

The Ant *Leptothorax muscorum* (Nylander) in North America

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The small ant *Leptothorax muscorum* (Nylander), of subfamily Myrmicinae, is one of the very few truly boreal-alpine members of its family. It is known from a very wide area in the northern Palearctic, and at least in the western part of Europe frequently occurs sympatrically with the similar but distinct species, *L. acervorum* (Fabricius).¹ The presence of true *L. muscorum* in North America has been indicated on several past occasions, but the tendency to treat the North American and Eurasian populations as separate taxonomically has grown stronger with each consideration of the problem. This tendency now appears to have been the result of several taxonomic accidents and the regrettable practice of North American taxonomists in refusing to consider populations outside their own continent. Unfortunately, the first man to consider fully the extra-continental relationships of the North American representative of the *muscorum* complex was deceived by a misleading set of circumstances.

In his recent book (*loc. cit. infra*), to which the reader is referred for extensive historical discussion, Creighton has separated as distinct species the Eurasian *L. muscorum* and *L. acervorum* and the Nearctic *L. canadensis* (Provancher), and has cited the characteristics of each. However, it has now been determined that Creighton depended for his characterization of European *L. muscorum* upon a set of specimens left grouped by W. M. Wheeler under that name, mostly from Swiss and German localities. This set now proves to be a mixture not only of *muscorum* and *acervorum*, but also of one or two super-

¹ I consider the current discussion of the application of the subgeneric names *Leptothorax s. str.*, *Mychothorax* Ruzsky, and *Myrafant* M. R. Smith to be pointless. *Leptothorax* and *Mychothorax* are known to be isogenotypic synonyms; *Myrafant* is a subjective synonym of *Leptothorax* in view of the fact that the antennal segmentation, metanotal impression and radial cell characters will not hold for the entire world fauna of the genus. This question will be discussed in a separate paper.

ficially similar forms in the *tuberum-nylanderi* group; the sorting of this series reveals that Creighton probably drew most or all of his *muscorum* diagnosis from members of the last-named group.

The mixup in the Wheeler Collection often extended to single triple-mount pins, and anyone who has ever worked with this collection realizes how likely it is to deceive even the most careful of workers. The confusion was discovered only when a new addition to the collection was being made from the *Leptothorax* of the Palearctic Finzi Collection, containing pure series of the species in question determined by such authorities as Mayr, Emery, Menozzi, Müller and Finzi. The *muscorum* series from the Finzi Collection, as authentic as can be obtained, were compared with the various forms of the *L. canadensis* complex in the Museum of Comparative Zoology; the detailed correspondence of characters indicates that *muscorum* and *canadensis* are conspecific. In fact, many of the western North American samples are as similar to the European samples as allonidal specimens can be expected to become. The European series do show a tendency, or average trend, toward slightly finer, more attenuate dorsigastric pilosity than is shown by most American samples, but even in this character, certain western Nearctic nest series can be found to match, or even overreach, this Old World variation. All degrees of variation in this character occur in the western United States, usually on a strictly local basis, and it seems impossible to correlate its distribution with coloration or any other character known to vary geographically.

Eastern North American populations are usually distinguishable by means of their concolorous piceous or blackish pigmentation, supposed to mark the nominate race of *canadensis*, but this condition merges toward the west into the "typical *muscorum*" or "*calderoni*" type of variation, in which the alitrunk is a contrasting yellowish-ferruginous against the brown or piceous head and gaster. The gradualness of this east-west color shift has been somewhat obscured by the recognition of race *yankee*, embracing both color forms, but removed from consideration on

the basis of a sculptural distinction. The dark concoloration reappears at high altitudes in the Rockies and in the Arctic Northwest of Alaska and Canada, often in mixed series with bicolored forms. Bicolored individuals are by no means restricted to the West of North America, for nests taken on Mt. Washington, New Hampshire, within sight of the Atlantic Ocean, frequently contain a proportion of fully adult but bicolored individuals. Color variation in Eurasia is not well known, but Dr. H. Kutter assures me that Swiss samples, while somewhat variable, are all bicolored. For me, this situation is readily interpreted as a circumpolar cline with numerous local reversals and irregularities.

After rightly synonymizing several variants, Creighton retained in addition to the nominate race of *canadensis* three North American races: *kincaidi* (Alaska, British Columbia, etc.), *calderoni* (northern California north into British Columbia and Alberta), and *yankee* (lower levels in the Rockies and Black Hills). The typical *canadensis* was assigned the territory to the east of these, and also the upper levels of the Rocky Mountains. Judging from his arrangement of the material in the Museum of Comparative Zoology as I found it, Creighton considered approximately half of the total Nearctic material to represent intergrades among the four races.

