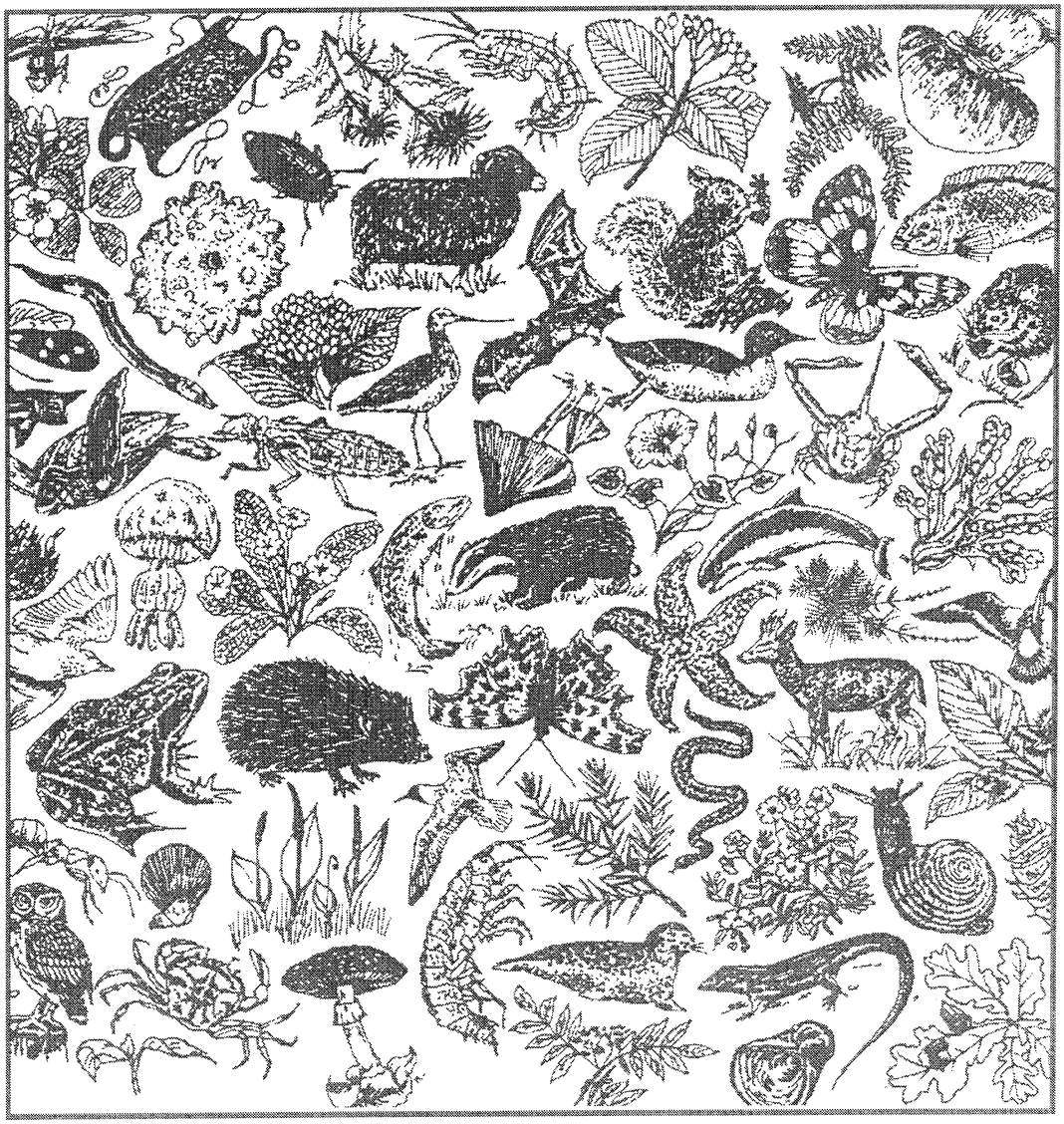
ENGLISH NATURE

Species Recovery Programme

Survey for the cranefly *Lipsothrix nigristigma* in 2000

No. 410 - English Nature Research Reports



working today
for nature tomorrow

English Nature Research Reports

Number 410

Species Recovery Programme
Survey for the cranefly *Lipsothrix nigristigma* in 2000

Andy Godfrey
90 Bence Lane
Darton
Barnsley
South Yorkshire
S75 5DA

ISSN 0967-876X

Contents

Summary
1. Introduction 7
2. Location 7
3. Methods 8
4. Results and discussion 9
5. Recommendations for future work 15
6. Conclusions 16
7. Acknowledgement 16
8. References 17
Table 1A. Cranefly species recorded from the sites surveyed 20
Table 1B. Cranefly species recorded from the sites surveyed 23
Appendix 1. Site descriptions 25
Appendix 2. Red Data Book and Nationally Scarce Species recorded 36
Appendix 3. Preliminary Key to the Pupal Exuviae of *Lipsothrix* species 37
Figure 1. Location of sample sites 38
Figure 2A. Figures of *Lipsothrix nigristigma* and *L. nervosa* 45
Figure 2B. Figures of *Lipsothrix nigristigma* and *L. nervosa* 46
Figure 3. Figures of the male genitalia of *Lipsothrix nobilis* and non-British *L. nervosa* .. 47

Summary

The two sites from which *Lipsothrix nigristigma* Edwards 1938 was recorded in 1994 were resurveyed along with twenty or so similar sites in Shropshire and just over the county border in Montgomeryshire.

The target species *Lipsothrix nigristigma* (Diptera, Limoniidae) (Red Data Book 1 and a priority Biodiversity Action Plan species) was located at eight (possibly nine) sites. The majority of sites are centred on southwest Telford with only two outlying sites (Habberley Valley and Oak Dingle). The records along with the few existing records (and the negative results for June 1999 in the Godfrey 2000) indicate that *Lipsothrix nigristigma* has a relatively short flight period from mid to late May in Britain. Adults were located by searching around semi-submerged logs in streams and rivers and by sweep netting around these and along the watercourses. A number of samples were also taken for rearing.

A few adults of *Lipsothrix nigristigma* were reared but not in sufficient numbers to permit separation of the larvae from the other *Lipsothrix* species. One of the problems encountered was the co-existence of 2, 3 or even 4 *Lipsothrix* species at some sites and careful segregation of the immature stages would be necessary in order to describe these. However, the pupal exuvia of *Lipsothrix nigristigma* has been depicted in this report and a preliminary partial key provided for the *Lipsothrix* exuviae has also been provided. Further work on the immature stages is recommended now that sites with good populations have been located and the larval habitat is better known.

Cranefly species were collected from all the sites and a list of species is provided. Site descriptions have also been made and environmental variables noted that might help in characterizing sites the support this very rare species. All the sites were wooded with first or second order streams of high water quality with good flows and abundant coarse woody debris in the channel.

The male genitalia of *Lipsothrix nigristigma* have also been figured along with those of *L. nervosa* since neither of these has been figured in the British literature and use of these is sometimes necessary for definite identification of the species concerned.

Dr Jaroslav Stary has repeated to the author his view that *Lipsothrix nigristigma* is synonymous with *L.nobilis* Loew 1873. The latter is almost certainly the valid name for the species covered by in this survey. Specimens of *Lipsothrix nobilis* provided by Dr Stary have been dissected and the male genitalia illustrated here. Whilst there is some difference in colouration between adults of *L. nigristigma* and *L. nobilis* this is considered to be due to clinal variation and the male genitalia of the two species appear identical suggesting the proposed synonymy is correct.

Three other species of *Lipsothrix* species were recorded, namely *Lipsothrix errans*, *L. nervosa* and *L. remota*. Several other RDB, Nationally scarce and BAP craneflies and other Diptera were observed or taken during the survey. The most significant of these is the recording of the very rare (Red Data Book 2) hoverfly *Chalcosyrphus eunotus* from five sites.

Lipsothrix nigristigma (and the other BAP *Lipsothrix* species) indicate the value of retaining coarse woody debris in watercourses and are good flagship species for this habitat. Further

research should be carried out on the species that utilize this resource and attempts to raise the awareness of this important habitat should be pursued.

1. Introduction

The cranefly *Lipsothrix nigristigma* is only known from the type specimen taken in Lancashire in 1924 and from two localities near Telford in 1994. The larvae of this genus live in galleries in wet, rotten wood lying in streams although the detailed ecological needs of *L. nigristigma* are not known.

In Great Britain the status of this species is given as *Endangered* (RDB1). English Nature require a survey in order to improve understanding of the distribution and habitats occupied so that measures can be put in place to maintain and enhance the existing populations in accordance with the published Species Action Plan (UK Biodiversity Group 1999).

Bearing this in mind the objectives of the survey were as follows:

1 Survey for *Lipsothrix nigristigma* at the known sites and at least 20 other similar sites.

2 Collect environmental variables that help to define the habitat requirements of *Lipsothrix* or habitats occupied.

3 Identify strong populations where more detailed autecological work can be undertaken in future.

4 Write a detailed species action plan that will lead to meeting the objectives in the published plan.

The Countryside Council for Wales also requested that a number of sites in Wales are surveyed in order to determine whether the species occurs in the principality.

Existing information on *Lipsothrix nigristigma*, other British, European and Holarctic *Lipsothrix* species and general studies on aquatic insects associated with submerged deadwood, which include *Lipsothrix* records was provided in the 1999 survey report (Godfrey 2000).

2. Location

A list of the sites selected is given below with grid references. These sites are figured in Figure 1.

Shropshire

Bannister's Coppice, Much Wenlock SJ615025 (upstream point)
Betton Dingle, Bromlow SJ315015 (upstream point)
Chermes Dingle - northern arm, Leighton, Telford SJ614063 (downstream end)
Chermes Dingle - downstream of Dingle, Leighton Mill SJ617061 (upstream point)
Cornbrook Dingle, Cornbrook, Cleehill SO602758 (upstream end)
Cuckoopen Coppice, Hopton Cangeford nr Ludlow SO538802 (northern end of section)
Habberley Valley, Pontesbury SJ415054 (wooden river bridge)
Holbrook Coppice, Buildwas, Telford SJ651050

Hope Valley, Hope SJ353020 (mid point)
Loamhole Dingle, Coalbrookdale, Telford SJ664054 (wooden footbridge over stream)
Lydbrook Dingle, Coalbrookdale, Telford SJ662058 (central point)
Lydbrook Dingle (upstream end) Coalmoor, Telford SJ657069
Oak Dingle, Tugford SO566870 (downstream point)
Saplins Wood, Buildwas, Telford SJ630050 (downstream point)
Tick Wood, Buildwas, Telford SJ646026 (upstream point)
Whitwell Coppice, Homer, Much Wenlock SJ615024

Montgomeryshire

Aston Dingle, Aston nr Bishop's Castle SO292918 (downstream end)
Bron-y-Buckley Wood, Welshpool SJ221079
Coed Byrrwyd, Castle Caereinion SJ166043 (downstream end)
Coed Pendugwm, Pontrobert SJ103143 (upstream end)
Cwm-y-Wydden, Pant-y-ffridd nr Berriew SJ1302
Mochdre Dingle, Newtown SJ079872

3. Methods

The selection of survey sites was agreed with English Nature (Shrewsbury office), the Countryside Council for Wales (Newtown office) and the contractor. For the 2000 survey it was decided to resurvey ten of the sites covered in the 1999 report and add ten new sites. Access permission was arranged by English Nature, CCW and the contractor.

The survey methods used were mainly direct searching for adults on logs in the watercourses and sweep netting within the channels and along the banks. Water traps were also put out down in Loamhole Dingle in the 2nd week of May and retrieved at the end of the month. An Owen emergence trap (Owen 1989) was also erected and filled with wet wood from a debris dam in Loamhole Dingle. This was in place from 13th May to 27th May 2000. Other species of cranefly were identified to help identify the species, which may be associated with *L. nigristigma*. Other insects encountered on the semi-submerged logs were retained or recorded and significant species from other groups that were swept have also been noted. Dates of visits are given in the site descriptions in Appendix 1.

Material for rearing was taken from most sites wherever suitable well-rotted wood in watercourses was encountered. The ideal material included wood immediately above the water level in streams. At least one larva and/or pupa from each sample site were preserved so that reared material could be related to the early stages. Because low numbers of immature stages were found at many sites, preservation of several specimens was not possible. The risk of high casualties in rearing also meant that as many specimens were reared as possible.

A description of the habitat and any observations of adult behavior are provided. Environmental variables likely to be of importance for the species have been noted in Appendix 1.

4. Results and discussion

Lists of the craneflies recorded are given in Tables 1A and 1B. Descriptions for the sites surveyed are provided in Appendix 1. Red Data Book and Nationally Scarce species are listed in Appendix 2. The status is taken from Falk (1992).

Characteristics of *L. nigristigma* sites

Lipsothrix nigristigma was encountered at eight out of the 22 sites surveyed. All of these are in Shropshire; the survey failed to locate the species in Montgomeryshire. The species was always associated with damp to sodden well-rotted wood in or immediately above watercourses. Water quality in the streams and rivers appeared high (based on visual inspection and on the presence of aquatic macroinvertebrates that require high water quality) in all cases, with an absence of pollution or eutrophication. The water flow was generally good, water depth shallow (usually much less than 1m.) and the width varied from 20cm to 5m. General channel features of most of the streams surveyed often included natural features such as riffles, pools, undercut banks, mud- or sandbanks or shingle bars and exposed bedrock. Coarse woody debris in the form of debris dams was a conspicuous feature of most of the sites studied and is intimately linked with the presence of *Lipsothrix nigristigma* and other *Lipsothrix* species.

Co-occurrence of *Lipsothrix* species

Whilst some data were collected regarding *Lipsothrix nigristigma*, not enough is available to characterize its detailed habitat requirements. In particular, it is not clear how the requirements of this species differ from those of the other *Lipsothrix* species. One of the main problems encountered on the survey was the co-occurrence of 2, 3 or even 4 species at some sites and how to separate the early stages of these.

What is clear from the data collected in June 1999 and in May 2000 is that *Lipsothrix nervosa* appears to be a later species (it was only recorded from one site in the present survey, yet it was frequent in June 1999. *Lipsothrix nigristigma* and *L. errans* were absent in the survey in 1999 suggesting that they are more restricted to May. The common *Lipsothrix remota* was frequent all through May and June in both surveys. The number of *Lipsothrix nigristigma*, *L. errans* and *L. nervosa* recorded on each date for the current survey is given below (rearing records excluded):

Lipsothrix nigristigma

Date	No.
15th May 2000	4
17th May 2000	18
21st May 2000	11
22nd May 2000	9

n = 42 (2000 records only)

Lipsothrix errans

Date	No.
13th May 2000	1
15th May 2000	5
17th May 2000	5
21st May 2000	4
23rd May 2000	1
27th May 2000	3

n = 19 (2000 records only)

Lipsothrix nervosa

21st May 2000	1

n = 1 (2000 records only)

Since publication of the previous report (Godfrey 2000) details have been received of the captures made in Loamhole Dingle (SJ665054) on 21st May 1994 by Mike and Liz Howe. David Heaver also took the species at the same site on the same day. Alan Stubbs determined these specimens in both cases and the records were mentioned in print by him (Stubbs 1994). Apart from the voucher(s) taken by Dr Martin Drake also in May 1994, the only other British record is that of the type specimen taken from Clayton-le-Dale by Dr Edwards on 1st June 1924 (Edwards 1938).

From the experience gained in 1999 and 2000 and the very few other records available it would appear that *Lipsothrix nigristigma* is confined to mid to late May. It also appears that *Lipsothrix nigristigma* can occur in small numbers around suitable debris dams whereas *Lipsothrix errans* is more sporadic in its occurrence.

