THE ANT FAUNA (HYMENOPTERA: FORMICIDAE) IN NORTHERN AND INTERIOR ALASKA.

A SURVEY ALONG THE TRANS-ALASKAN PIPELINE AND A FEW HIGHWAYS.[1]

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ABSTRACT: The ant fauna in northern and interior Alaska was systematically investigated along the Trans-Alaskan Pipeline. Additionally, samples were also taken at some localities close to certain highways in the interior. Ten ant species were found – three new to Alaska. Synonyms and distribution of all ant species mentioned for Alaska (18 species) are given, although there are questions whether six of these species belong to the Alaskan fauna. For each species, distribution maps and literature references are presented. Further, observed biological information is given for each species and their importance in foodchains and ecosystems is discussed.

The ant fauna in the arctic and subarctic regions of Alaska has never been investigated intensively. The only information on their distribution comes from single samples, often taken in connection with other biological projects. In the paper "The ants of Alaska" Wheeler (1917) wrote "that the Arctic circle may safely be taken as the extreme northern limit of the ant fauna." Later Weber (1950a) stated "Only two species of ants are definitely known from Arctic Alaska, *(Leptothorax acervorum canadensis* and *Camponotus herculeanus)".* By mentioning *Camponotus,* which is strictly associated with trees, Weber must have included at least the tree line in the arctic region. He gives no estimate of the number of ant species in the subarctic part of Alaska.

Isolated records of ants from all parts of Alaska are given by Brown (1955, 1957), Creighton (1950), Farquhard and Schubert (1980), Gregg (1963, 1969), Weber (1948, 1950b, 1953) and Yong (1974). Despite these records very little is known about the distribution of ants in Alaska.

The ant fauna of Canada has been better investigated. Most of the species found in northern Canada may also be found in Alaska, therefore the works of Brown (1949), Francoeur (1973, 1974, 1979, 1984) and Gregg (1972) are important for an understanding of the distribution of ants in Alaska.

The present paper deals with the results of some preliminary investigations of the ant fauna along the Trans-Alaskan Pipeline and some collections in the interior. It was not the aim to produce a complete list of ant species for this area, rather, the purpose was to make a general survey so

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further ecological investigations can be conducted. The very high density of ants at some of the biotopes means that they are very important elements in the ecosystem, e.g. they are probably important parts of the food-chain for many birds and some small mammals.

MATERIALS

Ants were collected during the summer of 1982 from 37 stations which were reasonably close to a road. At every station, 10-20 individuals were taken from each nest found. In all, 315 nests were sampled.

Most of the samples were taken along the Trans-Alaskan Pipeline, although some collecting trips were made between Prudhoe Bay in the north, and Glenallen.

In the Fairbanks area, intensive sampling was conducted. Further collections were made on trips along the George Parks Hwy., the Denali Hwy., and the Steese Hwy., and on a visit to the "Susitna River Project" and Tok. The main collection areas are shown in Fig. 1.

RESULTS

The available published data on the ant fauna of Alaska together with the data from these studies, are summarized in Table 1. Because of the difficulties with nomenclature, some synonyms are included, but only when the species name differs. The distribution of the species is subdivided into distribution in North America (NA) and Alaska (A). Often the literature only tells us that the species is found in Alaska.

The distributions of the 10 ant species found in the arctic and subarctic parts of Alaska in this study, together with the previously published records from other localities, are marked on the maps in Fig. 2.

Myrmica alaskensis Wheeler (Map No. 1)

Of the ants found in Alaska *M. alaskensis* was the most widely distributed species, being found on the south slope of the Brooks Range in the north and all over the interior. It lived in biotopes which ranged from tundra to forest. It was also found on tussocks in very wet swampy areas. The nests were built in old logs, decayed stumps, under stones, and in moss and other plant materials. *M. alaskensis* overwinters with larvae and the sexuals appear in July. This species has previously been accepted as a subspecies of *Myrmica brevinodis.*

Myrmica brevispinosa Wheeler (Map No. 2)

This species was only found in a few localities. There do not seem to be any other records from Alaska. The nests were in the ground in very sandy soil.

Leptothorax acervorum (Fabricius)(Map No. 3)

The records of *L. acervorum* are widely distributed in the interior, but the species was not common at any locality. In the arctic at Happy Valley Cut (69 01' N) 125 km from Prudhoe Bay, a very high density of this species was observed. This area is situated about 150 km north of the tree line and physically is quite isolated from the south by the mountains.

The ants at Happy Valley nest under flat stones on a southfacing slope. All nests contained larvae and pupae in the middle of June, which indicates that they overwinter with larvae and possibly also with pupae. This species has not previously been recorded from Alaska.

Leptothorax muscorum (Nylander) (Map No. 4)

Brown (1955) wrote "of all the ants occurring in North America *Leptothorax muscorum* is the species best able to survive in extreme Arctic-alpine conditions". This is not quite correct because while *L. muscorum* was found at nearly all the sample stations that had ants, these were all south of Brooks Range. Its nests were under stones, in stumps, in decaying logs, under bark and in plant materials in tussocks. In some localities, especially in the taiga, the nest density was very high. The taxonomy of the *muscorum*-complex has been very confused (Brown 1955) and the species has previously been named *Leptothorax acervorum canadensis* Prov.

