

## **The Ants of Norway.** **(Hymenoptera, Formicidae)**

By

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**T**he Norwegian ant fauna has been dealt with in several small papers, the most important one being the "Enumeratio" given by Siebke (1880). Later on E. Strand has very briefly summed up our species and their distribution (1898 a), and he has also in some subsequent papers mentioned ants collected by himself in different parts of Norway. Sparre Schneider has given valuable knowledge of the ants of Northern Norway in a paper from 1909. Otherwise the Norwegian ants, very seldom are referred to in the literature. Our knowledge of their distribution is very incomplete, as great parts of the country have never been visited by any entomologist interested in ants.

None of the previous authors being an experienced myrmecologist, their determinations cannot always be accepted as certain, and many of their communications may be regarded as questionable, as will be seen later.

As far as possible, I have revised the old material in our Museums, but there is still more to be done. Beside some short notes of various contents in our periodicals, I have recently given the results of this revision for the ants of Northern Norway (1942 b).

In the present paper I am going to give an account of the distribution of our ant species as we know it to-day, and at the same time I discuss some of the systematic characters of several of our species.

As will be seen from the data on the various species, collecting has been carried out chiefly in the environs of Oslo, and in the county of Rogaland. Besides, ants have been collected in a number of places in Eastern Norway, especially in the districts round

the Oslo Fiord, northwards to Dovre, in Western Norway near Bergen, in several places along the south coast, and in various parts of Northern Norway, as will appear from the above mentioned paper.

In the southern part of Norway I have occasionally been able to collect on some scattered localities during recent years, but apart from Rogaland, no part of this country can be said to have been thoroughly investigated in regard to the ant fauna. There is still much to be done, but as a preliminary account the following survey of our ant fauna may be of interest.

The communications on the distribution of our species have been founded upon the literature as well as upon the material in the collections of our museums in Oslo, Bergen, and Tromsø, and of myself.

For this work and for my other investigations on ants, I have had the benefit of economical assistance from "Nansenfondet" and "Prof. R. Collett's Legat" (1938/39/40). For this aid I want to express my most hearty thanks to the committees of these funds.

In the course of my work I have been in contact with several persons and institutions, who in different ways have supported my work, partly by giving or lending me ant-material from different parts of Norway, partly by sending me material used for comparison, or by sending me reprints of their publications.

Of these I want to adress my thanks to Mr. Charles Bisgaard, Copenhagen; Prof. Dr. Hjalmar Broch, Oslo; Dr. R. Clausen, Châteauneuf; Dr. Wm. Creighton, New York; Mr. Ingvald Dahl, Saura; Mr. H. Donisthorpe, London; Mr. N. Knaben, Bergen; mag. sc. Sv. G. Larsson, Copenhagen; Mr. H. Lohmander, Gothenburg; cand. mag. Bjørn Myklebust, Alesund; Mr. L. R. Natvig, Oslo; Mr. T. Soot-Ryen, Tromsø; Mr. A. Strand, Oslo; Mr. H. Tambs-Lyche, Bergen; mag. sc. S. L. Tuxen, Copenhagen; and Dr. Otto H. Wellenius, Ekenäs.

A great part of the work has been carried out when I was studying at the Zoological Laboratory of the University, Oslo—Blindern, where Prof. Dr. Bjørn Føyn and Prof. Dr. Hjalmar Broch very generously let me dispose of a room, microscopes, etc., for the purpose.

In the following text, "Northern Norway" comprises the three counties of Nordland, Troms, and Finnmark. "Southern Norway" comprises the fifteen counties Østfold, Akershus, Vestfold, Hedmark, Oppland, Buskerud, Telemark, Aust-Agder, Vest-Agder, Rogaland, Hordaland, Sogn og Fjordane, Møre og Romsdal, Sør-Trøndelag, Nord-Trøndelag, as well as the cities Oslo and Bergen.

The terms "Eastern" and "Western" Norway refer to no limited group of counties, but to the eastern and western parts of Southern Norway in a somewhat indefinite sense, Western Norway being the fiord and coastal districts from Rogaland to Møre, Eastern Norway reaching from the Swedish border in the south to Trøndelag in the north.

At the end of the paper I give a brief identification key to workers of all Norwegian species. A complete and illustrated key (in Norwegian) comprising all sexes, will be found in Norsk Entomologisk Tidsskrift, Vol. VI, part 4, Oslo 1943. Copies of this key are obtainable from the Zoological Museum, Oslo, Entomological Department.

The present paper was ready for press in the autumn of 1942. As printing, owing to various circumstances, has been delayed, I have been enabled to add several observations made during the summer of 1943 on some few of our more rare species.

### Subfamily Ponerinae Lepelletier.

*Ponera punctatissima* Roger, our only species of this subfamily, was discovered by Mr. A. Strand in August 1942, in a sawdust heap at Røa in Aker, near Oslo. First he captured two flying females, some days later still more, and this time he also found several workers, without, however, discovering any nest. (For further information, see Holgersen 1943 a.)

This species has not been found in Sweden (where the subfamily is not represented by any species); in Denmark it has been found in hot-houses in Copenhagen, as Meinert's *P. coarctata* (1860) actually belongs to Roger's species, as pointed out by Donisthorpe (1927 p. 73). In Finland *P. punctatissima* has been taken in Jyväskylä (Sahlberg 1913) and at Helsinki (*inter alia* by Wellenius

19 IX 1937, specimens in my collection, kindly sent me by Dr. Wellenius).

The Norwegian specimens belong to the typical form, the scape of antenna not reaching the posterior border of head (as it does in var. *exacta* Santschi).

### Subfamily Myrmicinae Lepelletier.

#### Genus *Formicoxenus* Mayr.

*Formicoxenus nitidulus* Nyl. is the only known species of this genus. As var. *picea* Wasmann (1906) has described a dark variety found in Luxembourg and — according to information sent me by Dr. O. Wellenius — in Finland. Some of the Norwegian specimens may probably be said to belong to this variety.

The first record of the species as Norwegian was made by Sparre Schneider (1909), who had found it in Målselv and Malangen, whilst Munster and Lysholm discovered it at Lakselv in Porsanger. The localities are all in Northern Norway, where it has later on several occasions been found in all three counties (for distribution in Northern Norway of this and other species, see Holgersen 1942 b).

In Southern Norway it is known from Otta in the valley of Gudbrandsdal, elsewhere only from the coastal districts from Oslo and Kongsberg to Rogaland. In certain places near Oslo I have found it to be rather numerous. No doubt it has a very wide distribution within the country, following the ants of the *Formica rufa*-group. That it is still known from only comparatively few localities is owing to lack of investigations as well as to its habits. Coleopterologists ought to look for this inquiline ant when sifting ant hillocks.

Its hosts are usually *Formica rufa* and *F. rufa* subsp. *pratensis*, but it has also been found in nests of *F. exsecta* and *F. truncorum*.

#### Genus *Harpagoxenus* For.

*Harpagoxenus sublaevis* Nyl. is found only in its typical form in Norway. Nylander (1849) described a var. *hirtula*, which is recorded as living with *Leptothorax muscorum* Nyl., whilst the typical *H. sublaevis* is to be found with *Lept. acervorum* F. Our

Fig. 1. Post-petiole of males of *Harpagoxenus sublaevis* Nyl. (left) and *Leptothorax acervorum* Fabr. (right).



*Harpagoxenus* have all — in the cases where the host species has been identified — been found in nests of *Lept. acervorum*, and the var. *hirtula* (questionable variety? See Holgersen 1942 a, p. 95) is still unknown in Norway.

The male of *H. sublaevis* is difficult to distinguish from the male of *Lept. acervorum*, as the spine of the post-petiole of the former is sometimes totally lacking (see e. g. Adlerz 1896 b, pp. 68—69). Clausen (1939) has pointed out that the genital apparatus in the two species is differently built, but to use these characters demands a very exact preparation of the genitalia, not suitable to all entomologists.

As far as I can judge from the few male specimens of *H. sublaevis* in my possession, the post-petiole shows a constant and quite distinct difference from the same in *Lept. acervorum*, when seen from above, as shown in Fig. 1.

The species is usually regarded as very rare. In Norway it has been found quite frequently in the south-west, in Rogaland and (once) in Vest-Agder. In the east it has been found in three places in Akershus, and also in Østfold, Buskerud, and Hedmark. Further the species has been taken at Kåfjord in Alta, Northern Norway, 69° 54' N.

It is quite possible that *H. sublaevis* has a continuous distribution in Norway, and further investigations will probably show that it is as common in other districts as it has proved to be in Rogaland.

I have dealt with this species in a previous paper (1942 a) and will not go into details again, but I want to add some remarks. The name *Harpagoxenus* was introduced by Forel in 1893 (Ann. Soc. Ent. Belg. 37), not in 1915. The Danish locality — Rye Nørreskov — is on the map placed some 6 mm too far to the north. The locality is — according to information from Mr. Ch. Bisgaard — situated on the same latitude as Aarhus, not near Rye Aa as I thought. The list of literature was not meant as a complete list

of publications on *H. sublaevis*; it contained only papers which I knew myself. To the list I can now add 5 publications by Adlerz (1887 and 1896 a), Gaunitz (1929), Wellenius (1904), and Lomnicki (1931), giving the following localities not mentioned in my paper: Sorsele in Lycksele Lappmark (Sweden), and Polish Tatra.