There is little evidence to suggest a sequence of species along the watercourses, as is the case with Simuliidae, *Wiedemannia* (Empididae) or the caseless caddis *Hydropsyche* spp but the samples here may not be from a sufficiently wide area to determine this (Vaillant 1967, Edington and Hildrew 1995).

Emergence trap results

The results from the Owen emergence trap proved to be of more interest in indicating the range of other cranefly species and other Diptera families utilizing deadwood in streams rather than for providing information on *Lipsothrix*. The contents of the trap were as follows:

Taxa	Abundance & sex
Limoniidae	
Molophilus appendiculatus	1m
Molophilus medius	1m
Scleroprocta pentagonalis	6m
Austrolimnophila ochracea	3m, 2f
Epiphragma ocellaris	1f
Dicranomyia chorea	1m
Numantia fusca	1m
Lipsothrix errans	3m
Lipsothrix remota	7m, 12f
Sciaridae	1f
Psychodidae	1m
Simuliidae	2
Chironomidae	86
Syrphidae	
Sphegina elegans	1m

Contents of the Owen emergence trap (m = male, f = female)

Most of the craneflies that appeared in the emergence trap were reared elsewhere in this study. The presence of *Molophilus* spp and *Dicranomyia chorea* are probably due to the addition of small quantities of mud or decaying vegetable matter being placed in the emergence trap on the logs. A better procedure for future would be to thoroughly wash deadwood prior to placement within the emergence trap but this may prove difficult in the field. Similarly, the simuliids are likely to have been using the deadwood for attachment whilst the psychodids and a proportion of the chironomids are likely to have been introduced with sediment or leaf litter. However, a large proportion of the chironomids may be utilizing the deadwood for development. The use of this resource by members of this family is well known (see, for example, Kaufman and King 1987, Cranston 1988, Anderson 1989).

Attempts to quantify the amount of wood placed in the emergence trap proved difficult due to its irregular nature.

For *Lipsothrix* species direct search and rearing proved more useful than the emergence trap although the latter may be particularly useful in studying the wider fauna associated with deadwood in streams.

The relationship between *Lipsothrix* spp. and deadwood in streams

There was a close correlation with *Lipsothrix* spp. pupal exuviae and logs that were anchored into the bank or firmly wedged in log jams. Clearly pieces of wood that are not anchored are susceptible to being carried downstream in winter spates. Other workers have mentioned that logs used by *Lipsothrix* spp. are very firmly lodged in the bank (for example Rogers and Byers 1956). The size of wood favored by *Lipsothrix* spp. (mainly based on rearing records) varied from 58cm to 88cm in diameter (see below).

Lipsothrix nigristigma locality	Diameter of wood
Bannister's Coppice	[c80cm]
Chermes Dingle downstream	80-88cm
Habberley Valley	58cm and 85cm
Lydbrook Dingle	Not recorded
Oak Dingle	Not recorded
Saplins Wood	72cm
Tick Wood	Not recorded
Whitwell Coppice	82cm
	N = 6

Diameter of wood favoured by *Lipsothrix nigristigma*

This albeit very limited sample suggests that wood with diameters in the range 70-80cm might be preferred. It would be instructive to compare these figures with those for *Lipsothrix remota* and other *Lipsothrix* species collected during this survey.

In the larger trunks overhanging streams *Lipsothrix* pupal exuviae were invariably on the underside. All the sites were wooded with natural vegetated earth banks and were free of interference by man.

Little information was obtained on the tree species preferred by *Lipsothrix* because of the decorticated and well-rotted nature of the wood. The only species mentioned in British literature is oak (*Quercus* sp.) in which Hinton (1955) found *Lipsothrix errans* and *L. remota*. Amongst the tree species utilized by American *Lipsothrix* species are red alder (*Alnus rubra*), rhododendron (*Rhododendron* sp.), hickory (*Carya* sp.), ash (*Fraxinus* sp.), big-leaf maple (*Acer macrophyllum*), western red cedar (*Thuja plicata*) and Douglas fir (*Pseudotsuga menziesii*) (Rogers and Byers 1956, Dudley and Anderson 1987).

Partitioning along a moisture gradient was observed in an Oregan stream in which *Austrolimnophila badia* occurred primarily above the water line, whereas *Lipsothrix* spp. occurred at and slightly below the water line (Anderson et al. 1984). In the present study *Lipsothrix* spp. were invariably found almost at the water line and up to 50cm above although in the latter case (mainly Bannister's Coppice and Whitwell Coppice) these appeared to have been normally partly submerged logs that were stranded by receding spring water levels. Further away from the watercourse along logs and branches, the immature stages of *Epiphragma ocellata* and *Tipula* sp. were present and sometimes accompanied by other species such as *Austrolimnophila ochracea*, *Atypophthalmus inusta* and *Numantia fusca*. Rogers and Byers (1956) mention *Epiphragma fascipennis* and *Elephantomyia westwoodi* in the parts of logs further away from the watercourse.

The immature stages of *Lipsothrix nigristigma*

The early stages of British *Lipsothrix* species have been described as follows:

errans: Beling (1886), Brindle (1967), Krivosheina and Mamaev (1967).

nervosa: see Hinton (1955: not described but one microscopic character to separate from *L. remota* is given).

remota: Hinton (1955), (1967: gills only).

The early stages of *Lipsothrix ecucullata*, which in Britain only occur in Scotland, is under investigation by the Malloch Society (Rotheray 2000).

Although *Lipsothrix nigristigma* was reared in this study only two adults emerged and insufficient larval material was available to kill and retain larval vouchers. However, pupae and pupal exuviae were obtained and figured in Figure 2. A feature that appears to be useful in identification of the pupal exuviae is the large pupal horn, which extends for some distance above the head. A preliminary key to the pupal exuviae of the *Lipsothrix* species seen by the author is provided in Appendix 3.

Additional characters are needed to improve this key and ideally a full description of the pupal exuviae should be made. Further rearing is required to provide more material in order to check this key and so that keys to the pupae (if different from the pupal exuviae) and larvae can be produced. Identification of the pupal exuviae has the advantage that material does not have to be killed in order to identify them, they are easy to find (after a little practice) and that they may remain *in situ* for several weeks prior to disintegrating.

It is tempting to suggest that the size and shape of the pupal horns may be significant in terms of the physico-chemical factors that determine partitioning within these species.

The identification of *Lipsothrix nervosa* and *L. nigristigma*

Figures of the male genitalia of *Lipsothrix nigristigma* and *L. nervosa* are not given by Edwards (1938) or Coe (1950) although the former provided descriptions. Figures are given in these works for the remaining British species however. One of the problems with collecting specimens from deadwood and in rearing specimens is that teneral specimens are frequently encountered with poorly developed wing stigmas and without dark apical markings on the femora, and in these cases examination of the male genitalia is necessary for a positive identification. The male aedeagus in particular is very useful for separating the species and was extensively used to check specimens for this study. In order to assist future work, figures are given here of the two remaining species. The aedeagus of *Lipsothrix nigristigma* have a sharp double bends and should be compared with the shallower angles present in *L. remota* whilst the aedeagus of *L. nervosa* is much shallower still and need only be compared with *L. ecucullata*. The male genitalia of *Lipsothrix nigristigma* were also figured by Savchenko (1982) and were reproduced in Godfrey (2000).

Edwards (1938) followed by Coe (1950) only knew the male of *Lipsothrix nigristigma* and were unable to provide identification characters for the female. Notes have been made by the author on the females taken in May 2000 and the ovipositor has been figured here (Figure 2) but detailed comparisons with the other species have yet to be made. Until then the usefulness of the ovipositor in assisting identification remains unclear.

Synonymy of *Lipsothrix nigristigma* and *L. nobilis*

Soos *et al* (1992) mentioned the possible synonymy of these two species. The previous survey report also depicted published figures of the male genitalia of both *Lipsothrix nigristigma* and *L. nobilis*, which revealed their close similarity (Godfrey 2000). Dr Jaroslav Stary was contacted by the author requesting specimens of *Lipsothrix nobilis* for comparison with British *L. nigristigma* collected on this study in order to confirm the synonymy. Specimens were later received from him from the Czech Republic and from Bulgaria. The

male genitalia have been examined by the author and are depicted in Figure 3. The male genitalia of the specimens of *L. nobilis* specimens supplied from Bulgaria and Moravia are very similar to the diagrams of *L. nigristigma* given in Godfrey (2000). Specimens of *Lipsothrix nigristigma* and *L. nervosa* (until very recently regarded as a British endemic) were also sent to Dr Stary for him to examine at his leisure. Dr Stary considers *Lipsothrix nigristigma* and *L. nobilis* are synonymous. Specimens of the latter seen by Dr Stary show a certain variation in colouration of the prescutum, pleura or abdomen which may be clinal variation but no substantial structural differences could be found by him between specimens examined from various countries. Stary (1971) provides some taxonomic information on *L. nobilis*.

Confirmation of the synonymy means that the very limited ecological information available on *Lipsothrix nobilis* relates equally to *L. nigristigma*. As a consequence a more detailed examination of the Continental literature may be worthwhile. Dr Stary comments that *L. nobilis* is far from common in his experience.

Chalcosyrphus eunotus (Syrphidae)

The Action Plan (UK Biodiversity Group 1999) for *Lipsothrix nigristigma* mentions that the Plan may be used to benefit other species using woodland streams. The previous report on *Lipsothrix nigristigma* mentions the hoverfly *Chalcosyrphus eunotus* as being one of the most obvious candidates that may benefit this way (Godfrey 2000). The recording of this species from five sites in May 2000 is a significant event given the rarity of this species. The absence of *Chalcosyrphus eunotus* in the June 1999 survey and its occurrence at five sites in May 2000 helps to confirm earlier suggestions that its flight period is restricted to May. There are few British records for this species (Stubbs 1983). Most of the specimens have been taken in wooded streams in the Welsh Borders and it is thought that the larvae may also develop in partly submerged wood. A specimen was reared in Switzerland by inducing oviposition in an artificial dendrolimnetic habitat (wet sawdust and rotting wood) (Maibach and Goeldlin de Tiefenau 1992). Such techniques could also be used to study *Lipsothrix* species.

Other rare craneflies recorded

The sites surveyed produced an impressive number of other rare cranefly species and indicate the value of these sites for other invertebrate species. The tiny limoniid *Tasiocera fuscescens* is currently accorded pRDB1 status by English Nature (Falk 1992). This is an error according to Alan Stubbs (pers. comm.). The author took this species in three other sites in Montgomeryshire in 2000 in addition to those mentioned in this report. A number of other species are additional to those taken last year including *Erioptera nigripalpis* (RDB3), *Eloephila trimaculata* (RDB3) and *Molophilus lackschewtzianus* (RDB3), which are often associated with woodland streams. *Dactylolabis transversa* (Nationally scarce) is found in a variety of habitats including sheltered valley woods whilst *Limonia masoni* (RDB3) occurs in calcareous woodland edges and scrub. The rare craneflies and other uncommon species recorded and mentioned in this report are listed in Appendix 2.

Coarse Woody Debris (CWD)

Gregory and Davis (1992) mention some of important ecological features of coarse woody debris in streams (some of these were summarized in Godfrey 2000 section 2.6). It is important that woody material in streams is broadly considered in environmental terms and not just as the resource for one group of BAP craneflies. Woody material in streams is used by a large number of other invertebrates either directly (as food like *Lipsothrix*) or indirectly (for perching, shelter, spawning and so on). Dudley and Anderson (1982) undertook a survey to examine the community of invertebrates associated with wood debris in freshwater systems with emphasis on the western states of America. Over fifty species closely associated with wood were recorded with another 129 taxa regarded as facultative users. CWD is also a valuable resource for bacteria, algae, fish and other biota and its retention or removal has important implications for the functioning of watercourses. A recent conference Wood in World Rivers has helped to raise awareness of this important resource (Petts 2000). Linstead and Gurnell (1999a, 1999b) have recently evaluated the role of woody debris in British headwater streams from a geomorphological context whilst Maser and Sedell (1994) provide a readable account of the value of wood in river systems based on North American experience.

Species Action Plan

A detailed species action plan has not been included here until further details are available on the ecology and status of *Lipsothrix nigristigma.*

5. Recommendations for future work

A number of recommendations are provided below. Good populations appear to be present at a number of sites where more detailed autecological work should be concentrated.

Habitat parameters

More detailed information is required on the parameters, which govern where *Lipsothrix nigristigma* is found. More close observation concerning the co-occurrence and partitioning of *Lipsothrix* species is required. Difficulties were experienced in 2000 with referring specimens to where they were collected and use of marker posts to indicate each of the significant log jams in Loamhole Dingle and Lydbrook Dingle as well as detailed annotated maps and use of global positioning devices should be considered. The state of decay of individual logs from which immatures or adults are taken may be recorded as one of a number of classes. The approximate dimensions of the debris dams should also be noted and use of standardized recording forms may ensure consistency of results between sites.

Description of immature stages

The discovery of good populations of *Lipsothrix nigristigma* should enable larval and pupal stages to be sought in a more detailed and organized manner and these should be described. The results of work carried out by the Malloch Society on the Scottish species *Lipsothrix ecucullata* will be very relevant and should be chased up.

Survey of the type locality

A survey of suitable sites around Clayton-le-Dale in Lancashire may be considered since this would help to confirm whether the species still occurs here.

Previous recommendations

The recommendations in the previous report (Godfrey 2000) should continue to be pursued.

6. Conclusions

Lipsothrix nigristigma (RDB1) was located at eight (possibly nine) sites out of 22 surveyed. The majority of sites are centred on southwest Telford with only two outlying sites (Habberley Valley and Oak Dingle), which suggests concentration of further effort should be on the outskirts of Telford. The sites where it was found are generally first or second order streams in woodland with good water quality, good flow and plenty of coarse woody debris in the channel. Channel features that are often present include mud, sand or shingle bars, undercut banks, riffles pools and frequent debris dams. Wood utilized by *Lipsothrix* species was almost invariably strongly anchored into the bank or streambed. Larvae, pupae, pupal exuviae and ovipositing females were found almost at the waters edge to up to 50cm away providing that wood was saturated.

Lipsothrix nigristigma was reared but because the survey concentrated on locating adults and because of the co-existence of 2, 3 or even 4 *Lipsothrix* species at some sites, more work is needed to differentiate and describe the immature stages. The pupal exuviae however, have been depicted in this report and a provisional key provided that may enable identification of *Lipsothrix nigristigma* from its relatives.

Dr Jaroslav Stary has indicated that *Lipsothrix nigristigma* is, in his view, synonymous with *L.nobilis*. Examination of specimens by the author of *Lipsothrix nobilis* supplied by Dr Stary would appear to confirm this view.

Two other BAP *Lipsothrix* species were recorded (*Lipsothrix errans* and *L. nervosa*) in the survey. More significantly, the rare hoverfly *Chalcosyrphus eunotus* (RDB2) that is also thought to utilize saturated wood in streams particularly in the Welsh Borders was also recorded from five sites. A number of other rare cranefly species and other Diptera were recorded.

7. Acknowledgement

This survey was financially supported by English Nature as a contribution to the species recovery programme.

8. References

ANDERSON, N.H., 1989. Xylophagous Chironomidae from Oregon streams. *Aquatic Insects*, **11**(1), pp. 33-45

ANDERSON, N.H., STEEDMAN, R.J. & DUDLEY, T., 1984. Patterns of exploitation by stream invertebrates of wood debris (xylophagy). *Verh. Internat. Verein. Limnol.*, **22**, pp. 1847-1852

BELING, T., 1886. Dritter Beitrag zur Naturgeschichte (Metamorphose) verschiedener Arten aus der Familie der Tipuliden. *Verh. Zool.-bot. Ges. Wien*, **36**, pp. 171-214

BRINDLE, A., 1967. The larvae and pupae of the British Cylindrotominae and Limoniidae (Diptera, Tipulidae). *Trans. Soc. Brit. Ent.*, **17**(7). pp. 151-216.