Camponotus herculeanus (Linné) (Map No. 5)

The boreal North American *Camponotus herculeanus* may differ specifically from the typical form in Europe, and in the future these may be treated as two separate species (Brown, pers. comm. 1986).

The species is strictly associated with trees, and the distribution in Alaska follows closely the distribution of forests. The nests are carved in wood e.g. trees, trunks, decaying branches, roots and lumber (houses).

The density of *C. herculeanus* can be quite high, but because of their hidden habits of life, their shyness, and non aggressive behavior, only few workers are normally seen on the ground.

Sexuals are produced in late summer and they overwinter in the nest. Mating flights take place in the beginning of June. A huge cloud of swarming *C. herculeanus* was observed several hundred meters over Fairbanks on June 6, 1982, and during the following weeks queens were found in great numbers on the ground. During swarming the queens are heavily preyed upon by birds. Frequently sexuals are blown great distances, e.g. to treeless areas and snow patches, giving those ecosystems an input of easily available food (Edwards 1972).

Formica subnuda Emery (Map No. 6)

The distribution of *F. subnuda* nests was patchy in the forested areas although locally they were very common. Most nests contained enslaved *Formica neorufibarbis.* The nests were very variable and often not permanent. The workers are aggressive and it seems likely that they exterminate other ant species in the same area.

Formica whymperi Forel (Map No. 7)

Only two samples were collected. These are the first records for this species from Alaska.

Formica podzolica Francoeur (Map No. 8)

Three samples of this species were taken. Previously it has been recorded only from the Ray Mountains.

Formica fusca Linne´(Map No. 9)

All the specimens collected in this investigation belong to the subspecies, *Formica fusca* subsp. *subaenescens.*

This species is distributed throughout the areas south of Brooks Range and locally can be common. Most nests were found in the soil, often having a very small dome made of loose sand and pieces of grass. There are no overwintering larvae in the nests and the sexuals and new workers appear at the same time as *Formica neorufibarbis.*

Formica neorufibarbis Emery (Map No. 10)

Of the Alaskan ants *F. neorufibarbis* is probably the most frequently seen species. Like *Myrmica alaskensis,* it is a very active species, which forages on the ground in great numbers during warm conditions. The nests of *F. neorufibarbis* frequently contain many queens. They are built under stones, in stumps and in hummocks anyplace where there is a protected and sunheated site. At Eagle Creek, nearly all tussocks on the south facing slopes contain nests of *F. neorufibarbis.* There are no overwintering larvae in the nests, so the first brood of workers appears in July and the sexuals some time later.

The color of the alitrunk varies from clear light red in the typical *F. neorufibarbis* to nearly blackish brown in *Formica neorufibarbis* subsp. *gelida* Wheeler. Sharplin (1966) has studied this variation in color of the workers and correlated it with altitude.

