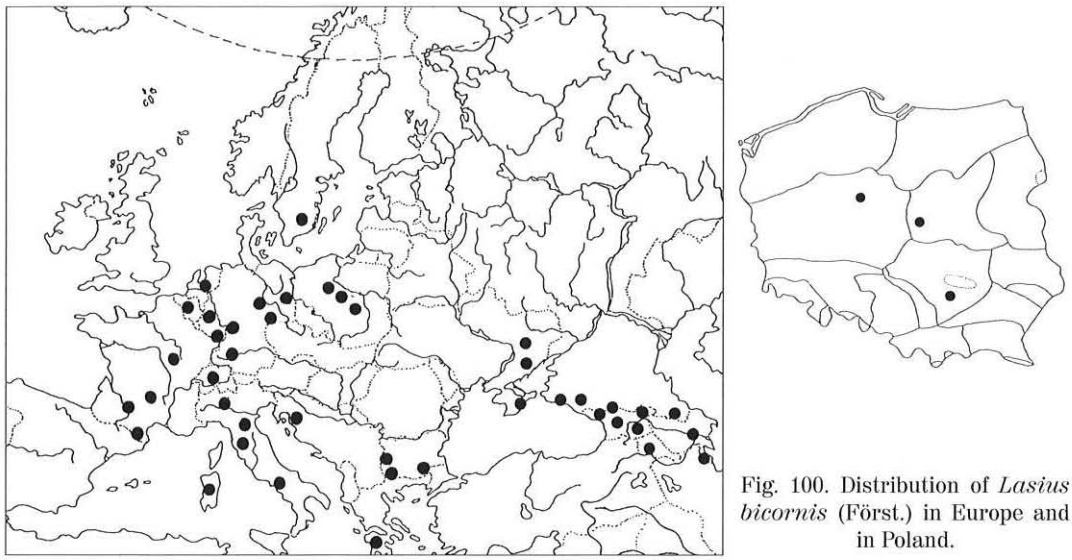


Fig. 100. Distribution of *Lasius bicornis* (Först.) in Europe and in Poland.

In Poland, the species is known on the basis of three finds with the latest two referring to alate sexuals. Pisarski (1975), having at his disposal only the Kulmatycki's report and the contemporary data on the general distribution of this species, called in question the possibility of its occurring in Poland.

Subgenus ***Dendrolasius*** Ruzsky, 1912

Dendrolasius Ruzsky, 1912 (as subgenus of *Lasius*). Type species: *Formica fuliginosa* Latreille, 1798, by monotypy.

Lasius fuliginosus (Latreille, 1798)

Formica fuliginosa Latreille, 1798: Schilling 1839, Siebold 1844, Runge 1870.
Lasius fuliginosus: Mayr 1861.

General distribution (Fig. 101). An Amphipalaearctic species, distributed in Europe, Caucasus, south part of Western Siberia, northern Kazakhstan, Russian part of Far East, north-eastern China, Korea, and Japan.

Distribution in Poland (Fig. 101, Table VI). Baltic Coast (Kulmatycki 1922);

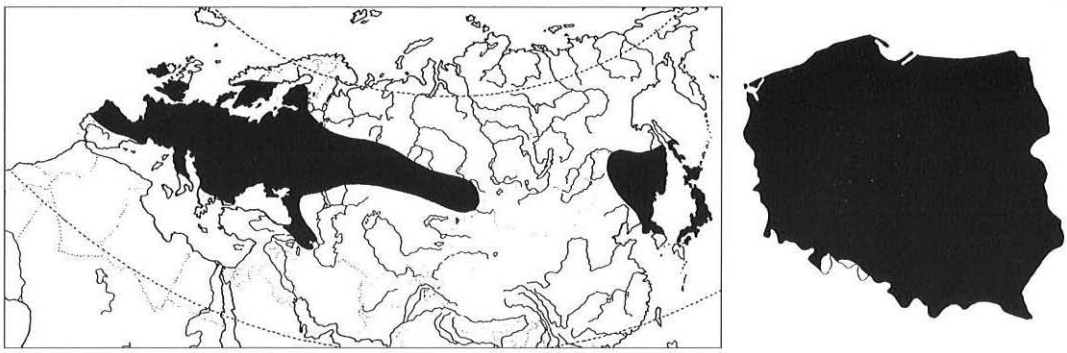


Fig. 101. Distribution of *Lasius fuliginosus* (Latr.) in Palaearctic and in Poland.

Pomeranian Lake District (Begdon 1932b, Griep 1938, Jacobson 1940, Będziak 1956, Mazur 1983, Szujecki et al. 1983); Masurian Lake District (Begdon 1932b, Wengris 1962, 1964, 1977, Dobrzańska 1966, Mazur 1983, Krzysztofiak 1985); Wielkopolsko-Kujawska Lowland (Runge 1870, Kulmatycki 1922, Begdon 1932b, 1954, Stawarski 1966, Kiełczewski and Wiśniewski 1971, Mazur 1983); Mazovian Lowland (Nasonov 1892, 1894, Jakubisiak 1948, Wiąckowski 1957, Kaczmarek 1963, Dobrzańska 1966, Pisarski and Czechowski 1978, Pisarski 1981, 1982, Mazur 1983, Bańkowska et al. 1984, Czechowski 1990a, Czechowski, Czechowska and Palmowska 1990, Czechowski and Pisarski 1990a,b, Czechowski, Pisarski and Czechowska 1990, Czechowski et al. 1995)); Podlasie Lowland (Pętal 1968a, Mazur 1983); Białowieska Forest (Bischoff 1925, Karpiński 1956, Czechowski et al. 1995, Czechowski 1998b); Lower Silesia (Kotzias 1930a, Herzig 1937, Stawarski 1966); Upper Silesia (Scholz 1926, Nowotny 1931a, Stawarski 1966); Krakowsko-Wieluńska Upland (Kotula 1873, Wierzejski 1873, Kulmatycki 1920a, Kaczmarek 1953); Małopolska Upland (Kulmatycki 1920b, Mazur 1983); Świętokrzyskie Mts (Kulmatycki 1920b, Krzysztofiak 1984); Lubelska Upland (Minkiewicz 1935, Pisarski 1953, Begdon 1954, Puszkar 1978, 1982, Mazur 1983); Roztocze Upland (Tenenbaum 1913, Kulmatycki 1920b, Pętal 1961, Mazur 1983); Sandomierska Lowland (Kulmatycki 1920a, Stawarski 1966); Western Sudeten Mts (Stawarski 1966, Banert and Pisarski 1972); Western Beskidy Mts (Kotula 1873, Kulmatycki 1920a); Eastern Beskidy Mts (Kulmatycki 1920a, Begdon 1954); Bieszczady Mts (Radchenko, Czechowska et al. 1999b); Pieniny Mts (Koehler 1951, Czechowska 1976); Tatra Mts (Wierzejski 1873, J. Łomnicki 1931); «Lower Silesia and Kłodzka Land» (Schilling 1839); «Western and Eastern Prussia» (Siebold 1844, Brischke 1888b).

Biology. A dendrophilous species, an oligotope of deciduous forests but found in mixed or even coniferous forests, also in parks and old orchards. The species nests in cavities under the trunk and roots of or in holes at the base of usually living trees of different species (deciduous and coniferous ones), occasionally in the walls of wooden buildings. The empty spaces are filled with carton nests of chewed wood impregnated with honeydew. Colonies very populous, often polygynous and polycalic. Foraging workers form long and narrow trails leading to aphids on bushes and trees; large parts of these trails often run in underground tunnels. These ants feed not only on honeydew but on tiny soft insects as well (a high proportion of their food frequently consists of other ants' brood). Temporary social parasite; young queens start new colonies in nests of species of the subgenus *Chthonolasius*. Mating periods irregular; nuptial flights may occur from May to October.

In Poland, the species occurs throughout the country (yet so far not recorded from the Eastern Sudeten Mts) except the high mountains

Species excluded from the list of the Polish fauna

Apart from the above-discussed 98 ant species whose presence in Poland is certain or, at least, may be considered possible, in the literature there are reports on 13 more species which, for different reasons, ought to be taken off the list of the Polish myrmecofauna. They are:

Stenamma westwoodi Westwood, 1840. A species first reported from almost the entire area of Poland, and then, as a result of a taxonomic revision of the species, automatically replaced with *S. debile* (Först.); see p. 38.

Leptothorax (*Temnothorax*) *recedens* (Nylander, 1856). A species reported from the Mazovian Lowland by Nasonov (1892), no doubt on the basis of misidentification. It is known from the Mediterranean region and from central Asia and Asia Minor, and its occurrence in Poland is out of the question.

Leptothorax (*Leptothorax*) *nigrescens* Ruzsky, 1905. A species reported from several sites in Poland as a separate species, in accordance with the then systematics (see Pisarski 1975). Later synonymized with *L. acervorum* (F.) by Collingwood (1971) and Radchenko (1995a).

Leptothorax (*Myrafant*) *bulgaricus* Forel, 1892. A species mistakenly reported from the Pieniny Mts by Czechowska (1976) and Woyciechowski (1985) basing on misidentification of *L. nadigi* Kutter; see p. 55 and Czechowska et al. (1998).

Tetramorium guineense (Fabricius, 1793). A species mistakenly reported from Poland (from a hothouse) by Pisarski (1957) basing on taxonomic misconception and misidentification of *T. insolens* (F. Sm.); see p. 68 and Radchenko, Czechowski and Czechowska (1999a).

Tetramorium simillimum (F. Smith, 1851). A species mistakenly reported from Poland (from a hothouse) by Roger (1857) basing on taxonomic misconception and misidentification of *T. caldarium* (F. Sm.); see p. 68 and Radchenko, Czechowski and Czechowska (1999a).

Acantholepis frauenfeldi (Mayr, 1861). A species mistakenly reported from Warsaw by Nasonov (1892) on the basis of misidentification of received museum specimens of *L. niger* (L.); see Pisarski (1975). It inhabits Greece and Dalmatia; its occurrence in Poland is out of the question.

Camponotus (*Tanaemyrmex*) *aethiops* (Latreille, 1798). A species reported, most probably on the basis of misidentification, from the Białowieska Forest and from one vague locality in «Western and Eastern Prussia»; see Pisarski 1975. The range of this species includes Southern Europe, the southern part of Eastern Europe, the northwestern part of Africa, the Caucasus, Asia Minor, Israel, Lebanon, Iraq, Syria, Iran, Afganistan, central Asia, and Kazakhstan. Reports on its occurrence in the northern part of Poland are not credible.

Camponotus (*Myrmentoma*) *lateralis* (Olivier, 1792). A species reported from Wrocław by Stitz (1939) and from one vague locality in «Western and Eastern Prussia» by Brischke (1888b). This is a Mediterranean species for whom the Carpathians are the northern boundary of its limit. Therefore, its occurrence in Poland is hardly possible.

Lasius (*Cautolasius*) *myops* Forel, 1894. The form first reported from Poland as *L. flavus myops* For. by Koehler (1951) from the Pieniny Mts, but later, in accordance with the then systematics, synonymised by Pisarski (1975) with *L. flavus* (F.). Later it was recognized as a separate species by Kutter (1977) and Seifert (1983). Although it is conceivable that the true *L. myops* occurs in Poland, no specimen of this species has been found in all the museum collections of *Lasius* ants from Poland, including the rich material from the Pieniny Mts. Most probably, Koehler's specimens were small-eyed *L. flavus* individuals.

Lasius (*Chthonolasius*) *rabaudi* Bondroit, 1917. A species mistakenly reported from the Lubelska Upland by Radchenko, Czechowska et al. (1999b) basing on misidentification of *L. nitidigaster* Seifert; see p. 113 and Czechowski et al. (2001).

Lasius (*Austrolasius*) *carniolicus* Mayr, 1861. A species reported from Poland by Wilson (1955) on the basis of misinterpretation of museum specimen labels (see

Pisarski 1975). However, the geographical range of this (southern-)Transpalaearctic species suggests that its presence in Poland is quite possible; it is sporadically found in whole Europe and across Southern Siberia to the Far East.

Formica (*Serviformica*) *gagates* Latreille, 1798. A species reported from the Tatra Mts by Nowicki (1864) and Wierzejski (1873), no doubt on the basis of misidentification of *F. lemani* Bondr. (see Dlussky, Pisarski 1971). In Poland, the occurrence of this Mediterranean species is hardly possible.

Cataglyphis (*Cataglyphis*) *viaticus* (Fabricius, 1787). An Iberian species, vaguely (and not credibly) reported from «Silesia» by Weigel (1806).

Characteristic and regional diversity of the myrmecofauna

Species richness and composition

The 98 ant species, including 93 outdoor species, in the fauna of Poland form a big number in comparison with the circa 600 species occurring throughout Europe. In two neighbouring countries, namely in Germany and in Ukraine, both well-studied in the myrmecological respect, bigger than Poland and physiographically more varied (steppes and Crimea in Ukraine!), the number of known ant species is 110 (Seifert 1996) and about 140 respectively. For the sake of comparison: merely about 60 species have been recorded from Belarus, and about 100 from the Czech Republic and Slovakia together.

It seems unlikely that any more than just a few new outdoor ant species will ever be recorded from Poland as a whole, but the situation looks different if particular geographic regions of the country are considered. In the Polish myrmecofauna there is a great proportion of rare species: genuinely rare ones, those overrecorded due to their cryptic habits or little known ones which have been separated from other species in the course of recent taxonomic revisions. As many as 14 species (15% of the myrmecofauna[9]) are known from one site only (*Myrmica hirsuta*, *Aphaenogaster subterranea*, *Leptothorax albipennis*, *L. nylanderi*, *L. sordidulus*, *L. nadigi*, *Doronomyrmex kutteri*, *Epimyrma ravouxi*, *Formica glauca*, *F. uralensis*, *F. forsslundi*, *Camponotus piceus*, *Lasius neglectus*, *L. nitidigaster*) and 18 other species (19%) from 2–5 sites, most of which are situated in different regions of the country (*Tapinoma ambiguum*, *Myrmica microrubra*, *M. hellenica*, *M. karavajevi*, *Messor structor*, *Leptothorax gredleri*, *L. nigriceps*, *L. interruptus*, *L. parvulus*, *L. affinis*, *L. clypeatus*, *Formica lugubris*, *F. aquilonia*, *F. foreli*, *Lasius paralienus*, *L. psammophilus*, *L. jensi*, *L. bicornis*). It is true that almost half of these rarities are stenotopic species which require a very specific type of habitat, but most of them are forms with a wide ecological amplitude (see Table III) that require habitats undoubtedly present in other regions as well. Further (profound) regional faunistic studies are likely to enrich considerably the wealth of knowledge about many local myrmecofaunas.

The core of the Polish myrmecofauna is made by common species occurring all over the country or in most of it. At present, there are 11 species (12% of the myrmecofau-

[9] All the estimates in this chapter have been based on the number of outdoor species.

na; *Myrmica rubra*, *M. ruginodis*, *M. rugulosa*, *M. sabuleti*, *Tetramorium caespitum*, *Formica rufa*, *F. polyctena*, *F. truncorum*, *F. sanguinea*, *Lasius niger*, *L. flavus*) recorded from all geographical regions. There is little doubt that it will be just a matter of time before at least nine more species (*Myrmica lobicornis*, *M. scabrinodis*, *Leptothorax acervorum*, *L. muscorum*, *Formica cinerea*, *Camponotus ligniperdus*, *Lasius platythorax*, *L. brunneus*, *L. fuliginosus*) are added to the list. It is probable that five other species (*Myrmica schencki*, *Formica pratensis*, *F. rufibarbis*, *F. cunicularia*, *F. fusca*) are absent, at most, only from the Tatra Mts.

According to current data, 43 species (46%) occur in at least ten geographical regions (subregions) of Poland. Under the arbitrarily adopted frequence criteria (see Table I), these are absolutely constant (11 species), constant (17) and relatively constant forms (15). There are 24 accessory and 26 accidental forms (Table I). The myrmecofaunas of particular regions comprise from 26 (Eastern Sudeten Mts) to 63 reported species (Pieniny Mts). The species richness of ants in the lowland zone (regions 1–7 and subregion 6a), in the upland one (regions 8–12) and in the mountainous one (regions 14–20 and subregion 10a; see Fig. 1 and Table VI) are almost identical: 76 reported species (82% of the Polish myrmecofauna), 74 (80%) and 76 (82%) respectively.

The recently published (Pisarski 1994) picture of the regional species diversity of ants in Poland is based on the author's posthumous data from the early 1970s. However, this diversity has been significantly reduced since then as a result of very numerous subsequent faunistic finds.

Table I. Constancy of occurrence of particular ant species in Polish zoogeographical regions

Class	Species
Absolutely constant (all the 22 regions)	*Myrmica rubra, M. ruginodis, M. rugulosa, M. sabuleti, Tetramorium caespitum, Formica rufa, F. polyctena, F. truncorum, F. sanguinea, Lasius niger, L. flavus*
Constant (21–16 regions)	*Myrmica lobicornis, M. scabrinodis, M. schencki, Leptothorax acervorum, L. muscorum, L. crassispinus, Formica pratensis, F. fusca, F. cinerea, F. rufibarbis, F. cunicularia, Camponotus ligniperdus, Lasius platythorax, L. brunneus, L. alienus, L. umbratus, L. fuliginosus*
Relatively constant (15-10 regions)	*Dolichoderus quadripunctatus, Myrmica gallienii, Manica rubida, Stenamma debile, Formicoxenus nitidulus, Solenopsis fugax, Myrmecina graminicola, Strongylognathus testaceus, Formica candida, F. exsecta, F. pressilabris, Polyergus rufescens, Camponotus herculeanus, C. fallax, Lasius mixtus*
Accessory (9-4 regions)	*Ponera coarctata, Tapinoma erraticum, T. ambiguum, Myrmica sulcinodis, M. hellenica, M. specioides, M. lonae, M. karavajevi, Leptothorax tuberum, L. unifasciatus, L. nigriceps, L. parvulus, L. corticalis, Harpagoxenus sublaevis, Tetramorium impurum, Anergates atratulus, Formica lemani, Camponotus vagus, Lasius emarginatus, L. paralienus, L. psammophilus, L. distinguendus, L. meridionalis, L. citrinus*
Accidental (≤ 3 regions)	*Myrmica microrubra, M. hirsuta, Aphaenogaster subterranea, Messor structor, Leptothorax gredleri, L. albipennis, L. interruptus, L. nylanderi, L. sordidulus saxonicus, L. affinis, L. nadigi, L. clypeatus, Doronomyrmex kutteri, Epimyrma ravouxi, Tetramorium moravicum, Formica lugubris, F. aquilonia, F. glauca, F. uralensis, F. forsslundi, F. foreli, Camponotus piceus, Lasius neglectus, L. nitidigaster, L. jensi, L. bicornis*

Table II. Qualitative similarities (Sörensen index; %) of the myrmecofauna of particular geographical regions in Poland (1 – Baltic Coast, 2 – Pomeranian Lake District, 3 – Masurian Lake District, 4 – Wielkopolsko-Kujawska Lowland, 5 – Mazovian Lowland, 6 – Podlasie Lowland, 6a – Białowieska Forest, 7 – Lower Silesia, 8 – Upper Silesia, 9 – Krakowsko-Wieluńska Upland, 10 – Małopolska Upland, 10a – Świętokrzyskie Mts, 11 – Lubelska Upland, 12 – Roztocze Upland, 13 – Sandomierska Lowland, 14 – Western Sudeten Mts, 15 – Eastern Sudeten Mts, 16 – Western Beskidy Mts, 17 – Eastern Beskidy Mts, 18 – Bieszczady Mts, 19 – Pieniny Mts, 20 – Tatra Mts)

Region	1	2	3	4	5	6	6a	7	8	9	10	10a	11	12	13	14	15	16	17	18	19	20	Mean
1		75	73	71	72	74	71	73	69	67	73	68	73	67	71	59	66	71	75	73	67	56	**70**
2	75		82	84	87	82	79	77	77	75	74	75	82	80	75	67	58	68	64	75	69	54	**74**
3	73	82		85	80	82	82	80	73	71	73	80	77	80	83	72	66	71	67	80	60	59	**75**
4	71	84	85		86	77	80	72	75	73	83	75	83	80	82	67	60	73	67	75	65	51	**74**
5	72	87	80	86		75	76	71	76	76	83	76	84	74	72	65	58	67	61	72	74	49	**73**
6	74	82	82	77	75		74	76	67	70	69	74	70	77	77	65	70	69	71	74	64	59	**72**
6a	71	79	82	80	76	74		77	69	69	77	77	77	80	80	69	60	68	64	78	64	65	**73**
7	73	77	80	72	71	76	77		82	80	70	84	70	75	73	68	71	75	72	78	65	67	**74**
8	69	77	73	75	76	67	69	82		82	77	80	75	78	78	70	61	76	65	71	73	63	**73**
9	67	75	71	73	76	70	69	80	82		73	80	75	74	69	67	64	76	68	69	75	60	**72**
10	73	74	73	83	83	69	77	70	77	73		74	86	81	81	67	58	73	67	73	76	52	**73**
10a	68	75	80	75	76	74	77	84	80	80	74		77	78	80	70	66	73	64	75	64	56	**74**
11	73	82	77	83	84	70	77	70	75	75	86	77		75	77	65	54	67	63	71	75	49	**73**
12	67	80	80	80	74	77	80	75	78	74	81	78	75		85	70	60	69	65	76	68	55	**74**
13	71	75	83	82	72	77	80	73	78	69	81	80	77	85		72	63	73	70	78	63	59	**74**
14	59	67	72	67	65	65	69	68	70	67	67	70	65	70	72		70	69	59	72	62	66	**67**
15	66	58	66	60	58	70	60	71	61	64	58	66	54	60	63	70		75	70	78	56	64	**64**
16	71	68	71	73	67	69	68	75	76	76	73	73	67	69	73	69	75		67	78	75	71	**72**
17	75	64	67	67	61	71	64	72	65	68	67	64	63	65	70	59	70	67		72	57	55	**66**
18	73	75	80	75	72	74	78	78	71	69	73	75	71	76	78	72	78	78	72		73	68	**74**
19	67	69	60	65	74	64	64	65	73	75	76	64	75	68	63	62	56	75	57	73		56	**67**
20	56	54	59	51	49	59	65	67	63	60	52	56	49	55	59	66	64	71	55	68	56		**59**

The widespread occurrence of numerous common species – coupled with a largely haphazard distribution of the known sites of rare forms – is reflected in the height and distribution of the values of the species composition similarity between the myrmecofaunas of particular regions and geographical zones of Poland. These values are generally very high and differ relatively little. In the case of particular regions they range from 49% (Mazovian Lowland/Tatra Mts and Lubelska Upland/Tatra Mts) to 87% (Pomeranian Lake District/Mazovian Lowland), and in most cases they exceed 70% (Table II); the mean similarity of the regional myrmecofaunas (calculated as "each with everyone") is 71%. The myrmecofauna of the Masurian Lake District has the highest greatest figure (75%) for the mean similarity to the myrmecofaunas of other regions. Thus, the myrmecofauna of this regio may be considered the most "representative" of the entire Polish myrmecofauna. On the other hand, the smallest average similarity (59%) is found in the myrmecofauna of the Tatra Mts, the highest mountain range in Poland.

The mean similarity of the species composition of ants within the group of the lowland regions is 77%, within the group of the upland regions – 78%, and within that of the mountainous ones – 67%. It can be said, therefore, that the mountainous zone is the geographical zone of the most regionally diversified myrmecofauna in Poland, whereas the upland zone is that of the most unified myrmecofauna. On the other side, however, the similarity between the myrmecofaunas of the Polish lowland, upland and mountainous zones to each other is very high: lowlands/uplands – 85%, lowlands/mountains – 87%, uplands/mountains – 84%.

Zoogeographical composition

The zoogeographical classification of the ant species composing the Polish myrmecofauna (Table III) has been made on the basis of their present distribution in the Palaearctic. The association of a given species with a natural zoogeographical zone determined by the history of the development of the fauna on the one hand and by the ecological requirements of the species on the other is the essence of this classification. The 93 species included are those occurring in Poland in natural habitats; foreign forms (*Hypoponera punctatissima*, *Linepithema humile*, *Monomorium pharaonis*, *Tetramorium insolens*, *T. caldarium*), artificially introduced and able to survive winter only in heated premises, have been disregarded.

In respect of their origin and distribution native ant species occurring in Poland belong to three main zoogeographical classes corresponding to three main vegetation zones in the Palaearctic, namely I) coniferous forest (taiga) zone, II) mixed and deciduous forest zone, III) Mediterranean zone sensu lato (comprising the Mediterranean region proper, extended eastwards along parallels of latitude to include the southern part of the Palaearctic up to the Tien Shan and the Pamirs). Within each zone there appear certain types of species ranges, corresponding to concrete zoogeographical elements. The following elements are represented in the myrmecofauna of Poland:

I. Class of the coniferous forest (taiga) zone

1) Boreo-montane element – species distributed mainly in the northernmost regions of the Palaearctic (the taiga zone), but also occurring in the mountains of Europe, Caucasia and Central Asia;

Table III. Zoogeographical and ecological classification of ant species of Poland (zoogeographical elements: AP – Amphipalaearctic, NP – North-Transpalaearctic, SP – South-Transpalaearctic, ES – Euro-Siberian, E – European, NE – North-European, CE – Central-European, EC – Euro-Caucasian, SE – South-European, MD – Mediterranean, BM – boreo-montane, M – montane, St – steppe, i – introduced artificially; ecological elements: E – eurytopic, P – polytopic, O – oligotopic, S – stenotopic) ("+" denotes that: in the case of an open habitat polytope the species enters some wooded habitats, too; in the case of a forest polytope the species enters some open habitats, too; in the case of a deciduous forest oligotope the species enters some mixed and coniferous forests, too; in the case of a coniferous forest oligotope the species enters some mixed and deciduous forests, too

No.	Species	Zoogeograhical element	Ecological element	Habitats required
1	2	3	4	5
1	*Ponera coarctata*	MD	O	Dry grasslands and forests
2	*Hypoponera punctatissima*	i	?	Synanthrope
3	*Dolichoderus quadripunctatus*	ES	O	Deciduos forests+
4	*Tapinoma erraticum*	MD	S	Xerothermal grasslands
5	*Tapinoma ambiguum*	SE	S	Xerothermal grasslands
6	*Linepithema humile*	i	?	Synanthrope
7	*Myrmica rubra*	NP	E	Ubiquist
8	*Myrmica microrubra*	E ?	E	Ubiquist
9	*Myrmica ruginodis*	NP	P	Forests
10	*Myrmica sulcinodis*	BM	O	Mountain meadows
11	*Myrmica lobicornis*	BM	O	Coniferous forests and mountain meadows
12	*Myrmica rugulosa*	ES	O	Dry grasslands
13	*Myrmica gallienii*	ES	O	Humid grasslands
14	*Myrmica hellenica*	CE	O	Dry grasslands
15	*Myrmica specioides*	CE	O	Dry grasslands
16	*Myrmica scabrinodis*	ES	P	Humid habitats
17	*Myrmica sabuleti*	ES	O	Dry grasslands and forests
18	*Myrmica lonae*	ES	S	Humid patches in xerothermal habitats
19	*Myrmica hirsuta*	CE	O	Dry grasslands and forests
20	*Myrmica schencki*	SP	O	Dry grasslands and forests
21	*Myrmica karavajevi*	E	P	Humid habitats
22	*Manica rubida*	M	S	Xerothermal grasslands
23	*Aphaenogaster subterranea*	MD	O	Deciduous forests
24	*Messor structor*	MD	S	Xerothermal grasslands

Table III. Continued

1	2	3	4	5
25	*Stenamma debile*	EC	O	Deciduous forests+
26	*Formicoxenus nitidulus*	NP	O	Coniferous forests+
27	*Leptothorax acervorum*	BM	O	Coniferous forests+
28	*Leptothorax muscorum*	BM	O	Coniferous forests+ and mountain meadows
29	*Leptothorax gredleri*	CE	O	Deciduous forests+
30	*Leptothorax tuberum*	ES	P	Forests
31	*Leptothorax unifasciatus*	EC	O	Deciduous forests+
32	*Leptothorax albipennis*	CE	S	Xerothermal grasslands
33	*Leptothorax nigriceps*	CE	S	Xerothermal grasslands
34	*Leptothorax interruptus*	E	S	Xerothermal grasslands
35	*Leptothorax nylanderi*	CE	O	Deciduous forests+
36	*Leptothorax crassispinus*	EC	O	Coniferous forests+
37	*Leptothorax parvulus*	MD	S	Dry deciduous forests
38	*Leptothorax sordidulus*	SE	S	Xerothermal grasslands
39	*Leptothorax affinis*	EC	S	Dry deciduous forests
40	*Leptothorax corticalis*	EC	S	Dry deciduous forests
41	*Leptothorax nadigi*	MD	S	Xerothermal grasslands
42	*Leptothorax clypeatus*	SE	S	Dry deciduous forests
43	*Doronomyrmex kutteri*	NE	O	Coniferous forests+
44	*Harpagoxenus sublaevis*	BM	O	Coniferous forests+
45	*Epimyrma ravouxi*	MD	S	Xerothermal grasslands
46	*Solenopsis fugax*	MD	O	Dry grasslands
47	*Monomorium pharaonis*	i	?	Synanthrope
48	*Myrmecina graminicola*	AP	O	Deciduous forests+
49	*Tetramorium caespitum*	SP	P	Dry habitats
50	*Tetramorium impurum*	CE	O	Mountain meadows
51	*Tetramorium moravicum*	CE	O	Dry grasslands
52	*Tetramorium insolens*	i	?	Synanthrope
53	*Tetramorium caldarium*	i	?	Synanthrope
54	*Anergates atratulus*	ES	P	Dry habitats
55	*Strongylognathus testaceus*	ES	P	Dry habitats
56	*Formica rufa*	NP	O	Coniferous forests+
57	*Formica polyctena*	NP	O	Coniferous forests+
58	*Formica lugubris*	BM	O	Coniferous forests+
59	*Formica aquilonia*	BM	O	Coniferous forests+
60	*Formica truncorum*	NP	O	Coniferous forests+
61	*Formica pratensis*	SP	P	Dry habitats

Table III. Continued

1	2	3	4	5
62	*Formica fusca*	NP	E	Ubiquist
63	*Formica lemani*	BM	O	Mountain meadows
64	*Formica candida*	BM	O	Peatbogs and mountain meadows
65	*Formica cinerea*	EC	O	Dry grasslands and forests
66	*Formica rufibarbis*	ES	O	Dry grasslands
67	*Formica cunicularia*	EC	P	Open habitats+
68	*Formica glauca*	St	O	Dry grasslands
69	*Formica uralensis*	BM	S	Peatbogs
70	*Formica sanguinea*	SP	P	Dry habitats
71	*Formica exsecta*	NP	O	Coniferous forests+
72	*Formica pressilabris*	NP	P	Open habitats+
73	*Formica forsslundi*	BM	S	Peatbogs
74	*Formica foreli*	EC	O	Dry grasslands and forests
75	*Polyergus rufescens*	ES	O	Dry grasslands
76	*Camponotus herculeanus*	BM	O	Coniferous forests+
77	*Camponotus ligniperdus*	E	O	Deciduous forests+
78	*Camponotus vagus*	ES	O	Coniferous forests+
79	*Camponotus fallax*	ES	O	Deciduous forests+
80	*Camponotus piceus*	MD	S	Xerothermal grasslands
81	*Lasius niger*	NP ?	P	Open habitats+
82	*Lasius platythorax*	NP ?	P	Forests+
83	*Lasius emarginatus*	SE	O	Dry grasslands and deciduous forests
84	*Lasius brunneus*	EC	O	Deciduous forests
85	*Lasius alienus*	SP	O	Dry grasslands and forests
86	*Lasius paralienus*	E	O	Dry grasslands
87	*Lasius psammophilus*	E	O	Dry grasslands
88	*Lasius neglectus*	MD?	O	Dry grasslands
89	*Lasius flavus*	SP	E	Ubiquist
90	*Lasius umbratus*	SP	P	Humid habitats
91	*Lasius distinguendus*	SP	O	Dry grasslands
92	*Lasius meridionalis*	SP	O	Dry grasslands
93	*Lasius nitidigaster*	SE	O	Dry grasslands
94	*Lasius jensi*	ES	S	Xerothermal grasslands
95	*Lasius citrinus*	SP	O	Coniferous forests+
96	*Lasius mixtus*	SP	O	Humid meadows and deciduous forests
97	*Lasius bicornis*	EC	O	Deciduous forests
98	*Lasius fuliginosus*	AP	O	Deciduous forests+

2) Montane element – species occurring only in the mountains of Europe and Caucasia;
3) North-Palaearctic element – generally Transpalaearctic forms whose ranges cover the taiga zone together with part of the mixed and deciduous forest zone;
4) North-European element – species whose distribution may be considered a western variant of boreo-montane distribution, in the east not extending beyond the Ural Mts.