#### Genus *Tetramorium* Mayr.

*Tetramorium caespitum* L., the only Norwegian representative of the genus, is a very variable species (see Emery 1909 b). In Norway only the typical form has been found, the same that is so common in Central Europe.

For this species Siebke (1880) knew of only a few captures near Oslo. Later it has been found in a number of localities in Southern Norway, in the districts round the Oslo Fiord, along the south coast to Rogaland, where I in some places have seen it rather abundantly. According to Schøyen (1880) Strøm has found *T. caespitum* in Sunnmøre, the species thus ranging northwards till well above 62° N.

Most of the captures have been made in the coastal districts, inconsiderably above sea level. Inland the species has been taken by Munster at Sandnes in Drangedal, at Kongsberg and Hokksund, and by E. Strand (1906) at Al in Hallingdal. — In Western Norway, where *T. caespitum* is still unknown between Rogaland and Sunnmøre, it will no doubt be found in many places along the coast, when investigated.

#### Genus *Leptothorax* Mayr.

The subgenus *Leptothorax* s. str. is confined to the south-eastern parts of the country, where *Lept. tuberum* Fabr. and its variety *nigricephala* Kar. have been found a few times, and from where also *Lept. interruptus* Sch. is reported.

For *Lept. tuberum* Siebke (1880) gives a few localities in and near Oslo, and he reports captures in Odal, Gudbrandsdal, and Dovre by W. M. Schøyen. In the vicinity of Oslo *Lept. tuberum* has been taken also by Esmark and Ths. Munster. E. Strand (1898 b, 1903) records it from Lyngør and Hvaler. The species thus seems to have an eastern distribution, ranging northward to Dovre.

It is possible that some of the *Lept. tuborum* mentioned in the literature belong to the following variety, and a revision of the material, if available, is desirable.

*Lept. tuborum* var. *nigricephala* Kar. was described by Karawajew (1930) from specimens taken by H. Lohmander in Öland and Gotland (Sweden). It has later been taken on the Swedish mainland by Mr. A. Jansson. — As I have stated in a previous paper (1940) several of the captures of *Lept. tuborum* in Norway actually refer to this dark-headed variety. It is known from the south-eastern part of the country, from Lillesand to Oslo, taken by Ths. Munster, A. Strand, and myself.

*Lept. interruptus* Sch. has been taken only by Siebke (1880, p. 78) at Oslo, and seems to be very rare in Norway. I have never found it myself, nor have I seen Norwegian specimens taken by other entomologists.

Of the subgenus *Mychothorax* Ruzsky two species — *Lept. acervorum* Fabr. and *Lept. muscorum* Nyl. — are known to occur in Norway. Ruzsky has (1905) described a variety of *acervorum*, viz. var. *nigrescens*, which has been found in Norway too (Stitz 1914, 1939). Translated, the description runs as follows: "Femura with great blackish or blackish brown spots, thorax and epinotum with basal part of spines chiefly dark brownish black." (Courtesy of Mr. H. Donisthorpe, British Museum). — Many of our specimens, in my collection as well as in the museums of Oslo and Tromsø agree well with this description. On several occasions I have, however, found nests where some specimens were typical light-coloured *acervorum*, others dark *nigrescens*, beside intermediate forms. Var. *nigrescens* seems to be founded upon individual variation only, and I have therefore not separated it from *Lept. acervorum* s. str. The variety is at present known from Ural, Norway, East-Prussia, and Dresden (Stitz 1939, p. 162). When still not reported more frequently from the well investigated Central Europe, it is, I think, because it has been overlooked or not paid attention to.

*Lept. acervorum* Fabr. is one of the most common ant species of Norway, and it is known from practically all parts of the country. It has been collected in great numbers in the east, south, and west, in the coastal districts as well as inland, up to considerable altitudes (some 1100 meters). In Northern Norway it is reported from many places as well; indeed, here it seems to be the most widely distributed ant. Northwards it reaches Hammerfest, 70° 40' N.

*Lept. muscorum* Nyl. is by some myrmecologists regarded as a subspecies of *Lept. acervorum*. Anyway, it is characteristic enough and is by several authors given specific rank. — This species was first discovered in Norway by Forel, at Fagernes in Valdres (see E. Strand 1919, specimen in Zoologisk Museum, Oslo). Next it was recorded by me in 1937, when I had captured it three times in Rogaland. Later I have found it in five more localities here, spread over the county. Near Oslo, I have taken a few workers at Ullern, where Mr. A. Strand has also found the species. Finally Ths. Munster has brought specimens from Lyngdal in Flesberg (Buskerud), and from Snarøya near Oslo. Further captures of *Lept. muscorum* in Norway are not known to me.

Though its distribution in this country is only fragmentarily known, it seems reasonable to regard this species as a southern one, not extending its range north of the Dovre mountains. It may be found along the west coast, and — of course — along the south coast and in other places in Eastern Norway. In Rogaland, where I in spite of careful investigations have found it in eight places only, it is one of the rarest species, and no doubt it is not common anywhere in Norway. The colonies I have seen have been rather small, by far not as populous as an average *acervorum*-colony.

#### Genus *Myrmica* Latr.

As known the two closely related species *Myrm. ruginodis* Nyl. and *Myrm. laevinodis* Nyl. are different in respect to the sculpture of thorax and post-petiole, length of epinotal spines, and sculpture of the space between the spines. Forel has given the name *var. ruginodo-laevinodis* to intermediate forms.



Sometimes I have found nests where the workers were not quite typical *Myrm. ruginodis*, and which therefore could be named var. *ruginodo-laevinodis*. They have, however, always been nearest to *Myrm. ruginodis*, not to *Myrm. laevinodis*, and of habitus been the former. I have therefore treated them as *ruginodis*. — It is my opinion that only those specimens which can not with certainty be said to belong to one or the other of the species, ought to be called var. *ruginodo-laevinodis*. Wanach (1910) says that he now and then has found single workers of the intermediate form in nests of *Myrm. ruginodis*, and only here. The variety thus seems to be a *ruginodis* with less developed sculpture and somewhat shorter spines than usual. Those forms which are more rugose and have longer spines than the "typical" form, have not been blessed with any special name, as they do not approach any other known species. But a certain freedom of variation ought to be allowed also in the other direction, towards *Myrm. laevinodis*. — To complete this discussion, I may mention that Stitz (1939, p. 85) suggests that such intermediate forms may come from crossing between *Myrm. ruginodis* and *Myrm. laevinodis*.

*Myrm. ruginodis* Nyl., which Siebke (1880) regards as rare in the south-eastern parts of Norway, is in fact a very common species in most of Norway, in the south the commonest beside *Formica fusca* L. It is, however, still not reported from great parts of central Norway, Hardangervidda and Jotunheimen and their environs, or Dovre, and not from the coast between Hordaland and Alesund. But as it has been found so numerousely nearly wherever ants are looked for, it is evident that it may be found over most of the country, except in the highest mountains. Also in the north *Myrm. ruginodis* is a common species and met with in a number of places. It extends northwards to Hammerfest, 70° 40' N.

*Myrm. laevinodis* Nyl. is widely distributed in Southern Norway, but although it is no really rare species, it has been found in a far smaller number of localities than *Myrm. ruginodis*. It is known from many places in the eastern districts, is found rarely in the south, but often in the west from Dalane to Herdla north of Bergen. Siebke (1880) reports it from Smøla and Trondheim.

In Northern Norway *Myrm. laevinodis* has been reported from Polmak only (see Holgersen 1942 b).

On journeys in Eastern Norway I have found this species quite easily and rather numerous in certain places, and further investigations no doubt will show that *Myrm. laevinodis* is a rather common species in great parts of Southern Norway.

Forel (1911, p. 457) gives the following description of a variety of *Myrm. laevinodis*: "*Myrmica rubra* L. subsp. *Champlaini* For. v. *europaea* n. var. Epines dentiformes, comme chez le type de la subsp. Pétiole antérieur du premier nœud plus distinct, mais plus court que chez la *laevinodis*. Couleur d'une *laevinodis* pâle. Sculpture de la *laevinodis*. — Bredheim [= Breim], Nordfjord, Norvège (Prell). Peut-être plutôt var. de la *laevinodis*."

I have not seen determined specimens of this variety, which later is said to have been found in Finland too (Stitz 1939, p. 83). Nor have I seen specimens or descriptions of subsp. *champlaini*, which would be of a certain interest in this connection, yet Emery (1921) regards *europaea* as a variety of *laevinodis*, not of the subspecies.

*Myrm. sulcinodis* Nyl. is a very characteristic species and easily distinguished from our other species of this genus. It is uncertain whether the variety *sulcinodo-scabrinodis* For. has been found in Norway or not (see Holgersen 1942 b). — Siebke (1880) knew *Myrm. sulcinodis* only from Oslo and Trondheim, and regarded it as very rare. It is, however, quite common, and found from Mandal in the south to Hadsel in the north, ranging over  $10\frac{1}{2}$  latitudinal degrees. In Eastern Norway it has been found on very scattered localities and mostly far inland. This no doubt is caused by the great forests in the lower parts of these districts, as *Myrm. sulcinodis* prefers open and mountainous country; so it has been found in Valdres, Gudbrandsdal, and Dovre, partly high above sea level. In Western Norway the species is frequently met with in the mountains, till about 800 meters. In Rogaland I have found it most numerous in altitudes from 200 to 550 meters above sea level, but here as well as further south and north, *Myrm. sulcinodis* also extends its range down to sea level, and it is often found on islands and the mainland in the nearest neighbourhood of the

sea. In Northern Norway, where *Myrm. sulcinodis* has been found at Bodø and in Vesterålen, it is — as in the south-west — not exclusively a mountain species.