CHANDLER, P.J. (ed.), 1998. *Part 1: Diptera. Checklists of insects of the British Isles (New series)*. Royal Entomological Society.

COE, R.L., 1950. *Diptera Family Tipulidae*. Handbooks for the identification of British insects, **9**(2). Royal Entomological Society of London.

CRANSTON, P.S. & OLIVER, D.R., 1988. Aquatic xylophagous Orthocladiinae – systematics and ecology. *Spixiana* Suppl., **14**, pp. 143-154

DUDLEY, T.L. & ANDERSON, N.H., 1987. The biology and life cycles of *Lipsothrix* spp. (Diptera: Tipulidae) inhabiting wood in Western Oregon streams. *Freshwater Biol.*, (1987) **17**, pp. 437-451

EDINGTON, J.M. & HILDREW, A.G., 1995. *Caseless caddis larvae of the British Isles: A key with ecological notes*. Freshwater Biological Association.

EDWARDS, F.W., 1938. British short-palped craneflies. Taxonomy of adults. *Trans Soc. Brit. Ent.*, **5**(1), pp. 1-168.

FALK, S.J., 1992. A review of the scarce and threatened flies of Great Britain (Part 1). *Research & Survey in Nature Conservation*, No. **39**. Nature Conservancy Council.

GODFREY, A., 2000. Survey for the cranefly *Lipsothrix nigristigma*. Peterborough: *English Nature Research Reports*, No. **351**.

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

HINTON, H.E., 1967. Structure of the plastron in *Lipsothrix*, and the polyphyletic origin of plastron respiration in Tipulidae. *Proceedings of the Entomological Society of London* A, **42**(1-3), pp. 35-38.

KAUFMAN, M.G. & KING, R.H., 1987. Colonization of wood substrates by the aquatic xylophage *Xylotopus par* (Diptera: Chironomidae) and a description of its life history. *Can. J. Zool.*, **65**, pp. 2280-2286

KRIVOSHEINA, N.P. & MAMAEV, B.M., 1967. [Key to the larvae of wood inhabiting dipteran insects] Izdatee'stro "Nauka"(Moscow).

LINSTEAD, C. & GURNELL, A.M. 1999. *Large woody debris in British headwater rivers. Physical habitat role and management guidelines.* R & D. Technical Report W181. Water Research Centre.

LINSTEAD, C. & GURNELL, A.M., 1999. *Large woody debris in British headwater rivers. Summary report.* R & D. Technical Report W185. Water Research Centre.

MAIBACH, A. & GOELDLIN DE TIEFENAU, P., 1992. Description de la pupe de *Chalcosyrphus (Xylotodes) eunotus* (Loew) et synthese des carateristiques des stades immatures de plusiers genres de la tribu des Xylotini (Diptera, Syrphidae). *Mitt. Schweiz. Ent. Gesell.* **65,** pp. 165-175

MASER, C. & SEDELL, J., 1994. *From the forest to the sea.* Florida: St Lucie Press.

OWEN, J.A., 1989. An emergence trap for insects breeding in dead wood. *Br. J. Ent. Nat. Hist.*, **2**, pp. 65-67

PETTS, G.E., 2000. Wood in world rivers. *FBA News*, No.12 Winter 2000, pp. 1-2

ROGERS, J.S. & BYERS, G.W., 1956. The ecological distribution, life history and immature stages of *Lipsothrix sylvia* (Diptera: Tipulidae). *Occ. Pub. Pap. Mus. Zool., Univ. Michigan*, **572**, pp. 1-14.

ROTHERAY, G.E., 2000. *Search for the larvae of the Priority Cranefly Lipsothrix ecucullata (Diptera, Tipulidae).* Commissioned Report F99AC09. Scottish Natural Heritage (unpublished report)

SAVCHENKO, E.N., 1982. Limoniid-flies (subfamily Eriopterinae). *Fauna Ukrainy*, **14**(3), pp. 1-355

SOOS, A., PAPP, L. & OOSTERBROEK, P. (eds.), 1992. *Catalogue of Palaearctic Diptera. Vol. 1 Trichoceridae-Nymphomyiidae.* Hungarian Natural History Museum.

STARY, J., 1971. Einige fur Mahren neue oder wenig bekannte Limoniinen (Tipulidae, Diptera). *Cas. Slez. Muzea Acta Musei Silesiae* Ser. A, XX-1971, pp. 69-84

STUBBS, A.E. & FALK, S.J. 1983. *British hoverflies: An illustrated identification guide.* British Entomological & Natural History Society.

STUBBS, A.E., 1994. Wildlife Reports: Flies. *British Wildlife*, **5**(6), pp. 393-394

UK BIODIVERSITY GROUP, 1999. *Tranche 2 Action Plans. Volume 4 - Invertebrates.* English Nature.

VAILLANT, F., 1967. La repartition des *Wiedemannia* dans les cours d'eau et leur utilization comme indicateurs de zones ecologiques [Diptera, Empididae]. *Annls Limnol.*, 3(2), pp. 267-293

Table 1A. Cranefly species recorded from the sites surveyed

Abbreviations:

A = Aston Dingle, Montgomeryshire
BC = Bannister's Coppice
BD = Betton Dingle
BB = Bron-y-Buckley Wood, Montgomeryshire
CDn = Chermes Dingle - northern arm
CDd = Chermes Dingle - downstream of Dingle Mill
CB = Coed Byrrwyd, Montgomeryshire
CP = Coed Pendugwm, Montgomeryshire
CD = Cornbrook Dingle
CC= Cuckoopen Coppice
CW = Cwm-y-Wydden, Montgomeryshire
HA = Habberley Valley
HC = Holbrook Coppice
HP = Hope Valley
LO = Loamhole Dingle
LY = Lydbrook Dingle
LYu = Lydbrook Dingle (upstream end)
M = Mochdre Dingle, Montgomeryshire
O = Oak Dingle
Sp = Saplins Wood
TW = Tick Wood
W = Whitwell Coppice

The above sites are in Shropshire unless otherwise indicated.

Nomenclature follows Chandler 1998.

The doubtful *Lipsothrix nigristigma* record for Loamhole Dingle in the table below is based on identification of pupal exuviae only.

	A	BB	BC	BD	CDn	CDd	CB	CP	CO	CC	CW
TIPULIDAE											
Dolichopeza albipes					x	x	x	x		x	
Nephrotoma quadrifaria						x					
Tipula couckei			x								
Tipula flavolineata	x										
Tipula paludosa											x
Tipula scripta											x
Tipula submarmorata								x			
Tipula variicornis	x							x			x
Tipula varipennis								x			
CYLINDRO-TOMIDAE											
Cylindrotoma distinctissima				x							
PEDICIIDAE											
Dicranota claripennis									x		
Dicranota pavida		x		x	x	x	x	x	x		
Dicranota subtilis		x						x			
Tricyphona immaculata		x	x	x				x			x
Ula crassicauda						x		x			x
Ula sylvatica		x		x							x
LIMONIIDAE											
Cheilotrichia cinerescens			x						x		
Erioptera lutea		x		x	x		x	x	x	x	
Erioptera nigripalpis										x	
Erioptera trivialis											x
Gonomyia simplex											x
Ilisia maculata		x		x		x	x				
Ilisia occoecata			x			x				x	
Molophilus appendiculatus		x									
Molophilus cinereifrons		x	x		x	x				x	
Molophilus curvatus	x			x	x	x	x	x		x	
Molophilus griseus						x	x		x		x
Molophilus ochraceus						x					
Molophilus serpentiger		x			x	x				x	
Molophilus variispinus					x			x		x	x
Ormosia hederae				x							
Ormosia nodulosa	x			x		x	x			x	x
Rhabdomastix edwardsi			x								
Symplecta stictica					x						
Tasiocera fuscescens		x					x	x			x
Tasiocera murina	x	x		x		x			x	x	x
Dactylolabis transversa				x		x	x	x			
Austrolimnophila ochracea	x	x	x			x		x		x	x
Limnophila schranki					x						
Eloeophila submarmorata									x		
Eloeophila trimaculata						x					
Epiphragma ocellata	x		x	x	x	x				x	
Euphylidorea lineola							x				
Neolimnomyia adjuncta	x	x	x	x		x				x	
Paradelphomyia senilis				x							
Pilaria discicollis								x			
Achyrolimonia decemmaculata							x			x	x
Atypophthalmus inustus							x				
Dicranomyia chorea	x			x		x			x	x	
Dicranomyia didyma									x		
Dicranomyia mitis s.l.					x		x	x	x	x	x

	A	BB	BC	BD	CDn	CDd	CB	CP	CO	CC	CW
Dicranomyia fusca	x	x	x	x	x	x	x	x	x	x	x
Dicranomyia modesta			x		x						
Limonia flavipes	x			x						x	
Limonia macrostigma			x	x	x	x				x	
Limonia nubeculosa	x	x	x	x	x	x	x	x	x	x	x
Limonia phragmitidis					x	x				x	x
Lipsothrix errans					x						x
Lipsothrix nervosa										x	
Lipsothrix nigristigma			x			x					
Lipsothrix remota	x	x			x	x	x	x		x	x
Rhipidia maculata								x		x	
PTYCHOPTERIDAE											
Ptychoptera albimana				x							
Ptychoptera paludosa			x								
OTHERS											
Chalcosyrphus eunotus				x							
Platyura marginata									x		
Xylophagus ater (reared)		x									
Xylota florum (reared)			x								

Table 1B. Cranefly species recorded from the sites surveyed

	HA	HC	HO	LO	LY	LYu	M	O	Sp	TW	W
TIPULIDAE											
Dolichopeza albipes		x	x	x					x		
Nephrotoma appendiculata						x					
Tipula couckei							x				x
Tipula flavolineata					x						
Tipula luna									x		
Tipula maxima		x									
Tipula meigeni				x							
Tipula paludosa					x			x			
Tipula variicornis			x					x			
PEDICIIDAE											
Dicranota pavida			x	x		x		x		x	
Dicranota subtilis			x								
Pedicia littoralis						x		x			
Ula crassicauda				x					x		
Tricyphona immaculata		x	x	x	x		x			x	x
LIMONIIDAE											
Cheilotrichia cinerescens					x	x				x	
Erioptera lutea		x	x	x	x	x	x	x	x	x	x
Erioptera griseipennis		x							x	x	
Erioptera nigripalpis						x				x	
Gonempeda flava				x							
Gonomyia simplex										x	
Ilisia maculata		x		x					x	x	x
Ilisia occoecata		x		x					x	x	
Molophilus appendiculatus				x							
Molophilus cinereifrons		x			x	x			x	x	x
Molophilus curvatus	x	x	x	x	x			x	x		
Molophilus griseus										x	x
Molophilus lackschewitzianus										x	
Molophilus medius		x		x		x					
Molophilus obscurus										x	
Molophilus ochraceus		x									
Molophilus serpentiger		x		x	x	x					
Molophilus undulates				x							
Ormosia nodulosa	x		x		x	x	x	x		x	x
Scleroprocta pentagonalis				x							
Rhabdomastix edwardsi											x
Symplecta stictica											x
Tasiocera fuscescens										x	
Tasiocera murina		x	x	x	x	x	x	x		x	
Dactylolabis transversa					x						
Austrolimnophila ochracea	x	x		x	x	x			x	x	
Eloephila maculata					x						
Eloeophila submarmorata			x		x	x					
Epiphragma ocellaris	x	x	x	x			x	x	x	x	x
Euphylidorea dispar		x									
Euphylidorea lineola				x							
Limnophila schranki											x
Neolimnomyia adjuncta		x	x	x	x					x	x
Neolimnomyia nemoralis s.l.					x		x				
Paradelphomyia senilis	x	x		x	x	x				x	
Pseudolimnophila sepium		x									

	HA	HC	HO	LO	LY	LYu	M	O	Sp	TW	W
Achyrolimonia decemmaculata		x		x							
Atypophthalmus inustus				x		x					x
Dicranomyia chorea	x		x	x	x	x	x	x			x
Dicranomyia modesta									x		x
Dicranomyia fusca	x	x	x	x	x	x		x	x	x	
Limonia flavipes		x		x							
Limonia macrostigma		x		x	x	x		x	x	x	
Limonia masoni	x	x									
Limonia nubeculosa	x	x	x	x	x	x		x	x	x	x
Limonia phragmitidis	x	x		x	x	x			x	x	x
Neolimonia dumetorum										x	
Lipsothrix errans		x		x	x		x		x	x	
Lipsothrix nigristigma	x			?	x			x	x	x	x
Lipsothrix remota	x	x		x	x	x	x	x		x	
Rhipidia maculata		x									
PTYCHOPTERIDAE											
Ptychoptera albimana		x	X	x					x		
Ptychoptera lacustris										x	
OTHERS											
Chalcosyrphus eunotus	x			x	x			x			
Platyura marginata					x						
Sphegina elegans (reared)				x	x						
Lyciella pallidiventris gp (reared)					x						
Spania nigra (reared)					x						
Sylvicola cinctus (reared)									x		

Appendix 1. Site descriptions

References to right hand side and left hand side of channels and banks assume that the surveyor is standing in the river and facing downstream. *Lipsothrix* pupal exuviae collected in the field were later identified in the majority of cases and these identifications have been added to the descriptions.

Shropshire

Bannister's Coppice (16th May 2000)

A description of the site surveyed was provided in the previous report (Godfrey 2000). (Note: the width of the river here is 4-5m wide not 4-5cm wide as stated in the previous report). Access into the site was via the track to the house at Sheinwood. A large log was examined downstream (similar to the log described at Whitwell Coppice below the weir). Large numbers of *Lipsothrix nigristigma* pupal exuviae present but very few larvae or pupae (sample taken). Several teneral and ovipositing *Lipsothrix* present including *Lipsothrix nigristigma*. A pupal exuvia was found on the underside of the log with a dead *Lipsothrix nigristigma* dangling from it (the fly presumably died having failed to emerge successfully).

The hoverfly *Xylota florum* (Syrphidae) later emerged from a puparium collected from the log here. The limoniid *Epiphragma ocellata* also emerged from the samples taken for rearing.

[Amongst the species swept from this site was *Tipula couckei*. The identification of this species was double-checked because it is a species that dislikes shade. However, both this site and Whitwell Coppice where it was also recorded are relatively open with adjoining pasture along certain sections. The third site were this species was taken was Mochdre Dingle which is incised and heavily shaded. A different explanation for the occurrence of this species there is therefore required].

Betton Dingle (22nd May 2000)

A description of the site surveyed was provided in the previous report (Godfrey 2000). Access was down the steep bank at the southern end of the dingle at Lyde. A rotten log a short way downstream had *Lipsothrix* pupal exuviae. *Chalcosyrphus eunotus* was closely observed and seen several times (probably the same individual) usually perched on a log amongst coarse woody debris in the stream. The dingle was heavily shaded here. Teneral *Epiphragma ocellata* present on logs. A reasonable amount of deadwood was present in the stream but only *Lipsothrix remota* was encountered.

Chermes Dingle - Northern Arm (16th May 2000)

A description of the site surveyed was provided in the previous report (Godfrey 2000). Access was via the track from the Leighton-Neves Castle minor road. No suitable looking logs with *Lipsothrix* pupal exuviae.

