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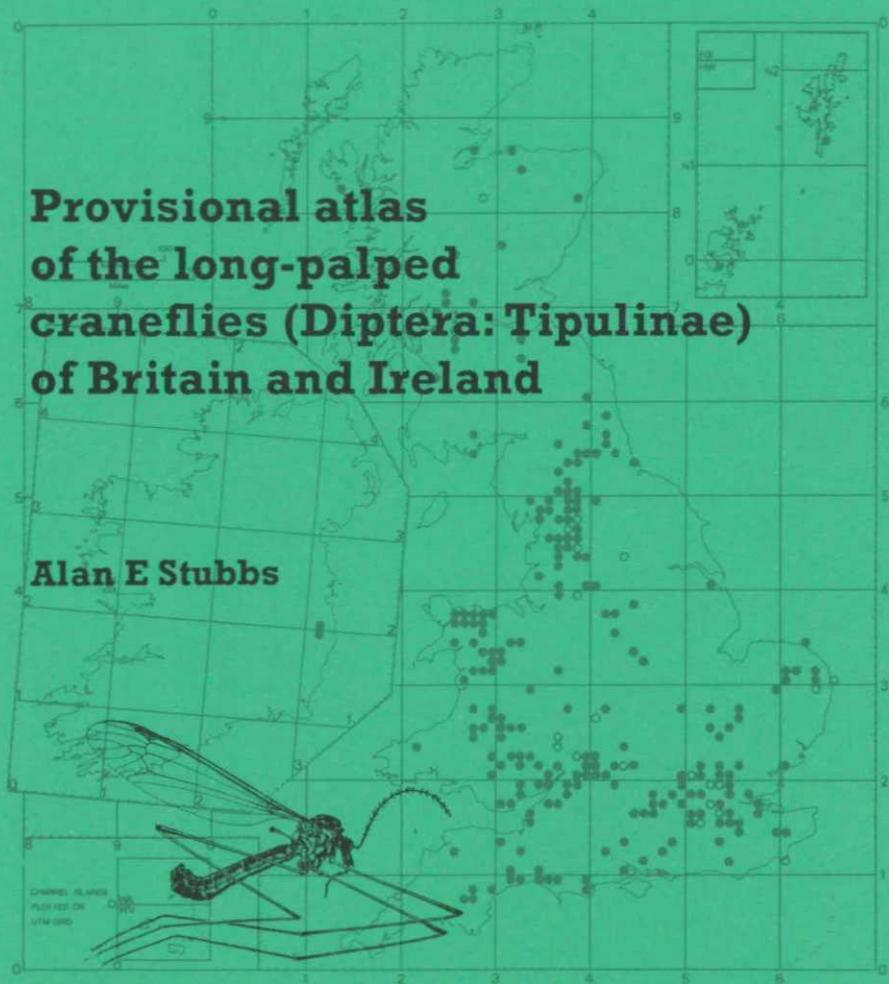
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Terrestrial  
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# Provisional atlas of the long-palped craneflies (Diptera: Tipulinae) of Britain and Ireland

Alan E Stubbs



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of the long-palped  
craneflies (Diptera: Tipulinae)  
of Britain and Ireland**

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This *Atlas* was edited for the  
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## PREFACE

The opportunity to publish an atlas is an important landmark for any scheme. It provides feedback to recorders, and hopefully acts as a further catalyst to them and, may it be said, to the scheme organiser.

The Crane-fly Recording Scheme is one of the longer standing schemes, currently including 342 confirmed species, and has remained very active in assembling a considerable number of records. Feedback has admittedly been limited, in part because I was preparing a book on British hoverflies, published in November 1983. In order to give new impetus to crane-fly recording, maps and text for provisional atlases to Tipulinae and Ptychopteridae were being prepared even while the hoverfly book was being completed. A draft of the Tipulinae text and bibliography together with hand plotted maps, were submitted to the Biological Records Centre for editing in 1984. Since there were substantial data, some with grid references to be completed and queries to be resolved, with a coverage of over 2000 10 km squares, such a task was a major undertaking.

Circumstances have been such that the atlas is eight field seasons out of date. Over this period the database has grown considerably. For instance, the Diptera Recording Schemes have had a further 17

major field meetings, plus over 25 shorter meetings, many of which yielded crane-fly data. These meetings have given a major boost to knowledge of the crane-fly fauna in many districts of Britain. The Nature Conservancy Council (NCC) survey of Welsh wetlands has provided much valuable data, and I have identified (and sexed) 37 293 specimens (plus another estimated 22 910 in bulk samples of *Sylvicola* species). A similar NCC survey of wetlands in East Anglia also involved thousands of identifications. Material and data have been coming in from many other sources, as well as from my own considerable recording. I have also recently re-examined the Leeds City Museum collection of over 2700 specimens. Irish data have also been increased, with active Irish recorders and substantial material being otherwise submitted to the Scheme.

It is difficult to estimate the proportion of new data to that mapped up to 1984 (and indeed there are still some earlier data to check and process). It would have been a major task to update the atlas manually, with the further delay in feedback to recorders. As I now have facilities to computerise the scheme data, time is better spent on that task rather than dissipating effort on a further round of manual plotting.

Despite the *Atlas* being far from up-to-date, it is a substantial advance on previous published information, both for the summaries of distribution and ecology, as well as for the bibliography. There are some aspects which have been updated.

The ecological notes on species have been revised in the light of new knowledge where appropriate. In the case of *Prionocera subsericornis*, *Nephrotoma sullingtonensis* and *N. aculeata*, where only pre-1960 records were available in 1983, recent records have been added. *Tipula invenusta* has been added to the British list very recently, so this has also been included.

The long awaited Palaearctic check list is due for publication in April 1992 so nomenclature has been brought right up-to-date. Although I have been consulted by the authors of the list, there are two species attributed to the British list

that remain doubtful and are omitted from this atlas, on the reasonable basis that I have not seen specimens. These are *Tipula (Vestiplex) excisa* Schum., a species very like *T. (V.) montana* (a specimen from Snowdon in the Natural History Museum which has conflicting characters is the closest potential candidate seen by me) and *Tipula (Yamatotipula) caesia* Schum, which has a strong dark costal wing margin. The latter is a grey species (rather than brown as in *T. (Y.) marginella*); on the continent I have seen *T. (Y.) caesia* beside small open streams on limestone.

Whilst naturally disappointed at the long delay in publication, my thanks go to BRC for seeing this *Provisional atlas* into print. I would especially like thank Paul Harding for editing the text and advising on the layout of the *Atlas*.

Alan E Stubbs

March 1992

## INTRODUCTION

The Tipulinae are known as the long-palped craneflies, forming a sub-family within the Tipulidae. Such a classification is traditional in Britain, but some European workers give family rank to what are regarded as sub-families in Britain.

Eighty-seven species have been found in Britain and Ireland, although there are no recent records for six of these species. They are for the most part large insects and as adults can form a conspicuous and major element of

the fauna of various habitats at certain times of year.

This *Atlas* summarises the state of knowledge about the distribution and ecology of the Tipulinae in Britain and Ireland on the basis of records which had been compiled by the Cranefly Recording Scheme up to December 1983, with minor updates. There is also a review of the study of craneflies and a bibliography of British and Irish literature. The Cranefly Recording Scheme covers Tipulidae, Trichoceridae, Anisopodidae and Ptychopteridae.

# NOMENCLATURE

The nomenclature used in this *Atlas* follows Kloet and Hincks (1976), with the few amendments which have been reported in *Antenna*. However, changes at the generic, sub-generic and specific levels have been made which follow Oosterbroek and Theowald (1992). The author is grateful to Dr P Oosterbroek for supplying a draft

copy of his *Palaeartic checklist of Tipulidae*.

The genus *Tipula* is large and has a worldwide distribution. For many years, it had been regarded as an entity by British and Irish workers. A reappraisal of the British/Irish list (Hutson & Vane-Wright 1969) led to acceptance of the use of sub-

Table 1. Nomenclatural changes in this *Atlas*

Nomenclature used in this <i>Atlas</i>	Nomenclature in Kloet & Hincks (1976)	Source of new name
<i>Ctenophora (Cnemoncosis) ornata</i>	<i>Ctenophora (Ctenophora) ornata</i>	1
<i>Ctenophora (Ctenophora) flaveolata</i>	<i>Ctenophora (Ctenophora) flaveolata</i>	1
<i>Ctenophora (Ctenophora) pectinicornis</i>	<i>Ctenophora (Ctenophora) pectinicornis</i>	1
<i>Dictenidia bimaculata</i>	<i>Ctenophora (Dictenidia bimaculata)</i>	1
<i>Tanyptera atrata</i>	<i>Ctenophora (Tanyptera) atrata</i>	1
<i>Tanyptera nigricornis</i>	<i>Ctenophora (Tanyptera) nigricornis</i>	1
<i>Nigrotipula nigra</i>	<i>Tipula (Nigrotipula) nigra</i>	1
<i>Tipula (Lunatipula) laetabilis</i>	Later addition (as <i>Tipula (Lunatipula) dilatata</i> )	2
<i>Tipula (Odonatisca) nodicornis</i>	<i>Tipula (Odonatisca) juncea</i>	1
<i>Tipula (Pterelachisus) pabulina</i>	<i>Tipula (Oreomyza) pabulina</i>	1
<i>Tipula (Pterelachisus) submarmorata</i>	<i>Tipula (Pterelachisus) meigeni</i>	1
<i>Tipula (Pterelachisus) truncorum</i>	<i>Tipula (Oreomyza) truncorum</i>	1
<i>Tipula (Savtshenkia) confusa</i>	<i>Tipula (Savtshenkia) marmorata</i>	1
<i>Tipula (Savtshenkia) invenusta</i>	Later addition	3
<i>Tipula (Tipula) subcunctans</i>	<i>Tipula (Tipula) czizeki</i>	1
<i>Tipula (Yamatotipula) marginella</i>	<i>Tipula (Yamatotipula) marginata</i>	1
<i>Tipula (Yamatotipula) pierrei</i>	<i>Tipula (Yamatotipula) solstitialis</i>	1

Sources of new names:

1 Oosterbroek and Theowald (1992); 2 Chandler and Stubbs (1977); 3 Hancock (1988)

genera, which provides further structure to an otherwise large and unwieldy grouping. This structure is further refined following Oosterbroek and Theowald.

Changes to the British/Irish checklist given in Kloet and Hincks (1976) are accommodated in this *Atlas*, but further changes, following Oosterbroek and Theowald (1992), have been implemented. In

particular, the sub-genera in the genus *Ctenophora* are elevated to the status of genera, with the new genus *Ctenophora* further subdivided into sub-genera. In the genus *Tipula*, the sub-genus *Oreomyza* is subsumed in the sub-genus *Pterelachisus* and the sub-genus *Nigrotipula* is elevated to the status of genus. Two species have been added to the list since 1976. These changes and additions are summarised in Table 1.

# HISTORY OF CRANEFLY RECORDING IN BRITAIN AND IRELAND

## Recording up to 1973

One of the earliest published lists of craneflies was that by Haliday (1833), incorporating 58 species of craneflies for a locality in Co Down, of which eight were described as new to science. For 100 years, this remained the longest published list for Ireland. However, there is a good base of published work on craneflies in Britain.

In his *Insecta Britannica*, Walker (1856) provided the first real baseline, including 129 Tipulidae, five Ptychopteridae, three Trichoceridae and two Anisopodidae. Today, this baseline would equate with a reasonably good (though not exceptional) county list, and represents about 40% of the currently known fauna. However, as many cranefly species are rare, it is clear that a reasonable foundation of collecting and knowledge had accumulated even at that early date.

The British cranefly fauna has been moderately well studied for the last century. Verrall did much to improve the British list, notably in his 1886–88 series of papers, and the key by Wingate (1906), accompanying a review of the fauna of Northumberland and Durham, must have been a standard reference work for many years.

Wood (1908) reviewed the fauna of Herefordshire and gave localities (unfortunately most other Victoria County Histories provide no more than a species list of doubtful value). Morley & Atmore (1915) provided a list for Norfolk and Suffolk. Carr (1916) included a list for Nottinghamshire, and Charbonnier (1915) a list for Somerset.

Glasgow was a focus of recording at the turn of the century. Ord (1900) published notes on the fauna of the Glasgow district, to be followed by Henderson's (1901a) list of 133 species for the Clyde area, an impressive contribution for the time, and between 1899 and 1916 Grimshaw published reviews on the Diptera fauna of several districts of Scotland. Cuthbertson continued the Glasgow-based tradition with a long series of papers in the 1920s.

The 1920s, and continuing into the 1930s, were an important period for work on craneflies. Haines (1926) gave a list for Dorset and the New Forest. Audcent (1929) published a list for Gloucestershire and Somerset and in 1932 published a new key to Tipulinae. Edwards became a frequent author in this period and did much to update the British list, an important landmark being an excellent

monograph on the short-palped craneflies (Edwards 1938b). Although he travelled widely, Edwards' home county of Hertfordshire was the source of much material; there is reference to a county list being in press, but this does not appear to have been published. Barnes (1924d, 1925) published a list for Caernarvonshire. Cheetham recorded actively for many years in Yorkshire (many small contributions in the *Naturalist*, *Hull*). Carr (1935) produced a supplement to his earlier (1916) review on the fauna of Nottinghamshire, and the Oxfordshire fauna was reviewed by Hamm (1926, 1939).

The 1940s, perhaps inevitably because of the War, was a sparse period, although Fordham (1945) produced a new Durham and Northumberland list, Hocken (1945) published a list for Suffolk, and Brown & Duncan (1949) gave a list for the Solway area of south-west Scotland. Audcent (1949–50) published a collated and revised list for Gloucestershire and Somerset.

The publication of new keys to Tipulidae by Coe in 1950, as part of a Royal Entomological Society Handbook, was an important stimulus to recording. It consolidated previous work, including some additions to the British list, and stimulated

subsequent publication of further additions, such as a revision of *Tasiocera* by Freeman (1951). The Handbook included entirely new keys to Tipulinae, Trichoceridae, Anisopodidae and Ptychopteridae, but most of the work was based on Edwards (1938b).

The 1950s and 1960s saw the issue of a list for Lancashire and Cheshire (Kidd & Brindle 1959) and several particularly good locality lists; Parmenter published a list for Bookham Common, Surrey (1950, 1960, 1966), Henson (1963) gave a list for Malham Tarn, Yorkshire, and Payne (1960–69) gave records for a number of districts, including Wales and the Lake District, and his 1969 paper consolidated a list for Essex. Feeney (1968) reported some records of Tipulinae from Ireland.

Up to the time of Coe (1950), the emphasis had been on the taxonomy and distribution of adult craneflies. However, in 1956, Chiswell published a detailed account of the larvae of the Tipulinae. This account was followed by a series of papers by Brindle (1957 to 1967, and with Bryce 1960) which led to his review of the larvae and pupae of the Tipulinae in 1960 and the remaining Tipulidae in 1967. Thus, by the end of the 1960s, there was a basic understanding of cranefly identification and biology at most life cycle stages.

Against this background, studies on crane-fly ecology came to the fore. Although Barnes (1925) had published an early paper with an ecological approach and many of Cuthbertson's papers in the 1920s had an ecological content, the first modern ecological paper (Coulson 1959) was on a high-altitude fauna in northern England, to be followed by an autecological paper (Coulson 1962). In the early 1960s, Laughlin, in part with Coggins and Milne, published studies on the ecology of *Tipula oleracea* and *T. paludosa*. Freeman (1964, 1967, 1968, and with Adams 1972) investigated the crane-fly fauna of several southern lowland habitats. Hadley (1969, 1971a, b) investigated the ecology of *Molophilus ater*. This sequence of research papers reinforced earlier indications that crane-flies are good subjects for ecological studies.

### **Crane-fly Recording Scheme (1973 onwards)**

With this basis of taxonomic, ecological and distributional knowledge, the Crane-fly Recording Scheme was officially launched in 1973, in collaboration with the Biological Records Centre (BRC), to cover Tipulidae, Trichoceridae, Anisopodidae (the Tipuloidea as defined at that time), and Ptychopteridae. A pilot study on Ptychopteridae had already been published (Stubbs 1972a) which demonstrated that such a scheme was a viable proposition. The

organisers of the Scheme were Dr R I Vane-Wright, A M Hutson and A E Stubbs.

It was foreseen that, even if only a few specialists were to pool their information, this would lead to a better understanding of the distribution and ecology of the fauna of Britain and Ireland. There was an early setback when Dr B E Freeman left Britain, R M Payne ceased to work on crane-flies on leaving Wales, and A Brindle largely transferred his attention to Oriental earwigs. However, the Crane-fly Recording Scheme attracted new support, mostly from people prepared to collect, rather than identify, crane-flies. Indoor meetings, field meetings and a newsletter helped promote recording. In the mid 1970s, Dr R I Vane-Wright and A M Hutson stepped down as organisers because their museum work was by then well set in other directions.

The Scheme has substantially consolidated and improved upon knowledge of the British crane-fly fauna, but there is still a long way to go. Up to 1984, 15 species had been added to the British fauna, four of which were new to science at the time, and including one tipuline – *Tipula laetabilis*. Some of these additions have been published (Chandler & Stubbs 1977; Hutson & Stubbs 1974; Hutson & Vane-Wright 1969; Stubbs 1977; Stubbs & Chandler

1973; Stubbs & Little 1974). More recently, *Tipula invenusta* has been added (Hancock 1988) and several more Limoniinae have been discovered.

Though often not directly related to the Recording Scheme, a succession of papers appeared in the literature in the 1970s. Ecological research studies continued (Butterfield 1973; Dobson 1973 1974a, b; Service 1973; Coulson *et al.* 1976), as well as a few site studies (Stubbs 1974b, 1976; Luff & Selman 1977), and there is a preliminary published list for Lincolnshire (Stubbs 1974c). Perhaps the most significant new line of research has been that of Carter (1971–78) and his colleagues on the viruses and other infections of crane-fly larvae; see

also the thesis by P L Sherlock (1973) on crane-fly pathogens.

This review has not attempted to include every paper, but provides a general perspective of the history of recording and study of crane-flies in Britain. However, the published work is only a small part of the considerable body of information available, as many people have placed specimens in museums. Yerbury, for example, collected crane-flies widely at the turn of the century, but he published little about them. There are many such unpublished and poorly known contributions to the study of the British crane-fly fauna.

For a fuller account of the early development of the Recording Scheme, see Stubbs (1990).

## NATURE OF THE CRANEFLY DATA

As at the end of 1983, records data had been manually processed for 2012 10 kilometre squares. This included 1905 10 km squares for which data were available for the 'recent' (1960 onwards) period. For Tipulinae the total is 1787, with 1690 recent squares.

It is probable that about 99% of the identifications have been made or checked by the Scheme organisers, and well over 95% by the present author. It is unusual for a scheme covering a large group (about 342 species) to be in this position. Thus, there has been stringent control over the acceptance of other data, ensuring that those who submit records have the necessary experience in identification. Virtually all data are based upon adult insects; even with the well-studied Tipulinae, very few people have the experience to identify larvae or pupae, and larval taxonomy in many genera of craneflies is weak.

There is a substantial body of further information in hand which still needs processing, and many old records require grid references to be clarified. So far it has been difficult to find the opportunity to check the scattered collections in museums. The literature records also need abstracting on a larger scale (very few are on the present maps). Most

collections have been found to contain errors in identification, especially among the smaller short-palped craneflies. Mistakes are frequently made with the Tipulinae, especially with female specimens. Literature and museum card index records must be treated with caution.

Despite the reservations, the records from cranefly specialists and others have made an invaluable contribution. For instance, the extensive records of A Brindle have made parts of Lancashire one of the best-recorded districts. Over the years, many people have submitted samples in envelopes and even people who had virtually no knowledge of craneflies have had great success – two of the first three records of *Tipula laetabilis* and the only two specimens of *Dicranoptycha fuscescens* were gained in this way. Knowledge of the fauna of parts of Denbighshire is strong because of the material submitted by J M Brummit. Material has also been identified from over 30 Rothamsted light traps operating in various parts of Britain.

The great bulk of the data arise from samples collected in the field by the author. At one time about 250 sites in 200 10 km squares were being sampled each year.

The Recording Scheme field meetings, of which there have been over 20 in various parts of England, Scotland and Wales, have given a major boost, with over 100 species of craneflies being recorded in a week in several cases. Perhaps the most successful effort was made by a group based over a

fortnight in Dundee and Ballater, when 100 sites in 56 10 km squares were sampled.

The maps presented in this *Atlas* were plotted by hand, pending computerisation of data using RECORDER and eventual transfer to the Biological Records Centre.

# THE ECOLOGY AND HABITAT ASSOCIATIONS OF TIPULINAE

Adult Tipulinae, as with all Tipulidae, can be found in all months between March and early November. Most species display a strongly seasonal period of emergence. Normally there is only one generation a year, but some species are multi-brooded. The Tipulinae often display peaks of relatively short emergence, a strategy which may minimise the impact of predation and maximise the chances of mating.

Because of these emergence peaks, there is an element of chance in the recorder being at the right place at the right time to record individual species. Thus, there has sometimes been difficulty in gaining a good national distribution picture, especially for the spring-emerging Tipulinae. Altitude, latitude and local climatic influences result in considerable local variation in emergence dates.

On moorland there is a marked peak of emergence in the spring and, as these are large and nutritious insects, many birds time their nesting to this major food resource. A visit to moorland in summer can be almost bereft of Tipulinae, but another major peak occurs in the autumn.

The great majority of craneflies are wetland species, though some are

associated with dry soils.

Woodland districts, especially those with streams and flushes, are particularly favourable. In lowland areas there tends to be more of an even spread of species of Tipulinae throughout the season, with a good number of species on the wing in mid-summer; however, even here, spring and autumn peaks can be apparent. The habitat associations of British Tipulinae are summarised in Table 2.

Nine species of Tipulinae breed solely in dead wood. Some of these, especially most *Ctenophora* species (and related genera), are uncommon because sites with a continuity of large dead timber are now rare in the British countryside.

The site with the largest recorded number of species of Tipulidae is Wisley Common in Surrey, with 101 species, including 37 Tipulinae. With its mosaic of heath, sandy woods and wetlands, this site is possibly exceptional, but a site with a good mixture of habitats in the lowlands ought to reach 70–80 species of craneflies. By comparison, Coulson (1959) recorded 66 species of Tipulidae at Moor House National Nature Reserve, high in the Pennines, of which 20 were Tipulinae. Thus, uplands are not necessarily poor in terms of numbers of species.

Table 2. Habitat associations

	Mountains	Bog and boggy flushes	Heath	Dunes	Dead wood	Dry and seasonally moist woodland	Wet woodland and carr	River banks	Streams	Wet rock faces	Edges of ditches, ponds and lakes	Fen	Wet meadow (often with <i>Juncus</i> , includes flushed meadows)	Dry grassland	Hedgerows	Gardens and waste ground
<i>Ctenophora (C.) flaveolata</i>																
<i>C. (C.) ornata</i>					•											
<i>C. (C.) pectinicornis</i>					•											
<i>Dictenidia bimaculata</i>					•											
<i>Dolichopeza albipes</i>									•							
<i>Nephrotoma aculeata</i>																
<i>N. analis</i>								•								
<i>N. appendiculata</i>																
<i>N. cornicina</i>														•		
<i>N. crocata</i>			•									•				
<i>N. dorsalis</i>																
<i>N. flavescens</i>			•	•										•		
<i>N. flavipalpis</i>						•										
<i>N. guestfalica</i>								•								
<i>N. lunulicornis</i>								•								
<i>N. quadrifarea</i>						•										
<i>N. quadristriata</i>				•												
<i>N. scurra</i>			•	•												
<i>N. submaculosa</i>				•				•								
<i>N. sullingtonensis</i>			•													
<i>Nigrotipula nigra</i>											•	•				
<i>Prionocera pubescens</i>		•														
<i>P. subserricornis</i>							•									
<i>P. turcica</i>		•														
<i>Tanyptera atrata</i>					•											
<i>T. nigricornis</i>					•											
<i>Tipula (A.) fulvipennis</i>							•									
<i>T. (A.) luna</i>							•						•			
<i>T. (A.) maxima</i>							•									

Table 2. Habitat associations (continued)

	Mountains	Bog and boggy flushes	Heath	Dunes	Dead wood	Dry and seasonally moist woodland	Wet woodland and carr	River banks	Streams	Wet rock faces	Edges of ditches, ponds and lakes	Fen	Wet meadow (often with <i>Juncus</i> ; includes flushed meadows)	Dry grassland	Hedgerows	Gardens and waste ground
<i>T. (A.) vittata</i>									•							
<i>T. (B.) unca</i>																
<i>T. (D.) flavolineata</i>					•											
<i>T. (L.) alpina</i>						•										
<i>T. (L.) bistilata</i>								•								
<i>T. (L.) cava</i>			•			•										
<i>T. (L.) fascipennis</i>						•										
<i>T. (L.) helvola</i>						•										
<i>T. (L.) laetabilis</i>						•		•								
<i>T. (L.) livida</i>						•										
<i>T. (L.) lunata</i>						•						•				
<i>T. (L.) peliostigma</i>						•									•	
<i>T. (L.) selene</i>					•		•					•				
<i>T. (L.) vernalis</i>																
<i>T. (M.) sarajevensis</i>					•	•								•		
<i>T. (M.) siebkei</i>					•	•										
<i>T. (O.) nodicornis</i>				•				•								
<i>T. (P.) luteipennis</i>		•											•			
<i>T. (P.) melanoceros</i>		•														
<i>T. (P.) irrorata</i>					•											
<i>T. (P.) luridirostris</i>						•										
<i>T. (P.) mutila</i>						•										
<i>T. (P.) pabulina</i>						•										
<i>T. (P.) pseudovariipennis</i>						•										
<i>T. (P.) submarmorata</i>						•										
<i>T. (P.) truncorum</i>						•										
<i>T. (P.) variipennis</i>						•										
<i>T. (S.) alpium</i>	•															
<i>T. (S.) cheethami</i>																

Table 2. Habitat associations (continued)

	Mountains	Bog and boggy flushes	Heath	Dunes	Dead wood	Dry and seasonally moist woodland	Wet woodland and carr	River banks	Streams	Wet rock faces	Edges of ditches, ponds and lakes	Fen	Wet meadow (often with <i>Juncus</i> , includes flushed meadows)	Dry grassland	Hedgerows	Gardens and waste ground
<i>T. (S.) confusa</i>						•										
<i>T. (S.) gimmerthali</i>	•	•														•
<i>T. (S.) grisescens</i>		•														
<i>T. (S.) holoptera</i>		•														
<i>T. (S.) invenusta</i>	•												•			
<i>T. (S.) limbata</i>							•									
<i>T. (S.) obsoleta</i>																
<i>T. (S.) pagana</i>														•		
<i>T. (S.) rufina</i>														•		
<i>T. (S.) signata</i>							•									•
<i>T. (S.) staegeri</i>							•									•
<i>T. (S.) subnodicornis</i>		•														
<i>T. (S.) varicornis</i>							•									
<i>T. (S.) yerburyi</i>							•									
<i>T. (T.) oleracea</i>							•				•		•			
<i>T. (T.) paludosa</i>												•		•		
<i>T. (T.) subcunctans</i>													•	•		
<i>T. (V.) hortorum</i>						•										
<i>T. (V.) montana</i>	•															
<i>T. (V.) nubeculosa</i>						•										
<i>T. (V.) scripta</i>						•										
<i>T. (Y.) coerulea</i>								•								
<i>T. (Y.) couckeii</i>								•								
<i>T. (Y.) lateralis</i>								•								
<i>T. (Y.) marginella</i>									•			•				
<i>T. (Y.) montium</i>							•									
<i>T. (Y.) pierrei</i>										•						
<i>T. (Y.) pruinosa</i>						•							•			

Single site visits in ideal crane-fly habitat can produce at least 30 species of Tipulidae, on rare occasions the number rising to over 40 species, or even over 60 species in June. In mid to late May in the south (early to mid-June in the Scottish Highlands), a productive site can yield ten or more species of Tipulinae in one visit.

There is much to learn about crane-fly ecology as regards habitat, especially in the early stages, but there are also some intriguing biological points that deserve attention. There is only one observation of Tipulinae (*Tipula lunata*) males swarming (Perry 1974), an activity which is well known in the short-palped crane-flies. It is possible that this was a freak observation of an activity which occurs unnoticed at night. The adult has functional mouth parts, as evidenced by the occasional

observations of feeding at flowers (and at lepidopterist's sugar), but flower feeding is apparently rare, although it can occur under a wide range of conditions, even in intense hot sunlight which crane-flies normally avoid. Why do crane-flies have long legs (see Stubbs 1972b)? There are various observations of ovipositing, or apparent ovipositing, and it is known that some species sink their abdomen right into the ground for this purpose at night (Hemmingen 1952) – exactly how general are such habits remains unknown. Much has to be learned about parasites in the early stages as most studies relate to only a few grassland species, but it is known for instance that the tachinid fly *Trichopareia seria* seems to be specific to *Ctenophora* larvae. Unidentified parasitic larvae have occasionally been found in the swollen abdomens of adult Tipulinae.

## SPECIES STATUS IN BRITAIN

In common with other biological groups, invertebrates are now being taken into account when evaluating the importance of sites for conservation purposes.

The Wildlife and Countryside Act 1981 requires a statement of the biological (or geological) interest of statutory Sites of Special Scientific Interest (SSSI) and the listing of damaging operations which may affect that interest. In this requirement there is a need for the clear definition of criteria for site assessment, taking account of the presence of threatened and nationally scarce species.

The *British red data book for insects* was published by the Nature Conservancy Council in 1987 (Shirt 1987), with definition of endangered (RDB 1), vulnerable (RDB 2), and rare (RDB 3) categories. Such categories take into account threats to the survival of species and the rarity of species. The RDB status of some species has undergone revision since 1987: Table 3 includes the RDB status given by Shirt (1987) and the revised status proposed by Falk (1991).

The next rarest group is those species which, though not *Red data book* category, only occur in (or on current judgement are likely to occur in) up to 100 10 km squares. Such species are termed 'notable'

(N) or 'nationally scarce' (see Falk 1991). There are about 3000 10 km squares in Britain, so these species are of very restricted occurrence.

A further useful category is 'local' (L), here defined as those species likely to occur in not more than 500 10 km squares. Because coverage is incomplete, this definition is based on extrapolation from the known distribution. The category is not in formal usage, but it helps focus attention on species which are not common and widespread in Britain as a whole.

This *Provisional atlas* does not provide an absolute basis for defining the status of species. Many literature and other records are not on the maps, but they have been taken into account in the status categories. In many cases, it is possible to give a reasonable view of the likely present status of species, taking account of the level of the recording effort in recent years and the knowledge of ecology in relation to national availability of habitat. Species with specialised and restricted habitat requirements are clearly not going to be widespread. There are several species which have been found on only one or a few occasions, and these are therefore regarded as rarities. The degree of risk to the survival of habitat is an important part of the assessment of

Table 3. Species status in Britain

Map no.	Species	Shirt (1987)	Status Falk (1991)	'Local' Species
3	<i>Ctenophora (Cnemoncosis) ornata</i>	RDB 1	RDB 1	
4	<i>Ctenophora (Ctenophora) flaveolata</i>	RDB 1	RDB 2	
5	<i>Ctenophora (Ctenophora) pectinicornis</i>		N	
6	<i>Dictenidia bimaculata</i>			L
8	<i>Nephrotoma aculeata</i>	RDB 3	RDB 2	
9	<i>Nephrotoma analis</i>			L
11	<i>Nephrotoma cornicina</i>			L
12	<i>Nephrotoma crocata</i>	RDB 3	RDB 3	
13	<i>Nephrotoma dorsalis</i>		N	
16	<i>Nephrotoma guestfalica</i>			L
17	<i>Nephrotoma lunulicornis</i>	RDB 3	N	
19	<i>Nephrotoma quadristriata</i>	RDB 3	RDB 2	
20	<i>Nephrotoma scurra</i>			L
22	<i>Nephrotoma sullingtonensis</i>	RDB 1	RDB 1	
23	<i>Nigrotipula nigra</i>			L
24	<i>Prionocera pubescens</i>	RDB 1	RDB 2	
25	<i>Prionocera subsericornis</i>	RDB 1	RDB 2	
27	<i>Tanyptera atrata</i>	RDB 2	N	
28	<i>Tanyptera nigricornis</i>	RDB 3	RDB 3	
32	<i>Tipula (Acutipula) vittata</i>			L
34	<i>Tipula (Dendrotipula) flavolineata</i>			L
35	<i>Tipula (Lindneria) bistilata</i>	RDB 2	RDB 2	
36	<i>Tipula (Lunatipula) alpina</i>	RDB 3	RDB 3	
39	<i>Tipula (Lunatipula) helvola</i>		N	
40	<i>Tipula (Lunatipula) laetabilis</i>	RDB 2	RDB 2	
41	<i>Tipula (Lunatipula) livida</i>	RDB 3	N	
43	<i>Tipula (Lunatipula) peliostigma</i>	RDB 3	N	
44	<i>Tipula (Lunatipula) selene</i>	RDB 2	RDB 3	
46	<i>Tipula (Mediotipula) sarajevensis</i>	RDB 1	RDB 1	
47	<i>Tipula (Mediotipula) siebkei</i>	RDB 1	RDB 1	
48	<i>Tipula (Odonatisca) nodicornis</i>	RDB 3	RDB 3	
50	<i>Tipula (Platytipula) melanoceros</i>			L
52	<i>Tipula (Pterelachisus) luridirostris</i>	RDB 3	RDB 3	
53	<i>Tipula (Pterelachisus) mutila</i>	RDB 1	RDB 1	
54	<i>Tipula (Pterelachisus) pabulina</i>			L
55	<i>Tipula (Pterelachisus) pseudovaripennis</i>		N	

Table 3. Species status in Britain (continued)

Map no.	Species	Shirt (1987)	Status Falk (1991)	'Local' Species
57	<i>Tipula (Pterelachisus) truncorum</i>	RDB 3	N	
60	<i>Tipula (Savtschenkia) cheethami</i>	RDB 3	N	
62	<i>Tipula (Savtschenkia) gimmerthali</i>	RDB 3	RDB 3	
63	<i>Tipula (Savtschenkia) grisescens</i>	RDB 3	RDB 3	
64	<i>Tipula (Savtschenkia) holoptera</i>	RDB 3	N	
66	<i>Tipula (Savtschenkia) limbata</i>	RDB 1	RDB 3	
70	<i>Tipula (Savtschenkia) serrulifera</i>	RDB 3	RDB 1	
75	<i>Tipula (Schummelia) yerburyi</i>		N	
79	<i>Tipula (Vestiplex) hortorum</i>	RDB 3	RDB 3	
80	<i>Tipula (Vestiplex) montana</i>		L	
81	<i>Tipula (Vestiplex) nubeculosa</i>		N	
83	<i>Tipula (Yamatotipula) coeruleascens</i>	RDB 3	RDB 3	
86	<i>Tipula (Yamatotipula) marginella</i>	RDB 3	RDB 3	
88	<i>Tipula (Yamatotipula) pierrei</i>			L
89	<i>Tipula (Yamatotipula) pruinosa</i>			L

species as *Red data book* candidates.

The extent of recording in Ireland is uneven so that the status of species cannot be assessed with any confidence.

### Craneflies as habitat indicators

Many crane-fly species, but by no means all, are useful in assessing habitat quality. Apart from individual species with fairly exacting ecological requirements, the richness of species characteristic of

a habitat type is a useful indicator of habitat quality.

As an example, the best ancient woodland indicator species among the scarcer Tipulinae are as follows: *Ctenophora flaveolata*, *C. ornata*, *C. pectinicornis*, *Tipula (Dendrotipula) flavolineata*, *T. (Lunatipula) alpina*, *T. (Mediotipula) sarajevensis*, *T. (M.) siebkei*, *T. (Pterelachisus) pabulina*, *T. (P.) luridirostris*, *T. (P.) mutila*, *T. (P.) pseudo-varipennis*, *T. (Vestiplex) hortorum* and *T. (V.) nubeculosa*.

## FUTURE RECORDING

### Identification

The key by Coe (1951) is not particularly easy to use, as far as Tipulinae are concerned. This is unfortunate because male Tipulinae are usually easy to identify. The external genitalia, as well as body and wing features, provide plenty of good characters on what are relatively large insects. Field identification characters are easy to discern, by eye or with a hand lens.

For anyone wishing to identify their own material, it is initially better to concentrate on males. Stubbs (1972-74) gave an identification guide. The Recording Scheme can also provide, on request, a key to *Nephrotoma* by Dr P Oosterbroek and a set of illustrations to the male genitalia of British Tipulinae. New keys are being prepared.

### Finding craneflies

In practice, it should not be too difficult to recognise the 30 or so commoner species; most have distinctive characters. Many of the scarcer species may be readily found by collecting at suitable sites and habitats, but some species take perseverance to find (even now the author has not personally found ten species as adults in Britain, although he has found nearly all the other British craneflies). It is likely that a few further Tipulinae still await discovery.

Craneflies are most active at dusk and at night, but they can also be active during the day, especially if conditions are warm, overcast and calm. Conversely, a cold morning, the hottest sunny conditions during a drought, or a strong wind will cause these insects to lie low. It is usually possible to find craneflies quite readily on most days in season. Craneflies are often easily obtained on dull days, or in the evening, when many other insects, such as hoverflies, are difficult to obtain.

### Catching craneflies

The easiest way to catch craneflies is by sweeping herbage, especially in damp shaded places. Tipulinae are large and many species can be obtained by gently disturbing vegetation and catching specimens as they fly up, or on watching where they land after a short flight. However, many species can be very active and remarkably elusive if stalked. Some species sit on tree trunks or on dead wood. The males of a few species are most easily located as they fly up tree trunks or coppice stems looking for females. If a wood has little ground flora, clumps of ferns may shelter adults or it may be necessary to sweep tree foliage (especially the dense foliage of yew (*Taxus baccata*) and conifers, if present). In late afternoon, woodland species often congregate on the sunny edge within the dappled light, both

on herbage and in the foliage of trees and shrubs. Some woodland species of *Tipula*, especially the autumn-emerging ones, tend to congregate on the foliage along woodland edges, from which they may be disturbed and netted in flight as they are silhouetted against the sky. In the evening, even well before dusk, species of open habitats can become active and easy to find.

### **Submitting and preserving specimens**

The Scheme will continue to value the submission of samples in envelopes. It does not matter if legs fall off; for the purpose of gaining records, material does not have to be in perfect condition. It is preferable to have all the specimens from a site and date in one envelope (50 or even 100 flies together), but they must be dried out properly to prevent mould developing. It is useful to have a brief habitat description, and it can be worthwhile to collect separate samples from different habitats within a site. Envelopes should be kept in a container which cannot be crushed. Selected voucher specimens can be sent back to recorders on request.

Those running light traps will often be in a position to gain useful records (*Tipula truncorum* and other apparently uncommon species have been obtained this way). If a trap is run regularly at a given site, it will be sufficient to keep one envelope (or box) for the year or separated into

monthly samples.

Craneflies do not necessarily look tidy in collections. There are frequent complaints that the legs fall off and they take up too much space. The best procedure is to place selected specimens neatly into envelopes with the wings held together above the thorax, folding up the legs if possible. One has to accept the occasional loss of a leg. Transparent envelopes designed for photographic negatives are ideal. When dry, it is a simple matter to point mount the specimen on a cardboard triangle held with a pin (see Stubbs & Chandler 1978). Alternatively, the specimen may be side-pinned in the usual manner, with other pins to hold the wings and legs in position until dry.

### **Information needed with specimens**

It is important to give a grid reference if at all possible, preferably a six-figure one, viz: 52/281362. The vice-county (or modern county) and a locality name (especially if a conservation site) from an Ordnance Survey map should be stated. Errors in giving grid references are frequent, so locality names enable grid references to be checked. Also required are the date (or at least the year), the name of the recorder/collector, and a note of the habitat.

### **Purposes of recording**

It must be emphasised that the Recording Scheme is not solely

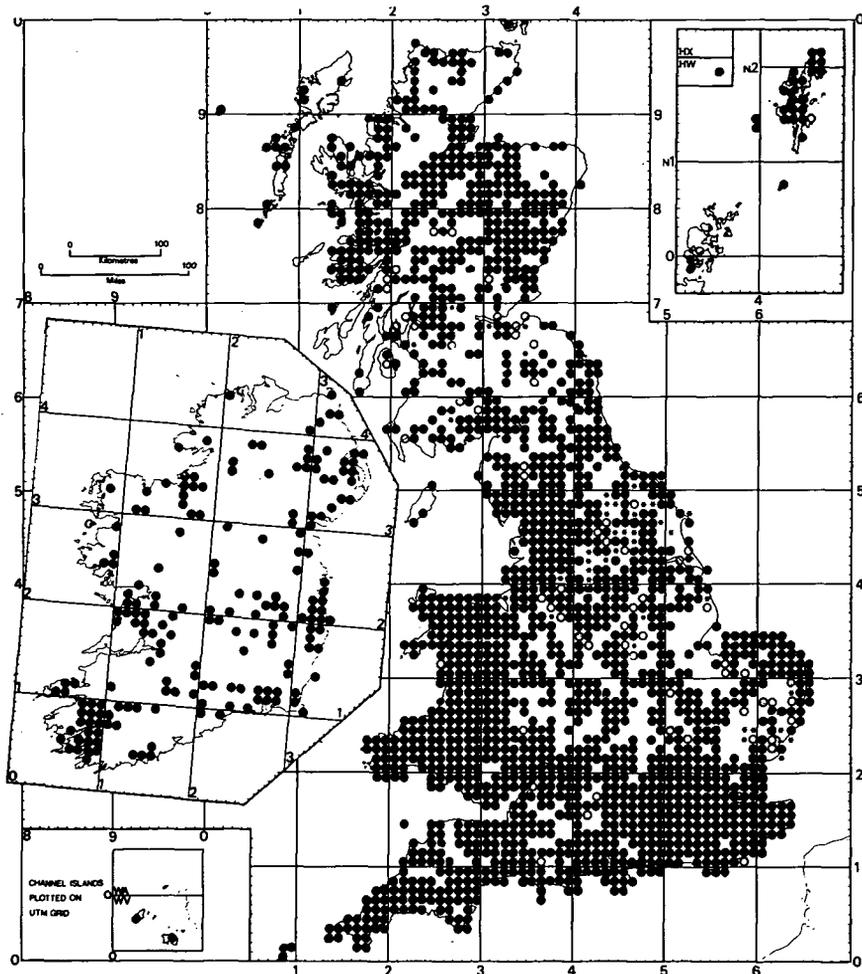
concerned with the production of 10 km square distribution maps. Such maps are simply a convenient visual way of summarising data and, at the same time, they act as an index to the data. Maps are only meaningful if the underlying information and understanding of the ecology of species are adequate. Thus, all aspects of ecological/biological information are relevant, as is the continuing improvement of the taxonomic information on which identifications are based. Apart from the value of a data bank for research (using that term in its widest sense, from naturalist's observations to academic studies), such data are relevant to conservation in terms of knowledge of sites containing rare species or notable assemblages of species. Many crane fly species have restricted ecological associations and therefore provide

useful indicators of habitat quality aiding ecological description.

This *Atlas* will hopefully act as a spur to further recording. The maps illustrate that there are major gaps in recording, even for common species. In particular, the early spring-emerging fauna is under-recorded. Only at a more advanced stage in the Recording Scheme will it become apparent whether some are real gaps in distribution. Apart from the need for continued field sampling, there remain the tasks of checking museum collections and abstracting more literature records. The task of editing the existing records will be continued with the aim of computerising all data, enabling the production of maps for the rest of the Tipulidae, the Trichoceridae and the Anisopodidae. The Ptychopteridae are the subject of a BRC *Atlas* to be published in 1993.