II. Class of the mixed and deciduous forest zone

5) Amphipalaearctic element – species with disjunctive ranges (Europe–the Far East), associated mainly with deciduous forests;
6) European element – species whose ranges cover mainly the mixed and deciduous forest zone, but also the forest-steppe zone in Europe;
7) Euro-Siberian element – species with ranges covering the European part of the mixed and deciduous forest zone, and in the forest-steppe zone going eastwards beyond Europe (Siberia up to the Altai Mts or even to Lake Baykal);
8) Euro-Caucasian element – forms distributed mainly in deciduous forest and partly in mixed forest in Europe and Caucasia;
9) Central-European element – species with ranges restricted mainly to the mixed and deciduous forest zone of Central and partly Southern Europe;
10) South-European element – species distributed mainly over the area of dry light forests and xerothermal associations of Suthern Europe and partly of Central Europe;
11) South-Palaearctic element – trans-Palaearctic forms whose ranges cover mainly the southern part of the forest zone and the forest-steppe zone; ecologically associated with dry light forests or dry grasslands.

III. Class of the Mediterranean zone (sensu lato)

13) Mediterranean element – species living in habitats of the Mediterranean type (dry forests, macchia scrub, stony mountain slopes, xerothermal associations);
14) Steppe element – species associated with the steppe zone in Europe and Asia which stretches parallelly of latitude from the region of the Black Sea up to Central Asia.

The zoogeographical composition of the Polish myrmecofauna (Table IV) corresponds well with the situation of the country: on the boundary of the natural ranges of mixed and deciduous forests on one side and in the very centre of Europe on the other. Most species – as many as 57 (ca 61% of the total number of outdoor forms) represent the group of species associated with the mixed and deciduous forest zone. The taiga forms are fewer nearly by 2.3 times (25 species, ca 27%), and the Mediterranean (sensu lato) ones by over five times (11 species, ca 12%). The most numerous group of species of the mixed and deciduous forest zone is dominated by the Euro-Siberian element, which also is the most abundant element in the entire Polish myrmecofauna (14 species, ca 15% of the myrmecofauna; e.g. *Myrmica rugulosa*, *Formica rufibarbis*, *Camponotus vagus*); further positions are occupied by the South-Palaearctic element (second with respect to the number of species in Poland; 11 species, ca 12%; e.g. *Tetramorium caespitum*, *Formica pratensis*, *Lasius flavus*), Euro-Caucasian (10 species, ca 11%; e.g. *Formica cinerea*, *Lasius brunneus*), Central-European (9 species, ca 10%; e.g. *Myrmica specioides*, *Tetramorium impurum*), European (6 species, 6.5%; e.g. *Myrmica karavaievi*, *Camponotus ligniperdus*), South-European

(5 species, ca 5.5%; e.g. *Tapinoma ambiguum*, *Lasius emarginatus*), and amphi-Palaearctic (2 species, ca 2%; *Myrmecina graminicola*, *Lasius fuliginosus*). The group of the taiga species is constituted mainly by boreo-montane elements (12 species, ca 13% of the myrmecofauna; e.g. *Myrmica lobicornis*, *Leptothorax acervorum*, *Formica lemani*) and North-Palaearctic (11 species, ca 12%; e.g. *Myrmica rubra*, *Formica polyctena*, *Lasius niger*); the remainder are North-European (*Doronomyrmex kutteri*) and montane (*Manica rubida*) forms (1 species, ca 1% each). The core of the Mediterranean group (broadly speaking) is made by the Mediterranean element proper (10 species, ca 11% of the myrmecofauna; e.g. *Ponera coarctata*, *Tapinoma erraticum*, *Solenopsis fugax*); there is only one steppe species (*Formica glauca*; ca 1% of the myrmecofauna).

In each of the geographical zones of Poland (lowlands, uplands, mountains; see Fig. 2) the proportions of particular zoogeographical elements, especially when grouped into the above-mentioned three classes, are similar to those in the myrmecofauna of the whole country (Table IV). The internal diversity of the Polish myrmecofauna, estimated on the basis of the distribution of the numbers of species representing each class in particular zoogeographical zones, is very far from significant (test χ^2;

Table IV. Zoogeographical composition of the myrmecofauna of the whole Poland and of its particular geographical zones (N – number of species, % – proportion)

Zoogeographical elements	Poland		Geographical zones							
			Lowlands		Uplands		Mountains		Mountains exept Pieniny	
	N	%	N	%	N	%	N	%	N	%
Elements of coniferous forest zone	**25**	***26.9***	**20**	***26.3***	**21**	***28.4***	**22**	***29.0***	**21**	***32.3***
– boreo-montane	12	*12.9*	8	*10.5*	8	*10.8*	10	*13.2*	9	*13.9*
– montane	1	*1.1*	1	*1.3*	1	*1.4*	1	*1.3*	1	*1.5*
– North-Palaearctic	11	*11.8*	11	*14.5*	11	*14.8*	11	*14.5*	11	*16.9*
– North-European	1	*1.1*	–	–	1	*1.4*	–	–	–	–
Elements of mixed and deciduous forest zone	**57**	***61.3***	**48**	***63.2***	**48**	***64.9***	**47**	***61.8***	**41**	***63.1***
– Amphipalaearctic	2	*2.1*	2	*2.6*	2	*2.7*	2	*2.6*	2	*3.1*
– European	6	*6.5*	5	*6.6*	5	*6.8*	4	*5.3*	3	*4.6*
– Euro-Siberian	14	*15.1*	14	*18.4*	13	*17.5*	14	*18.4*	12	*18.5*
– Euro-Caucasian	10	*10.7*	9	*11.9*	9	*12.1*	8	*10.5*	7	*10.8*
– Central-European	9	*9.7*	5	*6.6*	3	*4.1*	7	*9.2*	6	*9.2*
– South-European	5	*5.4*	2	*2.6*	5	*6.8*	2	*2.6*	1	*1.5*
– South-Palaearctic	11	*11.8*	11	*14.5*	11	*14.9*	10	*13.2*	10	*15.4*
Mediterranean (sensu lato) elements	**11**	***11.8***	**8**	***10.5***	**5**	***6.8***	**7**	***9.2***	**3**	***4.6***
– Mediterranean	10	*10.7*	7	*9.2*	5	*6.8*	7	*9.2*	3	*4.6*
– steppe	1	*1.1*	1	*1.3*	–	–	–	–	–	–
Total	**93**		**76**		**74**		**76**		**65**	

$P>0.9$). Neither does the zoogeographical composition of the myrmecofauna of any of the geographical zones differ significantly from the composition of the myrmecofauna of the whole country ($P>0.9$ for lowlands and uplands). A bigger, though statistically not significant, difference ($P>0.1$) is found only between the entire Polish myrmecofauna and that of the mountain zone, if the Pieniny Mts are excluded from the latter.

The Pieniny Mts have a unique position in Polish faunistics. Due to the geological and climatic separatedness from the surrounding environment, and therefore also phytosociological and faunistic separatedness, this small mountain range is a peculiarity of nature not only on the scale of Poland, but of Europe as well. The Pieniny Mts are built mainly of limestone, the climate there is mild and precipitation relatively low (see Pancer-Kotejowa and Zarzycki 1976, Kostrakiewicz 1982). Plant associations of xerothermal character have developed there, and as a result the proportion of xerothermophilous species in the local (very rich) fauna is exceptionally high for this part of Europe. The myrmecofauna of the Pieniny comprises 63 ant species as against the 65 species recorded from all the other seven mountain ranges in Poland together. As many as 11 species (14%) of the myrmecofauna of the whole mountain zone in Poland (76 species) are known only from the Pieniny. Six of the ten Polish Mediterranean ant species occur there (*Ponera coarctata*, *Tapinoma erraticum*, *Leptothorax parvulus*, *L. nadigi*, *Epimyrma ravouxi*, *Solenopsis fugax*), whereas only two such species have been recorded from the other Polish mountain ranges (*P. coarctata* and *Messor structor*; the last species undoubtedly accidental in the Polish fauna). Two of the Polish Mediterranean species (*L. nadigi*, *E. ravouxi*) are known only from the Pieniny.

The myrmecofaunas of particular geographical zones of Poland are zoogeographically very similar to one another. The distributions of the numbers of species in each of the three zoogeographical classes in the compared pairs of the myrmecofaunas of lowlands and uplands, lowlands and mountains, and uplands and mountains do not differ significantly ($P>0.9$ in all cases). These differences do not gain statistical significance even when the Pieniny Mts are excluded from the mountain zone.

Ecological composition

The ecological classification of Polish ant species (Table III) has been based on two criteria – the degree of ecological plasticity and habitat requirements. In respect of plasticity four forms have been distinguished, namely eurytopic, polytopic, oligotopic and stenotopic ones.

1) Eurytopes – species occurring both in forest and in open areas and manifesting no distict preference for any type of habitat or ecological factor (in respect of habitat preferences they are identical with ubiquitous forms);
2) Polytopes – species occurring in many different biotopes within their definite category, e.g. in forest of all types or in various open habitats;
3) Oligotopes – species occurring in habitats of a few similar types, e.g. in (various) coniferous forests, deciduous forests or dry grasslands;
4) Stenotopes – species closely associated with a habitat of one type, e.g. peat bogs or xerothermal grasslands.

In respect of habitat requirements the species have been classified mainly on the basis of the ecological preferences manifested by their populations in Poland.

Forms prevailing in the Polish myrmecofauna are those with fairly well defined or clearly defined habitat requirements (Table V). There are 56 oligotopic species (ca 60% of the total number of outdoor species) and 19 stenotopic ones (ca 20%). Species with a wide range of ecological plasticity are fewer – 14 (ca 15%) polytopes and four (ca 4%) eurytopes (ubiquists; e.g. *Myrmica rubra*, *Formica fusca*), yet just these usually are the quantitative dominants of local communities. Forms of coniferous forests (14 species, ca 15% of the myrmecofauna; e.g. *Leptothorax acervorum*, *Formica polyctena*, *Camponotus herculeanus*) and those of dry grasslands (14 species, ca 15%, too; e.g. *Myrmica rugulosa*, *Solenopsis fugax*, *Formica rufibarbis*) dominate among the ten ecological elements distinguished within the specifically richest group of oligotopes. These elements are also the most abundant ones in the entire Polish myrmecofauna; there also are many forms of deciduous forests (12 species, ca 13%; e.g. *Dolichoderus*

Table V. Ecological composition of the myrmecofauna of the whole Poland and of its particular geographical zones (N – number of species, % – proportion)

Zoogeographical elements	Poland		Geographical zones							
			Lowlands		Uplands		Mountains		Mountains exept Pieniny	
	N	%	N	%	N	%	N	%	N	%
Eurytopes (= ubiquists)	**4**	***4.3***	**3**	***3.9***	**4**	***5.4***	**3**	***3.9***	**3**	***4.6***
Polytopes	**14**	***15.0***	**14**	***18.4***	**12**	***16.2***	**14**	***18.4***	**13**	***20.0***
– of open habitats	3	*3.2*	3	*3.9*	3	*4.1*	3	*3.9*	3	*4.6*
– of forests	3	*3.2*	3	*3.9*	3	*4.1*	3	*3.9*	3	*4.6*
– of dry habitats	5	*5.4*	5	*6.6*	4	*5.4*	5	*6.6*	4	*6.2*
– of humid habitats	3	*3.2*	3	*3.9*	2	*2.7*	3	*3.9*	3	*4.6*
Oligotopes	**56**	***60.2***	**50**	***65.8***	**43**	***58.1***	**46**	***60.5***	**44**	***67.7***
– of dry grasslands	14	*15.0*	13	*17.1*	11	*14.9*	10	*13.2*	9	*13.9*
– of dry grasslands and forests	7	*7.5*	6	*7.9*	5	*6.8*	6	*7.9*	5	*7.7*
– of dry grasslands and deciduous forests	1	*1.1*	1	*1.3*	1	*1.4*	1	*1.3*	1	*1.5*
– of deciduous forests	12	*12.9*	12	*15.8*	9	*12.2*	8	*10.5*	8	*12.3*
– of coniferous forests	14	*15.1*	13	*17.1*	12	*16.2*	13	*17.1*	13	*20.0*
– of coniferous forests and mountain meadows	2	*2.2*	2	*2.6*	2	*2.7*	2	*2.6*	2	*3.1*
– of humid grasslands	1	*1.1*	1	*1.3*	1	*1.4*	1	*1.3*	1	*1.5*
– of humid meadows and deciduous forests	1	*1.1*	1	*1.3*	1	*1.4*	1	*1,3*	1	*1.5*
– of peatbogs and mountain meadows	1	*1.1*	1	*1.3*	1	*1.4*	1	*1.3*	1	*1.5*
– of mountain meadows	3	*3.2*	–	–	–	–	3	*3.9*	3	*4.6*
Stenotopes	**19**	***20.5***	**9**	***11.9***	**15**	***20.3***	**13**	***17.1***	**5**	***7.7***
– of xerothermal grasslands	11	*11.8*	6	*7.9*	7	*9.5*	9	*11.9*	3	*4.6*
– of dry deciduoud forests	5	*5.4*	2	*2.6*	5	*6.8*	3	*3.9*	1	*1.5*
– of humid patches in xerothermal habitats	1	*1.1*	1	*1.3*	1	*1.4*	1	*1.3*	1	*1.5*
– of peatbogs	2	*2.2*	–	–	2	*2.7*	–	–	–	–
Total	**93**		**76**		**74**		**76**		**65**	

quadripunctatus, *Camponotus ligniperdus*, *Lasius fuliginosus*). The group of stenotopes consists first of all of clearly xerophilous species: forms of xerothermal grasslands (11 species, ca 12% of the myrmecofauna; e.g. *Tapinoma erraticum*, *Manica rubida*, *Leptothorax nigriceps*) and of dry deciduous forests (5 species, ca 5%; e.g. *Leptothorax corticalis*). The group of polytopes, too, is dominated by species associated with dry habitats (5 species, ca 5% of the myrmecofauna; e.g. *Tetramorium caespitum*, *Formica sanguinea*).

The proportions of the ecological elements in the geographical zones of the country (lowlands, uplands, mountains; see Fig. 2) are similar to those in the myrmecofauna of whole Poland (Table V). Only in the lowlands there is found a considerable (nearly double) decrease in the proportion of stenotopic forms (mainly to the advantage of oligotopes). However, the internal diversity of the Polish myrmecofauna, estimated on the basis of the distribution of the numbers of species representing each class of ecological plasticity in particular zoogeographical zones is not significant (test χ^2; $P>0.5$). It must be stressed that the high (almost as high as in the uplands) proportion of stenotopes in the mountain zone is due to the impact of the Pieniny Mts. In all the other mountain ranges together the proportion (and number) of stenotopic species is even lower than that in the lowlands; they are replaced mainly by oligotopes. Statistically, the ecological composition of the myrmecofauna of neither geographical zone differs significantly from that of whole Poland ($P>0.1$ for lowlands, $P>0.9$ for uplands and mountains, $P>0.1$ for mountains without the Pieniny).

In general, the myrmecofaunas of particular geographical zones of Poland are similar in the ecological respect. The distributions of the numbers of species from each of the four classes of ecological plasticity in the compared pairs of myrmecofaunas of lowlands and uplands, lowlands and mountains, and uplands and mountains do not differ significantly ($P>0.1$ for lowlands vs. uplands, $P>0.5$ for lowlands vs. mountains and for uplands vs. mountains). Just as in the case of zoogeographical diversity, these differences do not become statistically significant even when the Pieniny Mts are disregarded in the mountain zone; in such situation, the difference between the myrmecofaunas of the lowland and of the mountain zones is even smaller ($P>0.9$). Nonetheless, the great ecological similarity between the myrmecofauna of uplands and that of mountains is due just to the presence of the Pieniny in the latter zone. When the Pieniny Mts are excluded, the similarity decreases considerably ($P>0.1$). The Pieniny are the only mountain range in Poland whose myrmecofauna is characterized by a high proportion of stenotopic species, particularly the forms of xerothermal grasslands, mostly typical of uplands in south-eastern Poland. Of the 13 stenotopes recorded from all the mountain ranges together as many as eight (*Tapinoma erraticum*, *T. ambiguum*, *Leptothorax albipennis*, *L. parvulus*, *L. affinis*, *L. nadigi*, *Epimyrma ravouxi*, *Lasius jensi*) occur only in the Pieniny Mts; six of them are species of xerothermal grasslands and two are species of dry deciduous forests.

It is evident that the zonal diversity of the Polish myrmecofauna – considered in the qualitative aspect (i.e. on the basis of the number of species of particular categories) – on the whole is small in spite of a fairly great geographical diversity of the country. It applies both to the local species richness and to the zoogeographical and ecological profiles of the fauna. The reasons for this state of affairs may be found in the situation of Poland and in the generally intermediate climate of the country. This relatively small

and compact area in the centre of Europe is a place where marine, oceanic and continental climate influences and also upland and mountain influences clash and intermingle (see Górski and Cukierska 1975). The effect is that in the case of many species blurred are the boundaries of their regional occurrence which might be expected from their zoogeographical character and ecological requirements. No doubt, the picture of the zonal or regional diversity of the Polish myrmecofauna would be much clearer if the analysis had been made in a quantitative aspect, i.e. on the basis of data on the abundance of local populations of particular species. However, this would have required long-term regional studies, not so much faunistic as zoocoenological investigations.

Keys for identification

For general ant morphology see Plates I and II. The following measurements and indices are used in the keys:

HL – length of head in full-face view, measured in a straight line from anterior poin of median clypeal margin to mid-point of occipital margin (see Plate III: *1*);
HW – maximum width of head in full-face view directly behind eyes (see Plate III: *1*);
AL – diagonal length of alitrunk in profile, measured from anterio-dorsal point of alitrunk to posterior margin of propodeal lobes (workers), or from anterio--upper margin of pronotum to posterior margin of propodeal lobes (queens) see Plate III: *2*, *4*);
AH – height of alitrunk, measured from upper level of mesonotum perpendicularly to level of lower margin of mesopleurae (see Plate III: *4*);
FW – minimum width of frons between frontal lobes (see Plate III: *1*);
FLW – maximum width between external borders of frontal lobes (see Plate III: *1*);
PPW – maximum width of postpetiole from above;
PPH – height of postpetiole (see Plate III: *2*);
SL – maximum straight-line length of antennal scape in profile (see Plate III: *4*; compare SL');
SL' – scape length (see Plate III: *5*; compare SL);
SW – width of lobe at the base of antennal scape (see Plate III: *5*);
SH – height of antennal scape (see Plate III: *6*);
CI (cephalic index) = HL/HW;
SI (scape index) = SL/HL;
AI (alitrunk index) = AL/AH;
FI (frontal index) = HW/FW;
FLI (frontal lobe index) = FLW/FW;
SI (scape index) = SL/HL;
SWI (scape lobe index) = SL'/SW;
SHI (scape height index) = SL/SH;
PPI (postpetiolar index) = PPW/HW.
PF (palp formula) – in indicates the number of segments in the maxillary and labial palps. The number of maxillary palp segments is given first, the number of labial palp segments second (e.g. 6,4).

Taxa not recorded from Poland but possible to occur are marked in the keys with an asterisk.

Key to subfamiles

Workers and queens

1 Body with two isolated segments (petiole and postpetiole) between alitrunk and gaster (Plates V: *4–6*, *16*; VI: *3–7*, *11–15*; IX: *15–23*; XI: *7–9*, *12–16*; XII: *9*, *11*, *13*) . . . . . **Myrmicinae** (p. 16)

– Body with one isolated segment (petiole) between alitrunk and gaster (Plates IV: *1*, *6–10*; XV: *13–16*, *24*, *25*; XVI: *5–8*, *10*, *12*; XVIII: *1–3*; XIX: *4*, *5*; XX: *8–11*, *14–16*) **2**

2 (1) Sting present, always visible without dissection; first gastral segment separated from second by distinct constriction (Plate IV: *1*) . . . . . **Ponerinae** (p. 11)

– Sting absent or rudimental and not visible without dissection; first gastral segment broadly attached to second, not separated from it by distinct constriction (Plates IV: *8*, *9*; XV: *7*, *8*; XVII: *3–5*; XIX: *6–8*) **3**

3 (2) Apex of gaster with circular nozzle-like acidopore, fringed with setae (coronula) (Plates IV: *2*; XV: *7*, *8*; XVII: *3–5*; XIX: *6–8*) . . . . . **Formicinae** (p. 71)

– Apex of gaster lacking acidopore and coronula (Plate IV: *3*, *8*, *9*) . . . . . **Dolichoderinae** (p. 13)

Males

1 Body with two isolated segments (petiole and postpetiole) between alitrunk and gaster (Plates VIII: *1–4*, *11–14*; X: *15–17*, *19*) . . . . . **Myrmicinae** (p. 16)

– Body with one isolated segment (petiole) between alitrunk and gaster (Plates IV: *13*, *14*; XIV: *8*; XVII: *11*, *12*, *15*, *16*) **2**

2 (1) First gastral segment separated from second by distinct constriction (Plate IV: *4*) . . . . . **Ponerinae** (p. 11)

– First gastral segment broadly attached to second, not separated from it by distinct constriction (Plates XIV: *8*; XVII: *11*, *12*) **3**

3 (2) Hind tibiae with simple spur; clypeus does not get between frontal lobes (Plate XVII: *9*, *10*) . . . . . **Formicinae** (p. 71)

– Hind tibiae with pectinate spur; clypeus get between frontal lobes (Plate IV: *5*) . . . . . **Dolichoderinae** (p. 13)

Key to genera of Ponerinae

Workers and queens

1 Ventral petiolar process with foramen, sharply angulate or with tooth behind (Plate IV: *6*). Outdoor species . . . . . ***Ponera*** Latr. (p. 11)
In Poland one species – ***P. coarctata*** (Latr.) (p. 11)

– Ventral petiolar process without foramen, rounded and without tooth behind

(Plate IV: *7*). In Poland lives only in houses or hothouses . . . . . *Hypoponera* Santschi (p. 12)
In Poland one (indoor) species – ***H. punctatissima*** (Rog.) (p. 12)

Males

1 Alate, eyes large, antenna with 13 segments . . . . . ***Ponera*** Latr. (p. 11)
In Poland one species – ***P. coarctata*** (Latr.) (p. 11)
– Dealate, ergatoid, eyes small, antenna with 12 segments . . . . . *Hypoponera* Santschi (p. 12)
In Poland one (indoor) species – ***H. punctatissima*** (Rog.) (p. 12)

Key to genera of Dolichoderinae

Workers

1 Tegument thick, solid, alitrunk with foveolate sculpture; gaster black and with four light spots on first and second tergites; propodeal declivity in profile deeply concave (Plate IV: *8*) . . . . . ***Dolichoderus*** Lund (p. 13)
In Poland one species – ***D. quadripunctatus*** (L.) (p. 13)
– Tegument thin, relatively soft, body more or less smooth or with fine micropunctures; gaster black or dark brown, without light spots; propodeal declivity in profile straight or convex (Plate IV: *9*, *10*) **2**
2 (1) Petiole lacking scale, overlapped by gaster (Plate IV: *9*) . . . . . ***Tapinoma*** Först. (p. 14)
– Petiole with scale, not overlapped by gaster (Plate IV: *10*) . . . . . ***Linepithema*** Mayr (p. 16)
In Poland one (indoor) species – ***L. humile*** (Mayr) (p. 16)

Queens

1 Tegument thick, solid, alitrunk with foveolate sculpture; gaster black and with four light spots on its first and second tergites . . . . . ***Dolichoderus*** Lund (p. 13)
In Poland one species – ***D. quadripunctatus*** (L.) (p. 13)
– Tegument thin, relatively soft, body more or less smooth or with fine punctures; gaster black or dark brown, without light spots **2**
2 (1) Petiole lacking scale, overlapped by gaster . . . . . ***Tapinoma*** Först. (p. 14)
– Petiole with scale, not overlapped by gaster . . . . . ***Linepithema*** Mayr (p. 16)
In Poland one (indoor) species – ***L. humile*** (Mayr) (p. 16)

Males

1 Forewing with two cubital cells (Plate IV: *11*) . . . . ***Dolichoderus*** Lund (p. 13)
In Poland one species – ***D. quadripunctatus*** (L.) (p. 13)
– Forewing with one cubital cell (Plate IV: *12*) **2**

2 (1) Scale of petiole inclined forwards (Plate IV: *13*); anterior clypeal margin medially notched . . . . . ***Tapinoma*** Först. (p. 14)

– Scale of petiole vertical (Plate IV: *14*); anterior clypeal margin convex, without notch . . . . . ***Linepithema*** Mayr (p. 16)

In Poland one (indoor) species – ***L. humile*** (Mayr) (p. 16)

Key to species of *Tapinoma*

Workers, queens and males

1 Workers and queens: notch on anterior clypeal margin deep, with parallel sides (Plate IV: *15*). Males: subgenital plate with wide, trapezoidal apical lobes (Plate IV: *17*) . . . . . ***T. erraticum*** (Latr.) (p. 14)

– Workers and queens: notch on anterior clypeal margin not so deep, triangular (Plate IV: *16*). Males: subgenital plate with narrow, triangular apical lobes (Plate IV: *18*) . . . . . ***T. ambiguum*** Em. (p. 15)

Key to genera of Myrmicinae

Workers

1 Antenna with 10 segments and with conspicuous 2-segmented apical club; eyes very small, with several facets (Plate V: *1*) . . . . . ***Solenopsis*** Westw. (p. 60)

In Poland one species – ***S. fugax*** (Latr.) (p. 60)

– Antenna with 11–12 segments, apical club with 3–4 segments or absent (Plates V: *2*, *3*; XI: *5*, *6*); eyes distinctly larger (Plates V: *7*, *8*, *14*, *15*, *17–19*; XI: *3–6*) **2**

