BIRD PELLETS FROM A SOMERSET LEVELS NEOLITHIC TRACKWAY

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Summary

Four dense accumulations of insect remains associated with the timbers of Abbot's Way, a Neolithic trackway, are identified as bird pellets, possibly formed by a member of the crow family. Examination of the beetle content shows that although dominantly composed of peat bog species, the pellets do contain other species which require different habitats. The importance of this form of insect transport and its possible significance in archaeological deposits is discussed.

Introduction

The prehistoric trackways embedded in the peat of the Somerset Levels have been investigated by archaeologists for many years and current excavations are carried out by the Somerset Levels Project. The best known of these trackways, Abbot's Way, is a Neolithic structure which connects the 'islands' of Westhay and Burtle, dated by radiocarbon measurements of five samples to about 2,000bc (Coles and Coles, 1975). In July, 1974 a 33 m stretch of the trackway was excavated by the Somerset Levels Project. In addition to the careful archaeological techniques employed in recording and lifting the track (Coles and Orme, 1976), the timbers were subjected to dendrochronological analysis (Morgan, 1976), and associated peat was investigated for botanical (Beckett and Hibbert, 1976) and insect remains (Girling, 1976).

These latter studies were carried out on a peat monolith which included the raised bog deposit, containing the trackway, and successively earlier layers to the underlying clay horizon, 2.5 m below the surface.

During the excavation, archaeologists noticed occasional insect remains embedded in the peat. Common amongst these finds were the metallic legs and undersides of Geotrupes spp., Plateumaris elytra and large dipterous puparia. These constitute only the conspicously visible element, and a much more extensive fauna was washed out of samples collected at the trackway level. Inferences about the depositional environment are generally based upon the total fauna from a standard sampling unit and not upon these highly attractive but probably not representative species. An exception was made, however, with the discovery of four small insect clusters found on the trackway by the excavators. The density of insect remains, vastly exceeding numbers usually found in peat, indicated a special and possibly, artificial mechanism to account for such a concentration in a small area, which merited further investigation.

The first, and largest, of the clusters was found as the mat of Eriophorum peat overlying the track was peeled away from the timbers. The black, roughly circular accumulation, measuring about 5 cms. in diameter and partly draped across one of the timbers, was seen to consist of large numbers of insect remains. Three similar clusters were subsequently uncovered at trackway level. In each case the cluster and surrounding peat were collected intact for laboratory analysis.

When examined microsopically, the clusters were found to be composed of closely packed insect exoskeletons, dominantly of carabid beetles. In many of the beetles, the entire exoskeleton was present, the heads, pronota and elytra generally in their relative positions, but with the legs and smaller sclerites frequently packed into the thoracic cavity. The suggestion that these compact masses of insects originated as bird pellets was made by Dr. G.R. Coope of Birmingham University, on the basis of their content and, in particular, the close packing of the exoskeletons which is very characteristic in pellet material. Bird pellets are agglomerations of the undigested remains of food, commonly insect cuticle, seed husks, vertebrate bones and fur, which are regurgitated or 'cast' usually during the early morning prior to leaving the night's roost, and also during periods of intense feeding activity during the day. The bird pellet mechanism explains not only the high concentration of insects and their compaction but two other features which are evident from a study of the beetle species; the selection of larger numbers of a limited total of species, and the introduction into the acid peat bog deposit of beetles which do not live in such a habitat today.

Species List

Insect remains were extracted from the pellets first by hand sorting then by disaggregating the remaining peat in warm water, washing this on to a 300 micron sieve and sorting small amounts in alcohol under a binocular microscope. Most of the smaller beetles and ants were recovered this way. Identification was achieved by direct comparison of the insects with a modern reference collection. The nomenclature of the species list follows Lindroth (1974) for Carabidae and Kloet and Hincks (1945) for other Coleoptera. The numbers given represent the minimum numbers of individuals present based upon the highest number of any particular skeletal element.