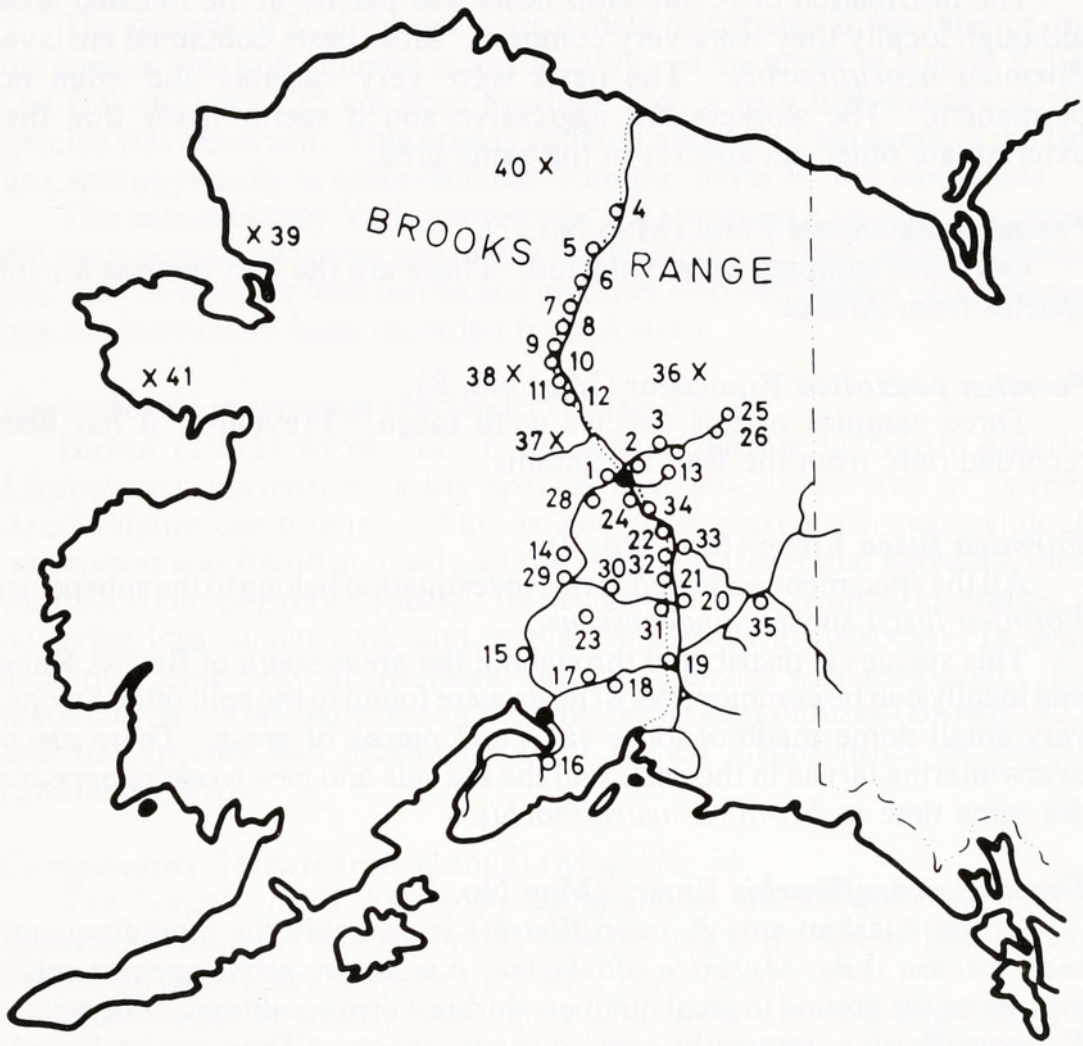
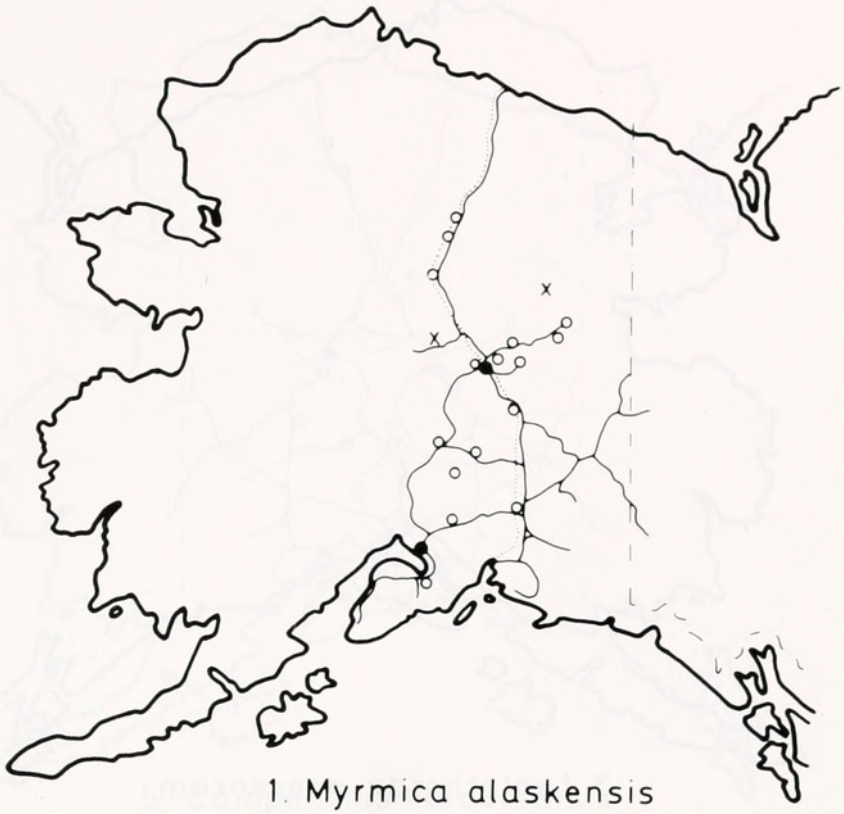


