

The distribution of the subgenus *Coptoformica* MÜLLER, 1923 (Hymenoptera: Formicidae) in the Palaearctic Region

Roland SCHULTZ & Bernhard SEIFERT

Abstract

Ten described and two undescribed *Coptoformica* MÜLLER, 1923 species (Hymenoptera: Formicidae, genus *Formica*) are currently known from the Palaearctic Region. Three of them – *Formica exsecta* NYLANDER, 1846 et *mesasiatica* DLUSSKY, 1964, *F. pressilabris* NYLANDER, 1846, and *F. forsslundi* LOHMANDER, 1949 – are distributed in both the West and East Palaearctic. *Formica exsecta* et *mesasiatica* has the widest distribution of all *Coptoformica* species. We have chosen this composite name to avoid executing here a formal synonymisation of *F. mesasiatica* under *F. exsecta*. A thorough argumentation in favour of this synonymy, using morphological, chorological and genetic evidence will be presented elsewhere (B. Seifert & A. Goropashnaya, unpubl.).

Six species are restricted to the West Palaearctic: *Formica bruni* KUTTER, 1967, *F. fennica* SEIFERT, 2000, *F. foreli* BONDROIT, 1918, *F. suecica* ADLERZ, 1902, and two undescribed species. *Formica bruni* and *F. foreli* extend east directly to the Johansen Line. *Formica fennica* is known from Finland and the Caucasus. *Formica suecica* has been found in Fennoscandia, the Alps and West Siberia. Not much is known about the distribution of the two undescribed species.

Three species are East Palaearctic: *Formica fukaii* WHEELER, 1914, is endemic to the Japanese islands; *F. manchu* WHEELER, 1929 and *F. pisarskii* DLUSSKY, 1964 are of more or less Central Asian distribution. *Formica manchu* and *F. pisarskii*, probably with the same basic type of distribution, inhabit the forest-steppe zone of Russia between the Altai Mountains and Lena River, Mongolia, Manchuria and, in the case of *F. manchu*, also Tibet.

This contribution provides an overview of the known locations of the *Coptoformica* species and attempts to construct patterns of distribution.

Key words: *Formica*, *Coptoformica*, Formicidae, distribution, Palaearctic.

Myrmecol. News 10: 11-18

Dr. Roland Schultz (contact author), Zoologisches Institut & Museum, Ernst-Moritz-Arndt-Universität Greifswald, Johann-Sebastian-Bach-Str. 11-12, D-17487 Greifswald, Germany. E-Mail: roland@uni-greifswald.de

Dr. Bernhard Seifert, Staatliches Museum für Naturkunde Görlitz, Postfach 300154, D-02806 Görlitz, Germany. E-Mail: bernhard.seifert@smng.smwk.sachsen.de

Introduction

The subgenus *Coptoformica* MÜLLER, 1923 of the genus *Formica* LINNAEUS, 1758 contains ten described species (SEIFERT 2000) plus two undescribed species (B. Seifert, unpubl.), all living in the Palaearctic (see SEIFERT 2000). All these species build nest mounds from blades of grass bitten into pieces. This is achieved using their strongly developed mandible muscles, which extend into the occipital corners. These occipital corners result in the unmistakable, characteristic appearance of the subgenus *Coptoformica*, the only *Formica* species-group with this feature in the Palaearctic. As far as known and also concluded from gyne morphology (STILLE 1996) all species of this group are temporary social parasites, using several *Serviformica* species as hosts during colony foundation. The question of host species selection is poorly known – not only in the Central Asian species. For species in which more information is available (*F. exsecta*, *F. pressilabris*, *F. forsslundi*) use of several (at least two) host species is evident (SEIFERT 2007).

European entomologists have studied the distribution of this group for a long time (FOREL 1874, 1915, RUZSKY 1905, EMERY 1909, WHEELER 1913, LOMNICKI 1925, KA-

RAWAJEW 1927, STITZ 1939, KUTTER 1957, AGOSTI 1989, GLASER 1999, SEIFERT 2000). While the distribution in Europe can be described with a rather good level of certainty (e.g., SEIFERT 2000), the knowledge on distribution in Asia, that was outlined by DLUSSKY (1964, 1965, 1967) and KUP-YANSKAYA (1990) suffers from big regional sampling deficits and confused taxonomy.

This publication describes the distribution of species of the subgenus *Coptoformica* in the Palaearctic. Because of numerous misidentifications in the past but also presently, we have mapped only those locations that have been checked by us (a sufficiently reliable species determination in the subgenus is only possible considering numerically described character combinations and investigation standards defined by SEIFERT 2000; but note in this context the guide lines for correct character recording presented in SEIFERT 2007). Other locations given in the literature are mentioned in the text and discussed. Sampling intensity has varied considerably throughout the Palaearctic: Europe is well studied and the Caucasus, Central Asia, Mongolia and, Tibet have been the target of several expeditions. All remaining areas

