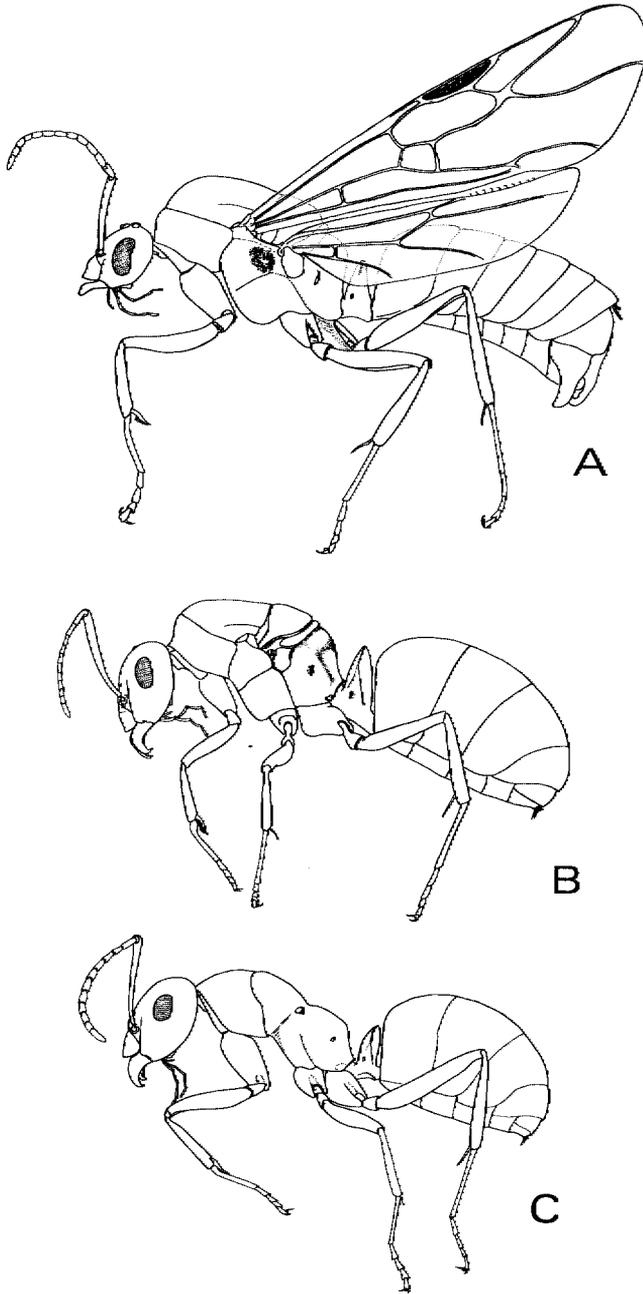


Ants of the Yukon



FRONTISPIECE. Lateral view of the 3 morphological forms of *Formica podzolica* Francoeur, a boreal ant that occurs commonly in the southern Yukon. A, Alate male; B, Dealated gyne; C, Ergate. Drawings from Francoeur (1979). Length of the gyne is about 8 mm.

Ants (Hymenoptera: Formicidae) of the Yukon

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Abstract. Ant material examined from the Yukon suggests that 19 recognized species occur there, taking into account outdated species taxonomy for the genera *Myrmica*, *Leptothorax* (sensu stricto) and *Formica* that compose the core of the ant fauna of the Yukon. The Palearctic *Formica gagatoides*, a species associated with taiga environments in Eurasia, is recorded for the first time in North America. The species assemblage is characteristic of the boreal coniferous biome with elements restricted to southern or northern areas. Northern elements are *Leptothorax acervorum* and *Formica gagatoides*, which appear to be candidates for Beringian survival of their Nearctic populations. The ants *Formica neorufibarbis* and *F. subnuda* may well also have northern populations that have afterwards intermingled with those coming from the south. No species are expected to be limited to the Yukon; most of them have already been reported from adjacent territories. Most species exhibit a transcontinental range and latitudinal extensions southwards along the Cordilleran system. The most common species like *Myrmica alaskensis*, *Camponotus herculeanus* and *Formica neorufibarbis* have been detected as fossil remains in Quaternary palaeoecological studies, indicating their long-standing presence in boreo-arctic habitats. Many woodpeckers (Pisicidae) occurring throughout the forested Yukon include wood-nesting ants in their regular diet, indicating a general presence of ants.