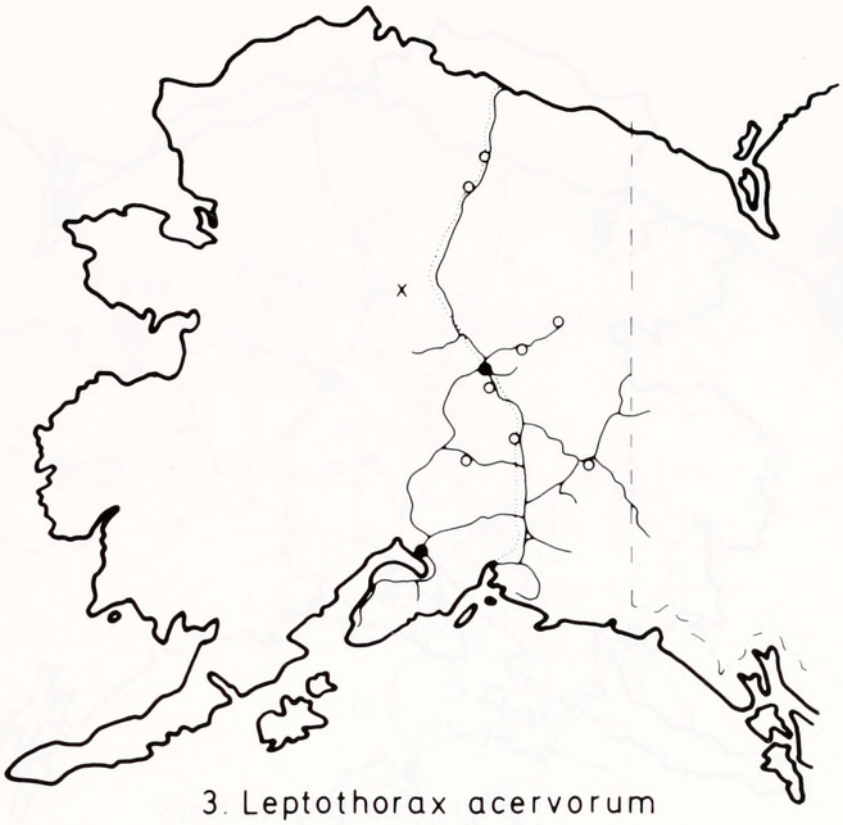
Fig. 1. The main sampling stations in Alaska. This study: (1) Fairbanks; (2) Fox; (3) Chatanika; (4) Happy Valley Cut/Camp; (5) Chandalar Camp; (6) Sukakpak Mt.; (7) Coldfood; (8) Gryling Lake; (9) Goblers Knob; (10) Bonanza Creek; (11) Connection Rock; (12) Old Man Camp; (13) Chena Hot Springs; (14) Iglo Creek; (15)Susitna River; (16) East Granite Creek; (17) Long Lake/Glenn Hy; (18) Caribou Creek; (19) Glennallen; (20) Paxon Lake; (21) Fielding Lake; (22) Shaw Creek; (23) Watana Camp; (24) Eilson; (25) Circle City and Birch River; (26) Central and Miller Creek; (27) Eagle Creek; (28) Nenana; (29) Cantwell; (30) Denali I, II; (31) Tangel Lake; (32) Darling Creek and Donnelly Creek; (33) Delta Junction; (34) Salcha River; (35) Tok; From the literature: (36) Fort Yukon; (37) Pynaw Mt, Rampart; (38) Ray Mtns; (39) Noatak; (40) Umiat; (41) Upper Kugarok near Nome.

Fig. 2. The distributions of ants found in the arctic and subarctic part of Alaska are shown in maps 1 to 10. The samples from this investigation are indicated with (o) and data from literature (x).