In Enumeratio (1880) Siebke reports *Myrm. rugulosa* from Aset (in Åmot) in Østerdal, and in 1903 E. Strand informs that he has found the species at Fredrikstad. In the Zoological Museum of Oslo no specimens of *rugulosa* are to be found in the collections of Siebke and as I have pointed out earlier (1940), Strand's *Myrm. rugulosa* from Fredrikstad is a worker of *Leptothorax acervorum* F. — Any proof that *Myrm. rugulosa* belongs to the Norwegian fauna does not exist at the time being, but the possibility of finding it here can not be eliminated. *Myrm. rugulosa* is known from Sweden, and may be found in Norway too, for instance in the south-eastern districts.

*Myrm. lobicornis* Nyl. has a distribution similar to that of *Myrm. sulcinodis*, but it seems to be more frequently met with in the wooded districts of Eastern Norway. In the south-west it prefers open country as does *sulcinodis*, and I have found it more abundantly in heights above 200 meters than below. It is, however, also found at sea level. — On the whole, *Myrm. lobicornis* appears to be a little less common than *Myrm. sulcinodis*. It has been found in scattered localities in the lower parts of Eastern Norway, also in the mountains inland, and in the south-west its habits are — as mentioned — similar to those of *Myrm. sulcinodis*. In the northern counties it has been reported from some few places, from Brønnøy over Lofoten to Alta and Pasvik in Finnmark. It nearly reaches the 70° lat. N. — *Myrm. lobicornis* may be expected to inhabit most of this country, except the highest mountains and the most extreme north. — E. Strand in 1903 erroneously reports this species as new to our fauna: Siebke 23 years earlier, in 1880, reports it from Oslo and Eidsvoll.

*Myrm. schencki* Em. — In a previous paper (1940) I have published as localities for *Myrm. schencki* Helgøya, Bygdøy, and Aker. These localities have to be stricken, as the specimens taken there actually belong to a form of *Myrm. lobicornis*. Only the specimens mentioned from Brønnøy in Asker are *Myrm. schencki*.

And now I can add two more captures of the species, both in Ryfylke in the south-west (Rogaland), where I in the summer 1940 found a small colony near Hinderåvåg in Nedstrand, and a single worker on Sjernerøy.

As previously mentioned (1940, p. 184) *Myrm. schencki* was first recorded as Scandinavian in 1930, when Lohmander found it in Öland and Gotland (Sweden). At that time it was unknown in Denmark, where Ch. Bisgaard found a colony in 1939, and where it in some districts seems to be fairly numerous (according to information from Mr. Bisgaard, and from Larsson 1943).

Workers and females of *Myrm. lobicornis* and *Myrm. schencki* are often very difficult to identify. The specialist K. V. Arnoldi says that the two species are very often impossible to separate unless one has males at hand. The scape of antennae of the males are widely different in shape, whilst the lobus of antennae in workers and females is not sufficiently constant and may easily lead to mistake of identity (Arnoldi 1934, p. 166). Unfortunately the males are to be found only during a short period in the nests, and therefore they seldom play any rôle at the determination of workers and females. If they can be secured together with the other sexes in the nests, the identification is guaranteed.

However, it seems that also the workers (and females) may be determined with certainty, by means of the different shape of the pedicel in the two species. The post-petiole of *Myrm. schencki* is low and thick, in *Myrm. lobicornis* it is high and narrow, when seen from the side, as shown in Fig. 2 (and in Figs 1 and 11 in my paper 1943 b). — The epinotal spines are usually longer in *Myrm. schencki* than in *Myrm. lobicornis*, but in *lobicornis* they may vary and are often as long as in *schencki*. The different shape of the post-petiole in the two species is also seen from the figures given by Stitz (1939, pp. 98 and 103), but he does not especially draw attention to this character in the text. — *Myrm. lobicornis* is said to have a short lobus on the scape. One may not rarely find nests where all individuals have large and curved lobus. These belong perhaps to one or the other of the lately described varieties (see e. g. Stitz 1939, Finzi 1926). Where I have found males, they have — as far as I have been able to decide it — been typical, and I have made no attempt to separate the workers into groups based upon the

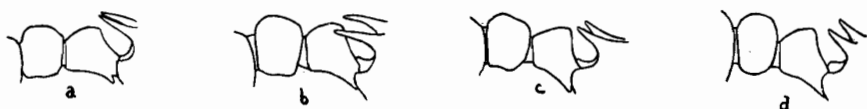


Fig. 2. Pedicel and epinotal spines of workers of *Myrmica schencki* Em. (a—c), and *M. lobicornis* Nyl. (d).

a from Jugoslavia, b from Brønnøy, Asker, c from Nedstrand, Ryfylke, d from Frafjord, Ryfylke.

variation of lobus, as I do not possess the necessary literature to get a general view of all the varieties of *Myrm. lobicornis*. The most important publication on the systematics of the genus *Myrmica* no doubt is that of Finzi, a paper which I have not seen.

*Myrm. scabrinodis* Nyl. is rather common in Southern Norway. In the south-east it has been reported from a number of localities in the coastal districts as well as inland. It has been found in some places along the south coast, and in Rogaland I have seen it very often and — especially on some islands — in great numbers. In Western Norway it has been taken at Granvin (Hardanger) and near Bergen. Its northernmost locality in Southern Norway is Ringeby in Gudbrandsdal. There is a distance of nearly 3 latitudinal degrees between this place and Bodø, the only locality in Northern Norway where *Myrm. scabrinodis* is known to have been found.

No doubt the species also inhabits the great areas in between, where ants have hitherto never or scarcely been searched for. If this proves to be correct, the species has a wide distribution in Norway, spread all over the southern parts of the country, and extending to 67° in the north.

*Myrm. sabuleti* Mein. was added to the Norwegian list as late as in 1940, when I reported it as common in this country. Previously it has been treated as *Myrm. scabrinodis* by Norwegian authors, myself included. It is true that it is common in Norway, but — as far as we know now — only in two widely separated districts, Oslo and environs, and Rogaland.

In and near Oslo it has been found in several places by Esmark, nearly a hundred years ago, and Siebke, later by K. Haanshus,

A. Strand, and myself. It is there rather common, though not so numerous as e. g. *Myrm. ruginodis*. In the county of Rogaland it is met with very frequently in the coastal districts, on the islands as well as some distance inland. But it is rare in the inner fiord districts and in the mountain regions, where I have never seen it higher up than 300 meters above sea level. — Finally, N. Knaben has discovered the species near Bergen, and in 1940 I found it on Jeløy in the Oslo Fiord.

When found so abundantly in the districts where thorough investigations on ants have been carried out, there is good reason to believe that *Myrm. sabuleti* is as common also in other districts in the south, where the species is still unknown.

Usually *Myrm. sabuleti* is regarded as a variety of *Myrm. scabrinodis*. In Rogaland, where I have had the occasion to observe both species very often, they have rather different habits (see Holgersen 1943 d, pp. 25—28), and this in connection with the circumstance that they (in Norway at least) always can be easily distinguished by their systematic characters, makes me inclined to regard *Myrm. sabuleti* as just as good a species as *Myrm. scabrinodis*. I have never seen any intermediate forms which could be difficult to identify with one or the other of these species, but it is possible that such may occur in others parts of their area of distribution.

In his determination key of 1915 Forel erroneously let *Myrm. sabuleti* and *Myrm. scabrinodis* change places. Being beside Emery the great authority among the myrmecologists of that time, it is no wonder that some entomologists have followed him in this question and made the same mistake later. This is for example the case with Kutter, who in a key (1920) gives several very good sketches of systematic characters for various species. On p. 150 is an illustration showing scape of the antenna of "*Myrmica scabrinodis*", but it is readily seen that the scape belongs to *Myrm. sabuleti*, a species not mentioned in the text. To be quite sure I sent some specimens (workers and males) of *Myrm. sabuleti* and *Myrm. scabrinodis* to Mr. S. L. Tuxen (Zoological Museum, Copenhagen). Mr. Tuxen kindly compared them with Meinert's type specimens of *Myrm. sabuleti*, and found that these agreed with my supposed *sabuleti* from Rogaland.

**Subfamily Camponotinae For.****Genus Camponotus Mayr.**

In Norway only the two species *Camp. herculeanus* L. and *Camp. ligniperdus* Latr. occur. The latter is often regarded as a subspecies of *herculeanus*, connected with this by the intermediate form var. *herculeano-ligniperda* Forel. — Some *Camponotus* specimens may be difficult to identify with certainty, and thus should be referred to this variety. I have seen a few such specimens from Sirdal and Oslo. Especially workers in old collections are sometimes problematic. Probably the grease on the body makes the red colour and the shiny appearance of the gaster of *ligniperdus* disappear or look vague, the specimens thus looking like transitional forms. It has never been difficult to identify fresh material, which I have frequently found in Rogaland and at Oslo.