# DISTRIBUTION MAPS AND SPECIES ACCOUNTS

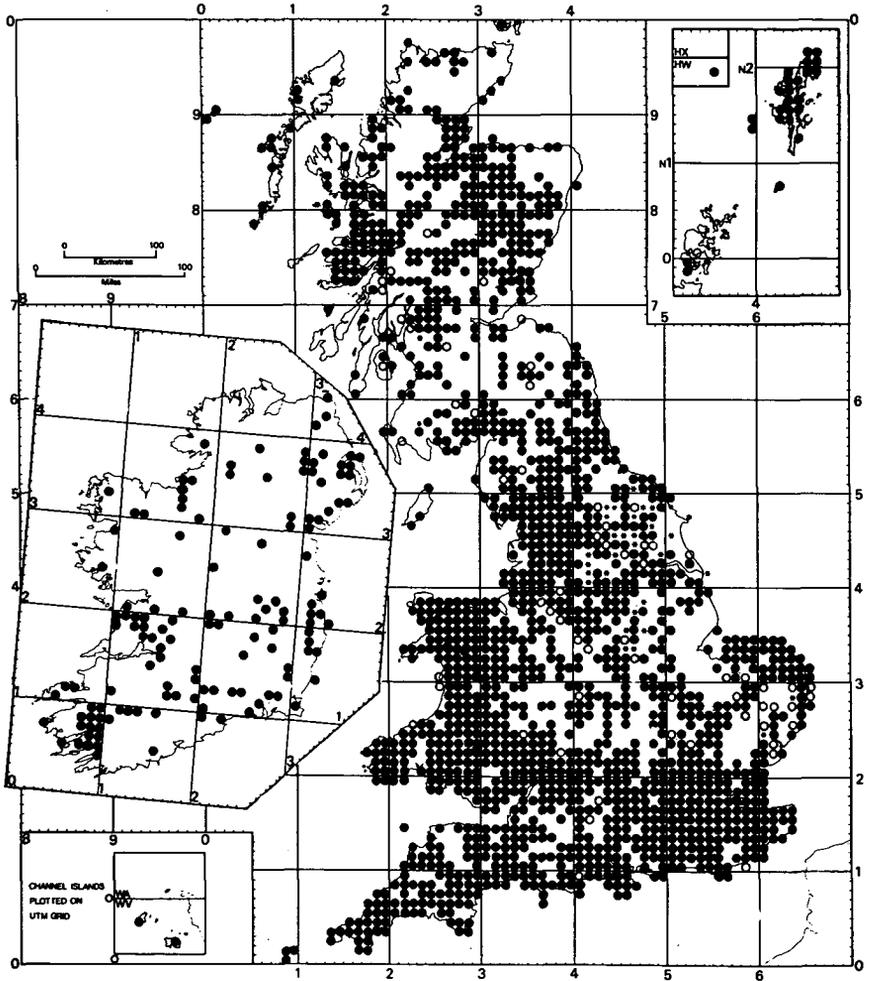
## 1 Overall cranefly coverage



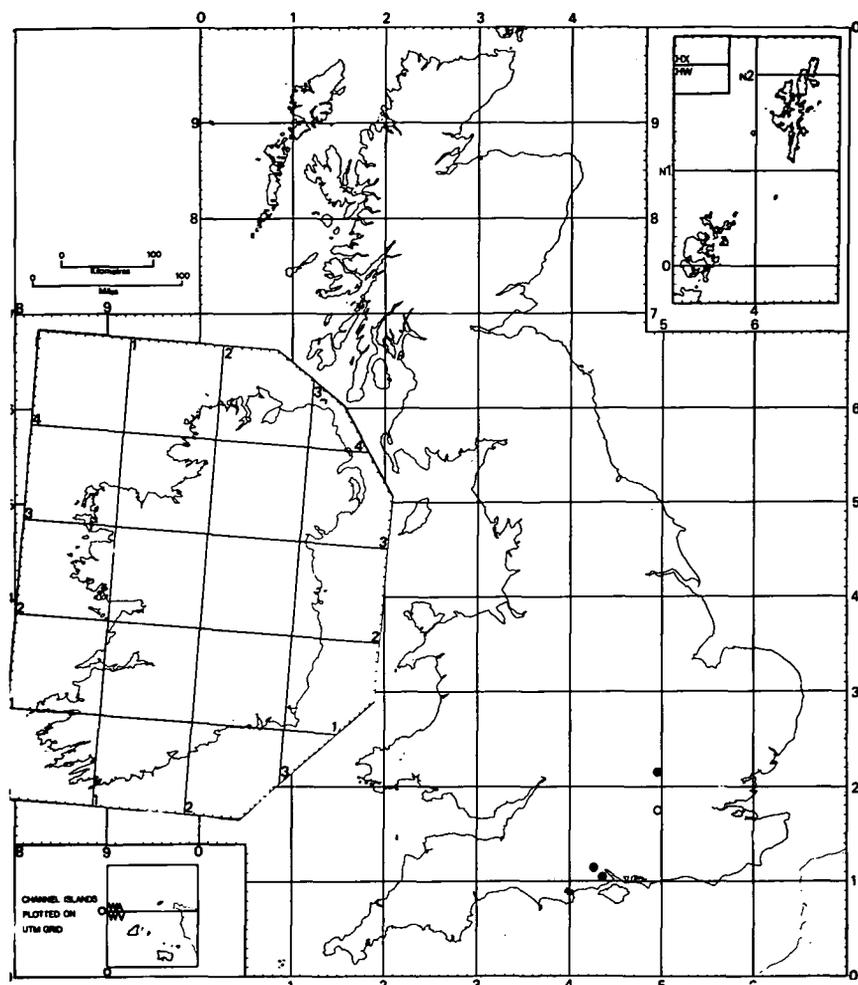
### Caption to all maps

- \* Published records only (mainly pre-1960 records which have not been validated)
- Recorded before 1960 only
- Recorded from 1960 onwards

## 2 Tipulinae coverage only

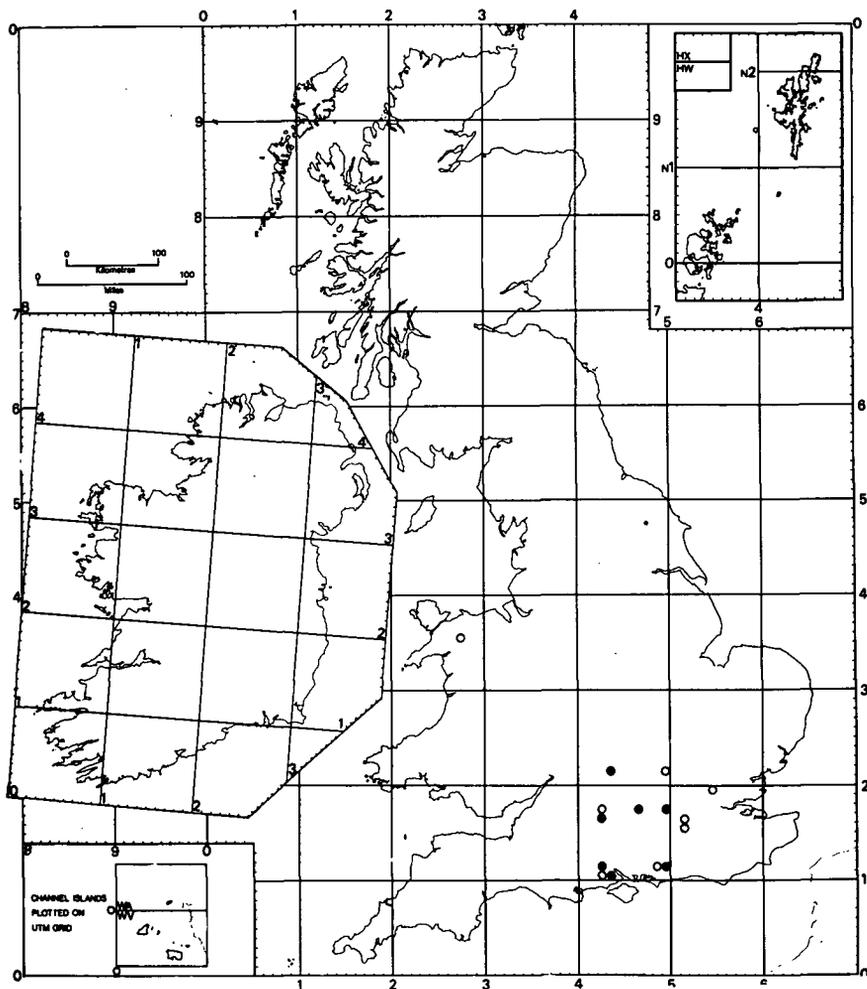


### 3 *Ctenophora (Cnemoncosis) ornata* Meigen 1818



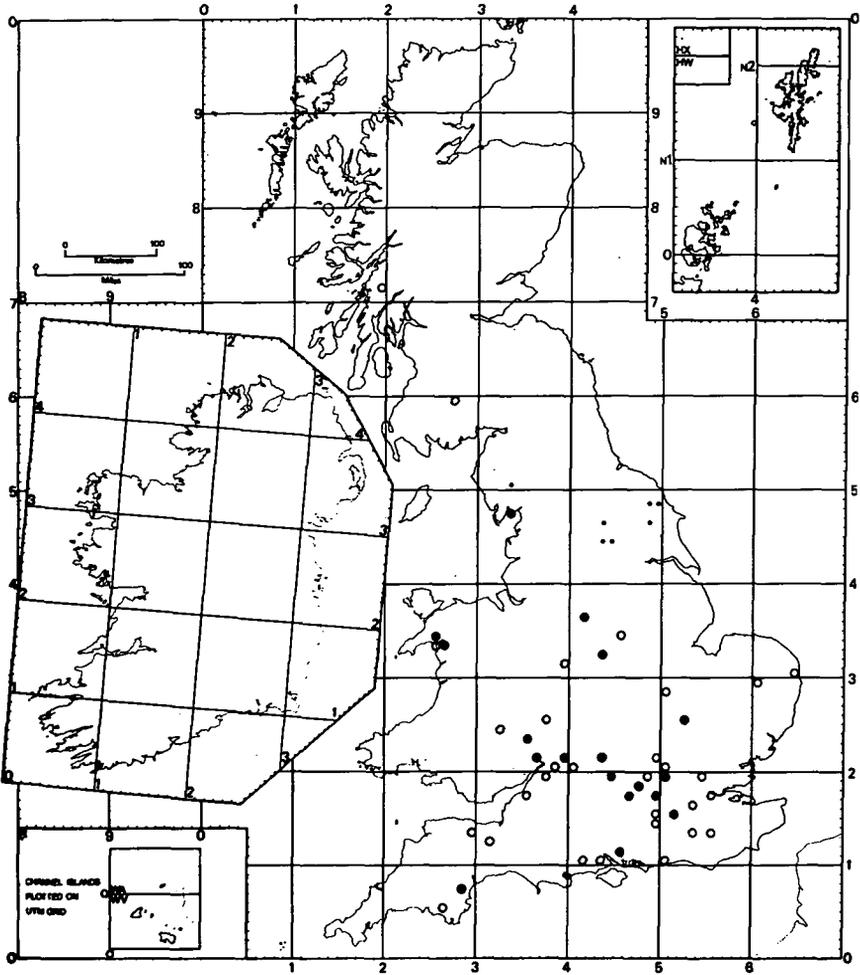
There are long series of specimens in old collections from the New Forest, but very few have been reported in recent years. There is a curious record of two specimens reputedly taken in a light trap in February in the Chilterns, but the origin of these specimens is in doubt. The Darenth Wood and Cannock Chase records in Coe (1950) are in fact *C. pectinicornis*. The larvae have been found in porridge-like wood detritus in the base of a hollow beech (*Fagus sylvatica*) and also in similar material in a fallen beech trunk only 50 cm in diameter. Flight period: June to July.

#### 4 *Ctenophora (Ctenophora) flaveolata* (Fabricius 1794)



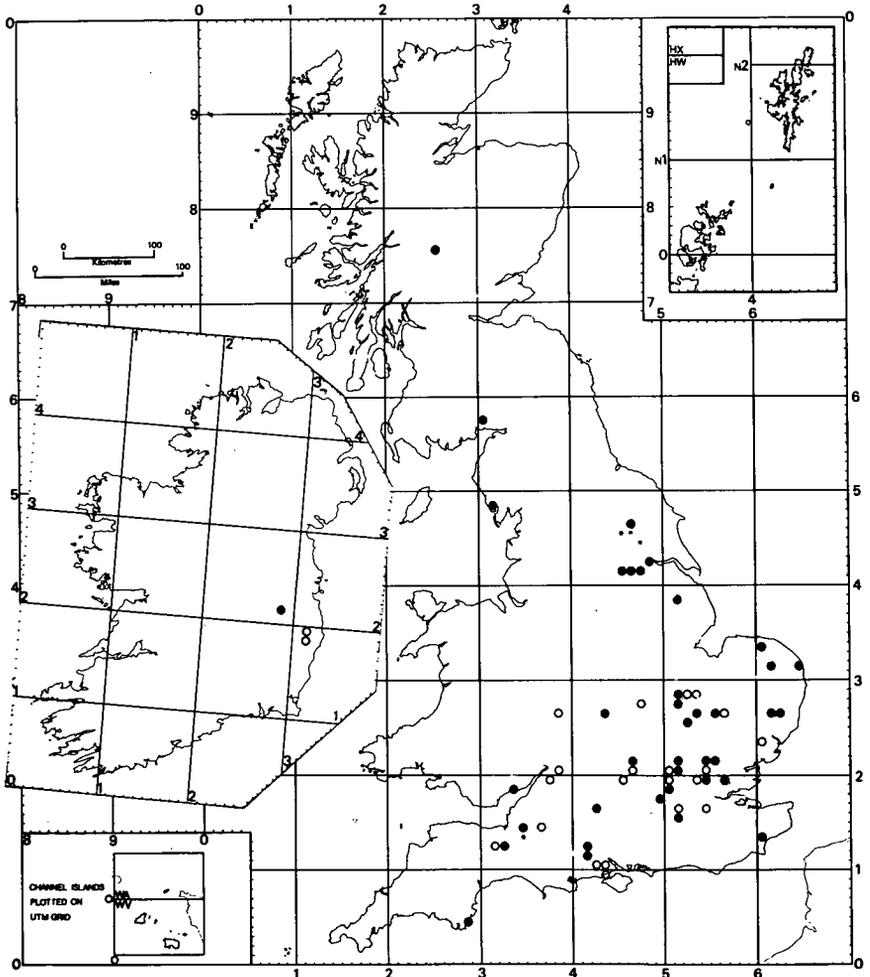
This is a spectacular yellow-and-black species so the scarcity of records seems to indicate that it is truly rare. It has recently been taken only in the New Forest, Savernake Forest, Windsor Forest and one other site. It is assumed to be associated with ancient beech about which a female has been seen flying. The larvae and their ecological requirements are undescribed, but other species in the genus are associated with dead wood. Flight period: May.

5 *Ctenophora (Ctenophora) pectinicornis*  
(Linnaeus 1758)



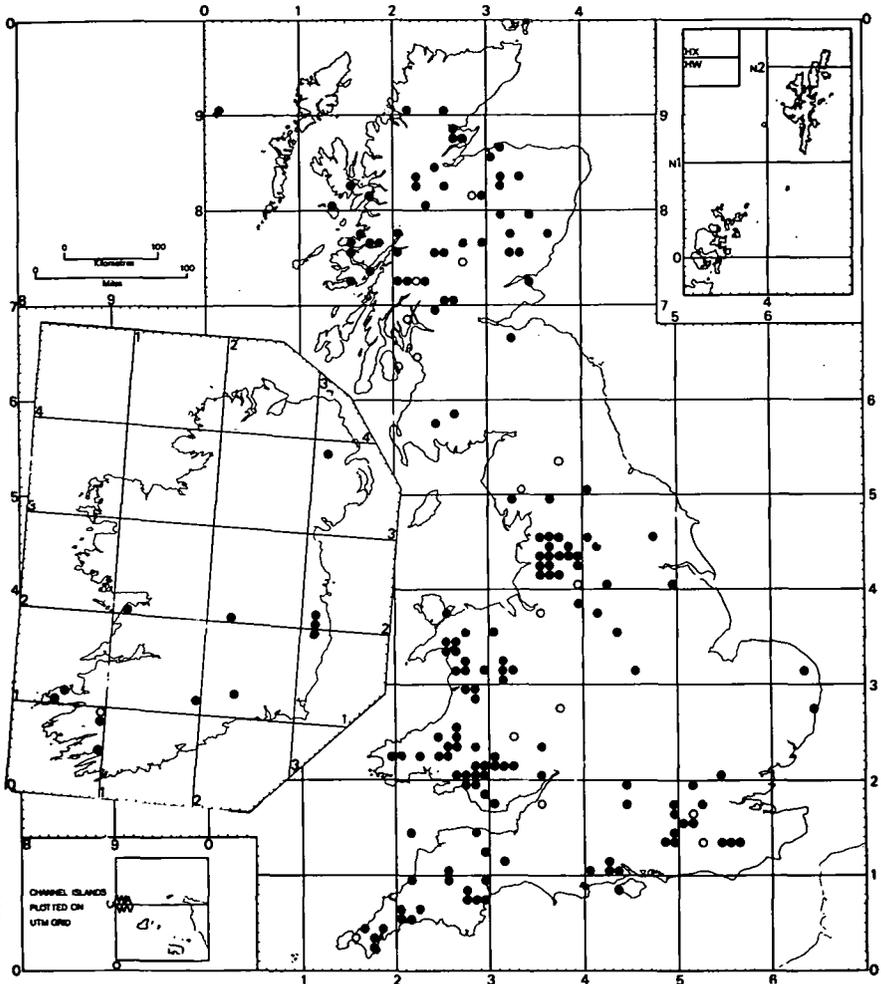
This is of the most widespread *Ctenophora* associated with large dead timber, beech being especially suitable. The larvae often occur in the rotten shattered ends of trunks and have been found in rotten boughs which have freshly fallen from at least 10 m up the trunk. Flight period: May to July.

## 6 *Dictenidia bimaculata* (Linnaeus 1761)



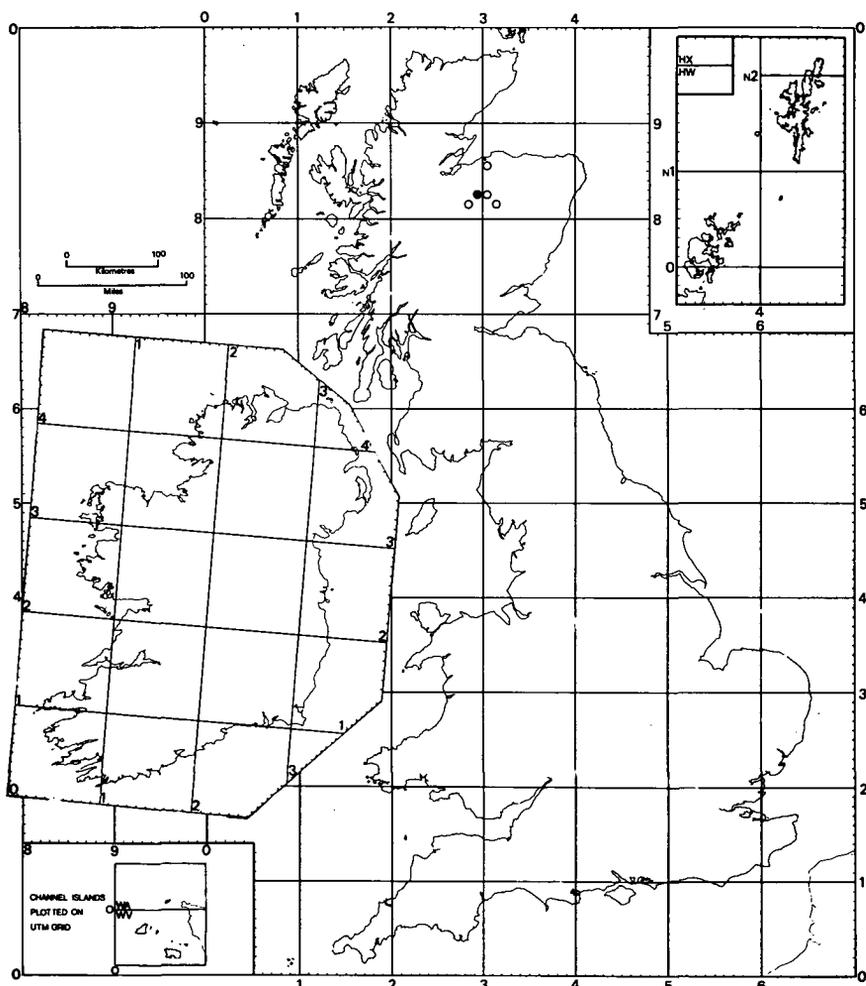
This species occurs mainly in fens, but it also occurs in ancient woodland. It breeds in birch (*Betula* spp.), willow (*Salix* spp.) (probably also long-leaved willows (*Salix* spp.) as well), beech, oak (*Quercus* spp.), and probably other deciduous trees, preferring wood in an advanced state of decay. Flight period: April to July, mainly May and June.

## 7 *Dolichopeza albipes* (Stroem 1768)



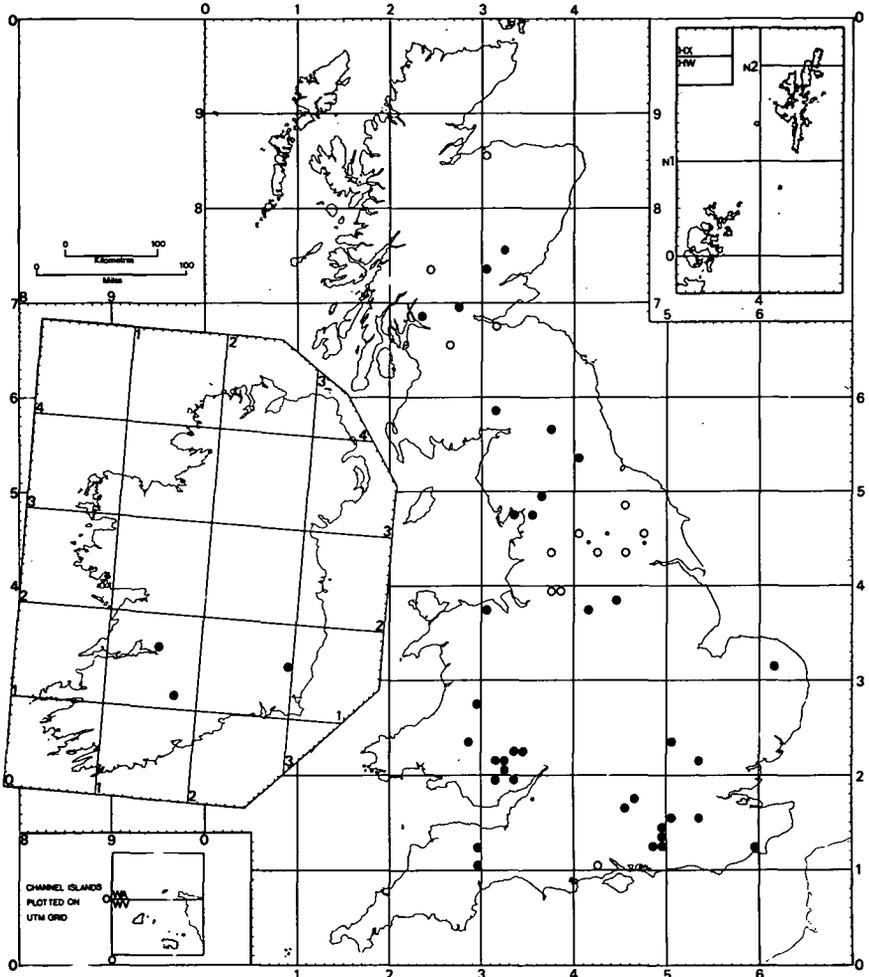
Though widely distributed, this species is highly localised by its ecological requirements which are most easily met in northern and western districts and in certain other areas, such as the Weald. Adults are to be found in heavily shaded spots, however small, nearly always at the edge of water. Stream margins in woodland, especially in gullies or under tree roots, are typical situations, the dark adults 'hovering' almost invisibly with only the outstayed white tarsi betraying their presence. This species can also be found on open moorland, in dark overhangs, along tiny streams. Larvae are said by Brindle (1960) to feed on liverworts. Flight period: April to June.

## 8 *Nephrotoma aculeata* (Loew 1871)



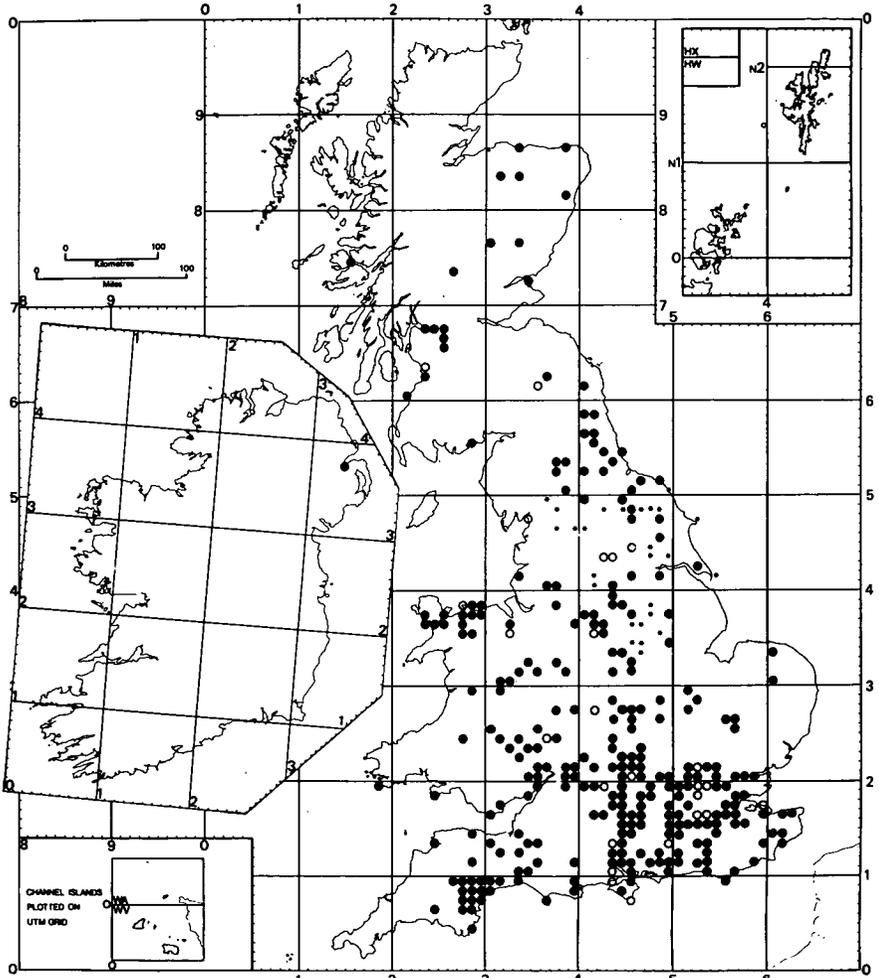
There are old records from a small area of the Scottish Highlands. Despite earlier reports that it was locally common, recent searches were not successful in rediscovering the species until a single specimen was taken at a previously unsurveyed site in 1990. From experience abroad, the most suitable habitat would seem to be areas of scrub along the sandy banks of rivers such as the Spey. Flight period August to September.

## 9 *Nephrotoma analis* (Schummel 1833)



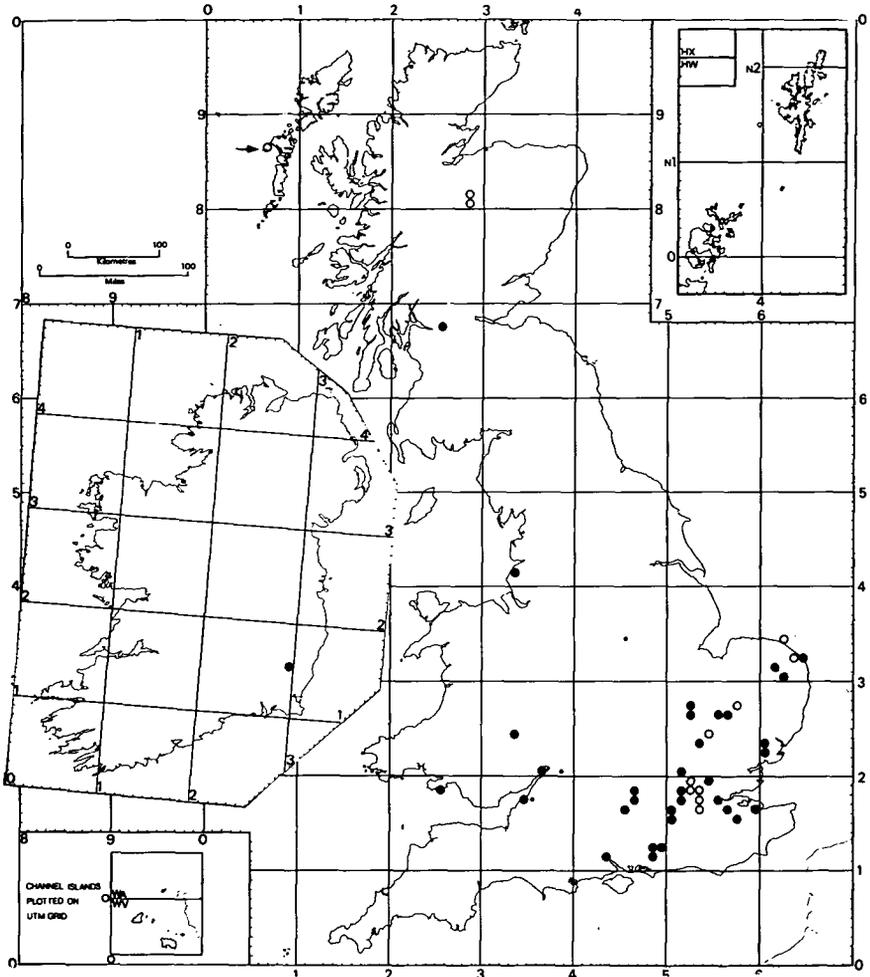
For a scarce species, records have accumulated quite well. Most records are from shaded river banks, especially those with a sandy soil. Flight period: June to July.

## 10 *Nephrotoma appendiculata* (Pierre 1919)



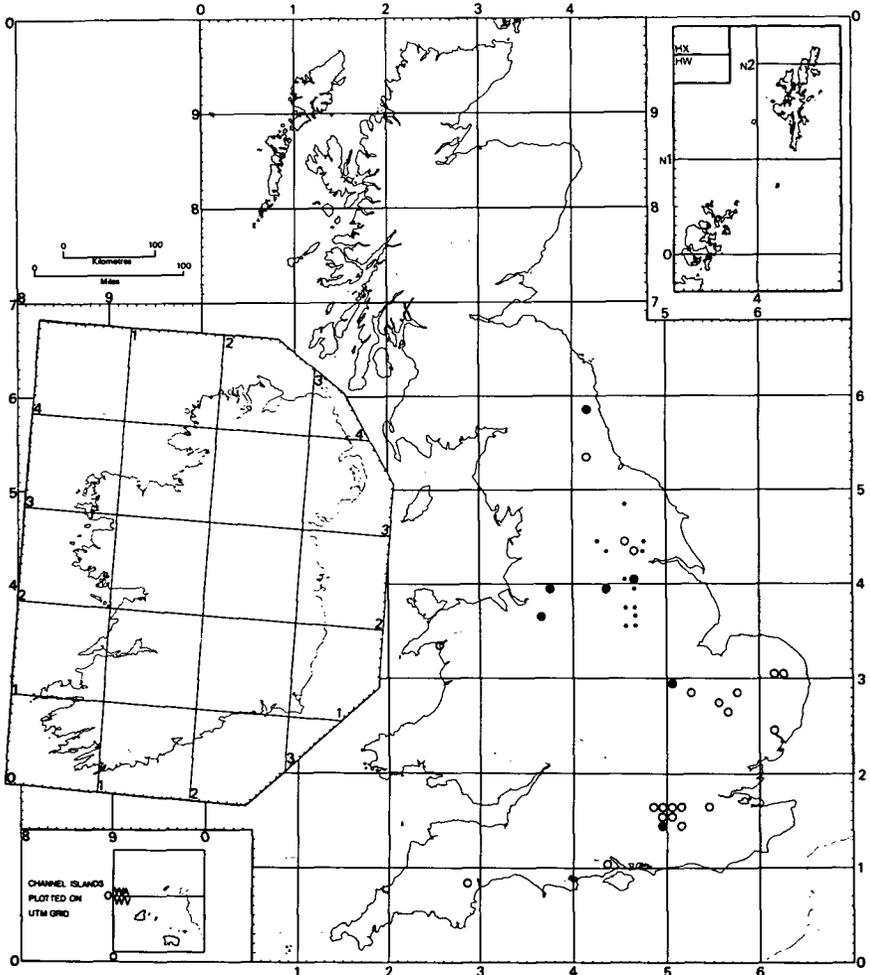
This is a typical spring-time species of open grassland. It prefers fairly rich soils in meadows and along road verges. Dry chalk grassland is suitable, especially where the soils are deepest in the valley bottoms, but it is less tolerant of the driest and poorest areas of dunes and heaths. In upland districts it is found in the main valleys. The apparent extreme rarity in Ireland may be due to insufficient collecting early in the season. Flight period: typically May, but some specimens can be found into June, especially in the north.

## 11 *Nephrotoma cornicina* (Linnaeus 1758)



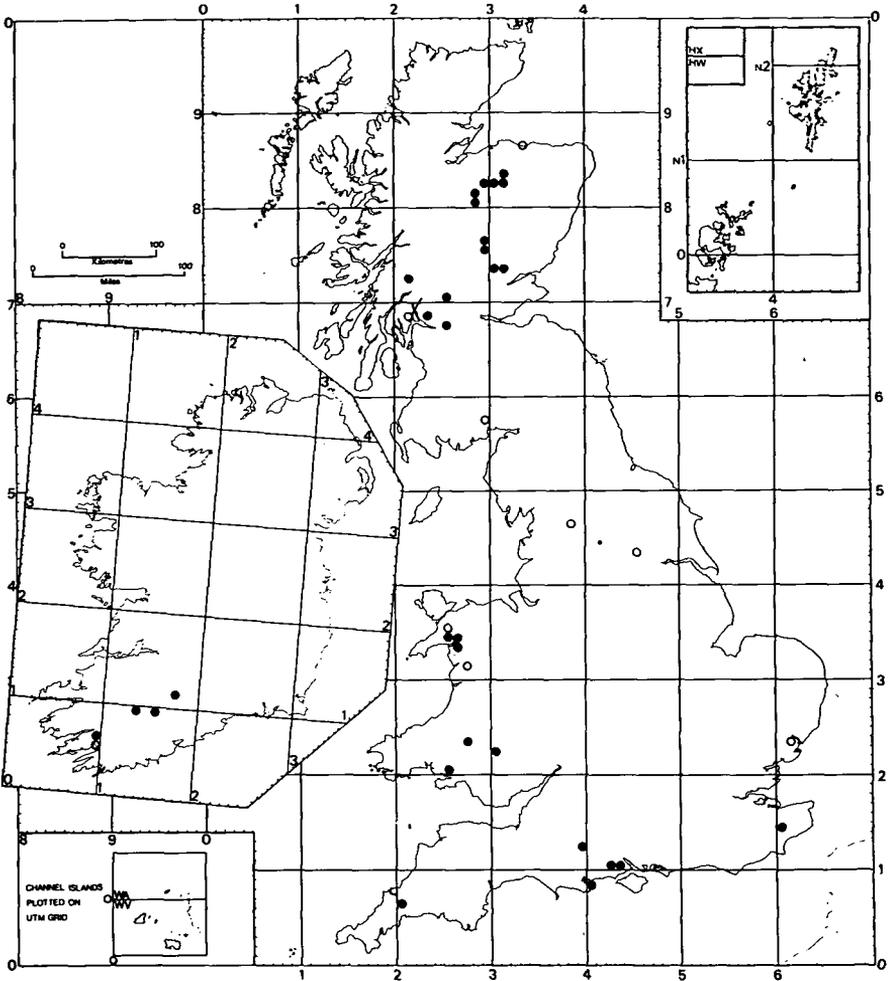
The London area seems relatively favourable, where it even occurs in gardens. It likes dry soils and can be found in large numbers in old chalk pits containing dumps of clay overburden, and occurs more widely on sand and clay, especially along hedgerows. It is surprising that this southern cranefly should occur in the Outer Hebrides, presumably in association with machair. Flight period: July to early September, mainly August.

## 12 *Nephrotoma crocata* (Linnaeus 1758)



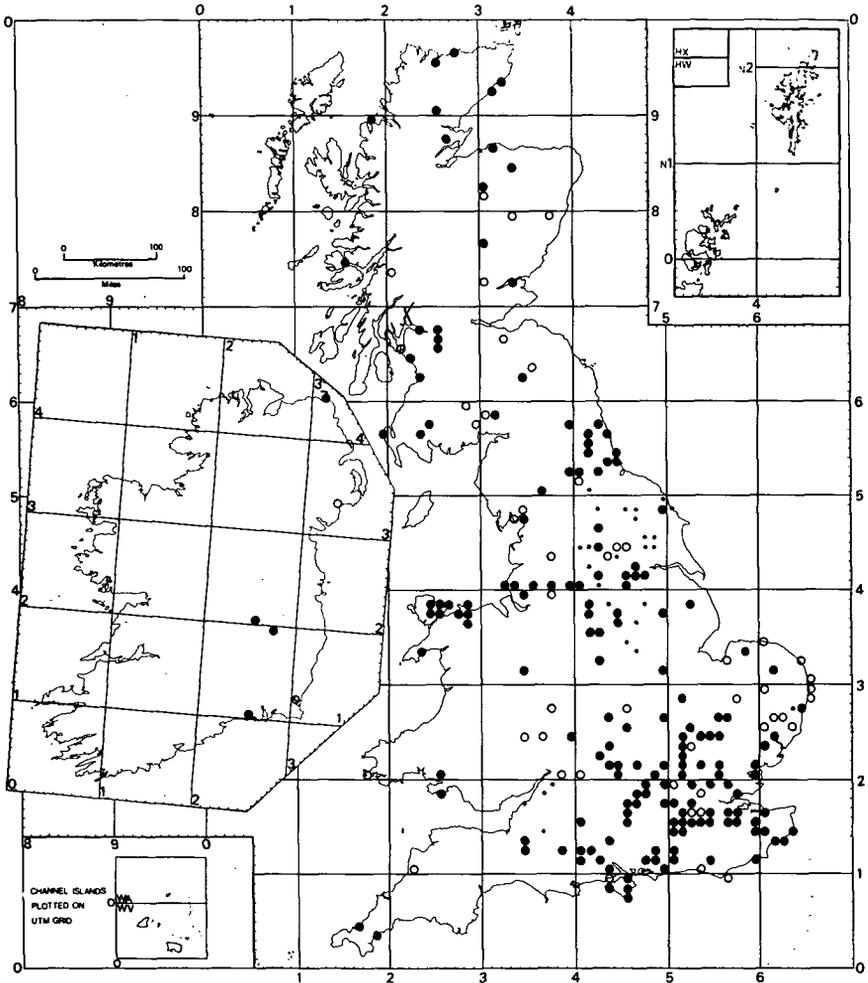
Being a very striking yellow-and-black banded species, specimens tend to be recorded even by non-dipterists. Thus, it is interesting to note that there are relatively few recent records in southern districts, where it used to be found frequently. There is a cluster of records from the heathlands of Surrey and Wealden Hampshire, but some records are from fens, as in East Anglia. The ecological requirements are still poorly known. Flight period: May to June, rarely August.

### 13 *Nephrotoma dorsalis* (Fabricius 1782)



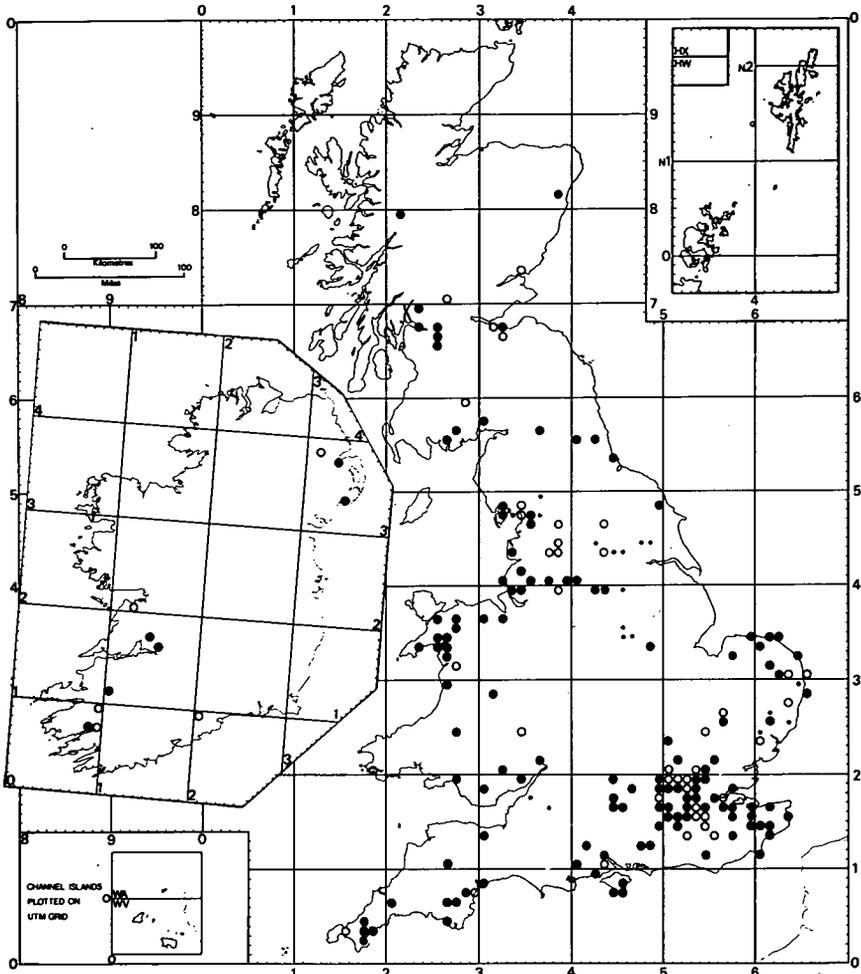
This is a very localised species which is a rarity in southern and south-eastern England. It is more frequent in the north and west. Most records have been from shaded, sandy river banks. The record by B Freeman from Kent is doubtful because it was from dry woodland. Flight period: May to August, most commonly June.

# 14 *Nephrotoma flavescens* (Linnaeus 1758)



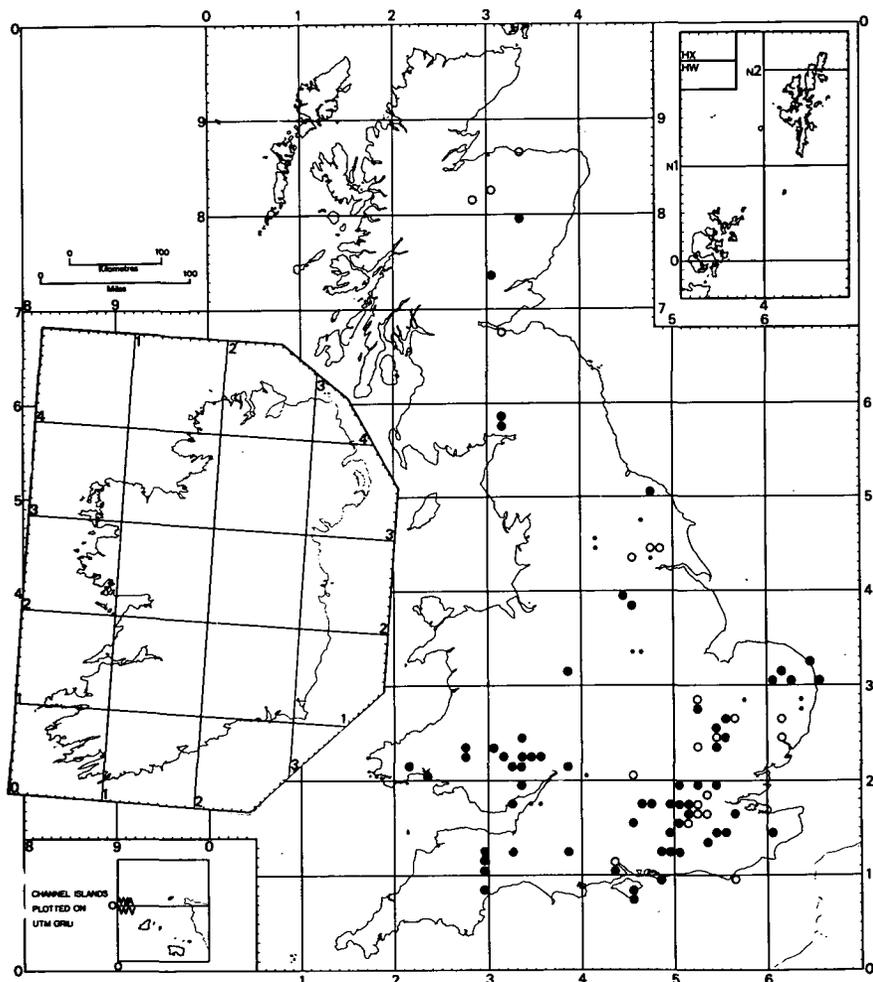
A widespread species occurring in a wide range of open, dry grasslands, it is often plentiful on chalk grassland (emerging after *N. appendiculata*) and on stabilised grassy dunes (emerging after the peak of *N. submaculosa*). Flight period: June to July, rarely continuing into August (Coe (1950) includes September).

## 15 *Nephrotoma flavipalpis* (Meigen 1830)



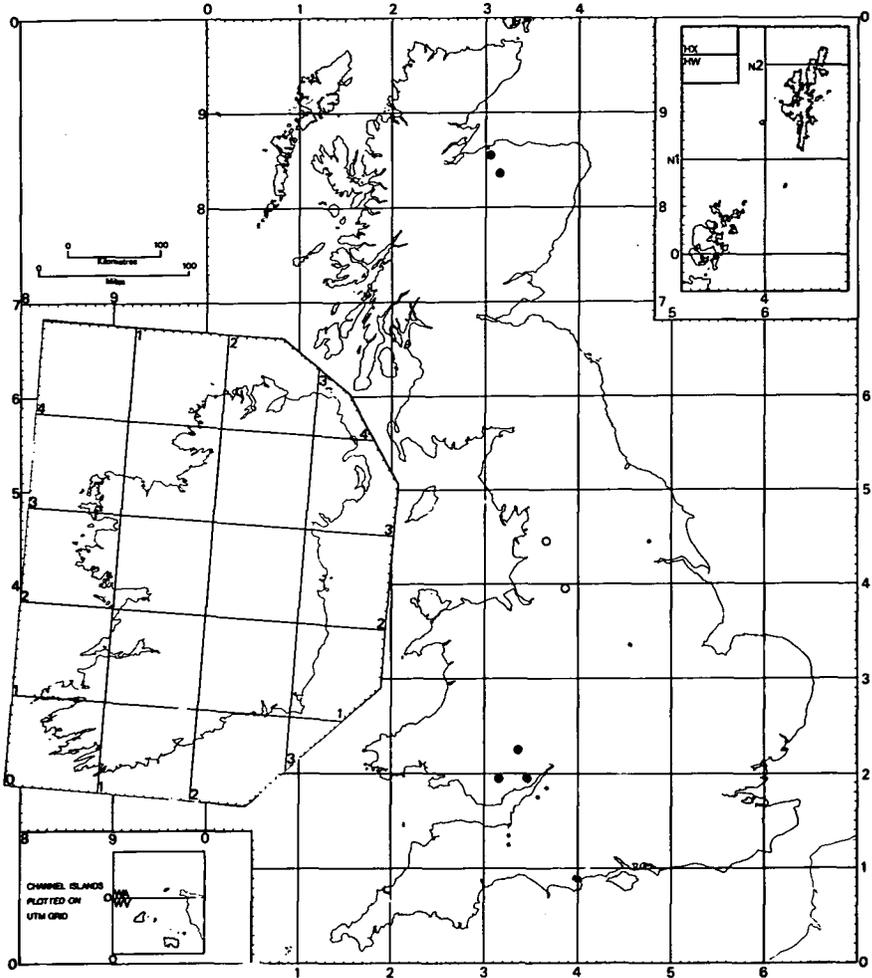
Woodland and hedgerows are the usual habitats, especially where there is good undergrowth in which the adults can shelter. Dry or well- drained humid soils are preferred. This is a relatively frequent species in many lowland districts, but it is elusive except at a period of peak emergence. Flight period: June to October, the peak often being in July or early August.

## 16 *Nephrotoma guestfalica* (Westhoff 1879)



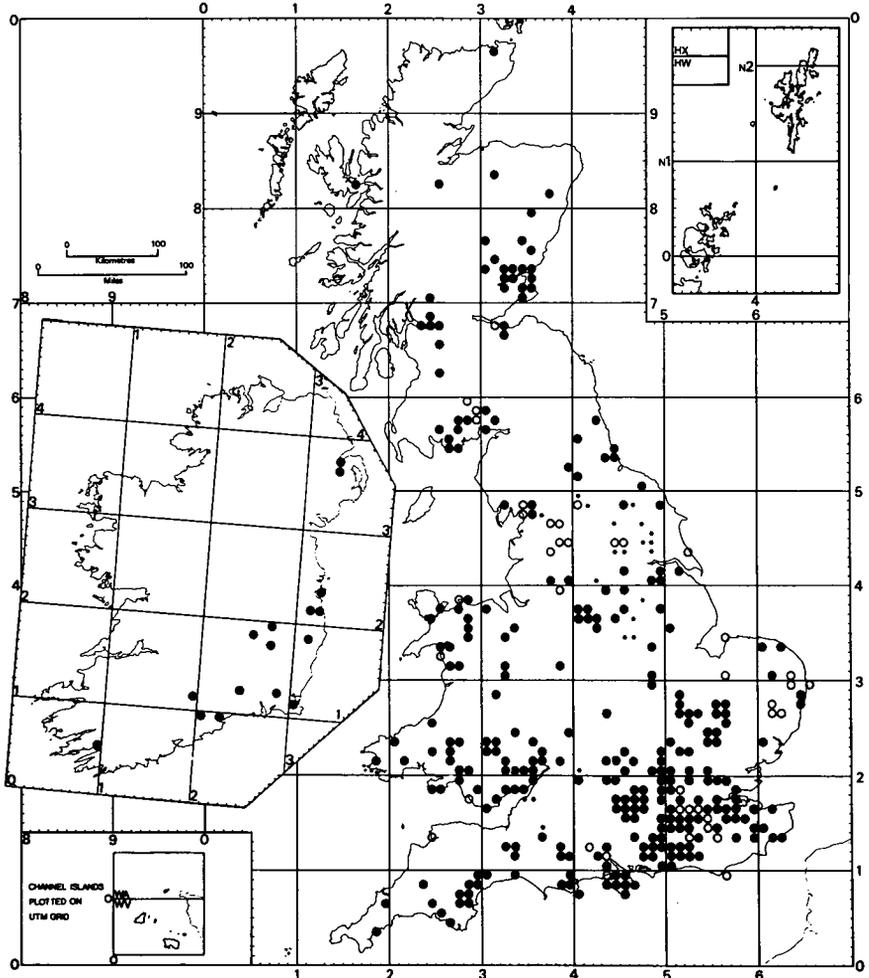
This species occurs most typically along shaded, sandy river banks where there is herbage for shelter, preferring the lowland reaches of the river. However, it can sometimes occur in gardens and other places well removed from river banks, as in parts of London, and it is unclear in these circumstances whether to regard specimens as strays or as residents. The distribution pattern is of particular interest as it is absent from north Wales and Lancashire, both of which are very well-recorded areas. There is a markedly southern and eastern bias in its occurrence. Flight period: June to August, mainly mid-June to early July.

