

A PRELIMINARY ECOLOGICAL CLASSIFICATION OF ANT COMMUNITIES IN IRELAND.

FERGUS J. O'ROURKE, M.Sc., Ph.D., M.B.

Wheeler (1910) described seven ethological associations of ants in North America. This classification was based mainly on the type of plant community with which the ants were associated, and was as follows: the woodland (silvicolous), the glade (nemoricolous), the field (caespiticulous), the meadow (pratiniculous), the heath (ericeticulous), the sand (arenicolous), and the desert (deserticolous). In a study of the Irish ant fauna, some data were collected with the object of establishing a classification of the indigenous species along similar lines. Unfortunately it was not possible to complete the study but sufficient information was obtained to enable some general conclusions to be reached.

It became clear that Wheeler's classification is too elaborate for the impoverished ant fauna of Ireland and only three ant communities could be recognised:—

(a) *The low soil humidity (L.S.H.) fauna*, comprising ants that inhabit sandy soil or heath (*Erica-Calluna*) areas which are characterised by fluctuating but usually low humidities and by a considerable exposure to solar radiation.

(b) *The medium soil humidity (M.S.H.) fauna*, which is composed of those ants that inhabit the fields and glades and the drier parts of bogs where there is a rather constantly humid substrate and a lesser exposure to solar radiation.

(c) *The high soil humidity (H.S.H.) fauna*, found in areas where there is a constantly high soil moisture content and a low solar radiation, as for example, in woods and forests.

This classification might be based equally well on the soil structure, although this might be less convenient in practice. It should be pointed out, nevertheless, that the structure of the soil is of great importance to the ants as it is difficult for them to work and excavate their nests in very heavy soil. For example, although *Lasius flavus* F. is usually a mound builder, it becomes a lapidicolous species where the soil is too heavy to work.

In Ireland there are but two species, which are restricted to one type of community (stenotypic) *Stenamma westwoodi* Westwood and *Formica rufa* L., both of which occur in the H.S.H. Fauna and are rather limited in their distribution. The remaining species may be found in all three types of communities (eurytypic) although in varying proportions. This plasticity is associated with the adaptability of the fertilised female which may found the colony in a wide variety of microhabitats. It is

also an indication of the relative biological uniformity of the Irish species. The communities are characterised by the varying proportions in which the colonies of the different species occur rather than by a series of stenotypic species.

(a) *The low soil humidity fauna.*

The L.S.H. fauna is characterised by the preponderance of *Formica fusca* L., *Lasius niger* L., *Myrmica scabrinodis* Nyl., or *M. sabuleti* Meinert. An example of the preponderance of *F. fusca* was clearly indicated in an *Erica-Calluna* association on the southern slope of Carrigollogan, County Dublin, where of the 43 colonies examined no less than 41 were of this species. Two of these colonies were in plesbiosis with other species (*L. flavus* and *M. laevinodis* Nyl. The remaining two colonies were of *M. scabrinodis* and *M. sabuleti*, respectively. This very clear preponderance of a single species is almost certainly a case of true dominance in the ecological sense, as the ants are in fact moulding the environment. Such a clear cut case is rather unusual and may be contrasted with a more typical distribution found in a similar habitat at Castlekelly, Glenasmole, County Dublin, where of the 25 nests examined 13 were of *F. fusca*, five of *M. scabrinodis*, four *M. sabuleti* and three of *M. rubra* L. The importance of differences in microhabitat was shown in a count made at another situation in Castlekelly. The site was a well-drained bank facing south with little plant cover other than few plants of *Erica*, *Calluna*, and *Vaccinium myrtillus*. Here there were 91 colonies of *F. fusca* and eight of *M. rubra*. These figures show clearly how *F. fusca* can dominate the fauna of such microhabitats. The colonies of *M. rubra* were found in the moist patches in the area as a general rule. I have seen occasionally striking examples of this where there are two separate ecoclimates under the same stone; the moist end inhabited by a colony of *M. rubra* and the dry end by a colony of *M. scabrinodis*. This illustration also demonstrates the difficulty one encounters in endeavouring to consider the ant fauna of an area as a whole.

The L.S.H. fauna in Ireland is occasionally dominated by *Tetramorium caespitum* L. as at Ballyteige Burrows, County Wexford. *Lasius niger*, however, is frequently found dominating this type of habitat, especially when the soil is very sandy, as at the North Dunes, Arklow, County Wicklow, where of the 37 colonies examined 29 were of this species, five of *F. fusca*, two of *L. flavus*, and one of *M. laevinodis*.

(b) *The medium soil humidity fauna.*

The second type of community, the M.S.H. fauna, is characterised by the occurrence of *L. flavus*, *M. laevinodis*, or *M. scabrinodis*, as dominants. This was well illustrated in the Rye Water Valley, County Kildare, where of 37 colonies counted 14 were of *M. scabrinodis*, 12 of *L. flavus*, 10 of *M. laevinodis*, and the remaining one of *F. fusca*.