Résumé. Les fourmis (Hymenoptera: Formicidae) du Yukon. La myrmécofaune du Yukon comprend au moins 19 espèces selon les données d'échantillonnage rassemblées dans cette étude et en tenant compte de la taxonomie déficiente des espèces appartenant aux genres *Myrmica*, *Leptothorax* (sensu stricto) et *Formica*; ces derniers regroupent la majorité des espèces. La présence de *Formica gagatoides*, une espèce paléarctique associée aux milieux de taïga en Eurasie, est rapportée pour la première fois en Amérique du Nord. Cet assemblage d'espèces s'avère typique du biome de la forêt boréale de conifères; pour certaines, le territoire se limite au sud, pour d'autres au nord du Yukon. Les populations ancestrales des espèces nordiques, *Leptothorax acervorum* et *Formica gagatoides*, peuvent avoir survécu en Béringie lors de la dernière glaciation. Après celle-ci, il est possible aussi que des populations nordiques de *Formica neorufibarbis* et de *F. subnuda* se soient mélangées à celles provenant du sud. Il semble peu probable que des espèces soient limitées au seul territoire du Yukon puisque la majorité ont déjà été récoltées dans les territoires adjacents. D'ailleurs, la plupart affichent une répartition transcontinentale avec des extensions vers le sud dans les Cordillères de l'ouest du continent. Les espèces les plus communes, telles que *Myrmica alaskensis*, *Camponotus herculeanus* et *Formica neorufibarbis*, ont été repérées comme subfossiles dans les études paléoécologiques de sites du Quaternaire, révélant une longue association avec des habitats boréo-arctiques. Les espèces de Pics (Pisicidae) qui habitent les forêts du Yukon mangent régulièrement des fourmis, indiquant une présence générale de ces insectes.

Introduction

A general picture of the northern myrmecofauna of the Nearctic region is slowly emerging more clearly as taxonomic knowledge and surveys progress (Francoeur 1974, 1983; Luken and Billings 1986; Nielsen 1987), but the situation still resembles a puzzle. The present contribution is intended to reduce the number of missing pieces in the context of outdated species taxonomy for such major genera as *Myrmica*, *Leptothorax* and *Formica*.

Available data on the ants of the Yukon remain up-to-now scarce and scattered in papers dealing with surveys of larger territories or in taxonomic revisions. Most information on species distributions comes from single samples taken in connection with collections of other kinds of insects or samples represented by flying gynes and males. Nest series, the standard for myrmecological studies, are rarely available. No list of ants from the Yukon seems to exist.

The following limited analysis is founded mainly on 3 collections, made during field campaigns organized largely for the Yukon project on behalf of the Biological Survey, by the Geological Survey of Canada, the Royal Ontario Museum and the Department of Zoology of the University of British Columbia. The specimens from the Geological Survey are deposited in my collection. Material kept in the Canadian National Collection (CNCI), Ottawa, and some published (Francoeur 1973) and unpublished data were used to complement these collections, for a total of more than 325 samples.

The picture that derives from such material is significant, yet preliminary because the available data are fragmentary. The fact that most series of specimens were strays captured by ground traps rendered identification quite difficult in half of the recognized species forms, especially because the typical and widespread genera are in need of revision to determine reliably what are the natural species.

For the genus *Myrmica* most species concepts carried in the traditional literature are misleading and have shifted in the course of time from the real nature of the type series; this shift applies especially to much-used names, like *emeryana*, that include more than one species (unpublished data). Also the genus *Leptothorax* (sensu lato) had, with time, become a catch-all, playing the role of a taxon of higher rank. It is used here sensu stricto as explained in Francoeur et al. (1985). The *Leptothorax muscorum* species concept as established by Brown (1955) now appears to be a complex of closely related species, as revealed by chromosome studies (Loiselle et al. 1990). Because I am currently revising both of these genera for the Nearctic region the determination of the species follows the progress currently achieved. Difficult problems also affect species-groups of the genus *Formica*. Some alate gynes and males from the Yukon were tentatively attributed to *F. argentea* Wheeler, but are not taken into account in this study.