## 17 *Nephrotoma lunulicornis* (Schummel 1833)



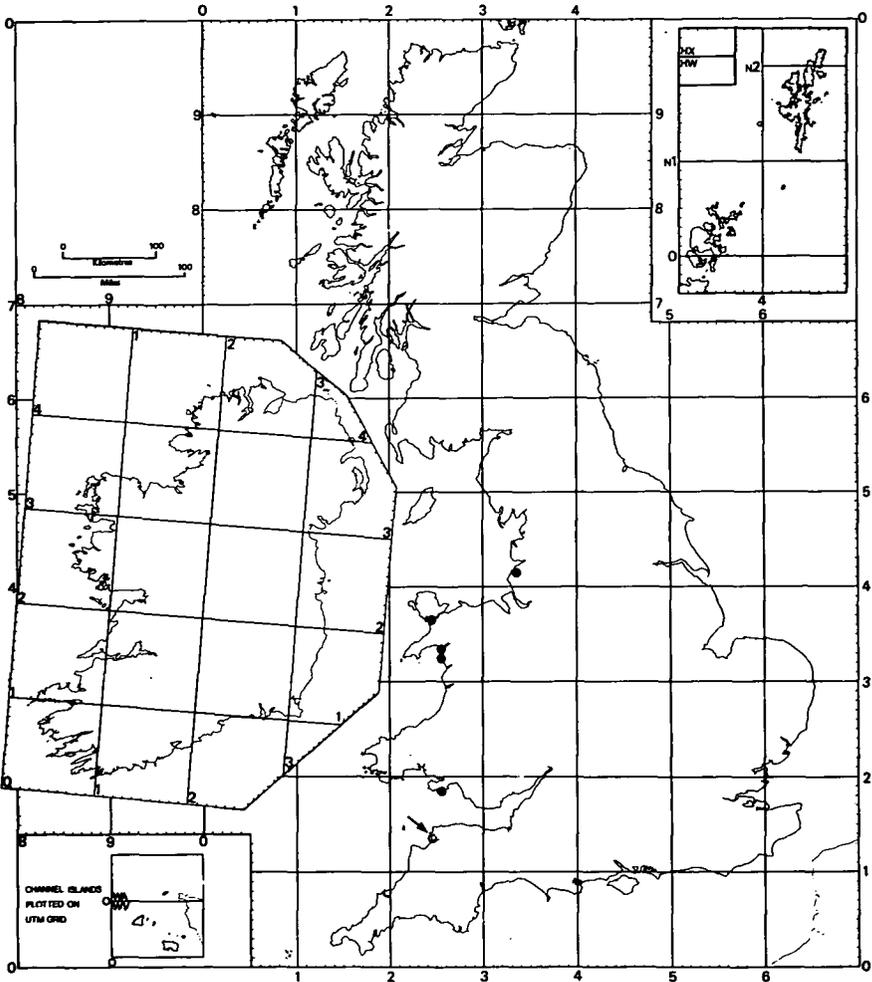
A rare species of shaded, sandy river banks, it seems to prefer stretches of river below the fast-flowing upper reaches, but above the gentle, sluggish sections. On the River Spey, it is seemingly confined to the lower reaches, but where the flow is still fairly fast. Flight period: end of May to July (also October according to Coe (1950)).

## 18 *Nephrotoma quadrifarea* (Meigen 1804)



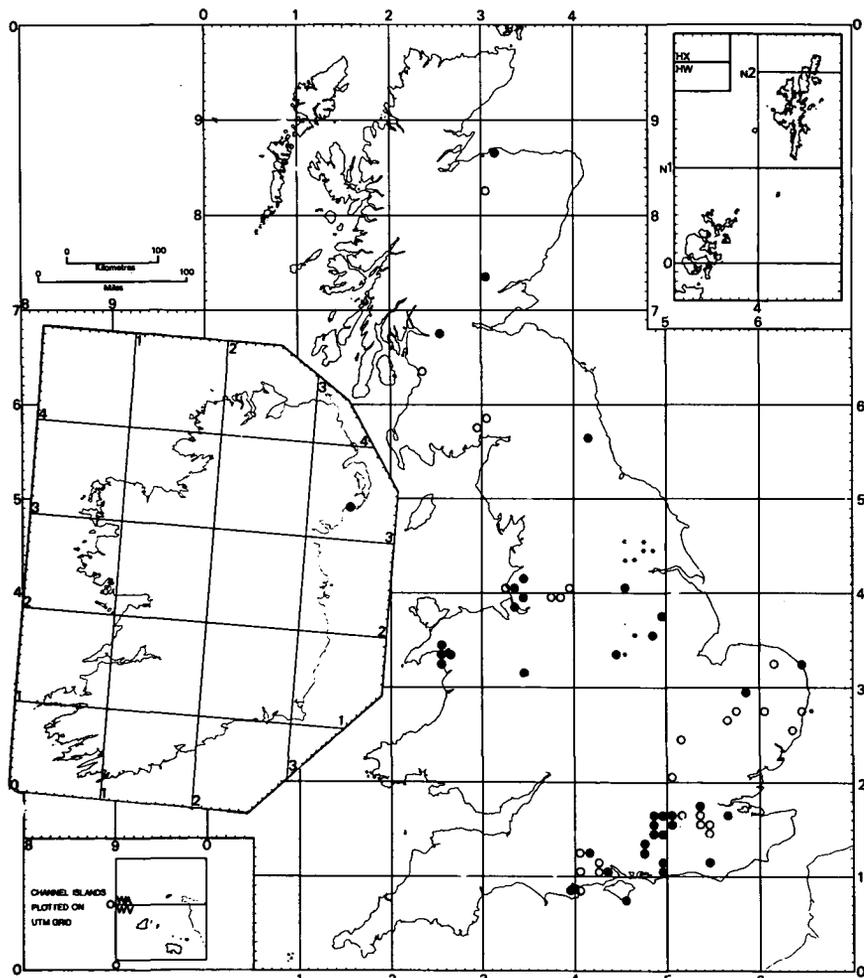
This is the commonest of the woodland *Nephrotoma* species, also occurring in hedgerows and scrubby gardens. It prefers slightly damp areas and seems to avoid the very driest situations. Some undergrowth is normally present. Flight period: June to August, mainly mid-June to mid-July.

## 19 *Nephrotoma quadristriata* (Schummel 1833)



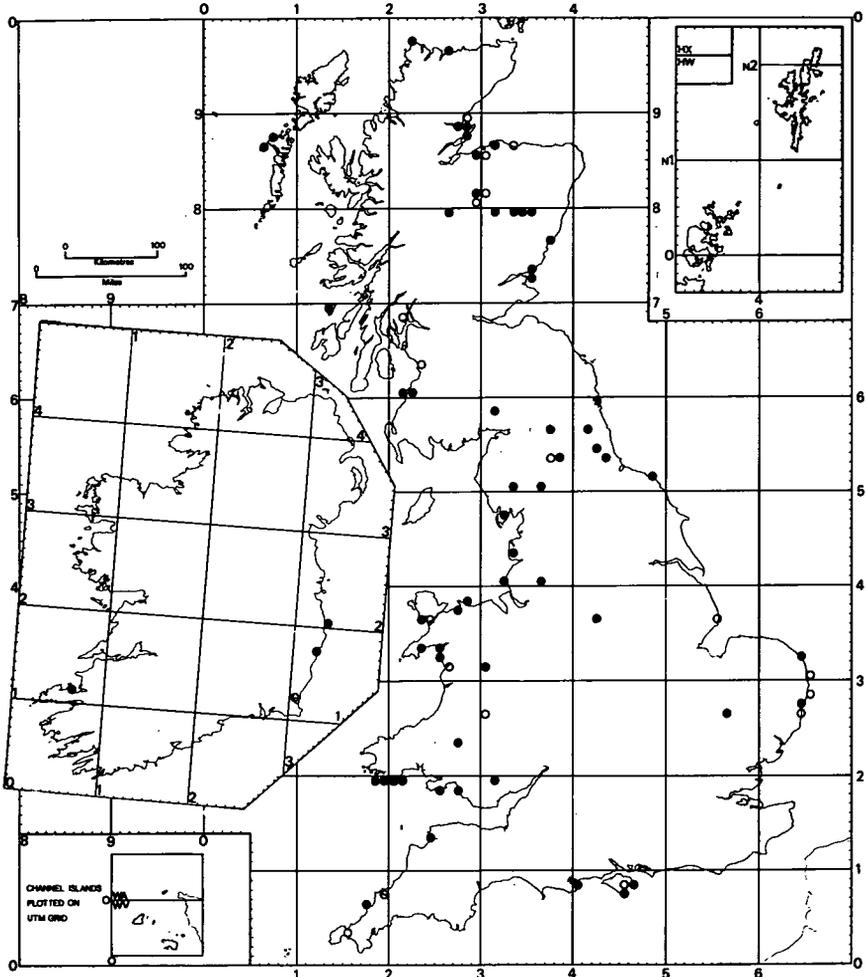
Confined to major dune systems on the west coast of England and Wales, it is usually found on the landward side of mobile dunes, especially near the edges of slacks, in one case adjoining a sea club-rush (*Scirpus maritimus*) marsh. Flight period: July to August.

## 20 *Nephrotoma scurra* (Meigen 1818)



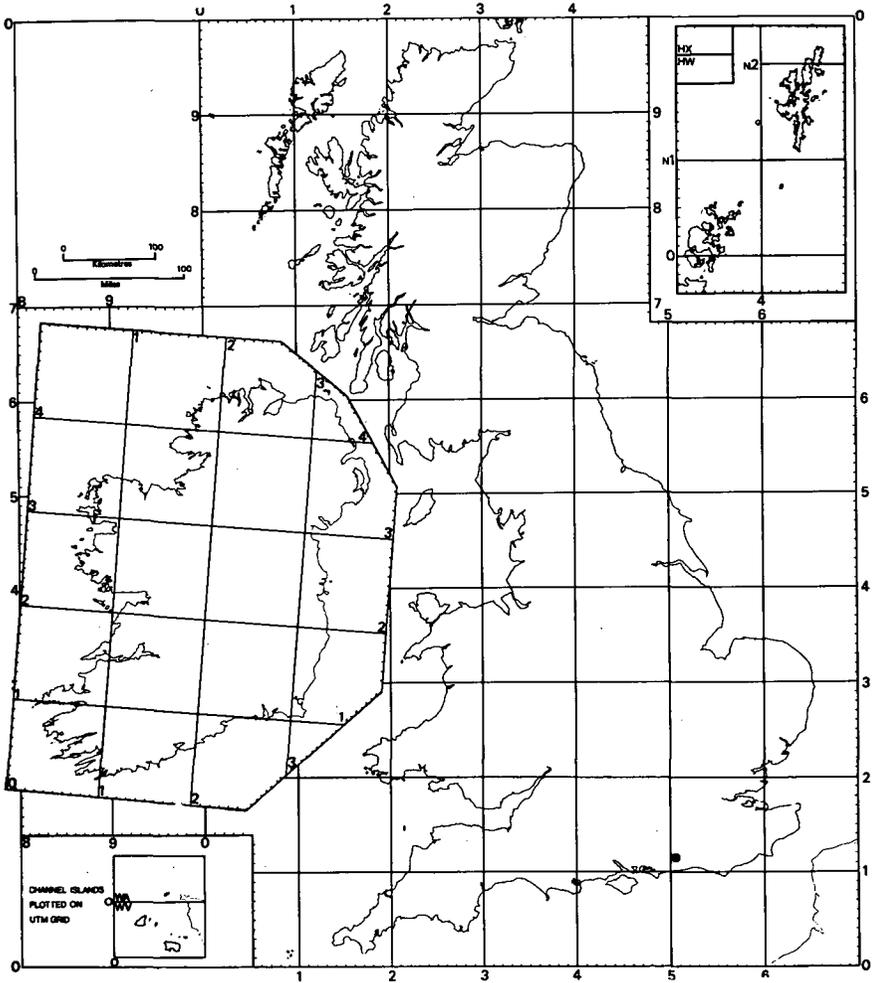
This species is strongly associated with dry, well-drained soils. It is typical of dry heathland, usually occurring where some scrub is present. Whilst it is most frequent on sandy soils in coastal and other lowland districts, there are a few records from upland sites, but it is usually associated with especially well-drained areas. At two northern locations it has been found at sites which may be inundated during winter floods; these sites were on a large, partly vegetated sandbar at a river confluence and at a shaded oxbow with sandy banks. Flight period: June to September, especially mid-July to mid-August.

21 *Nephrotoma submaculosa* Edwards 1928



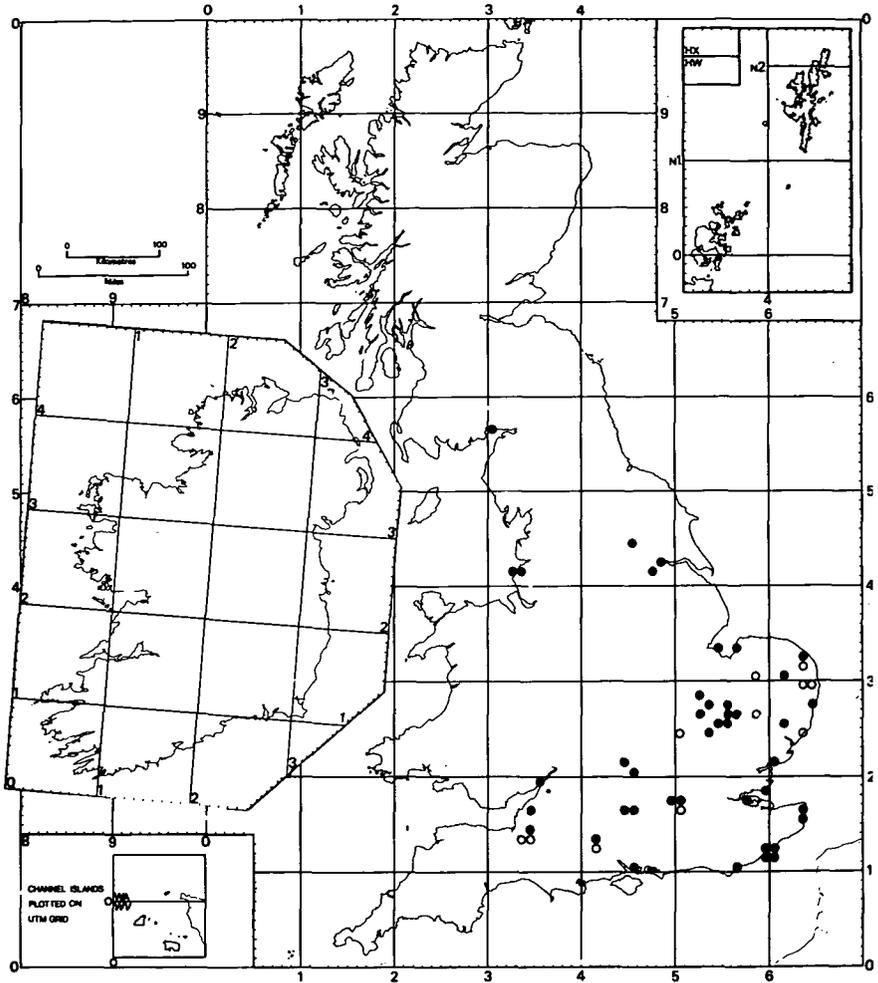
A widespread and often abundant species on coastal dunes, it also occurs inland, where it is locally frequent on patches of sparsely vegetated sand and sandy shingle along the margins of rivers. Flight period: April to August, especially mid-May to early June.

## 22 *Nephrotoma sullingtonensis* Edwards 1938



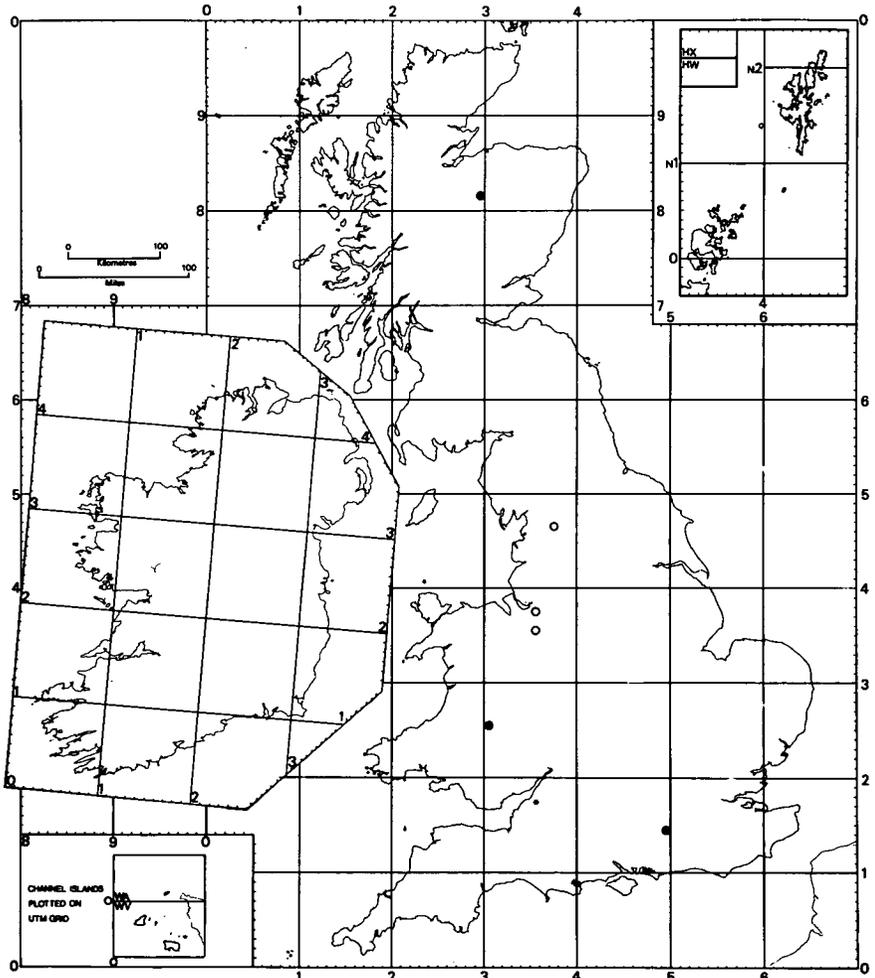
It was taken on two occasions in 1936 at Sullington, in Sussex. The habitat was recorded as being pine (*Pinus* spp.) woods. It was not rediscovered in the 1970s, despite searches on Sullington Warren, an area of heath and sandy woodland which is assumed to be the site of the original records. However, it was rediscovered there in 1985 along a sandy path in a heathland glade within the pine woods (this record has been included to update the *Atlas*). Flight period: June.

23 *Nigrotipula nigra* (Linnaeus 1758)



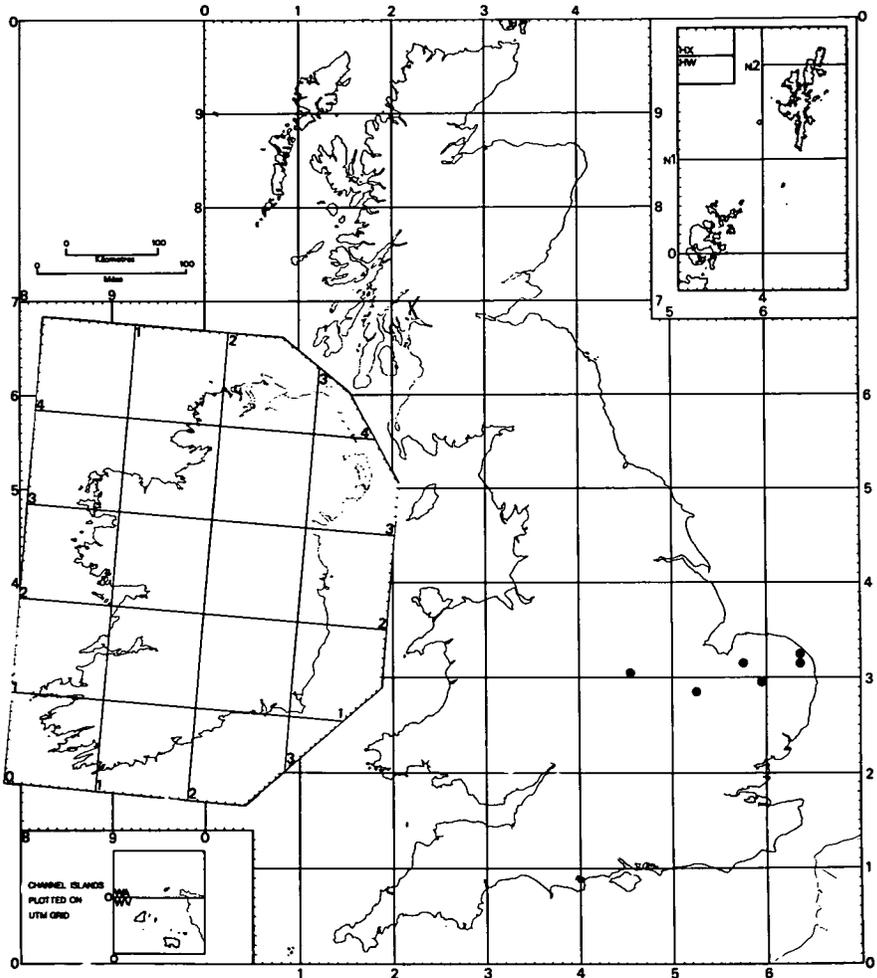
Predominantly a fenland species, with a concentration of records in East Anglia, it also occurs by ponds and ditches on coastal grazing levels. Usually there is some saturated bare mud or peat present, with adjacent long herbage, although the larvae prefer unsaturated peat. In flight this dark, chocolate-brown species looks rather like an ichneumon. Flight period: June to August, peaking in late July.

## 24 *Prionocera pubescens* Loew 1844



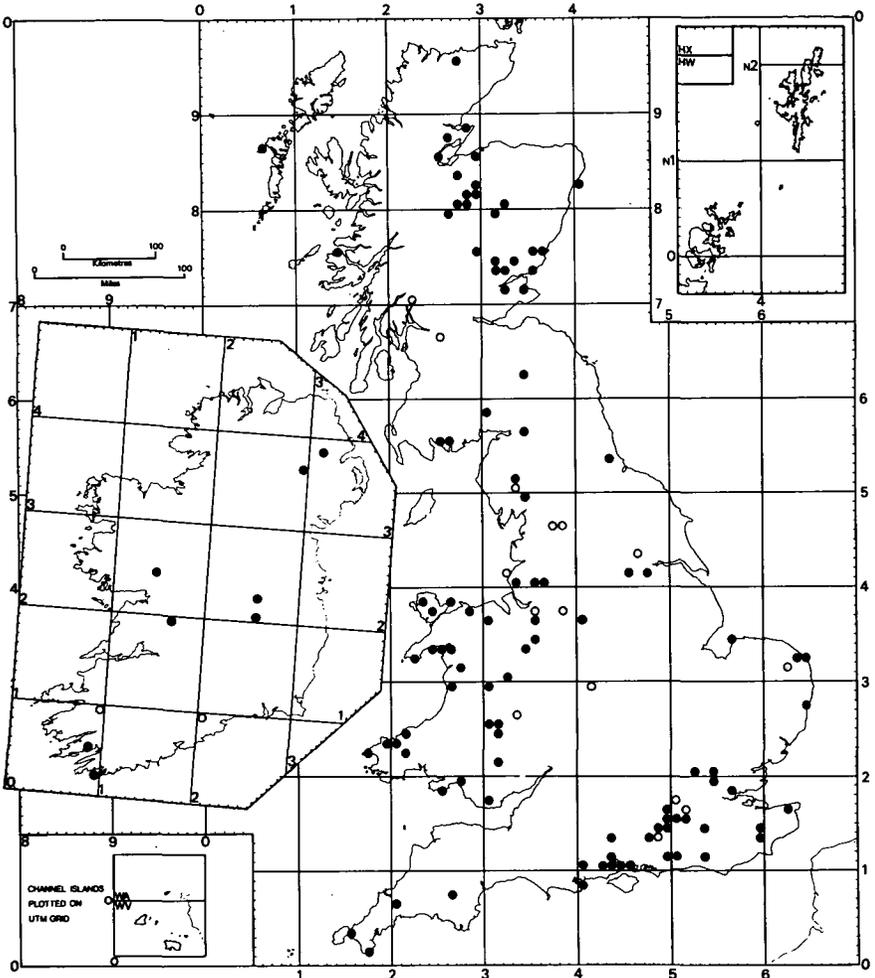
The first published record was from 'near Bristol' in 1924, but Verrall's collection contains a female (apparently of this species) from Brockenhurst dated 1897. In 1938 it was taken at Austwick, in Yorkshire, and at two sites in Cheshire in the early 1940s. In the five years up to 1983 it was found at Thursley Common National Nature Reserve (NNR), Surrey, Cors y Llyn NNR, Powys and at Aviemore in the Spey valley. It is found on bogs, often in the same localities as *Prionocera turcica*, but usually in separate areas. It is still unclear what determines the ecological separation of these two species. Flight period: April to early August.

25 *Prionocera subsericornis* (Zetterstedt 1851)  
 [P. proxima of Coe (1950)]



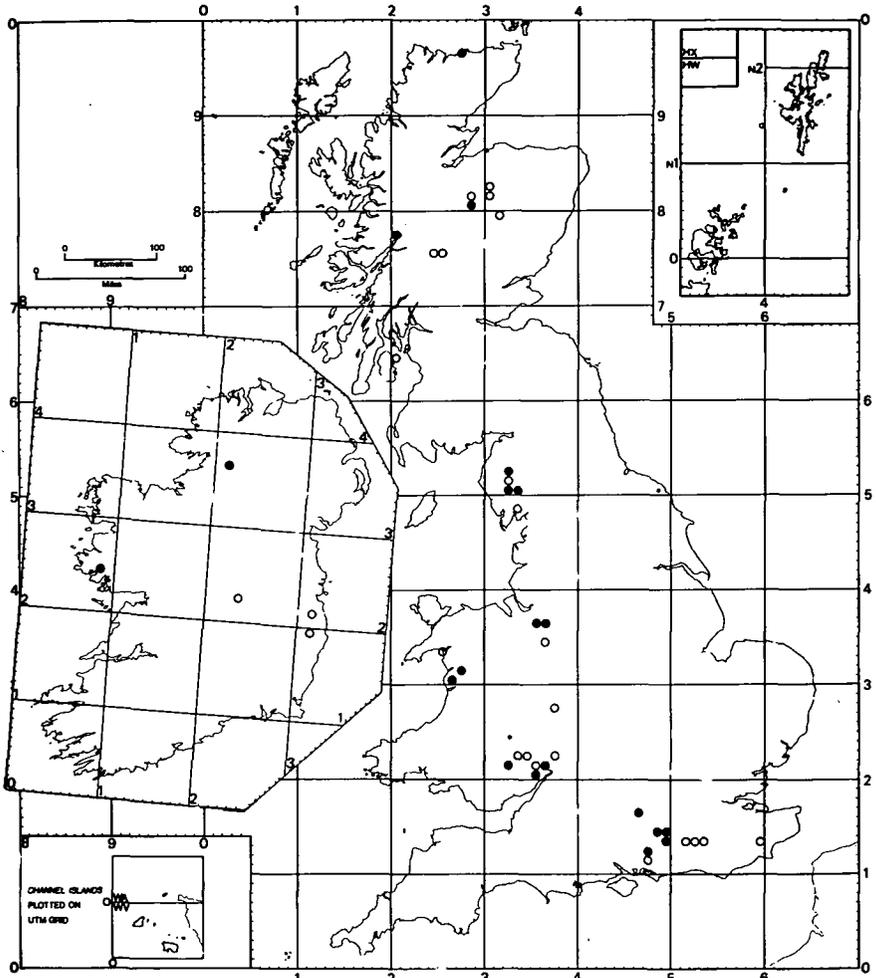
A male was taken at Great Catfield Fen, Norfolk, on 9 August 1920, the only British record until it was taken at Thompson Common, Norfolk, in the mid-1980s. It has since been refound at Great Catfield Fen and found at Woodbastwick Fen NNR, Alderfen Broad, and East Walton Common. It has now been found outside Norfolk, at Woodwalton Fen NNR, Cambridgeshire, and Groby Pool, Leicestershire. It is associated with densely shaded ditches or pools under alder (*Alnus glutinosa*) where there is a thick 'soup' of saturated organic debris; larvae have been collected from such material at the edge of a ditch. Adults sometimes visit wild angelica (*Angelica sylvestris*) flowers in open, sunny conditions. Flight period: June to early September.

26 *Prionocera turcica* (Fabricius 1787)



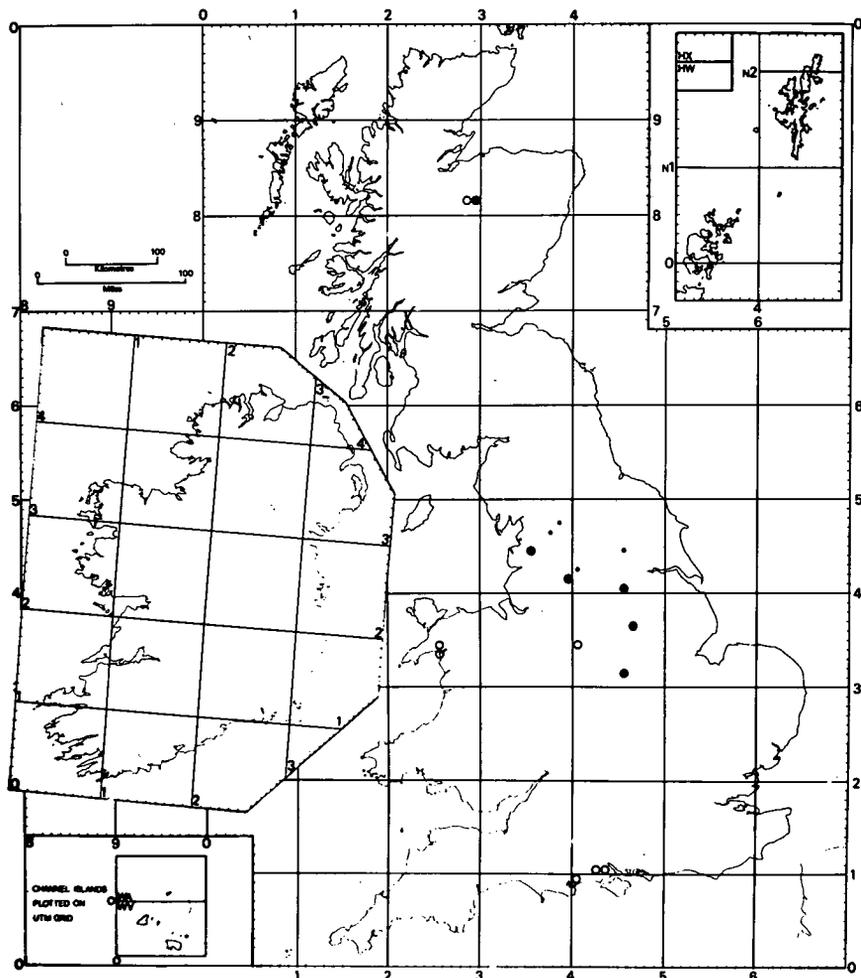
This is a widespread species which is typical of the marshy margins of eutrophic ponds and also frequent in the richer types of lowland bog, quaking mire and, more rarely, fens. The larvae are adapted to a semi-aquatic existence. Flight period: May to September, sometimes in large numbers between late June and early August.

## 27 *Tanyptera atrata* (Linnaeus 1758)



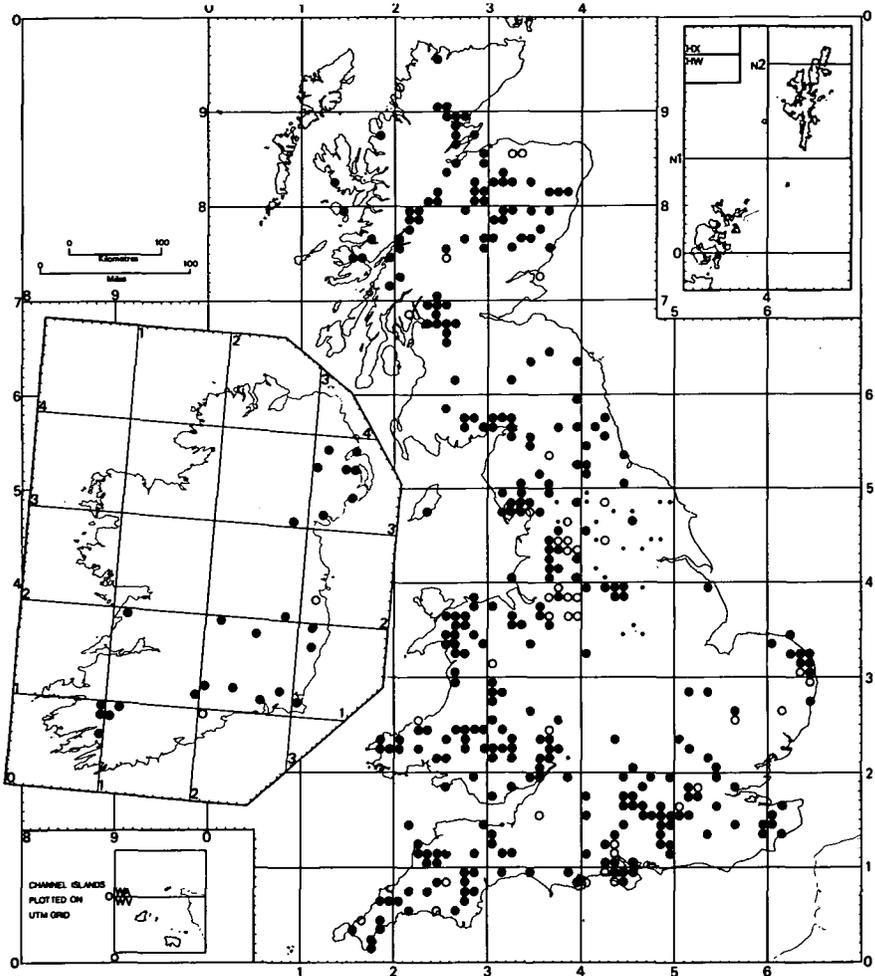
With an intriguingly clumped distribution, the species is usually associated with old forest areas and heaths, but surprisingly there are no definite records from the New Forest. Being a large, spectacular insect, it has been frequently collected in the past, but there are very few recent records. It is thought to breed mostly in birch. Coe's comment that it is a species of damp woods does not seem reliable; several sites are heathy woods. Flight period: April to June.

## 28 *Tanyptera nigricornis* (Meigen 1818)



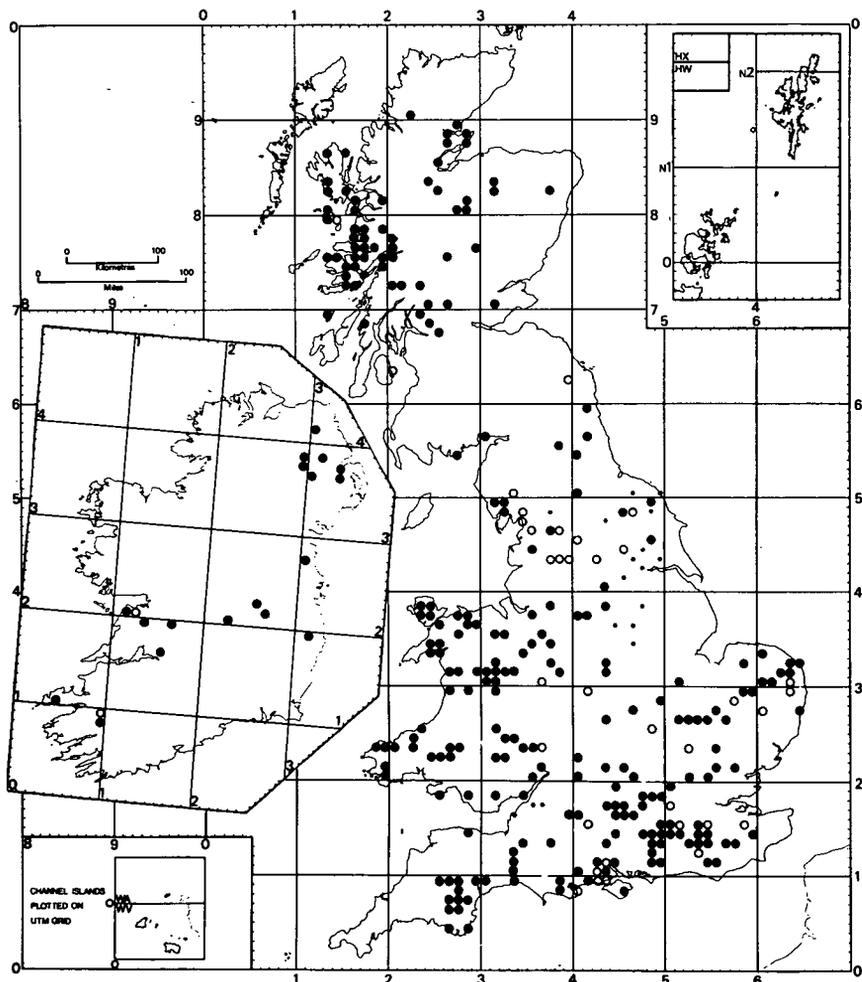
The distribution should be compared with that of *T. atrata* (Map 27). The remarkable features are that *T. nigricornis* has been taken in large numbers in the New Forest (but not the Weald) and it is widespread, though rare, across the north Midlands/Lancashire/Yorkshire district. The species breeds in dead wood, but its requirements are largely unknown; a female was found in open woodland at a live ash (*Fraxinus excelsior*) tree with one side of the trunk rotted away. Flight period: May to June.

29 *Tipula (Acutipula) fulvipennis* De Geer 1776



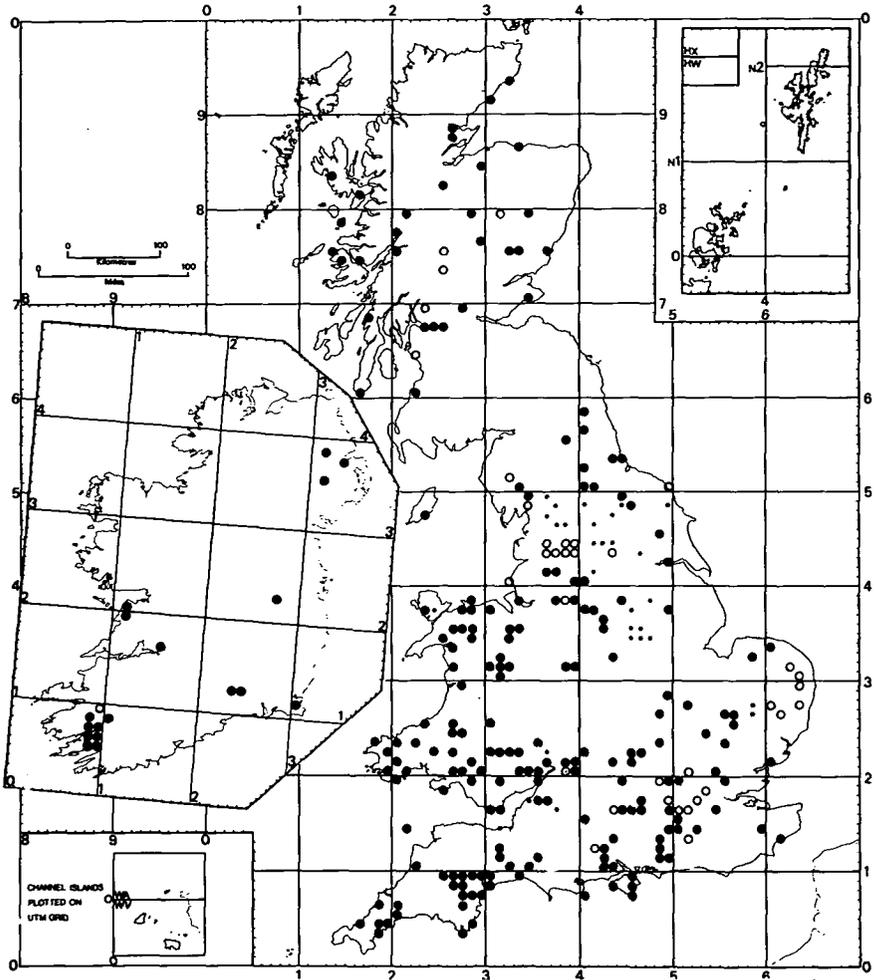
A very widespread species, it is found in most districts with moist or wet woodland, including the margins of small shaded streams. The adult is particularly active on disturbance and often escapes certain identification (unfortunately its size and flight resembles *T. maxima*). Flight period: May to October, but in most localities July to September would be regarded as the peak.

### 30 *Tipula (Acutipula) luna* Westhoff 1879



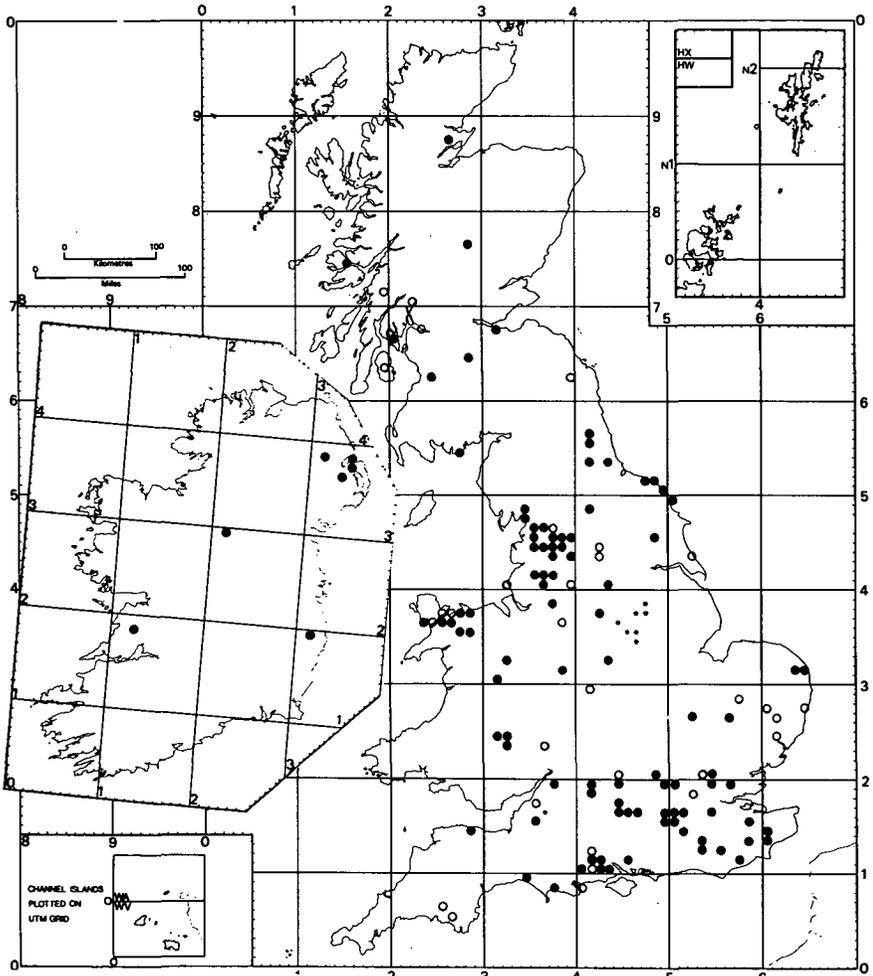
Lush wet meadows with rushes (*Juncus* spp.) support this species in most districts where such habitat survives, and it also occurs in wet woodland such as carr on wet heathland and fens. Flight period: April to July, usually with a peak in May in the south, early June in the north.

### 31 *Tipula (Acutipula) maxima* Poda 1761



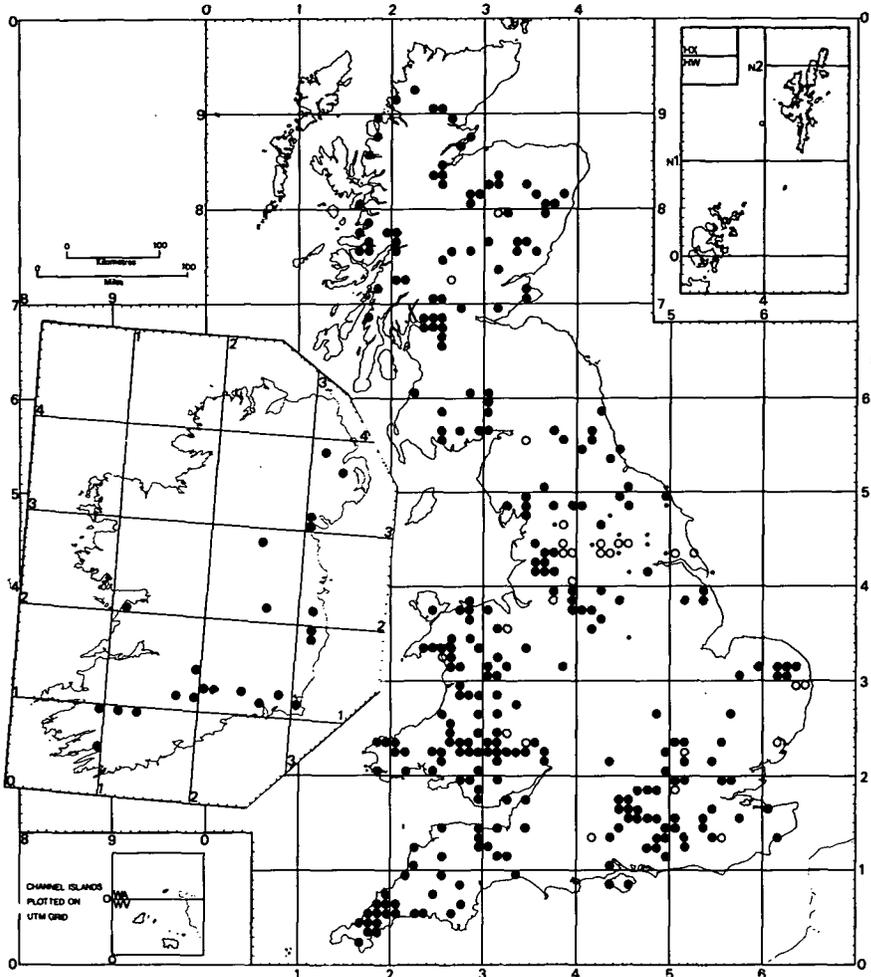
As one of our largest and most spectacular flies, many people regard *T. maxima* as a rarity. However, many entomologists do not visit the wet woodland and streamsidcs that this species requires; saturated mud is ideal. It also occurs in open ground on coastal cliff seepages. This is a very active species that easily evades capture, and is in fact very widespread and often frequent where it occurs. Flight period: May to July.