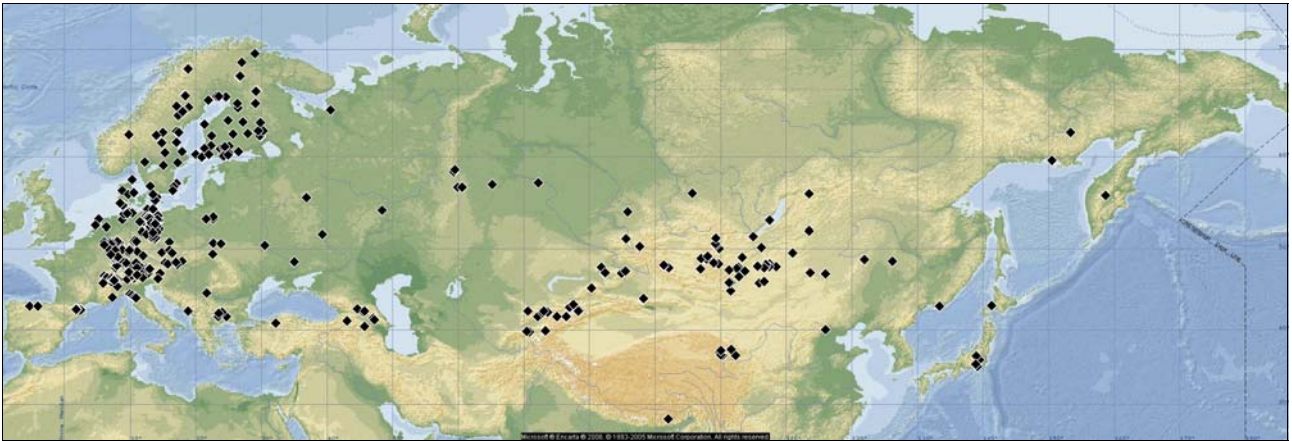


Fig. 1: Map of Europe and northern Asia including all collecting sites of *Coptoformica* MÜLLER, 1923 evaluated by us. Original map with permission of Microsoft®Encarta®2006©1993-2005 Microsoft Corporation. All rights reserved.

are strongly underrecorded. The seemingly disjunct distributions within the *Formica pressilabris* or *F. forsslundi* populations suggested by our maps are most probably artefacts of differential sampling intensity (Fig. 1).

Describing the distribution of a species requires the most dense net of detections possible. Unfortunately, in many cases there are only isolated findings, especially with regard to insect species. Conclusions can be drawn from the comparison with available zoogeographic and also phyto-geographic systems. A first attempt towards a faunistic description of the Palaearctic Region on an entomological basis was presented by SEMENOV-TJANSHANSKIJ (1936), and a recent zoogeographic system is given by KRZYZHANOVSKY (2002, see also MÜLLER-MOTZFELD 2006). An extensive overview of the zoogeographical classification of faunal elements is given by DE LATIN (1967). We chose this system and the classification of floral zones and regions given by MEUSEL & JÄGER (1992) as a basis for our brief diagnosis of the distribution of the *Coptoformica* species. Ants are not directly dependent on plants, but the floral zones and regions represent certain macro- and micro-climatic conditions which also apply to the ants living there. The classification according to broad floral zones succeeds relatively well in Europe but must be fine-tuned to the situation in Asia; floral regions as subdivisions are used here.

The present paper restricts itself to summarizing the known distribution of the subgenus *Coptoformica* but does not treat taxonomic questions. Research conducted since the revision of SEIFERT (2000) yielded three still unpublished changes which we do not want to establish here nomenclatorically. For this reason we use here the composite name *Formica exsecta* NYLANDER, 1846 et *mesasiatica* DLUSSKY, 1964 to avoid a formal, argumentation-free synonymisation of these two taxa which is strongly suggested by genetic, morphological and chorological evidence (B. Seifert & A. Goropashnaya, unpubl.) and we treat here two new species, one from mountain meadows of the Caucasus and another one from the Tarbagatay Mountains (East Kazakhstan), as *Formica* sp. 11 and *Formica* sp. 12.

Material and methods

In cooperation with the Academy of Sciences Kyrgyzstan (Bishkek), the Academy of Sciences Kazakhstan (Almaty) and the Xinjiang University Urumqi (P. R. of China), the

University of Greifswald (Germany) has conducted eight scientific expeditions in the mountains of Central Asia since 1998. The aim of these expeditions is to survey selected fauna in this mountain range. Initial results on the ant fauna were published in a checklist of the ants of Kyrgyzstan (SCHULTZ & al. 2006).

Roland Schultz participated in scientific expeditions to Central Asia from 1998 to 2001, in 2004 and 2005, Bernhard Seifert in 2000 and 2001. The expeditions always took place from mid-July to early August. They led to all parts of Kyrgyzstan and bordering areas of Kazakhstan, Uzbekistan, and Tadzhikistan. Each year different geographic areas were visited. In addition, RS participated in an expedition to the Lake Baikal (Russia) in 2001, to Mongolia in 2003, and to the western part of China (Xinjiang) in August-September 2004.

Further material was evaluated by RS from West Siberia (Altai, Russia), Primorsky Krai (Far East, Russia) and Mongolia, and by BS from Tibet (China), the Urals (Russia), and different parts of eastern Russia and Mongolia. Furthermore, both authors collected much material from different parts of Europe, and BS, especially, evaluated *Coptoformica* from all over Europe and Asia (SEIFERT 2000).

This study examines 855 samples of *Coptoformica*. Most of them could be determined to species level. The samples are from the following countries (number of samples from each country in brackets): Austria (31), Azerbaijan (2), Belgium (2), Bulgaria (6), China (31), Czech Republic (3), Denmark (6), Finland (50), France (20), Georgia (10), Germany (326), Italy (10), Japan (5), Kazakhstan (36), Kyrgyzstan (30), Mongolia (135), Netherlands (5), Norway (1), Poland (14), Russia (35), Serbia & Montenegro (2), Slovakia (3), Slovenia (1), Spain (4), Sweden (51), Switzerland (32), Turkey (2), and Ukraine (2) (Fig. 1). In total, more than 4500 specimens were examined.

Results

Formica bruni KUTTER, 1967

West Palaearctic. – Europe: North submeridional to temperate, planar to montane. Asia: South Siberian.

Due to the confusion of *Formica bruni* with *F. foreli* and *F. pressilabris*, the distribution of this species is probably underestimated. We have examined specimens originating from 28 different locations ranging from northern



Fig. 2: Map of Europe and northern Asia including all findings of *Formica bruni* KUTTER, 1967 evaluated by us. Original map with permission of Microsoft®Encarta®2006©1993-2005 Microsoft Corporation. All rights reserved.