2 (1) Antenna with 11 segments **3**

– Antenna with 12 segments **6**

3 (2) Postpetiole ventrally without lamella, spine or tooth (Plate V: *4*) . . . . . ***Leptothorax*** Mayr (subg. *Leptothorax* s.str.) (p. 41)

– Both postpetiole and petiole ventrally with lamella, spine or tooth (Plate V: *5*, *6* **4**

4 (3) Antennal scrobes present; masticatory margins of mandibles without teeth (Plate V: *7*). Social parasites of *Leptothorax* s.str. . . . . ***Harpagoxenus*** For. (p. 58)

In Poland one species – ***H. sublaevis*** (Nyl.) (p. 58)

– Antennal scrobes absent; masticatory margins of mandibles with teeth (Plate V: *8*) **5**

5 (4) Both postpetiole and petiole ventrally with wide lamella (Plate V: *5*); whole body sculptured, dull. Social parasites of *Leptothorax* (subg. *Myrafant*) . . . . . ***Epimyrma*** Em. (p. 59)

In Poland one species – ***E. ravouxi*** (E. André) (p. 59)

– Both petiole and postpetiole ventrally with spine or tooth (Plate V: *6*); whole body smooth and shiny. Xenobionts of *Formica* (mainly *Formica* s.str.) . . . . . ***Formicoxenus*** Mayr (p. 39)

In Poland one species – ***F. nitidulus*** (Nyl.) (p. 39)

6 (2) Mandibles narrow and falcate, without masticatory margins and teeth (Plate V: *9*). Social parasites of *Tetramorium* ..... ***Strongylognathus*** Mayr (p. 70)

In Poland one species – ***S. testaceus*** (Schenck) (p. 70)

– Mandibles wide, triangular, masticatory margins usually with teeth (Plates V: *10, 11, 14, 18, 19*; IX: *11–14*; XI: *3–6*; XII: *1–3*) **7**

7 (6) PF 6,4; middle and hind tibiae usually with single large pectinate spur, this spur distinctly longer than width of tibia at apex (Plate V: *12*); rarely some socially parasitic *Myrmica* species have simple tibial spur **8**

– PF less than 6,4; middle and hind tibiae usually with single simple spur (Plate V: *13*); if spur pectinate it is not longer than width of tibia at apex, or two additional simple spurs present, or lateral portion of clypeus raised into sharp ridge in front of antennal insertions (Plate V: *14*) **9**

8 (7) Propodeum with long spines ..... ***Myrmica*** Latr. (p. 16)

– Propodeum without spines, rounded or with short tubercles .... ***Manica*** Jurine (p. 34)

In Poland one species – ***M. rubida*** (Latr.) (p. 34)

9 (7) Lateral portion of clypeus raised into sharp ridge in front of antennal insertions (Plate V: *14*) ..... ***Tetramorium*** Mayr (p. 63)

– Lateral portion of clypeus not raised into sharp ridge in front of antennal insertions (Plates V: *18, 19*; XI: *5, 6*) **10**

10 (9) Ventrolateral margin of head delineated by sharp longitudinal carina on each side (Plate V: *15*); petiole low, without distinct peduncle, gable-like in profile (Plate V: *16*) ..... ***Myrmecina*** Curt. (p. 62)

In Poland one species – ***M. graminicola*** (Latr.) (p. 62)

– Ventrolateral margin of head without longitudinal carina on each side (Plate V, *17*); petiole of another shape (Plate XI: *7–9, 12–16*) **11**

11 (10) Antennal apical club 3-segmented (Plates V: *2*; XI: *5, 6*) **12**

– Antennal apical club 4–5-segmented or absent (Plate V: *3*) **13**

12 (11) Propodeum rounded, without teeth or spines. In Poland only in houses ..... ***Monomorium*** Mayr (p. 61)

In Poland one (synanthropic) species – ***M. pharaonis*** (L.) (p. 61)

– Propodeum with teeth or spines (Plate XI: *7–9, 12–16*). Outdoor species .... ***Leptothorax*** Mayr (subg. *Myrafant* M. R. Sm.) (p. 44)

13 (11) Median portion of clypeus in front of frontal lobes sharply raised under level of remainder part of clypeus; eyes small (Plate V: *18*) .... ***Stenamma*** Westw. (p. 38)

In Poland one species – ***S. debile*** (Först.) (p. 38)

– Median portion of clypeus in front of frontal lobes not raised under level of remainder part of clypeus; eyes distinctly larger (Plate V: *19*) **14**

14 (13) Monomorphic species. Mandibles elongate-triangular, with weakly convex sides, not massive, their masticatory margins always with sharp teeth (Plate V: *10, 19*); propodeum with teeth ..... ***Aphaenogaster*** Mayr (p. 35)

In Poland one species – ***A. subterranea*** (Latr.) (p. 35)

– Polymorphic species. Mandibles wide, with strongly convex sides, massive, their masticatory margins with blunt teeth or even without teeth (Plate V: *11*); propodeum without teeth, angulate or with blunt tubercles . . . . . ***Messor*** Mayr (p. 36)

In Poland one species – ***M. structor*** (F.) (p. 37)

Queens

1 Antenna with 11 segments **2**

– Antenna with 12 segments **8**

2 (1) Antennal apical club conspicuous, 2-segmented (Plate VI: *1*) . . . . . ***Solenopsis*** Westw. (p. 60)

In Poland one species – ***S. fugax*** (Latr. (p. 60)

– Antennal apical club 3–4-segmented or absent (Plate VI: *2*) **3**

3 (2) Postpetiole ventrally without lamella, spine or tooth (Plate VI: *3*) . . . . . ***Leptothorax*** Mayr (subg. *Leptothorax* s.str.) (p. 41)

– Both postpetiole and petiole ventrally with lamella, spine or tooth (Plate VI: *4–7*) **4**

4 (3) Antennal scrobes present; mandibles with wide, distinct masticatory margins, but without teeth (Plate VI: *8*); usually ergatoid (but with ocelli), rarely normal, alate . . . . . ***Harpagoxenus*** For. (p. 58)

In Poland one species – ***H. sublaevis*** (Nyl.) (p. 58)

– Antennal scrobes absent; masticatory margins of mandibles with teeth or mandibles narrow, finger-like, rounded at apex (Plate VI: *9*, *10*). **5**

5 (4) Both postpetiole and petiole ventrally with lamella (Plate VI: *4*, *5*) **6**

– Both postpetiole and petiole ventrally with spine or tooth (Plate VI: *6*, *7*) . . . **7**

6 (5) Anterior clypeal margin deeply notched medially; mandibles narrow, fingerlike, rounded at apex (Plate VI: *9*). Queen (not alate gynes!) physogastric. Workerless social parasite of *Tetramorium* . . . . . ***Anergates*** For. (p. 69)

In genus one species – ***A. atratulus*** (Schenck) (p. 69)

– Anterior clypeal margin not notched medially; masticatory margins of mandibles with teeth (Plate VI: *10*). Queen not physogastric. Workers present . . . . . ***Epimyrma*** Em. (p. 59)

In Poland one species – ***E. ravouxi*** (E. André) (p. 59)

7 (5) Whole body densely sculptured. Workerless social parasites of *Leptothorax* s.str. . . . . ***Doronomyrmex*** Kutter (p. 57)

In Poland one species – ***D. kutteri*** (Busch.) (p. 57)

– Whole body smooth and shiny. Workers present . . . . . ***Formicoxenus*** Mayr (p. 39)

In Poland one species – ***F. nitidulus*** (Nyl.) (p. 39)

8 (1) Mandibles narrow and falcate, without masticatory margins and teeth . . . . . ***Strongylognathus*** Mayr (p. 70)

In Poland one species – ***S. testaceus*** (Schenck) (p. 70)

– Mandibles wide, triangular, masticatory margins with teeth **9**

9 (8) PF 6,4; middle and hind tibiae with single large pectinate spur; this spur distinctly longer than width of tibia at apex **10**

– PF less than 6,4; middle and hind tibiae usually with single simple spur; if spur pectinate it is not longer than width of tibia at apex, or two additional simple spurs present, or lateral portion of clypeus raised into sharp ridge in front of antennal insertions **11**

10 (9) Propodeum with spines ..... ***Myrmica*** Latr. (part) (p. 16)

– Propodeum unarmed, rounded or with short tubercles ..... ***Manica*** Jurine (p. 34)

In Poland one species – ***M. rubida*** (Latr.) (p. 34)

11 (9) Lateral portion of clypeus raised into sharp ridge in front of antennal insertions ..... ***Tetramorium*** Mayr (p. 63)

– Lateral portion of clypeus not raised into sharp ridge in front of antennal insertions **12**

12 (11) Ventrolateral margin of head delineated by sharp longitudinal carina on each side; petiole low, without distinct peduncle, gable-like in profile ..... ***Myrmecina*** Curt. (p. 62)

In Poland one species – ***M. graminicola*** (Latr.) (p. 62)

– Ventrolateral margin of head without longitudinal carina on each side; petiole of another shape **13**

13 (12) Postpetiole and petiole ventrally with lamella (Plate VI: *11*). Workerless social parasite of other *Myrmica* ..... ***Myrmica*** Latr. (part) (p. 16)

In genus one such species – ***M. karavajevi*** (Arn.) (p. 33)

– Postpetiole ventrally without lamella (Plate VI: *12–15*). Workers present **14**

14 (13) Antenna with 3-segmented apical club **15**

– Antenna with 4–5-segmented apical club or without it **16**

15 (14) Propodeum rounded, unarmed (Plate VI: *12*). In Poland only in houses ..... ***Monomorium*** Mayr (p. 61)

In Poland one (synantropic) species – ***M. pharaonis*** (L.) (p. 61)

– Propodeum armed with a pair of spines or at least short pointed teeth, not rounded (Plate VI: *13*). Outdoor species ..... ***Leptothorax*** Mayr (subg. *Myrafant*) (p. 44)

16 (14) Body smaller, not more than 5 mm ..... ***Stenamma*** Westw. (p. 38)

In Poland one species – ***S. debile*** (Först.) (p. 38)

– Body larger, not less than 7 mm **17**

17 (16) Mandibles elongate-triangular, with weakly convex sides, not massive, their masticatory margins with pointed teeth; propodeum with a pair of spines (Plate VI: *14*) ..... ***Aphaenogaster*** Mayr (p. 35)

In Poland one species – ***A. subterranea*** (Latr.) (p. 35)

– Mandibles broad, with strongly convex sides, massive, their masticatory margins with blunt teeth; propodeum unarmed, angulate or, at most, with blunt tubercles (Plate VI: *15*) ..... ***Messor*** Mayr (p. 36)

In Poland one species – ***M. structor*** (F.) (p. 37)

Males

1 Alate **2**
Dealate **17**

2 (1) Forewing with one cubital cell which is partly separated by short vein (Plate VII: *1*) **3**

– Forewing with one or with two completely separated cubital cells (Plate VII: *2–5*) **4**

3 (2) Body smaller, less than 8 mm; mandible with 4–6 teeth . . . . . ***Myrmica*** Latr. (part) (p. 16)

– Body larger, more than 8 mm; mandible with more than 8 (up to 15) teeth . . . . . ***Manica*** Jurine (p. 34)
In Poland one species – ***M. rubida*** (Latr.) (p. 34)

4 (2) Scutum without Mayr's furrows (Plate VII: *6*) **5**

– Scutum with Mayr's furrows (Plate VII: *7*) **8**

5 (4) Antenna with 12 segments, first funicular joint globular (Plate VII: *8*) . . . . . ***Solenopsis*** Westw. (p. 60)
In Poland one species – ***S. fugax*** (Latr.) (p. 61)

– Antenna with 13 segments, first funicular joint not globular (Plate VII: *9*) **6**

6 (5) Forewing with one cubital cell (Plate VII: *2*); body smaller, less than 4 mm . . . . . ***Monomorium*** Mayr (p. 61)
In Poland one (synanthropic) species – ***M. pharaonis*** (L.) (p. 61)

– Forewing with two cubital cells (Plate VII: *3*); body larger, more than 5 mm **7**

7 (6) Body with sparse short straight standing hairs (Plate VIII: *1*) . . . . . ***Aphaenogaster*** Mayr (p. 35)
In Poland one species – ***A. subterranea*** (Latr.) (p. 35)

– Body with abundant long curved standing hairs (Plate VIII: *2*) . . . . . ***Messor*** Mayr (p. 36)
In Poland one species – ***M. structor*** (F.) (p. 37)

8 (4) Antenna with 13 segments (Plate VII: *10–12*) **9**

– Antenna with 10 or 12 segments (Plate VII: *13*, *14*) **11**

9 (8) Forewing darkened, with coarse veins and always without discoidal cell (Plate VII: *4*); antennal scape shorter than second and third funicular joints together (Plate VII: *10*) . . . . . ***Myrmecina*** Curt. (p. 62)
In Poland one species – ***M. graminicola*** (Latr.) (p. 62)

– Forewing transparent, not darkened, with fine veins and with discoidal cell (in *Leptothorax* it is occasionally absent) (Plate VII: *5*); antennal scape longer than second and third funicular joints together (Plate VII: *11*, *12*) **10**

10 (9) Antennae without distinct apical club (Plate VII: *11*); petiole with long cylindrical peduncle (Plate VIII: *3*) . . . . . ***Stenamma*** Westw. (p. 38)
In Poland one species – ***S. debile*** (Först.) (p. 38)

– Antennae with distinct 4-segmented apical club (Plate VII: *12*); petiole with shorter peduncle (Plate VIII: *4*). . . . . ***Leptothorax*** Mayr (subg. *Myrafant* M. R. Sm.) (p. 44)

11 (8) Antenna with 10 segments, second funicular joint very long (Plate VII: *13*) **12**

– Antenna with 12 segments, second funicular joint not very long, subequal to third one (Plate VII: *14*; VIII: *8*) **13**

12 (11) Mandibles broad, with teeth on masticatory margins (Plate VIII: *5*) . . . . . ***Tetramorium*** Mayr (p. 63)

– Mandibles narrow, falcate, without teeth (Plate VIII: *6*) . . . . . ***Strongylognathus*** Mayr (p. 70)

In Poland one species – ***S. testaceus*** (Schenck) (p. 70)

13 (11) Antennal scape long, reaching far beyond occipital margin of head (Plate VIII: *7*). Social parasite of other *Myrmica* . . . . . ***Myrmica*** Latr. (part) (p. 16)

In genus one such species – ***M. karavajevi*** (Arn.) (p. 33)

– Antennal scape much shorter, not reaching to occipital margin of head (Plate VIII: *8*) **14**

14 (13) Second to sixth funicular joints shorter, 1.5–2 times longer than broad; antennal scape longer than second to fourth funicular joints together; apical antennal club 4-segmented; masticatory margin of mandible with 3–5 pointed teeth (Plate VIII: *8*) . . . . . ***Epimyrma*** Em. (p. 59)

In Poland one species – ***E. ravouxi*** (E. André) (p. 59)

– Second to sixth funicular joints long, 3–4 times longer than broad; antennal scape shorter than second and third funicular joints together; apical antennal club indistinct (Plate VII, *14*); mandible bidentate or edentate (Plate VIII: *9*, *10*) **15**

15 (14) Postpetiole ventrally with pointed tooth (Plate VIII: *11*); body smaller, less than 2.5 mm . . . . . ***Doronomyrmex*** Kutter (p. 57)

In Poland one species – ***D. kutteri*** (Busch.) (p. 57)

– Postpetiole ventrally without tooth (Plate VIII: *12*); body larger, more than 2.5 mm **16**

16 (15) Mandibles bidentate (Plate VIII: *10*), rarely with reduced teeth. Difficult to distinguish from males of *Leptothorax* s.str. . . . . ***Harpagoxenus*** For. (p. 58)

In Poland one species – ***H. sublaevis*** (Nyl.) (p. 58)

– Mandibles edentate (Plate VIII: *9*) . . . . . ***Leptothorax*** Mayr (subg. *Leptothorax* s.str.) (p. 41)

17 (1) Ergatoid. Differs from workers by 12-segmented antenna, and by presence of ocelli and genitalia (Plate VIII: *13*); whole body smooth and shiny . . . . . ***Formicoxenus*** Mayr (p. 39)

In Poland one species – ***F. nitidulus*** (Nyl.) (p. 39)

– Not ergatoid, antenna with 11 segments (Plate VIII: *14*); whole body finely sculptured, dull . . . . . ***Anergates*** For. (p. 69)

In genus one species – ***A. atratulus*** (Schenck) (p. 69)

Key to species of *Myrmica*

Workers and queens[10]

1 Frontal carinae curving outwards to merge with rugae, which surround antennal sockets (Plate IX: *11*); antennal scape weakly curved at base, without angle or carina (Plate IX: *1*) **2**

– Frontal carinae not curving outwards, projecting beyond the upper level of eyes; antennal sockets not surrounded by rugae (Plate IX: *13*, *14*) or if so, rugae join frontal carinae near upper third of lengths of carinae (Plate IX: *12*); antennal scape angulate, with carina or lobe, or at least much strongly curved at base (Plate IX: *2–10*) **3**

2 (1) Petiolar node with rounded dorsum; nodes of petiole and postpetiole smooth or only with fine sculpture, not coarsely rugulose; propodeal spines short (Plate IX: *15*) . . . . . ***M. rubra*** L. (p. 17)

– Petiolar node with distinctly flattened dorsum; nodes of petiole and postpetiole coarsely rugulose; propodeal spines long (Plate IX: *16*) . . . . . ***M. ruginodis*** Nyl. (p. 19)

3 (1) Antennal scape at base angulate, with vertical lobe or dent (Plate IX: *2*). Antennal sockets surrounded by rugae, which join frontal carinae near upper third of their length **4**

– Antennal scape at base of different shape, but never with vertical lobe or dent (Plate IX: *3–10*) **5**

4 (3) Petiole with very short peduncle, its frontal surface steep, slightly concave and meets with dorsal surface at right or even acute angle (Plate IX: *17*) . . . . . ***M. lobicornis*** Nyl. (p. 22)

– Petiole with well developed peduncle, its frontal surface not steep, distinctly concave and meets with dorsal surface at blunt angle (Plate IX: *18*) . . . . . ***M. schencki*** Em. (p. 32)

5 (3) Antennal sockets surrounded by rugae, which join frontal carinae near upper third of length of carinae (Plate IX: *12*); antennal scape at base strongly curved, but not angulate and without horizontal carina or lobe (Plate IX: *3*); alitrunk, petiolar and postpetiolar nodes with very coarse longitudinal rugae; petiole without distinct peduncle, its frontal surface straight and steep, meets with dorsal surface at right angle (Plate IX: *19*) . . . . . ***M. sulcinodis*** Nyl. (p. 21)

– Antennal sockets not surrounded by rugae (Plate IX: *13*, *14*); antennal scape at base curved, without angle, or angulate, with horizontal carina or lobe (Plate IX: *4–10*) **6**

6 (5) Postpetiole very broad, wider than length, PPI>0.56 (Plate IX: *20*); whole body with very abundant, long standing hairs . . . . . ***M. hirsuta*** Elmes (p. 31)

[10] Workers of *M. microrubra* Seifert and *M. karavajevi* (Arn.) are unknown. Queens of *M. microrubra* differ from queens of *M. rubra* in much smaller size (HW<1.1, AL<1.8 vs. HW>1.2, AL>1.9 mm). Queens of *M. karavajevi* differ from those of any other Polish *Myrmica* species in presence of lamella on ventral surface of petiole and postpetiole (see also Key for genera and Plate VI: *11*).

– Postpetiole not broad, its width subequal to length, PPI<0.50 (Plate IX: *21*); standing hairs on body less abundant **7**

7 (6) Antennal scape at base curved, without horizontal lobe or carina, at most slightly angulate (Plate IX: *4*, *5*) **8**

– Antennal scape at base distinctly angulate, with horizontal carina or lobe (Plate IX: *6–10*) **9**

8 (7) Antennal scape at base bent in ideal curve (Plate IX, *4*); head longitudinally rugulose, reticulate sculpture present only between occiput and eyes (Plate IX: *13*) . . . . . ***M. gallienii*** Bondr. (p. 24)

– Antennal scape at base more sharply curved and slightly angulate (Plate IX: *5*); frons and genae longitudinally rugulose, upper third of head with reticulate sculpture (Plate IX: *14*) . . . . . ***M. rugulosa*** Nyl. (p. 23)

9 (7) Antennal scape at base with weak carina (Plate IX: *6*); frontal lobes slightly curved, frons wider: FLI 1.10–1.45, FI 2.14–2.30 . . . . . ***M. hellenica*** For. (p. 25)

– Antennal scape at base with lobe or at least with distinct carina (Plate IX: *7–10*); frontal lobes strongly curved, frons narrower: FLI 1.18–1.86, FI 2.60–3.50 . . . . . **10**

10 (9) Antennal scape at base with large, often very massive lobe (Plate IX: *7*, *8*); frontal lobes more strongly curved, frons narrower: FLI 1.59–1.86, FI 3.04–3.50 . . . . . **11**

– Antennal scape at base with much smaller lobe or sometimes only with carina (Plate IX: *9*, *10*); frontal lobes less strongly curved, frons wider: FLI 1.18–1.68, FI 2.60–3.21 . . . . . **12**

11 (10) Antennal scape at base with very large, massive lobe (SWI 4.92–6.00) (Plate IX: *7*) clearly raised at scape level (SHI 2.77–3.41) (to be viewed in profile, Plate IX: *7a*) . . . . . ***M. lonae*** Finzi (p. 30)

– Antennal scape at base with smaller and not massive lobe (SWI 6.00–8.28) (Plate IX: *8*) not raised at scape level (SHI 3.50–4.57) (to be viewed in profile, Plate IX: *8a*) . . . . . ***M. sabuleti*** Mein. (p. 29)

12 (10) Petiole with distinct, sharp horizontal dorsal plate; its posterior face abruptly falls to postpetiole (Plate IX: *22*). Antennal scape at base with wider lobe (Plate IX: *9*) . . . . . ***M. scabrinodis*** Nyl. (p. 27)

– Petiole without distinct horizontal dorsal plate; its posterior face smoothly falls to postpetiole (Plate IX: *23*); antennal scape at base with narrow lobe or even carina (Plate IX: *10*) . . . . . ***M. specioides*** Bondr. (p. 26)

Males

1 Antenna with 12 segments. Cubital cell on forewing not separated by short vein . . . . . ***M. karavajevi*** (Arn.) (p. 33)

– Antenna with 13 segments. Cubital cell on forewing partly separated by short vein (Plate VII: *1*) **2**

2 (1) Antennal scape longer and slenderer, SI>0.68 (Plate X: *1–4*) **3**

– Antennal scape shorter and thicker, SI<0.66 (Plate X: *5–10*) **6**

3 (2) Antennal scape weakly curved at base (Plate X: *1*, *2*) **4**

– Antennal scape strongly curved at base (Plate X: *3*, *4*) **5**

4 (3) Antennal scape and tibiae with numerous long standing hairs (Plate X: *1*, *11*) . . . . . ***M. rubra*** L. (p. 17)

– Antennal scape and tibiae with sparse short standing hairs (Plate X: *2*, *12*) . . . . . ***M. ruginodis*** Nyl. (p. 19)

5 (3) Antennal scape curved at base, but never angulate (Plate X: *3*); petiole in profile low, its dorsal surface broadly rounded or even slightly flattened (Plate X: *15*) . . . . . ***M. sulcinodis*** Nyl. (p. 21)

– Antennal scape angulate at base (Plate X: *4*), but sometimes curved, as in *M. sulcinodis*; petiole in profile higher, its anterior and dorsal surfaces meet at weakly rounded angle (Plate X: *16*) . . . . . ***M. lobicornis*** Nyl. (p. 22)

6 (2) Antennal scape relatively long, as length as 4–5 basal funicular joints together; SI>0.50 (Plate X: *5*, *6*) **7**

– Antennal scape short, as length as 3–3.5 of basal funicular joints together; SI<0.45 (Plate X: *7–10*) **8**

7 (6) Whole body, including sides and occipital margin of head, with very abundant, long standing hairs; posterior surface of petiole abruptly falls down before junction with postpetiole (Plate X: *17*, *18*) . . . . . ***M. hirsuta*** Elmes (p. 31)

– Whole body with sparser and shorter standing hairs; sides and occipital margin of head without hairs or with sparse short ones; posterior surface of petiole gradually falls down before junction with postpetiole (Plate X: *19*, *20*) . . . . . ***M. sabuleti*** Mein. (p. 29) and ***M. lonae*** Finzi (p. 30)

8 (6) Antennal scape clearly angulate at base (Plate X: *7*) . . . . . ***M. schencki*** Em. (p. 32)

– Antennal scape weakly curved at base (Plate X: *8–10*) **9**

9 (8) Antennal scape and legs with very long standing hairs (Plate X: *8*, *13*) . . . . . ***M. scabrinodis*** Nyl. (p. 27)

– Antennal scape and legs with much shorter standing hairs (Plate X: *9*, *10*, *14*) **10**

10 (9) Second funicular joint long, not less that 1.5 times longer than third (Plate X: *9*) . . . . . ***M. gallienii*** Bondr. (p. 24)

– Second funicular joint only slightly longer than third (Plate X: *10*) . . . . . ***M. hellenica*** For. (p. 25), ***M. rugulosa*** Nyl. (p. 23), ***M. specioides*** Bondr. (p. 26)

Key to species of *Leptothorax*

Workers

1 Antenna with 11 segments (subgen. *Leptothorax* s.str.) **2**

– Antenna with 12 segments (subgen. *Myrafant* M. R. Smith) **4**

2 (1) Antennal scape and tibiae with numerous standing hairs (Plate XI: *1*) . . . . . ***L. acervorum*** (F.) (p. 41)

– Antennal scape and tibiae only with decumbent pilosity (Plate XI: *2*) **3**

3 (2) Central part of clypeus between two longitudinal carinae entirely smooth and shiny, with no trace of striation; posterolateral part of head dorsum punctured and with distinct short longitudinal striae (Plate XI: *3*); alitrunk ochreous

yellow, head dorsum ochreous yellow to yellowish brown . . . . . *L. gredleri* Mayr (p. 43)

– Central part of clypeus between two longitudinal carinae shiny but at least with short striae; posterolateral part of head dorsum only with granulate sculpture, without striation (Plate XI: *4*); alitrunk reddish-yellow, head dorsum brown to dark brown . . . . . *L. muscorum* (Nyl.) (p. 42)

4 (1) Alitrunk dorsum with metanotal groove (Plate XI: *7–9*) **5**

– Alitrunk dorsum without metanotal groove (Plate XI: *12–16*) **8**

5 (4) Head quite long (CI>1.09, usually >1.11), with subparallel sides; propodeal spines relatively short, sometimes dentiform, but acute, directed backwards and upwards at an angle of about 45° (Plate XI: *7*); head dorsum brownish, distinctly darker than brownish yellow alitrunk and waist; gaster brown, only with yellow spot at base of first tergite . . . . . *L. sordidulus* subsp. *saxonicus* Seifert (p. 52)

– Head distinctly shorter (CI<1.09, usually <1.08), with slightly convex sides; propodeal spine usually longer and never directed at an angle of about 45° (Plate XI: *8, 9*) **6**

6 (5) Propodeal spines long, massive, wide at base and curved downward in their distal third (Plate XI: *8*). [Queens: propodeal spines relatively long, distinctly longer than half of distance between their tips (to be viewed from above) (Plate XI: *10*)] . . . . . *L. crassispinus* Karaw. (p. 50)

– Propodeal spines distinctly shorter, neither massive, nor wide at base, usually more or less straight (Plate XI: *9*). [Queens: propodeal spines short, distinctly shorter than half of distance between their tips (to be viewed from above) (Plate XI: *11*)] **7**

7 (6) Head dorsum brownish, distinctly darker than yellow or reddish-yellow alitrunk and waist; gaster brown, only with yellow spot at base of first tergite; gastral sternites at least partly brown . . . . . *L. nylanderi* (Först.) (p. 48)

– Whole body yellow, head dorsum never brownish; only distal half of first gastral tergite with brownish band; gastral sternites usually yellow . . . . . *L. parvulus* (Schenck) (p. 52)

8 (4) Alitrunk dorsum with distinct promesonotal suture (to be viewed from above); anterior clypeal margin distinctly notched medially . . . . . *L. clypeatus* (Mayr) (p. 56)

– Alitrunk dorsum without promesonotal suture (to be viewed from above); anterior clypeal margin without notch **9**

9 (8) Propodeal spines long, wide at base and curved downwards, only slightly shorter than propodeal dorsum; petiole with very short peduncle and with slightly concave, almost straight anterior surface (Plate XI: *12*) . . . . . *L. interruptus* (Schenck) (p. 48)

– Propodeum with teeth, if with spines they are thin, straight, not wide at base and not curved downwards; petiole of another shape (Plate XI: *13–16*) **10**

10 (9) Petiole without peduncle, in profile triangular, not truncate above; propodeum with blunt, short denticles (Plate XI: *13*) . . . . . *L. corticalis* (Schenck) (p. 54)

– Petiole with distinct peduncle, in profile not triangular, with distinctly truncate dorsum (Plate XI: *14–16*) **11**

11 (10) Propodeal spines long and thin, more or less straight and not wide at base, approximately as long as 3/4 of propodeal dorsum (Plate XI: *14*) . . . . . ***L. affinis*** Mayr (p. 53)