In such a context, some taxonomic or other comments based on my revisionary works are given when necessary for better follow up and understanding of the identity of particular species. The meagre available microhabitat data are compiled in Table 1 while habitats are discussed when possibly significant in relation to other parts of the species range. Except for species with few records, localities are not included, but a list is available on request. General analysis and conclusions follow the annotated list of species.

A different source of information shows that ants are present throughout the Yukon. According to Bent (1964) and data compiled by Michel Savard, ants were found in the diet of the following woodpeckers occurring from north to south. Taiga zone: Hairy and Three-toed Woodpeckers, *Picoides villosus* (Linn.) and *P. tridactylus* (Linn.), and Northern Flicker, *Colaptes auratus* (Linn.). Dense boreal zone: Black-backed and Downy Woodpeckers, *Picoides arcticus* (Swainson) and *P. pubescens* (Linn.), and Yellow-bellied Sapsucker, *Sphyrapicus varius* (Linn.). Extreme South-East zone: Pileated Woodpecker, *Dryocopus pileatus* (Linn.). Only for the last species were ant taxa mentioned: *Camponotus herculeanus* and *Crematogaster* sp.

Annotated List of Species Recorded from the Yukon

1. *Myrmica alaskensis* Wheeler

Previously referred to as *M. kuschei* Wheeler by Creighton (1950), this *Myrmica* is a typical species of the transcontinental boreal coniferous forest with southern extensions in the Cordillera (Francoeur 1983). It prefers to nest in dead wood, but can also use other soil microhabitats (Table 1). Many colonies develop long subterranean galleries along the tree roots on which aphids are tended (unpublished data). Collection localities in the Yukon are Hyland R., Dry Cr., Engineer Cr., km 178 on Dempster Hwy., Bluefish R. and Caves, Tack L. Ridge. These records surely do not reflect its full

TABLE 1. List of ants of the Yukon showing microhabitat data available from 3 collections of specimens (see Introduction) recovered from nests or ground traps.

Epigeous sites (above ground): 1, On living vegetation: shrubs, tree branches, flowers, herbs; 2, On stones; 3, On ligneous matter: logs, stumps, under bark.

Hypogeous sites (on or below ground): 4, In mineral soil: naked surface, under stones; 5, In organic horizon: litter; 6, Under mosses and tussocks; 7, Under caribou dung; 8, Under man-made wooden objects: boards, veneers; 9, Under natural wooden objects: decaying debris, fallen tree trunks.

Species	Epigeous sites			Hypogeous sites					Total	
	1	2	3	4	5	6	7	8		9
Subfamily Myrmicinae										
1. <i>Myrmica alaskensis</i> Wheeler			2							2
2. <i>M. brevispinosa</i> Wheeler								1		1
3. <i>M. incompleta</i> (Provancher)										0
4. <i>M. lobifrons</i> Pergande										0
5. <i>Leptothorax acervorum</i> (Fab.)	1				1	2				4
6. <i>L. retractus</i> Francoeur			1							1
7. <i>L. sp.</i> (near <i>faberi</i> Buschinger)				1						1
8. <i>L. sp.</i> 1 (<i>muscorum</i> group)	1		3	3	2	4	1	1	13	28
9. <i>L. sp.</i> 2 (<i>muscorum</i> group)						4				4
Subfamily Dolichoderinae										
10. <i>Tapinoma sessile</i> Say										no data
Subfamily Formicinae										
11. <i>Camponotus herculeanus</i> (Linn.)	2		5	3	1	4			3	18
12. <i>Lasius neoniger</i> Emery						2		1		3
13. <i>Formica dakotensis</i> Emery						1				1
14. <i>F. gagatoides</i> Ruzky			4	4	2	7				17
15. <i>F. hewitti</i> Emery										0
16. <i>F. neoclara</i> Emery										—
17. <i>F. neorufibarbis</i> Emery	4	1	7			5		1	3	21
18. <i>F. podzolica</i> Francoeur			2	1		1		3		7
19. <i>F. subnuda</i> Emery			3							3

presence in the Yukon. It is encountered as subfossils in palaeoecological studies (Matthews 1976 as *Leptothorax muscorum*; Elias 1982b).