32 *Tipula (Acutipula) vittata* Meigen 1804



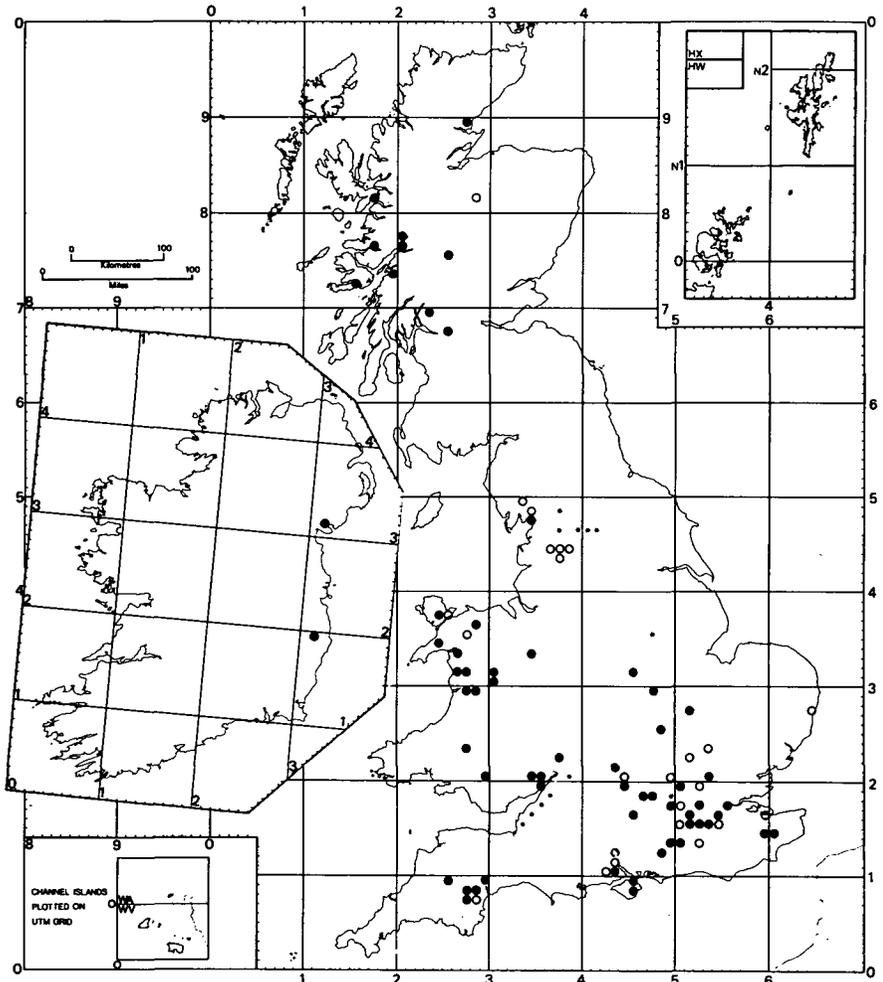
Adults occur at bare mud by small streams, and more rarely by lakes, usually in a shaded, or at least sheltered situation. Being an early species, it is under-recorded. The clumped distribution pattern, however, partly reflects the fact that it does seem to be more frequent in some districts than in others. Districts where streams have been modified by extensive ditching and management are probably unsuitable. The larvae are aquatic. Flight period: April to early May, rarely to June.

33 *Tipula (Beringotipula) unca* Wiedemann 1817



A widespread species of lush marshy ground in wet woodland. It is usually close to the shade of bushes and trees where found in more open marshy places. Flight period: June to July.

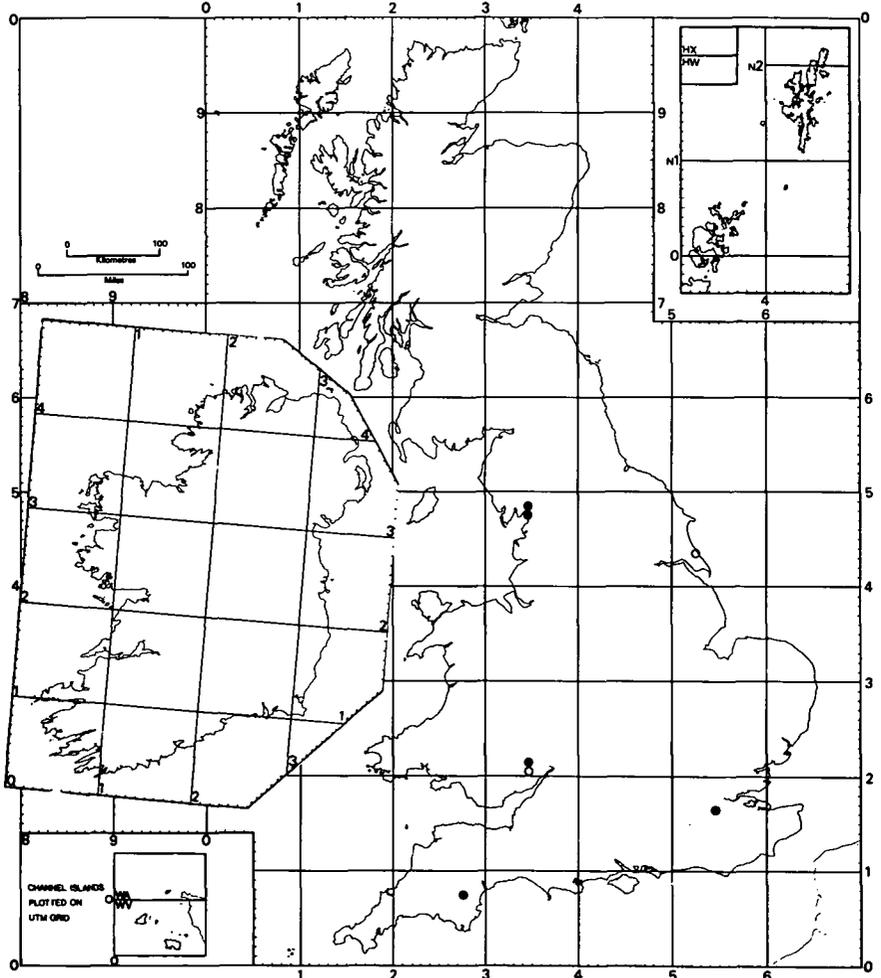
### 34 *Tipula (Dendrotipula) flavolineata* Meigen 1804



There would appear to be certain areas which are especially favourable, though the apparent clustered distribution may not be entirely real. It seems to be particularly scarce in Scotland, whilst in Ireland it only appears to occur in the east. Larvae live in dead wood, especially of beech and large birches, but various other deciduous trees are also used. It is a rather elusive species, the adults usually being inconspicuous on and around tree trunks and branches. Flight period: a short period in May or June.

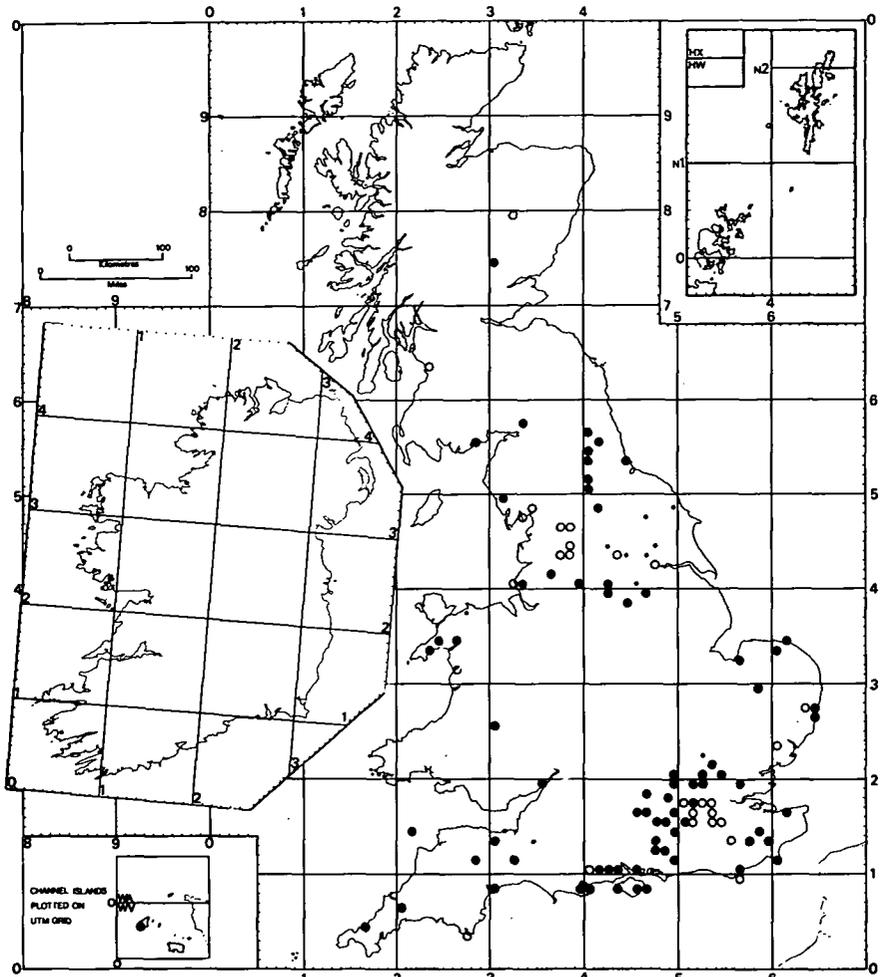


**36 *Tipula (Lunatipula) alpina* Loew 1873**  
 [*T. brevispina* of Coe (1950)]



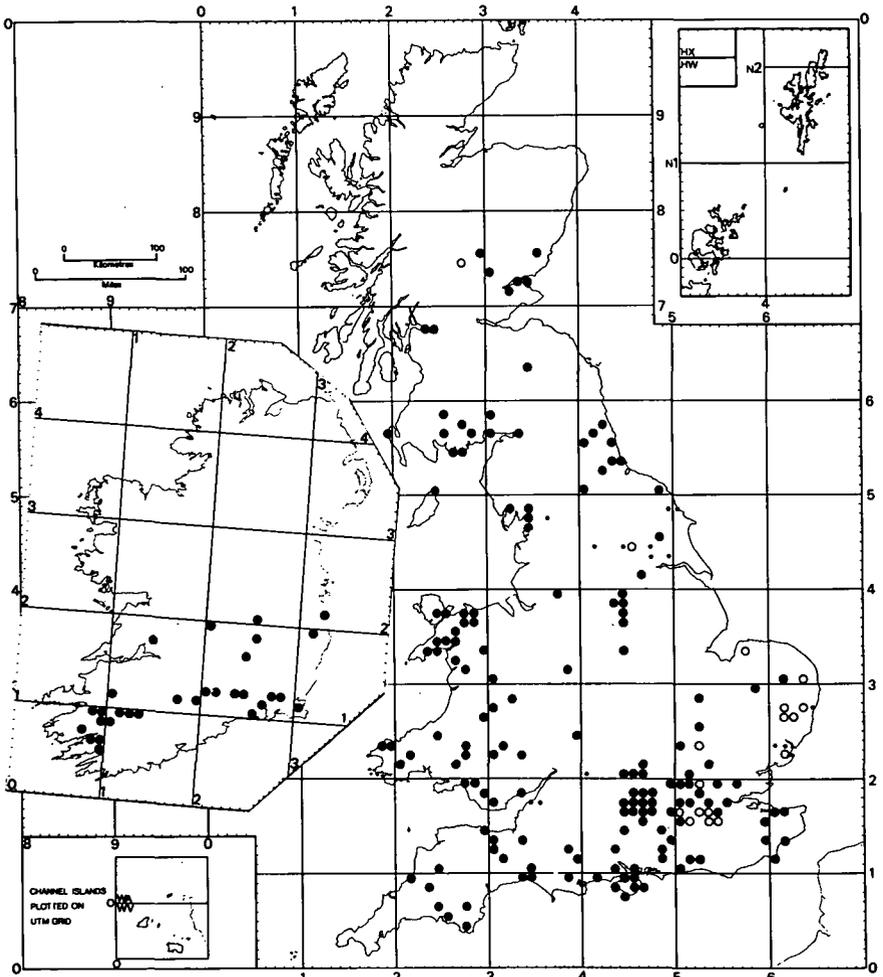
The limestone woods of the Wye valley and the Morecambe Bay area provide suitable habitat for this rare species. There is a single record from Kent. Flight period: June.

### 37 *Tipula (Lunatipula) cava* Riedel 1913



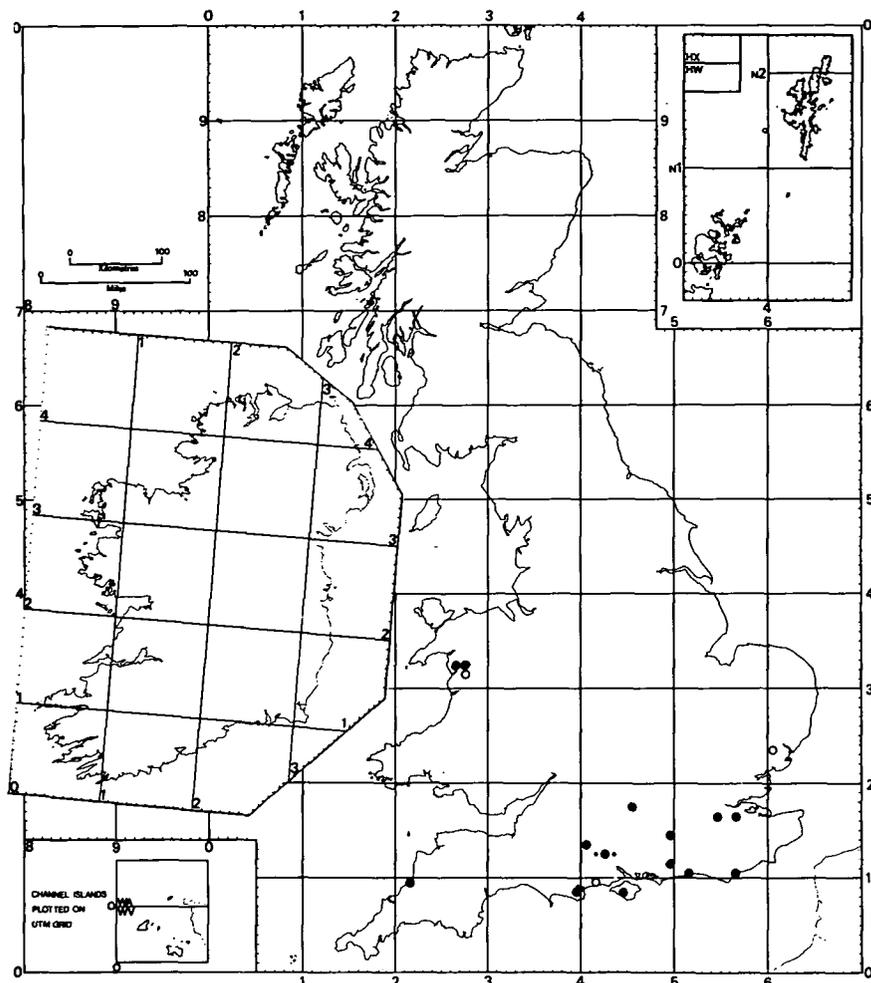
A widespread species in England, it is seemingly scarce in Scotland and absent from Ireland. It is associated with well-drained soils, occurring in scrubby areas on heaths and dunes. In hill country it occurs on semi-vegetated screes to a height of over 300 m. It is found within woodland, but only where there are very well-drained, poor, acid soils. It is absent from chalk soils and seemingly avoids other limestones. Flight period: June to August, with a peak often in July.

**38 *Tipula (Lunatipula) fascipennis* Meigen 1818**



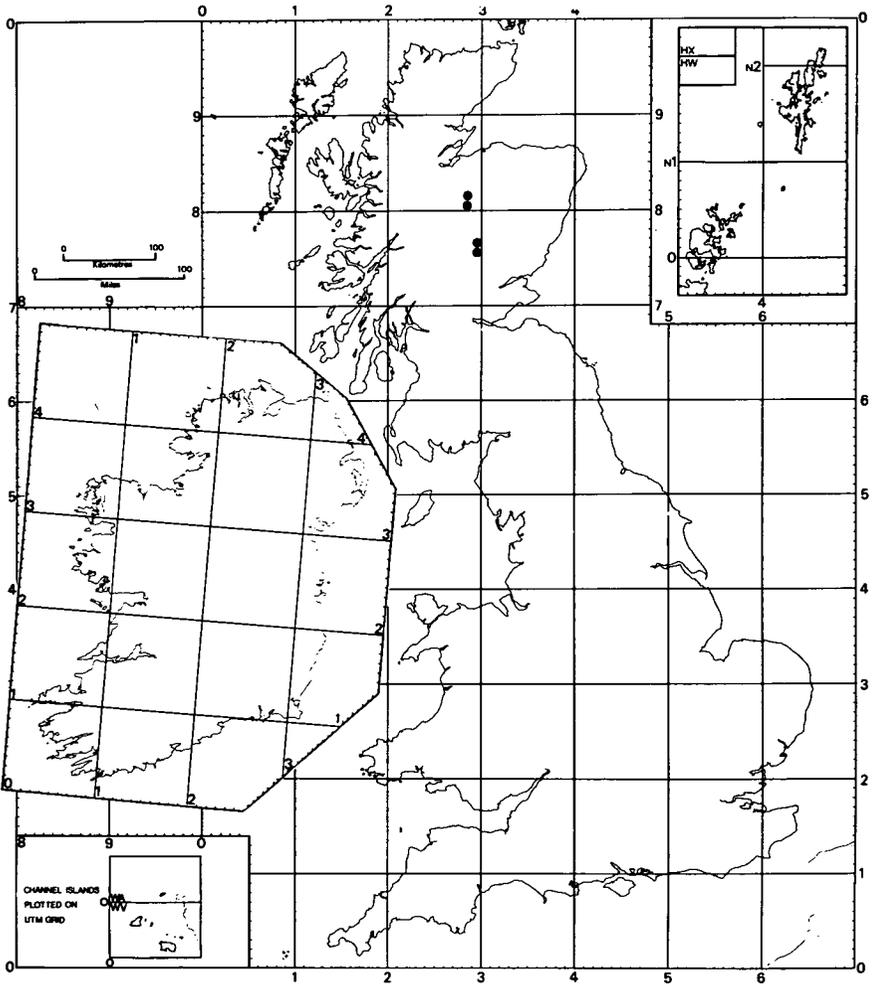
A widespread species in lowland districts, it occurs typically along lush woodland edges and hedgerows rather than within large forests. The marked southern distribution in Ireland is surprising; it may be more widespread. Flight period: May to August, peak late June to early July.

### 39 *Tipula (Lunatipula) helvola* Loew 1873



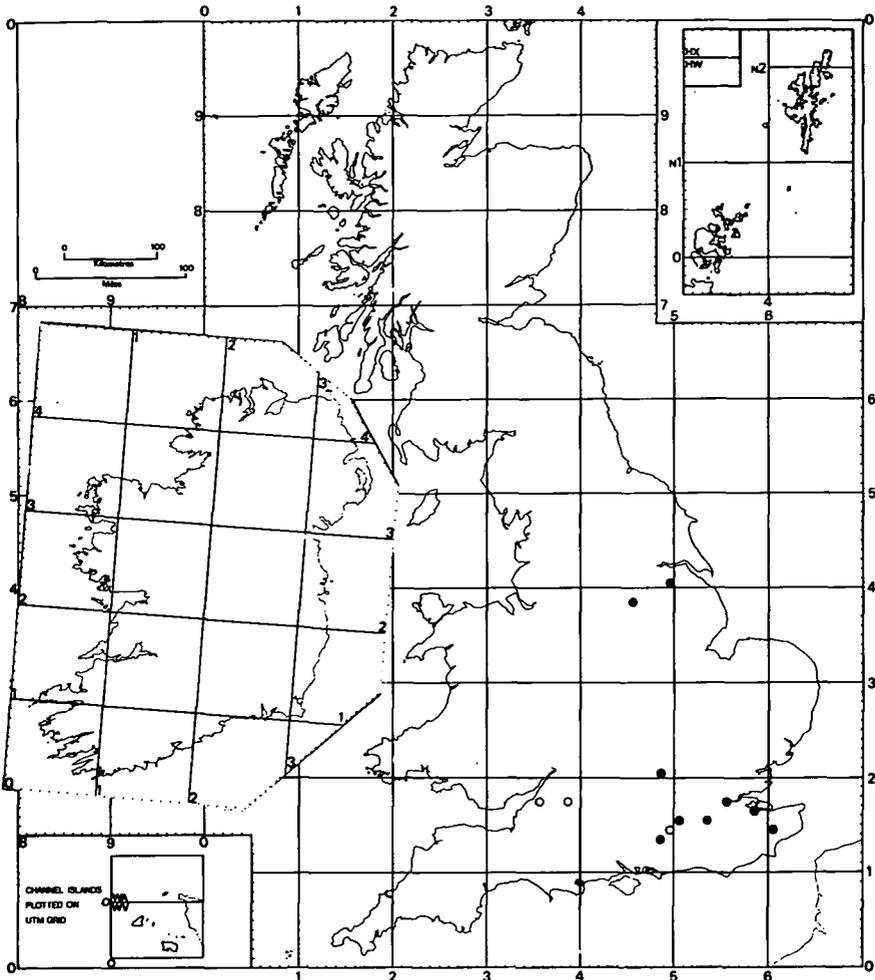
This rare species occurs in dry woodland in the south and south-east of England. An isolated old record from Dolgellau in mid-Wales has been followed by recent finds in the same district. Flight period: mid-July to mid-August.

**40 *Tipula (Lunatipula) laetabilis* Zetterstedt (1838)**  
 [Species added since Coe (1950)]



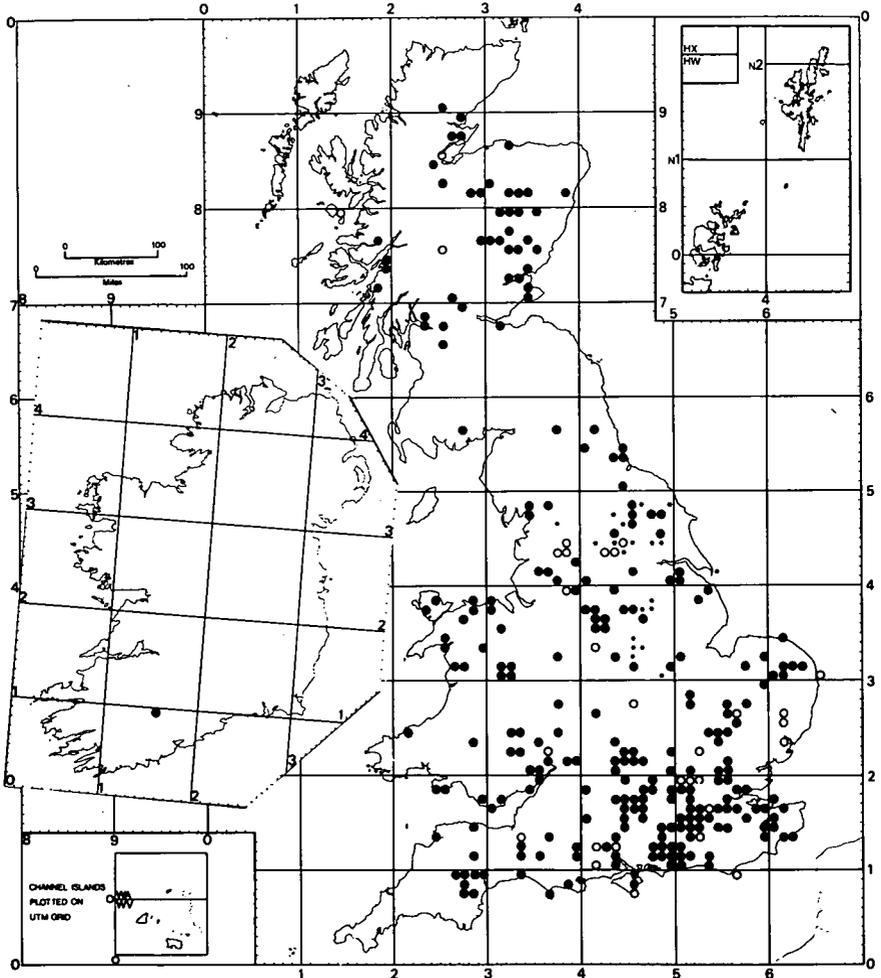
A recent addition to the British list under the name *dilatata*, this species was discovered in 1975 (Chandler & Stubbs 1977). It is known in the Scottish Highlands from four sites where riverside alder (*Alnus* spp.) grows on sandy alluvium. Flight period: early August.

**41 *Tipula (Lunatipula) livida* van der Wulp 1858**  
 [Species added since Coe (1950)]



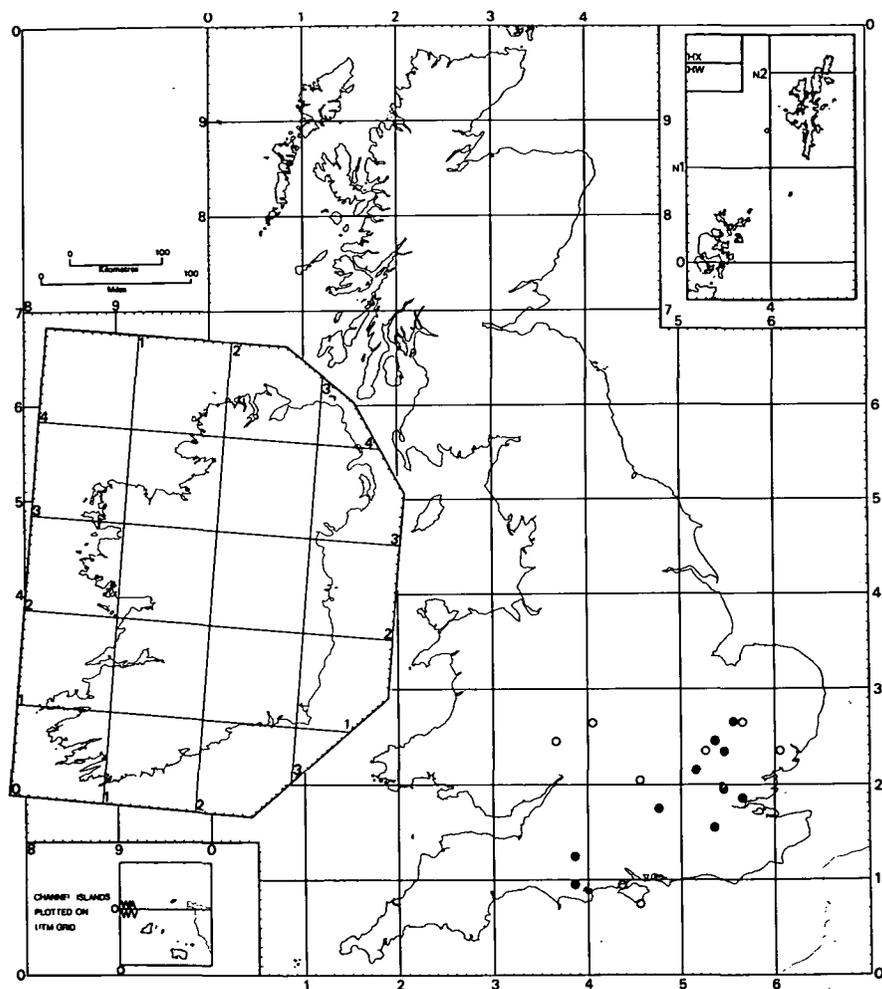
It was first discovered in Britain as a larva in 1952 (Chiswell 1954). However, an earlier adult specimen has now been located among craneflies taken at Compton, Surrey, dated 1929. There are scattered recent records from Surrey and Kent, either within woodland or beside clumps of trees. The sites typically have dry soils, as on the clay cappings on downs or on heaths, but several finds on heaths were close to water. Its occurrence in Lincolnshire and Yorkshire was unexpected. Flight period: June to early July.

## 42 *Tipula (Lunatipula) lunata* Linnaeus 1758



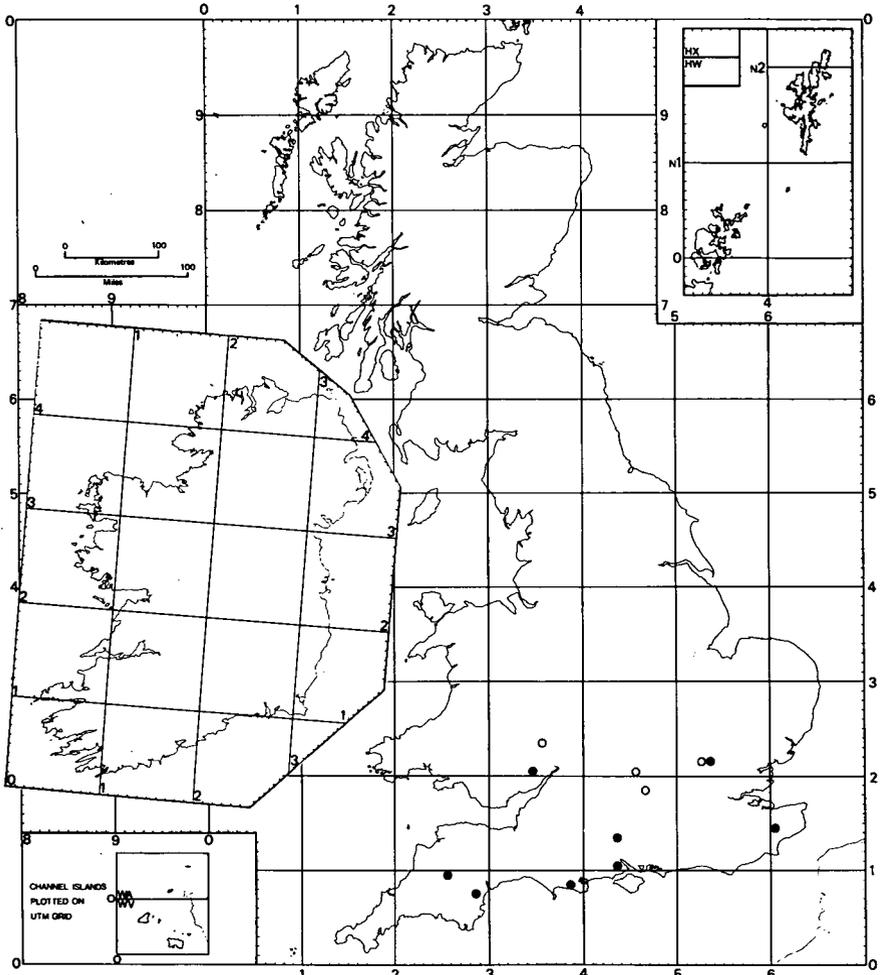
This is the commonest and most widespread of the orange *Tipula* species in Britain, so it is surprising that there is only one Irish record. It prefers lush woods and their margins. Flight period: May to July, with a peak in late May and early June in the south, but into July in Scotland.

### 43 *Tipula (Lunatipula) peliostigma* Schummel 1833



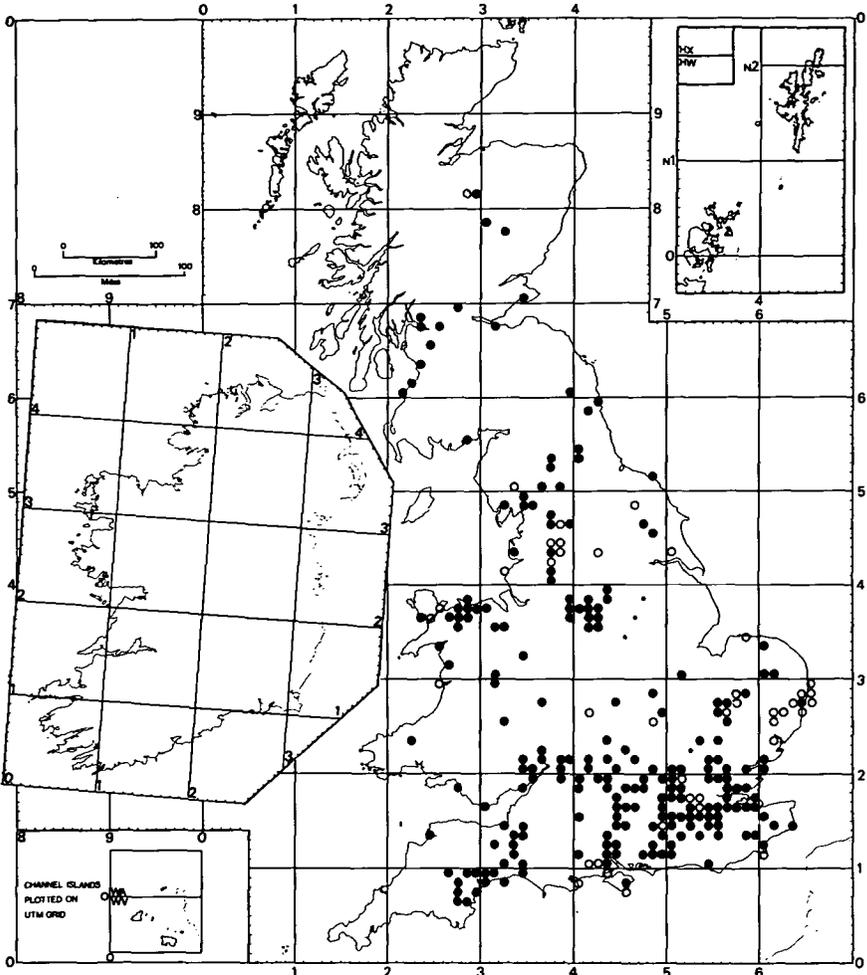
A scarce species of southern woods and hedgerows, this species would seem to be more frequent in East Anglia, relative to recording effort. It has been bred from birds' nests (eg song thrush (*Turdus ericetorum*)), but it is not clear whether this is the main or a subsidiary larval habitat. Flight period: May to August, mainly in July.

#### 44 *Tipula (Lunatipula) selene* Meigen 1830



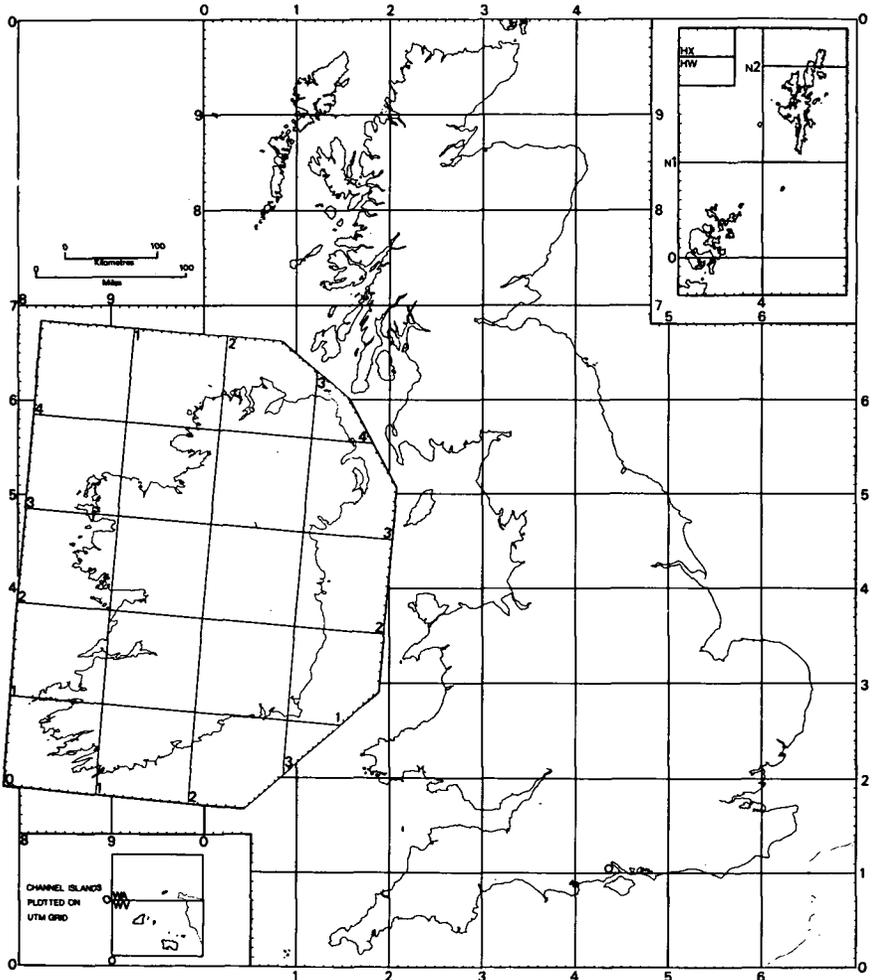
A species of southern woodland, it is rare in the south-east, but seems less rare, in relation to collecting effort, in Devon. Larvae occur in dead wood, even in small branches, lying on wet soil. Flight period: late May to June, rarely July.

45 *Tipula (Lunatipula) vernalis* Meigen 1804



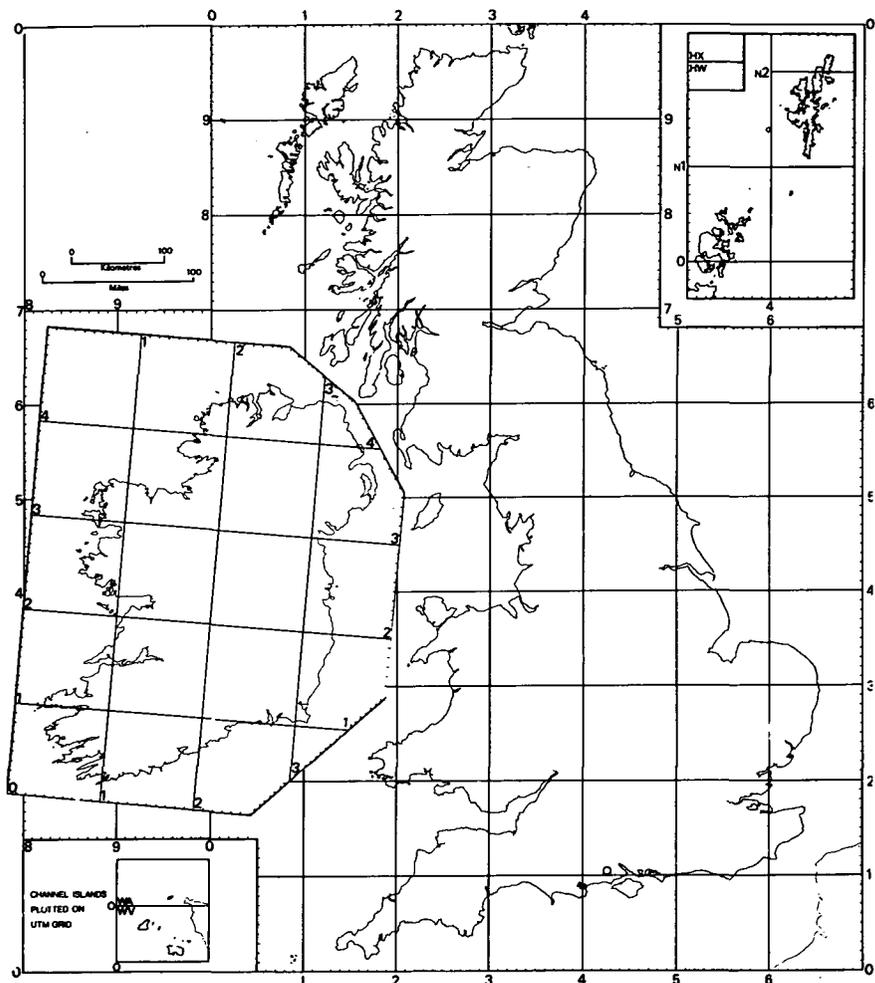
This species likes open herb-rich grassland on well-drained soils, as on chalk grassland, but avoids dense, rank vegetation. Sometimes it is also found in woods. In upland areas it is usually confined to the coast or the larger valleys, but occasionally occurs at altitudes over 300 m. It unexpectedly appeared on even higher ground, where it was previously absent, in the Pennines, possibly related to the drought years of 1975 and 1976. Flight period: a spring species occurring principally in May, but extending into June or even early July, tending to be latest in the north.

46 *Tipula (Mediotipula) sarajevensis* Strobl 1898



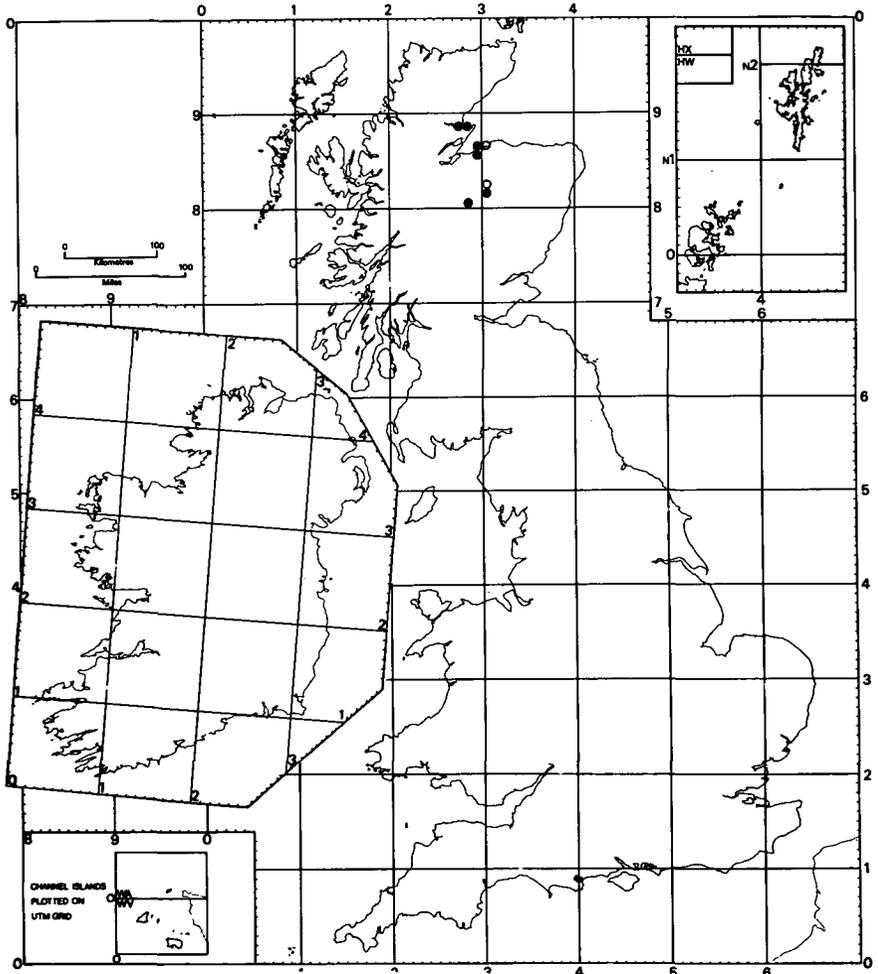
A female was taken in the New Forest on 1 July 1901. This remains the only British record. The larval ecology is unknown, but other species in the sub-genus, on the continent, breed in dead wood.

**47 *Tipula (Mediotipula) siebkei* Zetterstedt 1852**  
 [Species added after Coe (1950)]



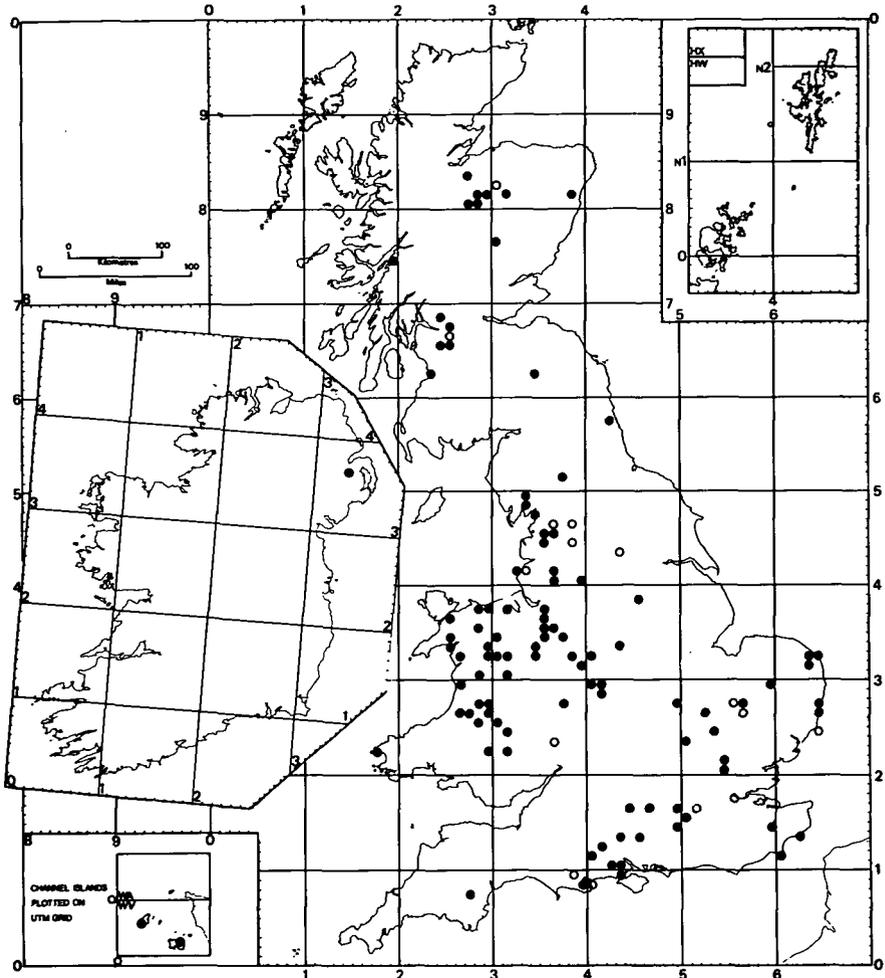
It is known in Britain only from a male taken on 26 June 1953 at Mark Ash in the New Forest (Collin 1954). On the continent, larvae have been reported from the rotting wood of aspen (*Populus tremula*).