NAME	PELLET NUMBER			
	1	2	3	4
HEMIPTERA				
Homoptera indet.	1	-	-	-
Hemiptera indet.	1	-	-	-
COLEOPTERA				
Carabidae				
Cychrus rostratus (L.)	-	-	1	-
Pterostichus diligens (Sturm)	103	48	21	5
P. minor (Gyll.)	10	-	-	-
P. nigrita (Payk.)	58	6	14	8
Agonum ericeti (Panz.)	38	29	7	5
Agonum viduum (Panz.)	1	-	-	-
Bradycellus ruficollis (Steph.)	1	-	-	-
Amara aenea (Deg.)	1	-	-	-
Cymindis vaporariorum (L.)	10	8	16	-
Hydrophilidae				
Helochares sp.	1	-	-	-
Enochrus sp.	1	-	-	-
Silphidae				
Silpha tristis Ill.	1	-	-	-
Phosphuga atrata (L.)	1	-	-	-
Staphylinidae				
Stenus sp.	1	-	-	-
Lathrobium terminatum (Grav.)	3	-	-	-
Ochthephilum fracticorne (Payk.)	1	-	-	1
Xantholinus linearis (Ol.) or longiventris Heer	2	-	-	-

Staphylinus stecorarius (Ol.)	-	5	-	-
Philonthus spp.	3	-	-	-
Tachyporus sp.	3	-	-	-
Gymnusa brevicollis (Payk.)	11	-	-	-
Drusilla canaliculata (F.)	1	-	-	-
Aloecharinae indet.	12	-	2	-
Elateridae				
Corymbites sjaelandicus (Mull.)	2	-	-	-
Sericus brunneus (L.)	2	-	-	-
Helodidae				
Gen. et spp. indet	4	-	2	-
Chrysomelidae				
Plateumaris discolor (Panz.)	1	-	-	-
Haltica sp.	-	-	-	-
DIPTERA				
Gen. et sp. indet.	1	-	-	-
HYMENOPTERA				
Parasitica	4	-	10	1
Formicidae	198	-	26	2
ARANAEDAE	10	-	1	-

Species of particular interest.

A notable occurrence in three of the pellets is Cymindis vaporariorum, represented by at least 34 individuals. Today, this species is found in Scotland, Wales and high ground in northern England. One possible explanation of this northwards contraction

of the species' range, that it has resulted from post-Neolithic climatic warming, finds no support from the rest of the fauna. C. vaporariorum is the only species in the pellets which is no longer found in southern England. Furthermore, the beetle fauna from the Abbot's Way peat monolith includes Oodes gracilis Villa and Anthicus gracilis Panz., central and southern European species which no longer live in this country, and which appear to indicate warmer temperatures than present. These species are only present near the base of the monolith, but their disappearance higher up is attributed to unavailability of habitat and there is no positive evidence of cooling at the trackway level. Analysis of assemblages from peats associated with later trackways should provide more climatic data, meanwhile, available evidence argues strongly against lower than present temperatures at about 2,000 bc.

If the whole European range of Cymindis vaporariorum is examined, its northerness in Britain appears anomalous. On the continent it is far more widespread, occurring over most of Scandinavia (Lindroth, 1960), north, central and east Germany (Reitter, 1908) and northern France (Jeannel, 1942). The species is a pronounced xerophile (Lindroth, 1949), preferring sand and gravel substrates and within its geographical range it is restricted to dry, acid biotopes such as the glacial end moraines of the north German plain. In the Somerset Levels, the sand islands of the Burtle Beds would have provided one of the rare habitats available to the species. The scarcity of such habitats in the south is probably the major feature determining the beetle's disappearance from this part of the country.

Another comparatively rare species present in the pellets is Agonum ericeti. This acid heath species has a disjunct distribution in Britain, again a reflection of the present deficiency of suitable habitats.

The bird, its diet and feeding range

About 60 British birds are known to produce pellets, (Landsborough-Thomson, 1964). Where no other information exists, it is difficult to identify birds from their pellets as these vary in size and shape. This is true for the Abbot's Way pellets, but several pointers exist to the possible identity of the bird or birds which produced them. The pellet contents can be compared with the known food of bird species. Assessment of bird diet can by achieved in several ways, such as examination of pellets (e.g. Chitty, 1938), direct observation of feeding and post-mortem examination of crop or stomach contents (Hartley, 1948). The object of many of these studies is to assess the role of birds in checking agriculturally useful and harmful insects (Ritchie, 1931). Newstead (1908) lists actual food records, mostly based upon post-mortem studies on large numbers of birds, and the Abbot's Way species list can be compared with this data. One feature of the Abbot's Way pellets is that recognisable food remains are wholly of insect origin. In water logged conditions which inhibit the decay of organic material, preserved insect remains are usually accompanied by seeds, and their absence from the pellets is likely to be a real feature, rather than incomplete preservation of the pellet constituents. The Neolithic trackway crosses a raised bog and it is possible that in such situations, edible vegetation would be restricted to seasonal berries.