*Camp. ligniperdus* Latr. is common in the south-east, where it has been found in many places from Langesund and Hvaler to Oslo and Odal. It is reported from Giving near Lyngør (E. Strand 1898 b) and Siebke has taken it at Gol. No doubt the species is more widely distributed in the eastern forest districts than the existing material in our collections indicates. — In the extreme south and in Western Norway *Camp. ligniperdus* seems to be very rare. In Rogaland for example I have found it only three times in 8 years. Else it is known from a couple of places in Vest-Agder, from Lærdal in Sogn and from Stordalen in Sunnmøre. — North of Dovre it may probably be more or less common in the fir and spruce districts, yet it has till now been found in only three localities in Snåsa and Rana, thus extending northwards nearly to the polar circle.

*Camp. herculeanus* L. is as common in the south-eastern counties as *Camp. ligniperdus*, as it seems. Near Oslo I have found them both and in about equal numbers. But outside these districts *Camp. herculeanus* has a wider range. It is found in several places and sometimes rather abundantly in the south and west, Agder, Rogaland, Hordaland, and Sogn. In Western Norway it is mostly to be found in the inner fiord districts, following the pine, which

seldom grows closely to the sea. In the central parts of Southern Norway *Camp. herculeanus* has been taken in the mountains to altitudes of some 1200 meters. It is widely distributed in the northern counties too, Nordland, Troms, and Finnmark, also here mostly in the inner districts and nearly reaching 70° N.

#### Genus *Lasius* Fabr.

Our species of *Lasius* have all — with one exception, see below — been found only in Southern Norway, two of them frequently, the others more or less seldom.

*L. fuliginosus* Latr. has an eastern distribution, ranging westwards to Søndeled and Lyngør, northwards to Elverum. It is known from a small number of localities between these places, e. g. Eidanger, Kongsberg, and Gran in Hadeland. In and near Oslo it has been captured on many occasions; I myself have found it on Brønnøy in Asker, at Ullern, and Gaustad in Aker, the nests being situated in hollow tree trunks, or in the ground between stones and roots. In the districts around the Oslo Fiord it is known from several places, outwards to Fredrikstad and Hvaler (E. Strand 1903).

*L. brunneus* Latr. was first demonstrated as belonging to the Norwegian fauna by Munster in a publication from 1921. He discovered it at Nes Verk near Tvedestrand. Later I have myself on several occasions found it at Ullern near Oslo, often in great numbers. A. Strand too has found it there, as well as on the nearby Bygdøy. Apart from these I only know Öland (Sweden) as Scandinavian locality for this species.

In 1903 E. Strand introduced *L. brunneus* var. *alieno-brunnea* For. as new to our fauna, taken by himself in Hvaler (Strand regards it as a race of *L. niger* L.). I have seen specimens taken by Munster in September, 1925, on Kirkøya, Hvaler, our only locality for this variety as far as I know.

*L. alienus* Först. has been captured by E. Strand at Elverum, Kornsjø, and in Ranem (= Ranum, Nord-Trøndelag), according to Stitz (1912). Other Norwegian localities are not known at pre-



sent, as far as I can find out from the literature, nor are any specimens to be found in the collections of our museums. — The species is no doubt confined to the eastern parts of the country, as it has not been found in Western Norway, where investigations have been carried out for such a long time. Whether its area of distribution is a continuous one, ranging from Østfold to Nord-Trøndelag, or not, is impossible to decide at the time being. Further investigations are needed to solve the problem.

*L. niger* L. is a common species in Southern Norway, occurring in vast numbers in well-suited places. It is widely distributed in the eastern counties, common along the south coast and very often found in the south-west, in Rogaland. It is also known from a great number of places in the outer and inner fiord districts of Western Norway. It has not yet been found farther north than at Ringeby in Gudbrandsdal,  $61\frac{1}{2}^{\circ}$  N., but evidently it may occur further north, and I find it very likely that it lives in Trøndelag too, on nearly  $64^{\circ}$  N.

*L. flavus* Fabr. has a distribution similar to that of *L. niger*, but it has been found in fewer localities in the east and south. Whilst *L. niger* is not known to occur north of Ringeby, *L. flavus* is reported from Vågå, Smøla, and Trondheim, and a female has been taken at Polmak in Finnmark (Holgersen 1942 b, p. 10). This capture is a little suspicious, and until the species has been found in some places in the intervening districts, Nordland and Troms, I prefer to regard only Southern Norway as the home of *L. flavus* in Norway.

*L. umbratus* Nyl. was first discovered in Norway by E. Strand (1903), who reported its occurrence on Hvaler and in Krødsherad. Later Munster has found it at Sørums in Vågå, and near Oslo I have taken it in Aker and Asker. In a nest at Røa in Aker I took a number of workers and winged females (October 1938), the females being typical *umbratus*, the workers belonging to the var. *mixto-umbrata* For. — No doubt *L. umbratus* may be found over most of Eastern Norway, and along the south coast as well. In this as in so many cases more collecting and careful investigations are needed to clear up the distribution.

*L. mixtus* Nyl. is at present known from three different places in Southern Norway and not from the northern counties. In the environs of Oslo (in a wider sense) T. Soot-Ryen has taken a winged female near Slemmestad in Røyken (Aug. 16, 1935); in Asker I have myself found the species on Brønnøy and at Skaugum, and A. Strand has brought a female from Ullern. In Western Norway N. Knaben has captured some swarming females at Strømme in Fana (Sept. 12, 1937); at Løvstakken in Bergen H. Tambs-Lyche found a dealated female (April 4, 1942), and near Roaldkvam in Suldal I discovered (July 23, 1940), a colony in a hollow oak.

Before knowing the western localities (Knaben sent me his specimens for determination in 1940) I supposed *L. mixtus* to be one of the species which have a distinctly eastern area of distribution in Norway. To judge from the now known captures, it seems evident that it may be found in several places in the fiord districts of Western Norway, especially in warm and sheltered localities. In Eastern Norway it no doubt has a wider distribution than it seems evident at present, but I feel sure that it nowhere in this country will prove to be a common species.

#### Genus *Formica* L.

This genus is divided into 2 to 4 subgenera by the various authors, as will be nearer demonstrated below.

*F. sanguinea* Latr., our only slave-making ant, is the only Norwegian representative of the subgenus *Raptiformica* For. It is a very characteristic species, in all sexes easy to separate from other species by means of its emarginate clypeus.

This species was first recorded as Norwegian by Forel (1893), who had found it at Fagernes in Valdres (specimen in Zoolog. Museum, Oslo). Next it was discovered in Kirkøya, Hvaler, by Munster (1927), who has presented specimens from other places too, Nesodden, Lågendal (Dovre), Kongsberg, and Lillesand. I have seen specimens taken by H. Tambs-Lyche at Kolsås near Oslo, and in Oslo proper Siebke has taken a worker (1871, in coll. Zoolog. Museum, previously determined as *F. rufa* L.). Near Oslo I have observed it several times at Ullern, a locality very rich in ants. Soot-Ryen has found the species at Mandal. In the county of

Rogaland I have found it many times, partly rather abundantly. Here it prefers the inner districts and nests in light woods, but does not occur on the open coastal plains. Finally, I found a large colony with only a few *fusca*-slaves at Ringebu in Gudbrandsdal, July 23, 1943.

According to our present knowledge *F. sanguinea* is thus distributed over Eastern Norway (northwards to Dovre), the south coast, and Rogaland. It occurs no doubt in many places in the western fiord districts, especially a little away from the coast, and may perhaps be found as far north as in Trøndelag. In Northern Norway it is still not observed and most probably never will be.

The Swiss species of the subgenus *Formica* Forel (1915) separates into two groups of species, *F. exsecta* and *F. rufa*. These he divides into several "races" with some varieties. The rest of the North and Central European species he gathers as the subgenus *Serviformica*, the subgenus which delivers the slaves to *F. sanguinea* and *Polyergus rufescens*.

Emery (1909 a) has done otherwise. He calls all species *Formica*, but he divides the genus into groups as *F. sanguinea*, *rufa*, *exsecta*, and *fusca* (and a few others, strange to our fauna). For the remaining species he uses names such as *F. exsecta suecica*, *F. rufa pratensis*, *F. fusca picea*, etc.

The *exsecta*-group is now sometimes separated as a special subgenus, *Coptoformica*, including the few species which have the posterior border of head deeply excised.

The *rufa*-group proper — i. e. *F. rufa* L. with *pratensis* Retz., *truncorum* F., and forms of lower systematical value (I speak only of the species of Northern Europe) — is regarded as *Formica* s. str., whilst *F. fusca* and its allies are partly regarded as belonging to the same subgenus (Emery 1925), partly to the subgenus *Serviformica* (Forel 1915, Stitz 1939).

*Coptoformica* in Norway comprises the three species *F. exsecta*, Nyl., *F. pressilabris* Nyl., and *F. suecica* Adl. The former ones may easily be separated by the maxillary palpi; *F. suecica* is recognized by its more rounded head and its irregularly built hillocks. Adlerz (1902) has given a good description of *F. suecica*; to his diagnosis also the different shape of the scales in *F. suecica* and *F. exsecta* ought to be added. The difference will appear from Fig. 15 in my paper 1943 b.