2. *Myrmica brevispinosa* Wheeler

This rather reddish-coloured species builds nests with very obscure entrances in the soil of open sandy habitats. It is readily distinguished from other *Myrmica* species by the short propodeal spines and a large interlamellar surface on the head. Morphological variations were detected in its western range which seem not to occur in eastern populations of this transcontinental ant (unpublished data). Collection locality in the Yukon is forest road, km 468 on Klondike Hwy. *M. brevispinosa* was reported in Alaska up to the Fairbanks area (Nielsen 1987).

3. *Myrmica incompleta* (Provancher)

Formerly known as *M. brevinodis* Emery (Francoeur and Béique 1966), this is a sister species of *M. alaskensis* but exhibiting a more southern transcontinental range reaching southwards to the Mexican border, and different ecology. It nests in rather humid soil of open habitats like fields, pastures, forest edges, bogs, under rocks and herbaceous vegetation (unpublished data). Polygynous colonies may develop large and probably polycalic populations as in Quebec. *M. incompleta* is widely distributed in the mountain systems of the whole Pacific Coast, from Alaska to New Mexico (Creighton 1950 and unpublished data). Collection localities in the Yukon are Slims R. delta and Halfway Lks. near Elsa. *M. incompleta* is reported as fossils in the Rocky Mountain National Park in Colorado by Elias et al. (1986).

4. *Myrmica lobifrons* Pergande

According to the recognized types in my revisionary studies, which originate from Metlakatla, Alaska (Creighton 1950), *M. lobifrons* identifies a very distinct species characterizing boreal bogs

throughout Canada, and other habitats that are very humid or temporarily flooded in part, such as riverbanks (unpublished data).

This species is included here even although represented only by a single male recovered from Haines Junction. This is the northernmost record presently known to me for *M. lobifrons* in Canada. This ant should be somewhat abundant at least in the southern half of the Yukon as well. I identified fossil remains of it from Lake Emma sediments, San Juan Mts., Colorado (Elias et al. 1991).

The traditional concept of *M. lobifrons* in publications is misleading and almost all records I have checked pertain to other species.

5. *Leptothorax acervorum* (Fabricius)

The occurrence of this eurytopic Palaearctic species was recognized for the first time in eastern Canada by Francoeur (1983) and in Alaska by Nielsen (1987). The eastern range appears limited to the tundra-treeline ecotone according to currently available data, but it is much more widespread in the west. Ergates were collected in the tundra at Firth R. (69°13'N 140°03'W), the northernmost Nearctic record, since Nielsen (1987) reported its presence at 69°01'N at Happy Valley Cut in Alaska, some 150 km beyond the treeline. A colony producing alates was detected in the shrub tundra of the Nahanni Range (road summit at 62°01'N 128°25'W). The distribution of *L. acervorum* seems to follow mainly the taiga territories in the Yukon, while it is also found in several birch and pine forests in Scandinavia (Collingwood 1979; Heatwole 1989). Other localities in the Yukon are the Old Crow area, Klo-Kut and McDougall Pass.

6. *Leptothorax retractus* Francoeur

The presence of *L. retractus* was already reported along the Dempster Hwy. (Eagle Plains Hotel, km 371) in the original description (Francoeur 1986). New Yukon localities are Marsh L., Blue Fish R., Klo-Kut and Tack Lake R. These records extend its range farther north in the area of Old Crow, not far away from the treeline, but likewise a mainly boreal area. The eastern currently known range covers only the southern part of the boreal forest (Francoeur 1986). This species nests in dead wood in forested habitats.