– Propodeum with blunt, short denticles or pointed teeth, which are distinctly shorter than half of propodeal dorsum (Plate XI: *15*, *16*) **12**

12 (11) Sculpture of head partly reduced, at least central part of head dorsum smooth and shiny (Plate XI: *5*); propodeum with blunt short denticles (Plate XI: *15*) . . . . . ***L. nadigi*** Kutter (p. 55)

– Head dorsum entirely sculptured (Plate XI: *6*); propodeum with pointed teeth (Plate XI: *16*) **13**

13 (12) At least central part of femora brown; gastral tergites brown, only first tergite yellow at base (Plate XI: *17*). Antennal club always distinctly darker than remainder of funiculus . . . . . ***L. nigriceps*** Mayr (p. 47)

– Femora yellow or ochreous yellow; gastral tergites and antennal club variously coloured **14**

14 (13) Gastral tergites brown, only first tergite yellow at base (Plate XI: *18*) . . . . . ***L. tuberum*** (F.) (p. 44)

– Gastral tergites yellow, only with dark wide band on posterior half of first tergite or with narrow bands on posterior margins of all tergites (Plate XI: *19*, *20*) **15**

15 (14) Gastral tergites yellow, only with dark wide band on posterior half of first tergite (Plate XI: *19*); head dorsum usually yellowish, concolour with alitrunk, rarely slightly darkened anteriorly . . . . . ***L. unifasciatus*** (Latr.) (p. 45)

– Gastral tergites yellow, only with narrow bands on posterior margins of all tergites (Plate XI: *20*); head dorsum darkened, distinctly darker than alitrunk . . . . . ***L. albipennis*** (Curt.) (p. 46)

Key to species of *Tetramorium*

Workers, queens and males

1 Frontal carinae of workers and queens short, terminating at upper level of eyes (Plate XII: *1*) **2**

– Frontal carinae of workers and queens long, projecting far beyond upper level of eyes (Plate XII: *2*, *3*) **4**

2 (1) Workers: dorsum of petiolar and postpetiolar nodes coarsely irregularly rugose; space between rugae only finely superficially punctured, more or less shiny; dorsum of petiolar node delineated by sharp raised rim at least in front and laterally (Plate XII: *4*). Queens: scutum slightly narrowed in front, frontolateral corners of pronotum visible from above (Plate XII: *7*). Males: stipes of genitalia rounded at apex, without concave or flattened apical areas (like in *T. impurum*, see Plate XIII: *5–8*) . . . . . ***T. moravicum*** Krat. (p. 66)

– Workers: dorsum of petiolar and postpetiolar nodes varies from entirely smooth and shiny to completely densely punctured and irregularly striate or finely rugulose and mat; never with coarse irregular rugae; dorsum of petiolar

node not delineated by sharp raised rim (Plate XII: *5*, *6*). Queens: scutum in front not narrowed, frontolateral corners of pronotum invisible from above (Plate XII: *8*) **3**

3 (2) Workers: dorsum of petiolar and postpetiolar nodes never entirely sculptured, usually mainly smooth and shiny, occasionally punctured and striated, but at least with smooth and shiny central part (Plate XII: *5*). Males: stipes of genitalia sharply truncate at apex, with distinct concave apical area (Plate XIII: *1–4*) . . . . . ***T. caespitum*** (L.) (p. 64)

– Workers: dorsum of petiolar and postpetiolar nodes never mainly smooth and shiny, usually entirely densely punctured and irregularly striate or finely rugulose, but often with smooth and shiny central part (Plate XII: *6*). Males: stipes of genitalia rounded at apex, without concave or flattened apical area (Plate XIII: *5–8*) . . . . . ***T. impurum*** (Först.) (p. 65)

4 (1) Workers: propodeum with long spines (Plate XII: *9*, *11*). Queens: large, more than 5 mm **5**

– Workers: propodeum with short acute teeth (Plate XII: *13*). Queens: very small, less than 3 mm **6**

5 (4) Workers: mandible finely striate. Longest hairs arising from frontal carina between antennal insertion and occipital corners shorter than maximum diameter of eye (Plate XII: *10*); petiolar node in profile subsquare, its dorsum horizontal, not sloping upwards posteriorly, anterodorsal and posterodorsal corners approximately on same level (Plate XII: *9*); gaster always distinctly darker than head and alitrunk . . . . . ***T. bicarinatum*** (Nyl.)* (an indoor species)

– Workers: mandible smooth and shiny, only with scattered hair-pits; longest hairs arising from frontal carina between antennal insertion and occipital corners longer than maximum diameter of eye (Plate XII: *12*); dorsum of petiolar node in profile gradually sloping upwards posteriorly, posterodorsal corner is on slightly higher level than anterodorsal one (Plate XII: *11*); gaster more or less concolour with head and alitrunk . . . . . ***T. insolens*** (F. Sm.) (an indoor species) (p. 68)

6 (4) Workers: frontal carinae strongly developed throughout their length, running unbroken almost to occipital margin and surmounted along all their length by narrow raised rim or flange; ground-sculpture of head between frontal carinae strongly granular or reticulate-punctate, surfaces mat; antennal scrobes broad and conspicuous; sides of head diverging behind eyes (Plate XII: *2*) . . . . . ***T. simillimum*** (F. Sm.)* (an indoor species)

– Workers: frontal carinae strongly developed to level of midlength of eye behind which they become weak, broken, or gradually fade out posteriorly, not surmounted by raised rim or flange beyond level of midlength of eye; ground--sculpture of head between frontal carinae feeble, surfaces dully shiny; antennal scrobes vestigial; sides of head subparallel along their whole length (Plate XII: *3*) . . . . . ***T. caldarium*** (Rog.) (an indoor species) (p. 68)

Key to genera of Formicinae

Workers

1 Mandibles narrow and falcate, without masticatory margins and teeth (Plate XIV: *1*) ..... ***Polyergus*** Latr. (p. 93)
In Poland one species – ***P. rufescens*** (Latr.) (p. 93)

– Mandibles broad, subtriangular, with distinct masticatory margins and teeth (Plates XIV: *2*; XV: *1*, *2*, *11*, *12*, *23*; XVI: *1–4*; XVIII: *4–6*; XIX: *1*; XX: *6*, *7*, *12*, *13*) **2**

2 (1) Antennae jointed distinctly behind posterior clypeal margin (Plate XVIII: *4–6*) ..... ***Camponotus*** Mayr (p. 94)

– Antennae jointed close to posterior clypeal margin (Plates XIV: *2*; XV: *1*, *2*, *11*, *12*, *23*; XVI: *1–4*; XIX: *1*; XX: *12*, *13*) **3**

3 (2) Eyes at or in front of midlength of sides of head (Plate XIV: *2*) ..... ***Paratrechina*** Motsch.*

– Eyes distinctly behind midlength of sides of head (Plates XV: *1–6*, *11*, *12*; XVI: *1–4*; XIX: *1–3*; XX: *12*, *13*) **4**

4 (3) Dorsal surface of propodeum distinctly shorter that declivity (Plate XIX: *5*; XX: *8*, *9*, *14–16*), if subequal then whole body yellow ..... ***Lasius*** F. (p. 100)

– Dorsal surface of propodeum subequal to its declivity (Plate XV: *13–16*, *24*, *25*; XVI: *5–8*), body never yellow ..... ***Formica*** L. (p. 71)

Queens

1 Mandibles narrow and falcate, without masticatory margins and teeth ..... ***Polyergus*** Latr. (p. 93)
In Poland one species – ***P. rufescens*** (Latr.) (p. 93)

– Mandibles broad, subtriangular, with distinct masticatory margins and teeth **2**

2 (1) Antennae jointed distinctly behind posterior clypeal margin Plate XVIII: *7*, *8*) ..... ***Camponotus*** Mayr (p. 94)

– Antennae jointed close to posterior clypeal margin (Plate XVI: *9*, *11*) **3**

3 (2) Eyes at or in front of midlength of sides of head .... ***Paratrechina*** Motsch.*

– Eyes distinctly behind of midlength of sides of head (Plates XVI: *9*, *11*; XIX: *9*, *10*) **4**

4 (3) Second to fifth joints of antennal funiculus shorter than remainder (Plate XIV: *3*) ..... ***Lasius*** F. (p. 100)

– Second to fifth joints of antennal funiculus longer than remainder (Plate XIV: *4*) ..... ***Formica*** L. (p. 71)

Males

1 Antennae jointed distinctly behind posterior clypeal margin ..... ***Camponotus*** Mayr (p. 94)

– Antennae jointed close to posterior clypeal margin **3**

2 (1) Mandible narrow, elongate, without masticatory margin, stick-like (Plate XIV: *7*) ..... ***Polyergus*** Latr. (p. 93)

In Poland one species – ***P. rufescens*** (Latr.) (p. 93)

– Mandible wide, with distinct masticatory margin (Plate XVII: *9, 10*) **3**

3 (2) Forewing without discoidal cell (Plate XIV: *5*); body smaller, less than 2.5 mm . . . . . ***Paratrechina*** Motsch.*

– Forewing with discoidal cell (Plate XIV: *6*) (in *Lasius* it occasionally absent); body larger, more than 3.5 mm **4**

4 (3) Body smaller, less than 5 mm; gaster seen from above subtriangular, with small genitalia (Plate XIV: *8*) . . . . . ***Lasius*** F. (p. 100)

– Body larger, more than 6 mm; gaster seen from above subcylindrical, with large genitalia (Plate XVII: *11, 12*) . . . . . ***Formica*** L. (p. 148)

Key to species of *Formica*

Workers

1 Head with strongly concave occipital margin (Plate XV: *1, 2*) (subg. *Coptoformica* Müll.) **2**

– Occipital margin of head straight, convex or, at most, slightly concave (Plates XV: *11, 12*; XVI: *1–4*) **5**

2 (1) Standing hairs present from 4th gastral tergite and from 3rd sternite to apex (Plate XV: *7*); maxillary palpes short, usually not reaching to midlength of distance from mouth to occipital hole (Plate XV: *3, 4*); occipital and lateral margins of head without standing hairs; eyes without microscopic hairs (to be viewed under magnification not less than 40×) (Plate XV: *1, 3, 4*) **3**

– Standing hairs usually present on all gastral segments (Plate XV: *8*); maxillary palpes longer, usually surpassing or at least reaching to midlength of distance from mouth to occipital hole (Plate XV: *5, 6*) **4**

3 (2) Pubescence in ocellar triangle relatively sparce (Plate XV: *9*). Distance between appressed hairs on gastral tergites more or less equal to hairs' length . . . . . ***F. pressilabris*** Nyl. (p. 91)

– Pubescence in ocellar triangle dense (Plate XV: *10*). Distance between appressed hairs on gastral tergites somewhat shorter than hairs' length. . . . . ***F. foreli*** Em. (p. 92)

4 (2) Eyes with distinct microscopic hairs (to be viewed under magnification not less than 40×); occipital corners of head with short standing hairs; maxillary palpes longer, surpassing midlength of distance from mouth to occipital hole (Plate XV: *2, 5*) . . . . . ***F. exsecta*** Nyl. (p. 89)

– Eyes without microscopic hairs (to be viewed under magnification not less than 40×); occipital corners of head without standing hairs; maxillary palpes shorter, only reaching to midlength of distance from mouth to occipital hole (Plate XV: *6*) . . . . . ***F. forsslundi*** Lohm. (p. 92)

5 (1) Whole body dark brown to black (subg. *Serviformica* For., part.) **6**

– Bicoloured species, with alitrunk red and contrasting with brownish black gaster; alitrunk often with darker patches **9**

6 (5) Occipital margin of head and alitrunk dorsum with numerous standing hairs (Plate XV: *11*, *13*); ventral surface of head with more than 6 standing hairs ..... ***F. cinerea*** Mayr (subsp. ***cinerea*** Mayr) (p. 82)

– Occipital margin of head without standing hairs; alitrunk dorsum without or, at most, with few standing hairs (Plate XV: *12*, *14-16*); ventral surface of head without or, at most, with 3–4 standing hairs **7**

7 (6) Whole body shiny. First gastral tergite with very sparse pubescence, distance between appressed hairs longer than hairs' length (Plate XV: *17*). Promesonotal dorsum with long curved standing hairs (Plate XV: *14*) .... ***F. candida*** F. Sm. (p. 81)

– Whole body with dense microsculpture, appears dull; first gastral tergite with dense pubescence, distance between appressed hairs much shorter than hairs' length (Plate XV: *18*); promesonotal dorsum without or, at most, with short straight standing hairs (Plate XV: *15*, *16*) **8**

8 (7) Femur of foreleg with 2–3 standing hairs on inner margin, femur of middle leg usually without standing hairs, rarely with 1–2 ones near base of femur (Plate XV: *19*, *20*); promesonotal dorsum usually without standing hairs, rarely with 1–5 hairs only on pronotum (Plate XV: *15*) ..... ***F. fusca*** L. (p. 79)

– Femur of foreleg with 3–12 standing hairs on inner margin, femur of middle leg with 3–7 hairs (Plate XV: *21*, *22*); promesonotal dorsum with more than 6 standing hairs (Plate XV: *16*) ..... ***F. lemani*** Bondr. (p. 80)

9 (5) Anterior clypeal margin distinctly notched medially (Plate XV: *23*) (subg. *Raptiformica* For.) ..... ***F. sanguinea*** Latr. (p. 88)

– Anterior clypeal margin convex, not notched medially (Plate XVI: *1–4*) **10**

10 (9) Frontal triangle dull (subg. *Serviformica* For., part.) **11**

– Frontal triangle shiny, contrasting with dull surface of other parts of head (subg. *Formica* s.str.) **15**

11 (10) Head dorsum unicoloured, dark brown to black. Nests with mounds from leaves and twigs (similar to those of wood ants) ..... ***F. uralensis*** Ruzs. (p. 87)

– At least genae and clypeus red. Nests in ground or with soil mounds **12**

12(11) Occipital margin of head and alitrunk dorsum with numerous standing hairs (Plate XV: *13*); ventral surface of head with more than 6 standing hairs ..... ***F. cinerea*** Mayr (subsp. ***fuscocinerea*** For.) (p. 82)

– Occipital margin of head without standing hairs; alitrunk dorsum without or with not abundant standing hairs (Plate XV: *24*, *25*); ventral surface of head with 3–4 standing hairs at most **13**

13 (12) Petiolar scale with numerous short standing hairs, directed somewhat forwards and backwards; promesonotal dorsum with not less than 10 standing hairs (Plate XV: *24*) ..... ***F. rufibarbis*** F. (p. 84)

– Petiolar scale without standing hairs or, at most, with a few hairs directed upwards; promesonotal dorsum with not more than 6 standing hairs (Plate XV: *25*) **14**

14 (13) Whole alitrunk yellowish red, without dark patches. More robust species ..... ***F. glauca*** Ruzs. (p. 86)

– Sides of alitrunk with dark patches, occasionally only suturae red. Slender species ..... ***F. cunicularia*** Latr. (p. 85)

15 (10) Whole head and alitrunk of larger workers red; head and alitrunk with numerous standing hairs (Plate XVI: *1, 5*) ..... ***F. truncorum*** F. (p. 76)

– At least upper third of head dorsum brownish black **16**

16 (15) Head and alitrunk with numerous standing hairs (Plate XVI: *2, 6*) **17**

– Occipital margin of head without or only with not abundant short erect to suberect hairs (Plate XVI: *3, 4*). Alitrunk dorsum without or, at most, with a few standing hairs (Plate XVI: *7, 8*) **18**

17 (16) Dark patch on promesonotal dorsum with well marked margins .... ***F. pratensis*** Retz. (p. 77)

– Dark patch on promesonotal dorsum (if presents) without well-marked margins ..... ***F. lugubris*** Zett. (p. 74)

18 (16) Occipital margin of head with at least a few short erect to suberect hairs (Plate XVI: *3*) ..... ***F. aquilonia*** Yarr. (p. 75)

– Occipital margin of head without hairs (Plate XVI: *4*) **19**

19 (18) Each segment of alitrunk dorsum usually with not less than 6 standing hairs (Plate XVI: *7*); ventral surface of head with relatively long erect hairs (to be viewed in profile) ..... ***F. rufa*** L. (p. 71)

– Each segment of alitrunk dorsum without or with less than 6 standing hairs (Plate XVI: *8*); ventral surface of head without or, at most, with short sparse suberect hairs (to be viewed in profile) ..... ***F. polyctena*** Först. (p. 73)

Queens

1 Head with strongly concave occipital margin (subg. *Coptoformica* Müll.) ... **2**

– Occipital margin of head straight, convex or, at most, slightly concave **5**

2 (1) Large, distinctly larger than workers, HW>1.6, AL>2.5 mm; eyes with hairs ..... ***F. exsecta*** Nyl. (p. 89)

– Smaller, more or less of the same size as workers, HW<1.4, AL<2.5 mm; eyes without hairs **3**

3 (2) Standing hairs present from 1st or 2nd gastral tergite to apex .... ***F. forsslundi*** Lohm. (p. 92)

– Standing hairs present from 3rd or 4th gastral tergite to apex **4**

4 (3) Pubescence in ocellar triangle relatively sparce (as in Plate XV: *9*). Distance between appressed hairs on gastral tergites more or less equal to hairs' length. Body finely sculptured, at least sides of alitrunk and scutellum (often also head and scutum) appear shiny ..... ***F. pressilabris*** Nyl. (p. 91)
Pubescence in ocellar triangle dense (as in Plate XV: *10*). Distance between appressed hairs on gastral tergites somewhat shorter than hairs' length. Body with dense microsculpture, appears dull ..... ***F. foreli*** Em. (p. 92)

5 (1) Whole body brownish black or greyish black (subg. *Serviformica* For., part.) ... **6**

– Bicoloured species, with alitrunk at least partly red and contrasting with brownish black gaster **9**

6 (5) Occipital margin, temples and ventral surface of head, whole pronotum and propodeum with numerous standing hairs (Plate XVI: *9, 10*) .... ***F. cinerea*** Mayr (p. 82)

– Head, pronotum and propodeum without or with a few standing hairs (Plate XVI: *11, 12*) **7**

7 (6) Ventral surface of head with 2–5 standing hairs (to be viewed in profile); whole body shiny . . . . . ***F. candida*** F. Sm. (p. 81)

– Ventral surface of head without standing hairs (to be viewed in profile); body with denser microsculpture, at least gaster appears dull **8**

8 (7) Middle femour usually without standing hairs on inner margin, rarely with 1–2 hairs near base of femour . . . . . ***F. fusca*** L. (p. 79)

– Middle femour with row of standing hairs on inner margin . . . . . ***F. lemani*** Bondr. (p. 80)

9 (5) Anterior clypeal margin distinctly notched medially (subg. *Raptiformica* For.) . . . . . ***F. sanguinea*** Latr. (p. 88)

– Anterior clypeal margin convex, not notched medially **10**

10 (9) Frontal triangle dull. Eyes completely without hairs (subg. *Serviformica* For., part.) **11**

Frontal triangle shiny, contrasting with dull surface of other parts of head; eyes at least with microscopic hairs (subg. *Formica* s.str.) **14**

11 (10) Head dorsum unicoloured, dark brown to black . . . . . ***F. uralensis*** Ruzs. (p. 87)

– At least genae and clypeus red **12**

12 (11) Posterior margin of pronotum with two rows of standing hairs (Plate XVI: *13*); propodeum usually with standing hairs . . . . . ***F. rufibarbis*** F. (p. 84)

– Posterior margin of pronotum with one row of standing hairs (Plate XVI: *14*); propodeum without standing hairs **13**

13 (12) Scutum from reddish brown to dark brown . . . . . ***F. cunicularia*** Latr. (p. 85)

– Scutum from yellowish red do dark red . . . . . ***F. glauca*** Ruzs. (p. 86)

14 (10) Scutum red to brownish red, sometimes with dark patches, but usually distinctly lighter than blackish brown scutellum; head usually entirely red; whole body with numerous standing hairs . . . . . ***F. truncorum*** F. (p. 76)

– Both scutum and scutellum blackish brown; upper third of head dorsum brown to black **15**

15 (14) Gaster densely sculptured and with abundant pubescence, appears dull . . . . . ***F. pratensis*** Retz. (p. 77)

– Gaster finely sculptured and with sparse short pubescence, appears shiny **16**

16 (15) Occipital margin of head and temples with numerous short straight standing hairs; propodeum and declivity of first gastral tergite with fine curved standing hairs (Plate XVII: *1*, *3*). . . . . ***F. lugubris*** Zett. (p. 74)

– Occipital margin of head, temples and propodeum without standing hairs (rarely with a few short hairs on occipital corners); declivity of first gastral tergite without or with short straight standing hairs (Plate XVII: *2*, *4*, *5*) . . . **17**

17 (16) Declivity of first gastral tergite with short standing hairs (Plate XVII: *4*). Occipital margin of head usually without hairs, rarely with a few short hairs on occipital corners. Eyes with numerous microscopic hairs. Surface of gaster with dense micropunctures, relatively less shiny . . . . . ***F. aquilonia*** Yarr. (p. 75)

– Declivity of first gastral tergite without standing hairs (Plate XVII: *5*). Occipital margin of head completely without hairs. Eyes with a few microscopic hairs. Surface of gaster with very sparse micropunctures, distinctly shiny **18**

18 (17) Central parts of scutum and scutellum usually with very sparse micropunctures, appear shiny . . . . . ***F. rufa*** L. (p. 71)

– Central parts of scutum and scutellum usually with dense micropunctures, appear dull . . . . . ***F. polyctena*** Först. (p. 73)

Males

1 Occipital margin of head shallowly concave (subg. *Coptoformica* Müll.) **2**

– Occipital margin of head straight or convex **4**

2 (1) Larger, HW>1.5, AL>2.7 mm; eyes with hairs . . . . . ***F. exsecta*** Nyl. (p. 89)

– Smaller, HW<1.4, AL<2.6 mm; eyes without hairs **3**

3 (2) Alitrunk only with dense decumbent to subdecumbent pubescens. Temples without hairs. Pubescence on gastral tergites very dense, distance between appressed hairs not less than 2 times shorter than hairs' length . . . . . ***F. pressilabris*** Nyl. (p. 91) and ***F. foreli*** Em. (p. 92)

– Alitrunk with pubescence and numerous fine standing hairs. Temples with thick short subdecumbent hairs. Pubescence on gastral tergites relatively rare, distance between appressed hairs not more than 1.5 times shorter than hairs' length . . . . . ***F. forsslundi*** Lohm. (p. 92)

4 (1) Anterior clypeal margin notched medially (subg. *Raptiformica* For.) . . . . . ***F. sanguinea*** Latr. (p. 88)

Anterior clypeal margin convex, not notched medially **5**

5 (4) Eyes without hairs (subg. *Serviformica* For.) **6**

– Eyes with conspicuous hairs (subgen. *Formica* s.str.) **12**

6 (5) Occipital margin of head with numerous standing hairs . . . . . ***F. cinerea*** Mayr (p. 82)

– Occipital margin of head without standing hairs **7**

7 (6) Ventral surface of head without standing hairs (to be viewed in profile) **8**

– Ventral surface of head with 2–6 standing hairs (to be viewed in profile) . . **11**

8 (7) Petiolar scale with very short hairs only, its upper margin convex or straight, rarely very shallowly concave (Plate XVII: *6*) . . . . . ***F. fusca*** L. (p. 79)

– Petiolar scale with both short and long hairs, its upper margin concave (Plate XVII: *7*, *8*) **9**

9 (8) Petiolar scale with strongly concave upper margin and with sharply angulate upper corners (Plate XVII: *7*) . . . . . ***F. rufibarbis*** F. (p. 84)

– Petiolar scale with shallowly concave upper margin and with rounded upper corners (Plate XVII: *8*) **10**

10 (9) Body black, with very fine microsculpture, appears shiny . . . . . ***F. lemani*** Bondr. (p. 80)

– Body brown to dark brown, with denser microsculpture, appears more or less dull . . . . . ***F. cunicularia*** Latr. (p. 85) and ***F. glauca*** Ruzs. (p. 86)

11 (7) Body massive, with dense microsculpture, appears dull; propodeum with appressed pubescence only, sometimes also with a few thick long golden standing hairs; 1st to 4th gastral tergites usually without standing hairs . . . . . ***F. uralensis*** Ruzs. (p. 87)

– Body slender, with fine microsculpture, appears shiny; propodeum with thick long golden or blackish hairs and numerous fine short whitish standing hairs; all gastral tergites usually with standing hairs .... ***F. candida*** F. Sm. (p. 81)

12 (5) Head margins, including genae, with numerous long standing hairs (Plate XVII: *9*) **13**

– Genae without or, at most, with sparse short standing hairs (Plate XVII: *10*) **14**

13 (12) Gastral tergites with very abundant short suberect hairs, forming uninterrupted fringe from base to apex of gaster (Plate XVII: *11*) ..... ***F. truncorum*** F. (p. 76)

– Gastral tergites with less abundant, scattered longer hairs, not forming uninterrupted fringe from base to apex of gaster (Plate XVII: *12*) ..... ***F. lugubris*** Zett. (p. 74) and ***F. pratensis*** Retz. (p. 77)

14 (12) External margin of hind femur with a row of very short, straight, thick suberect hairs (Plate XVII: *13*); genae usually with not numerous standing hairs ..... ***F. aquilonia*** Yarr. (p. 75)

– External margin of hind femur without or, at most, with a few hairs (Plate XVII: *14*); genae usually without, rarely with a few standing hairs **15**

15 (14) Scutum and propodeum with numerous long curved hairs (Plate XVII: *15*) ..... ***F. rufa*** L. (p. 71)

– Scutum and propodeum with much less abundant, usually shorter hairs (Plate XVII: *16*) ..... ***F. polyctena*** Först. (p. 73)

Key to species of *Camponotus*

Workers

1 Alitrunk dorsum in profile forming more or less regular arch, without metanotal groove (Plate XVIII: *1*, *2*) **2**

– Alitrunk in profile with distinct, often deep metanotal groove (Plate XVIII: *3*) ..... ***C. piceus*** (Leach) (p. 99)

2 (1) Anterior clypeal margin distinctly notched medially (Plate XVIII: *4*) ..... ***C. fallax*** (Nyl.) (p. 98)

– Anterior clypeal margin not notched medially (Plate XVIII: *5*, *6*) **3**

3 (2) Whole body black; occipital margin of head with numerous standing hairs (Plate XVIII: *5*) ..... ***C. vagus*** (Scop.) (p. 97)

– Alitrunk from yellowish red to brownish red, head and gaster brownish black; occipital margin of head without or, at most, with a few standing hairs (Plate XVIII: *6*) **4**

4 (3) At least basal third of first gastral tergite reddish, remainder of gaster brownish black (sometimes, in small specimens, this reddish patch is hardly visible) (Plate XVIII: *2*) ..... ***C. ligniperdus*** (Latr.) (p. 96)

– At most declivity of first gastral tergite could be reddish, remainder of gaster brownish black (Plate XVIII: *1*) ..... ***C. herculeanus*** (L.) (p. 95)

Queens

1 Anterior clypeal margin not notched medially; larger: HW>3.0, AL>5.0 mm ... **2**

– Anterior clypeal margin distinctly notched medially (Plate XVIII: *7*, *8*); smaller: HW<2.5, AL<3.5 mm **4**

2 (1) Occipital margin of head with numerous standing hairs. Whole body black ..... ***C. vagus*** (Scop.) (p. 97)

– Occipital margin of head without or at most with a few standing hairs. At least propodeum reddish **3**

3 (2) At least basal third of first gastral tergite reddish, remainder of gaster brownish black; pubescence on gastral tergites sparse, appressed hairs short, on first tergite not longer than distance between them ..... ***C. ligniperdus*** (Latr.) (p. 96)

– At most declivity of first gastral tergite could be reddish, remainder of gaster brownish black; pubescence on gastral tergites more dense, appressed hairs longer, on first tergite 1.5–2 times longer than distance between them ..... ***C. herculeanus*** (L.) (p. 95)

4 (1) Frons and lower part of head dorsum with only a few long standing hairs (Plate XVIII: *7*) ..... ***C. fallax*** (Nyl.) (p. 98)

– Frons and lower part of head dorsum with numerous long standing hairs (Plate XVIII: *8*) ..... ***C. piceus*** (Leach) (p. 99)

Males

1 Larger: HW>1.3, AL>3.5 mm **2**

– Smaller: HW<1.1, AL<2.8 mm **3**

2 (1) Occipital margin of head with numerous long curved standing hairs ..... ***C. vagus*** (Scop.) (p. 97)

– Occipital margin of head without or, at most, with a few short hairs ..... ***C. herculeanus*** (L.) (p. 95) and ***C. ligniperdus*** (L.) (p. 96)

3 (1) Occipital margin of head without standing hairs ..... ***C. fallax*** (Nyl.) (p. 98)

– Occipital margin of head with long standing hairs ..... ***C. piceus*** (Leach) (p. 99)

Key to species of *Lasius*

Workers and queens

1 Body shiny black; head with strongly concave occipital margin (Plate XIX: *1*) ..... ***L. fuliginosus*** (Latr.) (p. 117)

– Body never shiny black; occipital margin of head straight, convex or slightly concave at most (Plates XIX: *9*, *10*; XX: *12*, *13*) **2**