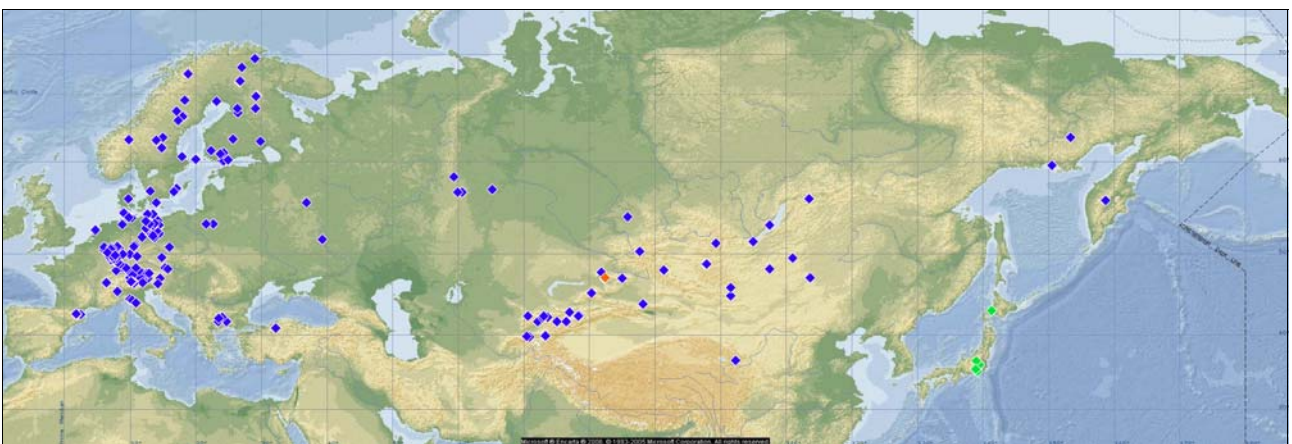


Fig. 3: Map of Europe and northern Asia including all findings of *Formica exsecta* NYLANDER, 1846 et *mesasiatica* DLUSSKY, 1964 (blue), *Formica fukaii* WHEELER, 1914 and *Formica* sp.12 (orange) evaluated by us. Original map with permission of Microsoft®Encarta®2006©1993-2005 Microsoft Corporation. All rights reserved.

Spain in the West to the Saur Mountains (East Kazakhstan) in the East, from South Sweden in the North to Montenegro in the South (Fig. 2). We report one new finding from the Ukraine: Orel'sky Forest near Dnepropetrovsk, 48° 27' N, 34° 59' E, 10.IX.2006, leg. Vyprík.

***Formica exsecta* NYLANDER, 1846 et *mesasiatica* DLUSSKY, 1964**

Panpalaeartic. – Europe: Temperate to boreal, planar to subalpine and submeridional-subalpine. Asia: Oreo-Turanian and Tibetan to boreal, montane to subalpine.

We investigated samples of *Formica exsecta* from 356 different localities. The examined specimens are from the French Pyrenees in the west to Kamchatka (East Russia) in the east, and from northern Finland to Tibet (China) in the south (Fig. 3). In southern Europe the geographical range apparently extends to central Spain (COLLINGWOOD 1979), to the North Apennines, and to the Balkans at 40° N. In Asia the known southern border extends from high Anatolia and Caucasus (SEIFERT 2000) to the Alai Valley (39° N, Kyrgyzstan), and Tibet (37° N, Beishan National Park, China). The species most probably occurs in southwestern England and the Scottish Highlands (summarized by SEIFERT 2000), but voucher material could not be examined in

the frame of this study. The northern range in Europe extends up to 71° N at North Cape (SEIFERT 2000) and is limited in the continental parts of Eurasia by the -8 °C isotherm of soil-temperature at a depth of one meter (achieved at 67° N in West Siberia at the Ob River and at 62° N in East Siberia at the Lena River). The southern distribution limit coincides with the southern border of the forest-steppe (DLUSSKY 1967). *Formica exsecta* et *mesasiatica* is apparently absent from the driest Pontic and Turanian steppes, semi-deserts, and deserts. The vertical distribution in Europe extends up to 2400 m a.s.l. (South Tyrol) and 2200 m a.s.l. (Bulgaria). In Asia, at more southern latitudes, the species can reach an altitude of 2700 m a.s.l. (Alai Mountains, Kyrgyzstan).

For reasons explained above, we include the range of *Formica mesasiatica* into the range of *F. exsecta*. In the Tarbagatay Mountains (East Kazakhstan) we found both the *F. exsecta* and the *F. mesasiatica* morph, a fact confirmed by REZNIKOVA (2003) with her findings in the Tarbagatay Mountains and near the Saysan Lake. South of the Dshungar Gate in the Tianshan and Alai Mountains, we found only the *F. mesasiatica* morph. This morph is present in all parts of the Tianshan Range, from Dshungar Alatao in the North to the Fergana Mountains in the South and from

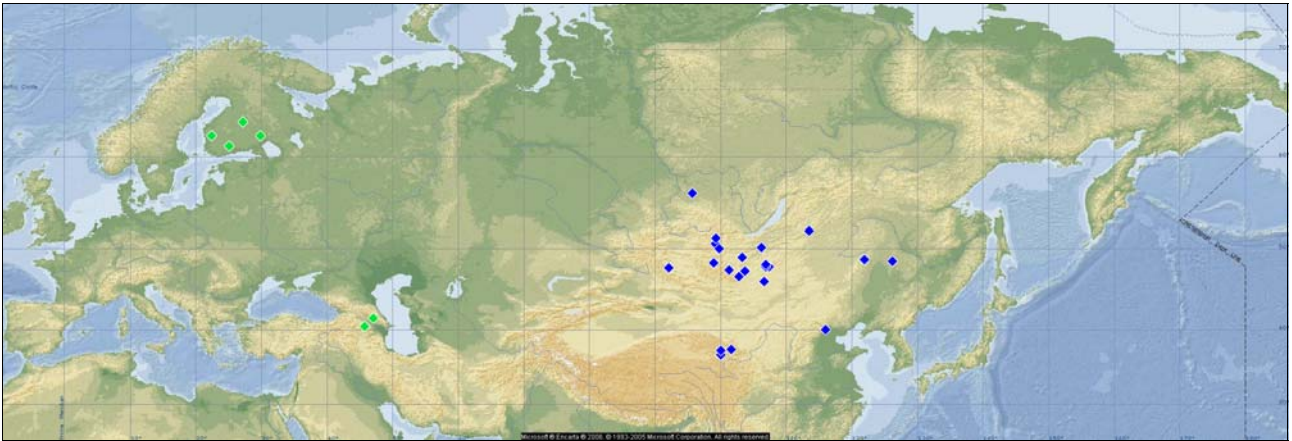


Fig. 4: Map of Europe and northern Asia including all findings of *Formica fennica* SEIFERT, 2000 (green) and *Formica manchu* WHEELER, 1929 (blue) evaluated by us. Original map with permission of Microsoft®Encarta®2006©1993-2005 Microsoft Corporation. All rights reserved.