**48 *Tipula (Odonatisca) nodicornis* Meigen 1818**  
 [*T. juncea* of Coe (1950)]



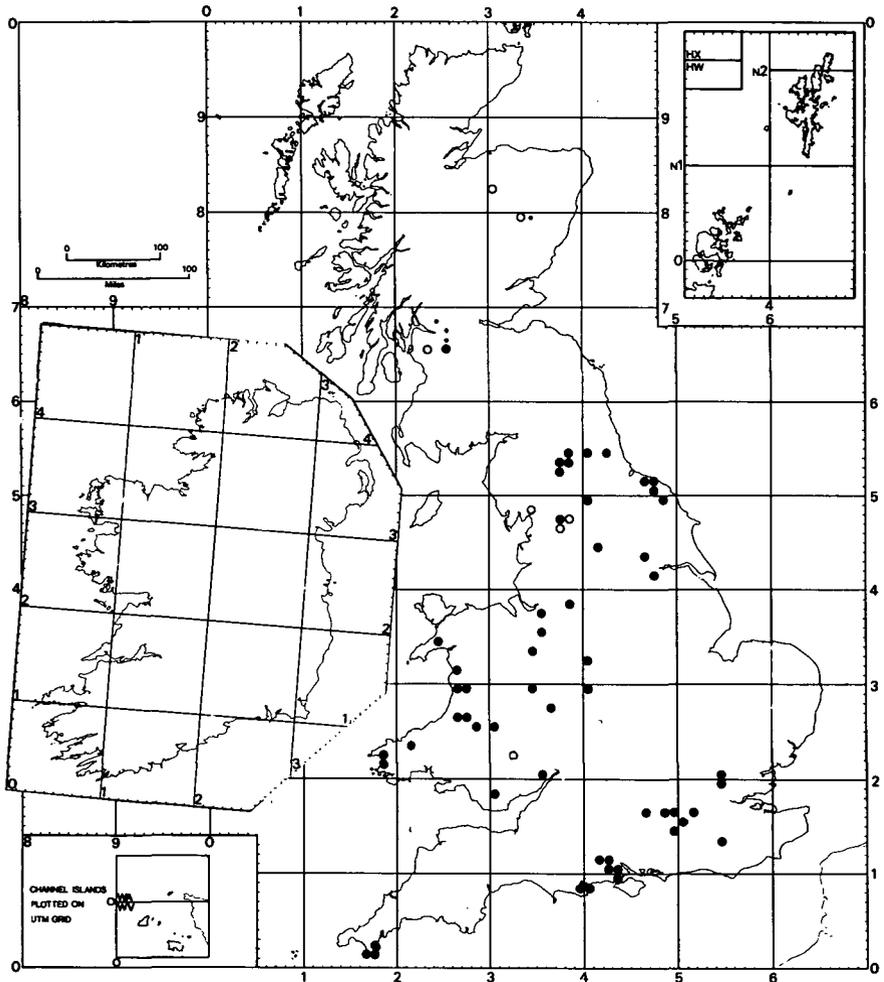
A species of north-east Scotland occurring on sand dunes, especially where windswept stony ground has sparse vegetation, it is also found along the sandy banks of the River Spey and the Dorbach Burn (Cairngorms) in open or, more rarely, shaded situations. Flight period: June.

49 *Tipula (Platytipula) luteipennis* Meigen 1830



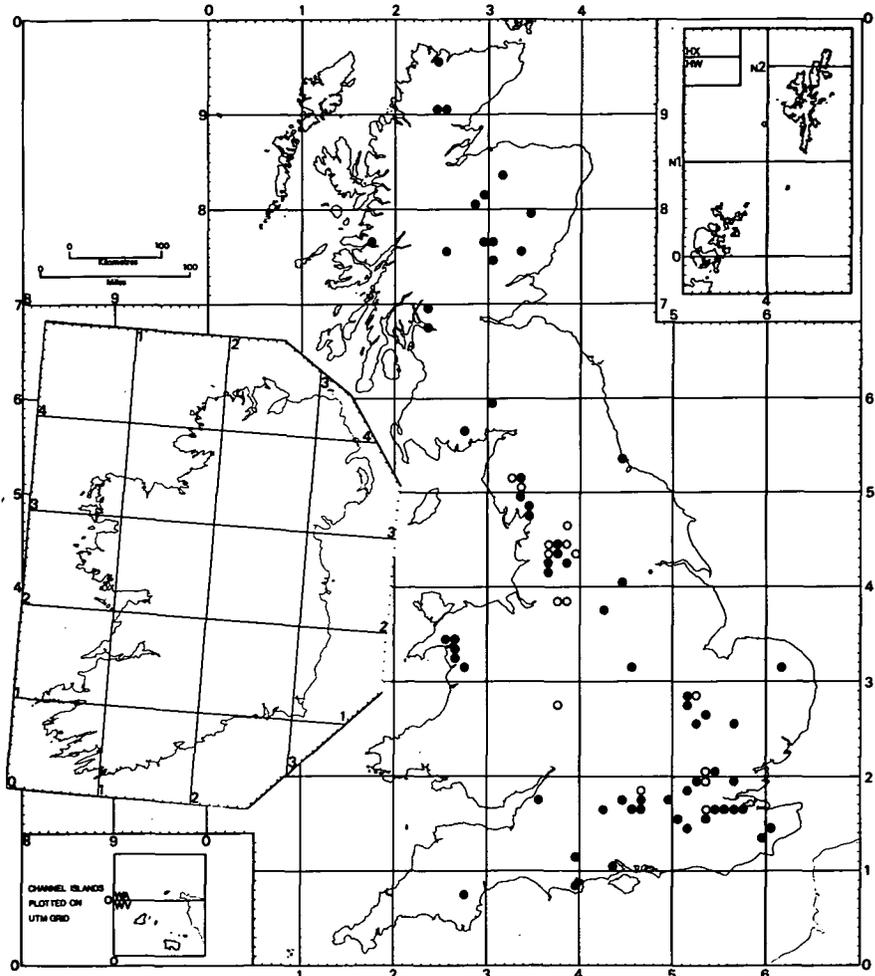
A widespread, autumn species, it occurs in marshy and boggy ground, especially in carr. The larvae are adapted to a sub-aquatic existence. Flight period: August to October.

50 *Tipula (Platytipula) melanoceros* Schummel 1833



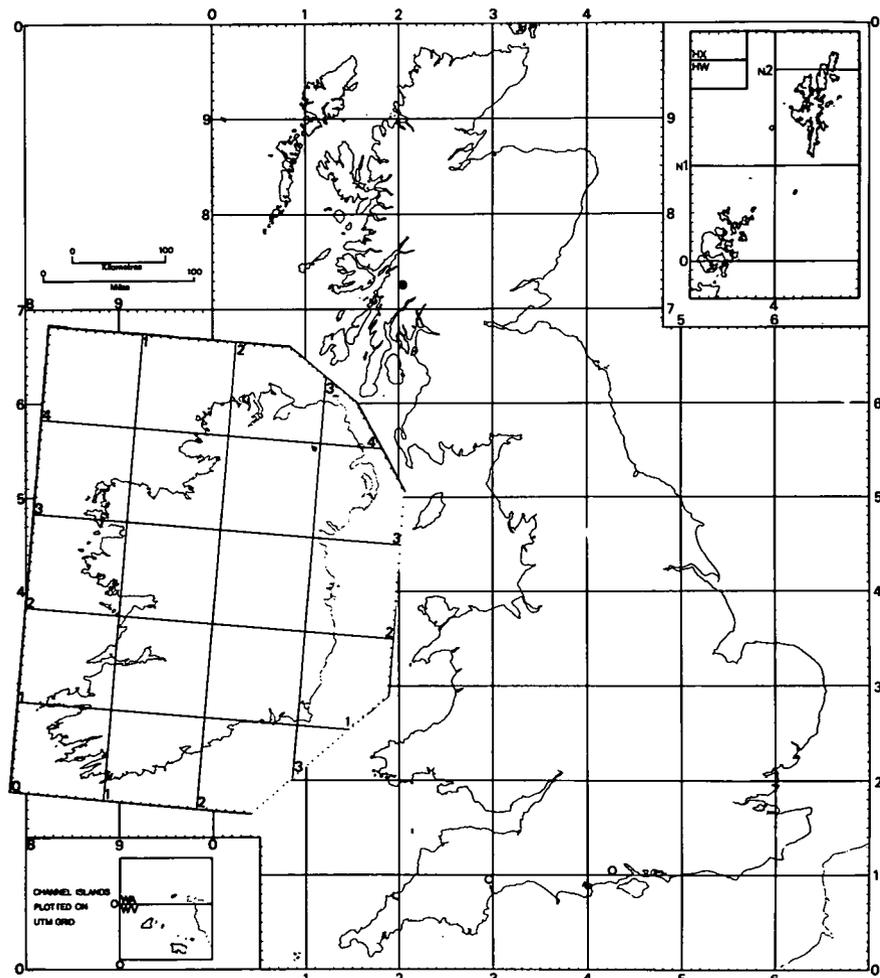
A species characteristic of bogs and boggy moorland, it occurs from near sea level to well over 600 m. Peat pools provide the breeding habitat in the Pennines. In some lowland districts, it can be found in the absence of bogs, on wet peat with pennywort (*Hydrocotyle vulgaris*). It can occur with *T. (P.) luteipennis*, but prefers more acid areas and is not found in carr. Larvae are sub-aquatic. Flight period: August to October.

51 *Tipula (Pterelachisus) irrorata* Macquart 1826



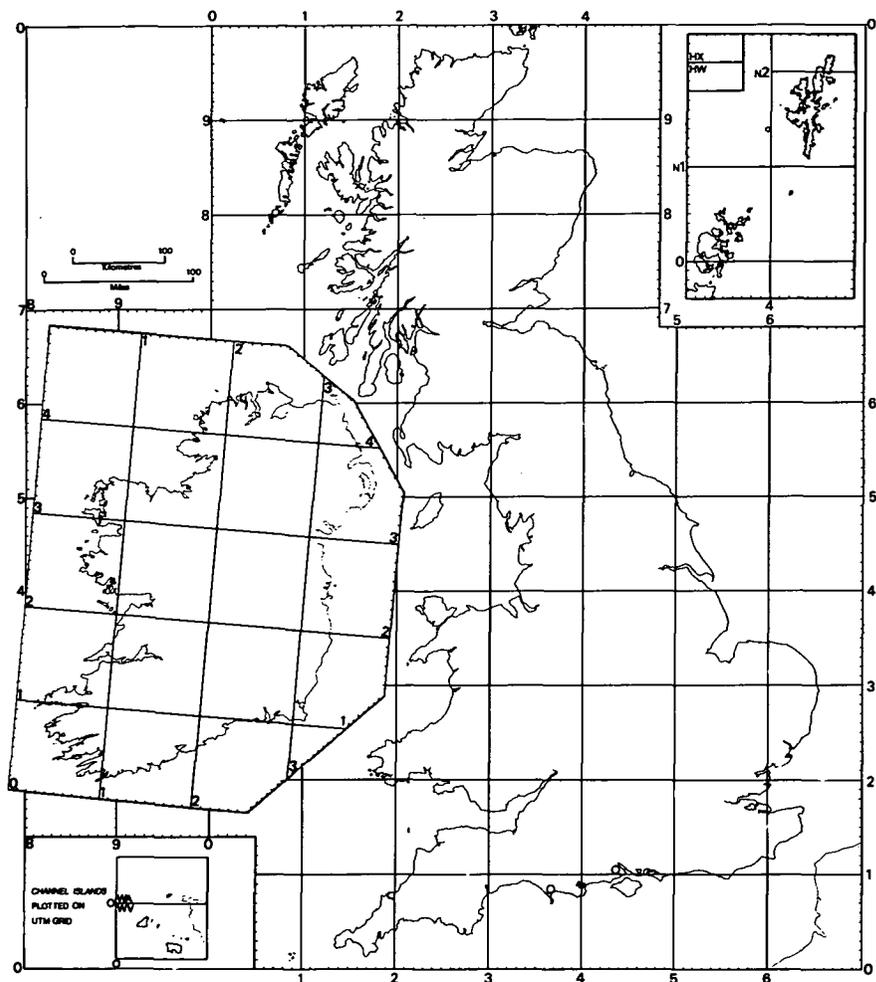
This widespread woodland species is easily overlooked. The grey larvae are often frequent under the bark of logs from deciduous trees. The adults are more elusive, tending to sit well camouflaged on tree trunks. A quiet approach to a cluster of logs and some rapid sweeps around is a good strategy for catching this species. Flight period: May to July.

## 52 *Tipula (Pterelachisus) luridirostris* Schummel 1833



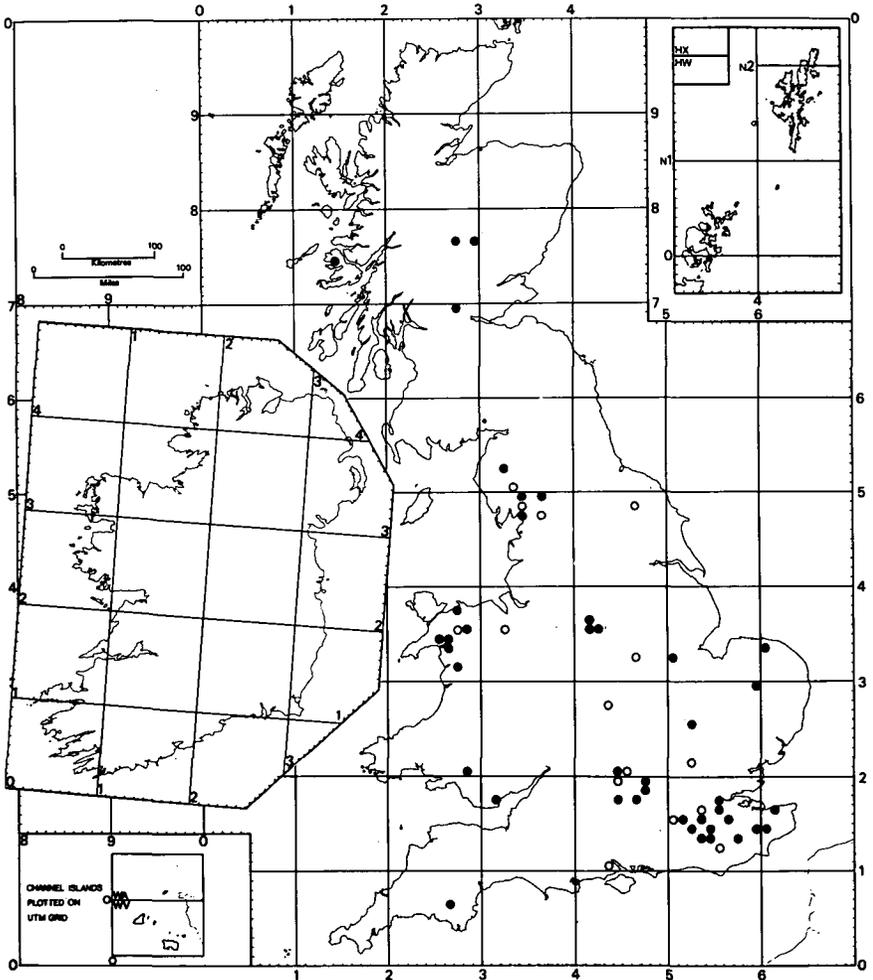
A rare species, it was originally found in the New Forest in 1936. There are also old records for the Exeter area, including one reared from a larva found associated with tree epiphytes. Recently an adult was taken in an Argyll oak wood. If this is an arboreal, western tipulid, it could be inferred that it is almost inevitably under-recorded; however, as western oak woods have been sampled on many occasions during the flight period without yielding further specimens, it remains likely that this is a genuinely rare insect. Flight period: May to June, August.

53 *Tipula (Pterelachisus) mutila* Wahlgren 1905



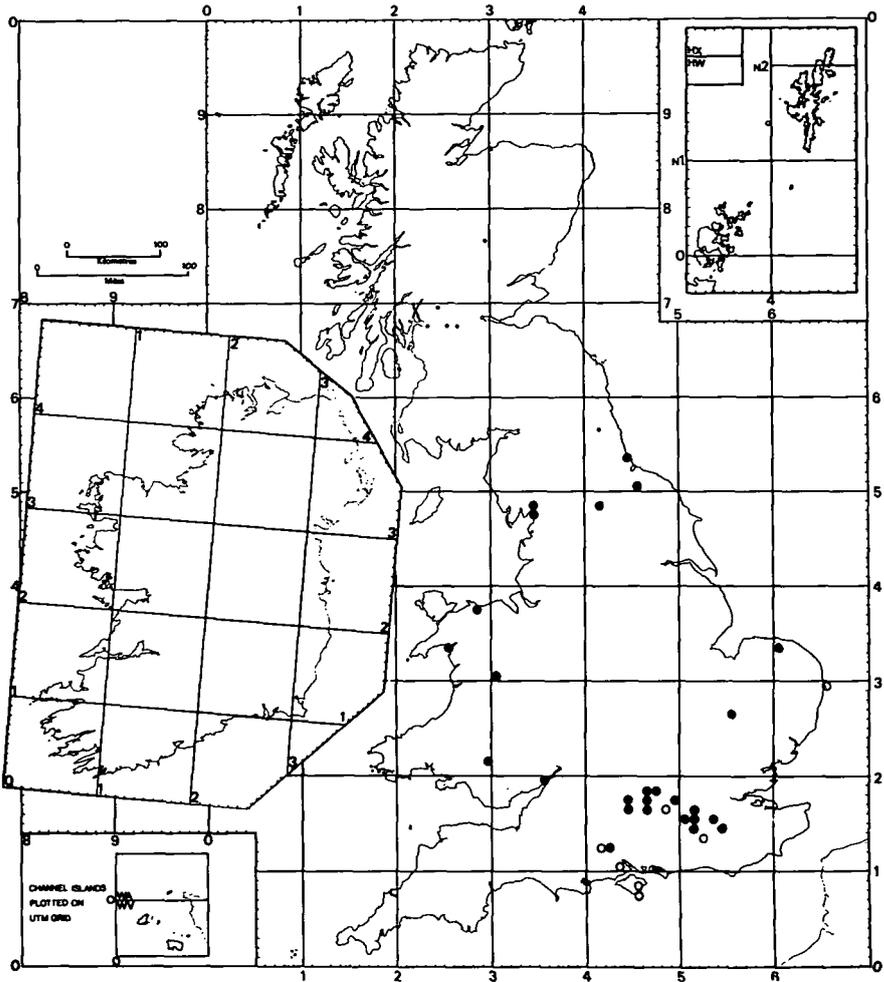
A small *Tipula* species, this is still known only from the original records in the New Forest (28 May 1896) and Dorset (no date, but earlier than 1926).

54 *Tipula (Pterelachisus) pabulina* Meigen 1818



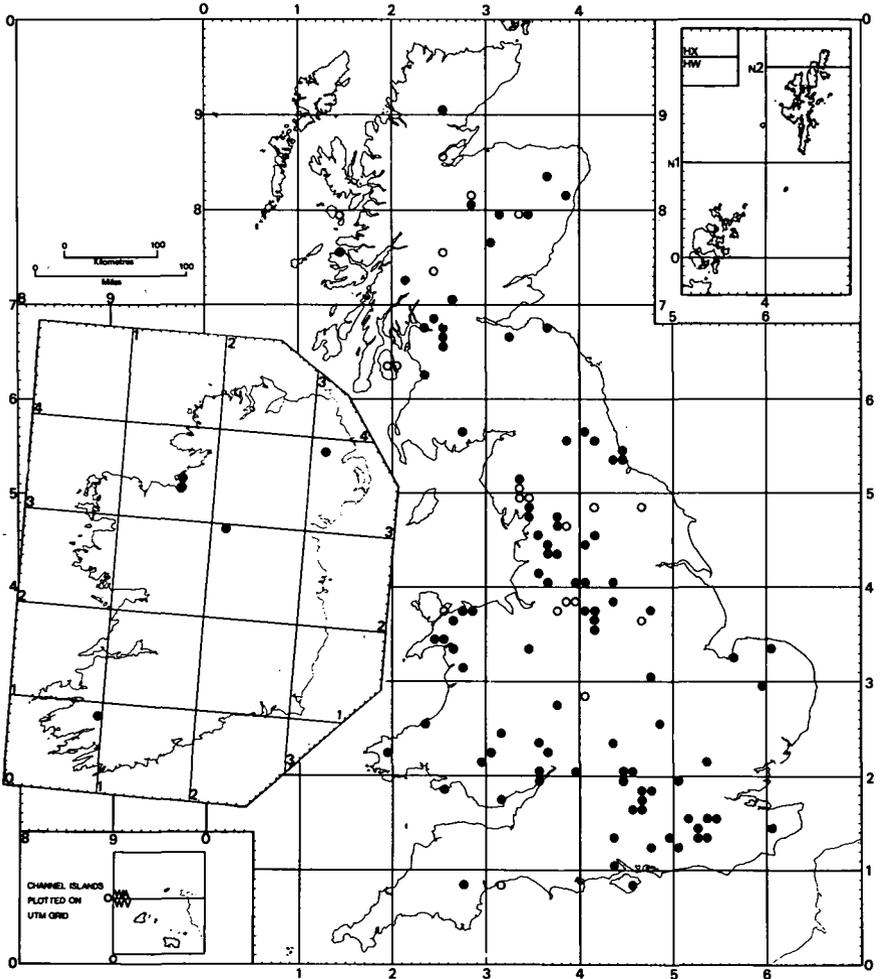
This local woodland species prefers a rich and often calcareous soil. The females sit on tree trunks and saplings, and the males systematically flutter up such trunks. This species is thus easy to miss when sweeping. Flight period: May to June, especially mid-May.

55 *Tipula (Pterelachisus) pseudovariipennis*  
Czizek 1912



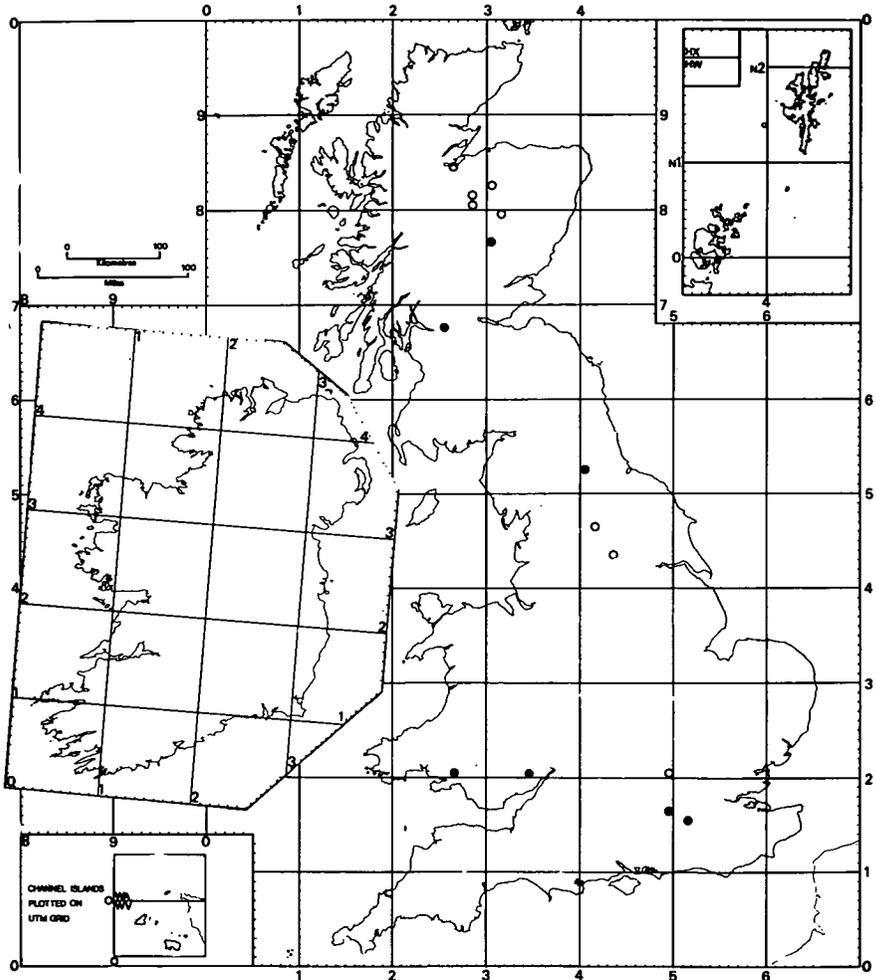
A scarce spring-time species of chalkland woods, there are also a few records from localities with sandy soils. Female *Pterelachisus* are much more variable than originally thought so some earlier identifications may be erroneous. Thus, it is suspicious that all Scottish and most (possibly all) northern and Midland England records are based on females only, giving cause for regret that the sex of so many records is not certain. There are few reliable records based on males, but they include some from woodlands on the North Downs in Surrey. There is a need to review more closely the true distribution of this species, including the reappraisal of all existing records. Flight period: May

56 *Tipula (Pterelachisus) submarmorata*  
 Schummel 1833 [*T. meigeni* of Coe (1950)]



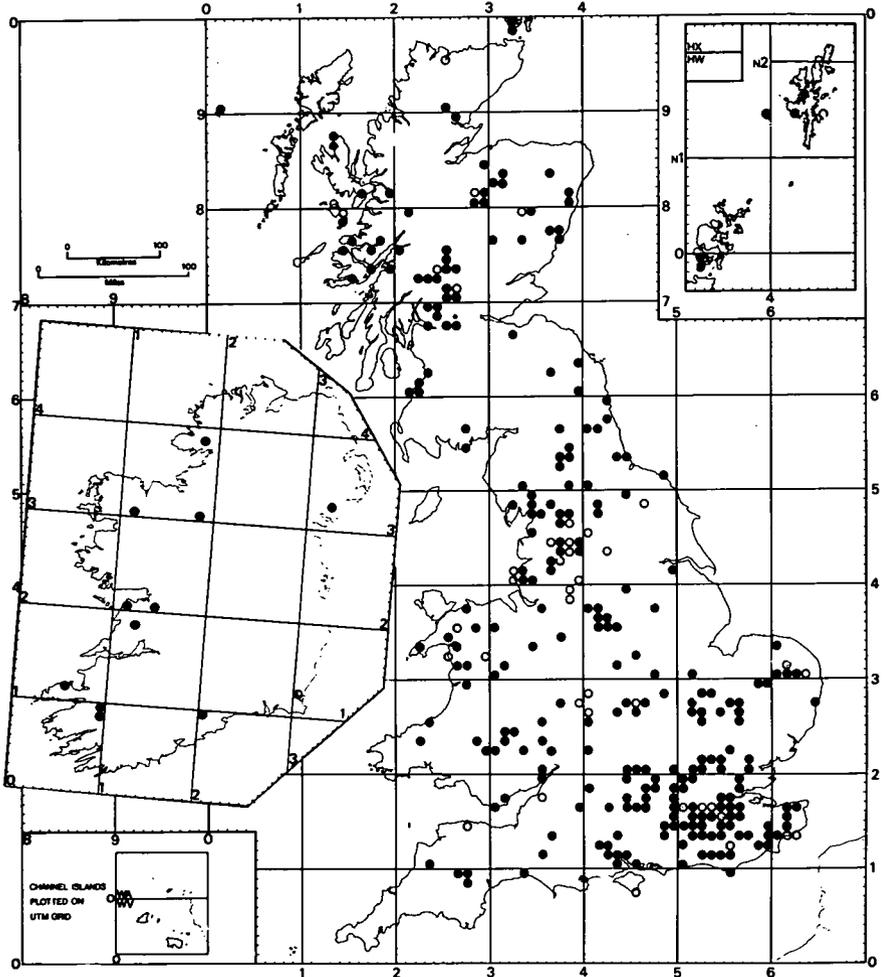
Though local, it is one of the characteristic species of spring-time in woodlands on rich soils. In common with *T. (P.) pabulina*, the females sit on trunks and saplings, and the males will be found in systematic search. Flight period: April to May, with a peak in May.

57 *Tipula (Pterelachisus) truncorum* Meigen 1830



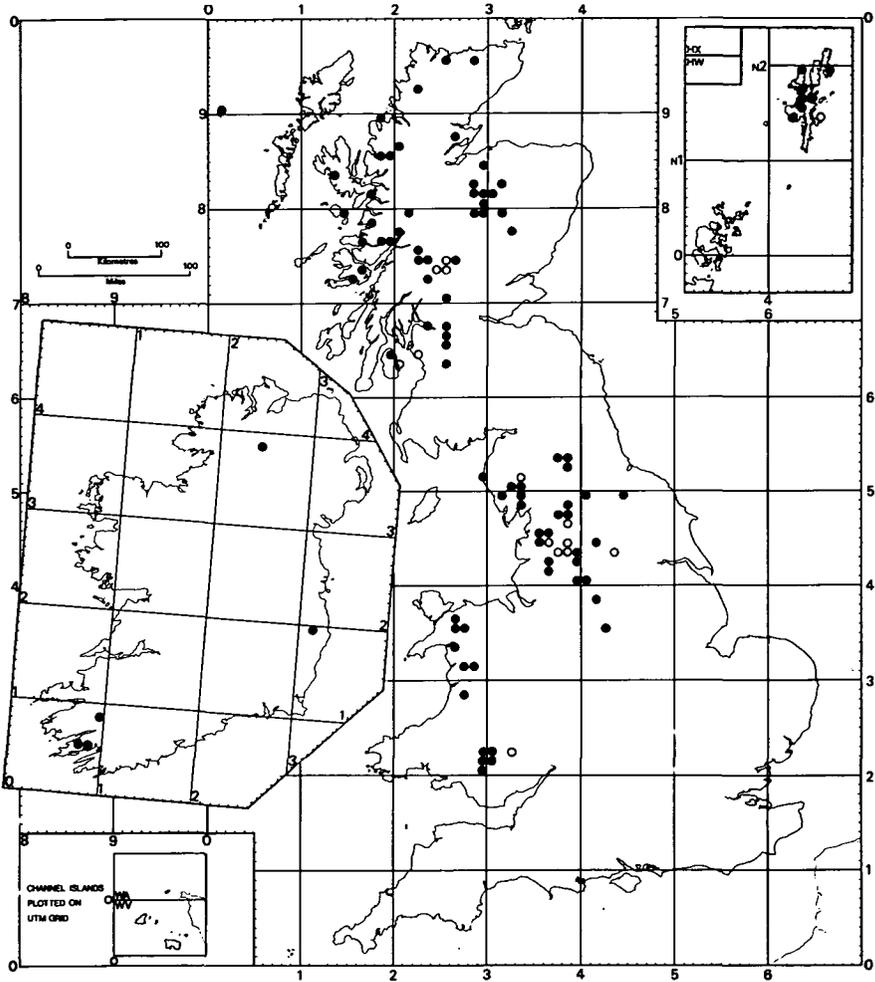
This forest species is poorly known and has a scattered distribution. In the Alps it has been obtained most easily by throwing stones into the foliage of spruce (*Picea* spp.) trees in order to flush out specimens - thus, it is possible that it is under-recorded because adults spend the day in tree foliage. This conclusion is supported in Britain by the fact that it has been taken almost as often in light traps as by all other methods. Flight period: June to August.

58 *Tipula (Pterelachisus) varipennis* Meigen 1818



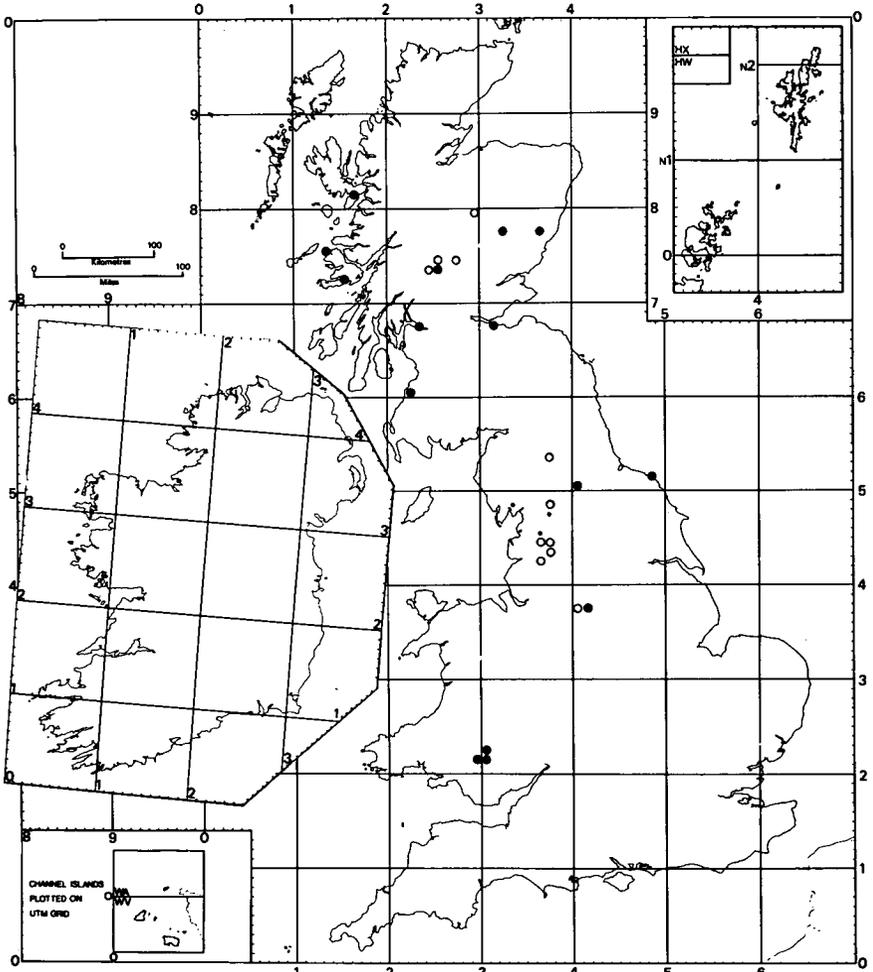
Lush woodland edges provide the ideal habitat for this widespread species. However, it has been taken on limestone grassland at over 650 m in the Pennines in mid-May, well before its appearance in the London area. Also, it is one of the few species to be found on Foula and St Kilda, isolated islands without woodland. Morphologically, the species seems constant, but perhaps there are ecological or physiological races. Flight period: April to June, usually with peaks in late May.

## 59 *Tipula (Savtshenka) alpium* Bergroth 1888



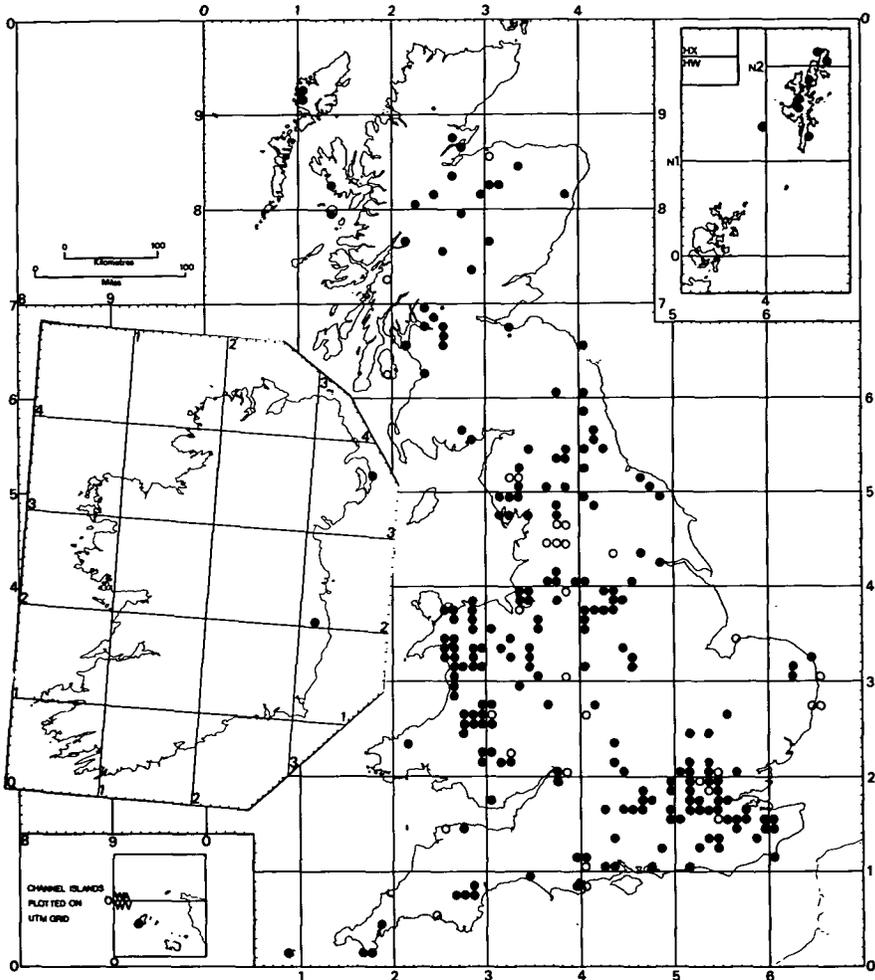
As the name would suggest, this crane fly is found in upland districts. Moorlands and mountainsides form the usual habitat, especially in rocky terrain, though it often occurs at low altitudes also. A more comprehensive distribution in the uplands is to be expected. Flight period: the main emergence is in May, extending into June according to altitude and latitude, but there is sometimes a partial autumn emergence as late as September.

60 *Tipula (Savtshenkia) cheethami* Edwards 1924



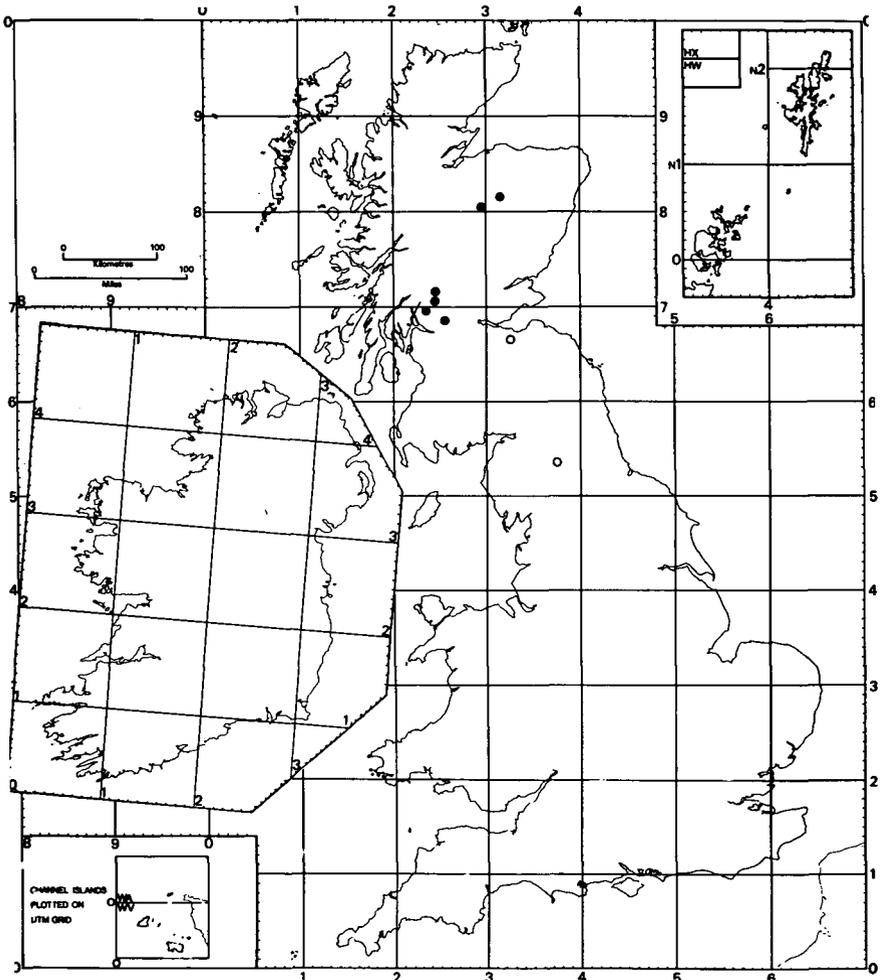
Confined to northern and western districts, this species may be found in lowland woods and on open moorland where sheltered wet moss occurs beside upland streams. Larvae are reported from moss (eg *Rhynchostegium riparioides*), or occasionally liverworts on wet rock faces, in streams and rivers, even where the current is fast. Some pH readings have revealed an association with slightly alkaline water which, if such a preference were constant, would account for the local distribution of the species. On the Inner Hebrides, it is associated with base-rich volcanic rocks, including coastal cliff seepages. Flight period: May and June.

**61 *Tipula (Savtshenka) confusa* van der Wulp 1887**  
 [*T. marmorata* of Coe (1950)]



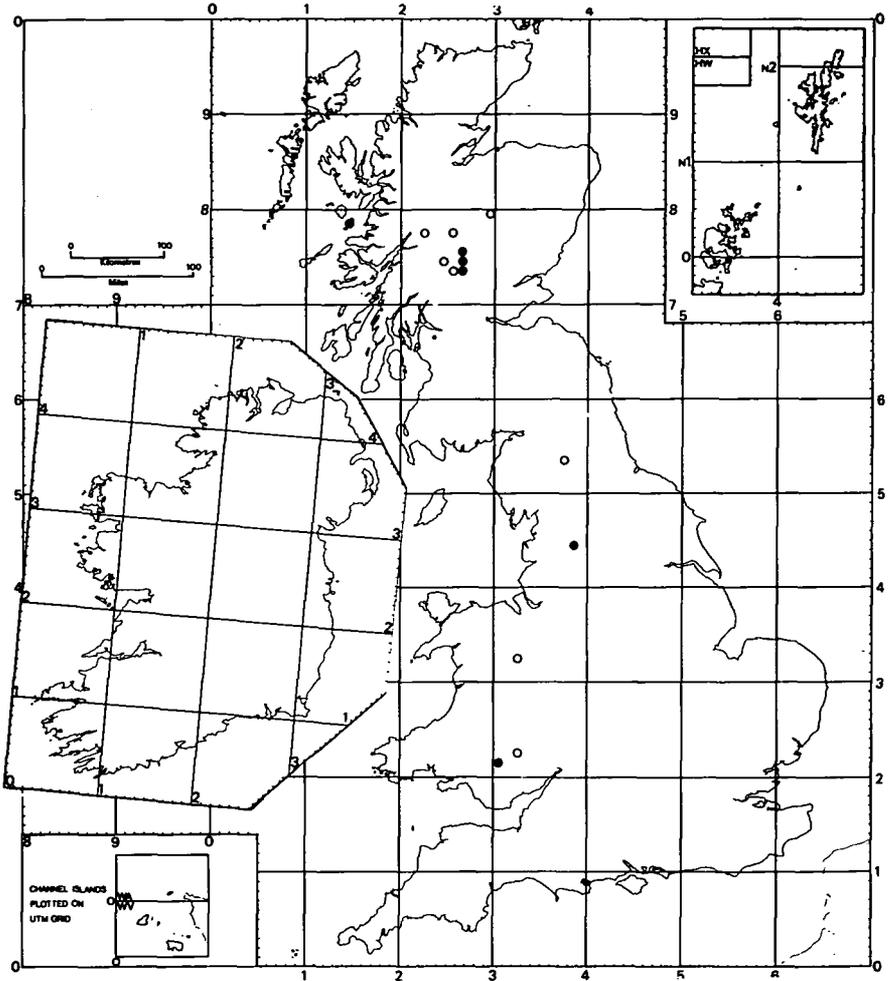
This widespread species occurs in a range of habitats, but in drier places than most related species. It occurs among heather (*Calluna vulgaris*) on moorland and heaths (especially where there is some shelter), in woods and in gardens. The larvae live in moss. Flight period: the main emergence is in the late summer and autumn, with a peak between late August and mid September, but in some districts it is plentiful even in mid-October. It is puzzling that two specimens have been taken in May in different years in the Bangor district of north Wales.

**62 *Tipula (Savtshenka) gimmerthali*  
Lackschewitz 1925**



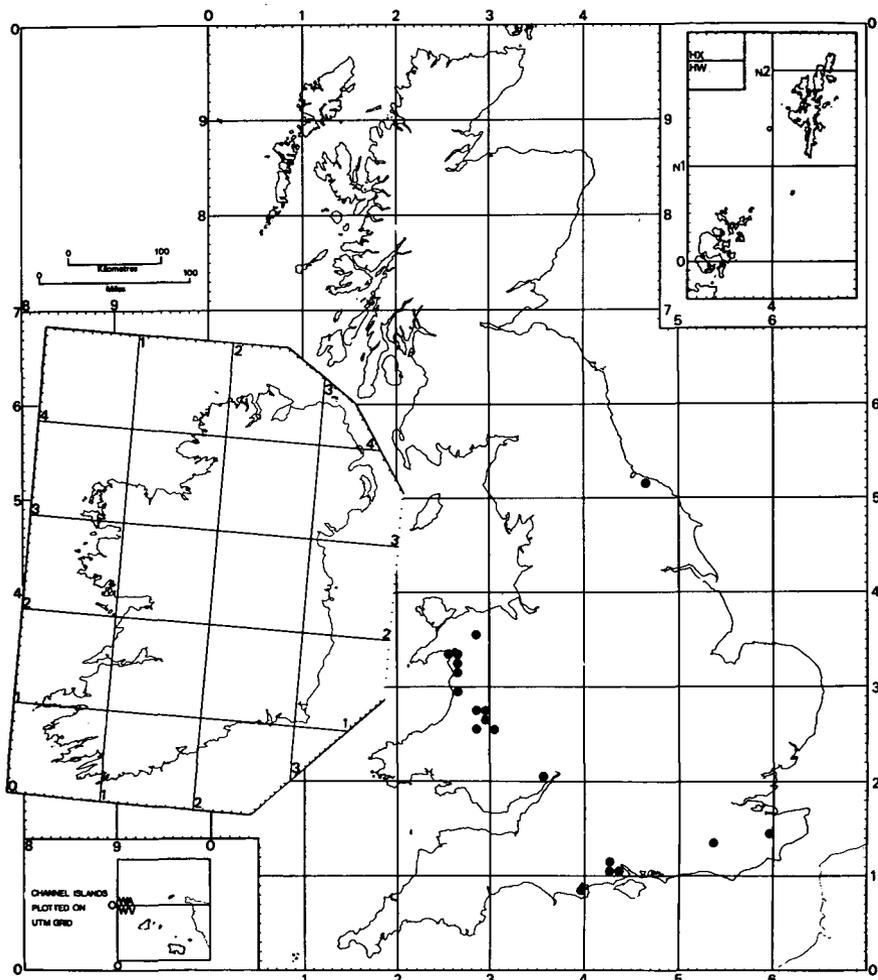
First found in 1945 in the Pentland Hills, near Edinburgh, it is now also known from several other upland districts. It occurs on boggy ground by streams and around alluvial flushes above 300 m, possibly in association with localised base-rich conditions. No doubt under-recorded, but several recorders refer to its highly localised occurrence within very small areas. There is an interesting report of a grouse having over 400 specimens in its crop (Butterfield & Coulson 1975). Flight period: late October to early November.