*F. exsecta* Nyl. is in Rogaland a very common species, numerous and widely distributed. Apart from Rogaland it is known only from a small number of localities between Agder in the south and Lakselv (in Finnmark) in the north. It is strange that it has been reported from so few places in the other counties. — To the north of Rogaland it has been captured a few times in Hordaland (Stord to Herdla). In the south it is known from Lyngør (E. Strand 1898 b) and in the east from a few localities, ranging from Hvaler to Mjøsa. It has been taken on Dovre (at Hjerkin and Vålåsjo), otherwise it is unknown from the greater part of central Norway. In the northern counties *F. exsecta* has been found at Nesna in Nordland, and on several occasions in Finnmark, from Alta to Sør-Varanger.

The species must be common in great parts of at least Southern Norway. As mentioned, I have found it abundantly in the south-west, and I have also found it easily and without much searching in some places outside Rogaland, in Sirdal, Setesdal, near Tønsberg, Oslo, and on Jeløy. Further investigations will probably show that *F. exsecta* is more common in the west and north, not so numerous in the wooded districts of Eastern Norway, as it prefers to nest in open country, not in dense woods.

*F. pressilabris* Nyl. is still known from only one Norwegian locality, at Blindern near Oslo, where I found a colony in September, 1938 (Holgersen 1940). The colony has later been destroyed.

*F. suecica* Adl. has been found in three different localities in Norway. In the summer of 1940 I found the species abundantly at Fundingsland in Hjelmeland (July 7), later (July 25) at Finnabu and Tjelmen in Sauda, in all some 45 nests, both localities in the county of Rogaland. — I have dealt with these captures in another paper (1943 d), giving detailed information as to hillock-building, surroundings, etc. Here I may only mention that the colonies were situated at heights of 300—400 meters (Fundingsland), and 475—650 meters (Tjelmen-Finnabu) above sea level.

A third capture was added in the summer of 1943, when I found (July 21) a nest of this rare species at a height of nearly 900 meters above sea in open birch-woods at Sørnesset (Atnasjøen, Hedmark). The hillock was situated on *Vaccinium*-ground (*V. uliginosum*

and *V. myrtilus*) with some *Betula nana*, lichens, grass, a little *Juniperus* and *Calluna*. The ground was fairly dry and the place sunny with a southern exposure. The hillock was constructed of the same fine and dry materials as are always used by this and allied species, along a dry birch-stump, being some 75 centimeters long with a width of 15–30 centimeters.

Outside Norway *F. suecica* is known from Alnö near Sundsvall (type locality, Adlerz 1902) and Lycksele Lappmark (Gaunitz 1929), both in Sweden, outside Scandinavia from Esthonia only, where Dampf has found it (Dampf 1924, Stitz 1924).

In the subgenus *Formica* s. str. *F. truncorum* Fabr. is a form which distinctly differs from *F. rufa* L. and subsp. *pratensis* Retz., in appearance as well as in habits, and I prefer to regard it as a good species. Its var. *truncicolo-pratensis* For. seems to be of little interest. I have found nests where the workers were *truncicolo-pratensis*, the females *truncorum*, and once I have found males which came very near to *truncorum*, whilst the workers were *truncicolo-pratensis*. Colour and pilosity vary within the same nest and colony, and in Norway the females usually belong to the typical form, the workers to the variety. Typical *truncorum*-workers have in Norway been found only at Voss (Forel, Knaben) and in Hardanger (Knaben).

*F. truncorum* Fabr. is in its typical form known from six (perhaps seven) localities in the west and north of the country. It was taken near Bergen, and Knaben found it to be numerous at Voss and the nearby Skjervet (Granvin). In Rogaland I have found it twice, both times females. In Northern Norway, Munster has brought a female from Strand in Sør-Varanger, and Elton (1932) records it from Punta in Reisa, but as previously stated (1942 b), I think his specimens are likely to be var. *truncicolo-pratensis*, as this variety is the common form of *truncorum* in Norway.

In Northern Norway var. *truncicolo-pratensis* For. is known from four localities, all in Finnmark. It is missing in the vast area from Alta to Dovre; from here southwards it has been found in a few places in Eastern Norway, is missing along the south-coast, but is common in Western Norway. Knaben has found it

near Bergen and in Sogn. In Rogaland I have found it in more than 40 different localities, sometimes in a great number of colonies (the largest one comprising at least seven well-sized nests). Near Oslo I have also found it several times, and I feel sure that it is common all over Southern Norway and perhaps in the northern counties too, except in the high mountain regions.

The typical forms of *F. rufa* and *F. pratensis* are very different from each other. *F. rufa* has no hairs on its eyes, few or no bristles on thorax, scale and gaster, and none or only small dark spots on pro- and mesonotum. *F. pratensis* is densely haired, also on the eyes, and has great and often fusing black spots on pro- and mesonotum. Transitional forms, intermediate in colour and pilosity, are often found.

Forel (1920) has divided all these forms as follows: *F. rufa*, *F. rufa pratensoides*, *F. rufo-pratensis*, *F. pratensis rufoides*, *F. pratensis*.

The forms which differ least from the typical *rufa* and *pratensis* respectively, are *F. rufa pratensoides* and *F. pratensis rufoides*. *F. rufo-pratensis* is an intermediate form which is difficult or impossible to refer to *rufa* or *pratensis*. Some systematists regard all intermediate forms, i. e. all which are not typical *rufa* or *pratensis*, as var. *rufo-pratensis* For.

Having seen a considerable Norwegian material of the *rufa*-group, I have come to the conclusion that the typical *F. rufa* L. must be very rare in this country, at least in worker specimens (the males are difficult to classify in the same manner). What I in this work have called *F. rufa*, are those forms which come nearest to the typical, and which — in the sense of Forel — may be called *F. rufa pratensoides*. These specimens have no hairs on the eyes, none or only a few on thorax, and they have only small spots on thorax.

In my material from Rogaland the groups *rufa* and *rufa pratensoides*, and on the other hand *pratensis* and *pratensis rufoides*, are usually distinctly separated. Intermediate and questionable forms, the real var. *rufo-pratensis*, I have found only a few times.

I must here mention, that for a reliable identification of specimens belonging to the *rufa*-group (apart from *F. truncorum*) several

— if possible, many — from the same nest are needed, major and minor workers. A singly captured worker is often difficult to place, and must in many cases be put into the *rufa-pratensis*-bag.

The commonest *rufa*-form in Rogaland and evidently also in other parts of the country, is *F. pratensis rufoides*, a not quite typical *pratensis*. It is not so densely haired as *pratensis*, and is usually not so dark, but its eyes are distinctly haired and it stands widely separated from the true *F. rufa*. Less common is the typical *F. pratensis*, which, however, not rarely has been found.

In this paper I understand with *F. pratensis* the typical form including *F. pratensis rufoides*. I regard *F. pratensis* as a subspecies of *F. rufa*, as they are connected by intermediate forms, and are not so distinctly separated as may be expected of "species". On the other hand I regard *F. truncorum* as just as good a species as *F. rufa*. During philogenesis it has undoubtedly branched off from the *rufa*-trunk at a comparatively early stage, whilst the typical *F. rufa* and *F. pratensis* are species which are still undergoing development.<sup>1</sup>

In the United States of America the *rufa*-group is represented by several forms, divided by colour and pilosity. Creighton (1940) who has investigated an extensive material of these forms, has given them subspecific rank, giving a sketch showing the gradual transition from *integra* to *obscuripes* (somehow corresponding to our *rufa* and *pratensis*?) over 14 transitional forms. Like Wheeler (1913) and Emery (1909 a), Creighton too prefers to regard *truncorum* as a good species.

*F. rufa* L. has been recorded from a great number of localities all over Norway, but as previous authors seldom separated *rufa* and *pratensis*, their determinations were often incorrect. It is therefore difficult to use old data on this species without having the material at hand. The true *F. rufa* (including *rufa pratensoides*) is known from a number of places in the south, from Ryfylke to

<sup>1</sup> In this connection I may cite the following lines from a paper by Rüschkamp (1927, p. 420): "Da die Artbildung immer noch vor sich geht . . . — Mit Recht kann daher der Systematiker vermuten, daß scharf getrennte Arten meist älter, schwierig zu unterscheidende Arten stammesgeschichtlich jüngeren Datums sind."

Oslo and the Swedish border, along the coast as well as inland. It has been found near Bergen, and at Vålåsjø in the Dovre mountains. In Northern Norway it is known from a few places in Nordland and Trøms.

*F. rufa* sensu lato is reported from very many places, as mentioned above, and as many of these reports no doubt also refers to the true *F. rufa* s. str. (inclusive *F. rufa pratensoides*), and this form — as I have seen — is no rarity in the south of Norway, the species must be common over the greater part of this country, wherever woods are to be found, ascending the mountains to considerable altitudes.

The intermediate form var. *rufo-pratensis* For. is common in the south and has also been found several times in Northern Norway. As stated above, singly captured specimens often have to be placed in this category, owing to the great variability of the specimens within the same nest.

As indicated above, some of the old data on *F. rufa* must actually refer to *F. rufa* subsp. *pratensis* Retz. (with *pratensis rufoides*), a form rather common in Norway. In the south-west I have found it to be far more numerous than *F. rufa* s. str., and it also seems to be more common in other districts too. Perhaps it does surpass *F. rufa* s. str. in number in open country, whilst *F. rufa* s. str. is the commonest form in the great woods, or in the pine and spruce woods, the subsp. *pratensis* preferring the light birch woods. — In the mountains, the subsp. *pratensis* ascends to the same altitudes as *F. rufa* s. str., perhaps higher still. In Northern Norway it has been found in Nordland and the inner parts of Troms, in Finnmark at Karasjok only.

