8 APPENDIX ONE

PUPARIA OF BRITISH SPHAEROCERIDAE

This section consists of a copy of the revision of the puparia of British Sphaeroceridae (Skidmore 1993), which was partly based upon the copious quantity of material studied during this research programme. It demonstrates the way in which subfossil material can assist in modern taxonomic studies.

Notes on the taxonomy of the puparia of British Sphaeroceridae

Peter Skidmore

In the course of studying dipterous material from archaeological sites in Greenland, Iceland and various parts of the British Isles, the author has examined some 15,000 sphaerocerid puparia. The importance of this family in this field of research was noted by Smith (1989), but I have found that in total, members of this family, and especially those belonging to the subfamily Limosininae, have massively outnumbered all other Cyclorrhapha combined. Clearly the identification of this material is of paramount importance in the interpretation of these deposits but the existing literature is inadequate for this purpose and a reappraisal of the taxonomy of sphaerocerid puparia is essential.

Pitkin (1988) provides references for the puparia of Sphaeroceridae described in the literature, and Okely (1974) gives keys for the identification of those which were then known. Whilst some may have been based upon misidentifications, the main problems were that some important features had been overlooked and that descriptions traditionally included trivial details emanating from the process of pupariation, and of structures common to most cyclorrhaphous puparia. The present paper aims to highlight characters which appear to be of taxonomic importance with a view to producing improved keys.

"Subfossil" puparia such as occur in postglacial deposits are, perhaps surprisingly, of great potential taxonomic value. Traditionally, the identification of emerged adults has been regarded as an essential prerequisite for the production of descriptions of puparia and dipterists have often discarded unhatched puparia. In "subfossil" material of course one is forced to rely upon the examination of unhatched flies for positive identification. The author has found that in deposits he has studied, puparia have occurred in huge numbers, and that between 1 and 10 percent have contained unhatched adults, often in a remarkably good state of preservation. In limosinine puparia such vital diagnostic features as male genitalia and pregenital combs, female spermathecae and cerci, and almost all important chaetotactic details may be clearly visible through the puparial integument. Obviously when identifications are based on the adult within the puparium, errors so easily resulting from incorrect correlation of puparia and emerged adults are inapplicable. Dipterists only interested in modern material should also bear this in mind: before throwing out those unhatched puparia, closely examine them for signs of the unhatched adult inside (see fig. 14).

Some of the excavations in which the writer has been involved in this study have yet to be published, even in outline. For those which have, the reader is referred to the following papers covering the respective sites - Baker & Higham 1982 (Hen Domen, Montgomery), Buckland 1983 and McGovern *et al* 1983 (Western Settlement, Greenland), Greig 1981 (Barrel Latrine, Worcester), Leach 1984 (Taunton) and Sveinbjarnardóttir 1981 (Stóraborg).

The terminology for morphological features of the puparium follows Skidmore (1985) and nomenclature that of Pitkin (*op. cit.*).