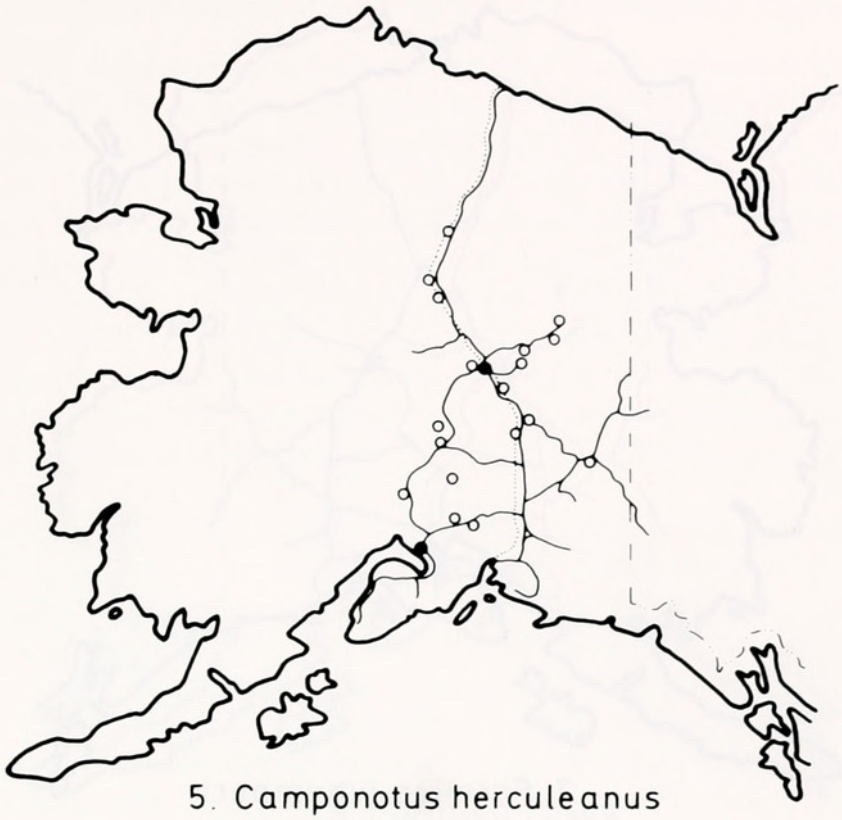
1. Myrmica alaskensis

2. Myrmica brevispinosa

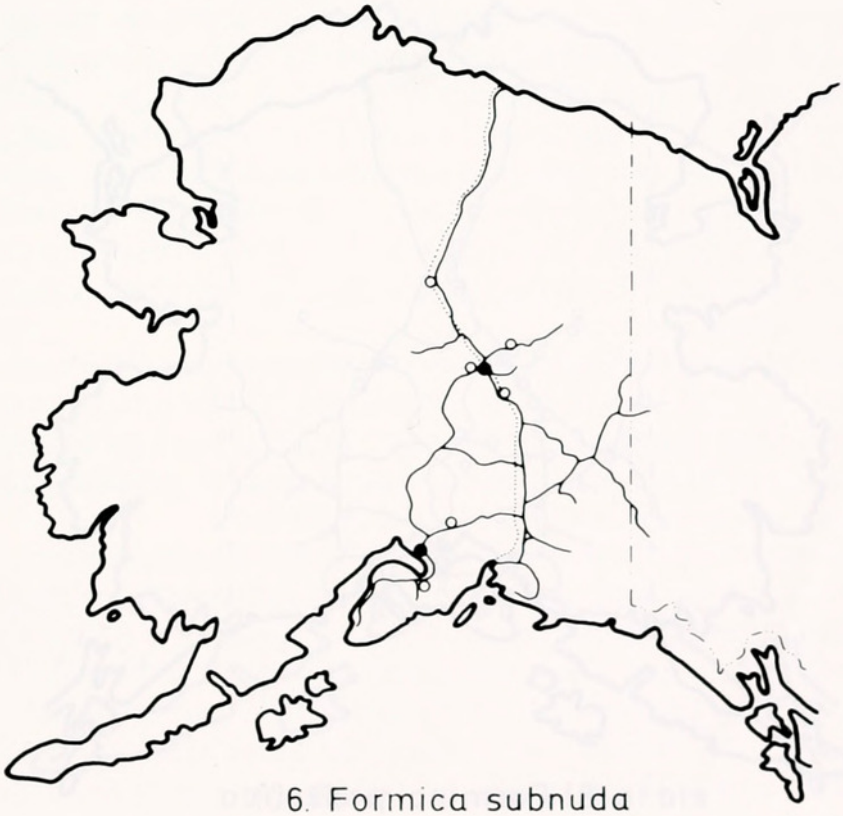


3. Leptothorax acervorum

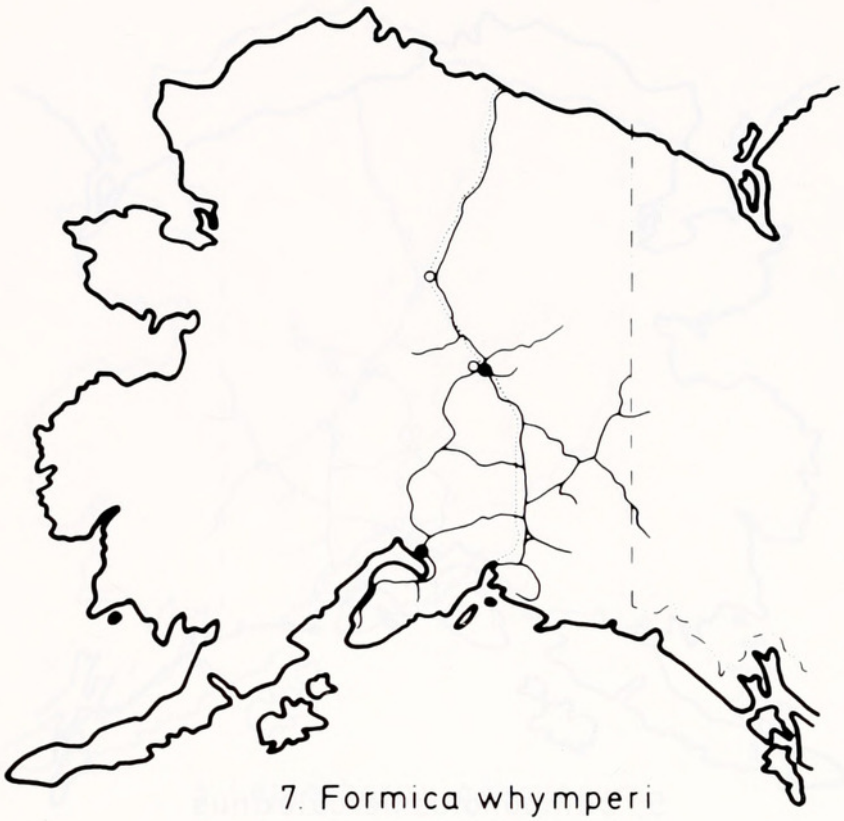
4. Leptothorax muscorum



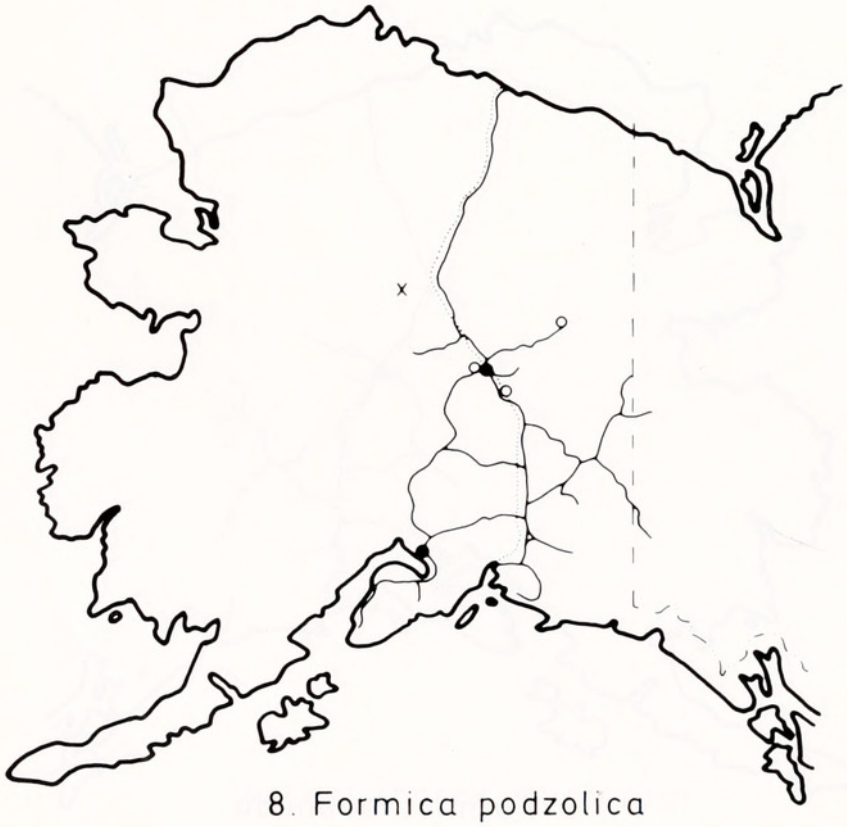
5. Camponotus herculeanus



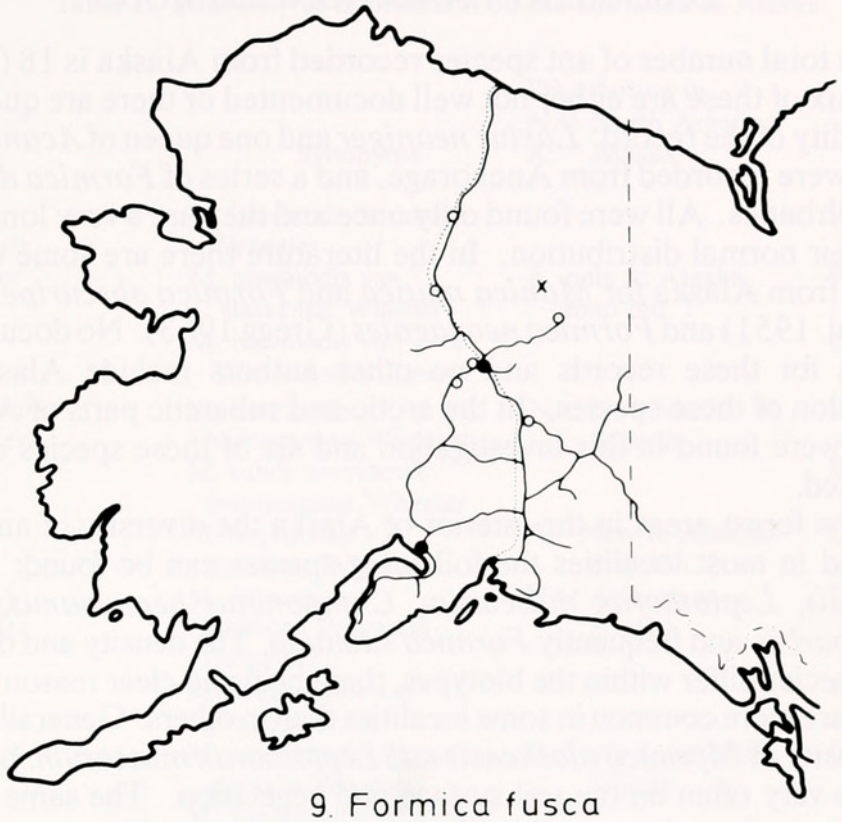
6. Formica subnuda



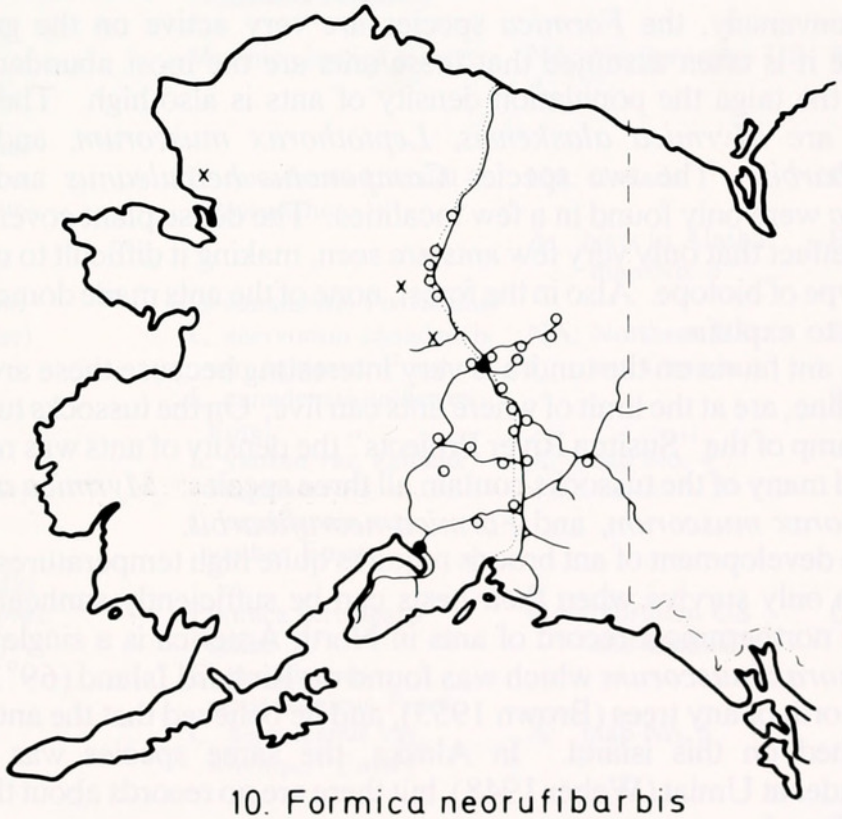
7. Formica whymperi



8. Formica podzolica



9. Formica fusca



10. Formica neorufibarbis

DISCUSSION AND CONCLUSIONS

The total number of ant species recorded from Alaska is 18 (see Table 1), but six of these are either not well documented or there are questions on the validity of the record. *Lasius neoniger* and one queen of *Acanthomyops latipes* were recorded from Anchorage, and a series of *Formica dakotensis* from Fairbanks. All were found only once and they are a very long distance from their normal distribution. In the literature there are some unspecific records from Alaska for *Manica mutica* and *Formica obscuripes* (Muesebeck et al. 1951) and *Formica neogagates* (Gregg 1963). No documentation is given for these records and no other authors include Alaska in the distribution of these species. In the arctic and subarctic parts of Alaska, ten species were found in this investigation and six of these species are widely distributed.