Fig. 5: Map of Europe and northern Asia including all findings of *Formica foreli* BONDROIT, 1918 evaluated by us. Original map with permission of Microsoft®Encarta®2006©1993-2005 Microsoft Corporation. All rights reserved.

the Kazak West-Tianshan to Bogda Shan in China. At least in the Alai Mountains and in the Alai Valley, the *F. exsecta* morph was also collected, and its range probably extends farther to the south into the Pamir Mountains.

***Formica fennica* SEIFERT, 2000**

West Palaearctic. – South boreal and Caucasian-montane.

Not much is known about the distribution of *Formica fennica* (Fig. 4). It is probably allopatric to its sister species, *F. manchu*. So far this species could only be found in Finland and in the Caucasus – the latter population is apparently a glacial relict. We report a new location from Azerbaijan: 41° 28' N, 47° 04' E, 1700 m a.s.l., 3.VI. 2006, leg. Etzold. Four localities are now known in Finland (including one referred to as *Formica bruni* by AGOSTI 1989 – see SEIFERT 2000) and two in the Caucasus.

***Formica foreli* BONDROIT, 1918**

[First available use of *Formica exsecta* subsp. *pressilabris* var. *foreli* EMERY, 1909. – Annotation: Original description and type specimen come from EMERY (1909) – the retrospect application of article 45.5 ICZN withdraws the authorship from Emery, 51 years after his publication.]

West Palaearctic. – Europe: Submeridional-montane, temperate-planar to temperate-submontane. Asia: South Siberian.

Formica foreli is a submediterranean species with a southern border described by the known localities in northern Spain, northern Italy, Anatolia, Caucasus, and Saur Mountains (Kazakhstan) (Fig. 5). Isolated populations are known from northern Denmark and southern Sweden, the northernmost located on the Swedish island of Öland. We saw specimens from 92 different locations.

***Formica forsslundi* LOHMÄNDER, 1949**

Panpalaearctic. – Europe: Temperate to boreal, planar to submontane. Asia: Tibetan to Central-Siberian-Daurian.

There seems to be a large gap between a more or less coherent European range from northern Germany across Fennoscandia up to 66° N in Finland, and the Asian range from the Altai and Saur Mountains to Mongolia and Tibet (Fig. 6). From a zoogeographic or biocenotic perspective, there is no reason why these populations should not be connected. We have examined samples from 16 locations in Europe and from 22 locations in Asia. CZECHOWSKI & al. (2002) suggest a distribution similar to *F. uralensis* RUZS-

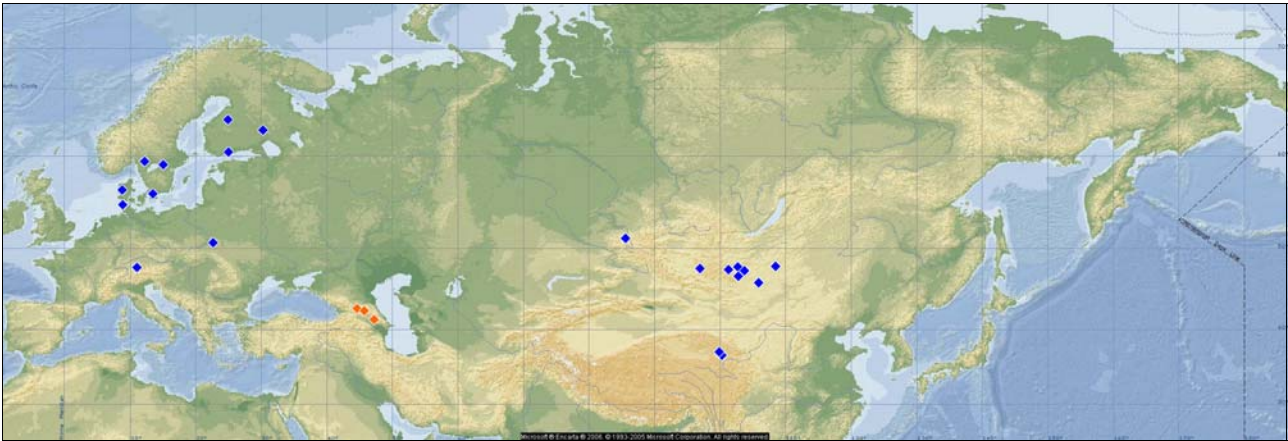


Fig. 6: Map of Europe and northern Asia including all findings of *Formica forsslundi* LOHMANDER, 1949 (blue) and *Formica* sp. 11 (orange) evaluated by us. Original map with permission of Microsoft®Encarta®2006©1993-2005 Microsoft Corporation. All rights reserved.