*F. rufa* var. *santschii* Wheeler (= *alpina* Sant.), a variety by some entomologists regarded as due to entoparasites, has been found at Breim in Nordfjord by Prell (Forel 1911).

Prell has also taken *F. rufa* var. *dusmeti* Em., in Aurland in Sogn (Forel 1911). This form is by some myrmecologists regarded as a variety of *F. rufa*, by others as belonging to *F. truncorum*. It may be defined as a hairless *truncorum* or a *truncorum*-coloured *rufa*. — The var. *dusmeti* was described from Spain (Emery 1909 a, p. 185), and has later been found in Latvia (Jacobson 1936), and, as mentioned, in Norway. In Ombo in Rogaland I have taken four



workers, which I first regarded as belonging to var. *dusmeti*. They are, however, a little darker than *truncorum*; two of them come nearer to *F. rufa*. Perhaps they are more likely to be only a hairless and light-coloured form of *F. rufa* s. str.

As mentioned in a previous paper (Holgersen 1942 a) H. Tambs-Lyche has taken a worker, which I have identified as *F. rufa* var. *nuda* Kar., on Kirkøya, Hvaler. This variety was described by Karawajew (1930) from the Swedish islands Öland and Gotland, and represents the most hairless form of the *rufa*-group.

The subgenus *Serviformica* For. comprises three Norwegian species and one variety, viz. *F. fusca* L., *F. fusca* var. *lemanii* Bondr., *F. gagatoides* Ruzsky, and *F. rufibarbis* F.

Siebke (1880, p. 77) reports the capture at Lesja in Gudbrandsdal of a specimen of *F. cinerea* Mayr, which was, however, by Siebke "... ad hanc speciem dubie relata". E. Strand (1898 b) records it — and without any reservation — from Steinsøy near Lyngør. — In the collections of the Zoological Museum in Oslo there are no specimens of *F. cinerea* among Siebke's insects, and I assume with great certainty that it does not belong to the Norwegian fauna. It has not been found in Sweden. Adlerz (1886, p. 308) says that he has found *F. cinerea* as var. *fusco-cinerea* in Öland, but it seems more probable that he speaks of *F. glebaria* Nyl., a species which he does not mention in his book on the Swedish ant species. Jansson (1934) has omitted *F. cinerea* from his list of the species of Öland.

In 1886 (p. 307) Adlerz reported the capture of *F. gagates* Latr. at Kongsvoll in the Dovre mountains. Later he corrects it to *F. picea* Nyl. (see Bönner 1915, p. 75). His specimens from Kongsvoll must, however, have been *F. gagatoides* Ruzsky. — It is very well possible that *F. picea* Nyl. may be found in Norway, for example in moors in the north and east, but it is quite unlikely that *F. gagates* Latr. should be a Norwegian species.

I have discussed this question at length in another paper (1943 c) and won't go into details again.

*F. fusca* L. is perhaps the most common of our ant species. It is widely distributed over most of the country, northwards to Alta, in the mountains ascending to heights of 1100 meters and

more. It may be found in nearly every not too limited place, nesting in woods as in open fields, preferring dry or at least not too damp localities. — *F. fusca* is known from the coastal districts as well as from the inland, abundant everywhere. It has been missing only in very few of the localities I have investigated in search for ants, but it does not — of course — occur at too high altitudes.

Bondroit has (1917—18) described as *F. fusca* var. *lemanii* a form which has been found in mountains in France, Switzerland, and Belgium, and also in Norway (according to Bondroit). Where in Norway var. *lemanii* has been found, I do not know. I have not seen any specimens of *F. fusca* which could be said to belong to this form, as far as I can judge from Bondroit's description.

*F. gagatoides* Ruzsky has a peculiar distribution in Norway, similar to that of many insects of other orders, especially coleoptera. It is rather common in Northern Norway, where it lives at sea level as well as at higher altitudes. In Southern Norway it seems to be less numerous, and it has here been found in the mountain regions only, from 725 meters upwards to at least 1200 meters above sea level. Its area of distribution in Southern Norway ranges from Suldal in the south-west over Hardangervidda, Jotunheimen, to the northern part of Dovre. Between Kongsvoll and Mo in Rana it has not been found, nor between Mo and Målselv. It is known from a number of localities in Troms and especially Finnmark.

In Northern Norway *F. gagatoides* seems to be so common, that there is reason to believe that it is distributed all over the northern counties, and in Southern Norway too it may be very common, but here only in the mountains.

I have recently dealt with this species in another paper (1943 c), giving particulars of its discovery in Norway and distribution in this country.

During the summer of 1943 I had the occasion to visit some of its localities already known, and I also found it in a few other places. At Vålåsjø (Dovre), where A. Strand discovered *gagatoides* in 1938, I found it to be the most numerous ant species, by far more abundant than *F. fusca*, so common elsewhere. In and outside the comparatively light and open birch-wood was a great number

of colonies, nesting in earthen tufts, in birch roots and stumps, and also under flat stones, upwards to 1200 meters altitude.

At Kongsvoll I could ascertain myself that the species found here by Lindman and reported first as *gagates*, later as *picea*, by Adlerz, was in fact *gagatoides*. Here as well as at Hjerkinns the species was rather common, as it was also at Dalholen and Follalds Verk. I also saw it frequently in the valley of N. Atnadalen, nesting on dry ground along the road, where odd specimens were often seen running to and from.

Although the species was found only at greater altitudes, it was not bound exclusively to the terrain above or scarcely below the tree line as it seems to be in Rogaland, as reported before. At Follalds Verk and in N. Atnadalen I found it very often also in the pine-woods, down to some 800 meters above sea level.

Some colonies nested on medium damp or even damp ground, but the great majority nested on dry and very dry, so e. g. in the pinewoods on the *Empetrum-Arctostaphylos*-covered moraines, which in these districts have a very wide extension. My new observations do not alter my opinion that the species is a xerophilous one, but its ecological valence is so large, that the colonies do not succumb if they should happen to be founded where the ground is or later gets damp.

The new localities for this species in Norway are: Dalholen, Follalds Verk, Fallet, N. Atnadalen (Follald hd.), July 18—19, 1943; Muen (Sollia hd.), July 22, 1943. All in northern Hedmark.

*F. rufibarbis* Fabr. was first spoken of as Norwegian by E. Strand (1919), who had found it in Krødsherad. It had, however, been found several times earlier, by Esmark, Siebke, and Collett, but none of these collectors had published anything on the species. Their captures were made in and near Oslo, where I myself have found *F. rufibarbis* at Ullern, in one case as slave of *F. sanguinea*, and on Brønnøy in Asker. — Munster has found this species on Justøya near Lillesand, and at Mandal. *F. rufibarbis* thus seems to have a south-eastern distribution in Norway, its area extending westwards to Vest-Agder.

### Introduced Species.

Of the genus *Monomorium* Mayr one species has been found in Norway, captured by Knaben in a hot-house at Bergen Museum (1937). In 1943 I had the opportunity of seeing these tiny ants in numbers on the floor of the hot-house. Any nest could not be discovered.

In a hot-house in the Botanical Garden at Tøyen, Oslo, I found a number of a very small *Dolichoderine* ant (1941). — Owing to lack of necessary literature, none of these two species has been further determined.

As far as known, the cosmopolitan species *Monomorium pharaonis* L. has not yet been discovered in Norway. It has become an inhabitant of cities as near as Copenhagen, Åbo, Helsinki, and many British towns and cities. It is very possible that the species may live in some of our coastal towns, where it ought to be looked for in bakeries, ware-houses, etc.

According to Stitz (1912) E. Strand has taken a worker of *Acantholepis frauenfeldi* Mayr at Kornsjø (1903) and two workers of *Camponotus maculatus* F. var. *thoracicus* F. in Langesund (1903). Kornsjø is a railway station near the Swedish border, Langesund a port on the south coast. The occurrence of these species is thus easily understood, the specimens having been brought with imported goods.

### Summary.

At present (1944) 34 ant-species with 1 subspecies and 13 varieties are known to occur in Norway, 4 introduced species excluded. 2 species, *Formica gagates* Latr. and *Formica picea* Nyl., previously published as Norwegian, have to be omitted from the list, and the same ought to be done with *Formica cinerea* Mayr.

Apart from the varieties, the distribution of our ants may be summed up as follows (see Table II).

*Ponera punctatissima* Rog. and *Formica pressilabris* Nyl. have both been taken only once, near Oslo. *Formica suecica* Adl. is known from a couple of places in the mountains of Rogaland, here in numbers, and from one locality in Hedmark.

*Formica gagatoides* Ruzsky is distributed over most of Northern Norway, in the south it lives only in the high mountain regions.

*Harpagoxenus sublaevis* Nyl. has been found several times in the south, only once in the far north.

*Formica fusca* L., *F. rufa* L. and its subsp. *pratensis* Retz., *Camponotus herculeanus* L., *Leptothorax acervorum* Fabr., and *Myrmica ruginodis* Nyl. are common and distributed over most of the country.

*Formica truncorum* Fabr., *F. exsecta* Nyl., and *Formicoxenus nitidulus* Nyl. have a similar distribution, but are not common. *Camponotus ligniperdus* Latr. is common in the south-east, rare in the rest of Southern Norway, and ranging only to some 66° 20' N. lat.