In the forest areas in the interior of Alaska the diversity of ants is quite high, and in most localities the following species can be found: *Myrmica alaskensis, Leptothorax muscorum, Camponotus herculeanus, Formica neorufibarbis,* and frequently *Formica subnuda.* The density and distribution of the species differ within the biotypes, there being no clear reason why some species are more common in some localities than in others. Generally there is a high density of *Myrmica alaskensis* and *Leptothorax muscorum,* but they are not seen very often on the soil surface and vegetation. The same is true for *Camponotus herculeanus,* which is a very shy species with a secretive way of life. Conversely, the *Formica* species are very active on the ground and therefore it is often assumed that these ants are the most abundant.

On the taiga the population density of ants is also high. The dominant species are *Myrmica alaskensis, Leptothorax muscorum,* and *Formica neorufibarbis.* The two species *Camponotus herculeanus* and *Formica subnuda* were only found in a few localities. The dense plant cover of the soil has the effect that only very few ants are seen, making it difficult to collect ants in this type of biotope. Also in the forest, none of the ants made domes, which is difficult to explain.

The ant fauna on the tundra is very interesting because these areas, above the tree line, are at the limit of where ants can live. On the tussocks tundra close to the camp of the "Susitna River Projects" the density of ants was remarkably high and many of the tussocks contain all three species: *Myrmica alaskensis, Leptothorax muscorum,* and *Formica neorufibarbis.*

The development of ant broods requires quite high temperatures, therefore ants can only survive when their nests can be sufficiently sunheated.

The northernmost record of ants in North America is a single worker of *Leptothorax muscorum* which was found on Richard Island (69°32') about 80 km north of any trees (Brown 1955), and he believed that the ants were not established on this island. In Alaska, the same species was found by Scholander at Umiat (Weber 1948), but there are no records about the number of ants found.

Table 1. Summary of information on the ant fauna in Alaska.