2 (1) Maxillary palpes short, not reaching to midlength of ventral surface of head (Plate XIX: *2*). Workers: body from yellow to ochreous yellow **3**

– Maxillary palpes relatively long, distinctly reaching beyond midlength of ventral surface of head (Plate XIX: *3*). Workers: body brownish or greyish black, sometimes bicoloured, with alitrunk lighter than gaster, never yellow **12**

3 (2) Workers: propodeum broadly rounded; petiolar scale, seen in profile, thick, with rounded crest (Plate XIX: *4*). Queens: very small, not more than 4 mm ... . ***L. carniolicus*** Mayr*

– Workers: propodeum narrowly rounded or slightly angulate; petiolar scale, seen in profile, thin, with flattened crest (Plate XIX: *5*). Queens: much larger, not less than 6 mm **4**

4 (3) Workers polymorphic; petiolar scale, seen in front or from behind, widest near upper margin (Plate XIX: *11*). Queens: head distinctly narrower than maximum width of alitrunk (Plate XIX: *9*) . . . . . ***L. flavus*** (F.) (p. 109)

– Workers monomorphic; petiolar scale, seen in front or from behind, widest distinctly below of upper margin, or with parallel sides (Plate XIX: *12–16*). Queens: head wider or, at least, as wide as maximum width of alitrunk (Plate XIX: *10*) **5**

5 (4) Standing hairs on gaster restricted to hind margins of tergites, remaining surface of tergites usually without or with a few hairs (Plate XIX: *6*) . . . . . ***L. bicornis*** (Först.) (p. 116)

Whole surface of gastral tergites with standing hairs (Plate XIX: *7*, *8*) **6**

6 (5) Alitrunk and gaster with very short standing hairs (Plate XIX: *7*); length of longest hairs on anterodorsal surface of first gastral tergite of queens less than 0.06 mm . . . . . ***L. mixtus*** (Nyl.) (p. 115)

– Alitrunk and gaster with much longer standing hairs (Plate XIX: *8*); length of longest hairs on anterodorsal surface of first gastral tergite of queens more than 0.07 mm **7**

7 (6) Dorsal surface of scape and external margin of hind tibia without standing hairs, at most with 1–2 hairs at base of tibia (Plate XIX: *19*, *22*) . . . . . ***L. citrinus*** Em. (p. 115)

– Dorsal surface of scape and external margin of hind tibia with a few to many standing hairs (Plate XIX: *20*, *21*, *23–30*) **8**

8 (7) Gastral tergites with very sparse pubescence, distance between appressed hairs equal to or only slightly shorter than their length (to be viewed under magnification not less than 60×) (Plate XIX: *17*) . . . . . ***L. nitidigaster*** Seifert (p. 113)

– Gastral tergites with dense pubescence, distance between appressed hairs much shorter than their length (to be viewed under magnification not less than 60×) (Plate XIX: *18*) **9**

9 (8) External margin of hind tibia with a few (usually less than 10) standing hairs (Plate XIX: *20*) . . . . . ***L. distinguendus*** Em. (p. 111)

– External margin of hind tibia with numerous (usually more than 15) standing hairs (Plate XIX: *21*, *28–30*) (in queens if less than 10 hairs, their antennal scape and tibiae distinctly flattened) **10**

10 (9) Petiolar scale of workers, seen in front or from behind, distinctly tapering to a bluntly pointed or narrowly rounded dorsal crest, very rarely crest slightly notched, but never distinctly emarginate (Plate XIX: *12–14*); antennal scape distinctly flattened (ratio of max/min scape diameter 1.50–2.04); scapes and tibiae of queens strongly flattened (corresponding ratios 1.80–2.35 and 2.10–3.0) (Plate XIX: *25*, *28*) . . . . . ***L. jensi*** Seifert (p. 114)

– Petiolar scale of workers, seen in front or from behind, not tapering to apex, dorsal crest usually emarginate, very rarely broadly rounded (Plate XIX: *15*, *16*); antennal scapes and tibiae of workers and queens flattened or oval in cross-section (ratio of max/min diameter of scape of workers 1.25–1.6, that of queens 1.15–2.10, ratio of max/min diameter of hind tibiae of queens 1.35–2.38) (Plate XIX: *26*, *27*, *29*, *30*) **11**

11 (10) Antennal scapes and tibiae of workers and queens not flattened, oval in cross--section (Plate XIX: *26*, *29*) . . . . . ***L. umbratus*** (Nyl.) (p. 110)

– Antennal scapes and tibiae of workers and especially of queens flattened (Plate XIX: *27*, *30*) . . . . . ***L. meridionalis*** (Bondr.) (p. 112)

12 (2) Dorsal surface of scape and external margin of hind tibia with numerous standing hairs (Plate XX: *1*, *2*, *4*) **13**

– Dorsal surface of scape and external margin of hind tibia without or, at most, with a few standing hairs (Plate XX: *3*, *5*) **15**

13 (12) Body of workers distinctly bicoloured, with head and especially alitrunk yellowish red to brownish red, contrasting with much darker gaster; clypeus with relatively sparse and long pubescence, distance between depressed hairs 2.5–3 times shorter than hairs' length (similar to that in *L. platythorax*, see below). Body of queens reddish brown, at least sides of alitrunk light reddish brown; alitrunk relatively long and low, AI>1.75 . . . . . ***L. emarginatus*** (Ol.) (p. 103)

– Body of workers yellowish brown to greyish black, never distinctly bicoloured. Body of queens brown to brownish black; alitrunk relatively shorter and higher, AI<1.70 (with exception of *L. platythorax*, see below) **14**

14 (13) Clypeus with very dense and short pubescence, distance between depressed hairs 3.5–4 times shorter than hairs' length (Plate XX: *6*); standing hairs on antennal scape relatively sparse and short, longest hairs not longer (usually shorter) than half of maximum width of scape at apex (Plate XX: *1*); metanotal groove usually relatively deep and abrupt, propodeal dorsum usually convex and rounded; standing hairs on body relatively sparse and short (Plate XX: *8*). Queens: alitrunk convex, relatively high and short, AI<1.70 (Plate XX: *10*) . . . . . ***L. niger*** (L.) (p. 100)

– Clypeus with relatively sparse and long pubescence; distance between depressed hairs 2.5–3 times shorter than hairs' length (Plate XX: *7*); standing hairs on antennal scape relatively abundant and long, longest hairs longer than half of maximum width of scape at apex (Plate XX: *2*); metanotal groove usually shallow, propodeal dorsum somewhat flattened, more conical than rounded; standing hairs on body relatively abundant and long (Plate XX: *9*). Queens: alitrunk weakly convex or somewhat flattened, relatively low and long, AI>1.75 (Plate XX: *11*) . . . . . ***L. platythorax*** Seifert (p. 103)

15 (12) Body with very fine, strictly appressed pubescence, so the surface appears perfectly smooth; body of workers distinctly bicoloured, with alitrunk yellowish red, contrasting with darker gaster. Antennal scape short, SI of queens <0.80 . . . . . ***L. brunneus*** (Latr.) (p. 104)

– Body with coarser pubescence, hairs slightly projecting from cuticle, so the surface does not appear perfectly smooth; body usually unicolour, occasionally alitrunk slightly lighter than gaster. Antennal scape longer, SI of queens >0.80 . . . . . **16**

16 (15) Head margin behind eyes with less than 15 (usually with 10–12) standing hairs (Plate XX: *12*); area between propodeal spiracles and metapleural glands without or, at most, with 1, very rarely with 2 (in workers) or 5–6 (in queens) standing hairs (Plate XX: *14*); clypeus with relatively sparse and long pubescence, distance between depressed hairs 2.5–3 times shorter than hairs' length (similar to that in *L. platythorax*, see above) . . . . . ***L. alienus*** (Först.) (p. 105)

– Head margin behind eyes with more than 15 (usually with 17–20) standing hairs (Plate XX: *13*); area between propodeal spiracles and metapleural glands with 2–5 (in workers) or 6–20 (in queens) standing hairs (Plate XX: *15*, *16*) **17**

17 (16) Clypeus with denser and shorter pubescence, distance between depressed hairs about 3.5 times shorter than hairs' length (similar to that in *L. niger*, see above); whole body brownish black . . . . . ***L. paralienus*** Seifert (p. 107)

– Clypeus with relatively sparser and longer pubescence, distance between depressed hairs 2.5–3 times shorter than hairs' length (similar to one of *L. alienus*, see above); head, and especially alitrunk of workers from brown to reddish brown, lighter than brownish black gaster **18**

18 (17) Workers: standing hairs on alitrunk dorsum longer; metanotal groove deeper and more abrupt (Plate XX: *16*). Queens: smaller, HW<1.44 mm. Monogynous species, inhabits predominately xerothermal sandy areas . . . . . ***L. psammophilus*** Seifert (p. 107)

– Workers: standing hairs on alitrunk dorsum shorter; metanotal groove shallow, propodeal dorsum more flattened (Plate XX: *15*). Queens: larger, HW>1.45 mm. Polygynous species, common in anthropogenic habitats, including urban areas . . . . . ***L. neglectus*** Van Loon, Boomsma et Andrasfalvy (p. 108)

For the morphological plates see the next pages

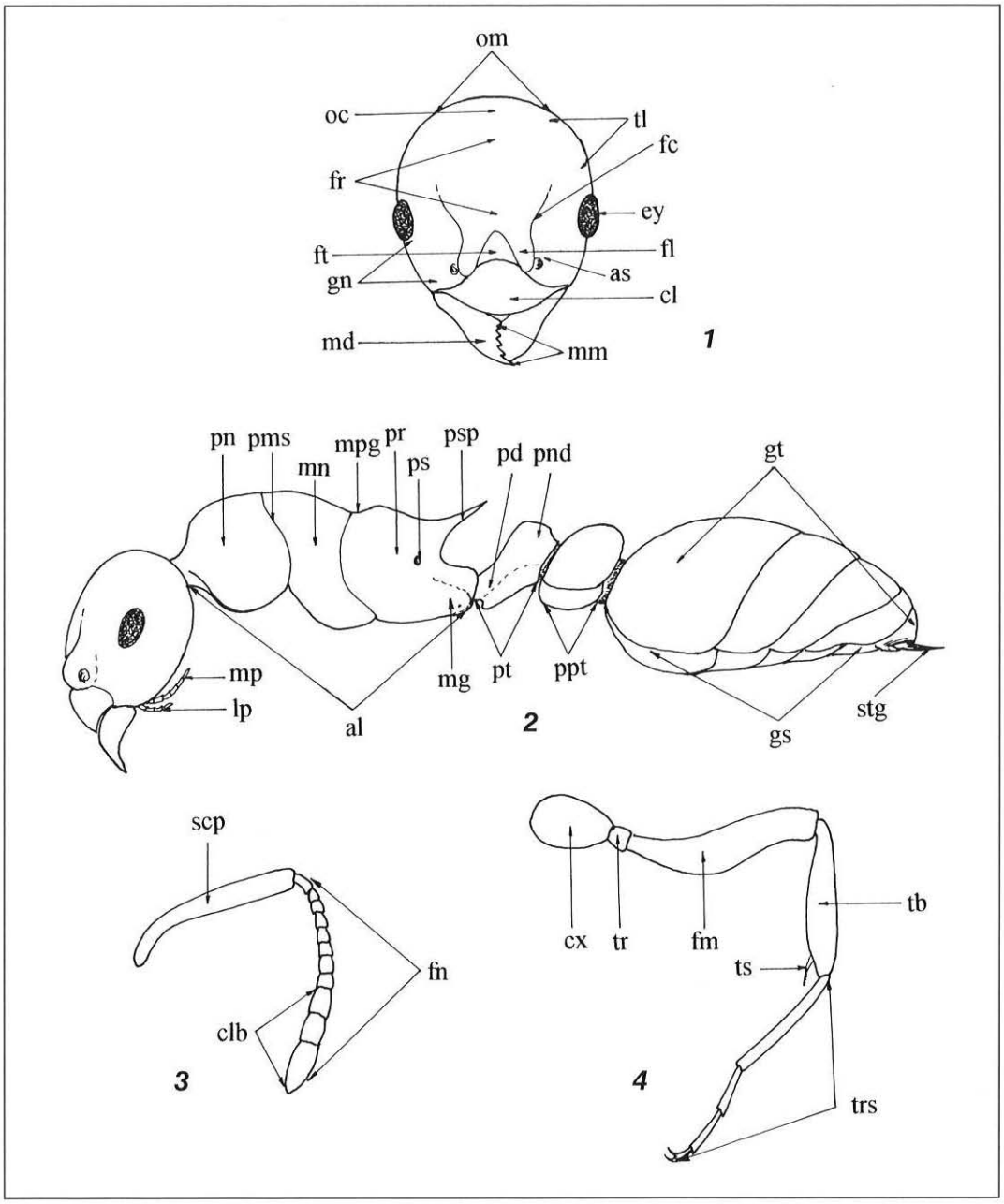


Plate I. Ant morphology – worker of *Myrmica* sp.: ***1*** – head, frontal view (sculpture, pilosity and antennae omitted): as – antennal socket, cl – clypeus, ey – eye, fc – frontal carina, fl – frontal lobe, fr – frons, ft – frontal triangle, gn – gena, md – mandible, mm – masticatory margin of mandible, oc – occiput, om – occipital margin, tl – temple; ***2*** – body, lateral view (sculpture, pilosity and legs omitted): al – alitrunk, gs – gastral sternites, gt – gastral tergites, lp – labial palpes, mg – metapleural gland, mn – mesonotum, mp – maxillary palpes, mpg – metanotal groove, pd – petiolar peduncle, pms – promesonotal suture, pn – pronotum, pnd – petiolar node, ppt – postpetiole, pr – propodeum, ps – propodeal spiracle, psp – propodeal spine, pt – petiole, stg – sting; ***3*** – antenna: clb – club, fn – funiculus, scp – scape; ***4*** – hind leg: cx – coxa, fm – femur, tb – tibia, tr – trochanter, trs – tarsus, ts – tibial spur.

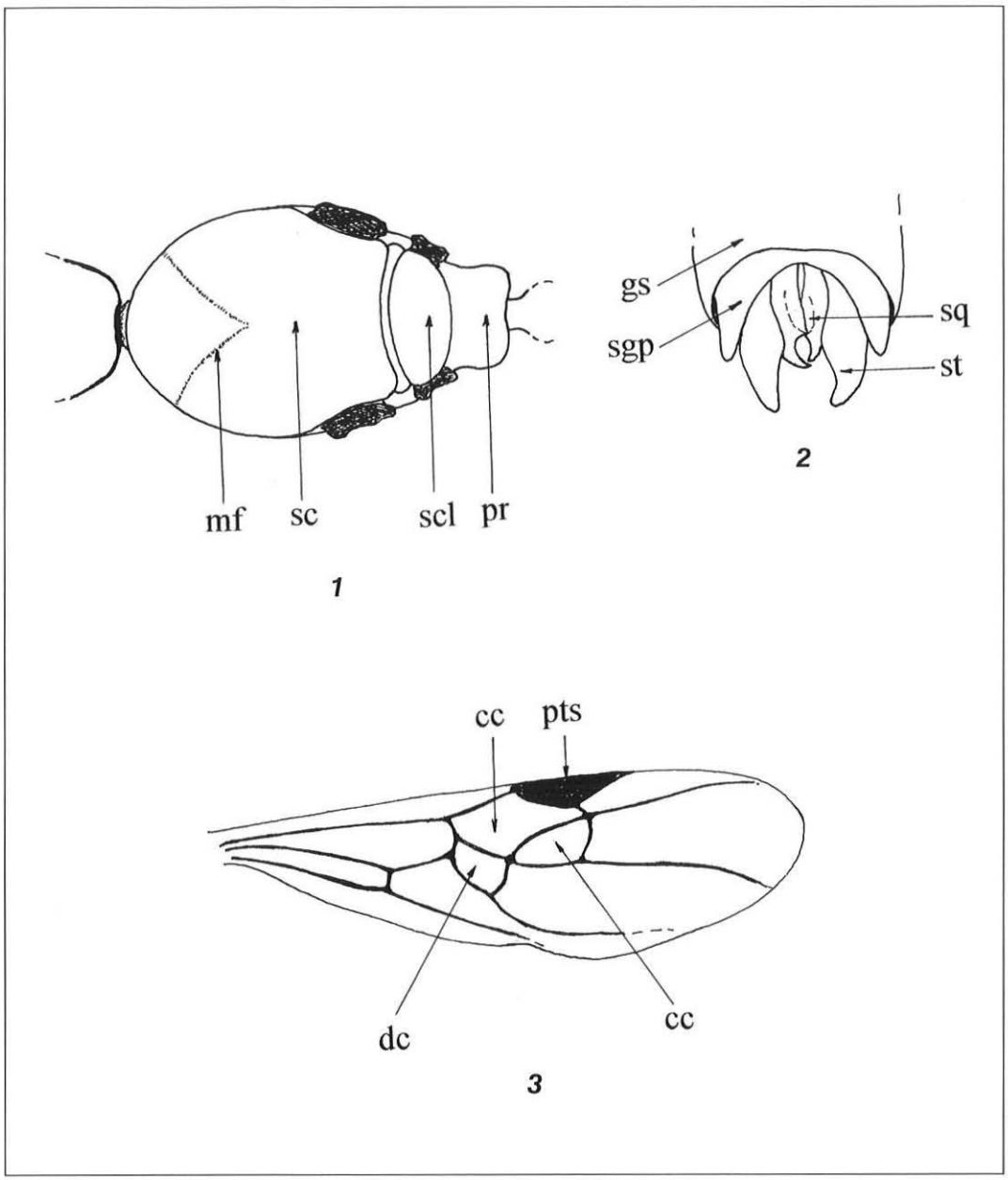


Plate II. Ant morphology – males: ***1*** – *Leptothorax* sp., alitrunk from above: mf – Mayr's furrow, pr – propodeum, sc – scutum, scl – scutellum; ***2*** – *Tapinoma ambiguum* Em., genitalia (ventral view): gs – last gastral sternite, sgp – subgenital plate, sq – squamula, st – stipes; ***3*** – *Dolichoderus quadripunctatus* (L.), forewing: cc – cubital cells, dc – discoidal cell, pts – pterostigma.

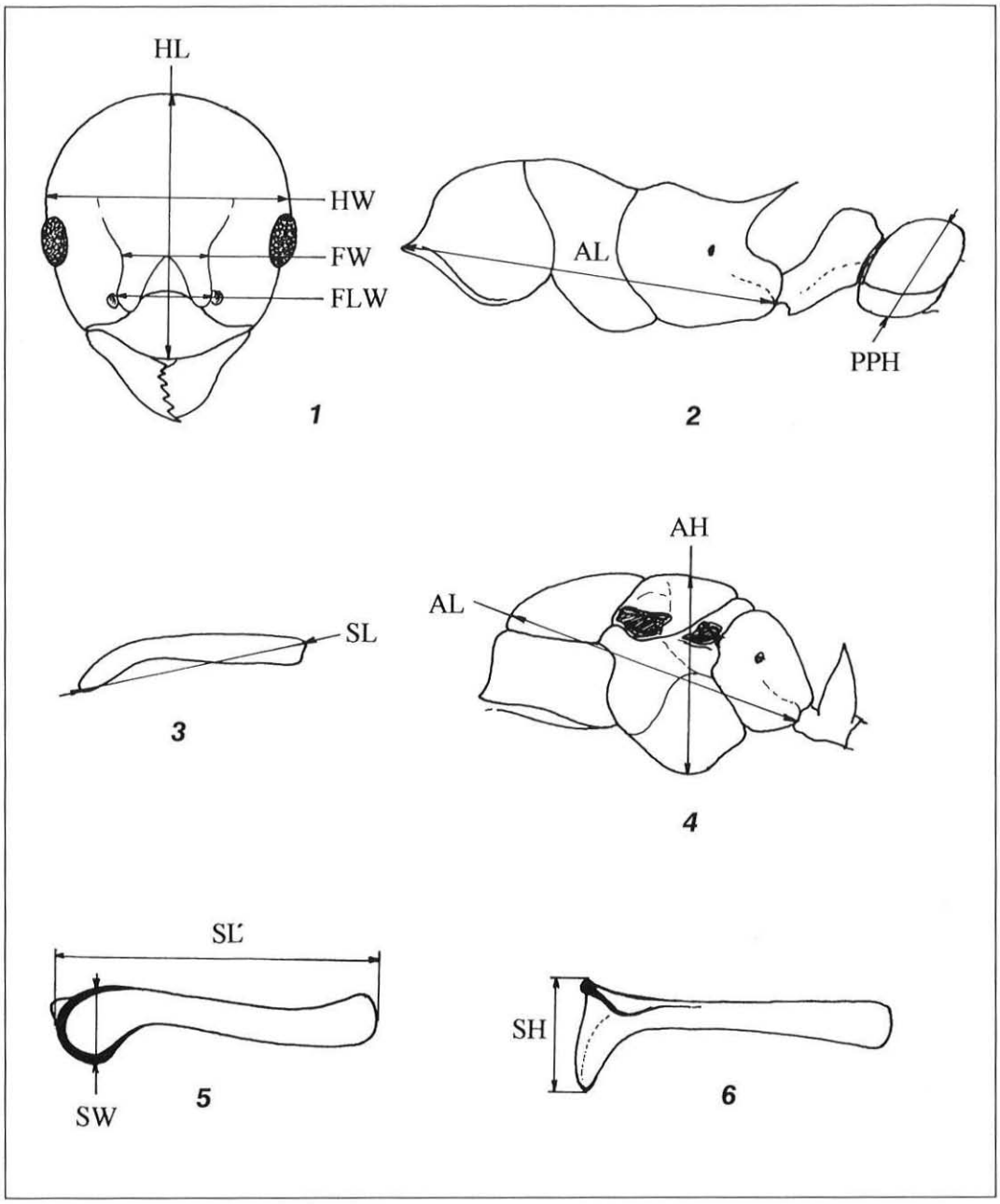


Plate III. Measuring of ants: ***1*** – *Myrmica* sp., worker head, frontal view: HL – length of head, HW – width of head, FW – width of frons, FLW – width of frontal lobes; ***2*** – *Myrmica* sp., worker alitrunk, petiole and postpetiole, lateral view: AL – length of alitrunk, PPH – height of postpetiole; ***3*** – *Myrmica* sp., worker antennal scape, lateral view: SL – maximum length of scape; ***4*** – *Formica* sp., queen alitrunk and petiole, lateral view: AL – length of alitrunk, AH – height of alitrunk; ***5***, ***6*** – *Myrmica lonae* Finzi, antennal scape (***5*** – dorsal view, ***6*** – lateral view): SL – length of scape, SW – width of scape lobe, SH – height of scape.

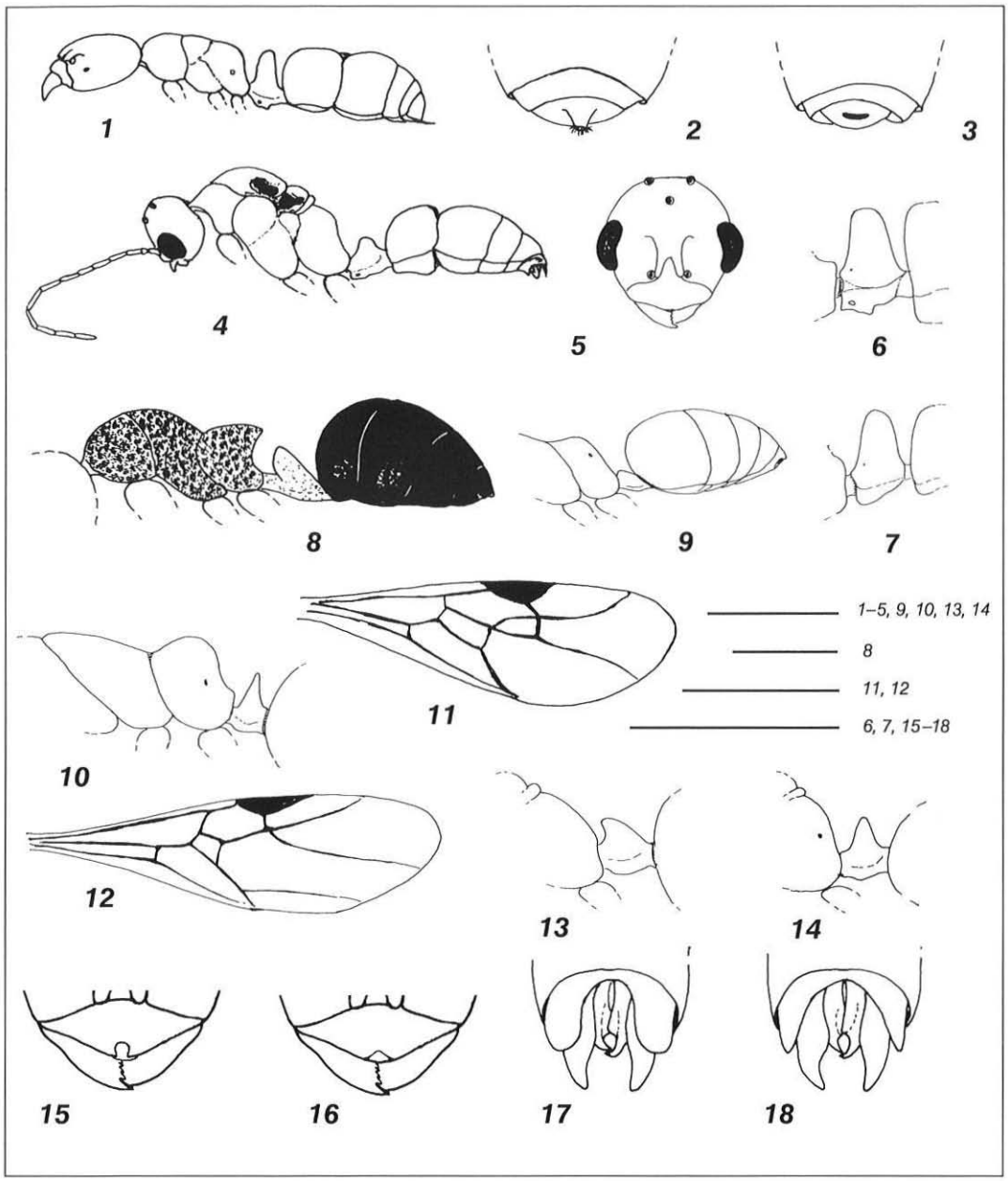


Plate IV. Details of structure of members of the subfamilies Ponerinae (***1***, ***4***, ***6***, ***7***), Formicinae (***2***) and Dolichoderinae (***3***, ***5***, ***8–18***): ***1***, ***4***, ***6*** – *Ponera coarctata* (Latr.) (***1***, ***6*** – worker, ***4*** – male); ***2*** – *Formica* sp., worker; ***3***, ***5***, ***8***, ***11*** – *Dolichoderus quadripunctatus* (L.) (***3***, ***8*** – worker, ***5***, ***11*** – male); ***7*** – *Hypoponera punctatissima* (Rog.), worker; ***9***, ***12***, ***13***, ***15***, ***17*** – *Tapinoma erraticum* (Latr.) (***9***, ***15*** – worker, ***12***, ***13***, ***17*** – male); ***10***, ***14*** – *Linepithema humile* (Mayr) (***10*** – worker, ***14*** – male); ***16***, ***18*** – *Tapinoma ambiguum* Em. (***16*** – worker, ***18*** – male). ***1***, ***4*** – body, lateral view; ***2***, ***3*** – apex of gaster, ventral view; ***5*** – head, frontal view; ***6***, ***7*** – petiole, lateral view; ***8*** – alitrunk, petiole and gaster, lateral view; ***9*** – propodeum, petiole and gaster, lateral view; ***10***, ***13***, ***14*** – propodeum and petiole, lateral view; ***11***, ***12*** – forewing; ***15***, ***16*** – clypeus and mandibles; ***17***, ***18*** – genitalia, ventral view. Scale: 1 mm.