The additional racial characters cited are, at least for me, extremely difficult or impossible to pin down. The "suberect" short pilosity of the anterior scape surfaces, marking *kincaidi*, could be described equally well as "decumbent," so feebly does it diverge from the fully appressed position. At any rate, this kind of pilosity of the scapes occurs in specimens from Skagway, Alaska, and Olympia, Washington, considered to be *kincaidi* by Creighton, but it may also be found in series from remote localities (such as Mt. Washington). Surprisingly, the *kincaidi* types, from Metlakahtla, Alaska, appear to me to have the scape hairs as fully appressed as the majority of specimens placed to other races by Creighton! The character may vary only as an artifact of preservation, but in any case, it certainly does not mark exclusively and uniformly any northwestern Nearctic population so far as I can tell from the available material.

Race *yankee* is reserved for forms having the superimposed rugulation of the alitruncal (presumably chiefly the pronotal) dorsum reduced and indistinct. Samples more or less fitting this description can be found at certain lower-altitude stations in the Rockies and Black Hills, as Creighton claims, but other samples from the same or very close localities, so far as the data go, have the rugulation more or less developed. This character is a feeble one at best, and a most illusory one, subject to changes with the pigment and lighting arrangements, at the worst. Due to the gradational nature of the dorsal pronotal sculpture, almost any specimen might be considered transitional to other races. Another disturbing feature in the evidence for *yankee* is the paucity of precise and specific citation of the sculptural variation with altitude and latitude. In the case of such an elusive difference, precise and detailed documentation is surely required.

Considering all suspected or known geographically variable characters of *muscorum* in North America together, we may stress: (1) their extreme elusiveness, (2) notable exceptions to and reversals of their supposed geographical exclusiveness, (3) the breadth of their intergradation, and (4) their lack of geographic concordance. I believe that it may accurately be stated that from no racial division so far proposed for this species can any satisfactory general idea of the full distribution of any or all of the variable characters be gained. If, as is generally claimed, the function of the racial category is the description in symbolic terms of geographical variation and/or the indication of probable potential incipient species, then I would say that formal racial subdivision certainly falls far short of the ideal in this particular case. In this connection, see Wilson and Brown, 1953.

I prefer at this time to emphasize the species-unity of the populations discussed by formally synonymizing all the North American racial names under *L. muscorum*. Decisions as to possible formalised subdivisions should be left to a future study of the trends and details of geographical variation backed by the necessary fullness of data, so far lacking from all published references to this species. For fuller references to the new

synonyms listed below, and for further synonymy, type localities, and other information, see Creighton (1950) and also the Genera Insectorum listings of Emery (1922). I am unfamiliar with the variants and possible synonyms of *L. muscorum* described from Eurasia, chiefly by Ruzsky, and cannot discuss them here in the absence of relevant material. I can, however, confirm the previous synonymization of var. *gredleri* Mayr on the basis of a specimen determined as *gredleri* by Mayr himself, now in the Museum of Comparative Zoology.

Leptothorax muscorum (Nylander)

Myrmica muscorum Nylander, 1846, Acta Soc. Sci. Fenn., 2: 1054, worker, female, male; *nec Leptothorax (Mychothorax) muscorum* of Creighton, 1950, pp. 274-275.

Leptothorax Canadensis Provancher, 1887, Addit. Correct. Faune Ent. Canad. Hym., Quebec, p. 245, worker, female, male; *L. (M.) canadensis*, Creighton, 1950, pp. 274-276. New synonymy.

Leptothorax (Mychothorax) acervorum canadensis var. *calderoni* Forel, 1914, Deutsch. ent. Zeitschr., p. 617, worker, female; *L. (M.) canadensis calderoni*, Creighton, 1950, p. 276. New synonymy.

Leptothorax yankee var. *kincaidi* Pergande, 1900, Proc. Wash. Acad. Sci., 2: 520, worker, female; *L. (M.) canadensis kincaidi*, Creighton, 1950, p. 277. New synonymy.

Leptothorax canadensis var. *yankee* Emery, 1895, Zool. Jahrb. Syst., 8: 319, worker; *L. (M.) canadensis yankee*, Creighton, 1950, p. 277. New synonymy.

ECOLOGY

Of all the ants occurring in North America, *Leptothorax muscorum* is the species best able to survive in extreme Arctic-alpine conditions. Throughout boreal and alpine North America within the limits of the timbered areas, *L. muscorum* is found in company with *Camponotus herculeanus* (Linnaeus) and *Formica neorufibarbis* Emery,² the two dominant ants of the region.

² *C. herculeanus* has also gone under the varietal name *whymperi* Forel. *F. neorufibarbis* has usually been recorded as *F. fusca* var. *gelida*, and was listed by Brown (1949) and Weber (1950) as *F. fusca*. The subspecies of *neorufibarbis* retained by Creighton appear to be untenable.

On Mt. Washington, New Hampshire, along the toll road on the eastern slope, tree line occurs at about 4000 to 4200 feet altitude. In the interior of the thick, dark spruce forest below 4000 feet, ants are very scarce or absent, probably due to inadequate insolation, but in the low, spaced wind timber (*Picea mariana*) at treeline, nests of *Formica neorufibarbis* are very abundant under stones. In similar nests under stones at this level are also found a few populous nests of *Camponotus herculeanus*, unable to utilize the spindly wind timber for nesting. *Leptothorax muscorum* at this belt is relatively scarce, being found mainly as strays in or near the nests of the two larger species. These three are the only ant species so far taken at or above tree line on Mt. Washington.