Chermes dingle - downstream of Dingle Mill (16th May 2000)

A description of the site surveyed was provided in the previous report (Godfrey 2000). Access was through the field on the opposite side of the road from the mill. A few *Lipsothrix nigristigma* pupal exuviae found in one log. A debris dam by alder (*Alnus glutinosa*) roots had two *Lipsothrix nigristigma* females ovipositing in a log (circumference 80-88cm). *Lipsothrix remota* was in flight. *Lipsothrix remota* pupal exuviae, *Tipula* pupal exuviae and *Rhizophagus* sp. (Coleoptera) were found here.

Cornbrook Dingle (21st May 2000)

Commenced the survey at Cornbrook Bridge and followed the stream downstream to the track just above the sewage treatment works. The narrow incised stream was 20cm wide, 8-12cm deep and had a good flow. The stream cuts through the edge of moorland (sheep-grazed hill pasture) with abundant bracken (*Pteridium aquilinum*) and is much more open than the other sites surveyed. Scrubby hawthorn (*Crataegus monogyna*) was present along the banks of the stream along with sections with mature ash (*Fraxinus excelsior*), sycamore (*Acer pseudoplatanus*), elm (*Ulmus* sp.) and holly (*Ilex aquifolium*). Some gorse (*Ulex europaeus*) was present on the hillside. No deadwood in the channel. The watercourse has very ochrous spring at the downstream end of the section surveyed (above the track which is above the sewage treatment works) which badly pollutes the watercourse below.

Cuckoopen Coppice (21st May 2000)

This site comprises mixed deciduous woodland on base-rich soil. The stream flowing from the road and which crosses the diagonal track that cuts through the wood was surveyed. The small stream was 20-30cm wide, 2.5-7.5cm deep with slow flow and a muddy substrate. Plenty of deadwood was present including rotten logs. Vegetation included sycamore (*Acer pseudoplatanus*), elm (*Ulmus* sp.), beech (*Fagus sylvatica*), holly (*Ilex aquifolium*), honeysuckle (*Lonicera periclymenum*), dog's mercury (*Mercurialis perennis*), lesser celandine (*Ranunculus ficaria*), opposite-leaved saxifrage (*Chrysoplenium oppositifolium*), enchanter's nightshade (*Circaea lutetiana*), bramble (*Rubus fruticosus* agg.), yellow archangel (*Galeobdolon luteum*) and wood avens (*Geum urbanum*). Some rubbish had been dumped in the stream.

Habberley Valley (22nd May 2000)

A description of the site surveyed was provided in the previous report (Godfrey 2000). Access was from the footpath skirting the east side of Pontesford Hill then branching out across fields to the wooden barn and following the footpath down to the river and the wooden footbridge there. The vegetation was wet from rain that has fallen all morning. *Lipsothrix nigristigma* was found ovipositing on a rotten decorticated log (circumference = 85cm). This log was just downstream of the wooden footbridge. Another log immediately upstream had ovipositing *Lipsothrix nigristigma* (circumference of log = 58cm). *Lipsothrix* pupal exuviae were frequent here (and downstream of the wooden footbridge). These were later identified as *L. nigristigma* and *L. remota*. A debris dam on the lefthandside above the footbridge was examined: this proved to be very good for ovipositing *Lipsothrix nigristigma*. Teneral *Lipsothrix* taken here along with limoniid pupal exuviae and *Tipula* pupal exuviae. A female *Numantia fusca* was taken on one log and *Lipsothrix remota* was also present. *Chalcosyrphus eunotus* was observed on coarse woody debris here.

Holbrook Coppice (15th May 2000)

A description of the site surveyed was provided in the previous report (Godfrey 2000). This site was accessed through a gate off the side of the A4169 and through the field heading northwards to the streams. This site is without steep slopes unlike Loamhole Dingle and Lydbrook Dingle, which were visited earlier in the day. No deadwood was present in the seepages although there was a reasonable amount of thin decaying coppice wood within the small streams. No pupal exuviae were found on a large log examined. The area of the wood sampled comprised mainly coppice with a few large standards of which a number were old and decaying.

Hope Valley (22nd May 2000)

A description of the site surveyed was provided in the previous report (Godfrey 2000). Access was down the steep slopes off the A488 below Hope Mill. The section down to the road culvert was uneventful. A seepage with small rotten wood just through the road culvert was briefly examined and a female *Tricyphona immaculata* was taken here. Very little rotten wood was present at this site. A few *Lipsothrix remota* pupal exuviae were found downstream.

Loamhole Dingle (13th May 2000)

A description of Loamhole Dingle was provided in the previous report (Godfrey 2000). For survey purposes the site was divided into the section below the footbridge and the section above. The footpath, which cuts across the dingle from Jigger's Bank, passes over this footbridge. Seven water traps were put down (four below the footbridge and three above). The Owen emergence trap was erected upstream of the footbridge on a small shingle bar on which was located a debris dam. Material from the debris dam was placed in the emergence trap. A number of logs were also examined including:

1. A fallen log on a muddy slip near the Owen trap. Larvae were found under the bark. *Numantia fusca* was later reared from this but no *Lipsothrix* emerged although *Lipsothrix remota* pupal exuviae were present.

2. A branch across the stream near the Owen trap. Nothing emerged from this sample subsequently.

3. Saxifrage and liverwort were scraped from a small cliff above the stream near the Owen trap. *Molophilus* sp. females emerged from this later along with other Nematocera.

   Vegetation here included wood-sorrel (*Oxalis acetosella*), yellow archangel (*Galeobdolon luteum*) and crab apple (*Malus sylvestris*).

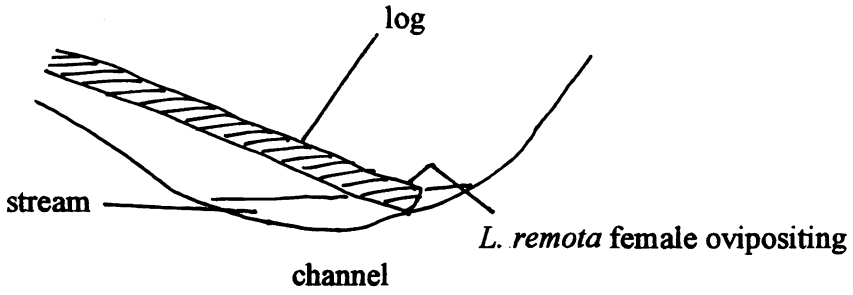
   Downstream of the wooden bridge a *Lipsothrix remota* female was observed ovipositing in a branch 5-8cm above the stream. The female was ovipositing in the wet decorticated tip of the branch: the rest of the branch retained its thin smooth papery bark (similar to birch but no living birch visible) and the opposite end disappeared into a log pile (and the stream?). The circumference of the branch was 16cm. The log pile here was at the base of a multi-stemmed wych elm (*Ulmus glabra*). Riffles were present in the stream and there were shingle bars upstream and

downstream of this point. The channel was 1-1.5m. wide, 5-8cm deep and the substrate comprised cobbles, pebbles and gravel. Bank vegetation included water avens (*Geum rivale*) and wild arum (*Arum maculatum*). The sides of the stream were muddy. Woody material was examined further downstream as follows:

4. Rotten wood with moss in first debris dam encountered below the footbridge. *Tipula signata* later emerged from this.

5. Under moss downstream of the footbridge. Nothing emerged from this sample.

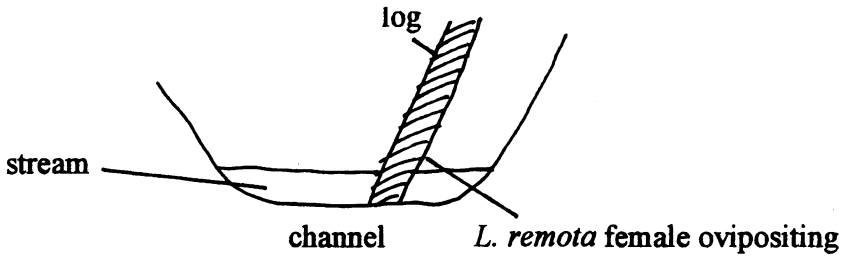
6. A *Lipsothrix remota* female was seen ovipositing in the wet part of a log immediately above the stream surface (see figure).



The bark was intermittent on the log. Yews (*Taxus baccata*) are present on the bank above with beech (*Fagus sylvatica*) on the opposite bank. Riffles and shingle were present here and a large pool present below. A sample of wood taken from near where the *Lipsothrix* was ovipositing later produced *Tricyphona immaculata* and other Nematocera. The channel width here was 90cm and small muddy landslips were present on the banks.

Lipsothrix pupal exuviae were on a small debris dam between where samples 6 and 7 were taken. The log next to it had *Lipsothrix* pupal exuviae and pupal exuviae of another limoniid (taken).

7. A *Lipsothrix remota* female was seen in a similar situation to the one above (see figure).



This individual was ovipositing in wet wood 8-10cm above the water's surface. The bark was patchy on the log, which was wet towards the end that was nearest the stream (where the

Lipsothrix was observed). This log was part of a dead tree that had fallen down the bank. Larvae were found in the wood here and 20-30 *Lipsothrix* pupal exuviae were present in the log. These were later determined as *L. nigristigma* (this record should be treated as provisional although adults of *L. nigristigma* were found in Loamhole Dingle in 1994). *Austrolimnophila ochracea, Sphegina elegans* (Syrphidae) and a chironomid were reared from here subsequently. A water trap was placed here. The channel width here was approximately 110cm.

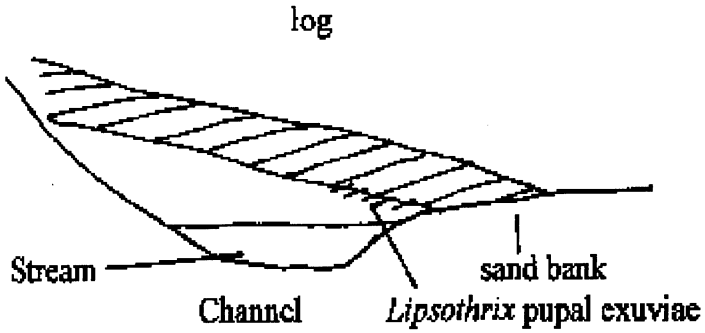
Loamhole Dingle (15th May 2000)

Woody material was further examined in the stream starting downstream of the wooden footbridge as follows:

8. Log (circumference = 27cm) with three *Lipsothrix* pupal exuviae. Collected woody material from wet sodden log next to this. The sodden log had a teneral *Chalcosyrphus eunotus* sitting on it and plenty of limoniid larvae within the log. *Lipsothrix* pupal exuviae (3-5) on wet horizontal log next to this. No limoniid larvae were found in the wet sodden wood in the log. The muscid fly *Lipsocephala spuria* was later reared from here.

   A few *Lipsothrix* pupal exuviae were found at the first debris dam but no larvae or adults. There is a fallen elm (*Ulmus* sp.) here.

9. The next log that was lying diagonally within the channel was examined. This log was part of a tree that had fallen down the steep slopes as with the previous debris dam. *Lipsothrix* pupal exuviae were frequent towards the end of the log and a few *Tipula* pupal exuviae were also taken (see figure).



   Wood-sorrel (*Oxalis acetosella*) grew on the log. Limoniid larvae were taken here but no adults appeared.

   Logs on shingle and in the stream where the 2nd water trap was placed were examined. Yew (*Taxus baccata*) was present on the righthandside here downstream. An old stump and large logs were present where a yew (*T. baccata*) had partly collapsed down the bank. *Lipsothrix remota* was emerging from pupal exuviae here. *Lipsothrix* pupal exuviae were frequent.

10. Larvae were found in a rotten log (elm?) at the site described immediately above. Adults later emerged of *Atypophthalmus inusta*, *Austrolimnophila ochracea*, *Lipsothrix errans* and *L. remota* (the former has been previously reared from fungi and the records presented in this report may represent the first rearing from saproxylic material: Alan Stubbs pers. comm.).

Debris dams were then examined upstream of the wooden footbridge.

At the Owen trap there had been a recent landslip. Ash (*Fraxinus excelsior*) (and other trees?) had fallen from the bank on the righthandside. Several pairs of *Lipsothrix remota* were seen in the Owen trap and *Lipsothrix remota* was also present in the water trap placed here.

Loamhole Dingle (21st May 2000)

Heavy rain overnight. Overcast and cold now with vegetation wet (at 11am). Craneflies taken off two logs below the footbridge included *Euphylidorea lineola*, *Lipsothrix errans*, *L. remota*, *Epiphragma ocellaris* and *Numantia fusca* (the former is a wet mud species Alan Stubbs pers. comm.). *Lipsothrix remota* were observed *in cop.* on a debris dam further down. The wet conditions appeared to suit *Lipsothrix* and may assist emergence. *Lipsothrix errans* was later reared from here.

Loamhole Dingle (27th May 2000)

The contents of the water traps were retrieved (the contents of some had been washed out due to rainfall).

Lydbrook Dingle (15th May 2000)

A description of Lydbrook Dingle was provided in the previous *Lipsothrix* report (Godfrey 2000). The area above the Owen trap was taken to be Lydbrook Dingle. This differs from the situation adopted in the previous report (Godfrey 2000). (It is not clear from the maps provided where Lydbrook Dingle finishes and where Loamhole Dingle begins. Because of the densely wooded nature of the sites situated in a deep valley it is difficult to pick out recognizable features). *Lipsothrix* pupal exuviae were present and larvae were taken from a log (sample 1) on the lefthandside immediately above the Owen trap debris dam. *Chalcosyrphus eunotus* came out of a woodpecker hole in a fallen log peppered with similar holes on the debris dam here. *Chalcosyrphus eunotus* was seen several times usually on a log in a more open area upstream (this was probably only one individual). A yellow water trap was placed here.

Lipsothrix pupal exuviae were found below the outfall. Two larvae were taken but adults did not appear later. A sample comprising substrate with mosses and liverworts was also taken from the seepages here. This later produced *Spania nigra* (Rhagionidae) and *Lyciella pallidiventris* gp (female) (Lauxaniidae). *Lipsothrix* pupal exuviae were present in logs. A woody sample was taken from a small waterfall below the road bridge. A female *Lipsothrix nigristigma* was taken here. A female *Limonia nigristigma* was also observed on a well-rotted decorticated log - no sample for rearing was taken because the wood was surprisingly hard and consequently appeared unsuitable.

Lydbrook (Upstream End) (16th May 2000)

This site was ponded-up at upstream end. Coal shale forms the banks here suggesting the site was formerly opencast. Tree and shrub cover comprises elm (*Ulmus* sp.), goat willow (*Salix caprea*), young alder (*Alnus glutinosa*), birch (*Betula* sp.) and hawthorn (*Crataegus monogyna*). The dingle has been blocked off lower down with a bund that supports a track. In the dingle below the bund, the vegetation comprises species indicating nutrient enrichment such as nettle (*Urtica dioica*), buttercups (*Ranunculus* sp.), docks (*Rumex* sp.), willowherbs (*Epilobium* sp.) and water-cress (*Rorippa nasturtium-aquaticum*) in a poorly drained wet area. The substrate here is mud and the water depth is 2.5-5cm. A few cut logs and small branches are present in this marsh. This area grades into an area of goat willow (*Salix caprea*) and alder (*Alnus glutinosa*) carr. Vegetation noted here included hartstongue fern (*Phyllitis scolopendrium*), red campion (*Silene dioica*), cleavers (*Galium aparine*) and opposite leaved saxifrage (*Chrysoplenium oppositifolium*). Muddy and shaley berms are present in the streambed. No *Lipsothrix* pupal exuviae were found and only one other limoniid pupal exuvia was found.