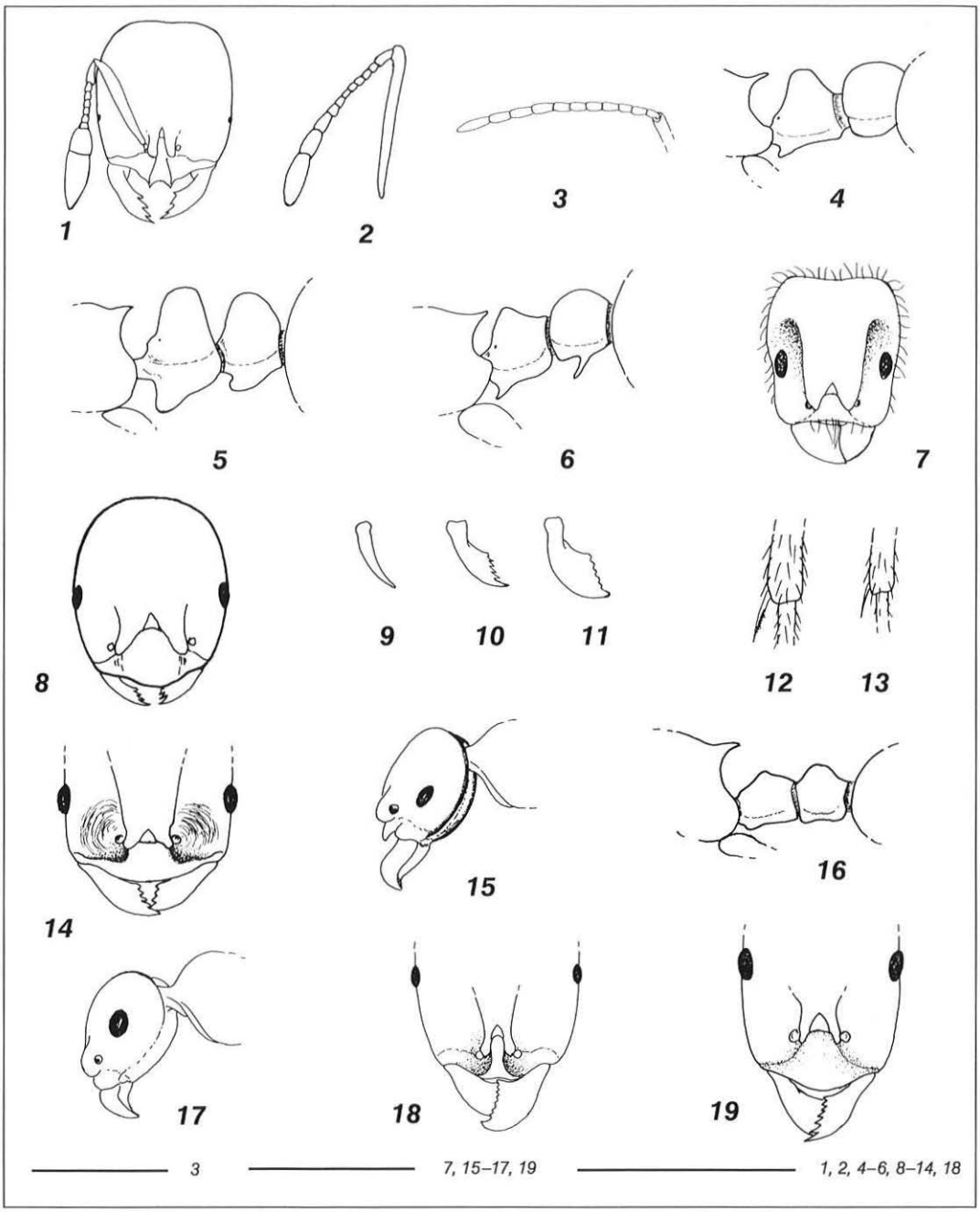


Plate V. Details of structure of members of the subfamily Myrmicinae (workers): ***1*** – *Solenopsis fugax* (Latr.); ***2*** – *Monomorium pharaonis* (L.); ***3***, ***10***, ***19*** – *Aphaenogaster subterranea* (Latr.); ***4*** – *Leptothorax acervorum* (F.); ***5*** – *Epimyrma ravouxi* (E. André); ***6***, ***8*** – *Formicoxenus nitidulus* (Nyl.); ***7*** – *Harpagoxenus sublaevis* (Nyl.); ***9*** – *Strongylognathus testaceus* (Schenck); ***11*** – *Messor structor* (F.); ***12*** – *Myrmica* sp.; ***13***, ***14*** – *Tetramorium caespitum* (L.); ***15***, ***16*** – *Myrmecina graminicola* (Latr.); ***17*** – *Leptothorax tuberum* (F.); ***18*** – *Stenamma debile* (Först.). ***1***, ***7***, ***8*** – head, frontal view; ***2***, ***3*** – antenna; ***4***, ***5***, ***6***, ***16*** – petiole and postpetiole, lateral view; ***9–11*** – mandible; ***12***, ***13*** – tibial spur; ***14***, ***18***, ***19*** – lower part of head, frontal view; ***15***, ***17*** – head, lateral view. Scale: 1 mm.

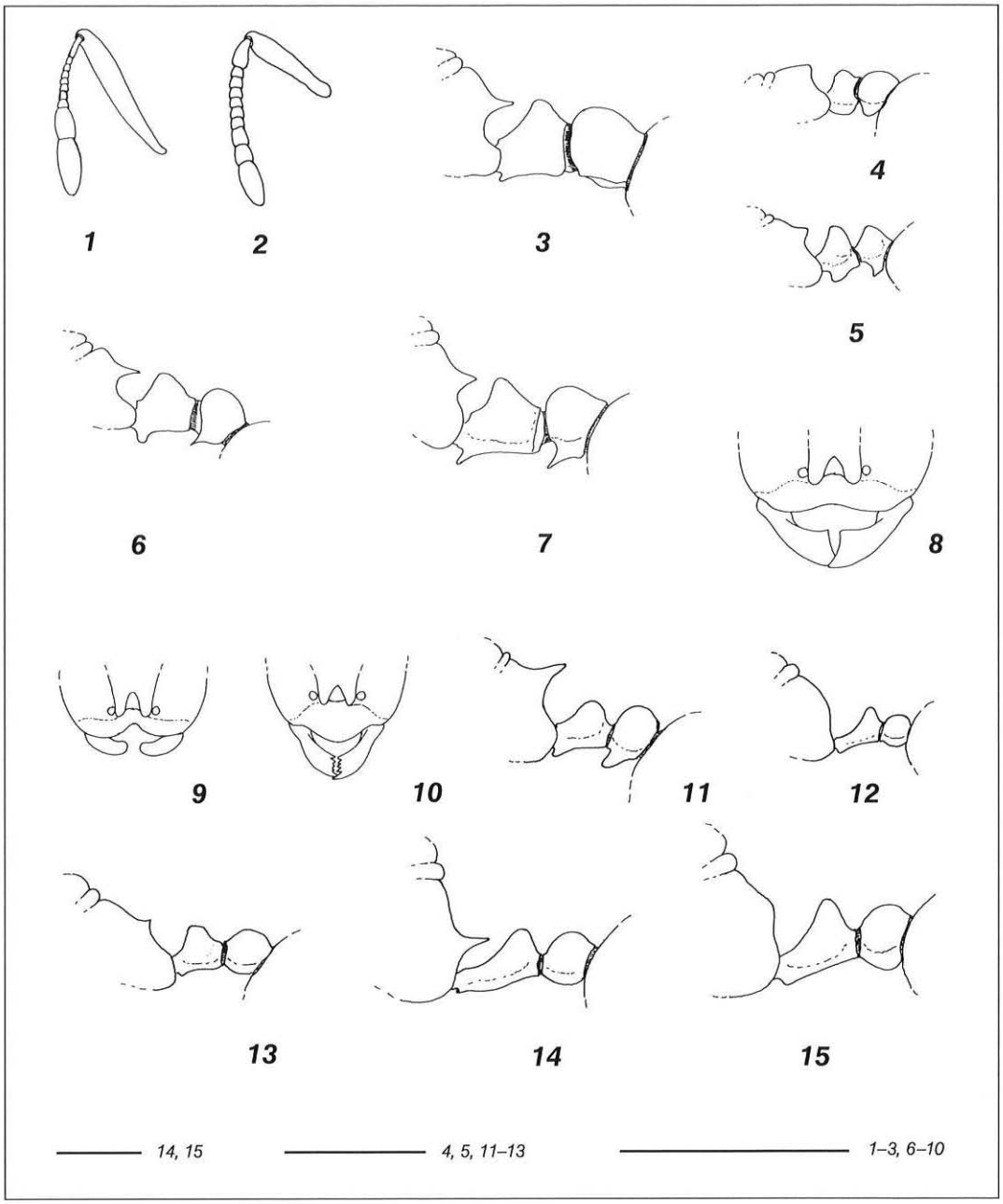


Plate VI. Details of structure of members of the subfamily Myrmicinae (queens): ***1*** – *Solenopsis fugax* (Latr.); ***2***, ***5***, ***10*** – *Epimyrma ravouxi* (E. André); ***3*** – *Leptothorax acervorum* (F.); ***4***, ***9*** – *Anergates atratulus* (Schenck); ***6*** – *Doronomyrmex kutteri* (Busch.); ***7*** – *Formicoxenus nitidulus* (Nyl.); ***8*** – *Harpagoxenus sublaevis* (Nyl.); ***11*** – *Myrmica karavajevi* Arn.; ***12*** – *Monomorium pharaonis* (L.); ***13*** – *Leptothorax tuberum* (F.); ***14*** – *Aphaenogaster subterranea* (Latr.); ***15*** – *Messor structor* (Latr.). ***1***, ***2*** – antenna; ***3–7***, ***11–15*** – propodeum, petiole and postpetiole, lateral view; ***8–10*** – lower part of head, frontal view. Scale: 1 mm.

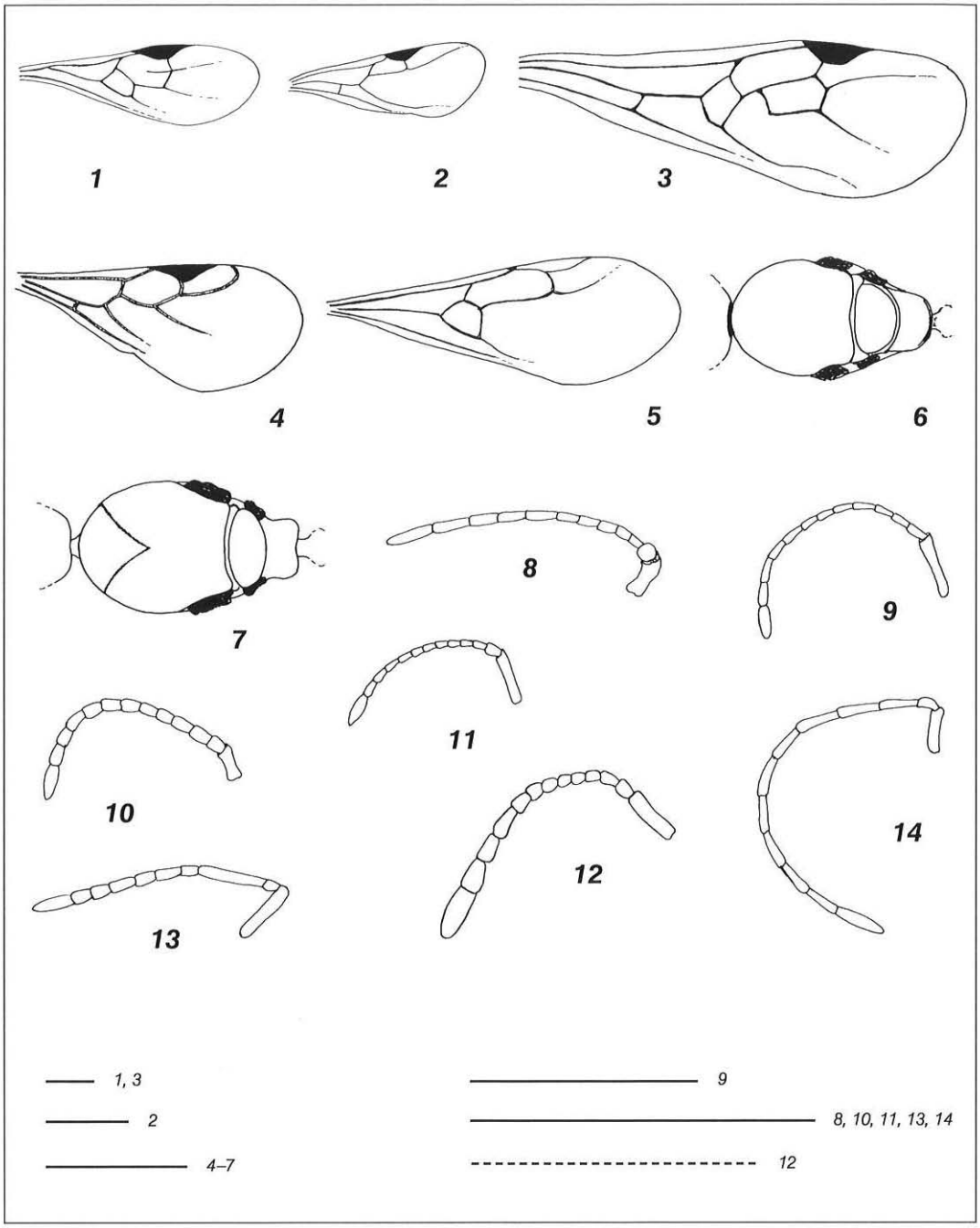


Plate VII. Details of structure of members of the subfamily Myrmicinae (males): ***1*** – *Myrmica* sp.; ***2*** – *Monomorium pharaonis* (L.); ***3*** – *Messor structor* (F.); ***4***, ***10*** – *Myrmecina graminicola* (Latr.); ***5***, ***11*** – *Stenamma debile* (Först.); ***6***, ***8*** – *Solenopsis fugax* (Latr.); ***7***, ***12*** – *Leptothorax tuberum* (F.); ***9*** – *Aphaenogaster subterranea* (Latr.); ***13*** – *Tetramorium caespitum* (L.); ***14*** – *Harpagoxenus sublaevis* (Nyl.). ***1–5*** – forewing; ***6***, ***7*** – alitrunk, dorsal view; ***8–14*** – antenna. Scale: solid lines – 1 mm, broken line – 0.5 mm.

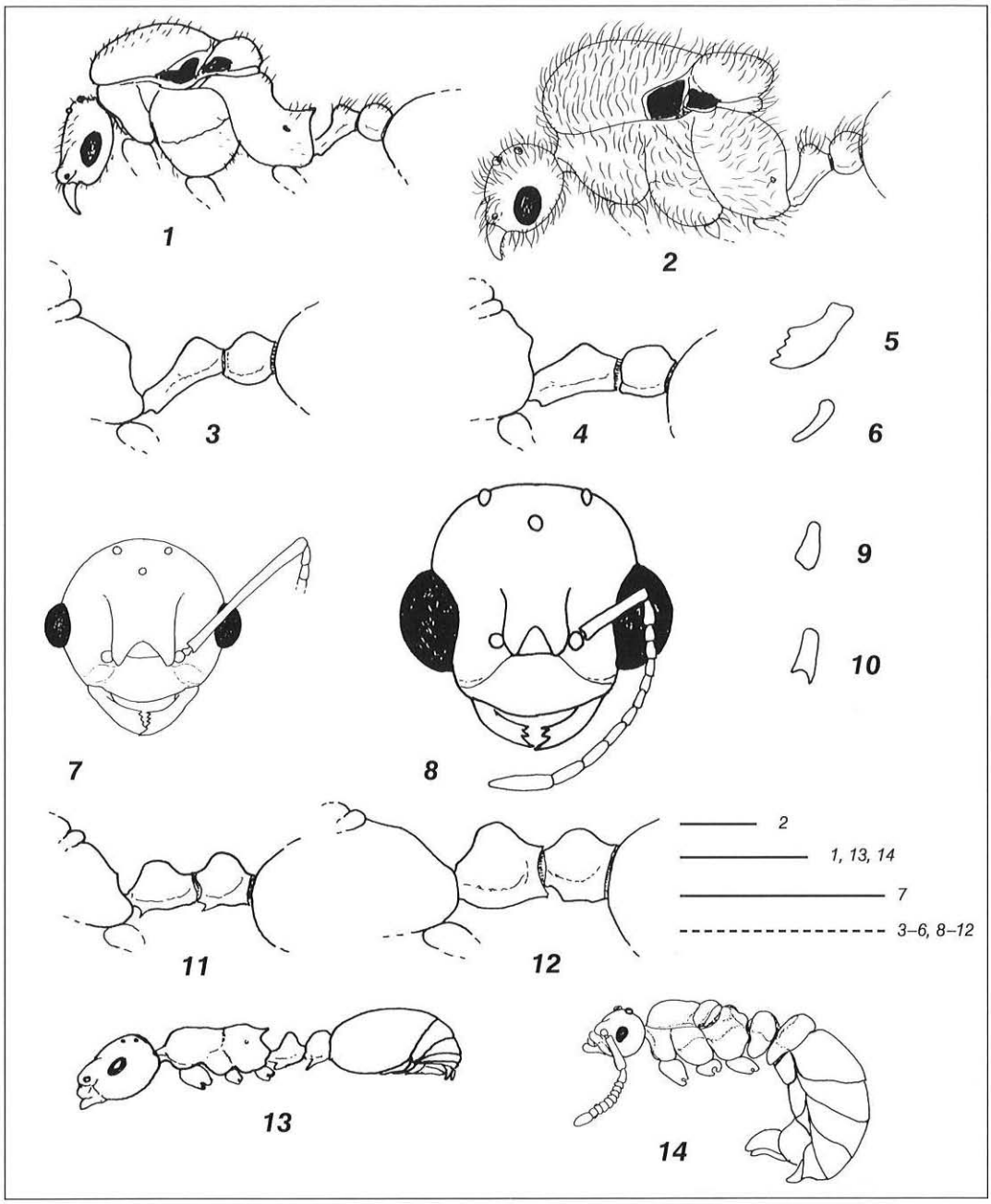


Plate VIII. Details of structure of members of the subfamily Myrmicinae (males): ***1*** – *Aphaenogaster subterranea* (Latr.); ***2*** – *Messor structor* (F.); ***3*** – *Stenamma debile* (Först.); ***4*** – *Leptothorax tuberum* (F.); ***5*** – *Tetramorium caespitum* (L.); ***6*** – *Strongylognathus testaceus* (Schenck); ***7*** – *Myrmica karavajevi* Arn.; ***8*** – *Epimyrma ravouxi* (E. André); ***9*** – *Leptothorax acervorum* (F.); ***10***, ***12*** – *Harpagoxenus sublaevis* (Nyl.); ***11*** – *Doronomyrmex kutteri* (Busch.); ***13*** – *Formicoxenus nitidulus* (Nyl.); ***14*** – *Anergates atratulus* (Schenck). ***1***, ***2*** – head, alitrunk, petiole and postpetiole, lateral view; ***3***, ***4***, ***11***, ***12*** – propodeum, petiole and postpetiole, lateral view; ***5***, ***6***, ***9***, ***10*** – mandible; ***7***, ***8*** – head, frontal view; ***13***, ***14*** – body, lateral view. Scale: solid lines – 1 mm, broken line – 0.5 mm.

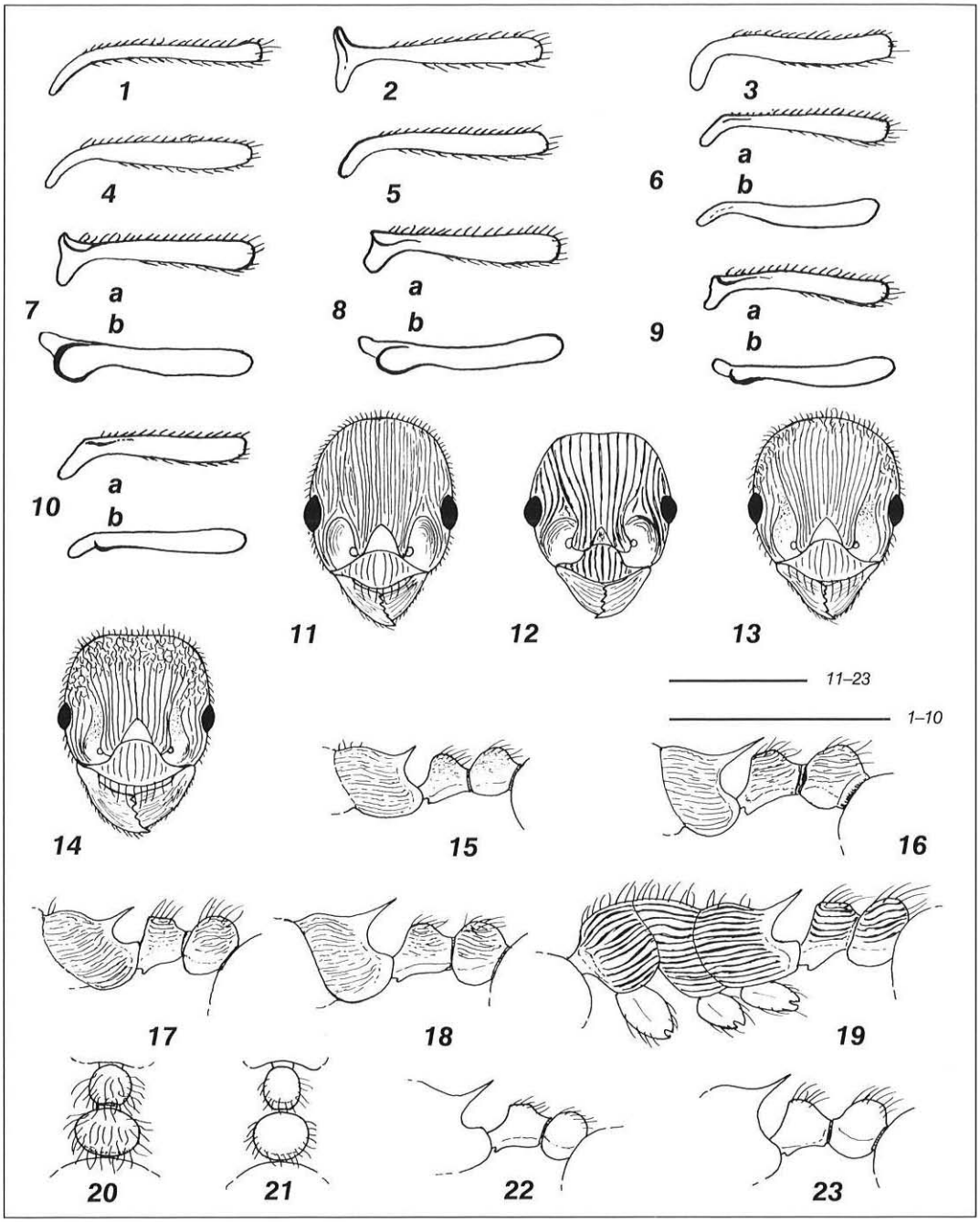


Plate IX. Details of structure of *Myrmica* species (workers): ***1***, ***11***, ***15*** – *M. rubra* (L.); ***2***, ***17*** – *M. lobicornis* Nyl.; ***3***, ***12***, ***19*** – *M. sulcinodis* Nyl.; ***4***, ***13*** – *M. gallienii* Bondr.; ***5***, ***14*** – *M. rugulosa* Nyl.; ***6*** – *M. hellenica* For.; ***7*** – *M. lonae* Finzi; ***8***, ***21*** – *M. sabuleti* Mein.; ***9***, ***22*** – *M. scabrinodis* Nyl.; ***10***, ***23*** – *M. specioides* Bondr.; ***16*** - *M. ruginodis* Nyl.; ***18*** – *M. schencki* Em.; ***20*** – *M. hirsuta* Elmes. ***1–10*** – antennal scape (***a*** – lateral view, ***b*** – dorsal view); ***11–14*** – head, frontal view; ***15–18***, ***22***, ***23*** – propodeum, petiole and postpetiole, lateral view (on ***22*** and ***23*** sculpture omitted); ***19*** – alitrunk, petiole and postpetiole, lateral view; ***20***, ***21*** – petiole and postpetiole, dorsal view. Scale: 1 mm.

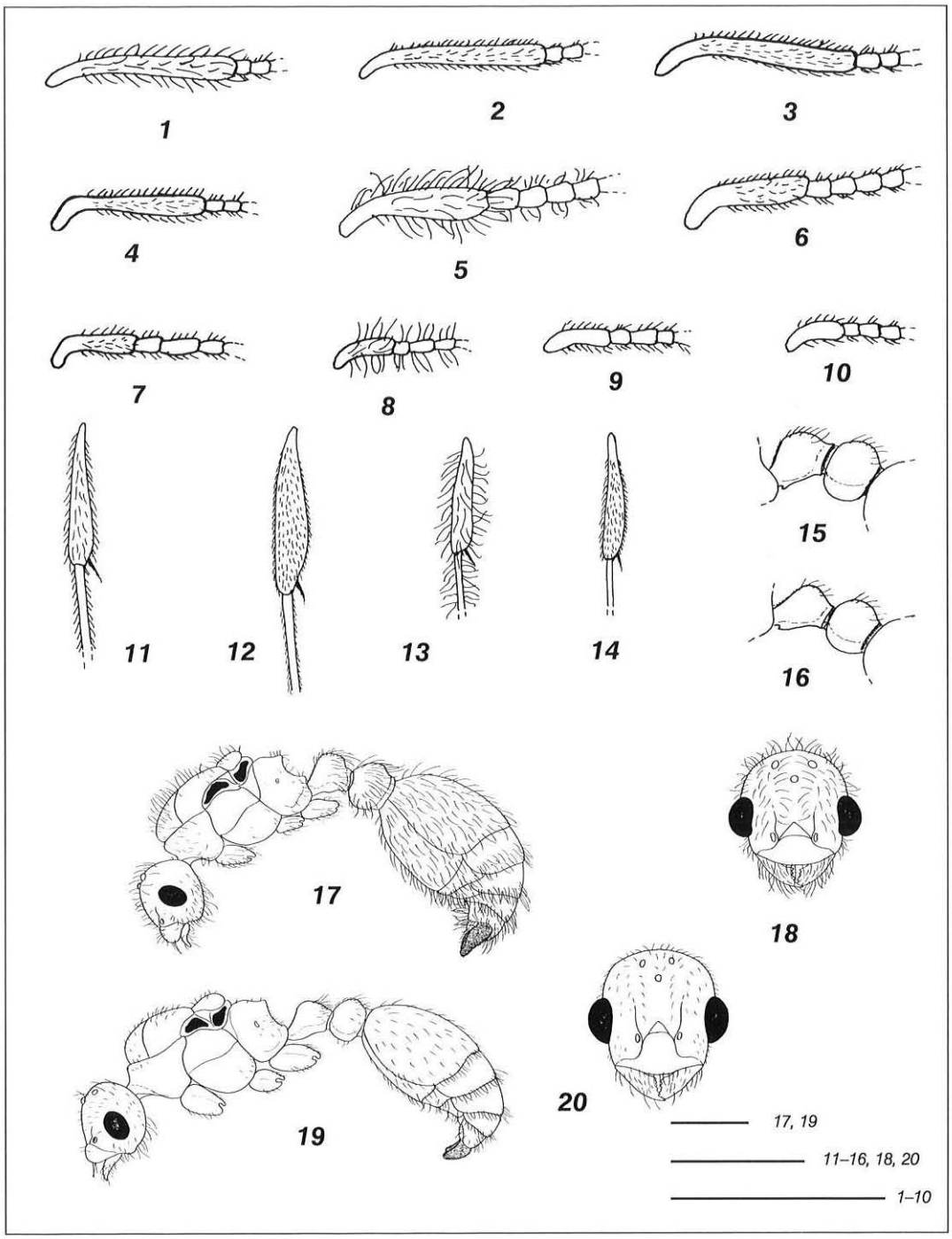


Plate X. Details of structure of *Myrmica* species (males): ***1***, ***11*** – *M. rubra* (L.); ***2***, ***12*** – *M. ruginodis* (Nyl.); ***3***, ***15*** – *M. sulcinodis* Nyl.; ***4***, ***16*** – *M. lobicornis* Nyl.; ***5***, ***17***, ***18*** – *M. hirsuta* Elmes; ***6***, ***19***, ***20*** – *M. sabuleti* Mein.; ***7*** – *M. schencki* Em.; ***8***, ***13*** – *M. scabrinodis* Nyl.; ***9*** – *M. gallienii* Bondr.; ***10***, ***14*** – *M. rugulosa* Nyl. ***1–10*** – antennal scape; ***11–14*** – hind tibia; ***15***, ***16*** – petiole and postpetiole, lateral view; ***17***, ***19*** – body, lateral view; ***18***, ***20*** – head, frontal view. Scale: 1 mm.