*Myrmica sulcinodis* Nyl. and *M. lobicornis* Nyl. are found scattered over the country, not very numerous. *Myrmica laevinodis* Nyl. and *Lasius flavus* Fabr. are quite common in the southern counties, and both have been found once in Northern Norway, at Polmak. *Myrmica scabrinodis* Nyl. has a similar distribution, being found once in Bodø.

Only in Southern Norway, but here widely scattered, have the following species been found: *Lasius niger* L., *L. mixtus* Nyl., *Myrmica schencki* Em., *M. sabuleti* Mein., *Leptothorax muscorum* Nyl., *Tetramorium caespitum* L., and *Formica sanguinea* Latr. The first one is abundant, the second and third are very rare, the fourth has been found abundantly, but only in few localities, the fifth rarely, whilst the two last-mentioned species are more common.

*Lasius alienus* Först. is known from Eastern Norway, reaching as far north as 64° 20' N. lat.

Finally, *Myrmica rugulosa* Nyl., *Leptothorax tuberum* Fabr., *L. interruptus* Sch., *Lasius brunneus* Latr., *L. fuliginosus* Latr., *L. umbratus* Nyl., and *Formica rufibarbis* Fabr. have been found only in the south-eastern districts.

Further investigations will no doubt show that some of the species, which have hitherto been found less numerously and only in few localities or districts, will prove to be rather abundant and have a wide and continuous distribution in Norway. Such species

are, I think, *Myrmica sulcinodis* Nyl. and *M. lobicornis* Nyl., *Formicoxenus nitidulus* Nyl., *Formica truncorum* Fabr. and *F. exsecta* Nyl. *Harpagoxenus sublaevis* Nyl. too will probably be distributed all over the country, although sparsely.

Other species will no doubt prove to be common in well-suited places all over Southern Norway, viz. *Lasius niger* L. and *L. flavus* Fabr., *Formica sanguinea* Latr., and *Myrmica sabuleti* Mein.

All species, *Ponera punctatissima* Rog. probably excepted, will certainly by further investigations have their area of distribution considerably widened.

Species of extreme northern origin are *Formica suecica* Adl. and *F. gagatoides* Ruzsky. *Formicoxenus nitidulus* Nyl. and *Harpagoxenus sublaevis* Nyl. are usually regarded as northern species, but they do also occur in Central Europe.

Our south-eastern species belong to the Central-European fauna, and in Norway they have occupied only a comparatively small area, having no doubt immigrated from Southern Sweden during recent times. *Lasius mixtus* Nyl. and *Myrmica schencki* Em. also belong to a more southern fauna, but they have both extended their area in Norway more than the last mentioned species, probably — as their rare occurrence in widely separated districts seems to indicate — by accidental and passive flight over great areas by fertilized females.

More than half of our species belong to a group which has a wide distribution in the western part of the palaearctic zone, reaching from Southern and Central Europe to the far north, some of them reaching the 70° N. lat.

Further investigations are desirable, also in order to show how correct or incorrect these suggestions may be.

A comparison between the ant faunae of Norway, Sweden, and Great Britain (Table I) shows that the three countries have 25 species in common; the two Scandinavian countries have 33, Norway and Great Britain 26, Sweden and Great Britain 32. The single species common to Norway and Great Britain but not found in Sweden, is *Ponera punctatissima* Rog. A second Norwegian species not found in Sweden, is *Formica gagatoides* Ruzsky, but it is likely to be found there too.

Table I. *Ants represented in Great Britain, Norway, and Sweden.*

	Great Britain	Norway	Sweden
<i>Ponera punctatissima</i> Rog. ....	GB	N	-
— <i>coarctata</i> Latr. ....	GB	-	-
<i>Myrmecina graminicola</i> Latr. ...	GB	-	S
<i>Formicoxenus nitidulus</i> Nyl. ....	GB	N	S
<i>Anergates atratulus</i> Sch. ....	GB	-	S
( <i>Monomorium pharaonis</i> L.) ....	GB	-	-
<i>Solenopsis fugax</i> Latr. ....	GB	-	S
<i>Strongylognathus diveri</i> Don. ...	GB	-	-
<i>Harpagoxenus sublaevis</i> Nyl. ...	-	N	S
<i>Myrmica ruginodis</i> Nyl. ....	GB	N	S
— <i>laevinodis</i> Nyl. ....	GB	N	S
— <i>sulcinodis</i> Nyl. ....	GB	N	S
— <i>rugulosa</i> Nyl. ....	-	N	S
— <i>scabrinodis</i> Nyl. ....	GB	N	S
— <i>sabuleti</i> Mein. ....	GB	N	S
— <i>lobicornis</i> Nyl. ....	GB	N	S
— <i>schencki</i> Em. ....	GB	N	S
<i>Stenamma westwoodi</i> Westw. ...	GB	-	S
<i>Leptothorax acervorum</i> Fabr. ...	GB	N	S
— <i>muscorum</i> Nyl. ....	-	N	S
— <i>nylanderi</i> Först. ....	GB	-	-
— <i>corticalis</i> Sch. ....	GB	-	-
— <i>tuborum</i> Fabr. ....	GB	N	S
— <i>interruptus</i> Sch. ....	GB	N	S
<i>Tetramorium caespitum</i> L. ....	GB	N	S
<i>Tapinoma erraticum</i> Latr. ....	GB	-	S
<i>Lasius fuliginosus</i> Latr. ....	GB	N	S
— <i>niger</i> L. ....	GB	N	S
— <i>alienus</i> Först. ....	GB	N	S
— <i>carniolicus</i> Mayr. ....	-	-	S
— <i>brunneus</i> Latr. ....	GB	N	S
— <i>flavus</i> Fabr. ....	GB	N	S
— <i>umbratus</i> Nyl. ....	GB	N	S
— <i>mixtus</i> Nyl. ....	GB	N	S
<i>Formica sanguinea</i> Latr. ....	GB	N	S
— <i>rufa</i> L. ....	GB	N	S
— <i>rufa pratensis</i> Retz. ....	GB	N	S
— <i>truncorum</i> Fabr. ....	-	N	S
— <i>exsecta</i> Nyl. ....	GB	N	S
— <i>pressilabris</i> Nyl. ....	-	N	S
— <i>suecica</i> Adl. ....	-	N	S
— <i>rufibarbis</i> Fabr. ....	GB	N	S
— <i>fusca</i> L. ....	GB	N	S
— <i>glebaria</i> Nyl. ....	GB	-	S
— <i>gagatoides</i> Ruzsky. ....	-	N	-
— <i>gagates</i> Latr. ....	-	-	S
— <i>picea</i> Nyl. ....	GB	-	S
<i>Camponotus herculeanus</i> L. ....	-	N	S
— <i>ligniperdus</i> Latr. ....	-	N	S
— <i>vagus</i> Scop. ....	-	-	S
<i>Polyergus rufescens</i> Latr. ....	-	-	S
51 species (1 originally introduced)	38 (+ 10 var.)	35 (+ 13 var.)	44 (+ 11 var.)

Table II. Regional Distribution of Norwegian

Species	County					
	Østf.	Akersh.	Hedm.	s-n	s-n	Ø-v
<i>Ponera punctatissima</i> .....	-	AK	-	-	-	-
<i>Harp. sublaevis</i> .....	Ø	AK	n	-	Ø	-
<i>Formic. nitidulus</i> .....	-	AK	-	n	Ø	-
<i>Tetr. caespitum</i> .....	Ø	AK	-	-	B	-
<i>Lept. acervorum</i> .....	Ø	AK	HE	n	B	-
(var. <i>nigrescens</i> ) .....	-	AK	-	n	-	-
<i>Lept. muscorum</i> .....	-	AK	-	s	Ø	-
<i>Lept. tuborum</i> .....	Ø	AK	s	n	-	-
var. <i>nigricephala</i> .....	-	AK	-	-	Ø	-
<i>Lept. interruptus</i> .....	-	AK	-	-	-	-
<i>Myrm. ruginodis</i> .....	Ø	AK	HE	s	Ø	-
(var. <i>ruginodo-laev.</i> ) .....	-	AK	s	-	-	-
<i>Myrm. laevinodis</i> .....	Ø	AK	HE	s	Ø	-
(var. <i>europaea</i> ) .....	-	-	-	-	-	-
<i>Myrm. sulcinodis</i> .....	-	-	n	O	Ø	-
<i>Myrm. rugulosa</i> .....	-	-	n?	-	-	-
<i>Myrm. scabrinodis</i> .....	Ø	AK	s	s	Ø	-
<i>Myrm. sabuleti</i> .....	Ø	AK	-	-	-	-
<i>Myrm. lobicornis</i> .....	Ø	AK	HE	n	Ø	-
<i>Myrm. schencki</i> .....	-	AK	-	-	-	-
<i>Camp. herculeanus</i> .....	Ø	AK	HE	O	B	-
(var. <i>herc.-lign.</i> ) .....	-	AK	-	-	-	-
<i>Camp. ligniperdus</i> .....	Ø	AK	s	-	B	VE
<i>Lasius fuliginosus</i> .....	Ø	AK	s	s	Ø	-
<i>Lasius flavus</i> .....	Ø	AK	s	O	B	-
<i>Lasius mixtus</i> .....	-	AK	-	-	Ø	-
<i>Lasius umbratus</i> .....	Ø	AK	-	n	Ø	-
var. <i>mixto-umbrata</i> .....	-	AK	-	-	-	-
<i>Lasius niger</i> .....	Ø	AK	s	s	Ø	VE
<i>Lasius alienus</i> .....	Ø	-	s	-	-	-
<i>Lasius brunneus</i> .....	-	AK	-	-	-	-
var. <i>alieno-brunnea</i> .....	Ø	-	-	-	-	-
<i>Form. sanguinea</i> .....	Ø	AK	-	O	Ø	-
<i>Form. exsecta</i> .....	Ø	AK	s	n	Ø	-
<i>Form. pressilabris</i> .....	-	AK	-	-	-	-
<i>Form. suecica</i> .....	-	-	n	-	-	-
<i>Form. rufa</i> s. l. ....	Ø	AK	s	n	v	-
<i>Form. rufa</i> s. str. (cum f. <i>pratensoides</i> ) ...	Ø	AK	n	n	Ø	-
var. <i>nuda</i> .....	Ø	-	-	-	-	-
var. <i>dusmeti</i> .....	-	-	-	-	-	-
var. <i>santschii</i> .....	-	-	-	-	-	-
var. <i>rufo-pratensis</i> .....	Ø	AK	s	-	B	-
subsp. <i>pratensis</i> (cum f. <i>rufoides</i> ) ...	-	-	n	O	Ø	-
<i>Form. truncorum</i> .....	-	-	-	-	-	-
var. <i>trunc.-pratensis</i> .....	-	AK	-	O	Ø	-
<i>Form. rufibarbis</i> .....	-	AK	-	-	Ø	-
<i>Form. fusca</i> .....	Ø	AK	HE	O	B	-
<i>Form. gagatoides</i> .....	-	-	n	n	v	-
Introduced species:						
<i>Acantholepis frauenfeldi</i> .....	-	-	-	-	-	-
<i>Camp. maculat. thoracius</i> .....	Ø	-	-	-	-	-
<i>Monomorium</i> sp. ....	-	-	-	-	-	-
Gen. sp. ....	-	AK	-	-	-	-