7. *Leptothorax* sp. (near *faberi* Buschinger)

An interesting series of specimens was collected under a rock with workers of *Leptothorax* sp. 1, at km 178 on the Dempster Hwy. Without doubt, they represent a parasitic form close to *L. faberi*, which is known only from the type locality, Jasper Park, Alberta (Buschinger 1981). Whether the specimens are a distinct species or represent clinal variation will be resolved in the course of the generic revision.

8. *Leptothorax* sp. 1 (*muscorum* group)

This slender rather brownish species is the most common and widespread of the *L. muscorum* group according to the present collections. It is found in more open forest stands as well as in prairie-like habitats. Table 1 shows the variety of microhabitats used by this species. A similar form is found in eastern Canada.

9. *Leptothorax* sp. 2 (*muscorum* group)

The present records of this stouter and darker form remain sporadic in the southern half of the Yukon. It nests mainly in mineral soils under mosses and tussocks in open sandy habitats.

10. *Tapinoma sessile* Say

This is a ubiquitous and versatile, tiny and opportunistic species, developing large but discrete colonies in any habitat suitable for ants, ranging from sandy beaches and fields to bogs and woods or human settlements (Smith 1965). It is common throughout North America with the exception of desert areas in the southwest. There is only one record from the Yukon, Pelly Crossing Campground at km 466 on Klondike Hwy. This species has surely been favoured by human activities in extending its presence so far north. It has not yet been reported in Alaska.

11. *Camponotus herculeanus* (Linnaeus)

Camponotus herculeanus is a typical and widespread species of all of the boreal forest biome, so it is not surprising to find it common through the forested habitats of the Yukon, usually nesting in living or dead tree trunks. This shy species, non-aggressive despite its size, can develop large colonies and maintain high densities in favourable habitats, but usually only a few workers are seen on the ground because of its hidden habits of life. Alate gynes and males overwinter in the mother nest and

mating flights usually take place during June, according to meteorological conditions and latitude. *C. herculeanus* is commonly found in the diet of woodpeckers (Bent 1964). Quaternary fossil remains are often determined as that species (Elias 1982b; Böcher 1989).

12. *Lasius neoniger* Emery

This species exhibits strong ruderal adaptation, particularly following human roads. Colonies prospering along roadsides can be detected by the typical sandy craters they build around nest entrances. *L. neoniger* nests almost exclusively in open areas, and colonies develop well where the vegetation cover is becoming degraded. By virtue of such ability *L. neoniger* may have extended its range northward where the habitat has become favourable through transformation by human activity.

Wilson (1955), in his revision of the genus *Lasius*, questioned the occurrence of this species from 18 miles north of Anchorage, Alaska: "the considerable range extension that this record represents for the genus, with the nearest specific record for *Lasius neoniger* in southern Idaho, makes it desirable to withhold judgment until additional material can be secured". The presence of *L. neoniger* in 3 different localities (Pelly Crossing, 7 km E of Rancheria, Tatchun L.) from the southern half of the Yukon now reduces this distribution gap and gives possible credibility to the Anchorage record, but Nielsen (1987) did not report the species from interior Alaska. The known range is transcontinental, but appears to be naturally southern in latitude.

13. *Formica dakotensis* Emery

This interesting species characterizes the afforestation stages of spruce-bog succession in the east (Francoeur and Pépin 1978). Talbot (1971) reported colonies in shrubby woodland border near a swamp in Michigan. Its distribution in the boreal coniferous biome appears patchy and the species cannot survive in the climax conditions that terminate bog succession. Colonies build typical small thatch mounds or large and flattened thatch patches (Francoeur and Pépin 1978). A record from near Dawson is the northernmost known in Canada, where the species is transcontinental. It was reported in Fairbanks, Alaska (Brown 1957).

14. *Formica gagatoides* Ruzky

The material now at hand confirms my earlier suspicion that the large amount of morphological variation observed in the Pacific range of *Formica neorufibarbis* and *Formica fusca subaenescens* Emery (Francoeur 1973 and unpublished data) should be re-evaluated. The taxonomic paper referred to showed then that the Palaearctic *gagatoides* belongs to the *neorufibarbis* complex, together with the Nearctic *hewitti*. Single specimens of both *neorufibarbis* and *gagatoides* are not easily recognized, but some nest series examined by me show significant differences, particularly in the head and pronotum shapes and partly in colouration.