	Synonyms	Distribution in NA: North America A: Alaska	Reference
Myrmica alaskensis Wheeler	M. brevinodis kuschei Wheeler		Wheeler (1917)
	M. brevinodis var. alaskensis Wheeler	A. only in Alaska, map No. 1	Weber (1950)
	M. brevinodis var. sulcinodoides Emery		Creighton (1950)
brevispinosa Wheeler	M. brevinodis brevispinosa Wheeler	NA: New Mexico to Alberta	Wheeler (1917)
	M. rubra brevinodis brevispinosa Wheeler		Weber (1950)
	M. brevinodis var. decedens Wheeler	A: New to Alaska, map No. 2	Creighton (1950)
lobicornis Nylander	M. sabuleti var. lobifrons Pergande (in parts)	NA: Arizona to Alaska	Wheeler (1917)
	M. scabrinodis var. glacialis Forel		Weber (1948)
	M. scabrinodis lobicornis glacialis Wheeler	A: only in southern Alaska	Creighton (1950)
	M. scabrinodis lobicornis lobifrons Pergande		
Manica mutica (Emery)	Myrmica mutica Emery	NA: Northwestern US A: ??	Muesebeck (1951)
Leptothorax acervorum (Fabricius)	L. canadensis kincaidi Provancher	NA: Canada	Gregg (1972)
		A: New to Alaska, map No. 3	Francoeur (1984)
muscorum (Nylander)	L. canadensis Provancher		
	L. acervorum canadensis var. calderoni Forel	NA: Northern US and Canada	Brown (1955)
	L. canadensis calderoni Forel		Creighton (1950)
	L. yankee var. kincaidi Pergande	A: map No. 4	
	L. canadensis var. yankee Emery		
Camponotus herculeanus (Linné)	Formica herculeana Linné	NA: Northern US and Canada	Creighton (1950)
	C. herculeanus pensylvanicus Forel		
	C. herculeanus var. whymperi Emery	A: map No. 5	

	Synonyms	Distribution in NA: North America A: Alaska	Reference
Lasius			
sitkaensis Pergande	L. niger sitkaensis Pergande L. niger neoniger Emery (in parts)	NA: Northern US and Southern Canada A: only in southern part	Wilson (1955)
neoniger Emery	L. niger var. neoniger Emery (in parts)	NA: Eastern US until Iowa A: only one questionable record, 18 miles north of Anchorage	Wilson (1955)
Acanthomyops			
latipes (Walsh)	Formica latipes Walsh	NA: Northern US to Southern Canada	
	Lasius latipes Mayr		Wing
	Lasius (Acanthamyops) latipes (Walsh)	A: A single questionable queen from Anchorage	(1968)
Formica			
neogagates Emery	F. fusca subpolita neogagates Emery	NA: Northern US and Southern Canada	
	F. fusca var. gagates Mayr (in parts)	A: ???	Gregg (1963)
subnuda Emery	F. sanguinea subnuda Wheeler	NA: US and Canada A: map No. 6	Creighton (1950)
dakotensis Emery	F. montigena Wheeler	NA: New Mexico to Alberta A: only one sample from Fairbanks	Brown (1957)
obscuripes Forel	F. rufa obscuripes Forel	NA: Northwestern US and British Columbia	Muesebeck (1951)
	F. rufa aggerens Wheeler	A: ??	
whymperi Forel	F. rufa var. whymperi Forel F. rufa obscuripes whymperi Wheeler F. microgyna rasilis pullula Wheeler F. adamsi Wheeler	NA: Michigan West to Washington & British Colombia A: New to Alaska, map No. 7	Creighton (1950)
poodzolica Francoeur	F. fusca Linné (in parts)	NA: Most of US and Canada A: map No. 8	Francoeur (1973)
fusca Linné	F. marcida Wheeler (in parts) F. lecontei Kennedy and Dennis	NA: Most of US and Canada A: map No. 9	Francoeur (1973)
neorufibarbis Emery	F. fusca var. neorufibarbis Emery (in parts) F. fusca var. algida Wheeler	NA: Most of US and Canada A: map No. 10	Francoeur (1973)

In this investigation the northernmost record of ants was the species *Leptothorax acervorum* and it came from Happy Valley Cut (69° 01' N) at the foothills on the northern side of Brooks Range. The mean temperature in the warmest month is only 11.3°C and the thaw season is only 118 days (Haugen and Brown 1980). All the ants in this area were found under dark slates on steep southfacing slopes. It is clear that the microclimate in the nests on southfacing slopes must be much warmer than the "meteorological climate". On gentle southfacing slopes and plain areas in this locality there were no signs of ants at all. Similar observations were made at the tussocks tundra at Eagle Creek, where *Formica neorufibarbis* inhabits most of the tussocks on the south facing slopes and none were found elsewhere. The warm sunheated climate inside the vegetation makes conditions acceptable for the ants. They rarely are seen on the surface even if they live in very high numbers inside the tussocks.

The density of ants found in a great proportion of the different biotopes was remarkably high. This may have been overlooked in previous studies, possibly because of their strongly aggregated distribution and their hidden way of life in these cold areas. Ants must be very important elements in several of these ecosystems because they can be preyed upon the whole year.

Although little is known about bird predation of ants in these climatic conditions, it should be expected that ants are an important food source for several bird species. At the same time birds and ants are competitors for other food sources, such as other insects.

It would be a great help to a better understanding of Alaskan arctic and subarctic ecosystems if ecological investigation of the ant fauna could be carried out in order to elucidate the role of ants in this fascinating ecosystem.

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