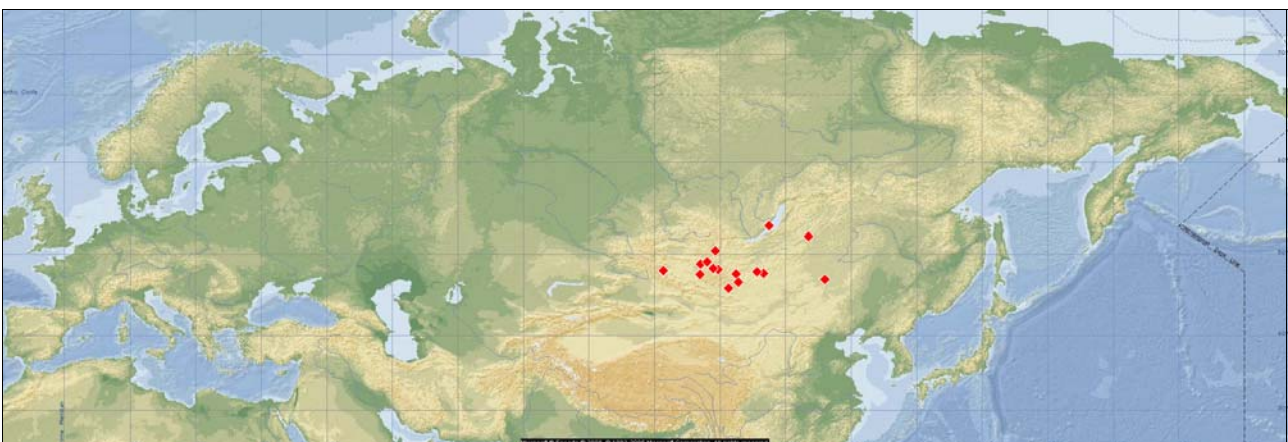


Fig. 7: Map of Europe and northern Asia including all findings of *Formica pisarskii* DLUSSKY, 1964 evaluated by us. Original map with permission of Microsoft®Encarta®2006©1993-2005 Microsoft Corporation. All rights reserved.

KY, 1895 and *F. picea* NYLANDER, 1846 et *candida* SMITH, 1878, but there are no findings of *F. forsslundi* in the Tianshan and Pamir regions. Beyond the known locations, we found *F. forsslundi* in the Tarbagatay Mountains north of the Dshungar Gate (see also findings of REZNIKOVA 2003).

***Formica fukaii* WHEELER, 1914**

Formica exsecta var. *fukaii* WHEELER, 1914. Type locality: Saitama, Japan.
East Palaearctic. – Endemic to Japan.

Formica fukaii seems to be closely related to *F. exsecta* et *mesasiatica* and is probably endemic to the islands of Japan and maybe Sakhalin (Russia) (Fig. 3). BS investigated five samples from different locations in Japan. The Japanese Ant Image Database described this species as occurring on the islands of Hokkaido, Honshu, and Sakhalin (JAPANESE ANT DATABASE GROUP 2003).

***Formica manchu* WHEELER, 1929**

East Palaearctic. – Tibetan to Central-Siberian-Daurian, in Central Asia up to 3400 m a.s.l.

We have examined samples from 44 different locations, ranging from South Siberia (Transbaikalian Region), through Mongolia, Manchuria to Tibet (Fig. 4). All samples are in

the range described by DLUSSKY (1967) for his "*F. longiceps*" from Kansk (96° E) to Yakutsk (130° E) and North Tibet (36° S) to Yakutsk (62° N). The species seems to have a Central Asian distribution, occurring east of the Johansen Line (JOHANSEN 1955) in the forest-steppe zone and mountain-steppe zone. It is unknown whether this species has contact somewhere with its western sister species, *F. fennica*.

RS found *F. manchu* in Mongolia in forest-steppe habitats between 1500 and 2300 m a.s.l. Here, the nests were always not far from trees or shrubs, sometimes even on north-exposed slopes with Taiga. *Formica manchu* were also found in sandy dune areas about 1200 m a.s.l., here especially in wet dune-valleys with shrub vegetation. The nests were generally rather large (compared to nests of *F. pisarskii* or *F. forsslundi*), with diameters between 20 and 100 cm and heights between 5 and 70 cm. Sometimes the nests merge, suggesting polycalic colonies.

***Formica pisarskii* DLUSSKY, 1964**

East Palaearctic. – Mongolian to Central-Siberian-Daurian.

Like *Formica manchu*, this seems to be an East Palaearctic species with Central Asian distribution. All 47 different findings evaluated by us are east of the Johansen

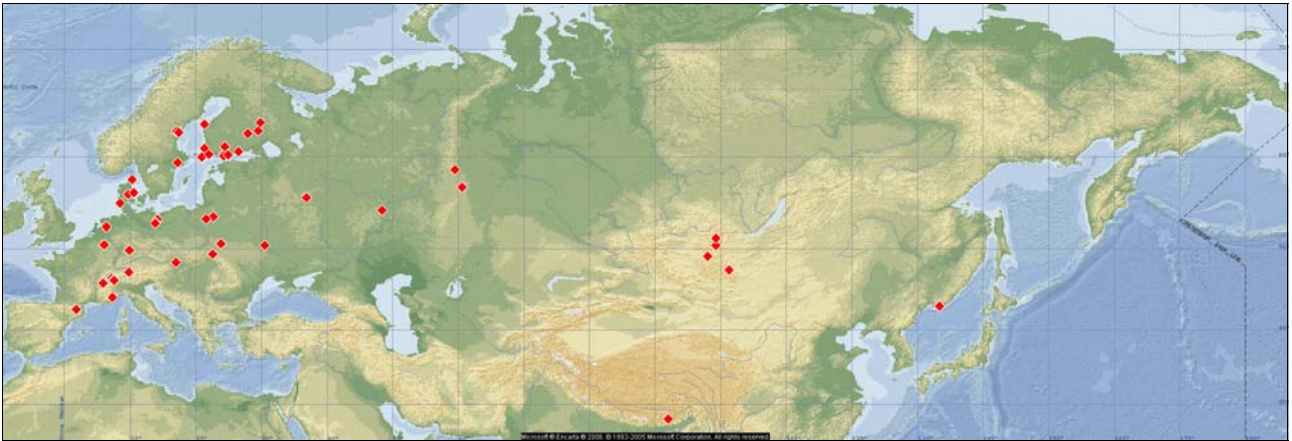


Fig. 8: Map of Europe and northern Asia including all findings of *Formica pressilabris* NYLANDER, 1846 evaluated by us. Original map with permission of Microsoft®Encarta®2006©1993-2005 Microsoft Corporation. All rights reserved.