Another bund crosses the dingle downstream again supporting a track. Below this bund, a more natural fast-flowing stream appears through an outfall. Vegetation here comprised sycamore (*Acer pseudoplatanus*), elder (*Sambucus niger*), dog's mercury (*Mercurialis perennis*), herb robert (*Geranium robertianum*), yellow archangel (*Galeobdolon luteum*), bramble (*Rubus fruticosus*) and *Dryopteris* sp. The sides of the valley here still comprise coal shale. Many more logs were encountered downstream and the dingle was much more attractive here than the restored opencast area described above. Few craneflies were swept however because of a wet net.

Oak Dingle (21st May 2000)

This site forms a small narrow dingle on the Abdon-Tugford road. A short section was initially surveyed parallel with the road downstream of the dingle. This comprised a fast-flowing stream unto 1m. deep in pools. The bedrock was extensively exposed throughout the channel. Vegetation includes sycamore (*Acer pseudoplatanus*), elm (*Ulmus* sp.), holly (*Ilex aquifolium*), cow parsley (*Anthriscus sylvestris*), dog's mercury (*Mercurialis perennis*), greater stitchwort (*Stellaria holostea*) and wild garlic (*Allium ursinum*). The substrate comprises gravel and pebbles. The occasional fallen tree is present in the channel. Liverworts are present in the bank of the stream.

In Oak Dingle the stream was followed upstream. The channel is 1.5m. wide with much of the channel exposed and the flow is slow. Vegetation included red campion (*Silene dioica*), woodruff (*Galium odoratum*), nettle (*Urtica dioica*), cleavers (*Galium aparine*), ivy (*Hedera helix*), rose (*Rosa* sp.), wild arum (*Arum maculatum*), bluebell (*Endymion non-scriptus*), occasional hogweed (*Heracleum sphondylium*), yellow archangel (*Galeobdolon luteum*), opposite-leaved saxifrage (*Chrysoplenium oppositifolium*), enchanter's nightshade (*Circaea lutetiana*) and herb robert (*Geranium robertianum*). Conifers increase upstream. The vegetation was wet due to sporadic rain all day. Some dead wood was present including well-rotted logs piled on the side of the bank (these may have been cleared from the stream?). Wide bedding planes extend away from the river upstream. Limoniid pupae were found in a rotten log by the stream. A teneral *Epiphragma ocellata* was found here. Several *Lipsothrix* ovipositing or perched on logs here (at least one *nigristigma* ovipositing). *Lipsothrix* pupal

exuviae taken here were later determined as *L. nigristigma*. Teneral *Epiphragma ocellata* and *Chalcosyrphus eunotus* were observed here.

Saplins Wood (15th May 2000)

A description of the site surveyed was provided in the previous report (Godfrey 2000). Access was from the B4380 through a gate. Conifers were present at the downstream end of the section. *Tipula* pupal exuviae were taken in a large log by the stream. *Tipula* pupal exuviae and limoniid pupal exuviae were found in the same log further on. *Lipsothrix nigristigma* were ovipositing in a well-rotted, decorticated log that was anchored into the bank. *Lipsothrix* pupal exuviae were taken here. The circumference of the log was 72cm. A ?beetle pupa was taken here but no limoniid larvae were found. *Tipula* pupal exuviae were also found in a log upstream (taken). A male *Lipsothrix errans* was also taken about a log.

Tick Wood (16th May 2000)

A description of the site surveyed was provided in the previous report (Godfrey 2000). Access to this site was by parking at Tickwood Hall and heading southeast along the track then branching off northwards down the slope to the stream at the edge of the wood. The weather was cold and windy with a light rain. *Lipsothrix* pupal exuviae and *Lipsothrix remota* were found on a sodden log in the stream - no sample was taken due to the difficult situation. *Tipula* larvae were taken on the surface of a log. *Lipsothrix* pupal exuviae were found to be infrequent with other limoniid pupal exuviae (?*Epiphragma ocellata*) more common. One *Tipula* pupal exuvia was found. *Lipsothrix nigristigma* pupal exuviae were found on a second log; no larvae were found but only a brief search was made. *Lipsothrix nigristigma* was swept here but the exact site within the wood is not known.

Whitwell Coppice (16th May 2000)

A description of the site surveyed was provided in the previous report (Godfrey 2000). This site was accessed via the converted farm buildings on the track above Sheinwood off the Much Wenlock-Sheinton road. Limoniid pupal exuviae were found in a log above the stream. *Lipsothrix nigristigma* pupal exuviae were frequent on one very rotten log embedded into the bank; no larvae were found. A male *Lipsothrix nigristigma* was emerging from its pupal case.

A log across the stream below the weir was examined and found to be excellent for *Lipsothrix nigristigma* pupal exuviae with 150-200 present. Larvae were also frequent (Two *Lipsothrix nigristigma* later emerged from a sample taken for rearing). A female *Lipsothrix nigristigma* was ovipositing in a log (circumference = 82cm). Other limoniids reared from woody material taken here were (somewhat unusually) *Symplecta stictica, Atypophthalmus inusta* and *Dicranomyia chorea.*

Montgomeryshire

All the Welsh sites selected were new sites compared with the previous survey (Godfrey 2000).

Aston Dingle (23rd May 2000)

Access to this site was by walking along westwards along the A488 from Aston Hall to the site and entering the wood by the road culvert. The stream was unto 1m. wide and had a moderate flow. The substrate comprised mud to gravel and the bedrock was exposed in the streambed. Vegetation comprised elm (*Ulmus* sp.), young ash (*Fraxinus excelsior*), bramble (*Rubus fruticosus* agg.), wild arum (*Arum maculatum*), lesser celandine (*Ranunculus ficaria*), dog's mercury (*Mercurialis perennis*), enchanter's nightshade (*Circaea lutetiana*) and opposite-leaved saxifrage (*Chrysosplenium oppositifolium*). Deadwood was occasional. Conifers were present. The vegetation was very wet because of heavy rain overnight and frequent rain all morning. *Lipsothrix remota* and *Lipsothrix remota* pupal exuviae (<10) were found on a log with bark and moss across the stream. A *Numantia fusca* female was taken on a log here. Teneral *Lipsothrix remota* present. *Tipula* larvae on surface of a log (in wet conditions). Above was a clearing then the stream becomes more incised above. A *Numantia fusca* was emerging from its pupal case in well rotten decorticated log in a debris dam (this record may represent the first rearing from saproxylic material: Alan Stubbs pers. comm.). *Lipsothrix remota in cop.* (2 pairs). Teneral *Epiphragma ocellaris* seen on a log. *Austrolimnophila ochracea* was also observed in the vicinity of logs in the stream.

Bron-y-Buckley Wood (18th May 2000)

This small dingle was accessed via steps from the residential estate to the south of the wood. The small stream was followed upstream. The stream was 1m + wide, 5-8cm deep and with a moderate flow. Tree and shrub cover comprised sycamore (*Acer pseudoplatanus*), beech (*Fagus sylvatica*), ash (*Fraxinus excelsior*) and holly (*Ilex aquifolium*) with water avens (*Geum rivale*) and dandelion (*Taraxacum* sp.) in the herb layer. The shale bedrock is exposed within the channel. *Lipsothrix* pupal exuviae were present in several logs. Rotten decorticated logs were present in the stream along with more recent dry cut logs with intact bark. A fly pupa found under beech (*Fagus sylvatica*) bark on a log later emerged as *Xylophagus ater* (Xylophagidae).

Coed Byrrwyd (18th May 2000)

This site is a good example of oak-ash (*Quercus-Fraxinus*) woodland with a well-developed shrub layer and a good diversity of flowering plant species. Access was from the road and the Luggy Brook was followed upstream to the ford. The channel was 2m wide and 2.5-7.5cm deep with moderate flow. Slates outcrop in the streambed and berms (comprising slate pebbles) were present. Vegetation included oak (*Quercus* sp.), hazel (*Corylus avellana*), bluebell (*Endymion non-scriptus*), valerian (*Valeriana dioica*), yellow archangel (*Galeobdolon luteum*), wild garlic (*Allium ursinum*), wood-sorrel (*Oxalis acetosella*), red campion (*Silene dioica*) and opposite-leaved saxifrage (*Chrysoplenium oppositifolium*) at the sides of the channel. Small log with female *Lipsothrix remota* present. *Dactylolabis transversa* and *Euphylidorea lineola* were individually taken on the banks of or in the stream.

A log was present further upstream with *Lipsothrix remota* pupal exuviae (and possibly larvae). *Lipsothrix remota* females were present here and on a stump. Frequent debris dams were present further upstream. A large log upstream was examined where the track comes down to the ford. *Lipsothrix remota* pupal exuviae were frequent here. *Lipsothrix remota* and *Atypophthalmus inusta* were later reared from woody material collected here (the former has been previously reared from fungi and the records presented in this report may represent the first rearing from saproxylic material: Alan Stubbs pers. comm.).

Coed Pendugwm (18th May 2000)

Light rain was present at times during the visit. The stream (Nant-y-Pandy) at the upstream end of the nature reserve is 1.5-3m. wide and has a good flow. The substrate comprises cobbles, pebbles and gravel. A small waterfall is present immediately upstream here. The stream forms the northern boundary of an ancient semi-natural woodland reserve owned and managed by Montgomeryshire Wildlife Trust.

The woodland is on a slope with tree cover along the watercourse comprising sycamore (*Acer pseudoplatanus*), ash (*Fraxinus excelsior*), young alder (*Alnus glutinosa*), holly (*Ilex aquifolium*), elm (*Ulmus* sp.), beech (*Fagus sylvatica*) and hazel (*Corylus avellana*) with ivy (*Hedera helix*) and honeysuckle (*Lonicera periclymenum*). Ground flora includes yellow archangel (*Galeobdolon luteum*) and bluebell (*Endymion non-scriptus*). A forest track is present on the opposite side of the channel with conifer plantations beyond. The stream was followed downstream to the eastern end of the reserve. Debris dams are occasional down the watercourse. *Tipula* pupal exuviae were present in a branch across the stream (near a beech *Fagus sylvatica*). Rocky berms are present in the streambed with bedrock platforms below the beech (*Fagus sylvatica*). One rotten, gouged and decorticated log was present downstream with *Lipsothrix remota* pupal exuviae and *Tipula* pupal exuviae. Sweep netting was poor due to rain and a hole in net.

Cwm-y-Wydden (19th May 2000)

This is ancient semi-natural woodland on steep slopes with a central stream and is owned and managed by Montgomeryshire Wildlife Trust.

The stream channel was 1.5-2m. wide with a moderate flow. Bedrock was exposed in the streambed and banks. Large amount of deadwood across the channel was present which had fallen in from the steep valley sides. Vegetation included wood avens (*Geum urbanum*), opposite-leaved saxifrage (*Chrysoplenium oppositifolium*), hazel (*Corylus avellana*), honeysuckle (*Lonicera periclymenum*), elm (*Ulmus* sp.), bramble (*Rubus fruticosus* agg.), sycamore (*Acer pseudoplatanus*), ash (*Fraxinus excelsior*), enchanter's nightshade (*Circaea lutetiana*), wild arum (*Arum maculatum*), wood-sorrel (*Oxalis acetosella*), dog's mercury (*Mercurialis perennis*), woodruff (*Galium odoratum*), bluebell (*Endymion non-scriptus*) and field maple (*Acer campestre*).

Lipsothrix pupal exuviae present in a log above the point where the footpath crosses the stream. Diptera pupae were taken here.

Downstream of the point where the footpath crosses the stream it is difficult to survey because of the large amount of deadwood in the channel and because of rock barriers and waterfalls. The amount of deadwood resulting from fallen trees is considerable. *Lipsothrix*

pupal exuviae were found in a well rotted decorticated log with pupal exuviae at the tip. Larvae and pupae here were frequent. The circumference of the log was 76cm (see figure). *Lipsothrix remota* later emerged from this sample.

Lipsothrix pupal exuviae were frequent on a decorticated rotten log downstream (downstream of the confluence with the tributary here) with one *Lipsothrix remota* was observed emerging from its pupal case. The circumference of this log was 77cm.
Lipsothrix pupal exuviae were present in rotten decorticated logs below the waterfall at the downstream end of the wood (circumference = 46cm.).

Lipsothrix pupal exuviae from this site were later identified as *L. errans* (partly based on the early date) and *L. remota.*

Mochdre Dingle (23rd May 2000)

This site comprises mixed deciduous dingle woodland and is apparently the richest wood in Montgomery for vascular plants. The survey covered a short section immediately below Loch Mochdre at the upstream (southern) end of the dingle. Access to this point was from a private car-parking area and down a poorly defined track that petered out halfway down the slope. Access to the stream below was then by descending a steep slope through the woodland. These steep slopes, the lack of footpaths, deep pools in the stream and frequent fallen trees made survey difficult.

At the bottom of the slope the channel is 2-3m. wide and up to 50cm deep with a muddy substrate and the slate bedrock exposed throughout. The vegetation comprised pedunculate oak (*Quercus robur*), sycamore (*Acer pseudoplatanus*), elm (*Ulmus* sp.), ash (*Fraxinus excelsior*), hazel (*Corylus avellana*), hawthorn (*Crataegus monogyna*), yellow archangel (*Galeobdolon luteum*), greater stitchwort (*Stellaria holostea*) and garlic mustard (*Alliaria petiolata*). Deadwood is frequent in the channel and at the bottom of the slopes. Various pupal exuviae were found in the logs at the first location examined. The vegetation was very wet due to rain. Two teneral *Epiphragma ocellata* were found on a log by the side of the channel. *Lipsothrix remota* were observed *in cop.* (2 pairs). *Lipsothrix remota* pupal exuviae were frequent. Considerable rotten wood was present which was thoroughly searched on the short section surveyed. Few craneflies swept due to the rain. *Epiphragma ocellata* was observed emerging from pupal case on a log.

Appendix 2. Red Data Book and Nationally Scarce Species recorded

Comments by Alan Stubbs (AES) added to the draft report are appended.

Red Data Book 1
Lipsothrix nigristigma

Red Data Book 2
Chalcosyrphus eunotus (Syrphidae)

Red Data Book 3
Erioptera nigripalpis
Molophilus lackschewitzianus
Scleroprocta pentagonalis
Eloephila trimaculata
Limonia masoni

These would rank as Notable A on current knowledge (AES).

Nationally Scarce
Atypophthalmus inusta
Dactylolabis transversa
Molophilus variispinus

Gonomyia simplex may qualify here (AES).

Spania nigra (Rhagionidae)
Sphegina elegans (Syrphidae)
Xylota florum (Syrphidae)

Sphegina elegans probably no longer qualifies (AES).

Biodiversity Action Plan species (List 2)
Lipsothrix errans
Lipsothrix nervosa
Lipsothrix nigristigma

The pRed Data Book 1 status accorded to *Tasiocera fuscescens* in Falk (1992) is an error (AES).