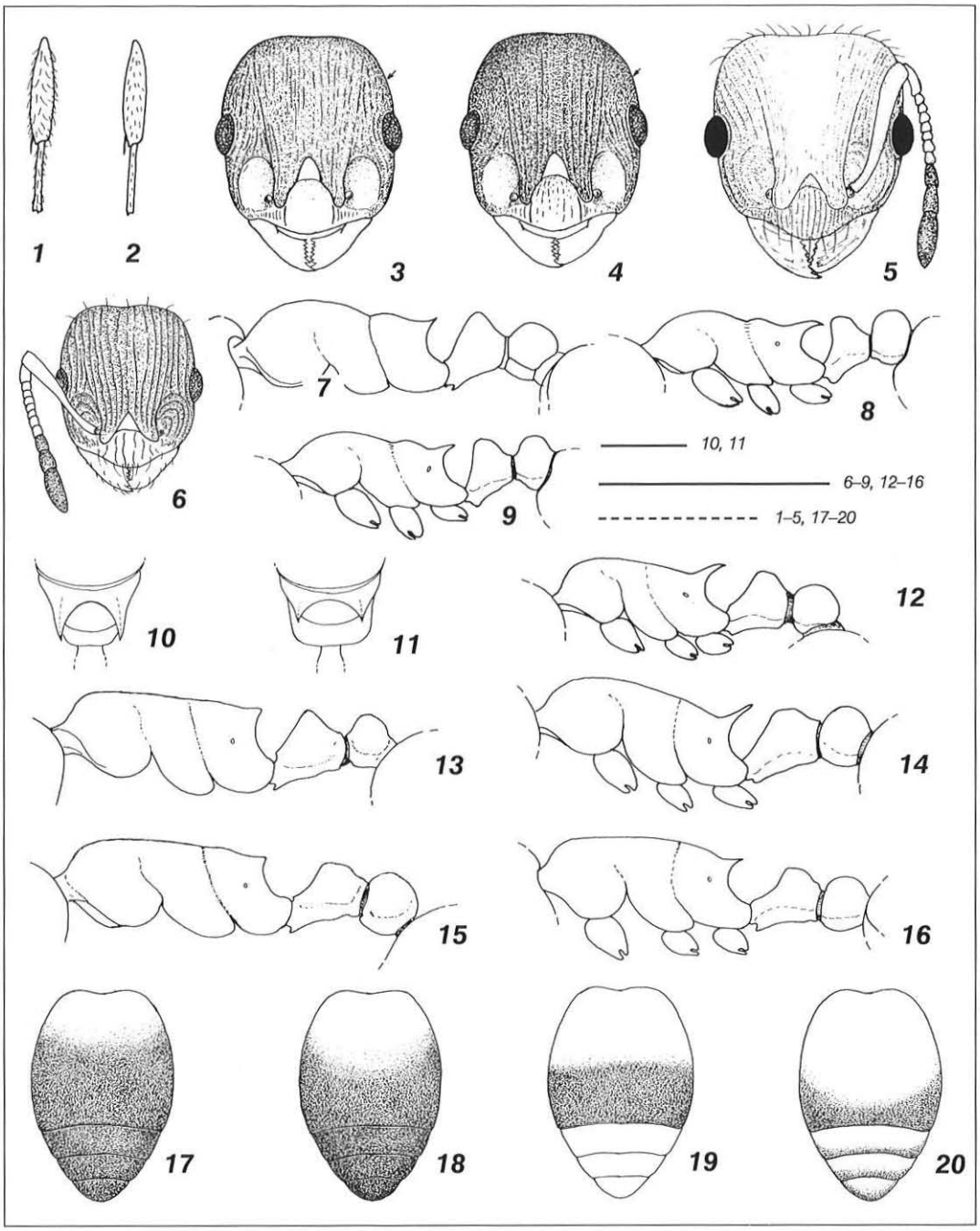


Plate XI. Details of structure of *Leptothorax* species (***1–9***, ***12–20*** – workers, ***10***, ***11*** – queens): ***1*** – *L. acervorum* (F.); ***2***, ***3*** – *L. muscorum* (Nyl.); ***4*** – *L. gredleri* Mayr; ***5***, ***15*** – *L. nadigi* Kutter; ***6***, ***18*** – *L. tuberum* (F.); ***7*** – *L. sordidulus saxonicus* Seifert; ***8***, ***10*** – *L. crassispinus* Karav.; ***9***, ***11*** – *L. parvulus* (Schenck); ***12*** – *L. interruptus* (Schenck); ***13*** – *L. corticalis* (Schenck); ***14*** – *L. affinis* Mayr; ***16***, ***19*** – *L. unifasciatus* (Latr.); ***17*** – *L. nigriceps* Mayr; ***20*** – *L. albipennis* (Curt.). ***1***, ***2*** – hind tibia; ***3–6*** – head, frontal view; ***7–9***, ***12–16*** – alitrunk, petiole and postpetiole, lateral view; ***10***, ***11*** – propodeal spines, dorsal view; ***17–20*** – gaster, dorsal view. Scale: solid lines – 1 mm, broken line – 0.5 mm.

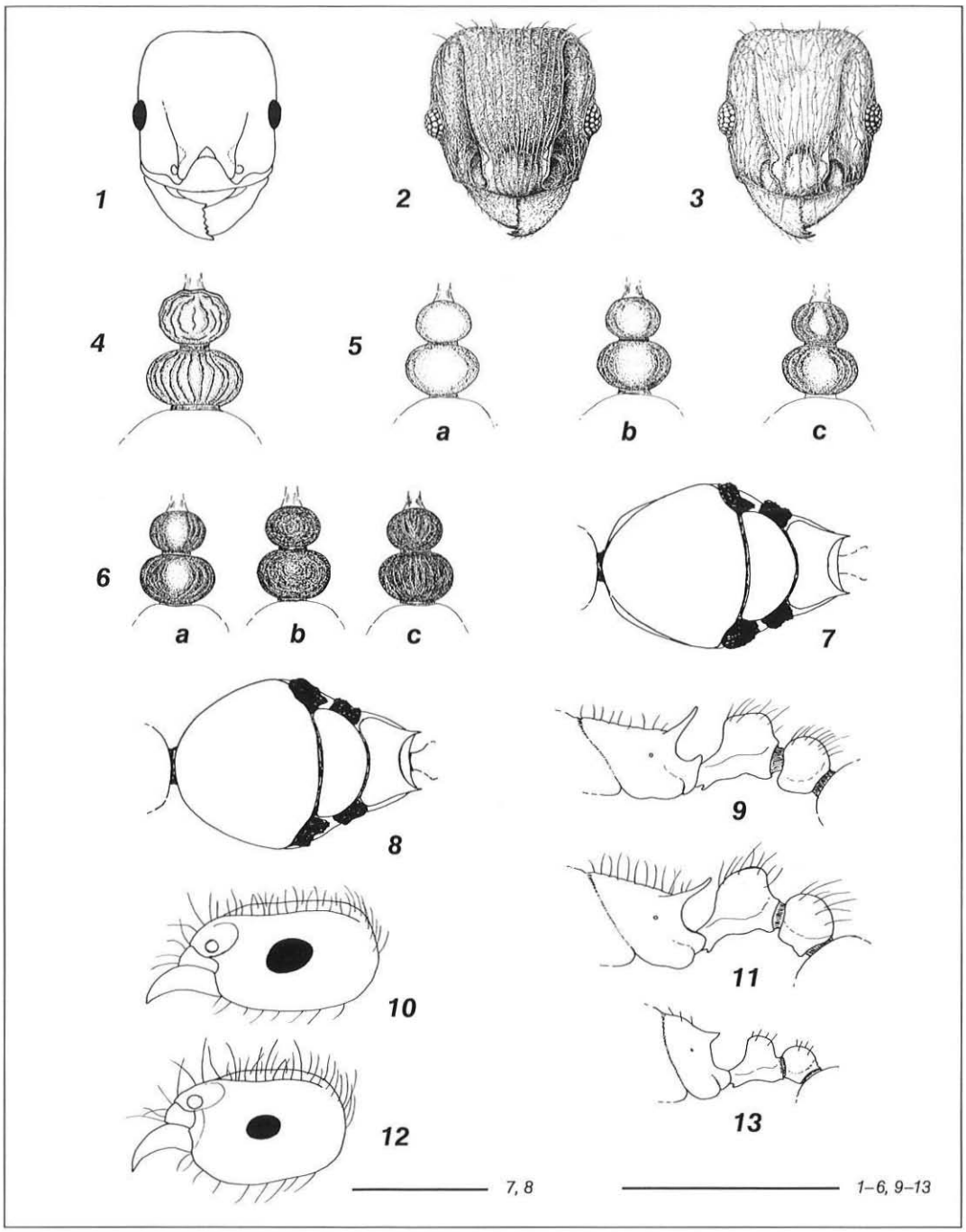


Plate XII. Details of structure of *Tetramorium* species (***1–6***, ***9–13*** – workers, ***7***, ***8*** – queens): ***1***, ***5a–c***, ***8*** – *T. caespitum* (L.); ***2***, ***13*** – *T. simillimum* (F. Sm.); ***3*** – *T. caldarium* (Rog.); ***4***, ***7*** – *T. moravicum* Krat.; ***6a–c*** – *T. impurum* (Först.); ***9***, ***10*** – *T. bicarinatum* (Nyl.); ***11***, ***12*** – *T. insolens* (F. Sm.). ***1–3*** – head, frontal view (on ***1*** sculpture and pilosity omitted); ***4–6*** – petiole and postpetiole, dorsal view (*a–c* – variability of sculpture); ***7***, ***8*** – alitrunk, dorsal view; ***9***, ***11***, ***13*** – propodeum, petiole and postpetiole, lateral view; ***10***, ***12*** – head, lateral view (***2*** and ***3*** – from Bolton 1979). Scale: 1 mm.

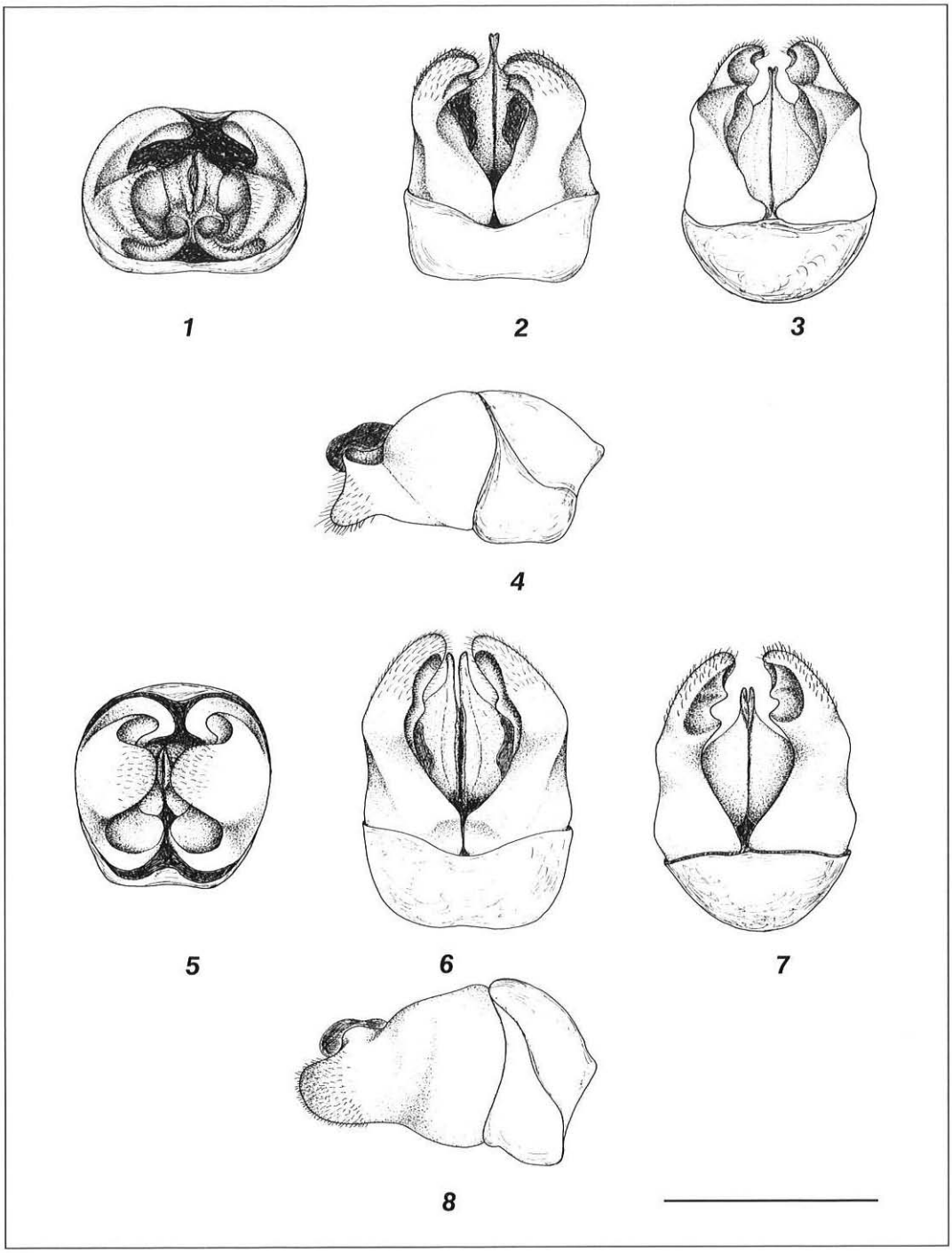


Plate XIII. Male genitalia of *Tetramorium caespitum* (L.) (*1–4*) and of *T. impurum* (Först.) (*5–8*): *1*, *5* – caudal view; *2*, *6* – ventral view; *3*, *7* – dorsal view; *4*, *8* – lateral view. Scale: 1 mm.

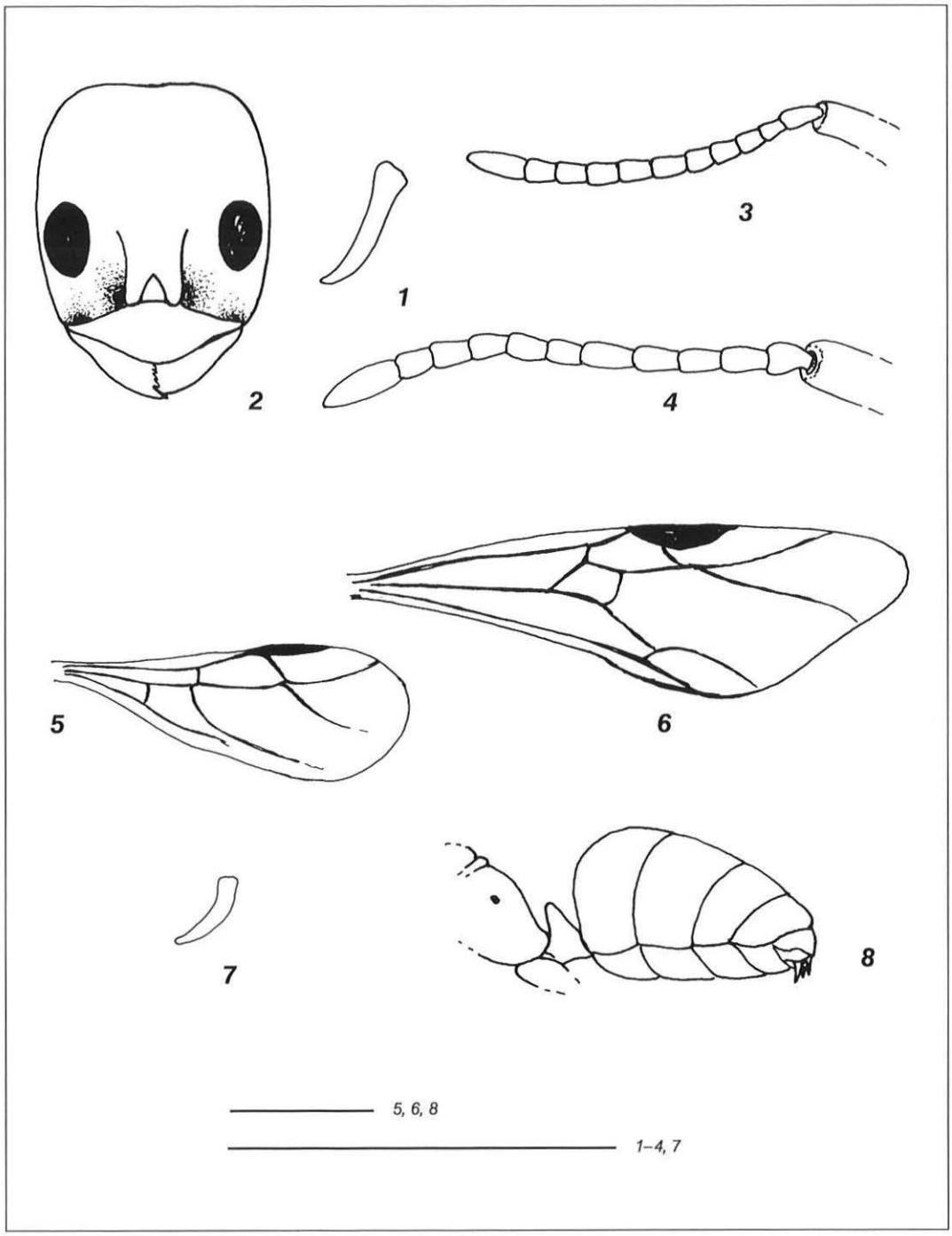


Plate XIV. Details of structure of members of the subfamily Formicinae (***1***, ***2*** – workers, ***3***, ***4*** – queens, ***5***–***8*** – males): ***1***, ***7*** – *Polyergus rufescens* (Latr.); ***2***, ***5*** – *Paratrechina vividula* (Nyl.); ***3***, ***8*** – *Lasius niger* (L.); ***4***, ***6*** – *Formica fusca* L. ***1***, ***7*** – mandible; ***2*** – head, frontal view; ***3***, ***4*** – antennal funiculus; ***5***, ***6*** – forewing; ***8*** – propodeum, petiole and gaster, lateral view. Scale: 1 mm.

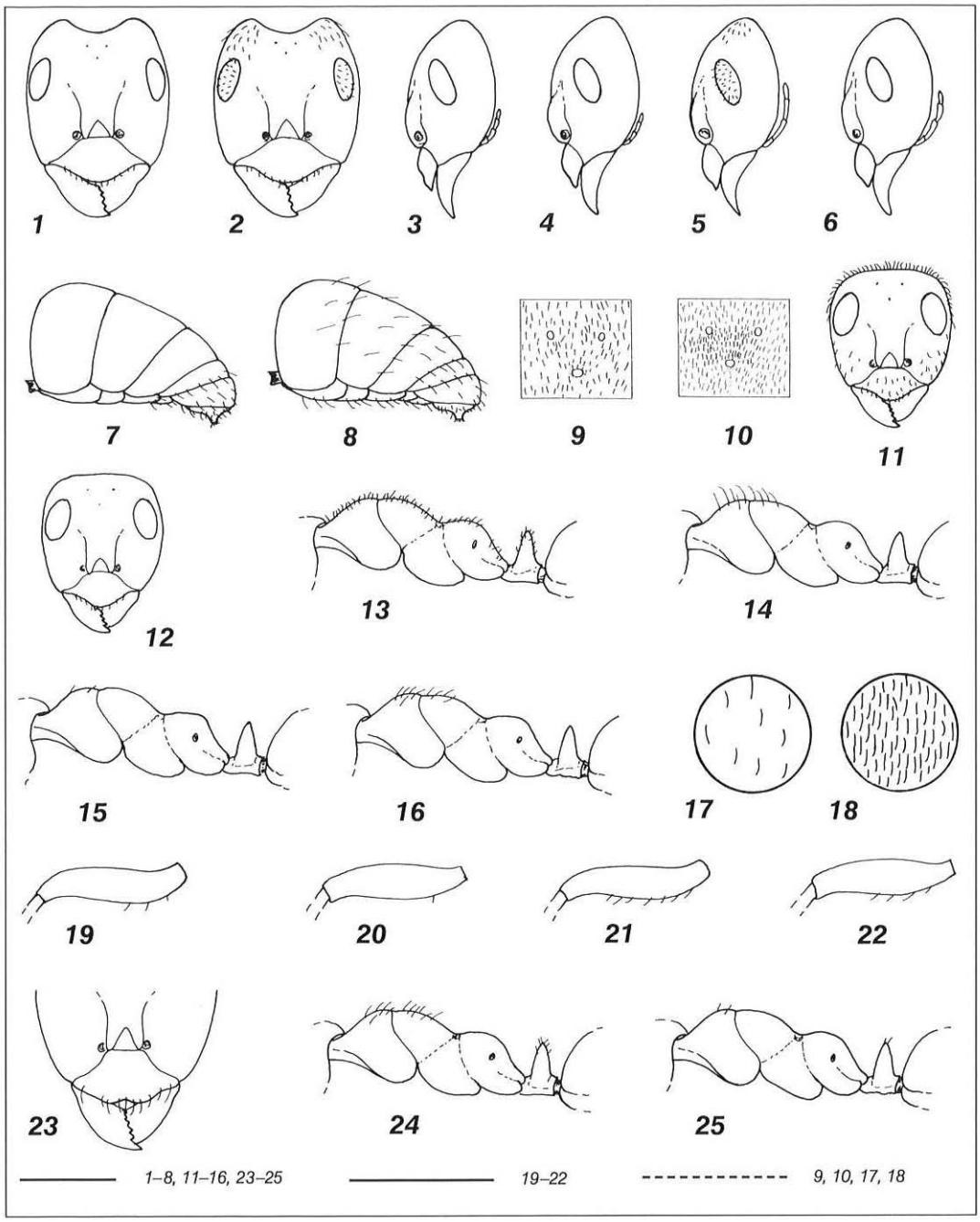


Plate XV. Details of structure of *Formica* species (workers): ***1***, ***3***, ***7***, ***9*** – *F. pressilabris* Nyl.; ***2***, ***5***, ***8*** – *F. exsecta* Nyl.; ***4***, ***10*** – *F. foreli* Em.; ***6*** – *F. forsslundi* Lohm.; ***11***, ***13*** – *F. cinerea* Mayr; ***12***, ***15***, ***18–20*** – *F. fusca* L.; ***14***, ***17*** – *F. candida* F. Sm.; ***16***, ***21***, ***22*** – *F. lemani* Bondr.; ***23*** – *F. sanguinea* Latr.; ***24*** – *F. rufibarbis* F.; ***25*** – *F. cunicularia* Latr. ***1***, ***2***, ***11***, ***12*** – head, frontal view; ***3–6*** – head, lateral view; ***7***, ***8*** – gaster, lateral view; ***9***, ***10*** – pubescence in the ocellar triangle (after Seifert 2000a); ***13–16***, ***24***, ***25*** – alitrunk and petiole, lateral view; ***17***, ***18*** – pubescence of second gastral tergite; ***19***, ***21*** – femur of foreleg; ***20***, ***22*** – femur of middle leg; ***23*** – lower part of head, frontal view. Scale: solid lines – 1 mm, broken line – 0.5 mm.

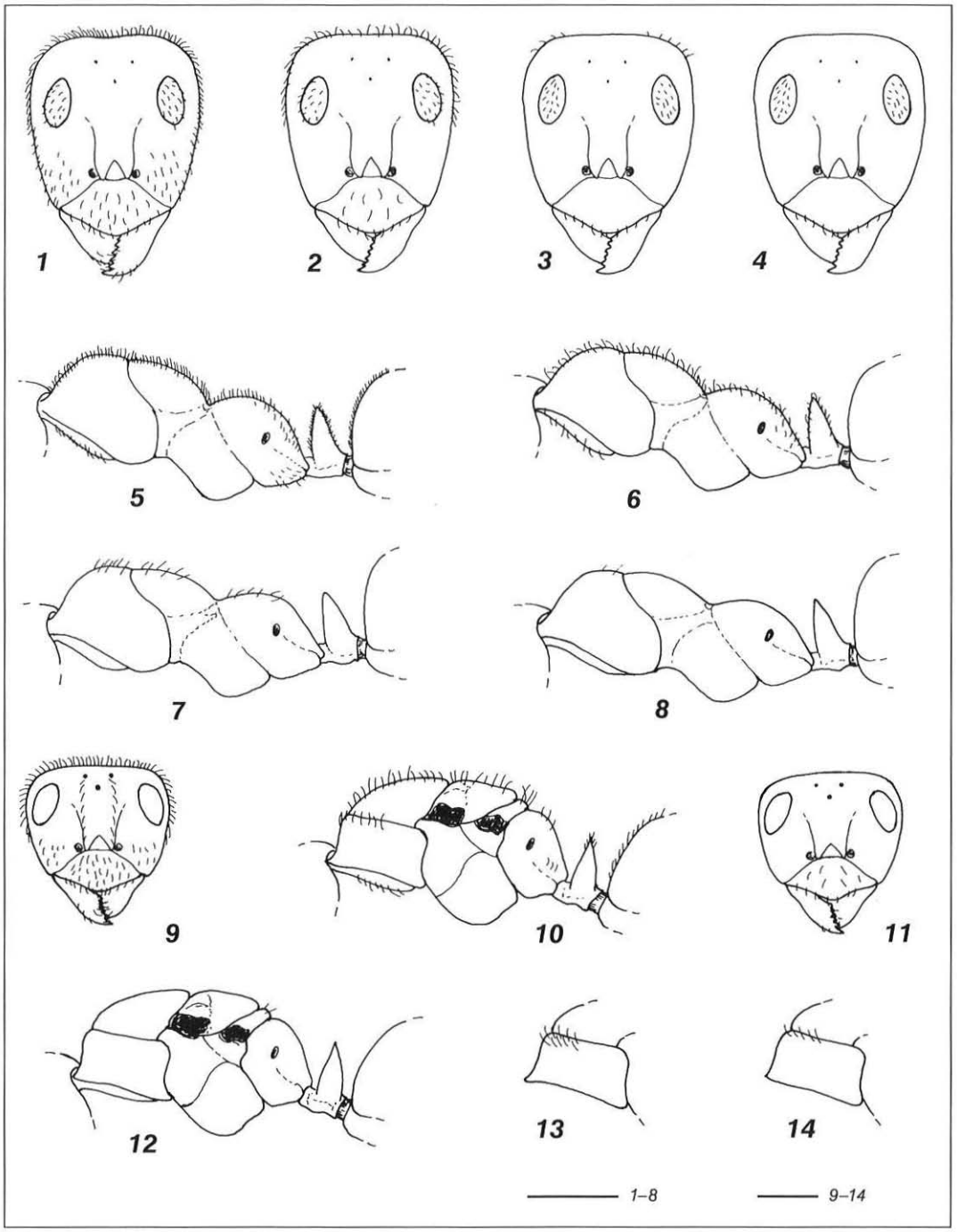


Plate XVI. Details of structure of *Formica* species (***1–8*** – workers, ***9–14*** – queens): ***1***, ***5*** – *F. truncorum* F.; ***2***, ***6*** – *F. pratensis* Retz.; ***3*** – *F. aquilonia* Yarr.; ***4***, ***7*** – *F. rufa* L.; ***8*** – *F. polyctena* Först.; ***9***, ***10*** – *F. cinerea* Mayr; ***11***, ***12*** – *F. fusca* L.; ***13*** – *F. rufibarbis* F.; ***14*** – *F. cunicularia* Latr. ***1–4***, ***9***, ***11*** – head, frontal view; ***5–8***, ***10***, ***12*** – alitrunk and petiole, lateral view; ***13***, ***14*** – pronotum, lateral view. Scale: 1 mm.

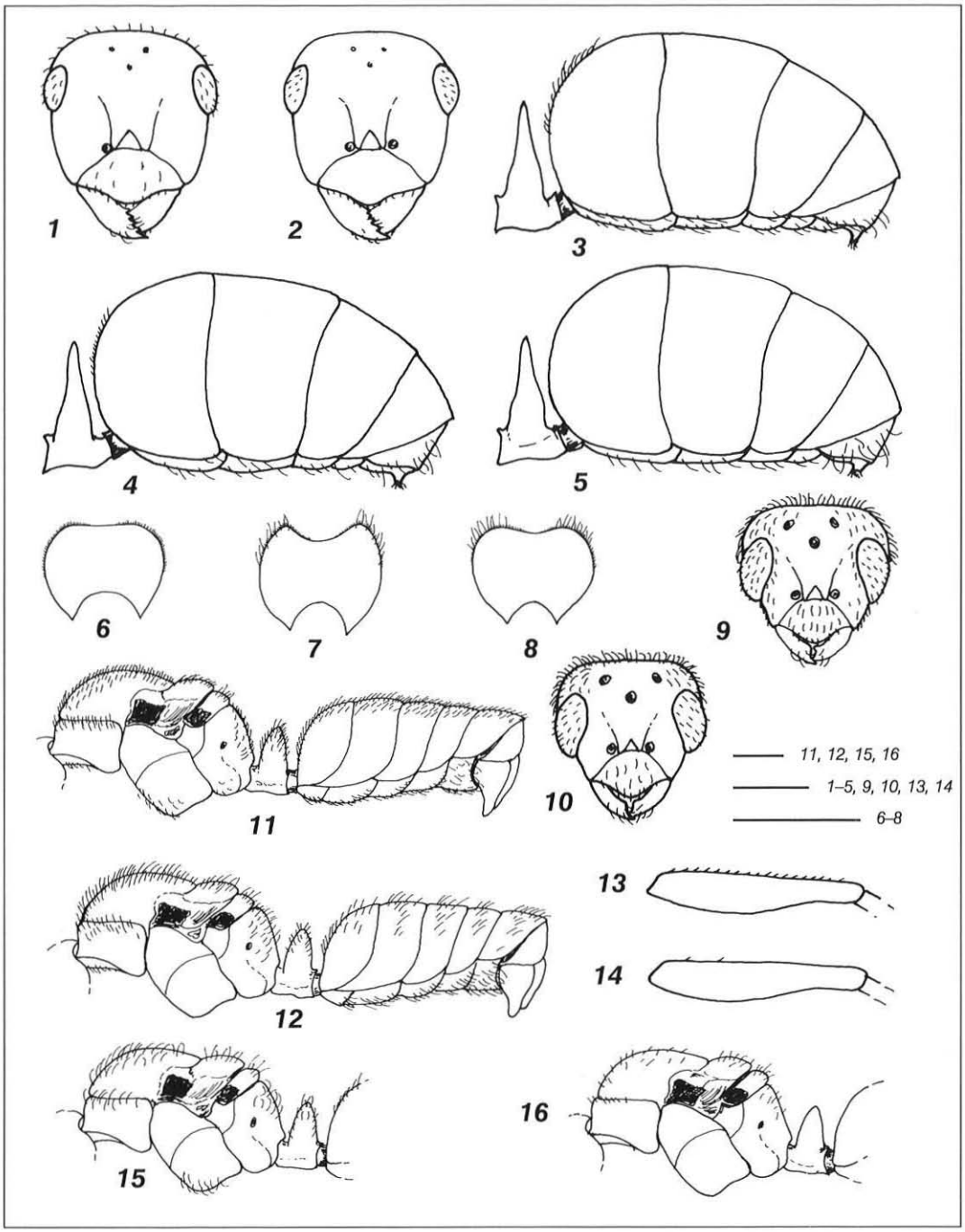


Plate XVII. Details of structure of *Formica* species (***1–5*** – queens, ***6–16*** – males): ***1***, ***3*** – *F. lugubris* Zett.; ***2***, ***5***, ***10***, ***14***, ***15*** – *F. rufa* L.; ***4***, ***13*** – *F. aquilonia* Yarr.; ***6*** – *F. fusca* L.; ***7*** – *F. rufibarbis* F.; ***8*** – *F. cunicularia* Latr.; ***9***, ***12*** – *F. pratensis* Retz.; ***11*** – *F. truncorum* F.; ***16*** – *F. polyctena* Först. ***1***, ***2***, ***9***, ***10*** – head, frontal view; ***3–5*** – gaster and petiole, lateral view; ***6–8*** – petiolar scale, caudal view; ***11***, ***12*** – alitrunk, petiole and gaster, lateral view; ***13***, ***14*** – hind femur; ***15***, ***16*** – alitrunk and petiole, lateral view. Scale: 1 mm.