Fig. 9: Map of Europe and northern Asia including all findings of *Formica suecica* ADLERZ, 1902 evaluated by us. Original map with permission of Microsoft®Encarta®2006©1993-2005 Microsoft Corporation. All rights reserved.

Line (JOHANSEN 1955) in the mountain-steppe and forest-steppe zone of Russia, Mongolia, and China (Fig. 7).

RS found *F. pisarskii* in open steppes and mountain-steppes between 500 m a.s.l. (near Lake Baikal) and 2300 m a.s.l. (Changai Mts, Mongolia). Shrubs and trees were mostly absent. The nests were often below stones without any mound of plant material. Whenever nest-mounds were built, they were rather small (diameter 10 to 30 cm, height 5 to 15 cm) but of usual *Coptoformica* type: built of finely-cut grass pieces.

***Formica pressilabris* NYLANDER, 1846**

Panpalaeartic. – Europe: temperate to South boreal, planar to subalpine. Asia: Tibetan to Central-Siberian-Daurian and East Manshurian, montane to subalpine.

Formica pressilabris is a boreo-alpine-continental species (SEIFERT 2000). DLUSSKY (1967) provided some insight into the distribution of "*F. rufomaculata*" in southwestern Siberia and Far East Russia, and KUPYANSKAYA (1990) indicated findings of "*F. rufomaculata*" along the Pacific Coast of Far East Russia (Primorsky Krai). We investigated specimens from 62 locations ranging from the French Pyrenees in the West to the Pacific coast near Vladivostok (Primorsky Krai, Russia) in the East, and from 65° N in Finland to South Tibet (China, exact locality unknown, approximately 28° N) in the South (Fig. 8). Only

few localities are known in Asia; we report, in addition to the above-mentioned locations, two findings from the Urals and one from Mongolia. The gap between the European and Asian findings is probably based on different collecting intensities in parts of the distribution area. Ecologically and zoogeographically, *F. pressilabris* should have a continuous distribution from west to east.

***Formica suecica* ADLERZ, 1902**

West Palaearctic. – North temperate to boreal, in the Alps montane to subalpine.

For a long time, *Formica suecica* was regarded as being endemic to Fennoscandia and Estonia (COLLINGWOOD 1979). An occurrence in southern Sweden, southern Finland, and Estonia (see map in COLLINGWOOD 1979: 135) seems possible from the zoogeographic point of view. However, the characters given in Collingwood's key will readily lead to confusion with reddish, broad-headed *F. exsecta* with weaker eye setae; it is the experience of BS that several myrmecologists made this type of misidentification. This urgently calls for careful investigation of voucher specimens from these regions. BS will readily check suspicious material.

Findings in the Alps (GLASER & SEIFERT 1999) and Siberia (West-Siberian lowlands near Tevris) indicate that *Formica suecica* has a much wider range (Fig. 9) – it ap-

parently has a boreal distribution and an isolated, montane-subalpine relict population in the Alps. The boreal area probably extends across West Siberia to at least the Johansen Line (JOHANSEN 1955), even if the species is probably relatively rare. We examined specimens from 20 different locations.

***Formica* sp. 11**

This undescribed species, a sister species of *F. forsslundi*, is apparently an endemic of the Great Caucasus. Georgia: Kazbegi, 42° 41' N, 44° 37' E, 2100 m a.s.l., 27.VII.1985, leg. Seifert and 2180 m a.s.l., 10.VIII.2004, leg. Tretin; Schenako, 42° 23' N, 45° 42' E, 1500 m a.s.l., 01.VIII.1985, leg. Seifert. Azerbaijan: 41° 14' N, 47° 14' E, 2000 m a.s.l., 05.VI.2006, leg. Etzold.

***Formica* sp. 12**

This new species, known only from several alate gynes caught during nuptial flight in the Tarbagatay Mountains in Kazakhstan, is probably a less widespread Central Asian species related to *F. exsecta* et *mesasiatica*. Tarbagatay: 47° 07' 37" N, 82° 22' 04" E, 2070 m a.s.l., 04.VIII.2001, leg. Seifert (Fig. 3).

Comparative zoogeographic consideration

Twelve *Coptoformica* species can currently be distinguished in the Palaearctic; three of them occur in the entire (northern) Palaearctic, six in the West Palaearctic and three in the East Palaearctic.

Of the three panpalaearctic species, *Formica exsecta* et *mesasiatica* shows by far the most extended distribution. This is a direct result of its (in terms of the subgenus) unusually large temperature and moisture tolerance; moreover it has a stronger self-assertion against other *Formica* species, including Wood Ants (*Formica* s. str.), due to its strength. The distribution of *F. exsecta* is probably continuous along the submeridional, temperate and at least south boreal zone from central Spain and the British Isles to Kamchatka. On the Japanese Islands, *F. exsecta* et *mesasiatica* is replaced by the sister species, *F. fukaii*. In the mountain ranges of Tianshan and Pamir as well as the Tibetan plateau, the range of *F. exsecta* et *mesasiatica* goes far below the submeridional zone to the south. However, the southern border of its distribution in the Pamir and in Tibet has yet to be found.

The two other Panpalaearctic species, *F. pressilabris* and *F. forsslundi*, show the same basic distribution picture as *F. exsecta* et *mesasiatica*. At least in Europe, however, they reach only the temperate zone; in Asia, on the other hand, they can occur through Mongolia to Tibet. Neither species were found in the Pamir-Tianshan mountains. Among all *Coptoformica* species, *Formica forsslundi* is the least able to defend itself; on mineral soil, it is agonistically inferior to most of the territorial ant species. Furthermore, it uses only one host species in Europe: the sole host in 19 examined cases was *F. picea*. The result is an occurrence on sites such as bogs, Atlantic moist heaths and mineral grounds of the subalpine zone where competing congeneric species are absent or rare, but it by no means follows the host into all parts of its distribution area.