Occasionally a community is found that combines both L.S.H. and

M.S.H. elements as, along the bank of the river Dodder at Old Bawn, County Dublin, where of 23 colonies examined 12 were *L. niger* and 11 *M. laevinodis*. At Roundstone, County Galway, there was a mixed community dominated by *L. flavus* (19) colonies, with *F. fusca* (5), *L. niger* (3), *M. rubra* (3), and *M. sabuleti* (1), as the other species.

(c) *The high soil humidity fauna.*

The third type or community, the H.S.H. fauna, is characterised by *M. rubra* and *Leptothorax acervorum* F. Occasionally the dominant species may be *L. fuliginosus* Latr., as at Glenmalure, County Wicklow, or *F. rufa*, as at Killarney, County Kerry (O'Rourke, 1950). *S. west-woodi* and *F. rufa*, our only stenotypic species, are found in no other type of community.

Discussion

It seems clear that this distribution pattern is determined to a large degree by the soil moisture content, which in its turn is responsible for the relative humidity of the nest itself. Weber (1942) showed that the great drought of 1930 considerably reduced the ant population in Manitoba, Saskatchewan, and North Dakota and that this reduction was still noticeable eleven years later in 1941. Little work has been done on the reactions of ants to moisture. Talbot (1934) seems to be the only author who has dealt with the problem experimentally. In a study of the ants of the Chicago region she came to the conclusion that moisture was the chief limiting factor in their distribution. To test this she subjected ants to a slow flow of air of specified dryness and temperature until they died. For the six species of *Formica* tested it was found that those that normally inhabit drier places were more resistant to dryness than those that normally inhabit places where the moisture supply was greater. However, no such differentiation was found for *Lasius* species. The ants of this genus do not forage on hot dry days and so do not face extremes of temperature and humidity to the extent encountered by the species of *Formica*. She also found that females lived much longer under dry conditions than did either males or workers from the same colonies. While this is to some extent because of their larger size, it is of definite survival value to the species, as the future of the incipient colony depends upon the ability of the fertilised female to withstand unfavourable conditions. The inter-specific differences are probably also adaptive, in that they are correlated with the ability of the species to penetrate habitats where the moisture supply may be very low at times.

In preliminary experiments on the workers of various Irish species it was found that at a Relative Humidity of 50% *M. rubra* workers survived 22 hours, *M. laevinodis* 26 hours, *M. scabrinodis* 48 hours, *F. fusca* 120 hours, and *L. flavus* 139 hours. Apart from the surprisingly high resistance of *L. flavus* to this rather low humidity the results are what might be expected from the type of community in which these species are normally found. At a high Relative Humidity (98%) *M. scabrinodis* survived for only 72 hours, by *M. laevinodis* for 118 hours, *M. rubra* for 432 hours, *F. fusca* for over 680 hours and *L. flavus*

for at least 1,200 hours. This indicates that *F. fusca* is a hardy species. This is further shown by the fact that under field conditions it exhibits a wide range of tolerance. The long survival time of *L. flavus* indicates that it too has a wide range of tolerance although its timidity in the field would not suggest it was very robust.

Although the Irish ant fauna cannot be considered as a purely underground one, it is apparent that the ecological distribution of the different species depends to a great extent on the relative humidity of the nest, which in its turn depends on the soil structure. It is to be hoped that others may be interested in undertaking further work on the correlation of physiological responses and field distribution.

References

- O'ROURKE, Fergus J. (1950). "The Distribution and General Ecology of the Irish Formicidae". Proc. R. Ir. Acad. 52 B, (9), 383-410.
TALBOT, Mary (1934). "The Distribution of Ant Species in the Chicago Area, with Reference to Ecological Factors and Physiological Toleration". Ecology 15, 416-438.
WEBER, N. A. (1942). "On Ant Nesting Habits in North Dakota in 1941 Compared with Drought Years". Canadian Ent. 74, (4), 61-62.
-

BOOK REVIEW.

The Middle-Thames Naturalist. The Annual Report of the Middle-Thames Natural History Society, 1950, No. 3, 8½ x 5½ in., 36 pp., 2 pls., 1951. Published by the Society and obtainable from the Sec.: Miss B. E. Adamson, 59 Wellington Street, Slough. Price 2s. 6d.

This third number of the Society's journal contains a report of Meetings for the year 1950. A survey of the geology of the Middle-Thames area with a folded map is the main feature.

The entomologist will find interesting material in the articles on parasites of birds and mammals in the area, notes on the insect fauna of birds nests, and a preliminary list of the Heteropterous bugs of the Middle-Thames area. The area covered by this list includes the well known Windsor Forest.

Other items in this number include notes on the Mandarin Duck and a detailed Bird report with a list of the more interesting plants found in Bucks and Berks. Finally there is a short report on the weather with details in chart form of Temperature, Rainfall, and Sunshine.

B. J. SOUTHGATE.