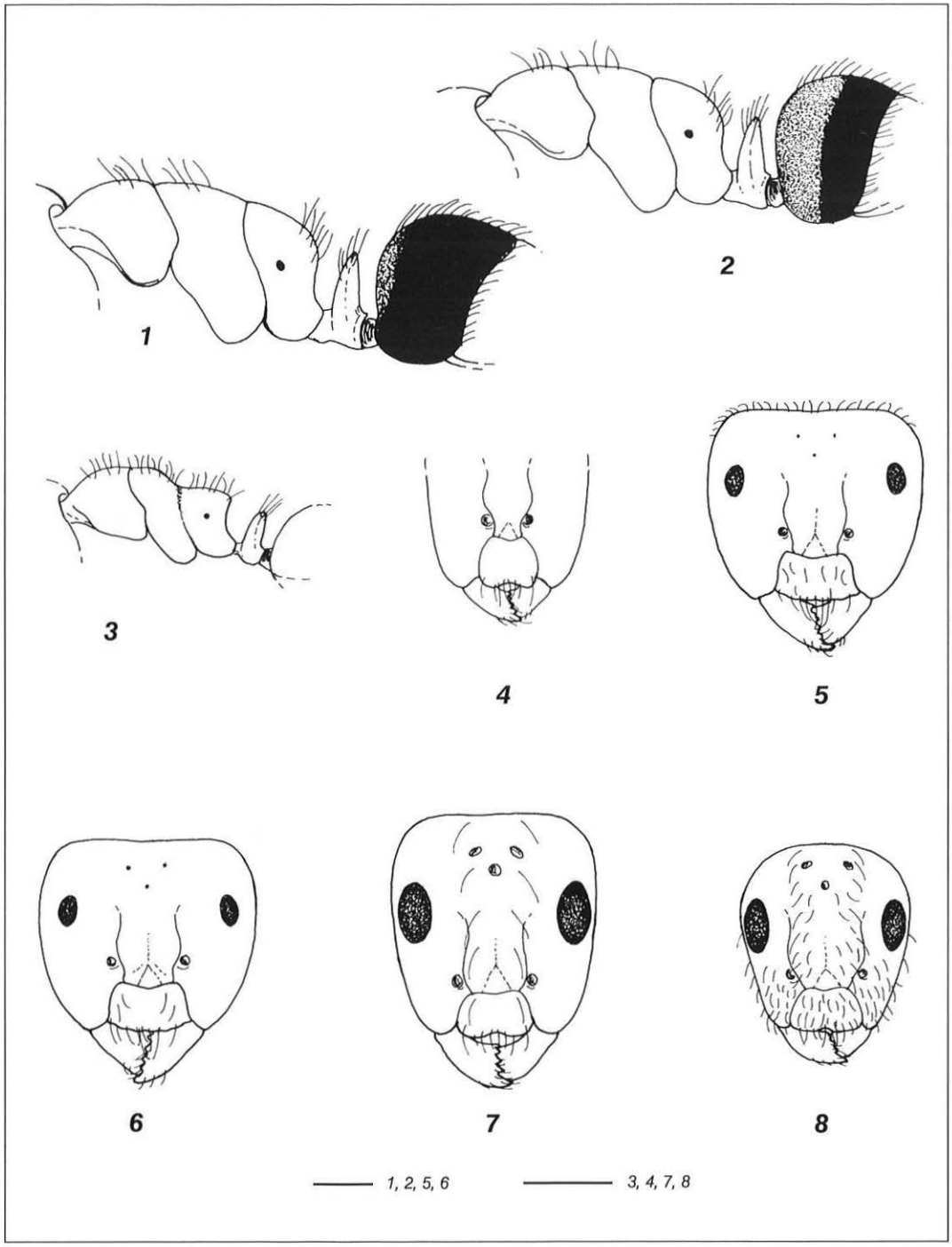


Plate XVIII. Details of structure of *Camponotus* species (*1–6* – workers, *7*, *8* – queens): *1*, *6* – *C. herculeanus* (L.); *2* – *C. ligniperdus* (Latr.); *3*, *8* – *C. piceus* (Leach); *4*, *7* – *C. fallax* (Nyl.); *5* – *C. vagus* (Scop.). *1–3* – alitrunk, petiole and first gastral segment, lateral view; *4* – lower part of head, frontal view; *5–8* – head, frontal view. Scale: 1 mm.

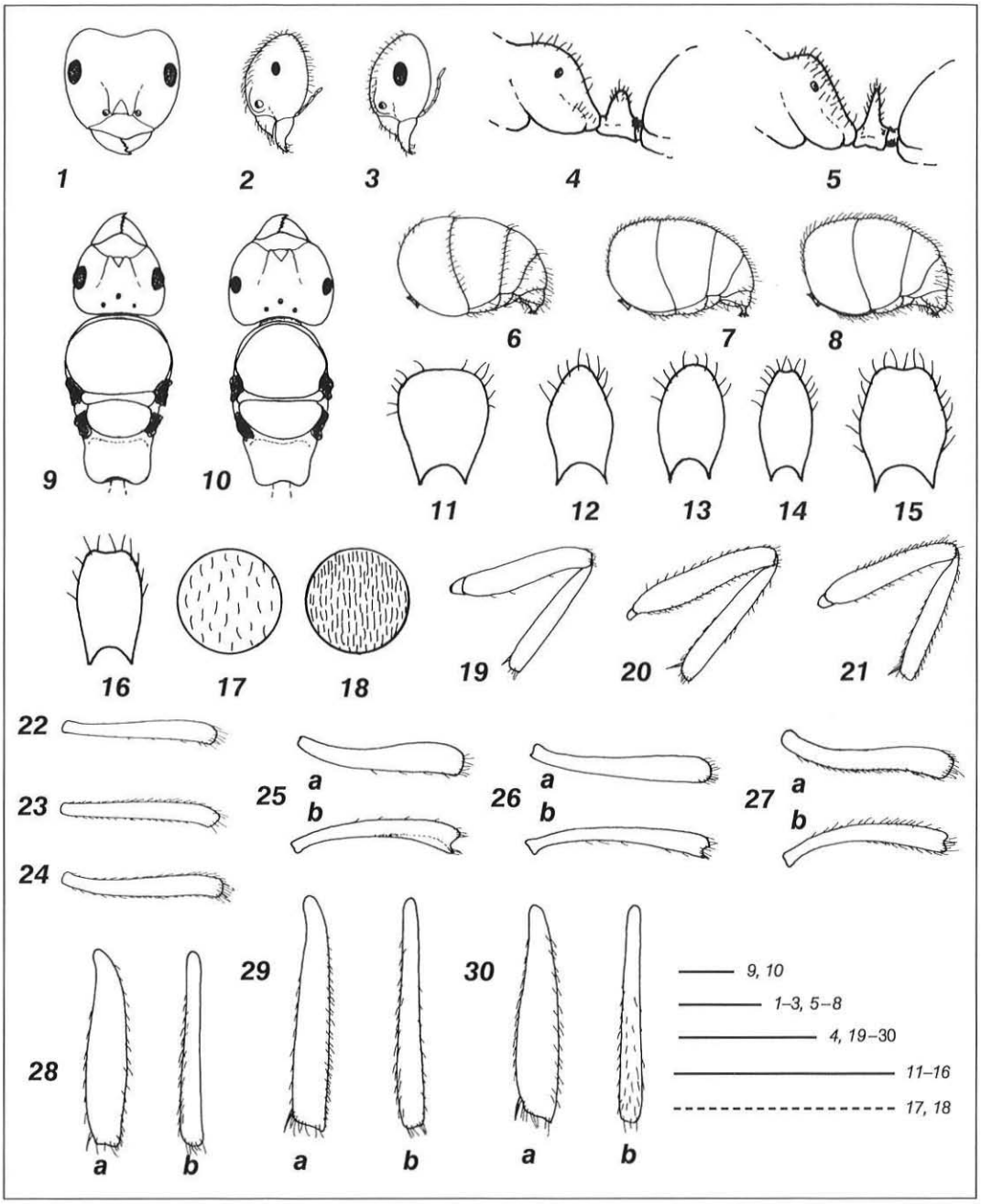


Plate XIX. Details of structure of *Lasius* species (***1–8***, ***11–24*** – workers, ***9***, ***10***, ***25–30*** – queens): ***1*** – *L. fuliginosus* (Latr.); ***2***, ***5***, ***8***, ***10***, ***16***, ***18***, ***21***, ***24***, ***26***, ***29*** – *L. umbratus* (Nyl.); ***3*** – *L. alienus* (Först.); ***4*** – *L. carniolicus* Mayr; ***6*** – *L. bicornis* (Först.); ***7*** – *L. mixtus* (Nyl.); ***9***, ***11*** – *L. flavus* (F.); ***12–14***, ***25***, ***28*** – *L. jensi* Seifert; ***15***, ***27***, ***30*** – *L. meridionalis* (Bondr.); ***17*** – *L. nitidigaster* Seifert; ***19***, ***22*** – *L. citrinus* Em.; ***20***, ***23*** – *L. distinguendus* (Em.). ***1*** – head, frontal view; ***2***, ***3*** – head, lateral view; ***4***, ***5*** – propodeum and petiole, lateral view; ***6–8*** – gaster, lateral view; ***9***, ***10*** – head and alitrunk, dorsal view; ***11–16*** – petiolar scale, caudal view; ***17***, ***18*** – pilosity of second gastral tergite; ***19–21*** – hind femur and tibia; ***22–27*** – antennal scape (***a*** – dorsal view, ***b*** – lateral view); ***28–30*** – hind tibia (***a*** – dorsal view, ***b*** – lateral view). Scale: solid lines – 1 mm, broken line – 0.5 mm.

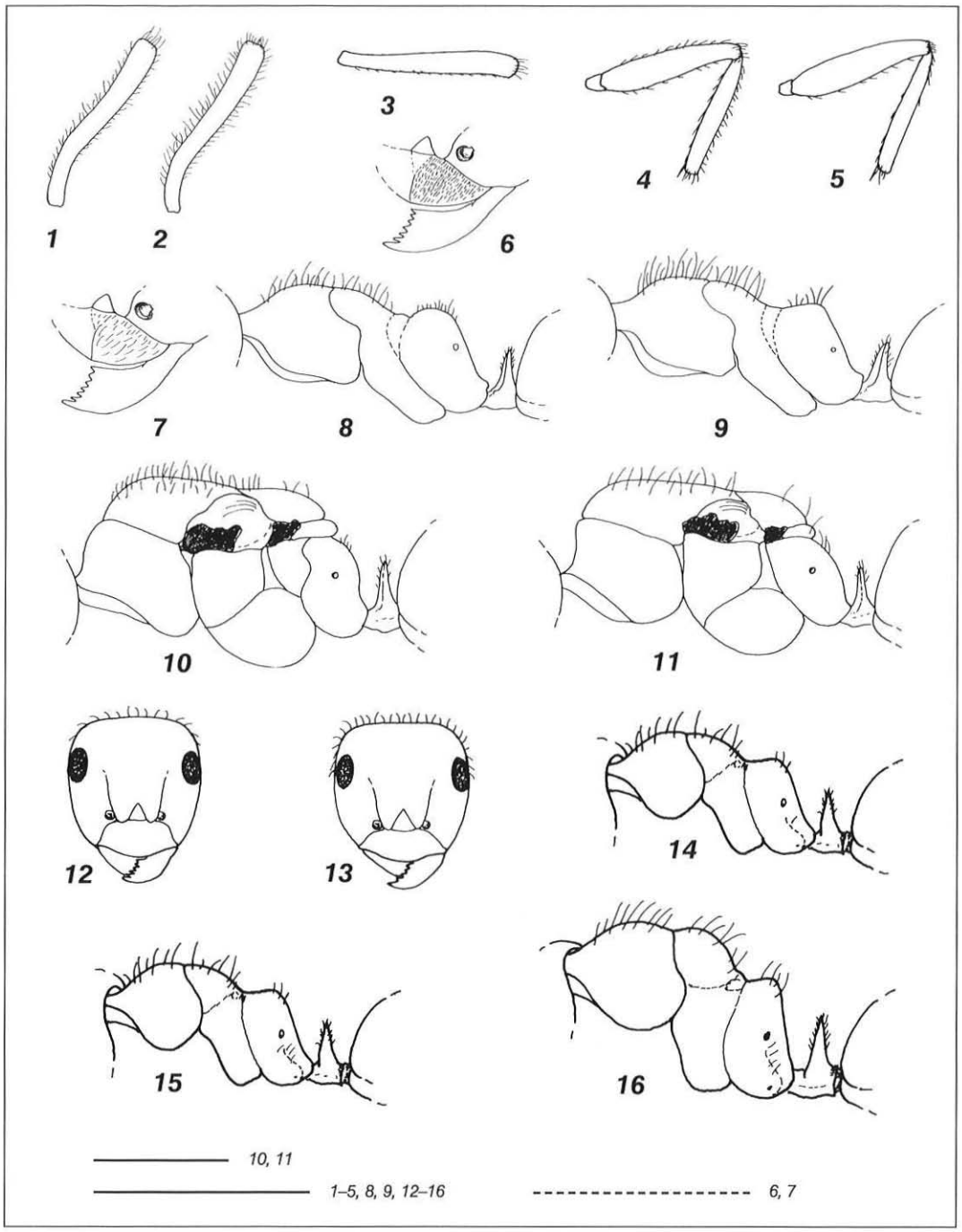


Plate XX. Details of structure of *Lasius* species (***1–9***, ***12–16*** – workers, ***10***, ***11*** – queens): ***1***, ***4***, ***6***, ***8***, ***10*** – *L. niger* (L.); ***2***, ***7***, ***9***, ***11*** – *L. platythorax* Seifert; ***3***, ***5***, ***13***, ***16*** – *L. psammophilus* Seifert; ***12***, ***14*** – *L. alienus* (Först.); ***15*** – *L. neglectus* Van Loon, Boomsma et Andrasfalvy. ***1–3*** – antennal scape; ***4***, ***5*** – hind femur and tibia; ***6***, ***7*** – clypeus; ***8–11***, ***14–16*** – alitrunk and petiole, lateral view; ***12***, ***13*** – head, frontal view. Scale: solid lines – 1 mm, broken line – 0.5 mm.

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Table VI. Distribution of the ant species in Poland (for the situation of the regions see Fig. 1) (● - outdoor species, ○ - synanthropic species)

No.	Species \ Region	Baltic Coast	Pomeranian Lake District	Masurian Lake District	Wielkopolsko-Kujawska Lowland	Mazovian Lowland	Podlasie Lowland	Białowieska Forest	Lower Silesia	Upper Silesia	Krakowsko-Wieluńska Upland	Małopolska Upland	Świętokrzyskie Mts	Lubelska Upland	Roztocze Upland	Sandomierska Lowland	Western Sudeten Mts	Eastern Sudeten Mts	Western Beskidy Mts	Eastern Beskidy Mts	Bieszczady Mts	Pieniny Mts	Tatra Mts
		1	2	3	4	5	6	6a	7	8	9	10	10a	11	12	13	14	15	16	17	18	19	20
1	*Ponera coarctata* (Latr.)		●		●	●				●	●	●		●					●			●	
2	*Hypoponera punctatissima* (Rog.)					○				○		○											
3	*Dolichoderus quadripunctatus* (L.)				●	●		●		●	●	●	●	●	●	●	●			●		●	
4	*Tapinoma erraticum* (Latr.)		●		●	●				●	●	●		●								●	
5	*Tapinoma ambiguum* Em.					●						●		●								●	
6	*Linepithema humile* (Mayr)								○														
7	*Myrmica rubra* (L.)	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
8	*Myrmica microrubra* Seifert										●												
9	*Myrmica ruginodis* Nyl.	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
10	*Myrmica sulcinodis* Nyl.																●		●			●	●
11	*Myrmica lobicornis* Nyl.	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●		●	●		●	●	●
12	*Myrmica rugulosa* Nyl.	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
13	*Myrmica gallienii* Bondr.	●	●		●	●	●	●				●		●	●	●	●						
14	*Myrmica hellenica* For.	●					●													●		●	
15	*Myrmica specioides* Bondr.				●					●		●		●		●			●			●	
16	*Myrmica scabrinodis* Nyl.	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●		●	●	●
17	*Myrmica sabuleti* Mein.	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
18	*Myrmica lonae* Finzi							●				●		●			●					●	●
19	*Myrmica hirsuta* Elmes																					●	
20	*Myrmica schencki* Em.	●	●	●	●	●	●	●	●	●	●	●		●	●	●		●	●	●	●	●	
21	*Myrmica karavajevi* (Arn.)		●			●															●	●	
22	*Manica rubida* (Latr.)								●	●	●		●				●	●	●		●	●	●
23	*Aphaenogaster subterranea* (Latr.)								●														
24	*Messor structor* (Latr.)								●				●										
25	*Stenamma debile* (Först.)		●	●	●	●		●	●	●	●	●	●	●	●		●						
26	*Formicoxenus nitidulus* (Nyl.)	●	●	●	●	●		●	●	●			●	●	●				●		●	●	

26	*Formicoxenus nitidulus* (Nyl.)	●	●	●	●	●		●	●	●			●	●	●				●		●	●	
27	*Leptothorax* (*Leptothorax*) *acervorum* (F.)	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●		●		●	●	●
28	*Leptothorax* (*Leptothorax*) *muscorum* (Nyl.)	●	●	●	●	●		●	●	●	●	●	●	●	●	●	●		●		●	●	●
29	*Leptothorax* (*Leptothorax*) *gredleri* Mayr				●	●																	
30	*Leptothorax* (*Myrafant*) *tuberum* (F.)		●			●	●				●		●	●								●	
31	*Leptothorax* (*Myrafant*) *unifasciatus* (Latr.)								●	●	●		●	●			●					●	
32	*Leptothorax* (*Myrafant*) *albipennis* (Curt.)																					●	
33	*Leptothorax* (*Myrafant*) *nigriceps* Mayr									●	●				●							●	●
34	*Leptothorax* (*Myrafant*) *interruptus* (Schenck)	●								●													
35	*Leptothorax* (*Myrafant*) *nylanderi* (Först.)	●																					
36	*Leptothorax* (*Myrafant*) *crassispinus* Karav.	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●				●	●	●	
37	*Leptothorax* (*Myrafant*) *parvulus* (Schenck)					●	●			●												●	
38	*Leptothorax* (*Myrafant*) *sordidulus saxonicus* Seifert										●												
39	*Leptothorax* (*Myrafant*) *affinis* Mayr										●											●	
40	*Leptothorax* (*Myrafant*) *corticalis* (Schenck)							●		●		●	●		●	●			●			●	
41	*Leptothorax* (*Myrafant*) *nadigi* Kutter																					●	
42	*Leptothorax* (*Myrafant*) *clypeatus* (Mayr)									●				●									
43	*Doronomyrmex kutteri* (Busch.)														●								
44	*Harpagoxenus sublaevis* (Nyl.)							●		●						●	●				●		●
45	*Epimyrma ravouxi* (E. André)																					●	
46	*Solenopsis fugax* (Latr.)	●	●			●	●	●	●	●	●	●	●	●	●							●	
47	*Monomorium pharaonis* (L.)	○	○		○	○	○		○	○	○		○					○	○				
48	*Myrmecina graminicola* (Latr.)		●		●	●				●	●	●		●	●		●		●			●	
49	*Tetramorium caespitum* (L.)	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
50	*Tetramorium impurum* (Först.)												●				●	●			●	●	
51	*Tetramorium moravicum* Krat.												●	●		●							
52	*Tetramorium insolens* (F. Sm.)				○																		
53	*Tetramorium caldarium* (Rog.)									○													
54	*Anergates atratulus* (Schenck)	●	●			●																●	
55	*Strongylognathus testaceus* (Schenck)	●	●	●	●	●		●		●		●	●	●		●							
56	*Formica* (*Formica*) *rufa* L.	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
57	*Formica* (*Formica*) *polyctena* (Först.)	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
58	*Formica* (*Formica*) *lugubris* Zett.	●	●														●						
59	*Formica* (*Formica*) *aquilonia* Yarr.			●		●											●						
60	*Formica* (*Formica*) *truncorum* F.	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
61	*Formica* (*Formica*) *pratensis* Retz.	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	
62	*Formica* (*Serviformica*) *fusca* L.	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	

58	*Formica (Formica) lugubris* Zett.	●	●														●						
59	*Formica (Formica) aquilonia* Yarr.			●		●											●						
60	*Formica (Formica) truncorum* F.	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
61	*Formica (Formica) pratensis* Retz.	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	
62	*Formica (Serviformica) fusca* L.	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	
63	*Formica (Serviformica) lemani* Bondr.																●	●	●		●	●	●
64	*Formica (Serviformica) candida* F. Sm.		●	●			●	●	●	●					●	●	●						●
65a	*Formica (Serviformica) cinerea cinerea* Mayr	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●							
65b	*Formica (Serviformica) cinerea fuscocinerea* For.								●										●	●	●	●	●
66	*Formica (Serviformica) rufibarbis* F.	●	●	●	●	●	●		●	●	●	●	●	●	●	●	●	●	●	●	●	●	
67	*Formica (Serviformica) cunicularia* Latr.	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	
68	*Formica (Serviformica) glauca* Ruzs.							●															
69	*Formica (Serviformica) uralenis* Ruzs.														●								
70	*Formica (Raptiformica) sanguinea* Latr.	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
71	*Formica (Coptoformica) exsecta* Nyl.		●	●	●	●	●	●				●	●	●	●	●	●		●		●	●	
72	*Formica (Coptoformica) pressilabris* Nyl.		●	●	●	●	●					●		●	●	●					●	●	
73	*Formica (Coptoformica) forsslundi* Lohm.														●								
74	*Formica (Coptoformica) foreli* Em.			●			●																
75	*Polyergus rufescens* (Latr.)		●	●	●	●	●	●	●		●		●	●									
76	*Camponotus (Camponotus) herculeanus* (L.)			●		●	●	●	●	●	●		●				●	●	●		●	●	●
77	*Camponotus (Camponotus) ligniperdus* (Latr.)	●	●	●	●	●	●		●	●	●	●	●	●	●	●	●	●	●	●	●	●	
78	*Camponotus (Camponotus) vagus* (Scop.)			●	●			●						●	●	●					●		
79	*Camponotus (Myrmentoma) fallax* (Nyl.)		●	●		●				●	●	●	●	●	●	●	●						
80	*Camponotus (Myrmentoma) piceus* (Leach)											●											
81	*Lasius (Lasius) niger* (L.)	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
82	*Lasius (Lasius) platythorax* Seifert	●		●	●	●	●	●			●	●	●	●	●	●	●	●	●		●	●	
83	*Lasius (Lasius) emarginatus* (Ol.)								●	●	●	●	●		●	●			●			●	
84	*Lasius (Lasius) brunneus* (Latr.)		●	●	●	●		●	●	●	●	●	●	●	●	●	●			●	●	●	
85	*Lasius (Lasius) alienus* (Först.)	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●			●	●	●	●	●
86	*Lasius (Lasius) paralienus* Seifert	●									●								●	●		●	
87	*Lasius (Lasius) psammophilus* Seifert	●				●						●		●								●	
88	*Lasius (Lasius) neglectus* Van Loon et al.					●																	
89	*Lasius (Cautolasius) flavus* (F.)	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
90	*Lasius (Chtonolasius) umbratus* (Nyl.)	●	●	●	●	●	●	●	●	●		●	●	●	●	●	●	●		●	●		
91	*Lasius (Chtonolasius) distinguendus* (Em.)	●										●		●						●	●	●	
92	*Lasius (Chtonolasius) meridionalis* (Bondr.)		●	●	●	●		●						●									
93	*Lasius (Chtonolasius) nitidigaster* Seifert													●									

75	*Polyergus rufescens* (Latr.)		●	●	●	●	●	●	●		●		●	●									
76	*Camponotus* (*Camponotus*) *herculeanus* (L.)			●		●	●	●	●	●	●		●				●	●	●		●	●	●
77	*Camponotus* (*Camponotus*) *ligniperdus* (Latr.)	●	●	●	●	●	●		●	●	●	●	●	●	●	●	●	●	●	●	●	●	
78	*Camponotus* (*Camponotus*) *vagus* (Scop.)			●	●			●						●	●	●					●		
79	*Camponotus* (*Myrmentoma*) *fallax* (Nyl.)		●	●		●				●	●	●	●	●	●	●	●						
80	*Camponotus* (*Myrmentoma*) *piceus* (Leach)											●											
81	*Lasius* (*Lasius*) *niger* (L.)	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
82	*Lasius* (*Lasius*) *platythorax* Seifert	●		●	●	●	●	●			●	●	●	●	●	●	●	●	●		●	●	
83	*Lasius* (*Lasius*) *emarginatus* (Ol.)								●	●	●	●	●		●	●			●			●	
84	*Lasius* (*Lasius*) *brunneus* (Latr.)		●	●	●	●		●	●	●	●	●	●	●	●	●	●			●	●	●	
85	*Lasius* (*Lasius*) *alienus* (Först.)	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●			●	●	●	●	●
86	*Lasius* (*Lasius*) *paralienus* Seifert	●									●								●	●		●	
87	*Lasius* (*Lasius*) *psammophilus* Seifert	●				●						●		●								●	
88	*Lasius* (*Lasius*) *neglectus* Van Loon et al.					●																	
89	*Lasius* (*Cautolasius*) *flavus* (F.)	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
90	*Lasius* (*Chtonolasius*) *umbratus* (Nyl.)	●	●	●	●	●	●	●	●	●		●	●	●	●	●	●	●		●	●		
91	*Lasius* (*Chtonolasius*) *distinguendus* (Em.)	●										●		●						●	●	●	
92	*Lasius* (*Chtonolasius*) *meridionalis* (Bondr.)		●	●	●	●		●						●									
93	*Lasius* (*Chtonolasius*) *nitidigaster* Seifert													●									
94	*Lasius* (*Chtonolasius*) *jensi* Seifert	●												●								●	
95	*Lasius* (*Chtonolasius*) *citrinus* Em.		●					●				●			●						●	●	
96	*Lasius* (*Chtonolasius*) *mixtus* (Nyl.)	●	●			●		●	●	●	●	●		●				●	●	●	●	●	●
97	*Lasius* (*Chtonolasius*) *bicornis* (Först.)				●	●						●											
98	*Lasius* (*Chtonolasius*) *fuliginosus* (Latr.)	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●		●	●	●	●	●
Number of species	All	42	48	41	46	56	38	44	42	53	47	51	45	55	46	41	40	27	39	28	41	63	27
	Outdoor	41	47	41	44	54	37	44	40	49	46	50	44	55	46	41	40	26	38	28	41	63	27

Erratum

Plate I, *1* (p. 158): the occiput pointed with the arrow (oc) refers to the back of the head.

THE ANTS (HYMENOPTERA, FORMICIDAE) OF POLAND is a monographic study of 98 ant species from 25 genera and four subfamilies whose occurrence in Poland has been reliably reported. The book comprises three sections. The first is a catalogue of the Polish ants which provides a systematic review of the species together with information about their geographical ranges, occurrence in Poland and biology. When necessary, a taxonomic history of the species is included. This section cites all faunistic literature data from the first publication in 1780 up to the year 2000. These are supplemented by data obtained by examining museum ant collections. Maps show the Palaearctic ranges of the species together with their distribution in geographical regions of Poland. The second section characterises the myrmecofauna of Poland, including its species, zoogeographical and ecological compositions. The third section consists of keys for identification of the Polish ant taxa (subfamilies, genera and species). This is the first complete set of keys to the ants of Poland.

The authors, **WOJCIECH CZECHOWSKI, ALEXANDER RADCHENKO** and **WIESŁAWA CZECHOWSKA**, are members of the Department of Social Insects and Myrmecophiles of the Museum and Institute of the Polish Academy of Sciences in Warsaw. A. Radchenko is also an employee of the Institute of Zoology of the Ukrainian National Academy of Sciences in Kiev. Complementary myrmecological specializations of the authors (ant ecology and social biology, systematics and zoogeography of the Palaearctic taxa, faunistics and taxonomy of the Polish species, respectively) guarantees reliability of their work.

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