Formica foreli and *F. bruni* are restricted to the West Palaearctic. Both species are clearly xerothermophilous and have their centre of distribution in the north-submeridional and temperate zone. Their range reaches from northern

Spain to the eastern border of the West Palaearctic in the Tarbagatay mountain range (East Kazakhstan). The apparent gigantic distribution gap in East Europe and West Asia is certainly not real, as the finding of *F. bruni* in the Ukraine points out. The present authors are willing to examine crucial specimens.

Two species, which based on the current state of information are also West Palaearctic, *F. fennica* and *F. suecica*, probably have a solid, distinctly boreal area with southern relict occurrences in the Caucasus (*F. fennica*) or in the Alps (*F. suecica*). *Formica fennica* is clearly more continental and will probably not extend farther to the west, neither in its boreal nor in its mountain area. In the east the species is probably restricted to the West Palaearctic and is replaced in the East Palaearctic by its sister species, *F. manchu*. How far the distribution area of *F. suecica* reaches to the east is currently unknown.

Two of the three East Palaearctic species, *F. manchu* and *F. pisarskii*, settle the forest-steppes and high steppes of Central Asia. Accordingly, their distribution range here is similar to that of the co-occurring *F. exsecta*, *F. pressilabris*, and *F. forsslundi*. Whether the known locations outline the entire distribution range remains unclear. It should be examined whether *F. pisarskii* also spreads into Tibet or Manchuria, like *F. manchu*.

In general, *Coptoformica* species prefer open, dry and warm habitats; closed woods are avoided. Thus, suitable habitats for *Coptoformica* are relatively frequent in the "artificial steppe" of Europe; the cleared areas of the southern taiga zone and the forest-steppe belts of Fennoscandia up to the Far East are also settled. In the central parts of Asia, however, *Coptoformica* also extend into the completely tree-free high steppes and can stretch their area far to the south.

We are far from fully understanding the distribution of all species belonging to the subgenus *Coptoformica*. The present contribution provides an insight into what is currently known. There are large gaps with low collection intensity, e.g., East Europe and West Siberia. Much more has to be done to understand the distribution, especially in Central and East Asia. Bibliographical references are potentially helpful, but should be reviewed due to potentially incorrect determinations.

Acknowledgements

We want to thank Norbert Amelang (Greifswald), Lars Kanter (Greifswald), Jonathan Etzold (Greifswald), and Martin Pfeiffer (Ulm) for collecting and sending ants from Asia for investigation. For his helpful comments on an early version of the manuscript, we want to thank Gerd Müller-Motzfeld (Greifswald). We are also grateful to John Fellowes and Alexander Radchenko who commented on this paper. We sincerely thank Michael Stachowitsch (Vienna, Austria) for improving the language.

Zusammenfassung

Zehn beschriebene und zwei unbeschriebene *Coptoformica*-Arten (Hymenoptera: Formicidae, Gattung *Formica*) sind gegenwärtig aus der Paläarktis bekannt. Drei von ihnen – *Formica exsecta* NYLANDER, 1846 et *mesasiatica* DLUSSKY, 1964, *F. pressilabris* NYLANDER, 1846 und *F. forsslundi* LOHMANDER, 1949 – kommen sowohl in der West- als auch in der Ostpaläarktis vor. *Formica exsecta* et *mesasiatica* ist von allen *Coptoformica*-Arten am weitesten ver-

breitet. Wir haben diesen zusammengesetzten Namen gewählt, um hier die formale Synonymisierung von *F. mesasiatica* mit *F. exsecta* zu vermeiden. Eine vollständige Argumentation zugunsten dieser Synonymie, mit morphologischen, chorologischen und genetischen Beweisen, wird an anderer Stelle präsentiert (B. Seifert & A. Goropashnaya, unpubl.).

Sechs Arten sind auf die Westpaläarktis beschränkt: *F. bruni* KUTTER, 1967, *F. fennica* SEIFERT, 2000, *F. foreli* BONDROIT, 1918, *F. suecica* ADLERZ, 1902 und zwei noch nicht beschriebene Arten. *Formica bruni* und *F. foreli* sind im Osten bis zur Johansen-Linie vertreten. *Formica fennica* ist aus Finnland und dem Kaukasus bekannt. *Formica suecica* wurde in Fennoskandien, den Alpen und Westsibirien gefunden. Wenig ist bekannt über die Verbreitung der zwei noch nicht beschriebenen Arten.

Drei Arten sind ostpaläarktisch: *F. fukaii* WHEELER, 1914, endemisch auf den japanischen Inseln; *F. manchu* WHEELER, 1929 und *F. pisarskii* DLUSSKY, 1964 mit mehr oder weniger zentralasiatischer Verbreitung. Wahrscheinlich haben *F. manchu* und *F. pisarskii* den gleichen Verbreitungstyp, sie bewohnen die Waldsteppenzone Russlands zwischen Altai und Lena, die Mongolei, Manschurei und, im Falle von *F. manchu*, auch Tibet.

Dieser Beitrag gibt einen Überblick über die Verbreitung der *Coptoformica*-Arten und versucht, aus bekannten Fundpunkten Verbreitungsbilder zu konstruieren.