Above tree line, up to about 4500 feet on the open tundra-like "lawns," *F. neorufibarbis* continues as a fairly abundant nester under stones. Established nests of *C. herculeanus* here reach only to about 4300 feet. At 4700 feet (Nelson Crag), I found *L. muscorum* suddenly abundant in a strip extending away from the road in both directions, under small, flat stones, fully exposed on the soil surface. These nests, while mostly consisting of the usual 50 to 100 workers, dealate females and intercaste females normal for the species, also harbored in several instances a complement of winged males and females (July 19, 1952) in proof of their flourishing condition. At the same station, intensive search revealed only a single nest of *F. neorufibarbis*, and this in a situation sheltered by a low rock ledge and mat spruce. (*F. neorufibarbis* and *L. muscorum* have very recently been taken at over 5000 feet on another slope.)

In northern Alaska, Weber (1950) records a worker of *L. "canadensis"* from Umiat on the Arctic Slope, where it is the only species of ant so far collected. I have published records of all three of the Arctic ants discussed above from the collections of Dr. Marie Hammer at Reindeer Depot in the Mackenzie River Delta, just a few miles from the Arctic Ocean (Brown, 1949; see footnote 2, above). Since that time, I have received more extensive series of the same three species from Dr. W. J. Brown, of the Canadian Department of Agriculture, Division of Entomology.

These series are also chiefly from Reindeer Depot, from the survey collections of Dr. Brown and Mr. J. R. Vockeroth, and they are accompanied by Dr. Brown's notes in a letter, from which I should like to quote, with insertion of my determinations of the ants in brackets.

"Reindeer Depot is on the eastern edge of the Mackenzie Delta at lat. $68^{\circ}43'$, long. $134^{\circ}06'$. It is well treed, but the last species, *Picea glauca* Voss, extends down the river only eight or ten miles. About 200 yards from the river, the Caribou Hills rise very steeply to about 500 feet, to bound the Delta on the east. The upper halves of the protruding parts of the slope are clay and quite bare except for small clumps of grasses, *Hedysarum*, and a few other low plants. The bare parts supported a surprisingly rich fauna, an intrusion from the south, that did not occur elsewhere in the region. [*F. neorufibarbis*] seemed tied to this habitat. The others occurred on the lower slopes, which were mostly sphagnum well covered with trees and other vegetation. Beyond the crest of the Caribou Hills, rolling, treeless tundra extends east and north to the limits of land. This tundra is sphagnum that thawed to a depth of from eleven to nineteen inches in the summer of 1948. It is fairly well covered with low, arctic plants. It was here, beneath firewood left at an old camp site of reindeer herders, that [*L. muscorum*] was taken, about a mile from the trees."

Dr. Brown also sent one worker of *L. muscorum* taken at Kidluit Bay on Richards Island (lat. $69^{\circ}32'$, long. $133^{\circ}47'$) in the Arctic Ocean, about 50 miles airline from any trees. Dr. Brown notes that great quantities of driftwood are found at this locality, however, which might mean that the ant is really not permanently established on Richards Island. It is of interest to note that this seems to be the northernmost record for ants in the Western Hemisphere. Dr. Brown concludes:

"I have not seen other ants from treeless tundra. Lack of trees and consequent exposure to wind causes abrupt, major changes in fauna and other flora. I have believed that ants ended with the trees."

The Mackenzie Delta *muscorum* sample contains a goodly proportion of both concolored and bicolored pigment forms with all possible intergrades, and frequently unicoloral.

In Colorado, Gregg (1947) found *L. muscorum* and *F. neorufibarbis* (under the older conventionally used names) to be the "only two species . . . discovered with any regularity" above timber line, and then only on the lowest and best-protected slopes. Eidmann (1933) reported the usual trio of Arctic species from Labrador, from collections made in the region of the Matamek River.

Such records render it very likely that *L. muscorum* inhabits the whole of the spruce-fir forest land of Arctic America and the greater part of the similar vegetational zones in the higher mountains, and that it can also exist in places a bit beyond the limit of trees where conditions are not too extreme. This little species can also occur at slightly greater extremes on the warm side of its range than can either of its two usual companion species, though all of these forms apparently are absent from the spruce and fir forests of the southern Appalachians, where intensive search has been made for them.

At White Lake, Ossipee, New Hampshire, and Saco, Maine, I found slightly dwarfed examples of *muscorum* nesting in a stand of *Pinus rigida* growing on sand; E. O. Wilson took a nest at the top of Snow Bowl Road, San Francisco Mts., Arizona, in pine-aspens to spruce-fir transition.

It would be interesting to see prepared a synthesis of the information available on the Eurasian populations of *muscorum*, but such a work would immediately run afoul of the doubtful identifications abounding in the Old World literature; many of these probably apply to *acervorum* or other species, and *vice versa*.

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