Appendix 3. Preliminary Key to the Pupal Exuviae of *Lipsothrix* species

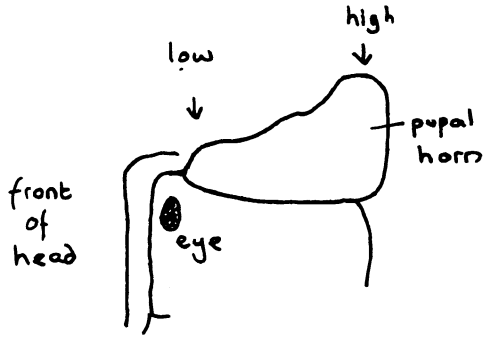
1. Pupal horn low at front, extending dorso-posteriorly. The triangular plates within the pupal horn on either side of split case are strongly rugose.....*remota*

\- Not as above.....2

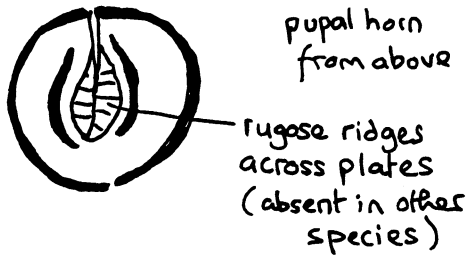
2. Pupal horn smaller and more symmetrical (cup-shaped). Head extending above the pupal horns.....3

\- Pupal horn large and extending well above the head.....*nigristigma*

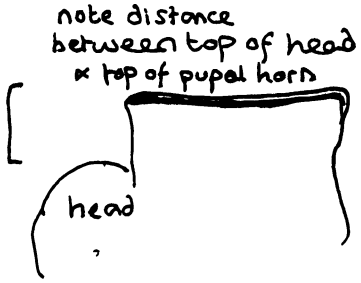
3 Difficult to separate.....*errans* and *nervosa*



Lipsothrix remota
pupal horn



Lipsothrix remota
internal plates in pupal horn



Lipsothrix nigristigma
pupal horn

Lipsothrix errans/nervosa
pupal horn

Figure 1. Location of sample sites

Sites with *Lipsothrix nigristigma* are indicated by Ln in brackets after the site name.

1a Aston Dingle (Ln)

1b Bannister's Coppice (Ln), Chermes Dingle (Ln), Loamhole Dingle (Ln), Holbrook Coppice, Lydbrook Dingle (Ln), Saplins Wood, Tick Wood (Ln) and Whitwell Coppice (Ln)

1c Betton Dingle, Habberley Valley (Ln) and Hope Valley

1d Bron-y-Buckley Wood

1e Coed Byrrwyd and Cwm-y-Wydden

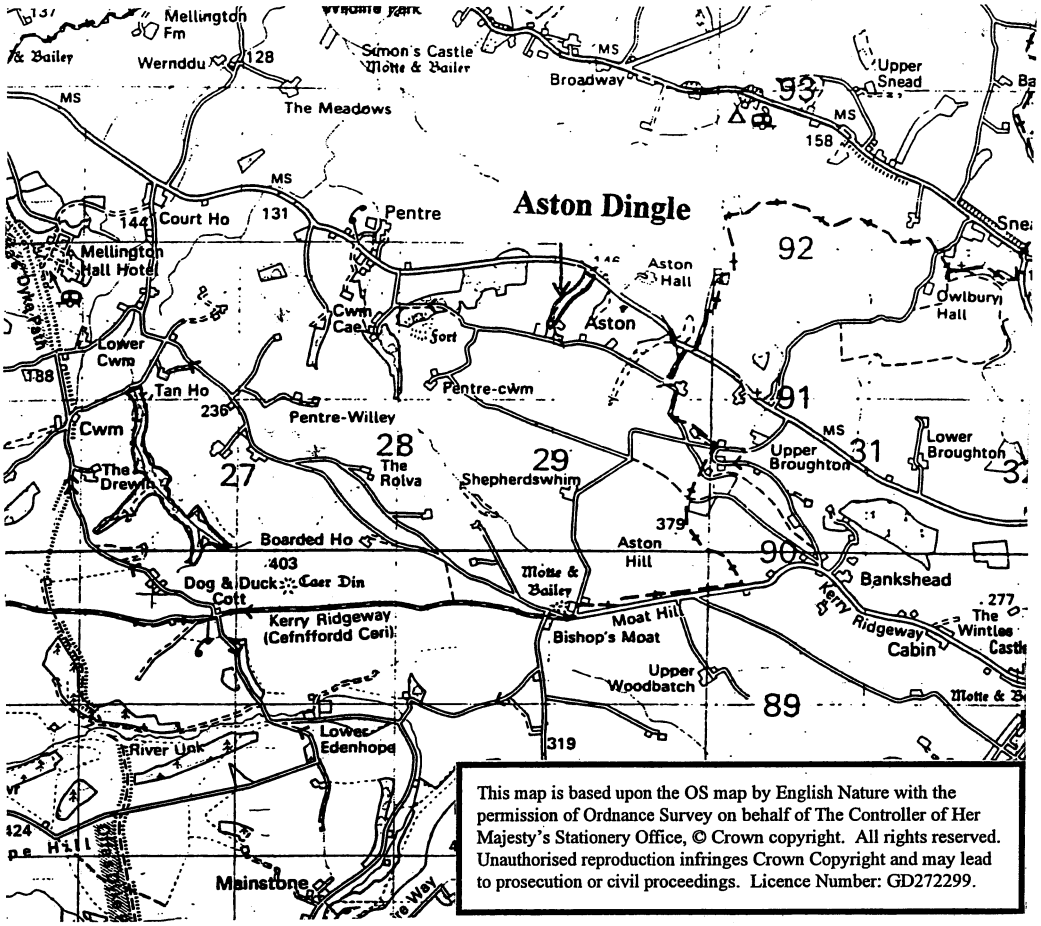
1f Coed Pendugwm

1g Cornbrook Dingle

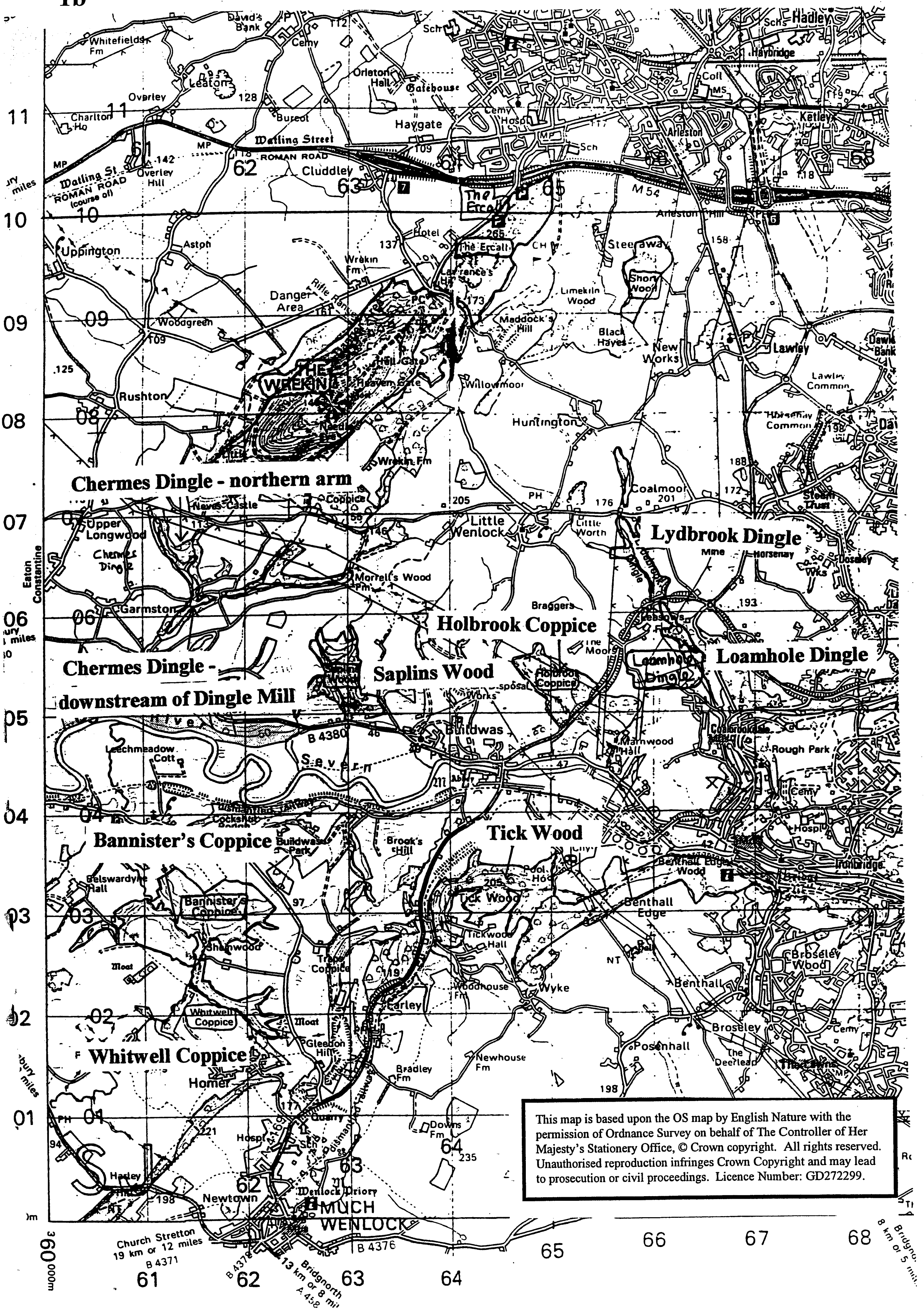
1h Cuckoopen Coppice and Oak Dingle (Ln)