References

- AGOSTI, D. 1989: Versuch einer phylogenetischen Wertung der Merkmale der Formicini (Hymenoptera, Formicidae), Revision der *Formica exsecta*-Gruppe und Liste der Formicidae Europas. – PhD Thesis, Eidgenössische Technische Hochschule Zürich, Switzerland, 266 pp.
- COLLINGWOOD, C.A. 1979: The Formicidae (Hymenoptera) of Fennoscandia and Denmark. – Fauna Entomologica Scandinavica 8: 1-174.
- CZECHOWSKI, W., RADCHENKO, A. & CZECHOWSKA, W. 2002: The ants (Hymenoptera, Formicidae) of Poland. – Museum and Institute of Zoology PAS, Warsaw, 200 pp.
- DE LATIN, G. 1967: Grundriß der Zoogeographie. – G. Fischer-Verlag, Jena, 602 pp.
- DLUSSKY, G.M. 1964: Ants of the subgenus *Coptoformica*, genus *Formica* from USSR. – Zoologicheskii Zhurnal 43: 1026-1040.
- DLUSSKY, G.M. 1965: Ants of the genus *Formica* L. of Mongolia and Northeast Tibet (Hymenoptera, Formicidae). – Annales Zoologici 23: 15-43.
- DLUSSKY, G.M. 1967: Ants of the genus *Formica* (Hymenoptera, Formicidae, g. *Formica*). – Izdatel'stvo "Nauka", Moscow, 236 pp. (In Russian)
- EMERY, C. 1909: Beiträge zur Monographie der Formiciden des paläarktischen Faunengebietes. (Hym.) 7 (*Formica*, *Proformica*). – Deutsche entomologische Zeitschrift 1909: 179-204.
- FOREL, A. 1874: Les fourmis de la Suisse. – Société Helvétique des Sciences Naturelles, Zurich, 452 pp.
- FOREL, A. 1915: Fauna insectorum helvetiae. Hymenoptera. Formicidae. Die Ameisen der Schweiz. – Mitteilungen der Schweizerischen Entomologischen Gesellschaft 12 (7/8 Beilage): 1-77.
- GLASER, F. 1999: Erste Ergebnisse zur Verbreitung, Habitatbindung und Gefährdung der Untergattung *Coptoformica* (Hymenoptera: Formicidae) in Österreich. – Myrmecologische Nachrichten 3: 54-61.
- GLASER, F. & SEIFERT, B. 1999: Erstfund von *Formica suecica* ADLERZ, 1902 (Hymenoptera, Formicidae) in Mitteleuropa. – Mitteilungen der Schweizerischen Entomologischen Gesellschaft 72: 83-88.
- JAPANESE ANT DATABASE GROUP 2003: Japanese Ant Image Database. – <<http://ant.edb.miyakyo-u.ac.jp/E/index.html>>, retrieved on 4 July 2007.
- JOHANSEN, H. 1955: Die Jenissei-Faunenscheide. – Zoologische Jahrbücher, Abteilung für Systematik, Ökologie und Geographie der Tiere 83: 237-247.
- KARAWAJEW, W. 1927: Die Ameisenfauna von Ukraine. – Trudy Ukrains'ka Akademiya Nauk Fizichno-Matematichnoho Vidilu 4: 247-296.
- KRYZHANOVSKY, O.L. 2002: Composition and distribution of global entomofaunas. – Tovar. Nautschn., Moskva, 238 pp. (In Russian)
- KUPYANSKAYA, A.N. 1990: Ants (Hymenoptera, Formicidae) of the USSR Far East. – Far East Branch of Academy of Sciences USSR, Vladivostok, 258 pp. (In Russian)
- KUTTER, H. 1957: Zur Kenntnis schweizerischer *Coptoformica* Arten (Hym. Form). – Mitteilungen der Schweizerischen Entomologischen Gesellschaft 30: 1-24.
- LOMNICKI, J. 1925: Przegląd polskich gatunków rodzaju mrówki (*Formica* LINNÉ). – Polskie Pismo Entomologiczne, Wrocław (Lemberg) 3: 151-182.
- MEUSEL, H. & JÄGER, E.J. 1992: Vergleichende Chorologie der zentraleuropäischen Flora. Text u. Karten. Bd. 3. – Gustav Fischer Verlag Stuttgart New York, 333 pp.
- MÜLLER-MOTZFELD, G. 2006: Faunenbeziehungen zwischen dem himalayischen und dem pamirischen Primärzentrum am Beispiel der Laufkäfergattung *Bembidion* (Insecta: Coleoptera: Carabidae). In: HARTMANN, M. & WEIPERT, J. (Eds.): Biodiversität und Naturausstattung im Himalaja. II. – Naturkundemuseum, Erfurt, pp. 125-132.
- REZNIKOVA, Zh.I. 2003: Distribution patterns of ants in different natural zones and landscapes in Kazakhstan and West Siberia along a meridian trend. – Eurasian Entomological Journal 2: 235-242.
- RUZSKY, M. 1905: The ants of Russia. Systematics, geography and biological data of Russian ants. Part 1. – Trudy Obshchestva Estestvoispytatelei pri Imperatorskom Kazanskom Universitete 38: 1-800. (In Russian)
- SCHULTZ, R., RADCHENKO, A. & SEIFERT, B. 2006: A critical checklist of the ants of Kyrgyzstan (Hymenoptera: Formicidae). – Myrmecologische Nachrichten 8: 201-207.
- SEIFERT, B. 2000: A taxonomic revision of the ant subgenus *Coptoformica* MÜLLER, 1923 (Hymenoptera, Formicidae). – Zootaxa 2000 22: 517-568.
- SEIFERT, B. 2007: Die Ameisen Mittel- und Nordeuropas. – Lutra Verlags- und Vertriebsgesellschaft, Tauer, 368 pp.
- SEMOV-TJANSKANSKIJ, A.P. 1936: Les limites et les subdivisions zoogeographiques de la region palearctique pour les animaux terrestres, basees sur la distribution géographique des Insectes Coleopteres. – Izdatel'stvo Akademii Nauk SSSR, Moskva - Leningrad: 1-15. (In Russian)
- STILLE, M. 1996: Queen/worker thorax volume ratios and nest founding strategies in ants. – Oecologia 105: 87-93.
- STITZ, H. 1939: Hautflügler oder Hymenoptera. 1. Ameisen oder Formicidae. – G. Fischer, Jena, 428 pp.
- WHEELER, W.M. 1913: A revision of the ants of the genus *Formica* (LINNÉ) MAYR. – Bulletin of the Museum of Comparative Zoology of Harvard College 53: 379-565.