**63 *Tipula (Savtshenkia) grisea* Zetterstedt 1851**  
 [*T. macrocera* of Coe (1950)]



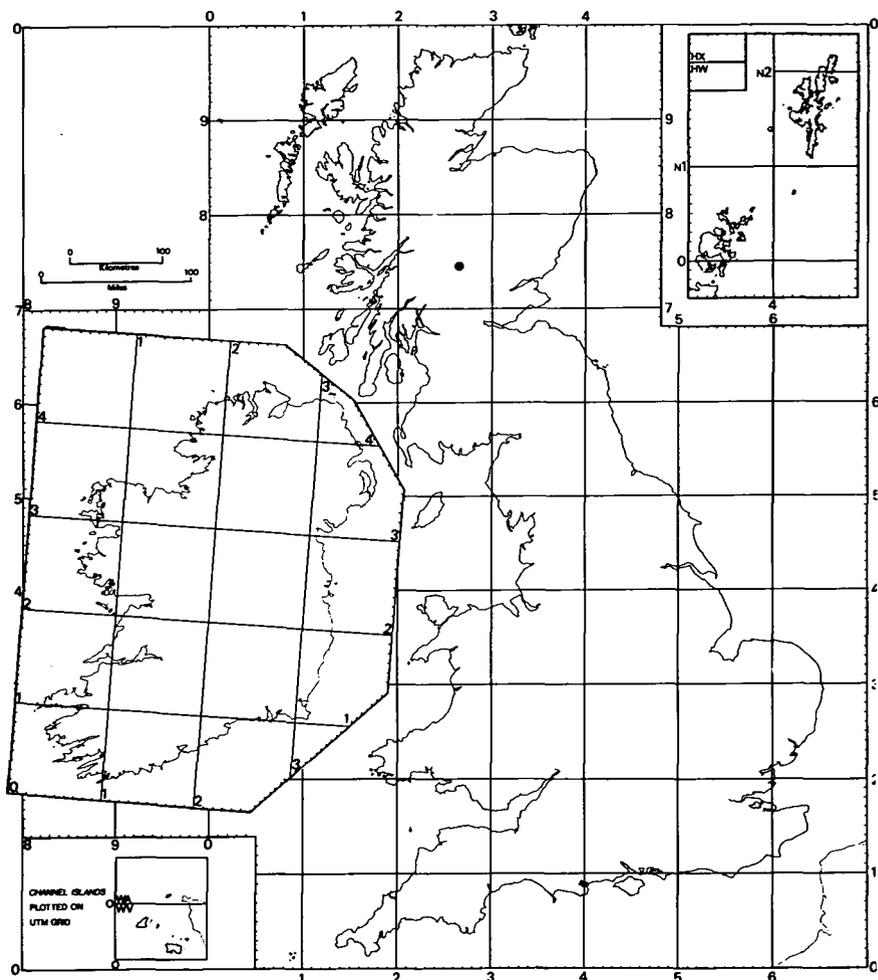
This crane-fly is found on upland boggy ground to an altitude of over 600 m. The habitat is grossly under-recorded early in the season, but the species would seem to be highly localised in occurrence. Flight period: April to mid-May.

## 64 *Tipula (Savtshenka) holoptera* Edwards 1939



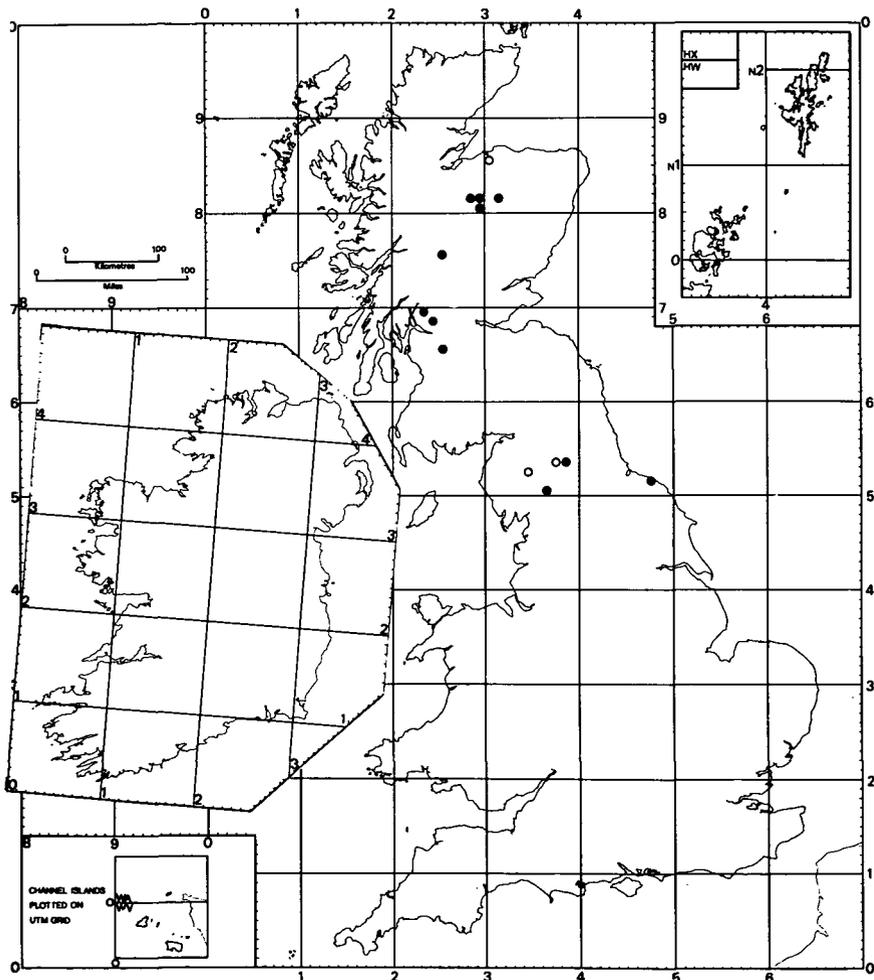
An extremely local species of boggy ground, it occurs with coarse herbage such as sharp-flowered rush (*Juncus acutiflorus*). An interesting distribution in Wales is becoming apparent; surveys during the flight period have shown it to be abundant in some districts and absent from others (compare this map with that for the sibling species *T. (S.) pagana*, map 68). Its taxonomic status is disputed; it may be a distinctive, and seemingly endemic, sub species of *T. (S.) pagana*. Flight period: October.

**65 *Tipula (Savtshenkia) invenusta* Riedel 1919**  
 [Species added since Coe (1950)]



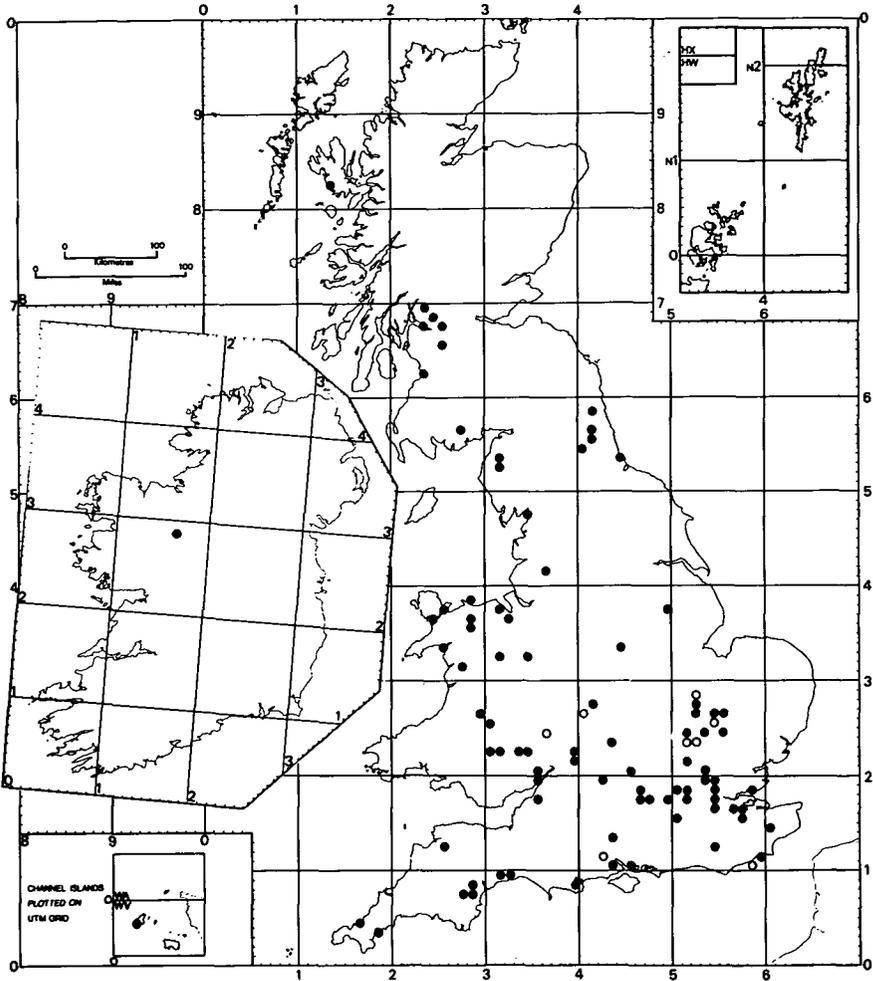
This is a very recent addition to the British list (Hancock 1988), known only from near the summit of Ben Lawers, Perthshire, a site which is famous for its base-rich rocks and associated flora. Larvae, which were found under moss covering boulders at 1060 m in July 1986, were reared through. Subsequently adults have been recorded in the same location. Flight period: September (late August when reared from larvae).

**66 *Tipula (Savtshenka) limbata* Zetterstedt (1838)**  
 [*T. vavra* of Coe (1950)]



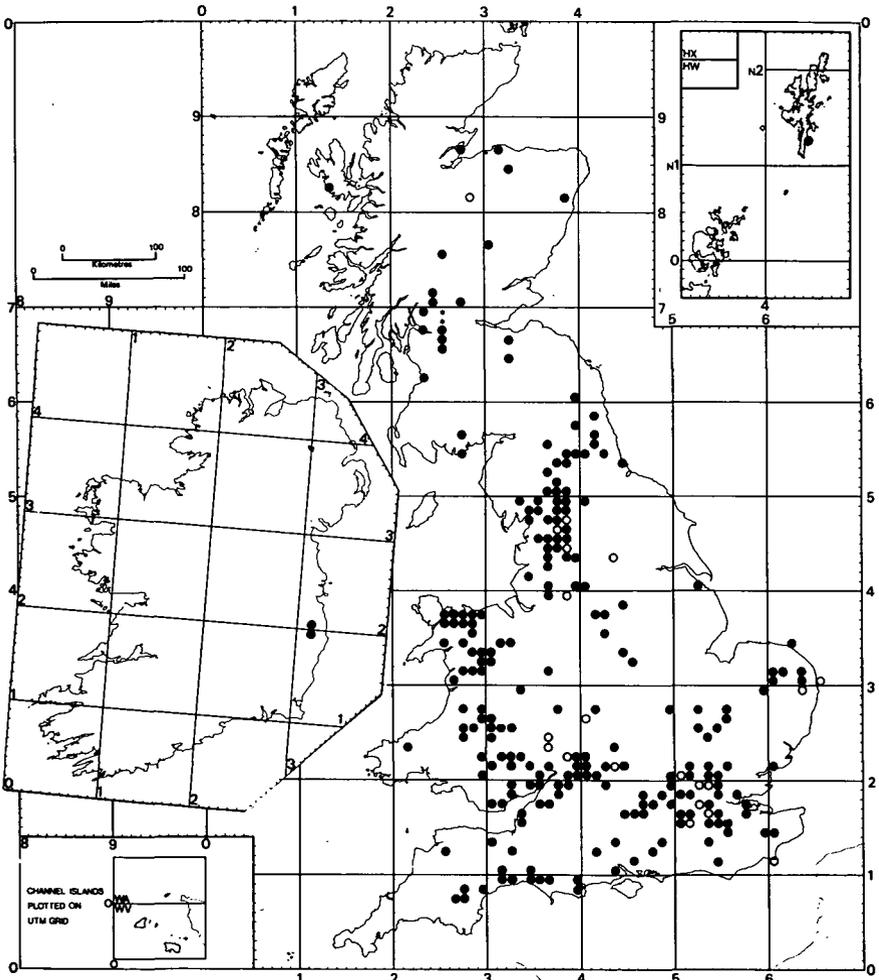
A little known species, but it is locally common in lowland wooded habitat with boggy flushes in the Spey valley. Single specimens have been found on high moorland (probably best interpreted as strays), and it has appeared in several light traps (eg around Glasgow). Flight period: mainly early to mid-September.

67 *Tipula (Savtshenkia) obsoleta* Meigen 1818



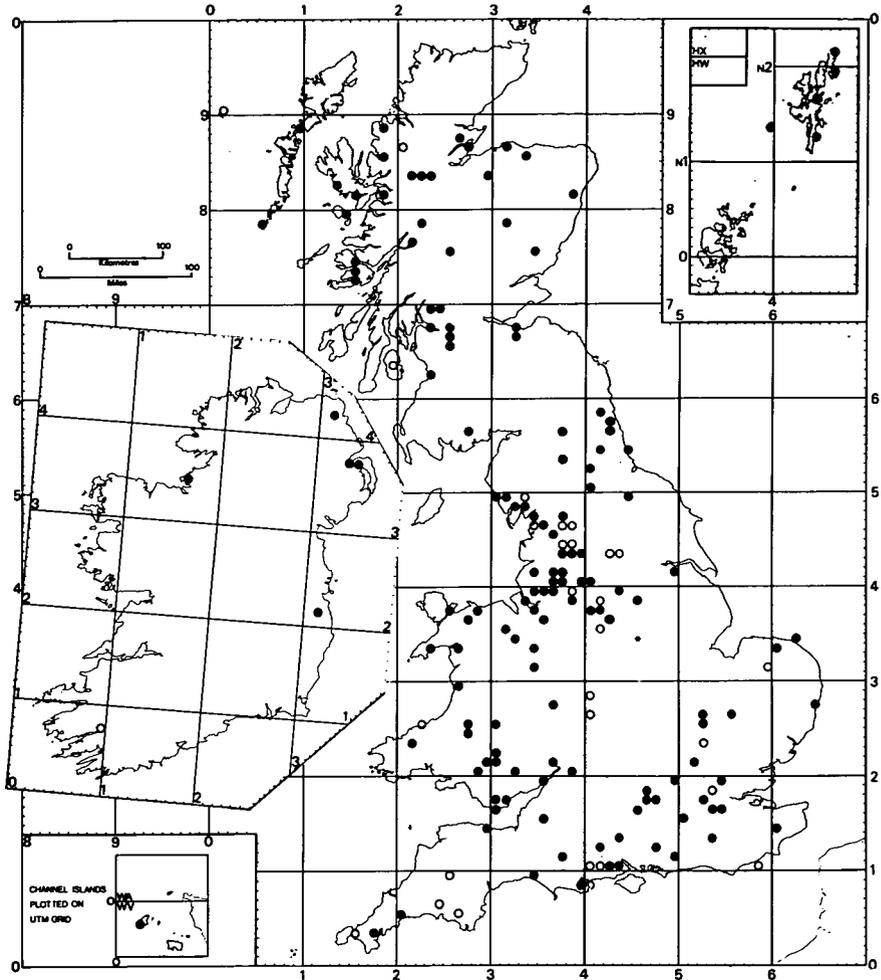
A widespread species in the lowlands, it is associated with rough grassland, margins of fields with permanent or semi-permanent pasture, common land, gardens, etc. It is most easily found at woodland edges or hedgerows, either among herbage or by flushing it out from tree foliage. Light traps have provided a good source of records. It usually occurs only in low numbers and can be difficult to record. Flight period: October, early November.

## 68 *Tipula (Savtshenkia) pagana* Meigen 1818



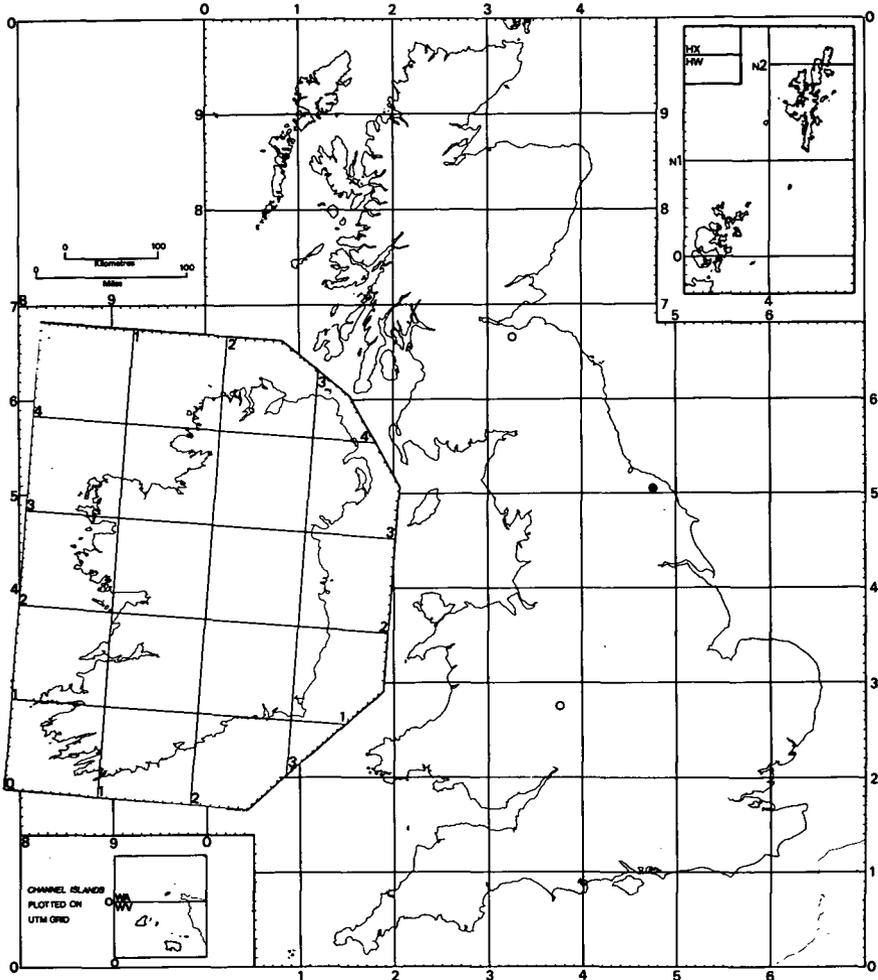
A plentiful autumn species, it occurs in a wide range of situations such as gardens (breeding in mossy lawns), lowland grassland, damp woodland and upland hillsides. In the uplands the species often makes use of the shelter provided by stands of bracken (*Pteridium aquilinum*). Flight period: the emergence peak is easily missed, typically being in late October, but sometimes in September or early November. There are two surprisingly early records: one male was taken on 5 July in north Devon and another was in a malaise trap sample taken between 21 and 28 May at Monks Wood in Huntingdonshire.

69 *Tipula (Savtshenkia) rufina* Meigen 1818



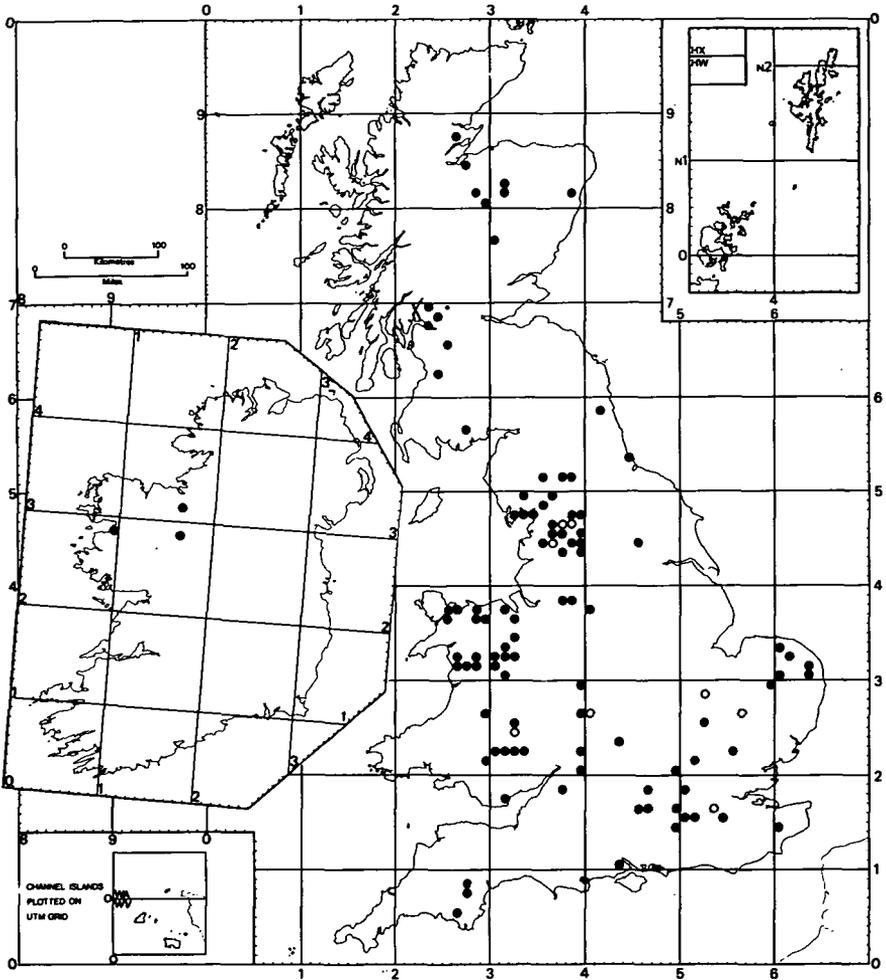
It is very widespread, but occurs in low numbers; the spread of records is due to its wide range of habitat and its prolonged seasonal occurrence. It is to be found in gardens (on walls or at light), in woods (on tree trunks), by wooded stream-sides in the uplands and on upland hillsides (especially where these are rocky), and on coastal cliffs with wet moss. Though not truly adapted to aquatic life, larvae are more frequently associated with very wet or aquatic mosses than is usual for members of the sub-genus. In urban areas it may possibly use gutters on buildings. Flight period: March to November.

**70 *Tipula (Savtshenka) serrulifera* Alexander 1942**  
 [*T. serrulata* of Coe (1950)]



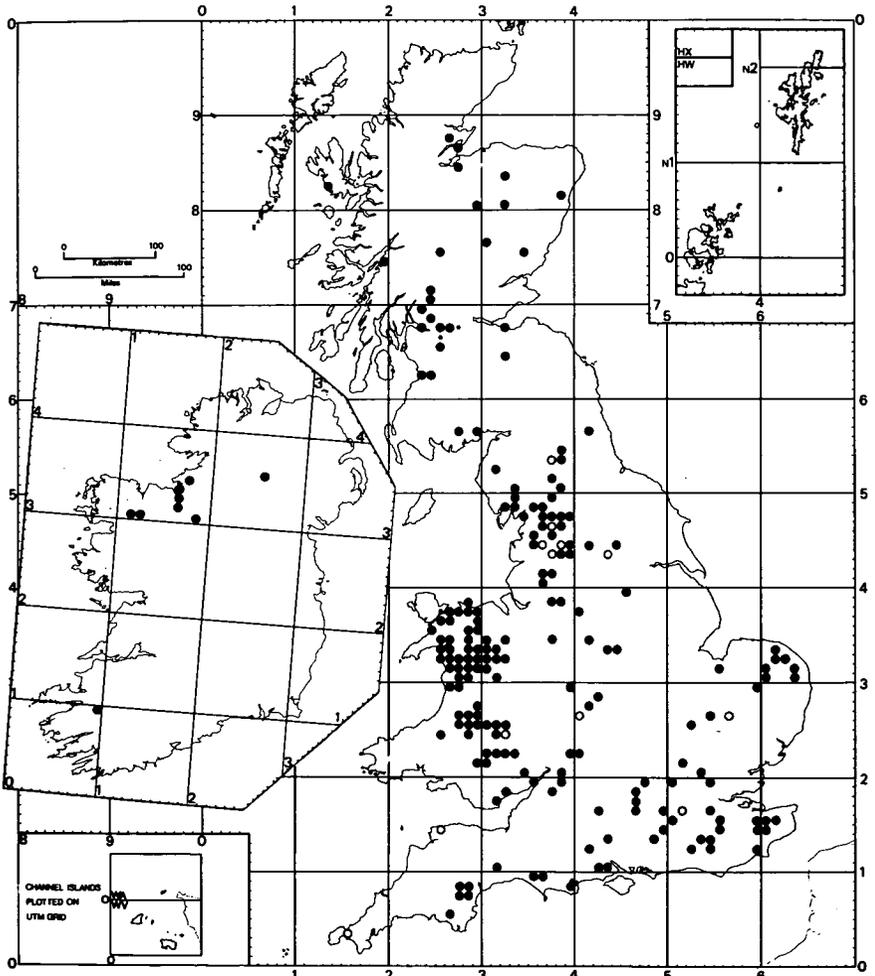
This species (under *T. serrulata*) was added to the British list in 1939 on the basis of a male taken in the Wyre Forest, Worcestershire, on 4 September 1892. Subsequently, it was found in 1945 on the Pentland Hills near Edinburgh, where it was confined to a small area of grassy heath beside a small burn in a steep-sided glen. There is a recent record from a moorland site in Yorkshire. Flight period: mid-August to early September.

**71 *Tipula (Savtshenkia) signata* Staeger 1840**



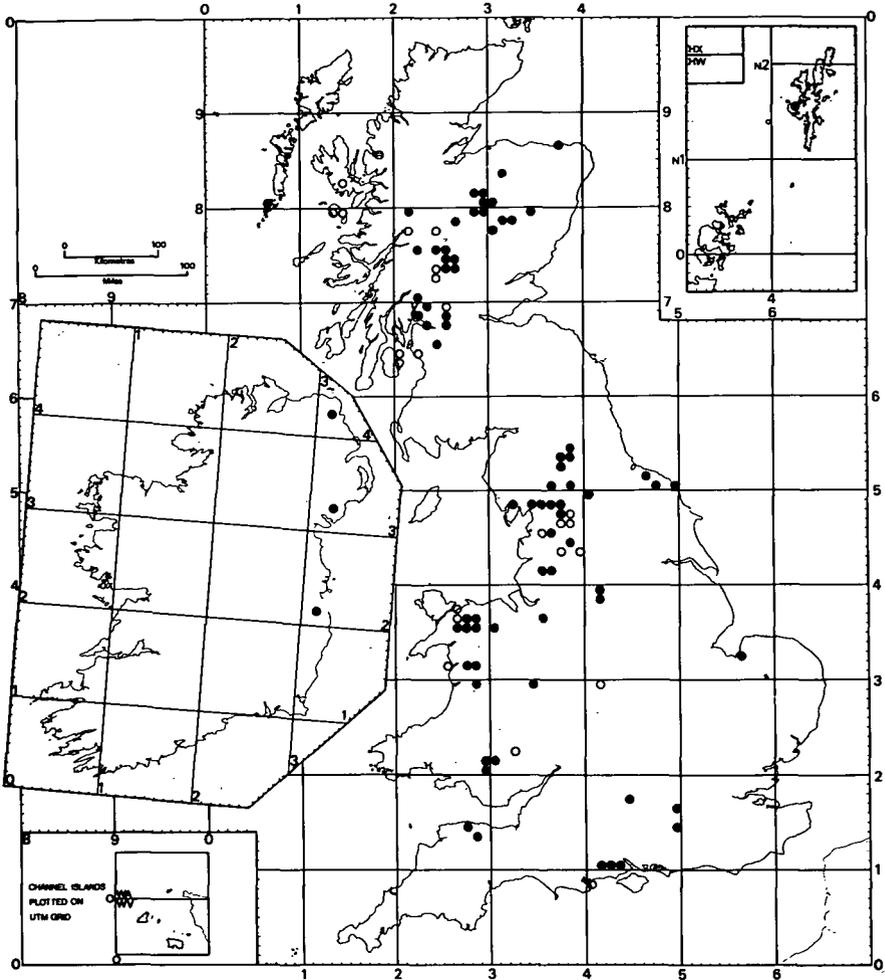
This cranefly is one of the typical autumn species of wet woodland, damp wooded stream gullies and wet heathland carr. However, its distribution is very patchy, being locally plentiful, but seemingly absent from some apparently suitable districts (compare with *T. (S.) staegeri*, map 72). Flight period: September to October.

72 *Tipula (Savtshenka) staegeri* Nielsen 1922



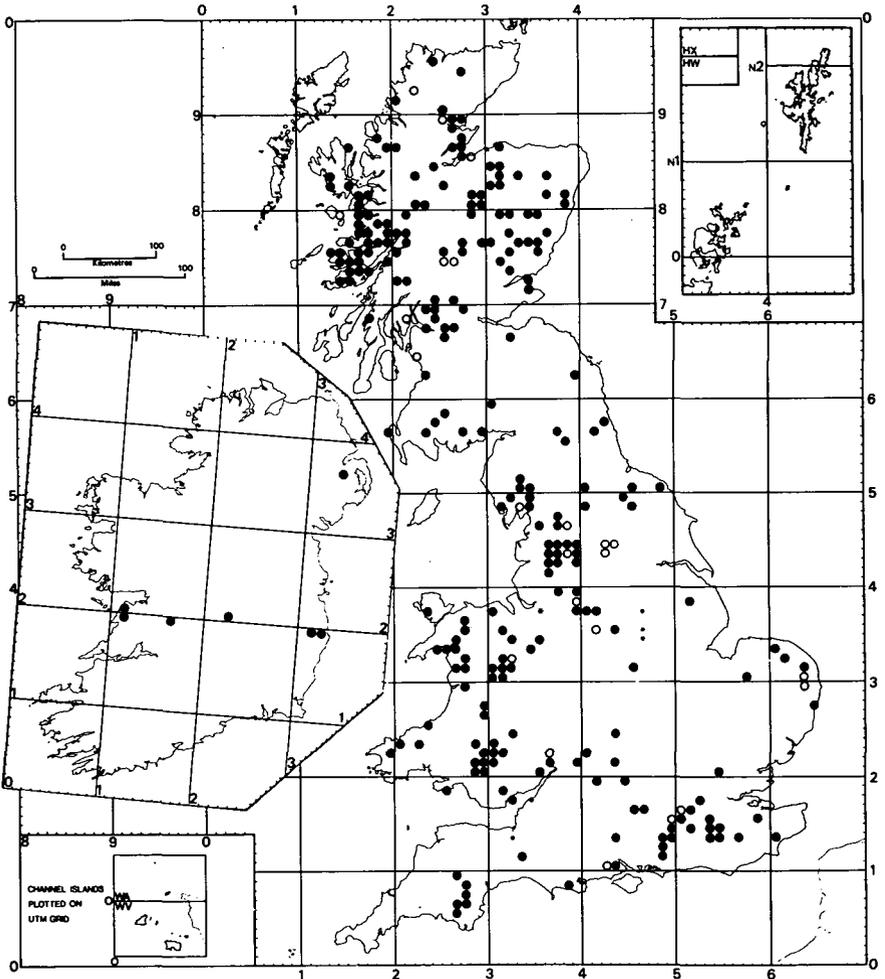
*T. (S.) staegeri* is a more ubiquitous wet woodland species than *T. (S.) signata* (map 71). Both species often occur together, but in some districts, as in parts of Wales, it occurs to the exclusion of *T. (S.) signata*. It is occasionally found beside open upland streamsides, presumably breeding in small, sheltered, mossy places along the stream banks. Flight period: September to late October.

**73 *Tipula (Savtshenka) subnodicornis*  
Zetterstedt (1838)**



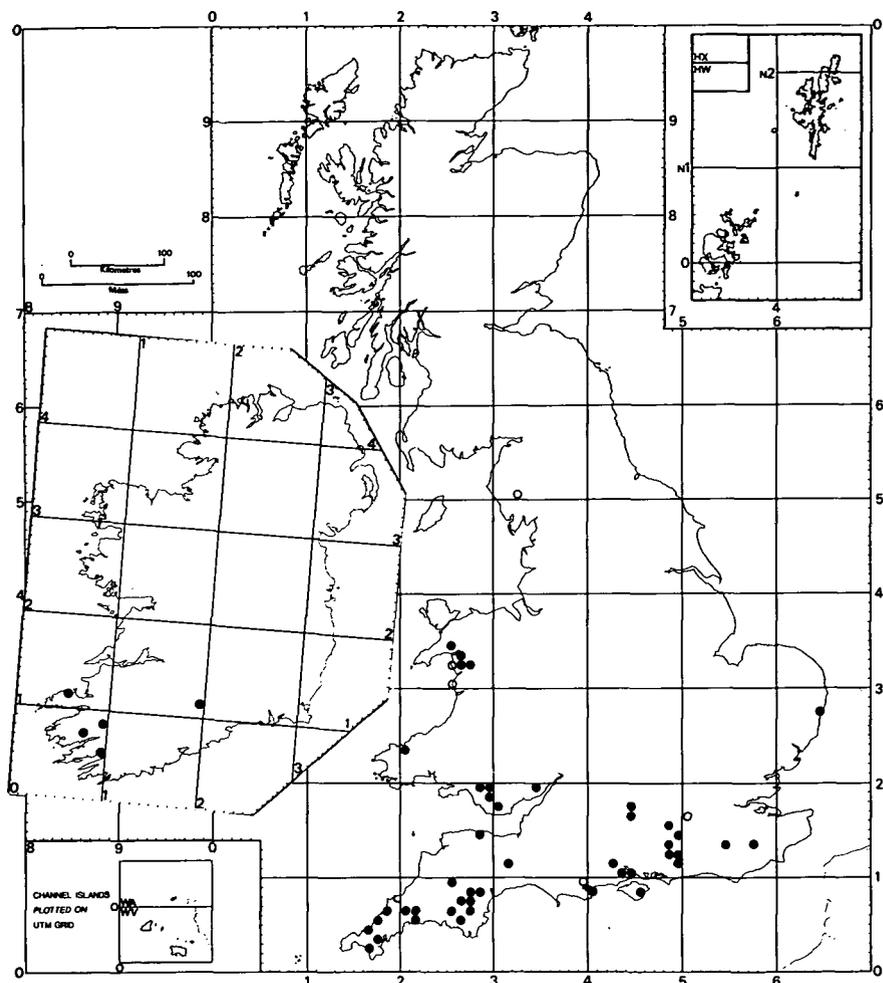
Typically a species of upland flushes with rushes and bog mosses (*Sphagnum* spp.), it also occurs on lowland bogs. This species is under-recorded in the uplands. Flight period: in the uplands May to early June, but rarely into July. There are interesting outlying records from southern valley bogs in late March to April. The Outer Hebrides record was also in April.

74 *Tipula (Schummelia) variicornis* Schummel 1833



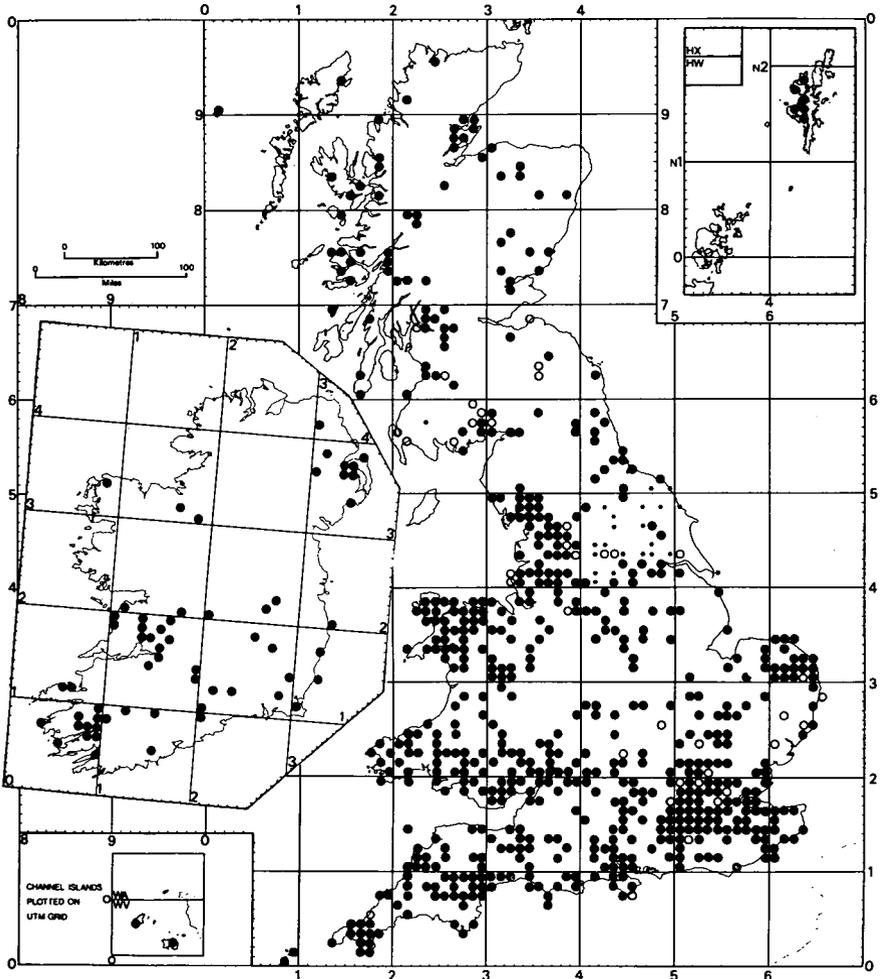
As a species of wet woodland, including ravines, it is particularly frequent in the north and west. In the Midlands and south-east, it is much more local, but the central Weald and the Broads of East Anglia provide plentiful habitat. There are few Irish records, with some surprising absences: Kerry, for instance, has plenty of suitable habitat, but only one record has been made in this relatively well-recorded district. Flight period: mainly late May to June but, according to Coe (1950), extending to August.

## 75 *Tipula (Schummelia) yerburyi* Edwards 1924



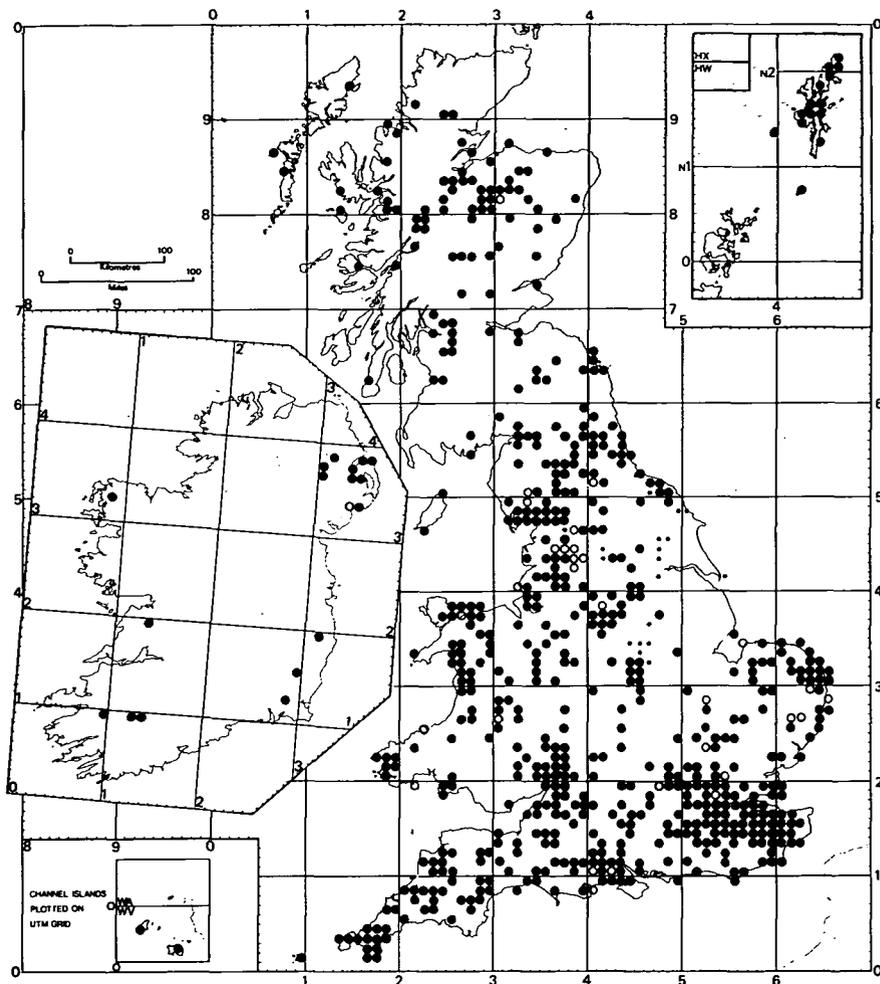
The distribution should be compared with that of *T. (S.) varicornis* (map 74). This is predominantly a southern species, including records from south-west Ireland. It occurs in wet woods, and in southern England has a preference for such habitat on heaths. South-west England appears to be a particularly favourable area, certainly in the woods around and on Dartmoor and along the coast of Cornwall, where small streams with grey willow (*Salix cinerea*) are a common feature. Flight period: in many districts July is the best period, but in Devon adults occur commonly even in late May.

**76 *Tipula (Tipula) oleracea* Linnaeus 1758**



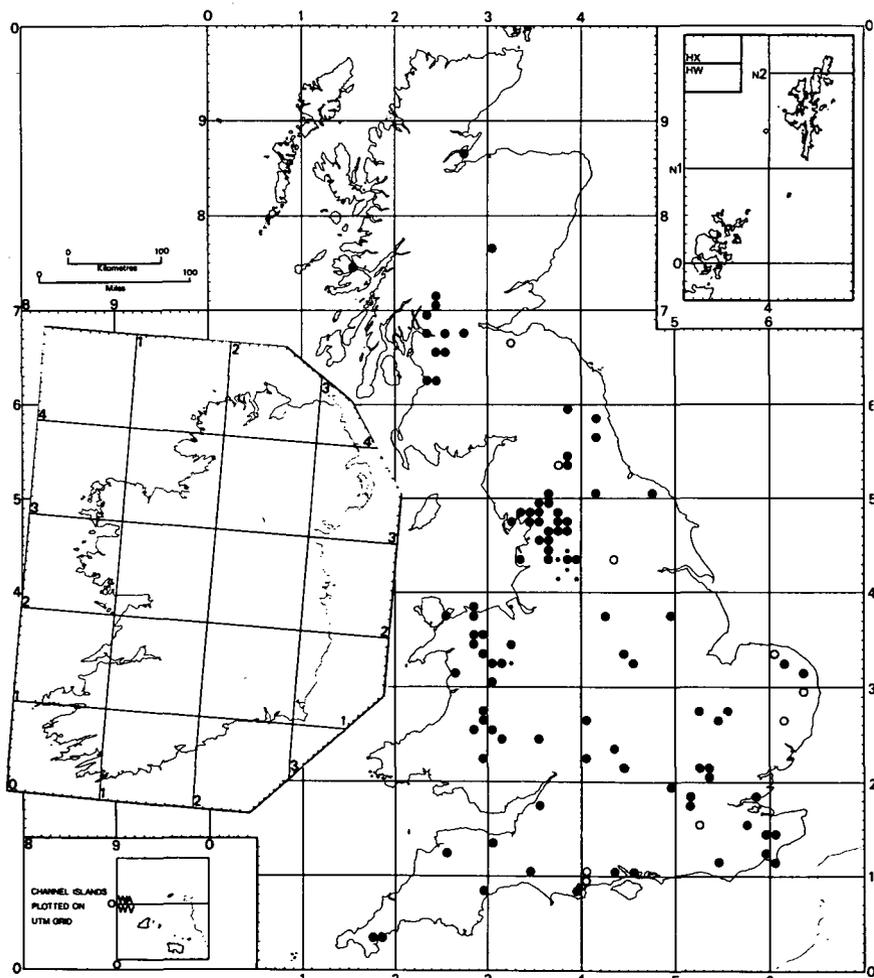
A very widespread species in wet fields, marshes, wet woods, ditches, and other places with wet soils. Flight period: extending from April to early November, typically with peaks in May to June and in mid-September to October.

## 77 *Tipula (Tipula) paludosa* Meigen 1830



This is the main agricultural pest leatherjacket. It occurs abundantly in pastures and it comes to attention when attracted to light in numbers in late summer, having bred in lawns. It avoids the driest soils, as on steep, chalk grassland slopes, and also the wettest marshes, but otherwise is a ubiquitous grassland species. Records based on larval identifications have been omitted because separation from *T. (T.) oleracea* and *T. (T.) subcunctans* is difficult. Flight period: the peak may be from late July, but is often in September. In most years the latest records are in early October, normally finishing before *T. (T.) cziziki* emerges; emergence can extend rarely to late October.

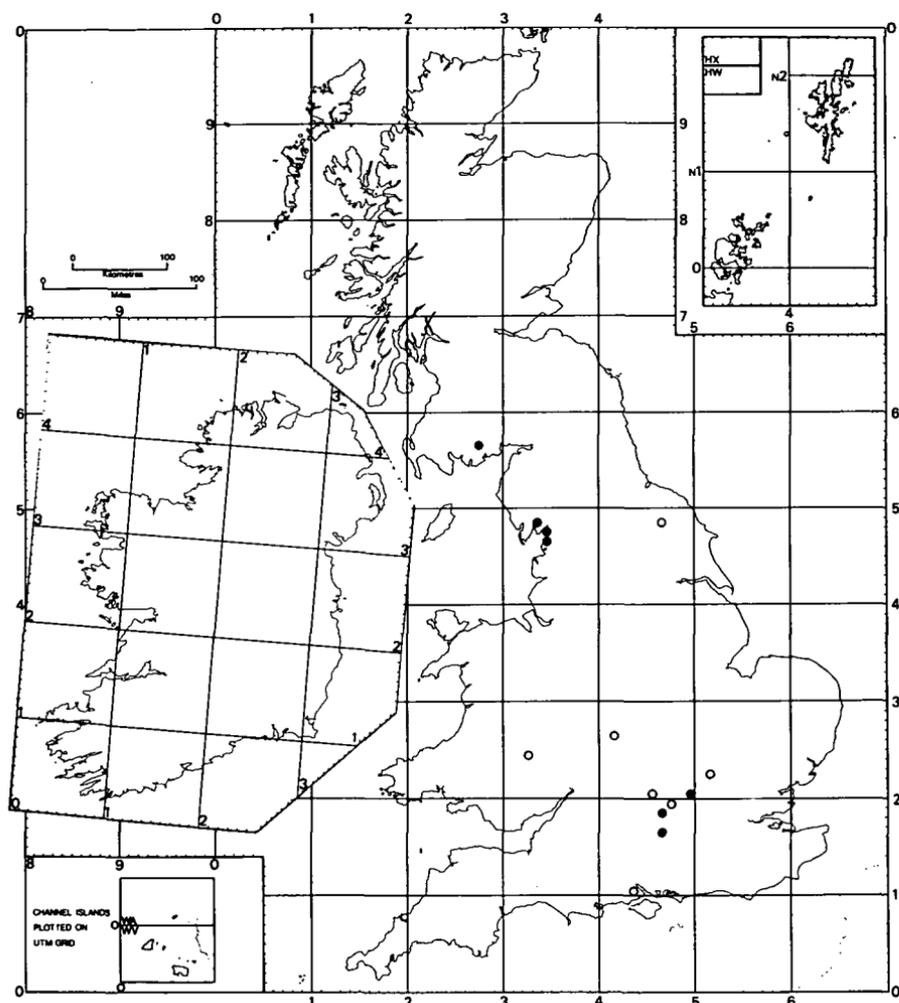
**78 *Tipula (Tipula) subcunctans* Alexander 1921**  
 [*T. czizeki* of Coe (1950)]



A late autumn species, it can be distinguished in the field as a dark grey species, rather than brownish as with *T. (T.) oleracea* and *T. (T.) paludosa*. It typically occurs in damp pasture or occasionally in much drier grassland. Though widespread, it is local, occurring at practically every sampling stop in some districts then abruptly absent in others (though whether this is a difference in geographic distribution or in seasonal emergence peaks is not clear). It is plentiful in some districts of Wales, north-west England and west Scotland. Flight period: October to early November.