The present investigation, though limited, reports for the first time the Nearctic occurrence of this Palaearctic species. The records at hand are scattered over the Yukon from 60°51' and 69°13'N (Firth R. near treeline). According to Dlussky (1967) *F. gagatoides* is the only arctic species of Palaearctic *Formica*, and it is not found south of 60°N in the mountains of the Scandinavian peninsula (Collingwood 1979). The northern limits of its range coincide with the treeline, particularly in Siberia. It is found in open forest stands, prairie borders and bogs.

The identification of *F. gagatoides* in the Yukon Territory brought into question some previous identifications under the name *neorufibarbis*, as well as *subaenescens* and even *marcida* Wheeler for northwestern America, and particularly for Alaska (Nielsen 1987). The latter 2 forms were reported for the Yukon by Francoeur (1973). Because the specimens involved have not been checked in the present study, it is safer not to include these names in the list for the time being.

15. *Formica hewitti* Emery

The only record of *Formica hewitti* in the Yukon was given by Francoeur (1973), from Takhini Springs at about 800 m in elevation. This transcontinental species has a range similar to that of *neorufibarbis*, except that apparently it does not reach the adjacent areas of the treeline. Its distribution appears more patchy with lower densities. It nests in dead wood or in mineral soil. The species was not represented in the material studied in the present investigation and is not yet reported from Alaska.

16. *Formica neoclara* Emery

No specimen of this species was present in the material examined. However, because this western species was reported in the Northwest Territories portion of the Nahanni range (Francoeur 1973), *F. neoclara* is clearly to be expected as well at least in the extreme south of the Yukon. It also occurs

along the Mackenzie River. This species should be found nesting in the sandy soil it prefers, in open habitats and in some forest stands like willow on alluvial shores. Primarily a mountain dweller, it can adapt easily to lower plains particularly in man-made environments, as seen along its range from Texas to the British Columbia mountains.

17. *Formica neorufibarbis* Emery

A widespread species, as presently understood, with abundant populations throughout the continental and mountain coniferous forests of the boreal biome. This species prefers to nest in dead wood of any type, above or in the ground, also in decaying sphagnum moss and in mineral soil in less favourable biotopes (bogs and taiga habitats). It occurs from Old Crow to the south of the Yukon, and is more frequent in the southern half. With *Camponotus herculeanus*, it is probably the most common and frequently seen ant in the Yukon. Foragers are active, running on the ground and on plants in great numbers, during warm conditions. The species has been reported in palaeoecological studies (Elias 1982b).

Morphological variations, particularly in body size and head and prothorax pilosity, characterize populations living in cold environments as seen at high elevations elsewhere on the continent; I named such polygynous populations "tundra form" (Francoeur 1973). The colour of the mesosoma in ergates may vary from clear light red to blackish brown. These variations were correlated with elevation in Alberta by Sharplin (1966). In the northern part of its transcontinental range, a percentage of series identified as *F. neorufibarbis* should probably rather be identified as *F. gagateoides*.

18. *Formica podzolica* Francoeur (Frontispiece)

This blackish and shy species is found in the boreal coniferous forest and in similar biomes in the mountains of North America where it builds large sandy or loamy mounds with huge polygynous populations (Francoeur 1973). These mounds may be naked or covered by mosses or herbaceous plants. The rather numerous records of *podzolica* in the material examined are limited to the southern half of the Yukon (Fig. 1). The species was reported from adjacent areas in the Northwest Territories and in Alaska (Francoeur 1973; Nielsen 1987).

19. *Formica subnuda* Emery

The transcontinental nature of the range of this species, which extends into the Yukon and Alaska, has been known for some time (Creighton 1950). In the collections at hand, 5 records are available for the Yukon; the northernmost one (Judas Cr. Campground, km 1403 on Alaska Hwy.) reaches 60°23'N, while in Quebec it goes above 55°N in latitude (Francoeur 1983). Therefore, *F. subnuda* should be found farther north in the Yukon.