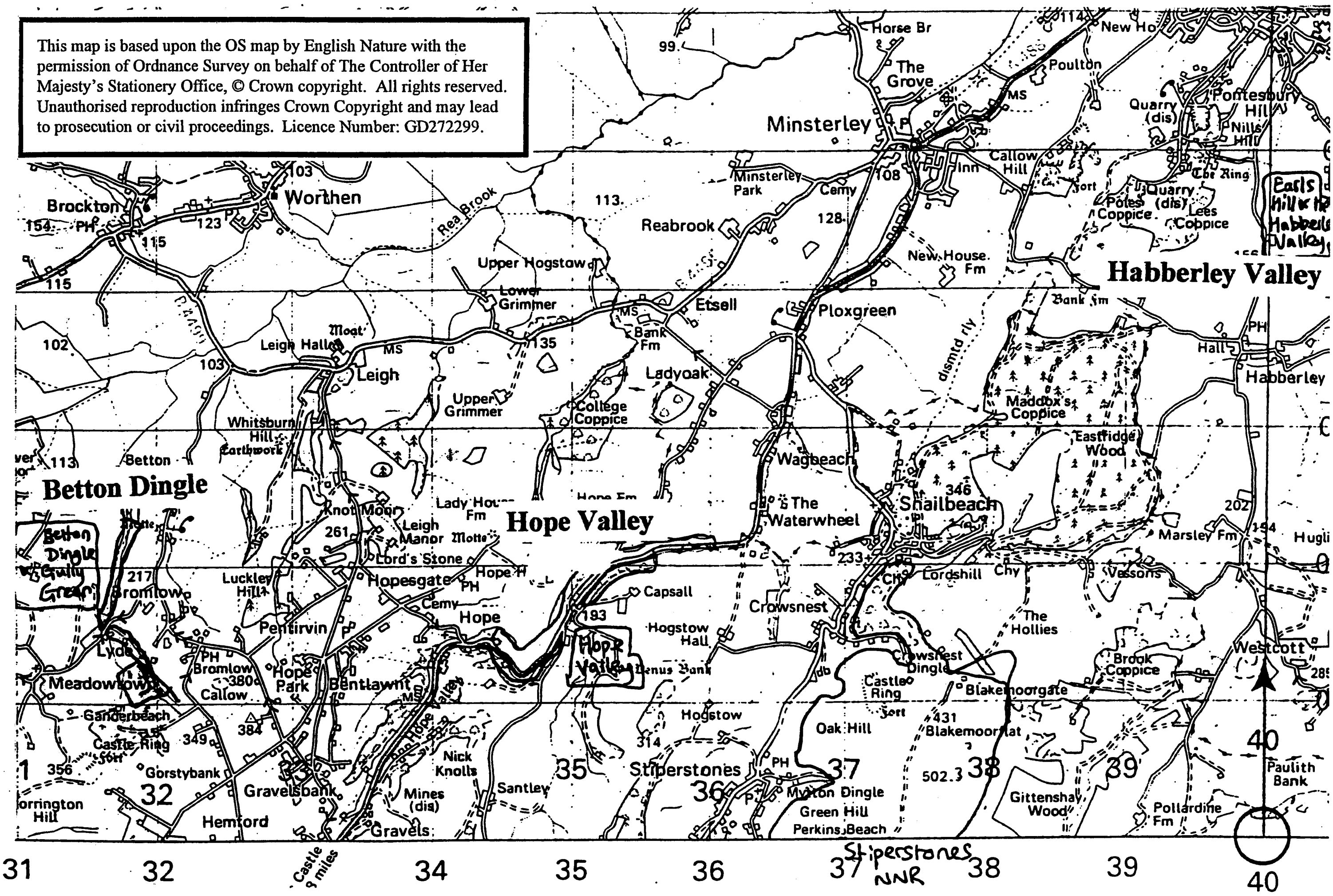
1i Mochdre Dingle

1a



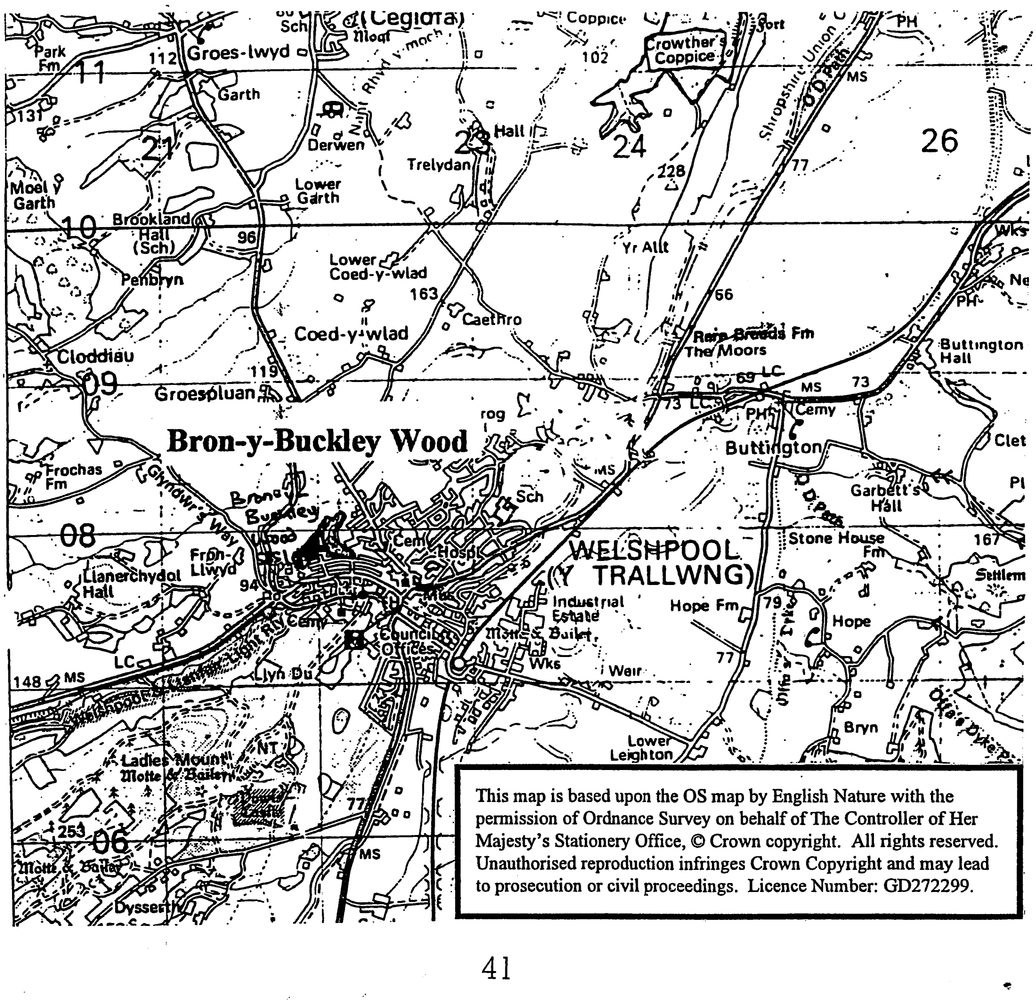
1b

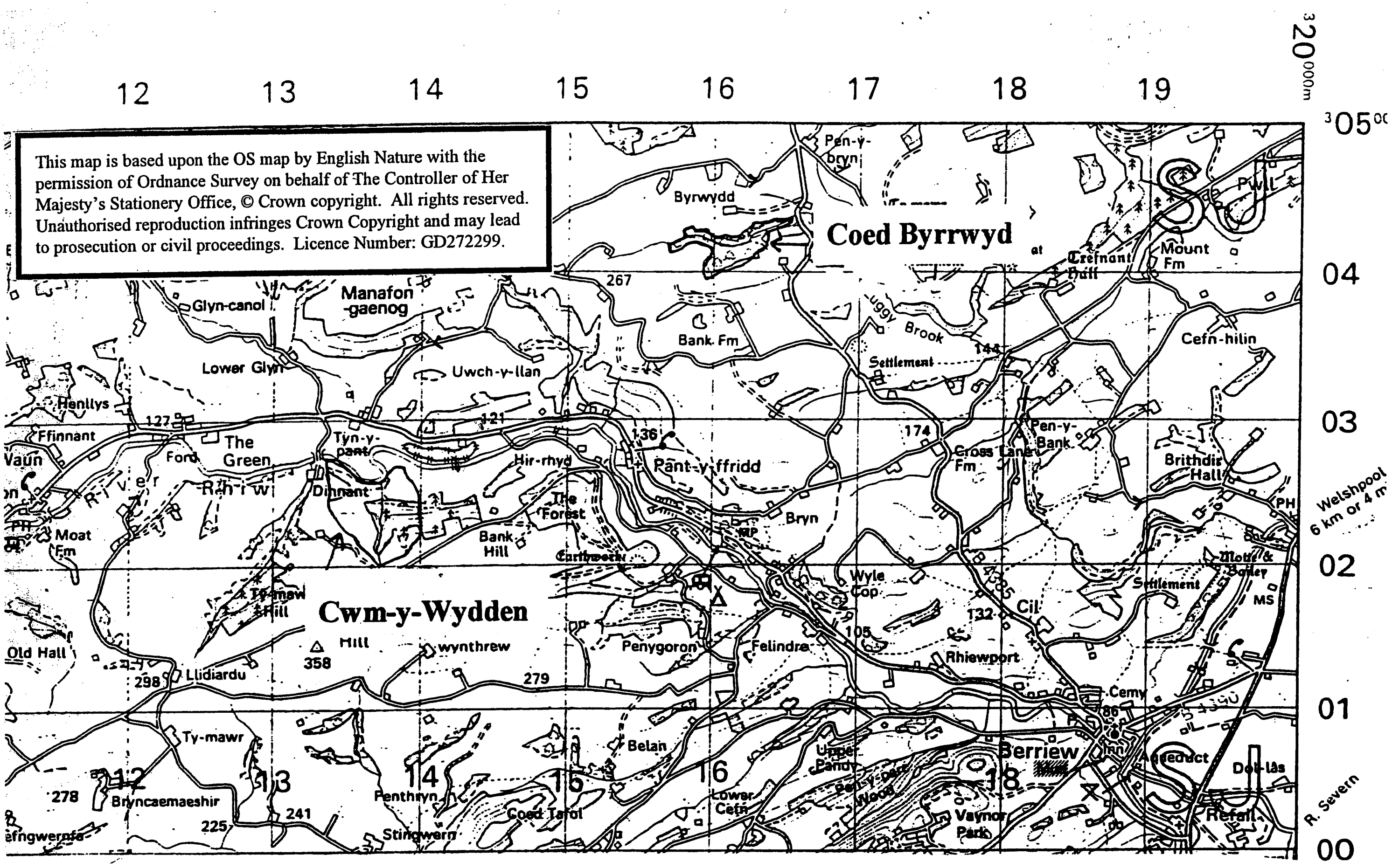

Chermes Dingle - northern arm
Chermes Dingle - downstream of Dingle Mill
Lydbrook Dingle
Holbrook Coppice
Loamhole Dingle
Saplins Wood
Tick Wood
Bannister's Coppice
Whitwell Coppice
The Wrekin
Little Wenlock
Much Wenlock
Buildwas
Broseley
Benthall
Ironbridge
Coalbrookdale
Hadley
Ketley
Lawley
Uppington
Rushton
Garmston
Homer
Watling Street
Severn
This map is based upon the OS map by English Nature with the permission of Ordnance Survey on behalf of The Controller of Her Majesty's Stationery Office, © Crown copyright. All rights reserved. Unauthorised reproduction infringes Crown Copyright and may lead to prosecution or civil proceedings. Licence Number: GD272299.



1c

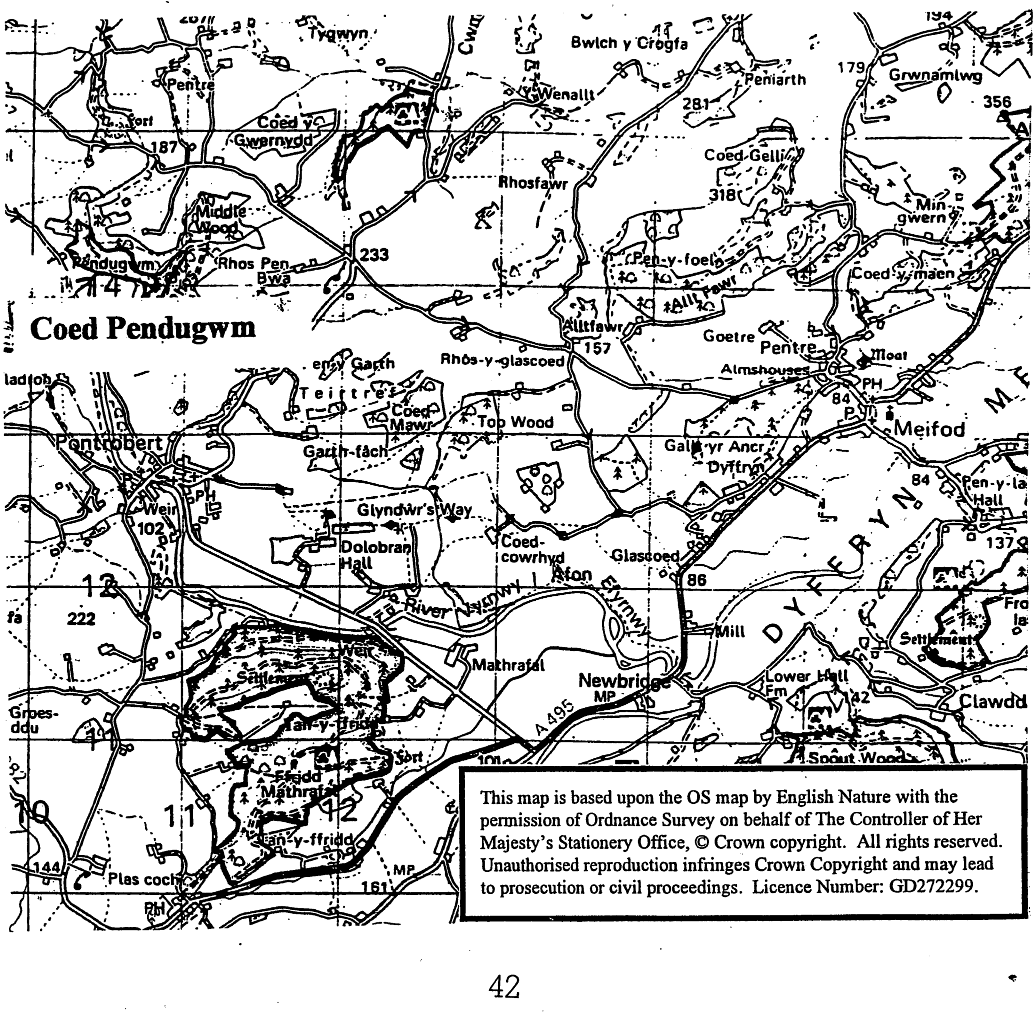
1d



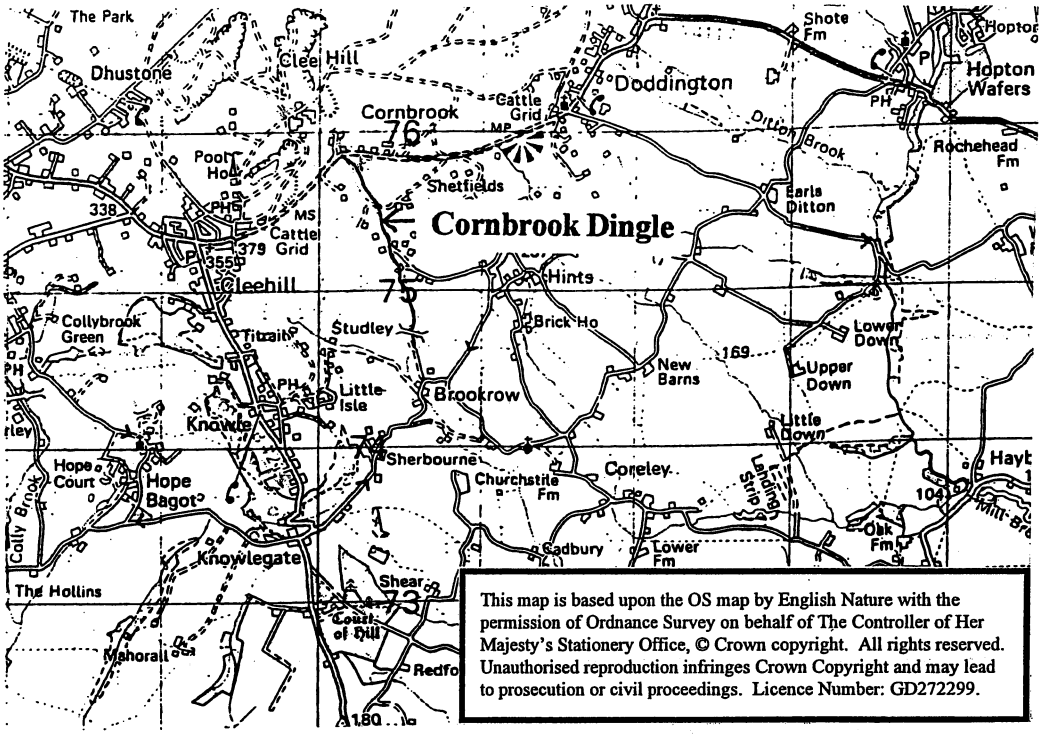

This map is based upon the OS map by English Nature with the permission of Ordnance Survey on behalf of The Controller of Her Majesty's Stationery Office, © Crown copyright. All rights reserved. Unauthorised reproduction infringes Crown Copyright and may lead to prosecution or civil proceedings. Licence Number: GD272299.
Coed Byrrwyd
Cwm-y-Wydden
Byrwydd
Pen-y-bryn
Manafon -gaenog
Glyn-canol
Lower Glyn
Uwch-y-llan
Bank Fm
Henllys
Ffinnant
The Green
Tyn-y-pant
Hir-rhyd
Pant-y-ffridd
The Forest
Bank Hill
Bryn
Moat Fm
Llidiardu
Penygoron
Felindre
Wyle Cop
Rhiewport
Cil
Cross Lane Fm
Pen-y-Bank
Brithdir Hall
Cefn-hilin
Mount Fm
Old Hall
Ty-mawr
Bryncaemaeshir
Penthryn
Coed Tafol
Stingwern
Belan
Lower Cefn
Berriew
Vaynor Park
Aqueduct
Dol-lâs
Refail
Welshpool 6 km or 4 m
R. Severn
12
13
14
15
16
17
18
19
04
03
02
01
00

1e

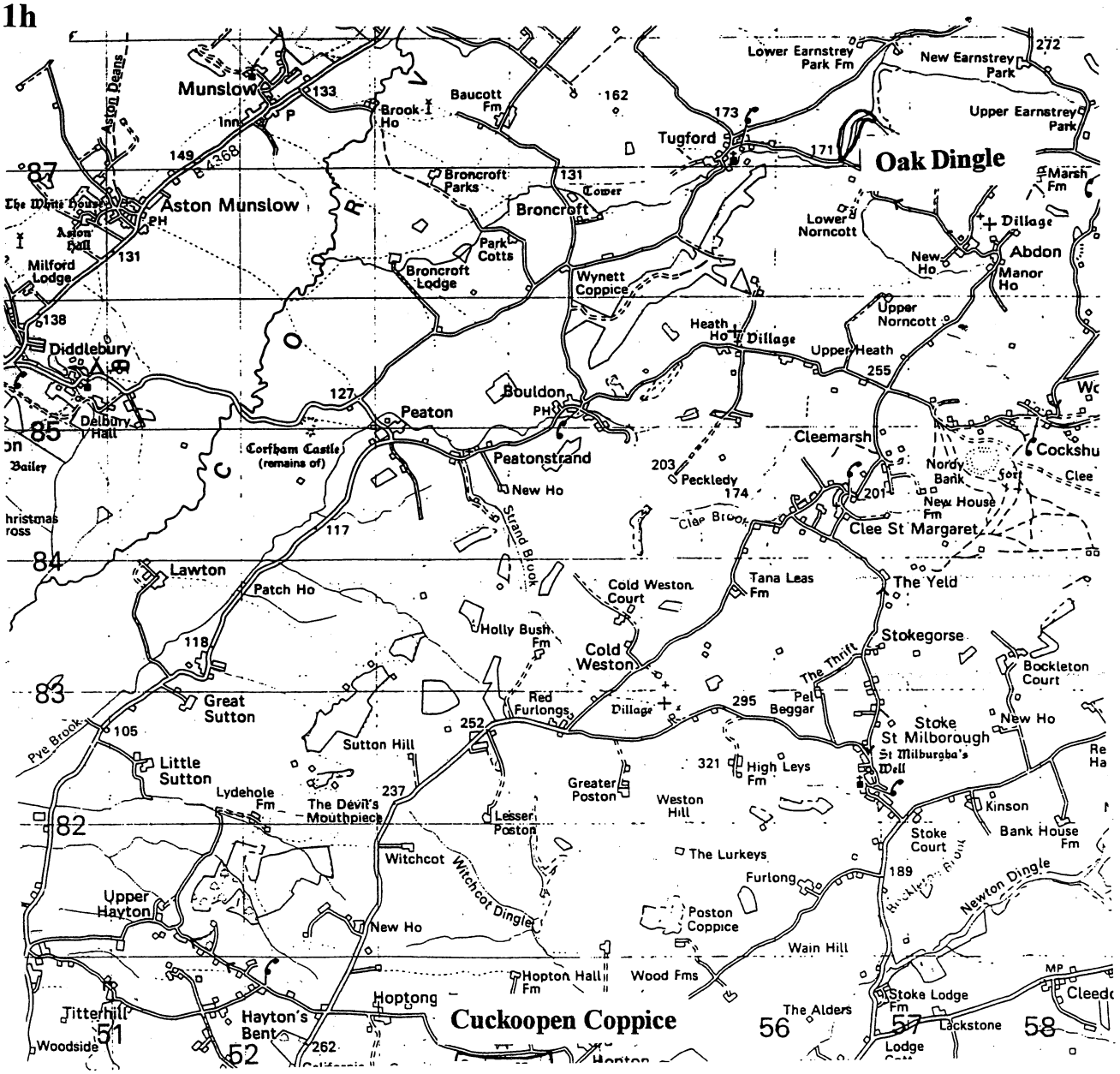
1f


Coed Pendugwm
This map is based upon the OS map by English Nature with the permission of Ordnance Survey on behalf of The Controller of Her Majesty's Stationery Office, © Crown copyright. All rights reserved. Unauthorised reproduction infringes Crown Copyright and may lead to prosecution or civil proceedings. Licence Number: GD272299.
Tygwyn
Bwlch y Crogfa
Peniarth
Grwnamlwg
Pentre
Coed y Gwernydd
Rhosfawr
Coed-Gelli
Middle Wood
Pendugwm
Rhos Pen Bwa
Min-gwern
Pen-y-foel
Allt Fawr
Coed-y-maen
Alltfawr
Goetre
Pentre
Almshouses
Meifod
Rhôs-y-glascoed
Teirtref
Coed Mawr
Top Wood
Garth-fâch
Pontrobert
Gallt-yr Ancr
Dyffryn
Pen-y-lan Hall
Glyndwr's Way
Dolobran Hall
Coed-cowrhyd
Glascoed
Afon Efyrnwy
River Vyrnwy
Mill
Mathrafal
Newbridge
Lower Hall Fm
Clawdd
Spout Wood
Plas coch
DYFFRYN