## 79 *Tipula (Vestiplex) hortorum* Linnaeus 1758

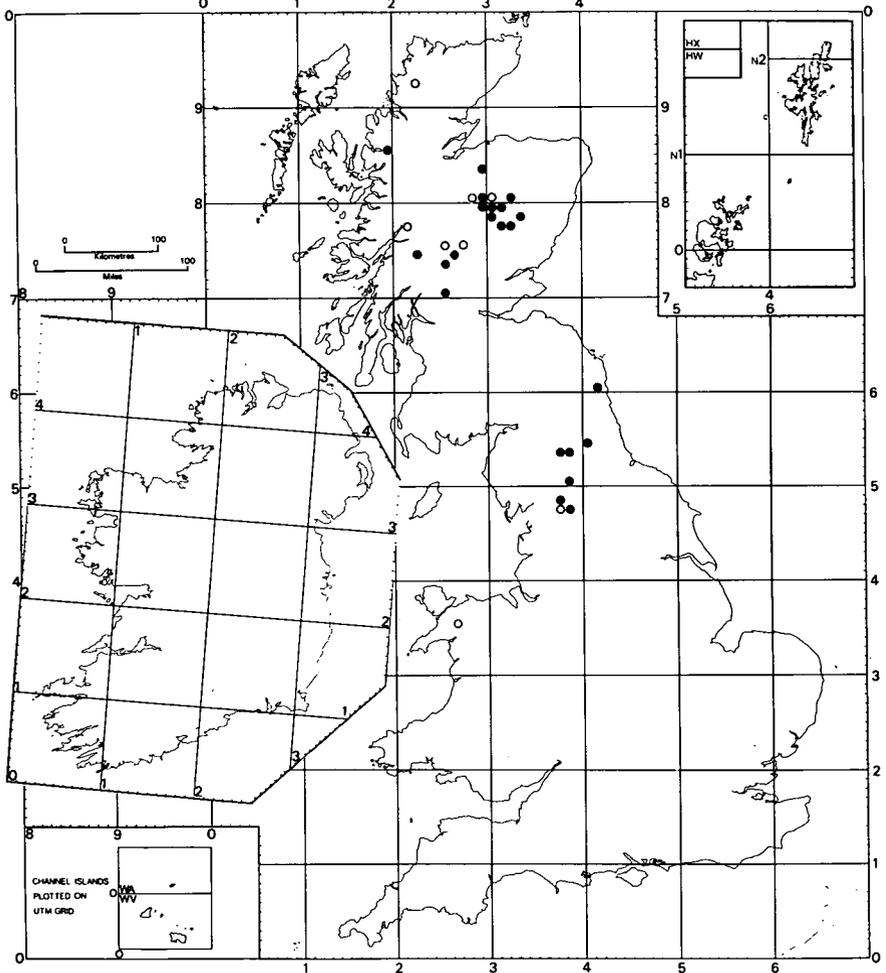
[*T. nubeculosa* of Coe (1950); *T. hortorum* of Coe is now  
*T. (P.) submarmorata* (= *T. meigeni* of Kloet & Hincks (1976))]



There is a suspicion that many former records are erroneous so care has been taken to accept only verified records. This is a woodland insect with few recent records. It may be under-recorded because of its early flight period, but it is currently assessed to be a genuinely rare species. Flight period: April and May.

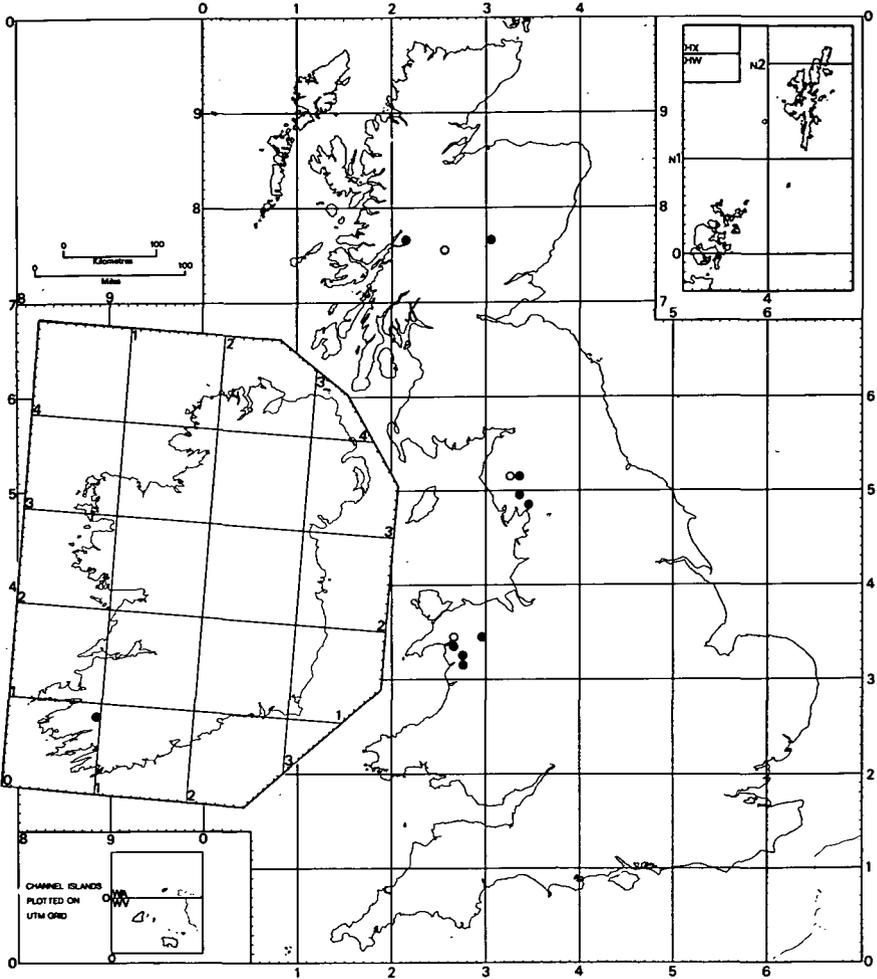
## 80 *Tipula (Vestiplex) montana* Curtis 1834

[*T. excisa* of Coe (1950), a misidentification; true *T. excisa* is a related mountain species which has not been verified in Britain by the author]



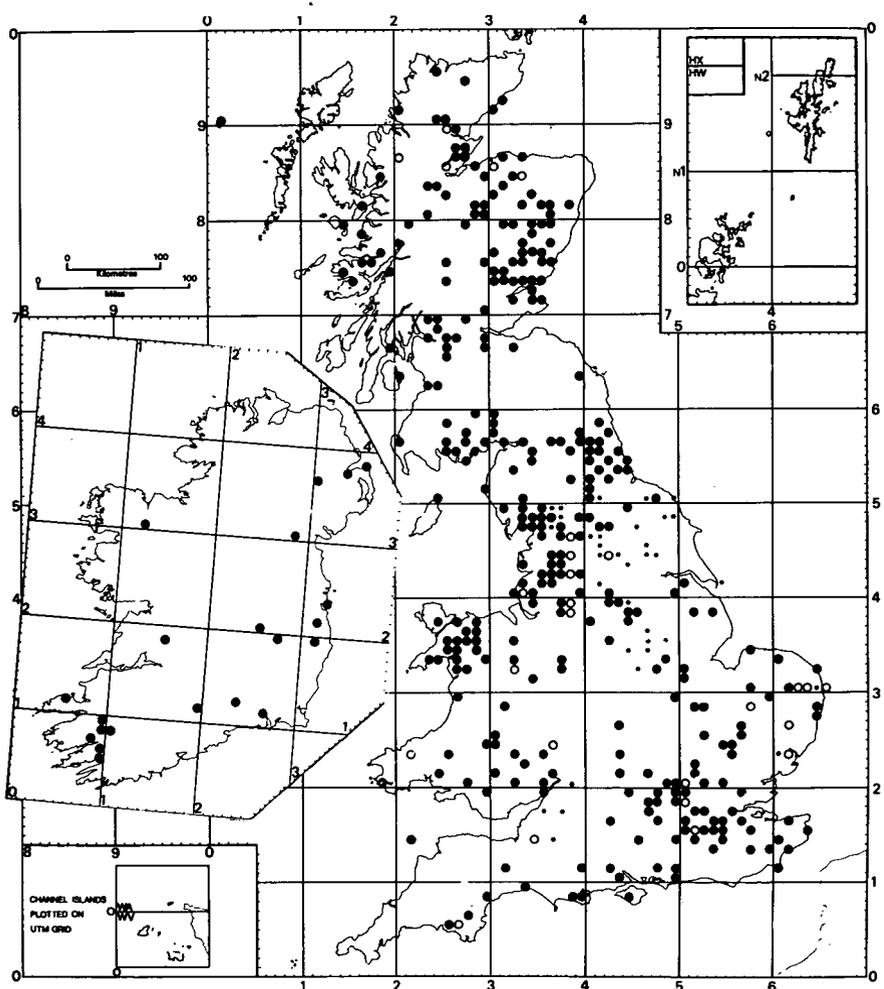
There seems little doubt that this mountain species will prove much more widespread than the map indicates. It may be found at well over 900 m on exposed stony ridges, as well as on lower ground down to about 450 m in the north-west Pennines (stray specimens may be found at lower altitudes). Though localised it can be abundant, usually where vegetation is sparse. Flight period: June or July.

**81 *Tipula (Vestiplex) nubeculosa* Meigen 1804**  
 [*T. rubripes* of Coe (1950); Coe applied the name  
*T. nubeculosa* to what is now *T. (V.) hortorum*]



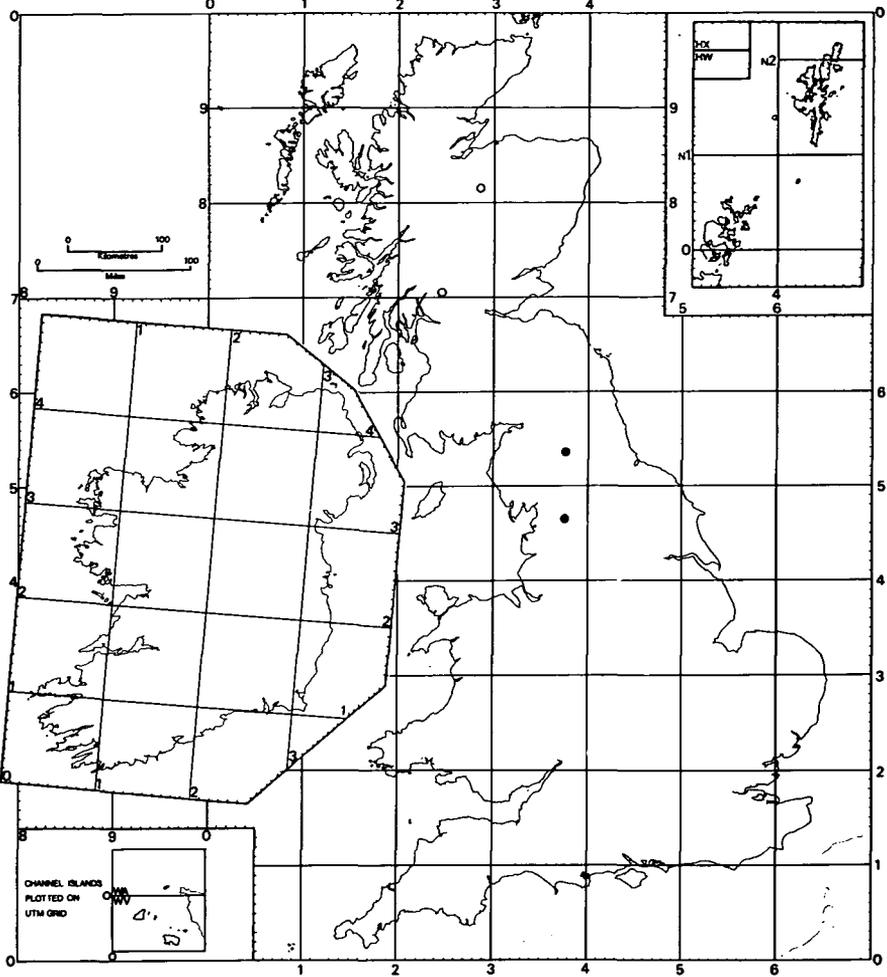
A poorly known species of deciduous woods in valleys in mountain areas, it is usually found within the proximity of streams. Flight period: June to August.

82 *Tipula (Vestiplex) scripta* Meigen 1830



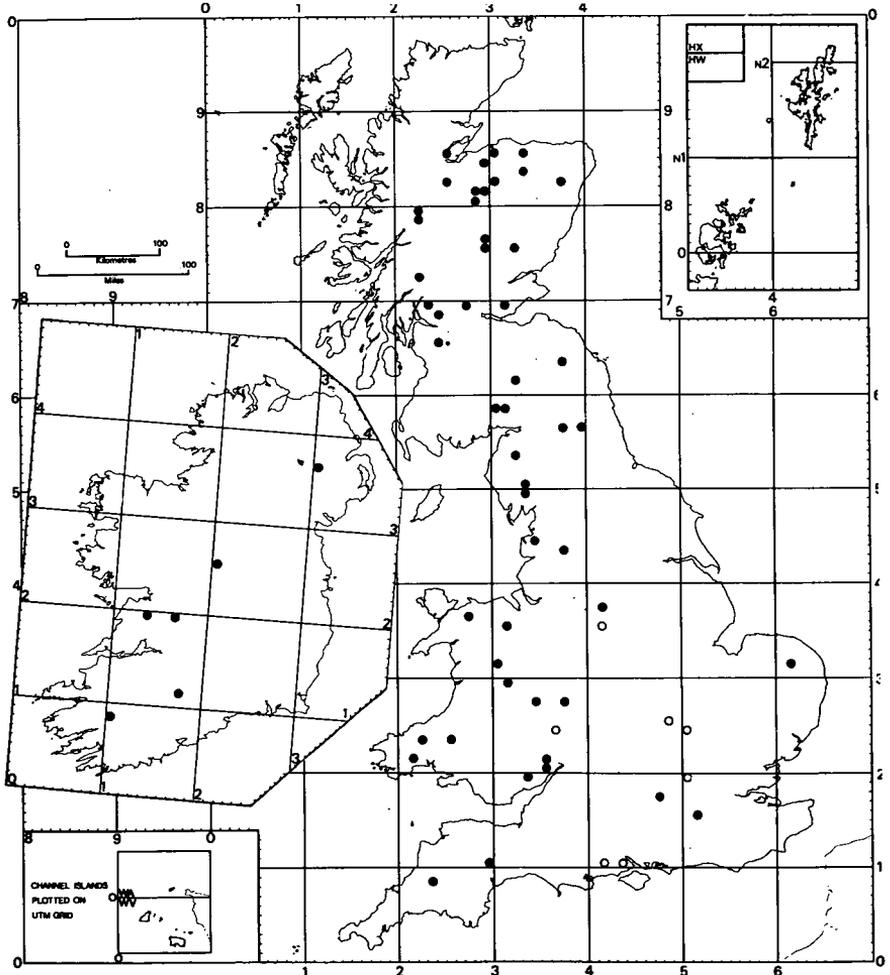
This is one of the most ubiquitous species of woodland, especially moist woodland with a good undergrowth. Flight period: May to September, but June and July are usually the peak months.

**83 *Tipula (Yamatotipula) coerulescens*  
Lackschewitz 1923**



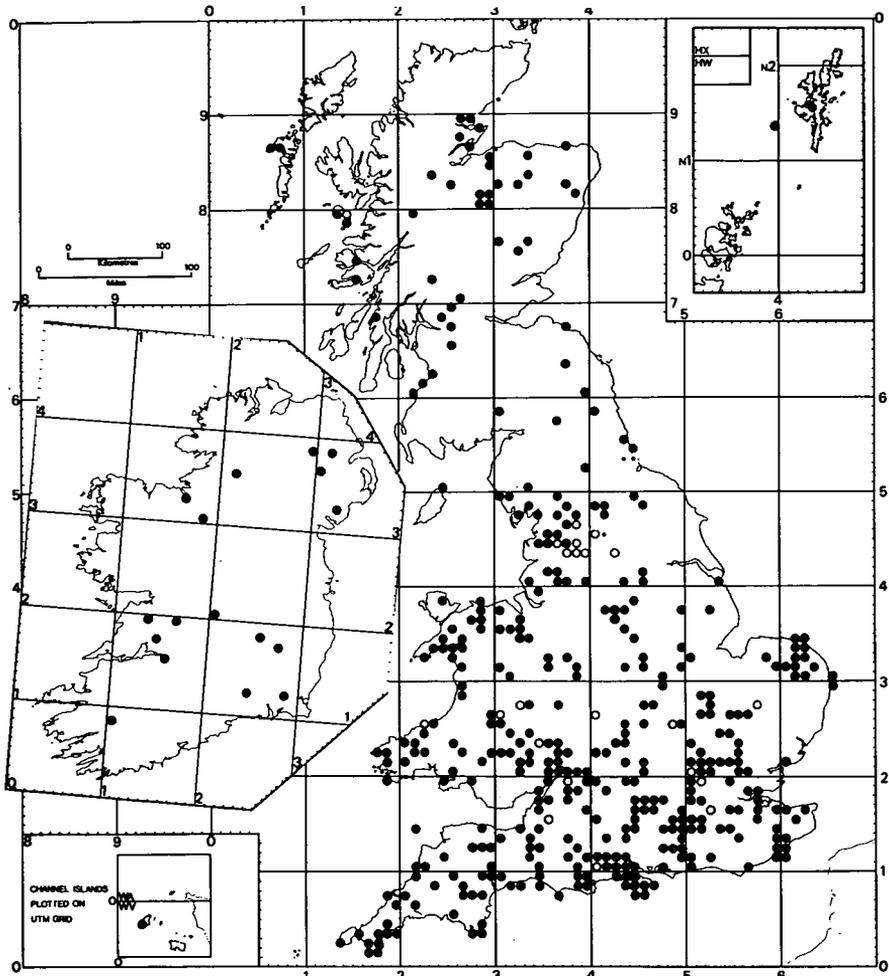
This species of small flushes and springs beside streams and rivers, requires calcareous conditions. It occurs up to more than 600 m in the Pennines. Larvae are aquatic. Flight period: May to early June, sometimes also in August.

**84 *Tipula (Yamatotipula) couckeii*  
Tonnoir in Goetghebuer & Tonnoir 1921**



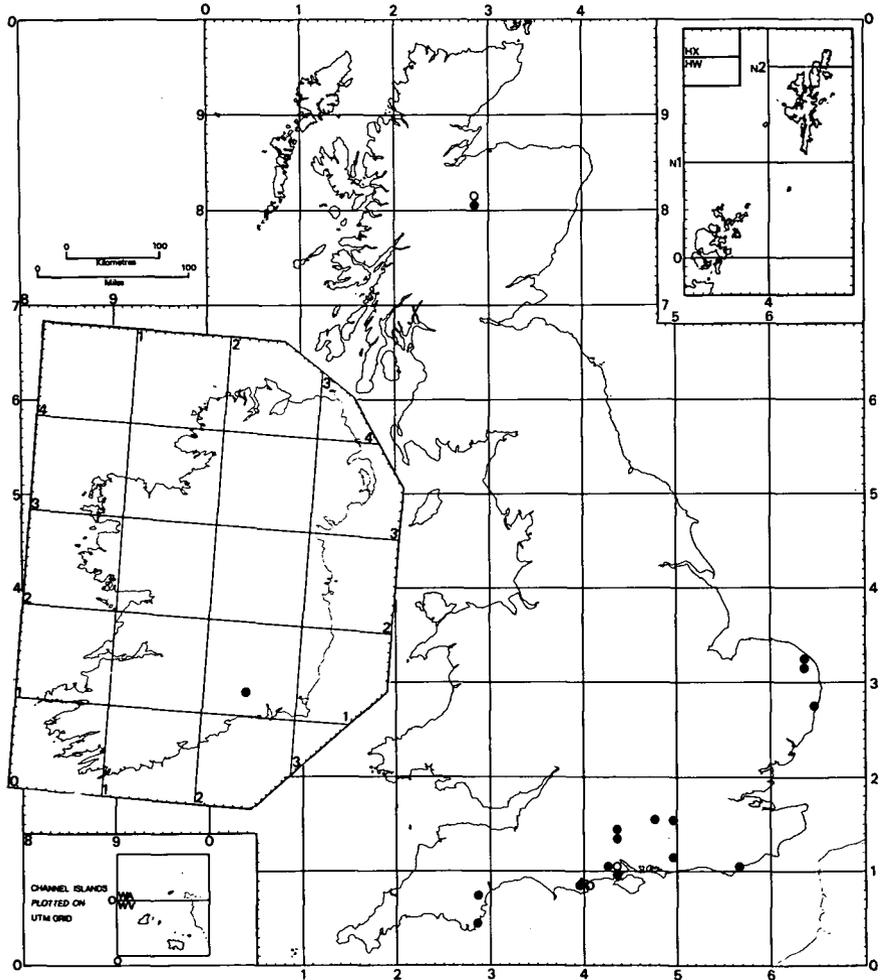
A local species, it is found beside large streams and rivers, more rarely by lakes. Usually there is a sandy or pebbly moist beach and some emergent vegetation such as reed-grass (*Phalaris* spp.) or sedges (*Carex* spp.) in close proximity, and shaded situations are usually avoided. Flight period: May to August.

85 *Tipula (Yamatotipula) lateralis* Meigen 1804



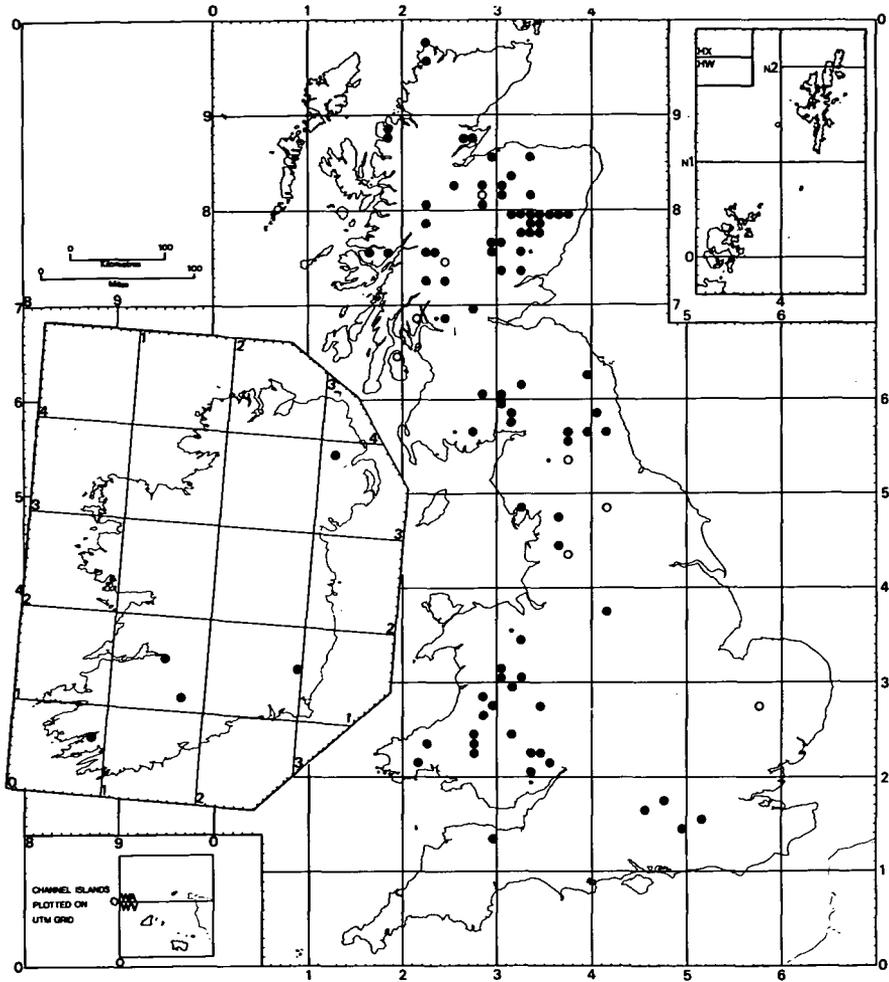
This species is widespread at wet muddy seepages in fields and on coastal cliffs, by small streams or sluggish rivers, and by canals, ponds and lakes. Suitable habitat is likely to be found in most lowland districts and in many upland ones. Adults avoid shaded situations. Larvae are aquatic. Flight period: adults are sparse in mid-summer, there usually being a spring generation (April to May) and an autumn generation (September).

**86 *Tipula (Yamatotipula) marginella* Theowald 1980**  
 [*T. marginata* of Coe (1950)]



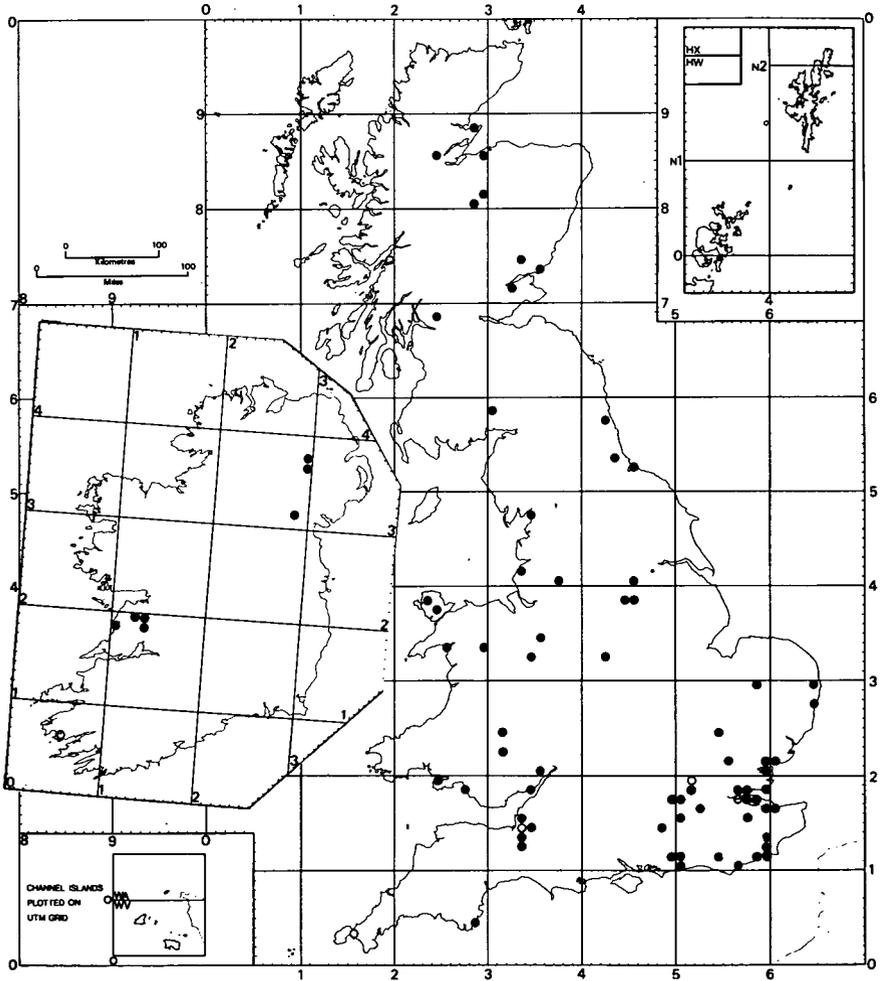
Mainly a southern species, it also occurs in the Spey valley and in southern Ireland. Adults are found in sparsely vegetated mud or peat beside slow-flowing streams and in marshes and fens, usually in open situations, but sometimes in carr. It is often confined to a few square metres of bare wet peat or mud. Larvae are aquatic. Flight period: June to August.

87 *Tipula (Yamatotipula) montium* Egger 1863



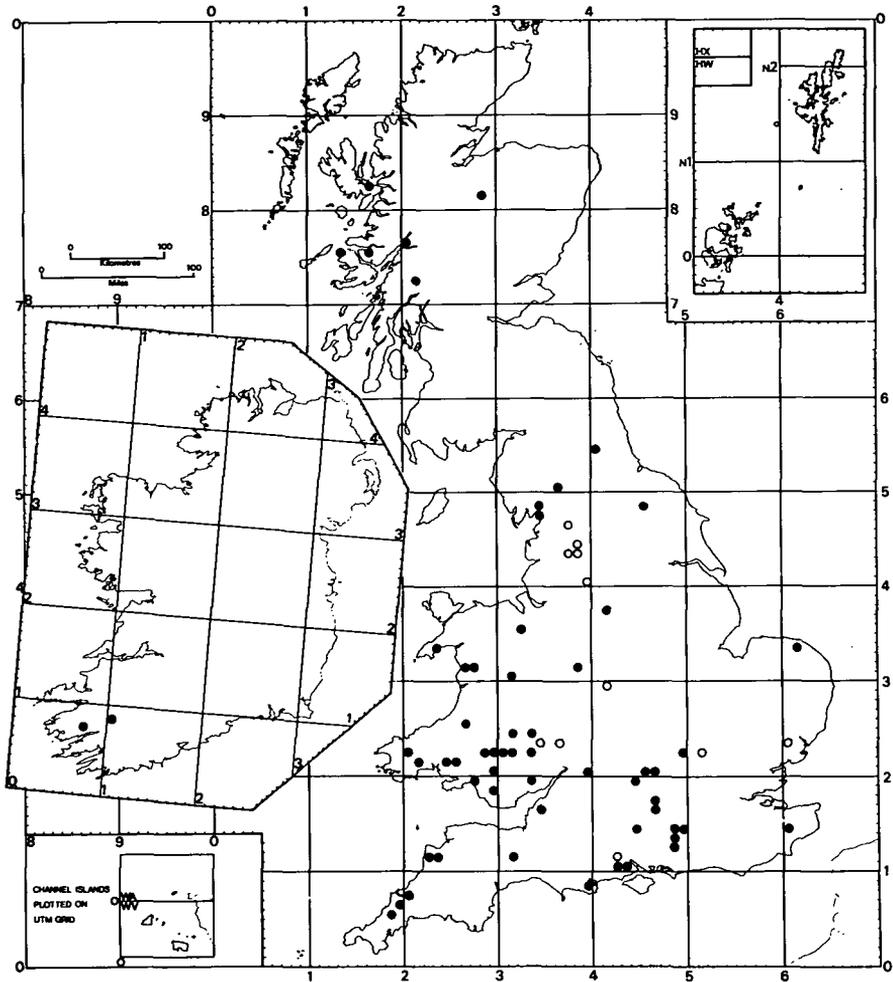
A species of upland and hill districts, it is found mainly within the associated valleys to altitudes of over 600 m, but there are also a few records for lowland southern England. It is primarily a species of rivers, where the banks are reasonably stable with some sediment and vegetation, avoiding the most densely wooded stretches. In some cases, *T. (Y.) montium*, *T. (Y.) couckeii* and *T. (Y.) lateralis* occur together at both riverside and lakeside sites: the ecological separation between these species is far from clear. Larvae are aquatic. Flight period: May to August.

**88 *Tipula (Yamatotipula) pierrei* Tonnoir  
in Goetghebuer & Tonnoir 1921  
[*T. solstitialis* of Coe (1950)]**



There is a strong association with coastal ditches and pools, and also with the more eutrophic lakes of the western Weald, the north Midlands, Scotland, and Ireland. Water margins have to be open and with some emergent vegetation; the shade of bushes and trees is avoided. All known sites are distinctly lowland in character. Larvae are aquatic. Flight period: May to September.

89 *Tipula (Yamatotipula) pruinosa* Wiedemann, 1817



This species is found about small patches of bare or sparsely vegetated very wet mud, often in meadows along woodland edges or along forest rides. It is nearly always localised and in very low numbers, but is fairly easy to locate in suitable areas, such as the western Weald and south Wales. Suitable habitat is scarcer in the drier, eastern areas. Larvae are aquatic. Flight period: May to August, especially June.

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## BIBLIOGRAPHY

The reference list below is a first step towards a bibliography of British and Irish literature on craneflies. It contains all the major papers on taxonomy and ecology, though it is not yet fully comprehensive on local lists and short papers. A few foreign papers are included on topics where the British literature is sparse. The main papers on Ptychopteridae are in the *Provisional atlas* to that family, to be published by the Biological Records Centre in 1993.

It must be borne in mind that use of older papers, such as local lists, can be misleading unless former usage of scientific names and the dates of species splits are taken into account. Local lists sometimes contain obvious errors, as well as less obvious ones, and this may apply to the extensive records of Cheetham in the *Naturalist* (these papers are not included in the bibliography).

It is hoped to complete the bibliography in due course, but the present version (with over 300 titles) provides an initial guide to the literature.

**Alma, P.J.** 1968. *Aspects of the biology of the Tipulidae*. PhD thesis, University of Reading.

**Alma P.J.** 1975. Parasitisation of *Tipula* spp. (Dipt. Tipulidae) by *Siphona geniculata* (Degeer) (Dipt., Tachinidae). *Entomologist's Monthly Magazine*, **111**, 105-107.

**Andrewes, C.H.** 1950. *Tipula bistilata* Lundstroem and other crane-flies (Dipt., Tipulidae) in the Cairngorms. *Entomologist's Monthly Magazine*, **86**, 70.

**Andrewes, C.H.** 1952. *Nephrotoma quadristriata* and other Diptera, Orthoptera and Neuroptera in the Gower peninsula, Glamorganshire. *Entomologist's Monthly Magazine*, **88**, 71.

**Audcent, H.** 1927a. Occurrence of *Rhypholophus bifurcatus* Goet. in Britain. *Entomologist's Monthly Magazine*, **63**, 112.

**Audcent, H.** 1927b. Occurrence of *Molophilus niger* Goet. in Britain. *Entomologist's Monthly Magazine*, **63**, 138.

**Audcent, H.** 1929. Bristol insect fauna, Diptera (Part 2) *Proceedings of the Bristol Naturalists' Society*, **7**, 120-127.

**Audcent, H.** 1932. British Tipulinae (Diptera, Tipulidae). *Transactions of the Entomological Society of the South of England*, **8**, 1-34.

**Audcent, H.** 1934. *Lipsothrix nobilis* Lw., a Tipulid (Dipt.) new to Britain. *Journal of the Society for British Entomology*, **1**, 7.

**Audcent H.** 1949-50. Bristol insect fauna. *Proceedings of the Bristol Naturalists' Society*, **27**, 409-470; **28**, 45-132. [Craneflies 27, 411-421.]

**Barnes, H.F.** 1923a. A hitherto undescribed *Gonomyia* Steph. (Diptera). *Entomologist's Monthly Magazine*, **59**, 255-256. [*G. conoviensis*: as *bispinosa*.]

**Barnes, H.F.** 1923b. A new British *Dicranomyia* Steph. *Entomologist's Monthly Magazine*, **59**, 261. [*D. distendens*.]

**Barnes, H.F.** 1924a. *Gonomyia bispinosa* Barnes; change of name. *Entomologist's Monthly Magazine*, **60**, 140. [*G. conoviensis*.]

**Barnes, H.F.** 1924b. On the occurrence of mites on crane-flies. *Entomologist's Monthly Magazine*, **60**, 135-137.

**Barnes, H.F.** 1924c. Some observations on

the mating habits and oviposition of the Limnobiidae (Dipt.) 1. *Entomologist's Monthly Magazine*, **60**, 71-74.

**Barnes, H.F.** 1924d. Preliminary list of crane-flies of Caernarvonshire, N. Wales. *Entomologist's Monthly Magazine*, **60**, 225-227.

**Barnes, H.F.** 1925. The ecological distribution of adult crane-flies in Caernarvonshire. *Journal of Ecology*, **13**, 138-148.

**Barnes, H.F.** 1926. The crane-flies of Caernarvonshire. *The North Western Naturalist*, 1926, 17-34.

**Barnes, H.F.** 1937. Methods of investigating the biometrics of the common crane-fly, *Tipula paludosa* Meigen, together with some results. *Annals of Applied Biology*, **24**, 356-368.

**Beirne, B.P.** 1949. Diptera from Ireland. *Irish Naturalists' Journal*, **9**, 277.

**Beirne, B.P.** 1951. Some records of Diptera collected in Ireland. *Irish Naturalists' Journal*, **10**, 198.

**Bergroth, E.** 1912. A new British Tipulid. *Entomologist's Monthly Magazine*, **48**, 133-136. [*Eloeophila verralli*: sp. nov. as *Ephelia*; but see Bradley 1893.]

**Binns, E.S.** 1975. Post emergence aggregation and mating in *Tipula paludosa* Mg. (Dipt., Tipulidae). *Entomologist's Monthly Magazine*, **111**, 93-96.

**Bloomfield, E.N.** 1903. Norfolk Diptera. *Transactions of the Norfolk and Norwich Naturalists' Society*, **7**, 541-551. [Crane-flies p 543.]

**Bradley, R.C.** 1893. Diptera new to Britain. *Entomologist's Monthly Magazine*, **29**, 285. [*Dactylolabis gracilipes*, *Gonomyia jucunda*, *Ephelia variinervis*.]=[*D. transversata*, *Idiocera punctata* of GB list, *Eloeophila verralli*.]

**Bradley, R.C.** 1896. New and rare British Diptera. *Entomologist's Monthly Magazine*,

**32**, 87. [*Dicranomyia stigmatica*, *D. ornata*, *Erioptera* (= *Scleroprocta*) *pentagonalis*.]

**Brindle, A.** 1957. The ecological significance of the anal papillae of *Tipula* larvae (Diptera, Tipulidae). *Entomologist's Monthly Magazine*, **93**, 202-204, plate 15.

**Brindle, A.** 1958a. A field key for the identification of *Tipula* larvae. (Diptera, Tipulidae). *Entomologist's Gazette*, **9**, 165-182.

**Brindle, A.** 1958b. Notes on the larvae of the British Tipulinae (Dipt., Tipulidae). Part 1 - The larvae of *Tipula fascipennis* Mg. and *T. pagana* Mg. *Entomologist's Monthly Magazine*, **94**, 230-232.

**Brindle, A.** 1958c. Notes on the larvae of the British Tipulinae (Dipt., Tipulidae). Part 2 - The larvae of the subgenus *Vestiplex* Bezzi. *Entomologist's Monthly Magazine*, **94**, 241-244.

**Brindle, A.** 1958d. Notes on the larvae of the British Tipulinae (Dipt., Tipulidae). Part 3 - The larvae of *Tipula montium* Egg. and *T. couckeii* Tonn. *Entomologist's Monthly Magazine*, **94**, 272-274.

**Brindle, A.** 1959a. Notes on the larvae of the British Tipulinae (Dipt., Tipulidae). Part 4 - The larvae of *Tipula luteipennis* Mg. and *T. melanoceros* Schum. *Entomologist's Monthly Magazine*, **95**, 36-37, plate 3.

**Brindle, A.** 1959b. Notes on the larvae of the British Tipulinae (Dipt., Tipulidae). Part 5 - The larvae of *Tipula pabulina* Mg. and *T. truncorum* Mg. *Entomologist's Monthly Magazine*, **95**, 64-65, plate 5.

**Brindle, A.** 1959c. Notes on the larvae of the British Tipulinae (Dipt., Tipulidae). Part 6 - The larvae of the *Tipula oleracea* group. *Entomologist's Monthly Magazine*, **95**, 176-177, plate 15.

**Brindle, A.** 1959d. Notes on the larvae of the British Tipulinae (Dipt., Tipulidae). Part 7 - The larvae of the *Tipula marmorata* group. *Entomologist's Monthly Magazine*, **95**, 204-205.

- Brindle, A.** 1960a. Notes on the larvae of the British Tipulinae (Dipt., Tipulidae). Part 8 - The larva of *Tipula nigra* L. *Entomologist's Monthly Magazine*, **96**, 213-214.
- Brindle, A.** 1960b. The larvae and pupae of the British Tipulinae (Diptera: Tipulidae). *Journal of the Society for British Entomology*, **14**, 63-114.
- Brindle, A.** 1961a. Notes on the life history of the genus *Hexatoma* (Dipt., Tipulidae). *Entomologist's Monthly Magazine*, **96**, 149-152.
- Brindle, A.** 1961b. Notes on the larvae of the British Tipulinae (Dipt., Tipulidae). Part 9 - The sub-genus *Lunaticipula* Edw., with a note on the synonymy of the sub-genus *Vestiplex* Bezzi. *Entomologist's Monthly Magazine*, **97**, 216-220.
- Brindle, A.** 1962. The natural groups of the British Pediciini (Dipt., Tipulidae). *Entomologist's Monthly Magazine*, **98**, 234-237.
- Brindle, A.** 1967. The larvae and pupae of the Cylindrotominae and Limoniinae (Diptera, Tipulidae). *Journal of the Society for British Entomology*, **17**, 151-216.
- Brindle, A. & Bryce, D.** 1960. The larvae of the British Hexatomini (Dipt., Tipulidae). *Entomologist's Gazette*, **11**, 207-224.
- Brindle, A. Kidd, L.N. & Pugh, C.H.** 1953. Some further Askham Bog captures. *Journal of the Society for British Entomology*, **4**, 189-190.
- Britten, H.** 1926. [Notes on T.A. Morrison's paper.] *The North Western Naturalist*, **1**, 97-98.
- Brown, E.S.** 1947. *Tipula gimmerthali* Lackschewitz (Diptera, Tipulidae) new to Britain. *Proceedings of the Royal Entomological Society of London*, **16**, 120-123.
- Brown, E.S.** 1950. A new British locality for *Tipula serrulata* Lackschewitz (Dipt., Tipulidae), with a re-description of the male genitalia. *Entomologist's Monthly Magazine*, **86**, 50-52.
- Brown, E.S. & Duncan, A.B.** 1949. A list of the Tipulinae (Diptera, Nematocera) of the Solway area, with some notes on the habitats of the adults. *Scottish Naturalist*, **61**, 156-168.
- Brown, J.M.** 1910. Some points in the anatomy of the larva of *Tipula maxima*. A contribution to our knowledge of the respiration and circulation of insects. *Transactions of the Linnean Society of London*, Ser. 2, **11**, 125-135.
- Bryce, D.** 1956. Notes on the life-history of *Tipula cheethami* Edw. (Dipt., Tipulidae). *Entomologist's Monthly Magazine*, **92**, 104-106.
- Bryce, D.** 1957a. Notes on the life histories of British Limoniinae (Dipt., Tipulidae). - 1. *Limonia nubeculosa* Meig. and *L. didyma* Meig. *Entomologist's Monthly Magazine*, **93**, 67-69.
- Bryce, D.** 1957b. Notes on the life histories of British Limoniinae (Dipt., Tipulidae) - 2. *Ula sylvatica* Meigen. *Entomologist's Monthly Magazine*, **93**, 131-133.
- Burk, R.R.** 1961. Tipulidae on *Anthriscus sylvestris*. *Entomologist's Record and Journal of Variation*, **73**, 135.
- Butterfield, J.E.L.** 1973. *Biological studies on a number of moorland Tipulidae*. PhD thesis, University of Durham.
- Butterfield, J. & Coulson, J.C.** 1975. Insect food of adult red grouse *Lagopus lagopus scoticus* (Lath.). *Journal of Animal Ecology*, **44**, 601-608.
- Buxton, P.A.** 1960. British Diptera associated with fungi. 3. Flies of all families reared from about 150 species of fungi. *Entomologist's Monthly Magazine*, **96**, 61-94.
- Carr, J.W.** 1916. *The invertebrate fauna of Nottinghamshire*. Nottingham: Bell.
- Carr, J.W.** 1935. *The invertebrate fauna of Nottinghamshire, first supplement*. Nottingham: Bell.
- Carter, A.E.J.** 1914. Perthshire Diptera -

Aberfoyle district. *Transactions and Proceedings of the Perthshire Society of Natural Science*, **5**, 176-181.

**Carter, A.E.J.** 1924. *Trichocera maculipennis* in Perthshire. *Entomologist's Monthly Magazine*, **60**, 140

**Carter, J.B.** 1971a. The mode of *Tipula* iridescent virus. 1. Source of infection. *Journal of Invertebrate Pathology*, **21**, 123-130.

**Carter, J.B.** 1971b. The mode of *Tipula* iridescent virus. 2. Route of infection. *Journal of Invertebrate Pathology*, **21**, 136-143.

**Carter, J.B.** 1973. Detection and array of *Tipula* iridescent virus by the latex agglutination test. *Journal of General Virology*, **21**, 181-185.

**Carter, J.B.** 1974. *Tipula* iridescent virus infection in the development stages of *Tipula oleracea*. *Journal of Invertebrate Pathology*, **24**, 271-281.

**Carter, J.B.** 1975a. The effect of temperature upon *Tipula* iridescent virus infection in *Tipula oleracea*. *Journal of Invertebrate Pathology*, **25**, 115-124.

**Carter, J.B.** 1975b. Rearing *Tipula oleracea* (Diptera, Tipulidae) in laboratory cultures. *Plant Pathology*, **24**, 101-104.

**Carter, J.B.** 1976a. A survey of microbial, insect and nematode parasites of Tipulidae (Diptera) larvae in north-east England. *Journal of Animal Ecology*, **13**, 103-122.

**Carter, J.B.** 1976b. A microsporidian infecting the nerve ganglia of *Tipula paludosa* larvae. *Journal of Invertebrate Pathology*, **27**, 409-410.

**Carter, J.B.** 1977. Survival of *Tipula paludosa* (Dipt., Tipulidae) larvae after infection with larvae of *Megaselia paludosa* (Dipt., Phoridae). *Entomologist's Monthly Magazine*, **112**, 245.

**Carter, J.B.** 1978. Field trials with *Tipula* iridescent virus against *Tipula* spp. larvae in grassland. *Entomophaga*, **23**, 169-174.

**Chandler, P.J.** 1973. Diptera and other insects associated with elms (*Ulmus procera* Salisbury) at Bromley, Kent. *Entomologist's Gazette*, **24**, 329-346.

**Chandler, P.J. & Stubbs, A.E.** 1977. *Tipula (Lunatipula) dilatata* Schummel 1833 (Diptera, Tipulidae) new to Britain. *Proceedings and Transactions of the British Entomological and Natural History Society*, **10**, 85-87.

**Charbonnier, H.J.** 1915. Notes on the Diptera of Somerset. Part 1. *Proceedings of the Somersetshire Archaeological and Natural History Society*, **61**, 189-240. [Craneflies pp. 195-198.] [See Jermy 1922.]

**Cheetham, C.A.** 1923. Additions to the Yorkshire Diptera list. *Naturalist*, 1923, 408-409. [*Mokophilus undulatus* new to Britain.]