This ant can nest in fields and pastures as well as in forested areas, using mineral soil and organic matter. Though generally patchy in distribution, the colonies may reach high numbers locally. This active and aggressive ant frequently enslaves other species of the genus *Formica* such as *neorufibarbis*, *podzolica* and *subaenescens*. If only one species is really involved here then this is one of the most ecologically versatile *Formica* species.

Discussion and Conclusions

Despite the limited amount of available data and continuing taxonomic changes in the identity and number of species, new and interesting facts are emerging that allow some interpretations within a general frame of faunal continuity with adjacent or similar regions.

The Yukon ant fauna as assessed in this study is composed of at least 19 species. A few additional species should be expected in the common genera like *Myrmica*, *Leptothorax* and *Formica*. For example *F. whymeri* Forel is present in Alaska and would be expected also in the Yukon. The number of species probably will reach at least 25 and would compare well with the 15 reliably identified taxa (out of 19 in all) mentioned for Alaska in publications (Francoeur 1973; Nielsen 1987). The latter author listed only 10 species for central Alaska, suggesting that 12 or 13 different forms will be found to occur in that territory after a taxonomic re-evaluation.

Most species occurring in the Yukon exhibit a transcontinental range, with the exception, in the present state of knowledge, of at most 3 cases: *Leptothorax* sp. near *faberi* (species no. 7), *Formica gagateoides* (14) and *Formica neoclara* (16). The range of the last species is

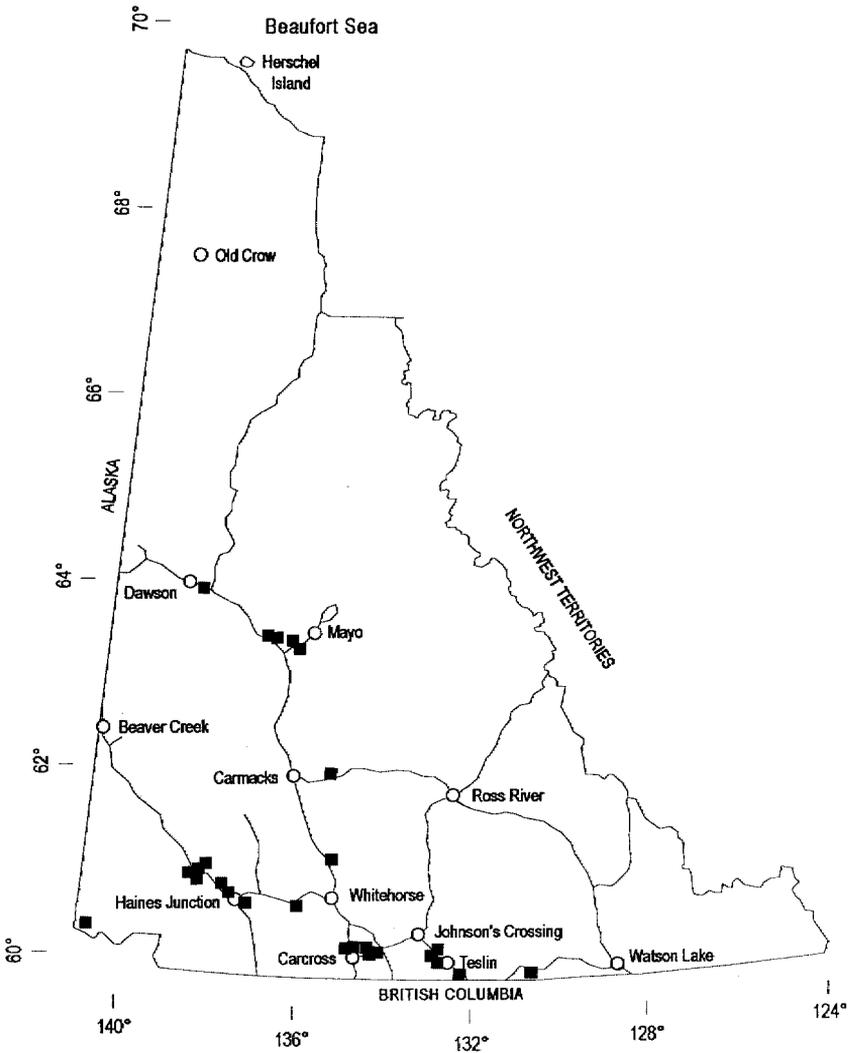


FIG. 1. Locality records (■) for *Formica podzolica* Francoeur (18) in the Yukon.

definitely southeastern-northwestern. The transcontinental range of most species appears to be more limited latitudinally in the east and much wider in the west of the continent, where they follow the mountain systems from Alaska south to Mexico.