1g



1h



1i

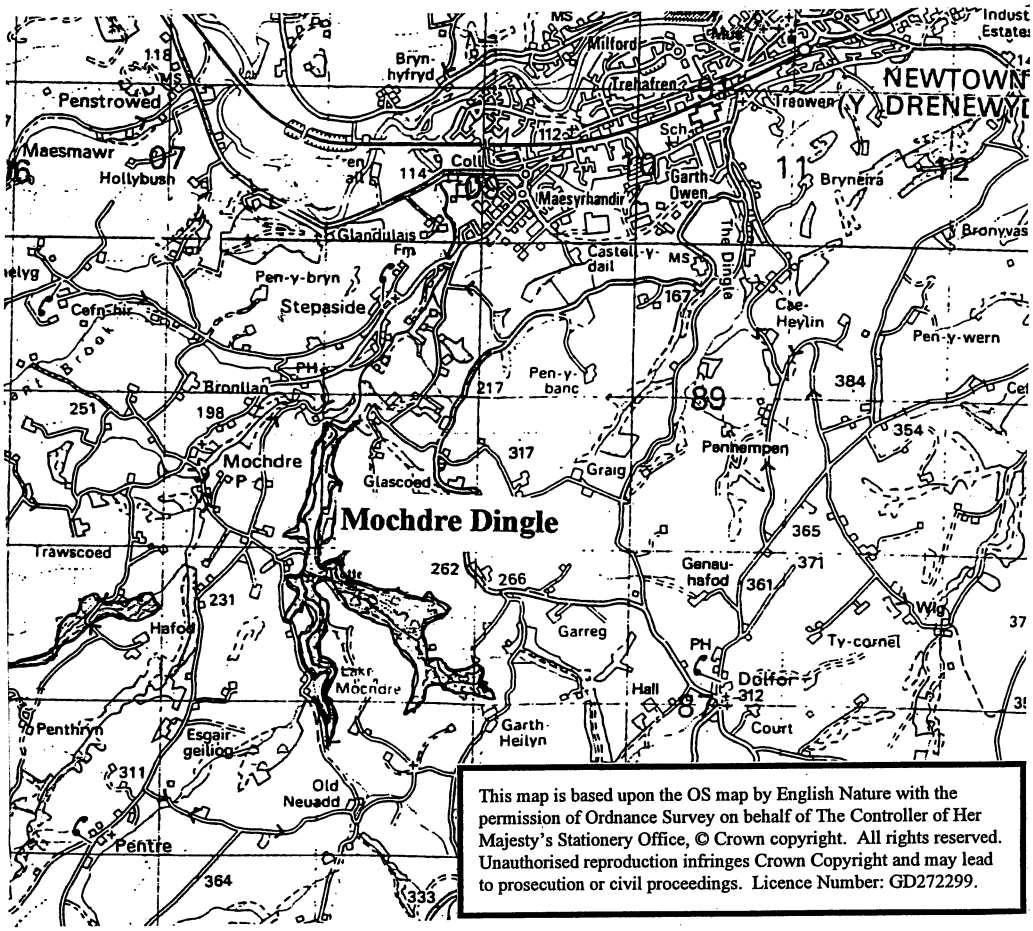
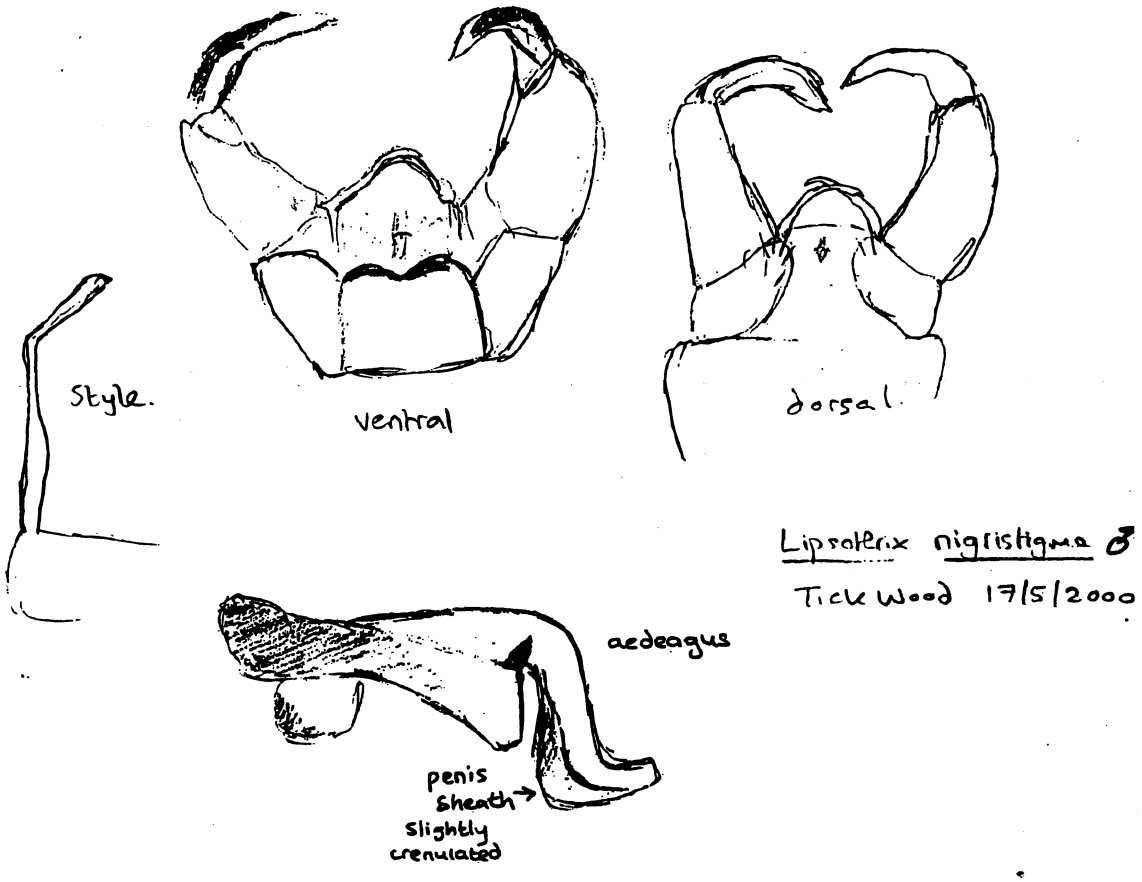

Mochdre Dingle
Penstrowed
Maesmawr
Hollybush
Bryn-hyfryd
Milford
Trehafren
Treowen
NEWTOWN
(Y DRENEWYDD)
Garth Owen
Bryneira
Bronyvas
Maesyrhandir
Glandulais Fm
Castell-y-dail
The Dingle
Pen-y-bryn
Stepaside
Cefn-bir
Brook
Bronllan
PH
Pen-y-banc
Cae-Heylin
Pen-y-wern
Mochdre
Glascoed
Graig
Penhampen
Trawscoed
Genau-hafod
Garreg
Ty-cornel
Hafod
Lake Mochdre
Hall
Dolfor
Court
Penthryn
Esgair-geiliog
Garth-Heilyn
Old Neuadd
Pentre
This map is based upon the OS map by English Nature with the permission of Ordnance Survey on behalf of The Controller of Her Majesty's Stationery Office, © Crown copyright. All rights reserved. Unauthorised reproduction infringes Crown Copyright and may lead to prosecution or civil proceedings. Licence Number: GD272299.

Figure 2A. Figures of *Lipsothrix nigristigma* and *L. nervosa*



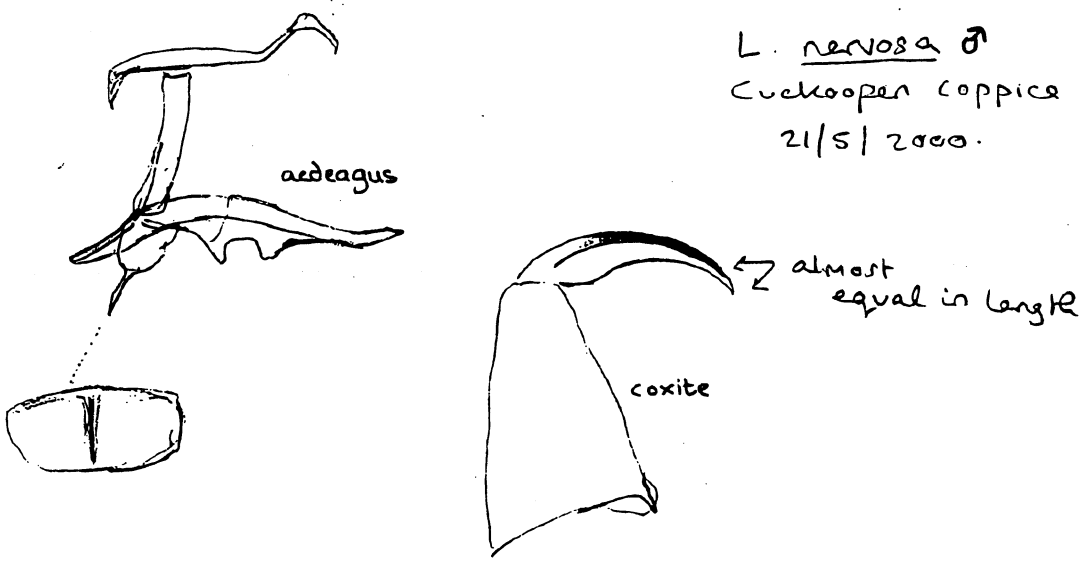
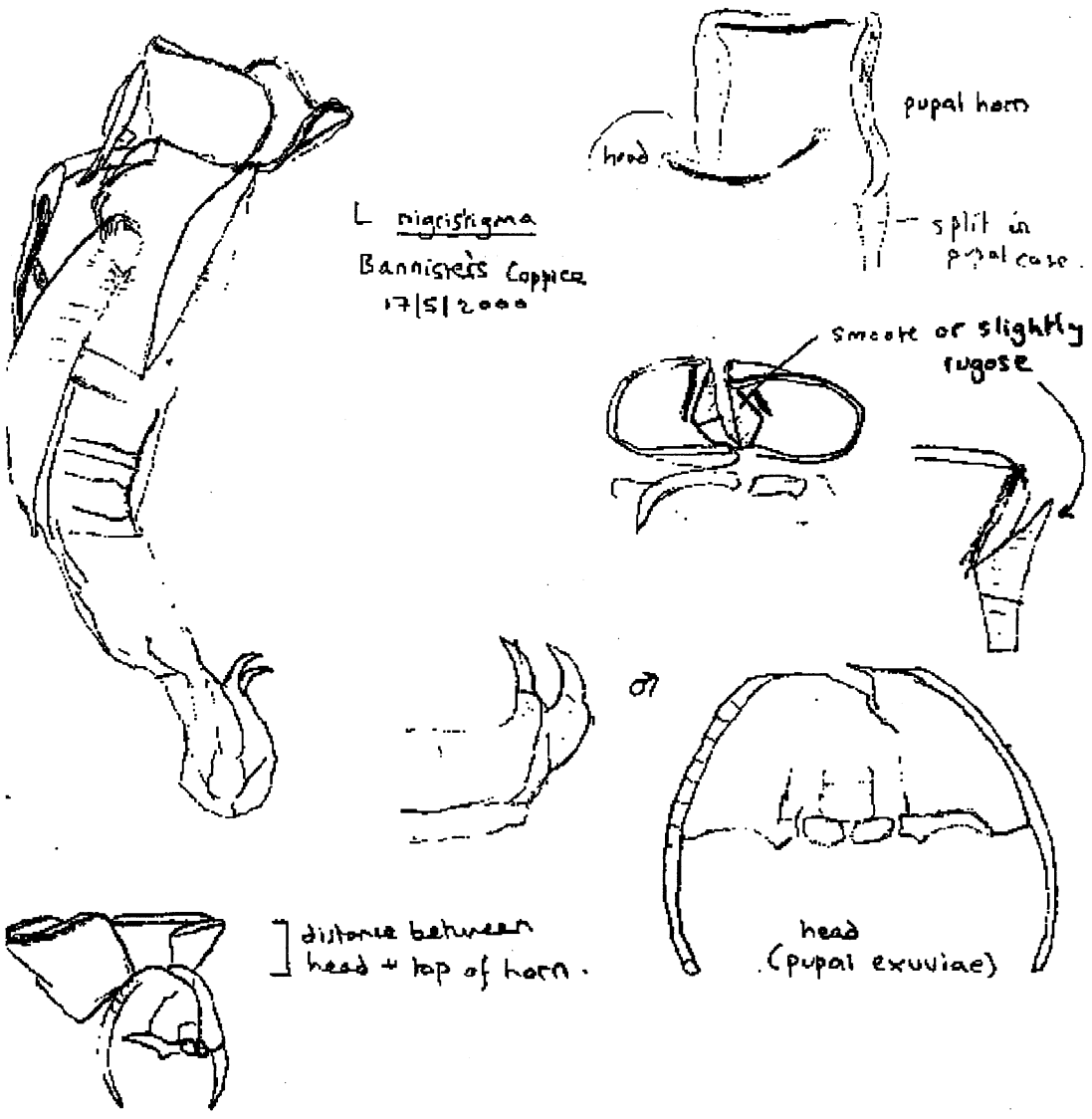


Figure 2B. Figures of *Lipsothrix nigristigma* and *L. nervosa*



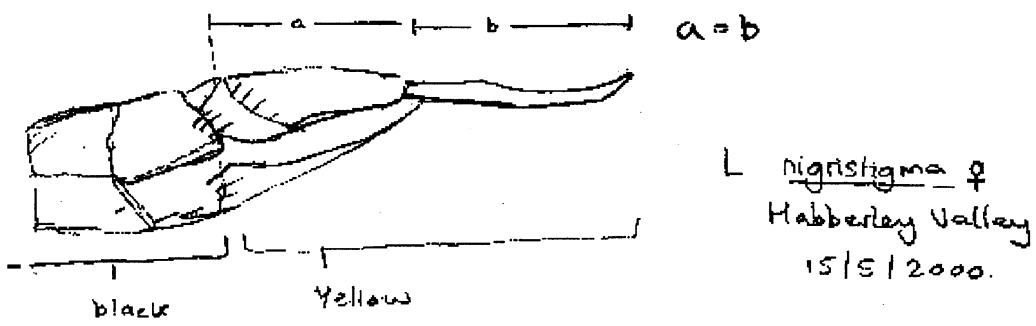


Figure 3. Figures of the male genitalia of *Lipsothrix nobilis* and non-British *L. nervosa*