**Cheetham, C.A.** 1923-53. [Diptera: notes and additions.] *Naturalist*, 1923-1953. [Many short notes, including within field meeting reports.]

**Cheetham, C.A.** 1924. Yorkshire Tipulids. *Naturalist*, 1924, 327-328.

**Cheetham, C.A.** 1927. *Dicranomyia aperta* Wahgr., an addition to the British Diptera list. *Naturalist*, 1927, 325-326.

**Cheetham, C.A.** 1932. *T. czizeki* de Jong in Yorkshire. *Naturalist*, 1932, 109-110.

**Cheetham, C.A.** 1934. A new station for *Dicranomyia aperta* Wahlg. *Naturalist*, 1934, 242.

**Chiswell, J.R.** 1954. *Tipula livida* van der Wulp (Diptera, Tipulidae) new to Britain. *Entomologist*, **87**, 124-126.

**Chiswell, J.R.** 1955. On the last instar larva of *Tipula livida* van der Wulp (Diptera, Tipulidae) with notes on the fronto-clypeal region of the larval Tipulinae and caterpillars. *Proceedings of the Royal Entomological Society of London A*, **30**, 127-136.

**Chiswell, J.R.** 1956. A taxonomic account of the last instar larvae of some British

- Tipulinae (Diptera, Tipulidae). *Transactions of the Royal Entomological Society of London*, **108**, 409-484.
- Clemons, L.** 1982. A survey of the flora and fauna of Murston Marshes. *Transactions of the Kent Field Club*, **9**, 31-64. [Craneflies, p63.]
- Coe, R.L.** 1941. Some breeding records of British Tipulidae. *Entomologist's Monthly Magazine*, **77**, 172.
- Coe, R.L.** 1950. Diptera. Family Tipulidae. In: *Handbook for the Identification of British Insects*, IX (2). London: Royal Entomological Society.
- Coggins, R.E.** 1970. *Megaselia paludosa* (Wood) (Dipt., Phoridae) parasitising *Tipula paludosa* (Dipt., Tipulidae). *Entomologist's Monthly Magazine*, **106**, 108.
- Cohen, M.** 1953. Survey of leatherjacket populations in England and Wales, 1946-1951. *Plant Pathology*, **2**, 80-82.
- Cole, J.H.** 1967. Tipulidae and Empididae (Diptera). *Report. Huntingdonshire Fauna and Flora Society, 19th*, 1966, 11-13.
- Cole, J.H.** 1970a. Diptera of Huntingdonshire (2). *Report. Huntingdonshire Fauna and Flora Society, 22nd*, 1969, 25-30.
- Cole, J.H.** 1970b. A preliminary list of the flies (Diptera) of Shepherds Close Nature Reserve. *Report. Huntingdonshire Fauna and Flora Society, 22nd* 1969, 31-32.
- Cole, J.H.** 1980. Additions to the Diptera of Monks Wood. *Report. Huntingdonshire Fauna and Flora Society, 32nd*, 1979, 27-31.
- Cole, J.H.** 1981. The flies of Holme Fen National Nature Reserve. *Report. Huntingdonshire Fauna and Flora Society, 33rd*, 1980, 21-28.
- Cole, J.H. & Wills, H.J.** 1973. Diptera: other families. In: *Monks Wood: a nature reserve record*, edited by R.C. Steele & R.C. Welch, 167-196. Huntingdon: Nature Conservancy. [Craneflies pp181-182.]
- Collin, J.E.** 1943. Additional confirmation of the occurrence of *Dicranomyia (Atypophthalmus) inusta* Mg. in Britain (Dipt., Tipulidae). *Entomologist's Monthly Magazine*, **79**, 182.
- Collin, J.E.** 1954. *Tipula siebkei* Zetterstedt (1852), an addition to the British Tipulidae (Diptera). *Journal of the Society for British Entomology*, **5**, 72.
- Coulson, J.C.** 1959. Observations on the Tipulidae (Diptera) of the Moor House nature reserve, Westmorland. *Transactions of the Royal Entomological Society of London*, **111**, 157-174.
- Coulson, J.C.** 1962. The biology of *Tipula subnodicomis* Zetterstedt, with comparative observation on *Tipula paludosa* Meigen. *Journal of Animal Ecology*, **31**, 1-21.
- Coulson, J.C., Horobin, J.C., Butterfield, J. & Smith, G.R.J.** 1976. The maintenance of annual life-cycles in two species of Tipulidae (Diptera); a field study relating development, temperature and altitude. *Journal of Animal Ecology*, **45**, 215-233.
- Crisp G., & Lloyd, L.** 1954. The community of insects in a patch of woodland mud. *Transactions of the Royal Entomological Society of London*, **104**, 269-314.
- Cuthbertson, A.** 1923. Some Limnobiine crane-flies of Loch Goil district. *Entomologist's Monthly Magazine*, **59**, 92.
- Cuthbertson, A.** 1926a. Crane flies of the Inner Hebrides. *Scottish Naturalist*, 1926, 53-58.
- Cuthbertson, A.** 1926b. Studies on Clyde crane-flies: the swarming of crane-flies. *Entomologist's Monthly Magazine*, **62**, 36-38.
- Cuthbertson, A.** 1926c. Studies on Clyde crane-flies: I. Additions to the local list, etc. *Entomologist*, **59**, 1-4.
- Cuthbertson, A.** 1926d. Studies on Clyde crane-flies: VI. Some photophilous crane-flies. *Entomologist*, **59**, 127-128.
- Cuthbertson, A.** 1926e. The study of Clyde

crane-flies; the larval habitats of the local species. *Entomologist's Monthly Magazine*, **62**, 84-88.

**Cuthbertson, A.** 1927a. Additions to the list of Clyde crane-flies. *Entomologist*, **60**, 66-67.

**Cuthbertson, A.** 1927b. Studies on Clyde crane-flies: VII. Some insect enemies. *Entomologist*, **60**, 111-113.

**Cuthbertson, A.** 1927c. The crane-flies of the Clyde Islands. *Scottish Naturalist*, 1927, 85-87.

**Cuthbertson, A.** 1929a. The mating habits and oviposition of crane-flies. *Entomologist's Monthly Magazine*, **65**, 141-145.

**Cuthbertson, A.** 1929b. The habits of some crane-flies (Dipt., Tipulidae) in the west of Scotland. *Scottish Naturalist*, **49**, 15-23.

**Cuthbertson, A.** 1929c. Studies of Clyde crane-flies: VIII. The seasonal prevalence of crane-flies (Tipuloidea, Dipt.) in the west of Scotland. *Entomologist*, **62**, 270-273.

**Dawson, R.B.** 1932. Leather jackets. *Journal of the Board of Greenkeeping Research*, **2**, 183-195.

**Disney, R.H.L.** 1979. Natural history notes on some British Phoridae (Diptera) with comments on a changing picture. *Entomologist's Gazette*, **30**, 141-150.

**Dobson, R.M.** 1973. Scottish long-palped crane flies (Diptera: Tipulinae). 1. Species taken at Threave Gardens, Kirkcudbrightshire and Ardmore Point, Dumbartonshire. *Glasgow Naturalist*, **19**, 45-54.

**Dobson, R.M.** 1974a. Scottish long-palped crane flies (Diptera: Tipulinae). 2. Species taken at Kindrogan, Perthshire and at Craibstone, Aberdeenshire. *Glasgow Naturalist*, **19**, 115-122.

**Dobson, R.M.** 1974b. Observations on the spatial distribution of flying Tipulinae (Diptera: Tipulidae) in Scotland. *Journal of Animal Ecology*, **43**, 513-519.

**Edwards, F.W.** 1912. Diptera. Tipulidae. *Transactions of the Linnean Society of London Zoology*, **15**, 195-214.

**Edwards, F.W.** 1916. On the current names of some common British Diptera. *Entomologist's Monthly Magazine*, **52**, 59-63.

**Edwards, F.W.** 1919. *Gnophomyia tripudiens* Bergroth: a new British fly. *Entomologist's Monthly Magazine*, **55**, 176. [*G. viridipennis* of British list.]

**Edwards, F.W.** 1921a. British Limnobiidae. Some records and corrections. *Transactions of the Entomological Society of London*, 1921, 196-230.

**Edwards, F.W.** 1921b. Diptera Nematocera from Arran and Loch Etive. *Scottish Naturalist*, 1921, 59-61, 89-92, 121-125.

**Edwards, F.W.** 1924b. Two new British Nematocerous insects. *Entomologist's Monthly Magazine*, **60**, 190. [*Ormosia bicornis*.]

**Edwards, F.W.** 1924c. Notes on some British species of *Tipula*. *Entomologist's Monthly Magazine*, **60**, 81-85.

**Edwards, F.W.** 1926. Additions to the list of British crane-flies. *Entomologist's Monthly Magazine*, **62**, 31-35.

**Edwards, F.W.** 1929. Diptera in the Killamey district. *Entomologist*, **62**, 163-164.

**Edwards, F.W.** 1930. The British species of *Lipsothrix*. *Entomologist*, **63**, 212.

**Edwards, F.W.** 1931a. A local variation of *Pedicia rivosa* L. (Dipt.) *Entomologist*, **64**, 19.

**Edwards, F.W.** 1931b. Some suggestions for the classification of the genus *Tipula* (Diptera, Tipulidae). *Annals and Magazine of Natural History*, (10), **8**, 73-82.

**Edwards, F.W.** 1932. Notes on Highland Diptera, with descriptions of six new species. *Scottish Naturalist*, 1932, 43-52.

**Edwards, F.W.** 1933a. *Tipula mutilla* Wahlberg. (Dipt. Tipulidae) in Dorset. *Journal*

of the *Entomological Society of the South of England*, **1**, 57.

**Edwards, F.W.** 1933b. *Tipula nubeculosa* Mg. in Bagley Wood, Berks; its distinction from *T. rubripes* Schumm. (Dipt., Tipulidae). *Journal of the Entomological Society of the South of England*, **1**, 79.

**Edwards, F.W.** 1933c. Some Perthshire Diptera. *Scottish Naturalist*, 1933, 87-92, 113-117.

**Edwards, F.W.** 1936a. The British species of *lisia*. *Entomologist*, **69**, 218-219.

**Edwards, F.W.** 1936b. Inverted male hypopygia in Eriopterine crane-flies. *Entomologist*, **69**, 243.

**Edwards, F.W.** 1936c. *Erioptera riedeli* Lackschewitz in Scotland: an addition to the British tipulid fauna. *Entomologist*, **69**, 219. [= *E. sordida*.]

**Edwards, F.W.** 1937. Craneflies in Mulgrave Woods. *Naturalist*, 1937, 253-254.

**Edwards, F.W.** 1938a. A new species of the genus *Nephrotoma* Mg. with notes on the species of the *flavescens* group. *Encyclopédie entomologique*, (B2), Dipt., **9**, 97-101. [*N. sullingtonensis*.]

**Edwards, F.W.** 1938b. British short-palped crane-flies. Taxonomy of adults. *Journal of the Society for British Entomology*, **5**, 1-168.

**Edwards, F.W.** 1939. Additions to the list of British crane-flies. *Entomologist's Monthly Magazine*, **75**, 241-249.

**Edwards, F.W. & Collin, J.E.** 1932. A revised list of the Diptera of St. Kilda. *Entomologist's Monthly Magazine*, **68**, 263-266.

**Edwards, F.W. & Keilin, D.** 1928. Anisopodidae. *Genera Insectorum*, **190**, 7-26.

**Elbourn, C.A.** 1965. The fauna of a calcareous woodland stream in Berkshire. *Entomologist's Monthly Magazine*, **101**, 25-30.

**Falk, S.J.** 1991. A review of the scarce and

threatened flies of Great Britain Part 1. *Research and survey in Nature Conservation* 39. Peterborough: Nature Conservancy Council.

**Fahy, E.** 1972. The larva and life history of *Dicranota guerini* Zett. (Dipt., Tipulidae). *Entomologist*, **105**, 260-263.

**Fahy, E.** 1973. A high altitude lotic invertebrate community in Co. Wicklow. *Irish Naturalists' Journal*, **17**, 343-345.

**Feeney, A.M.** 1967. An improved method for extracting leatherjackets from soil and an evaluation of the Maercks Method. *Scientific Proceedings of the Royal Dublin Society B*, **2**, 75-79.

**Feeney, A.M.** 1968. A list of crane-flies of the genera *Tipula* and *Nephrotoma* captured in counties Leitrim and Carlow. *Irish Naturalists' Journal*, **16**, 48-49. [See Stelfox 1968.]

**Felton, J.C.** 1975. Insects on Hothfield Local Nature Reserve. *Transactions of the Kent Field Club*, **5**, 150-174. [Craneflies pp172-173.]

**Fordham, W.J.** 1922. Diptera of East Yorkshire. In: *British Association Handbook to Hull and the East Riding*, edited by T. Sheppard, 431-437. London: A. Brown. [Craneflies p433, superficial.]

**Fordham, W.J.** 1926. Notes on some Durham Diptera. *Vasculum*, **12**, 71-76. [Superficial.]

**Fordham, W.J.** 1945. A preliminary list of the Diptera of Northumberland and Durham (excluding Cecidomyiidae). *Transactions of the Natural History Society of Northumberland, Durham, and Newcastle-upon-Tyne*, **7**, 197-265. [Craneflies pp198-205].

**Freeman, B.E.** 1963. *Studies on the ecology of the Tipulidae (Diptera) of a New Forest nature reserve*. PhD thesis, University of Southampton.

**Freeman, B.E.** 1964. A population study of *Tipula* species (Diptera, Tipulidae). *Journal of Animal Ecology*, **33**, 129-140.

- Freeman, B.E.** 1967. Studies on the ecology of larval Tipulinae (Diptera, Tipulidae). *Journal of Animal Ecology*, **36**, 123-146.
- Freeman, B.E.** 1968. Studies on the ecology of adult Tipulidae (Diptera) in southern England. *Journal of Animal Ecology*, **37**, 339-362.
- Freeman, B.E. & Adams, C.R.** 1972. The spatial and temporal distribution of adult Tipulidae (Diptera) at Hothfield Heath, Kent. *Journal of Animal Ecology*, **41**, 537-551.
- Freeman, P.** 1951. The British species of *Tasiocera* Skuse (Diptera, Tipulidae). *Proceedings of the Royal Entomological Society of London B*, **20**, 29-36.
- Gibbs, A.E. & Barraud, P.J.** 1908. A preliminary list of Hertfordshire Diptera. *Transactions of the Hertfordshire Natural History Society and Field Club*, **13**, 249-276. [Craneflies pp254-255.]
- Goffe, E.R.** 1928. Diptera in Hants during 1928. *Transactions of the Hampshire Entomological Society*, **4**, 42-48.
- Grensted, L.W.** 1944a. Records of Diptera and other insects from Dinas Head, Pembrokeshire. *Entomologist's Monthly Magazine*, **80**, 201-203.
- Grensted, L.W.** 1944b. Notes on the distribution of British crane-flies (Dipt., Tipulidae). *Entomologist's Monthly Magazine*, **80**, 174-177.
- Griffiths, C., Carter, J.B. & Overend, J.** 1984. *Phaonia signata* (Meigen) (Diptera: Muscidae) larvae predatory upon leatherjackets, *Tipula paludosa* (Meigen) (Diptera: Tipulidae) larvae. *Entomologist's Gazette*, **35**, 53-55.
- Grimshaw, P.H.** 1898. Lincolnshire Diptera: a preliminary list. *Naturalist*, 1898, 157-170. [Craneflies pp158-159.]
- Grimshaw, P.H.** 1899. Diptera Scotica: I. Perthshire. *Annals of Scottish Natural History*, 1899, 84-91.
- Grimshaw, P.H.** 1900. Diptera Scotica: II. Inverness-shire. *Annals of Scottish Natural History*, 1900, 18-30. [Craneflies pp19-20, only 4 spp.]
- Grimshaw, P.H.** 1903-4. Diptera Scotica: III.- The Forth district. *Annals of Scottish Natural History*, 1903, 154-166, 212-226; 1904, 98-102. [Craneflies 1903, 158-159; 1904, 31-32.]
- Grimshaw, P.H.** 1906. On the occurrence of a new British fly (*Trichocera maculipennis* Mg.) in the Forth district. *Annals of Scottish Natural History*, 1906, 210-211.
- Grimshaw, P.H.** 1907a. On the Diptera of St. Kilda. *Annals of Scottish Natural History*, 1907, 150-158. [See Edwards & Collin 1932.]
- Grimshaw, P.H.** 1907b. Diptera. In: Contributions to the natural history of Lambay, Co. Dublin. *Irish Naturalist*, **16**, 43.
- Grimshaw, P.H.** 1912. Clare Island survey. Diptera. *Proceedings of the Royal Irish Academy*, **31**, 1-34.
- Grimshaw, P.H.** 1914-16. Diptera Scotica: VI. The Western Isles. *Annals of Scottish Natural History*, 1914, 205-213, 234-236, 258-262; 1915, 276-281; 1916, 115-119, 134-138. [Craneflies 1914, 209-212.]
- Hadley, M.** 1969. The adult biology of the crane-fly *Molophilus ater* Meigen. *Journal of Animal Ecology*, **38**, 765-790.
- Hadley, M.** 1971a. Aspects of the larval ecology and population dynamics of *Molophilus ater* Meigen (Diptera: Tipulidae) on Pennine moorland. *Journal of Animal Ecology*, **40**, 445-466.
- Hadley, M.** 1971b. Pupation and fecundity of *Molophilus ater* Meigen (Diptera: Tipulidae) in relation to larval weight. *Oecologia*, **7**, 164-169.
- Haines, F.H.** 1926. Dorset and New Forest records of Tipulidae (Diptera) and allied families. *Entomologist*, **59**, 268-272.
- Halbert, J.N.** 1922. *Magdalis carbonaria* and

other insects at Powerscourt. *Irish Naturalist*, **31**, 9-10. [*Tanyptera atrata*.]

**Haliday, A.H.** 1833. Catalogue of Diptera occurring about Holywood in Downshire. *Entomologist's Magazine*, **1**, 147-180. [Craneflies 58 spp. including eight new to science.]

**Hamm, A.H.** 1926. Diptera. In: *Natural history of the Oxford district*, edited by J.J. Walker, 248-279. Oxford: Oxford University Press. [Craneflies pp255-258.]

**Hamm, A.H.** 1939. Diptera. In: *The Victoria history of the county of Oxford*, edited by L.F. Salzman, 1, 156-178. London: Oxford University Press. [Craneflies pp162-163.]

**Hancock, E.G.** 1973. Some records of craneflies for 1973. *Entomologist's Record and Journal of Variation*, **86**, 239-241.

**Hancock, E.G.** 1974. Antennal variation in *Erioptera pilipes* (Fabricius) (Diptera: Tipulidae). *Entomologist's Record and Journal of Variation*, **86**, 197-198.

**Hancock, E.G.** 1979. The craneflies (Diptera: Tipulidae) in the Bradford Museum collections. *Naturalist*, **104**, 23-27.

**Hancock, E.G.** 1988. A cranefly, *Tipula* (*Savtshenkia*) *invenusta* Riedel (Diptera: Tipulidae), new to the British Isles. *Entomologist*, **107**, 96-98.

**Hancock, E.G. & Gray, J.R.A.** 1975. Some insects from light-traps set at Leighton Moss. *Nature in Lancashire*, **5**, 19-24.

**Hazelton, M.** 1972a. Biological records no. 14. 1970 and 1971. *Transactions of the Cave Research Group of Great Britain*, **14**, 205-230.

**Hazelton, M.** 1972b. Vice-county records of fauna collected in the hypogean and related zones. *Transactions of the Cave Research Group of Great Britain*, **14**, 231-272.

**Hemmingsen, A.M.** 1952. The oviposition of some crane-fly species (Tipulidae) from different types of localities. *Videnskabelige Meddelelser fra Dansk naturhistorik Forening*,

**114**, 365-430.

**Henderson, R.** 1901a. Tipulidae in the west of Scotland. *Entomologist's Monthly Magazine*, **37**, 113-115. [List of 133 species.]

**Henderson, R.** 1901b. Tipulidae. In: *Fauna, flora and geology of the Clyde area*, edited by G.F.S. Elliot, M. Laurie, & L.B. Murdoch, 267-271. Glasgow: British Association for the Advancement of Science.

**Henderson, R.** 1905-6. The Diptera of the Clyde (2nd list). *Transactions of the Natural History Society of Glasgow*, **8**, 7-22.

**Henson, H.** 1957. *Ormosia sororcula* Zett. (Diptera, Tipulidae). New Yorkshire record. *Naturalist*, 1957, 106. [= *Sororcula pentagonalis*.]

**Henson, H.** 1963. The insects of the Malham Tam area: Tipulidae to Ptychopteridae. *Proceedings of the Leeds Philosophical and Literary Society*, **9**, 78-80.

**Hincks, W.D.** 1953. The entomology of Spurn Head, XII Diptera. *Naturalist*, 1953, 159-169.

**Hinton, H.E.** 1950. Aquatic Diptera collected in the River Dove near Dovedale, Derbyshire. *Journal of the Society for British Entomology*, **3**, 203-206.

**Hinton, H.E.** 1954. On the structure and function of the respiratory horns of the pupae of the genus *Pseudolimnophila* (Diptera: Tipulidae). *Proceedings of the Royal Entomological Society of London*, **A**, **29**, 135-140.

**Hinton, H.E.** 1955. The structure of the spiracular gill of the genus *Lipsothrix*, with some observations on the living epithelium isolated in the gill at the pupa-adult moult. *Proceedings of the Royal Entomological Society of London*, **A**, **30**, 1-14.

**Hinton, H.E.** 1957. The structure and function of the spiracular gill of the fly, *Taphrophila vitripennis*. *Proceedings of the Royal Society*, (B), **147**, 99-120.

- Hobby, B.M. & Smith, K.G.V.** 1961. The bionomics of *Empis tessellata* F. (Dipt., Empididae). *Entomologist's Monthly Magazine*, **91**, 2-10. [*Tipula varipennis* as prey.]
- Hocken, M.** 1945. Diptera of Suffolk. Family 2: Tipulidae. *Transactions of the Suffolk Naturalists' Society*, **5**, 184-198.
- Houlihan, D.F.** 1969. The structure and behaviour of *Notiophila riparia* and *Erioptera squalida*, two root piercing insects. *Journal of Zoology*, **159**, 249-267.
- Hutson, A.M. & Stubbs, A.E.** 1974. *Limonia* (*Dicranomyia*) *omissinervis* de Meijere (Diptera: Tipulidae) new to Britain and the identity of *L. (D.) patens* in Britain. *Entomologist's Gazette*, **25**, 297-301.
- Hutson, A.M. & Vane-Wright, R.I.** 1969. Corrections and additions to the list of British Nematocera (Diptera) since Kloet and Hincks' 'A check list of British Insects' (1945). Part 1. Introduction and families Tipulidae, Trichoceridae and Anisopodidae (Tipuloidea). *Entomologist's Gazette*, **20**, 231-256.
- Hutson, A.M., Vane-Wright, R.I. & Cranston, P.S.** 1976. Revised proposals for stabilising names in the *Tipula oleracea* species-group (Diptera: Tipulidae) Z.N.(S.) 896. *Bulletin of Zoological Nomenclature*, **33**, 39-45.
- Jermyn, T.** 1922. Notes on the Diptera of Somerset. Part 5. *Proceedings of the Somersetshire Archaeological and Natural History Society*, **68**, 1-14. [Craneflies pp6-8, see Charbonnier 1915.]
- Karandikar, K.R.** 1931. The early stages and bionomics of *Trichocera maculipennis* (Meigen) (Diptera, Tipulidae). *Transactions of the Royal Entomological Society of London*, **79**, 249-260.
- Kidd, L.N.** 1953. Some records of northern Tipulidae with special reference to those occurring in the Oldham district. *Report and Transactions of the Manchester Entomological Society*, 1941-51, 26-32.
- Kidd, L.N.** 1954. Notes on some Derbyshire crane-flies. *Journal of the Society for British Entomology*, **5**, 86-87.
- Kidd, L.N.** 1957. Some craneflies (Dipt.: Tipulidae) of a Lancashire Clough, including several new county records. *Naturalist*, 1957, 101-102.
- Kidd, L.N.** 1964. The Diptera of Lancashire and Cheshire, pt 1 (supplement). *Publications of the Lancashire and Cheshire Fauna Society*, **46**, 1-6.
- Kidd, L.N.** 1971. The Diptera of Lancashire and Cheshire. *Publications of the Lancashire and Cheshire Fauna Society*, **59**, 18-23.
- Kidd, L.N. & Brindle, A.** 1959. *The Diptera of Lancashire and Cheshire*. Arbroath: Lancashire & Cheshire Fauna Committee. [Craneflies pp15-32.]
- Kidd, L.N. & Collin, J.E.** 1953. Some West Cheshire Diptera. *Journal of the Society for British Entomology*, **4**, 137-138.
- Kidd L.N. & Fitton, M.G.** (editors), 1971. *Holden Clough: the natural history of a small Lancashire valley*. Oldham: Oldham Public Libraries.
- Kloet, G.S. & Hincks, W.D.** 1945. *A checklist of British insects*. Stockport: privately printed. [Craneflies pp327-332.]
- Kloet, G.S. & Hincks, W.D.** 1976. *A checklist of British Insects*, pt 6 Diptera and Siphonaptera, 2nd edition. In: *Handbook for the Identification of British Insects*, XI (5). London: Royal Entomological Society.
- Knab, F.** 1910. The feeding habits of *Geranomyia* (Diptera, Tipulidae). *Proceedings of the Entomological Society of Washington*, **12**, 61-67.
- Lam, A.B.Q. & Webster, J.M.** 1972. Morphological characteristics for differentiating larval instars of leatherjackets, *Tipula paludosa* (Diptera: Tipulidae). *Canadian Entomologist*, **104**, 899-902.
- Laughlin, R.** 1958a. The rearing of crane

flies (Tipulidae). *Entomologia experimentalis et applicata*, **1**, 241-245.

**Laughlin, R.** 1958b. Desiccation of eggs of the crane-fly (*Tipula oleracea* L.). *Nature*, **182**, 613.

**Laughlin, R.** 1960. Biology of *Tipula oleracea* L.: growth of the larva. *Entomologia experimentalis et applicata*, **3**, 185-197.

**Laughlin, R.** 1967a. Biology of *Tipula paludosa*; growth of the larva in the field. *Entomologia experimentalis et applicata*, **10**, 52-68.

**Laughlin, R.** 1967b. Treatment of data on the size of individual insects from field samples. *Entomologia experimentalis et applicata*, **10**, 131-142.

**Laurence, B.R.** 1957. The British species of Trichoceridae (Diptera: Trichoceridae). *Proceedings of the Royal Entomological Society of London*, A, **32**, 132-138.

**Lovibond, B.** 1937. Investigations on the control of leather-jackets. (3) Some results of breeding and sampling experiments in the coming season. *Journal of the Board of Greenkeeping Research*, **5**, 107-112.

**Luff, M.L. & Selman, B.J.** 1977. The Diptera of Castle Eden Dene. *Vasculum*, **62**, 32-40.

**Meats, A.** 1967a. The relation between survival and water loss in larvae of *Tipula oleracea* and *Tipula paludosa* (Diptera) on exposure to unsaturated air. *Journal of Insect Physiology*, **13**, 1119-1131.

**Meats, A.** 1967b. The relation between soil water tension and the rate of development of the larvae of *Tipula oleracea* and *T. paludosa* (Diptera) in turf. *Entomologia experimentalis et applicata*, **10**, 312-320.

**Meyrick, E.** 1903. Diptera. *Report of the Marlborough College Natural History Society*, **51**, 59-72. [Craneflies pp63-64].

**Miall, L.C.** 1893. *Dicranota*: a carnivorous tipulid larva. *Transactions of the*

*Entomological Society of London*, 1893, 235-253.

**Miall, L.C. & Shelford, R.** 1897. The structure and life-history of *Phalacrocer replicata*. *Transactions of the Entomological Society of London*, 1897, 343-361.

**Michelmores, A.P.C.** 1924. Lists of the Diptera, Hymenoptera, Sessiliventres, Hymenoptera, Aculeata, Paraneuroptera, Orthoptera, Siphonaptera, Thysanura and Campodeioidea of the Marlborough District. *Report of the Marlborough College Natural History Society*, **73**, 80-105. [Craneflies pp84-86.]

**Miles, P.M.** 1955. Some light trap records of Tipulidae (Dipt.) in Wales. *Entomologist's Monthly Magazine*, **91**, 95.

**Milne, A., Coggins, R.E. & Laughlin, R.** 1958. The determination of numbers of leatherjackets in sample turves. *Journal of Animal Ecology*, **27**, 125-145.

**Milne, A., Laughlin, R. & Coggins, R.E.** 1965. The 1955 and 1959 population crashes in the leatherjacket, *Tipula paludosa* Meigen, in Northumberland. *Journal of Animal Ecology*, **34**, 529-544.

**Moffat, C.B.** 1941. Troubles of *Tipula gigantea*. *Irish Naturalists' Journal*, **7**, 310-311. [Attack by another fly; bat predation.]

**Morgan, M.J.** 1975. In: *Biological recording working group for Wales, reports and records of field meetings 1974-5*, edited by J A Bateman & J E Chatfield, 15-26, 56-65. Cardiff: National Museum of Wales. [Lampeter area & Gwent.]

**Morley, C.** 1935. A beech-tree's insects, and their parasites. *Entomologist's Monthly Magazine*, **71**, 90-91. [New Forest.]

**Morley, C. & Atmore, E.A.** 1915. The Diptera of Norfolk and Suffolk. *Transactions of the Norfolk and Norwich Naturalists' Society*, **10**, Suppl.: 1-180. [Craneflies pp22-30.]

**Morrison, M.A.** 1925. Species determination of two common crane-flies,

- Tipula paludosa* and *Tipula oleracea*. *Proceedings of the Royal Philosophical Society of Glasgow*, **21**, 4-9. [See Britten 1926.]
- Oldham, J.N.** 1928. On the final larval instar of *Tipula paludosa* Meig. and *Tipula lateralis* Meig. *Proceedings of the Royal Philosophical Society of Edinburgh*, **21**, 217-252.
- Oosterbroek, P.** 1978-1980. The Western palaearctic species of *Nephrotoma* Meigen, 1803, (Diptera, Tipulidae). Parts 1-5. *Beaufortia*, **27**, 1-137; **28**, 57-111, 157-203; **29**, 129-197, 311-393.
- Oosterbroek, P. & Theowald B.** 1992. Family Tipulidae. In: *Catalogue of Palaearctic Diptera*, Volume 1, edited by A. Soós, L. Papp & P. Oosterbroek, 56-178. Oxford: Elsevier.
- Ord, G.W.** 1900. Notes on the Tipulidae of the Glasgow district. *Transactions of the Natural History Society of Glasgow, N.S.* **8**, 7-22.
- Parmenter, L.** 1942a. The survey of Limpsfield Common. Fifth Year. The Diptera of Limpsfield Common. *London Naturalist*, 1941, 18-33. [Craneflies p23.]
- Parmenter, L.** 1942b. *Tipula yerburyi* Edwards (Dipt., Tipulidae) in Dorset. *Entomologist's Monthly Magazine*, **78**, 15.
- Parmenter, L.** 1950. The Diptera of Bookham Common. *London Naturalist*, **29**, 98-133. [Craneflies pp108-109.]
- Parmenter, L.** 1960. A further list of Diptera of Bookham Common. *London Naturalist*, **39**, 66-76. [Craneflies p71].
- Parmenter, L.** 1966. Some additions to the list of flies (Diptera) of Bookham Common. *London Naturalist*, **45**, 56-59. [Craneflies pp56-57].
- Payne, R.M.** 1960. Some crane flies in the Lake District. *Entomologist's Record and Journal of Variation*, **72**, 270-271.
- Payne, R.M.** 1961. More crane-flies in the Lake District. *Entomologist's Record and Journal of Variation*, **73**, 239-240.
- Payne, R.M.** 1963. Crane-flies in Derbyshire and East Norfolk. *Entomologist's Record and Journal of Variation*, **75**, 85-87.
- Payne, R.M.** 1965. Diptera in Brecon. *Entomologist's Record and Journal of Variation*, **77**, 20-21.
- Payne, R.M.** 1966a. Mainly crane-flies in central Wales. *Entomologist's Record and Journal of Variation*, **78**, 54-55.
- Payne, R.M.** 1966b. Crane-flies in Thorndon Park, South Essex. *Essex Naturalist*, **31**, 342-346.
- Payne, R.M.** 1968a. Two crane-flies new to Wales. *Entomologist*, **101**, 137-138.
- Payne, R.M.** 1968b. The crane flies (Diptera: Tipulidae) of Epping Forest. *Entomologist's Gazette*, **19**, 33-43.
- Payne, R.M.** 1969a. Essex crane-flies. *Essex Naturalist*, **32**, 216-220.
- Payne, R.M.** 1969b. A crane-fly's day. *Entomologist's Record and Journal of Variation*, **81**, 217-220. [*Nephrotoma appendiculata*.]
- Payne, R.M. & Stubbs, A.E.** 1967. Tipulidae (Dipt.) in Central and North Wales. *Entomologist's Record and Journal of Variation*, **79**, 173-177.
- Perry, I.** 1974. Swarming of *Tipula lunata* L. (Diptera: Tipulinae) at Lode, Cambridgeshire. *Entomologist's Record and Journal of Variation*, **86**, 124-125.
- Pinchin, R.D. & Anderson, J.** 1936. On the nocturnal activity of Tipulidae (Diptera) as measured by a light trap. (1) The time of flight and proportion of sexes. *Proceedings of the Royal Entomological Society of London, A*, **11**, 69-75.
- Pritchard, G.** 1983. Biology of Tipulidae. *Annual Review of Entomology*, **28**, 1-22.
- Rennie, J.** 1917. On the biology and economic significance of *Tipula paludosa*. Pt

1. *Annals of Applied Biology*, **2**, 235-240.

**Rennie, J.** 1918. On the biology and economic significance of *Tipula paludosa*. Pt 2. Hatching, growth and habits of the larva. *Annals of Applied Biology*, **3**, 116-137.

**Rennie, J.** 1925. A merminthid parasite of *Tipula paludosa*, Meigen. *Proceedings of the Royal Physical Society of Edinburgh*, **21**, 1-3.

**Rennie, J. & Sutherland, C.H.** 1920. On the life history of *Bucentes (Siphona) geniculata* (Diptera: Tachinidae), parasite of *Tipula paludosa* (Diptera) and other species. *Parasitology*, **12**, 199-211.

**Rhynchhart, J.C.** 1924. Larva of *T. regelationis*. *Proceedings and Report of the Belfast Natural History and Philosophical Society, 1922-1923*, 36-47. [*Trichocera*.]

**Richards, O.W.** 1961. The fauna of an area of limestone pavement on the Burren, Co. Clare. *Proceedings of the Royal Irish Academy*, (B), **62**, 1-7. [*Dicranomyia stylifera*.]

**Robertson, A.G.** 1939. The nocturnal activity of crane-flies (Tipulinae) as indicated by their captures in a light trap at Rothamsted. *Journal of Animal Ecology*, **8**, 300-322.

**Rogers, J.S.** 1926. Some notes on the feeding habits of adult crane-flies. *Florida Entomologist*, **10**, 5-8.

**Saunders, L.G.** 1930. The early stages of *Geranomyia unicolor* Haliday, a marine tipulid. *Entomologist's Monthly Magazine*, **66**, 185-187.

**Saunt, J.W.** 1921. Ovipositing of *Pachyrrhina crocata* L. *Entomologist's Monthly Magazine*, **57**, 186. [*Nephrotoma crocata*.]

**Service, M.W.** 1973. Spatial and temporal distributions of aerial populations of woodland tipulids (Diptera). *Journal of Animal Ecology*, **42**, 295-303.

**Sherlock, P.L.** 1973. *Tipula paludosa* Meigen (Diptera: Tipulidae): A survey of its pathogens and a study of the gregarines of

the family Diplocystidae. PhD thesis, University of Newcastle upon Tyne.

**Shirt, D.B.** (editor) 1987. *British Red Data Books: 2. Insects*. Peterborough: Nature Conservancy Council.

**Smith, K.G.V.** 1950. Mites on *Limonia tripunctata* F. (Dipt., Tipulidae). *Journal of the Society for British Entomology*, **3**, 211-212.

**Smith, K.G.V.** 1951. Acarine larvae on *Limonia tripunctata* F. (Dipt., Tipulidae) and on a species of Chironomidae (Dipt.). *Entomologist's Monthly Magazine*, **87**, 63.

**Smith, K.G.V.** 1952. On some Diptera from Dublin and Wicklow with notes on several species new to Ireland. *Entomologist's Monthly Magazine*, **88**, 104-106.

**Smith, K.G.V.** 1955. Further notes on Acari in association with *Limonia tripunctata* F. and other Tipulidae (Dipt.). *Entomologist's Monthly Magazine*, **91**, 51-52.

**Smith, K.G.V.** 1958. Some records of Diptera and other insects from Lundy. *Entomologist's Monthly Magazine*, **94**, 94.

**Smith, K.G.V.** 1974. *Nephrocera flavicornis* Zett. (Pipunculidae) and other rare Diptera in North London. *Entomologist's Monthly Magazine*, **109**, 197. [*Gnophomyia lugubris* = *G. viridipennis* of British list.]

**Smith, K.M. & Xeros, N.** 1954. An unusual virus disease of a dipterous larva. *Nature*, **173**, 866-867.

**Speight, M.C.D.** 1975. *Conops vesicularis*, *Epistrophe nitidicollis* and *Ctenophora atrata*: insects new to Ireland. *Irish Naturalists' Journal*, **18**, 191-192. [See Halbert 1922.]

**Stelfox, A.W.** 1968. An error of statement concerning a crane fly. *Irish Naturalists' Journal*, **16**, 80. [See Feeney 1968.]

**Stubbs, A.E.** 1968. Some Tipulidae and Ptychopteridae (Diptera) from Golden Cap, Dorset. *Entomologist*, **101**, 145-146.

- Stubbs, A.E.** 1970a. The rediscovery of *Gonomyia bifida* Tonnoir (Dipt., Tipulidae) in Britain. *Entomologist's Gazette*, **21**, 27-29.
- Stubbs, A.E.** 1970b. Dancing over water by male craneflies, *Nephrotoma flavipalpis* Mg. (Dipt.: Tipulidae). *Entomologist's Record and Journal of Variation*, **82**, 50-54.
- Stubbs, A.E.** 1972a. A review of information on the distribution of the British species of *Ptychoptera* (Dipt., Ptychopteridae). *Entomologist*, **105**, 23-38, 308-312.
- Stubbs, A.E.** 1972b. Why do craneflies have long legs? *Entomologist's Record and Journal of Variation*, **84**, 108-111.
- Stubbs, A.E.** 1972-4. Introduction to craneflies, parts 1-7. *Bulletin of the Amateur Entomologist's Society*, **31**, 46-53, 83-93; **32**, 15-23, 58-63, 101-107; **33**, 19-23, 142-145.
- Stubbs, A.E.** 1974a. Llangollen - Cranefly recording. In: *Biological recording working group for Wales, reports and records of field meetings 1971-3*, edited by J.A. Bateman, 49-56. Cardiff: National Museum of Wales.
- Stubbs, A.E.** 1974b. A survey of the Tipulidae (Diptera) of chalkland at Sheepsheas, Surrey. *Entomologist's Gazette*, **25**, 127-136.
- Stubbs, A.E.** 1974c. A list of craneflies for Lincolnshire. *Naturalist*, 1974, 139-142.
- Stubbs, A.E.** 1975. Craneflies of the Dolgellau area, 25-26 October 1976. In: *Biological recording working group for Wales, reports and records of field meetings 1974-5*, edited by J.A. Bateman & J.E. Chatfield, 109-112. Cardiff: National Museum of Wales.
- Stubbs, A.E.** 1976a. Craneflies of Seabrook Valley and Holy Well, Cheriton, Kent: Channel Tunnel Survey. *Transactions of the Kent Field Club*, **6**, 43-51.
- Stubbs, A.E.** 1976b. Insects: Channel Tunnel survey. *Transactions of the Kent Field Club*, **6**, 17-22.
- Stubbs, A.E.** 1977a. *Gonomyia* (*Protogonomyia*) *limbata* (Ros.) and *Molophilus varispinus* Stary (Dipt.: Tipulidae) new to Britain from Wales. *Proceedings and Transactions of the British Entomological and Natural History Society*, **10**, 100-103.
- Stubbs, A.E.** 1977b. Insects III - Diptera Tipulidae. In: *Welsh biological recording group, reports and records of field meetings 1976*, edited by J.E. Chatfield, 23-28. Cardiff: National Museum of Wales. [Brecon area.]
- [**Stubbs, A.E.**] 1977c. Diptera in north central Wales. A Diptera Recording Schemes survey, October 1975. Nature Conservancy Council, North Wales Region. [Craneflies pp7-13, plus tables.]
- Stubbs, A.E.** 1990. The beginning of the Diptera Recording Scheme in Britain. *Dipterists Digest*, **6**, 2-6.
- Stubbs, A.E. & Chandler, P.J.** 1973. *Molophilus lackschewitzianus* Alexander 1952 (Diptera: Tipulidae) new to the British Isles. *Proceedings and Transactions of the British Entomological and Natural History Society*, **6**, 18-19.
- Stubbs, A.E. & Little, C.J.** 1974. *Dicranoptycha* Osten-Sacken (Diptera, Tipulidae), a cranefly genus new to Britain. *Proceedings and Transactions of the British Entomological and Natural History Society*, **7**, 44-45.
- Toye, S.A.** 1967. The larva of the marine tipulid, *Geranomyia unicolor* Haliday. *Proceedings of the Royal Entomological Society of London A*, **42**, 167-170.
- Uffen, R.W.J.** 1958. Shoreham, Kent - 31 May 1958. *Proceedings. South London Entomological and Natural History Society*, 1958, 70-71. [Includes *Limonia masoni*.]
- Verrall, C.H.** 1886-88. List of British Tipulidae, etc. ('daddy-longlegs'), with notes. *Entomologist's Monthly Magazine*, **23**, 117-125, 156-160, 205-209, 263-267; **24**, 108-112; **25**, 20-27, 97-99.
- Verrall, C.H.** 1894. A second hundred new British species of Diptera. *Entomologist's Monthly Magazine*, **30**, 76-79, 140-146.

[Includes *Gonomyia schistacea* = *Rhabdomastix edwardsi*.]

**Verrall, G.H.** 1911-12. Another hundred new British species of Diptera. *Entomologist's Monthly Magazine*, **48**, 20-27. [*Limnobia decemmaculata*, *Psiloconopa pusilla*, *Tipula nodicornis*.]

**Walker, F.** 1856. *Insecta Britannica*. Diptera 3, 1-352. London: Reeve & Benham. [Craneflies pp270-341.]

**Wardle, R.A.** 1926. The respiratory system of contrasting types of crane-fly larvae. *Proceedings of the Zoological Society of London*, 1926, 25-48.

**Wardle, R.A. & Taylor, E.A.** 1926. The cephalic skeleton of contrasting types of crane-fly larvae. *Proceedings of the Zoological Society of London*, 1926, 1-23.

**White, J.H.** 1951. Observations on the life history and biology of *Tipula lateralis* Meig. *Annals of Applied Biology*, **38**, 847-858.

**Williams, C.B.** 1935. The times of activity of certain nocturnal insects, chiefly Lepidoptera, as indicated by a light trap. *Transactions of the Royal Entomological Society of London*, **83**, 523-555.

**Wingate, W.J.** 1906. A preliminary list of

Durham Diptera with analytical tables. *Transactions of the Natural History Society of Northumberland, Durham, and Newcastle-upon-Tyne*, **2**, 1-416.

**Womersley, H.** 1927. On the habitat and early stages of some Tipuloidea. *Entomologist's Monthly Magazine*, **63**, 235-236.

**Wood, J.H.** 1908. Diptera. In: *The Victoria history of the county of Herefordshire* edited by W. Page, **1**, 96-108. London: Archibald Constable. [Craneflies pp97-98.]

**Xeros, N.** 1954. A second virus disease of the leatherjacket, *Tipula paludosa*. *Nature*, **174**, 562.

**Yerbury, J.W.** 1902. A list of the Diptera met with in Cork and Kerry during the summer of 1901 (with some notes on their habits, etc.). *Irish Naturalist*, **11**, 74-93.

**Yerbury, J.W.** 1918. The Diptera of Glamorgan. *Transactions of the Cardiff Naturalists' Society*, **51**, 48-79. [Craneflies p51; only four species.]

**Yerbury, J.W.** 1920. A list of the Diptera hitherto recorded from the county of Devon. *Report and Transactions of the Devonshire Association for the Advancement of Science*, **52**, 336-359. [Craneflies pp343-347.]

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( <i>Mediotipula</i> ) <i>sarajevensis</i>	72	46
<i>siebkei</i>	73	47
( <i>Odonatisca</i> ) ( <i>Juncea</i> )	74	48
<i>nodicornis</i>	74	48
( <i>Platytipula</i> ) <i>luteipennis</i>	75	49
<i>melanoceros</i>	76	50
( <i>Pterelachisus</i> ) ( <i>hortorum sensu Coe</i> )	82	56
<i>irrorata</i>	77	51
<i>luridirostris</i>	78	52
<i>(meigeni)</i>	82	56
<i>mutila</i>	79	53
<i>pabulina</i>	80	54
<i>pseudovaripennis</i>	81	55
<i>submarmorata</i>	82	56
<i>truncorum</i>	83	57
<i>varipennis</i>	84	58
( <i>Savtshenkia</i> ) <i>alpium</i>	85	59
<i>cheethami</i>	86	60
<i>confusa</i>	87	61
<i>gimmerthali</i>	88	62
<i>grisescens</i>	89	63
<i>holoptera</i>	90	64
<i>invenusta</i>	91	65
<i>limbata</i>	92	66
<i>(macrocera)</i>	89	63
<i>(marmorata)</i>	87	61
<i>obsoleta</i>	93	67
<i>pagana</i>	94	68
<i>rufina</i>	95	69
<i>(serrulata)</i>	96	70
<i>serrulifera</i>	96	70
<i>signata</i>	97	71
<i>staegei</i>	98	72
<i>subnodicornis</i>	99	73
<i>(vafra)</i>	92	66
( <i>Schummelia</i> ) <i>varicornis</i>	100	74
<i>yerburyi</i>	101	75
( <i>Tipula</i> ) ( <i>czizeki</i> )	104	78
<i>oleracea</i>	102	76
<i>paludosa</i>	103	77
<i>subcunctans</i>	104	78
( <i>Vestiplex</i> ) <i>hortorum</i>	105	79

<i>Tipula (Vestiplex) continued</i>		
<i>montana</i>	106	80
<i>nubeculosa</i>	107	81
( <i>nubeculosa sensu Coe</i> )	105	79
( <i>rubripes</i> )	107	81
<i>scripta</i>	108	82
( <i>Yamatotipula</i> ) <i>coerulescens</i>	109	83
<i>couckeii</i>	110	84
<i>lateralis</i>	111	85
( <i>marginata</i> )	112	86
<i>marginella</i>	112	86
<i>montium</i>	113	87
<i>pierreii</i>	114	88
<i>pruinosa</i>	115	89
( <i>solstitialis</i> )	114	88