No species are expected to be limited to the Yukon, and almost all of them have already been reported from adjacent territories. Not surprisingly, this myrmecofauna is essentially boreo-arctic, and comprises the same genera found in similar areas throughout the Holarctic region. Most of the Nearctic species are distinct; however, they are morphologically close

and ecologically equivalent to those of the Palaearctic region, indicating common ancestry. This statement is derived from my experience in comparing species for taxonomic studies. The trio of species occurring farthest north in Asia and eastern Europe (Dlussky 1967), *Leptothorax acervorum*, *Camponotus herculeanus*, and *Formica gagatoides* (5, 11, 14), shows the same range characteristics in the Yukon.

Very high densities of ants in some biotopes have been reported in Alaska and also in areas adjacent to treeline in Québec (Francoeur 1983; Nielsen 1987). In such circumstances these insects probably play a significant role in ecosystem dynamics as part of the food chain for birds, some small mammals and bears. This general situation would also be expected in the Yukon, as supported by data for woodpeckers.

The assemblage of reported species comprises 3 faunistic sets. The first consists of southern elements reaching or extending their northern areas of distribution: *Myrmica brevispinosa*, *Myrmica incompleta*, *Tapinoma sessile*, *Lasius neoniger* and *Formica neoclara* (2, 3, 10, 12, 16). The first 4 show a more northern limit in the Yukon compared to the known limit in the east (Francoeur 1983), so following a general trend recognized for other groups of organisms in the boreal biome. *Formica neoclara* is a western species reaching only the mountains of Texas in the southeast of the continent (Francoeur 1973).

The second set characterizes the boreal forest biome including ecotones and mountain equivalents as a whole. Some are typically widespread like *Myrmica alaskensis*, *Leptothorax* sp. 1, *Camponotus herculeanus*, *Formica neorufibarbis*, *F. podzolica* and *F. subnuda* (1, 8, 11, 17, 18, 19). Others offer, as currently known, a more sporadic distribution like *Myrmica lobifrons*, *Leptothorax retractus*, *L. sp. near faberi*, *Formica dakotensis* and *Formica hewitti* (4, 6, 7, 13, 15).

The third set includes species limited to northern areas, including the taiga or forest-tundra and the tundra adjacent to the treeline: *Leptothorax acervorum* and *Formica gagatoides* (5, 14). Colony establishments are here confirmed for these 2 species in the tundra. They are strong candidates for Pleistocene survival in Beringia. Their known Nearctic ranges support such a conclusion.

However, *Myrmica alaskensis*, *Leptothorax retractus*, *Camponotus herculeanus*, *Formica neorufibarbis* and perhaps *F. subnuda* are also able to reach the northern or alpine limits of forests. This group of species, together with the 2 more exclusively northern ants, belonging in all to 4 different genera, compose the basic myrmecofauna best able to survive and reproduce in Nearctic taiga-like conditions. The observed morphological variations in the ant *Formica neorufibarbis* and *F. subnuda* suggest that such populations may have come also from the Beringia refugium and afterward intermingled with those coming from the south. These genera and species have been detected among fossil insect remains in Quaternary palaeoecological studies (Matthews 1975, 1976; Elias 1982a, 1982b, 1985; Elias et al. 1986, 1991; Böcher 1989), indicating that they have occupied habitats of a boreo-arctic nature for a long time. For instance, *Myrmica alaskensis* (as *Leptothorax muscorum* in Matthews 1976), *Leptothorax muscorum* forms and *Camponotus herculeanus* are the species most frequently encountered in such palaeoentomological studies.

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