*Ants as at Present (1944) Known.*

[illegible]

The great difference between the faunae of Norway and Sweden is due to a number of species of southern origin, found in Southern Sweden, especially in the Baltic islands Öland and Gotland, e. g. *Myrmecina graminicola* Latr., *Anergates atratulus* Sch., *Stenamma westwoodi* Westw., *Solenopsis fugax* Latr., *Tapinoma erraticum* Latr., *Polyergus rufescens* Latr., *Formica glebaria* Nyl., *gagates* Latr., and *Camponotus vagus* Scop. Several of these species are common to Sweden and Great Britain.

In all, the Norwegian ant fauna shows little remarkable. The most interesting species are in my eyes *Formica gagatoides* Ruzs. and *F. suecica* Adl., and — because of its comparatively common occurrence — *Harpagoxenus sublaevis* Nyl., next, also *Ponera punctatissima* Rog. Most of our species are such as one might in advance expect to find in this country.

Of species which one may still hope to find in Norway, I may mention *Formica uralensis* Ruzsky and *F. picea* Nyl., probably also *Anergates atratulus* Sch. Of course, one may find new or unexpected species, but these will be cases similar to for example the discovery of *Strongylognathus diveri* Don. in England.

### Key to Workers of Norwegian Ant Species.

A. Pedicel distinctly two-jointed ..... Subfamily *Myrmicinae* Lep.

B. Pedicel not two-jointed.

1. Gaster constricted between first and second segment

Subfamily *Ponerinae* Lep.

2. Gaster not constricted ..... Subfamily *Camponotinae* For.

Subfamily *Ponerinae* Lep.

One Norwegian species, *Ponera punctatissima* Roger.

Subfamily *Myrmicinae* Lep.

A. Post-petiole with a spine beneath.

I. Mandibles dentate, head rounded, oblong

*Formicoxenus nitidulus* Nyl.

II. Mandibles not dentate, head rectangular

*Harpagoxenus sublaevis* Nyl.

B. Post-petiole without a spine beneath.

I. Antennae 11-jointed. .... Subgenus *Mychothorax* Ruzsky

a. Tibiae and scape of antennae with outstanding hairs

*Leptothorax (Mychothorax) acervorum* Fabr.

b. Tibiae and scape of antennae without outstanding hairs

*Leptothorax (Mychothorax) muscorum* Nyl.

## II. Antennae 12-jointed.

- a. Epinotum unarmed. .... Genus *Monomorium* Mayr (introd.)  
 b. Epinotum armed with two spines.

1. Epinotum armed with two strong and usually long spines, greater forms.

\* Scape of antennae evenly curved from base.

§ Epinotum between spines transversely striate, spines longer, thorax and pedicel strongly rugose

*Myrmica ruginodis* Nyl.

§§ Epinotum between spines smooth and shining, spines shorter, triangular, thorax and pedicel less rugose

*Myrmica laevinodis* Nyl.

\*\* Scape of antennae abruptly bent at base.

§ Scape of antennae without any tooth at bend.

† Colour red and black, frontal area longitudinally striate, size 4–5½ mm ... *Myrmica sulcinodis* Nyl.

†† Colour light red, frontal area smooth and shining, size 3½–4½ mm ..... *Myrmica rugulosa* Nyl.

§§ Scape of antennae with a usually distinct lateral or transverse tooth at bend.

† Tooth transverse, pointed in profile.

° Tooth more pointed in profile, post-petiole high and narrow ..... *Myrmica lobicornis* Nyl.

°° Tooth less pointed in profile, post-petiole low and thick ..... *Myrmica schencki* Em.

†† Tooth lateral, not pointed in profile.

° Lateral tooth very strong and flat, continues into a ridge along scape .... *Myrmica sabuleti* Mein.

°° Lateral tooth not strongly developed, indistinct ridge, if any, along scape

*Myrmica scabrinodis* Nyl.

2. Epinotum armed with two shorter spines, small forms.

\* Funiculus uniform light-coloured, shoulders angled

*Tetramorium caespitum* L.

\*\* Club of antennae (three last joints) darker than rest of funiculus, shoulders rounded.

§ Epinotal spines shorter, not curved, posterior two thirds of gaster brown, else reddish yellow

*Leptothorax tuberum* Fabr.

§§ Epinotal spines longer, curved, first segment of gaster on upper side with a brown transverse band, interrupted in center ..... *Leptothorax interruptus* Sch.

## Subfamily Camponotinae For.

- A. Antennae jointed distinctly apart from clypeus.

I. Gaster shining, pubescence sparse, base of abdomen red

*Camponotus ligniperdus* Latr.

II. Gaster not shining, pubescent, base of abdomen black or with only a small red spot near petiolus .... *Camponotus herculeanus* L.

- B. Antennae jointed closely to clypeus.

I. Frontal area indistinct, ocelli indistinct or missing, small forms.

Genus *Lasius* Fabr.

a. Colour shining bluish black, head deeply excised posteriorly

*Lasius fuliginosus* Latr.

## b. Colour otherwise.

## 1. Colour yellow.

- \* Scale low, broadest and not emarginate at apex

*Lasius flavus* Fabr.

- \*\* Scale higher, broadest at base, narrower and emarginate at apex.

§ Tibiae and scape of antennae with outstanding hairs.

*Lasius umbratus* Nyl.

§§ Tibiae and scape without outstanding hairs

*Lasius mixtus* Nyl.

## 2. Colour brown or brownish black.

- \* Colour yellow brown, frontal furrow distinct, tibiae and scape of antennae without outstanding hairs

*Lasius brunneus* Latr.

- \*\* Colour blackish brown, frontal furrow indistinct.

§ Tibiae and scape of antennae with outstanding hairs

*Lasius niger* L.

§§ Tibiae and scape of antennae without outstanding hairs

*Lasius alienus* Först.

## II. Frontal area distinct, ocelli present, greater forms.

Genus *Formica* L.

- a. Clypeus emarginate .....
- Formica sanguinea*
- Latr.

## b. Clypeus not emarginate.

## 1. Head deeply excised posteriorly.

- \* Sides and posterior corners of head rounded

*Formica suecica* Adl.

- \*\* Sides of head less rounded, posterior corners of head pointed.

§ Scale emarginate, maxillary palpi long, reaching the foramen occipitale ..... *Formica exsecta* Nyl.

§§ Scale not emarginate, maxillary palpi very short, clypeus with a transverse impression

*Formica pressilabris* Nyl.

## 2. Head not excised posteriorly.

- \* Body robust, head distinctly broader than thorax, hillock-building species.

§ Head, thorax and base of abdomen red, gaster brown, eyes haired, head and body with outstanding hairs

*Formica truncorum* Fabr.

§§ Gaster brown, head and thorax reddish brown, but front of head and usually one or two spots on thorax black.

† Eyes not haired, head and thorax with none or few bristles, pronotum with a small black spot.

*Formica rufa* L.†† Eyes haired, head and thorax with abundant bristles, pro- and mesonotum with big black spots, often fusing ..... *Formica rufa* subsp. *pratensis* Retz.

- \*\* Body slender, head longer and narrower, slightly broader than thorax, no hillocks.

§ Colour black or blackish brown.

† Shining, pubescence very sparse, scale emarginate at apex ..... *Formica gagatoides* Ruzsky†† Not shining, pubescence well developed, scale rounded, not emarginate, at apex ..... *Formica fusca* L.

§§ Gaster brown, thorax red, with outstanding bristles

*Formica rufibarbis* Fabr.

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