(MB)

The pellets might have contained some plant material indistinguishable from the peat in which they were embedd ed, but it is unlikely that this was important in the diet. Beetles, dominantly of four or five carabid species, appear from the pellets to be the major food source.

The diet indicated by the Abbot's Way pellets would suit many birds, particularly those of the crow family. Newstead's records for corvids show that insects were important in several species, for instance, 127 individuals of the click -beetle Agriotes obscurus were found in the crop of a jay. Other species eaten by jays included carabids and chafers, and beetles were also found in the crops of jackdaws, rooks and carrion crows.

The general preservation of the beetles, i.e. very little fragmentation of the exoskeleton, is similar to that observed in modern crow pellets, whereas owls and birds of prey tear insects to pieces when feeding. The numbers of beetles varies in the form over 250 to 20, and the higher total would not be unexpected for a corvid. The selection of medium to large species suggests of birds of crow size.

The presence of nearly 200 ants in the largest pellet may indicate anting. Goodwin (1976) in discussing the habit, which is widespread amongst passerines and possibly common to all crows, states that once the defensive fluid has been applied to the plumage, the ant is usually discarded. This is always the case with jays and certain magpies. Other corvids, however, are known to eat the ants.

Analysis of the habitat preferences of the named species gives an indication of where the bird was feeding. Most of the twenty species would be found in a raised bog, and eleven of the species have been recorded at the Abbot's Way monolith at trackway level. It is therefore likely that the peat lands around the trackway were an important feeding ground. Two species, however Cymindis vaporariorum, the fourth commonest species and Amara aenea, would not tolerate such bog situations, but require dry habitats, perhaps provided by the Burtle Beds. The more eurytopic beetles in the pellets might have lived in either of these situations. This beetle habitat data suggestes that the birds ranged over a fairly wide area.

Significance of bird pellets in archaeological studies.

The presence on the trackway of the pellets suggests that the site may have been used for roosting and that perches were certainly available. Trees could provide suitable perches, but not only is there little evidence for much tree growth in the raised bog, it is likely that all wood along the course of the trackway would be used in its construction. Alternatively, the trackway itself might have provided perches in the form of the planking or the projecting pegs along the sides of the track, which projected up to 20-30 cm above the trackway timbers. Coles and Orme (loc. cit.) in discussing whether the trackway planks provided a walking surface or whether the structure was deliberately covered with vegetation, draw attention to signs of wear on the bark of the timbers, evidence for the former suggestion. The presence of one of the pellets actually draped across one of the timbers provides further evidence that the trackway was initially exposed.

Possibility of 'contamination' by pellet material.

Significant in the Abbot's Way pellets is the introduction into a peat bog deposit of beetles with markedly different habitat requirements from those of the immediate fauna. Kenward (1975, 1976) discussing the list of species from urban situations which are clearly extraneous to the area, cites bird pellets as a possible mechanism by which insects can become incorporated in such deposits. The Abbot's Way pellet were recognised in the field as unusual insect accumulations and have been made the subject of a special study. It is possible that pellets could unknowingly be collected in large peat samples but unlikely that these would go unnoticed during the faunal analysis. An insect rich pellet would result in an enormous increase in the number of insects retrieved from a peat sample, which in a series of samples, would stand out. Also, the characteristic packing of legs and occasionally, heads, into the thoracic cavities of the pellet does in fact survive the normal sample pretreatment and betrays the presence of pellets in the sample. Faunal differences between samples containing pellets and those without should be easily detectable. The higher insect numbers contributed by the pellets would not be mistaken for a general population increase because selected species only would be involved. If, as in the case of the Abbot's Way pellets, the birds were feeding away from the depositional site, environmentally anomalous species would occur sporadically and sometimes abundantly, but might not be present in adjacent samples, a fact that should not escape notice.

To summarise, whilst transport of insects by birds may be an important mechanism by which insects arrive in built-up situations, it is unlikely that occasional pellets in less artificial surrounding would go unnoticed or lead to erroneous results because they would probably represent a much smaller component of the total fauna. Furthermore, transport of this type is unlikely to involve great distances because of the reluctance of birds to undertake journeys with pellets on board. The existence of bird pellets in a deposit may, of course, be turned to advantage since they may provide evidence for neighbouring environments that may well pass unnoticed in the absence of these species from further afield.

Acknowledgements

I am grateful to members of the Somerset Levels Project for drawing my attention to the pellets, and particularly, to Dr J.M. Coles for useful comments on their archaeological significance. My special thanks are due to Dr G.R. Coope for much help in this project, and many useful criticisms of the manuscript.

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