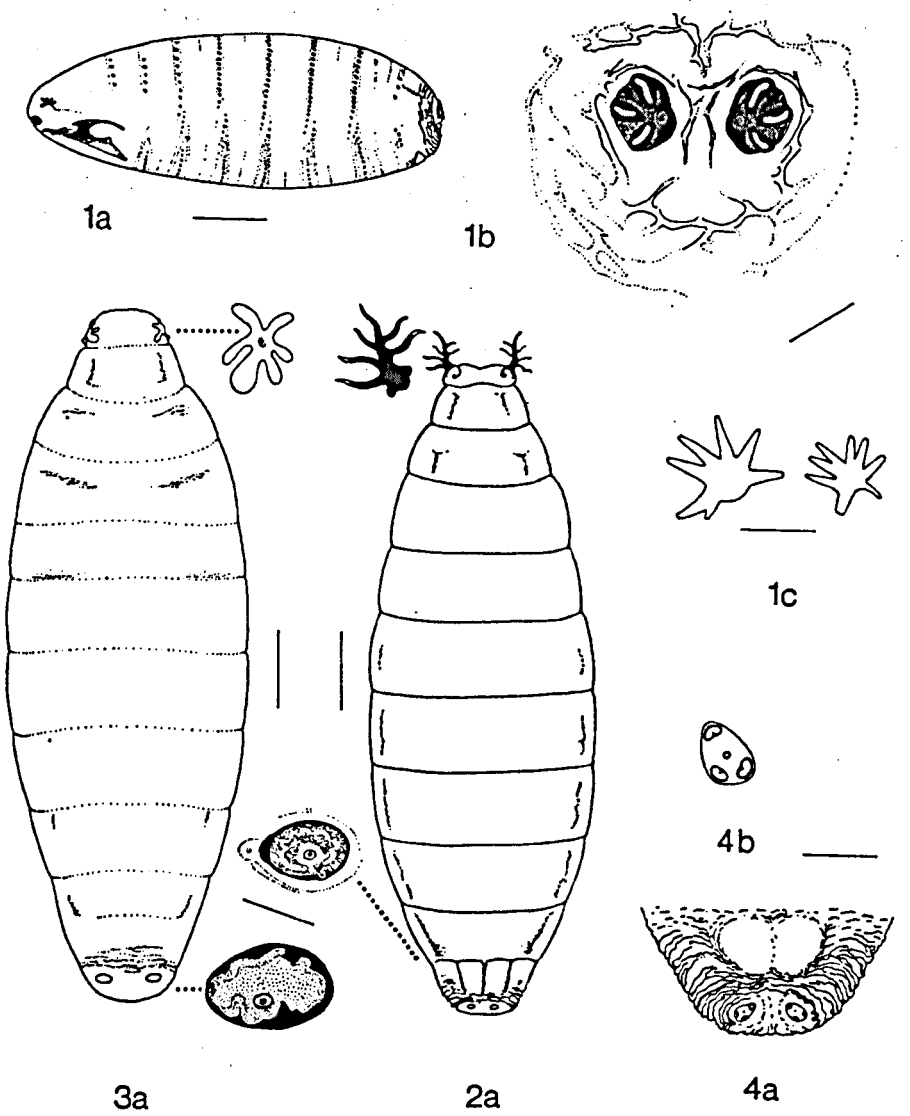

Fig. 1-4. 1 *Copromyza (s.str.) similis*, a, puparium (lateral), b, anal spiracles (posterior), c, prospiracular processes showing two variants. 2a *Ischiolepta denticulata*, puparium (dorsal) showing details of prospiracular process and right anal spiracle. 3a, *I. pusilla*, puparium (dorsal) showing details of prospiracular process and right anal spiracle. 4 *Sphaerocera curvipes*, a, caudal segment of puparium (dorsal), b, right anal spiracle. (Scales: 1a, 0.6mm; 1b,1c, 0.12mm; 2a,3a,4a,4b 0.24mm) (Orig.)

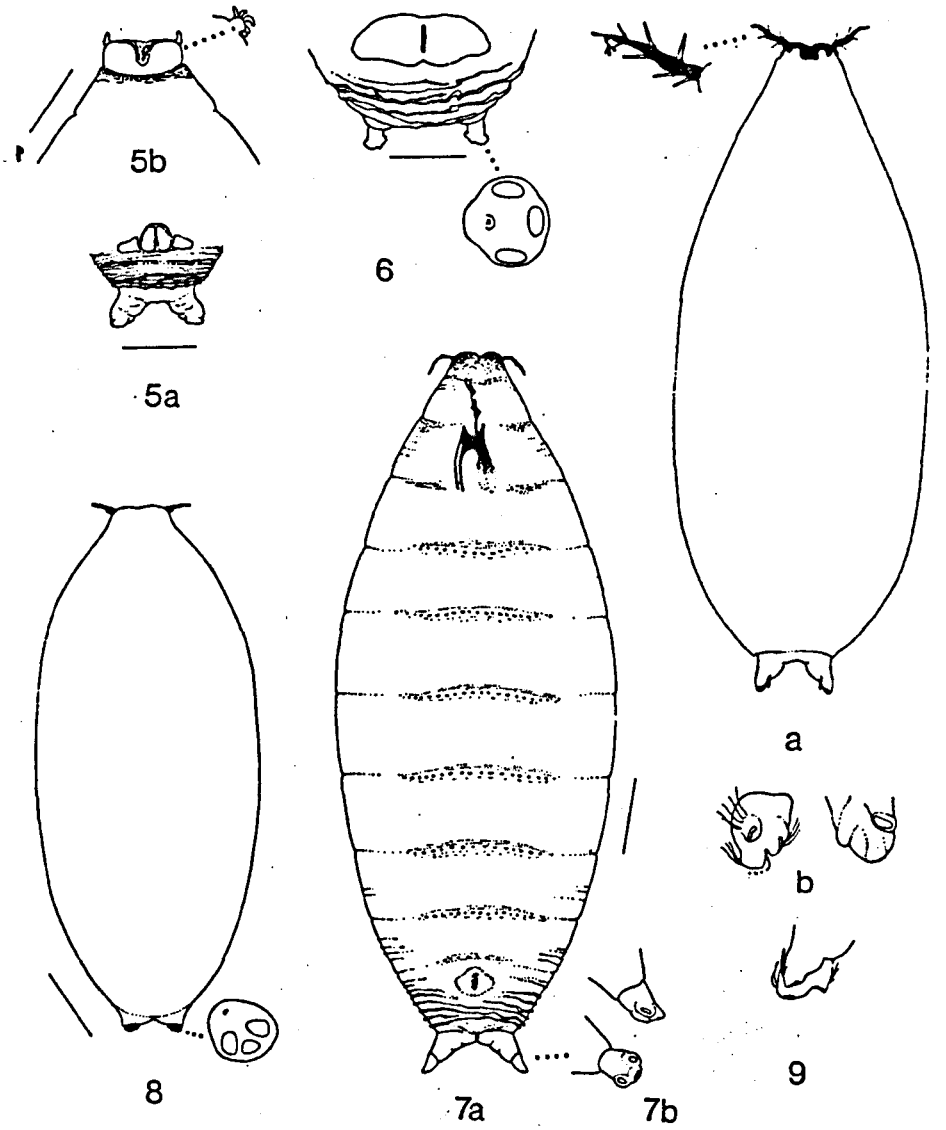

Fig. 5-9. **5** *Hemiosina bequaerti*, a, caudal segment of puparium (dorsal), b, thoracic segments showing detail of prospiracular process. **6** *Leptocera (s.str.) fontinalis*, caudal segment of puparium (ventral) showing detail of left anal spiracle. **7** *Opalimosina (Pappiella) liliputana*, a, puparium (ventral), b, anal spiracle in dorsal and frontal view. **8** *Pullimosina heteroneura*, puparium (dorsal) showing detail of right anal spiracle. **9** *Spelobia (s.str.) rufilabris*, a, puparium (dorsal) showing detail of prospiracular process, b, anal spiracle in various aspects. (Scales: 0.12mm) (Orig.)

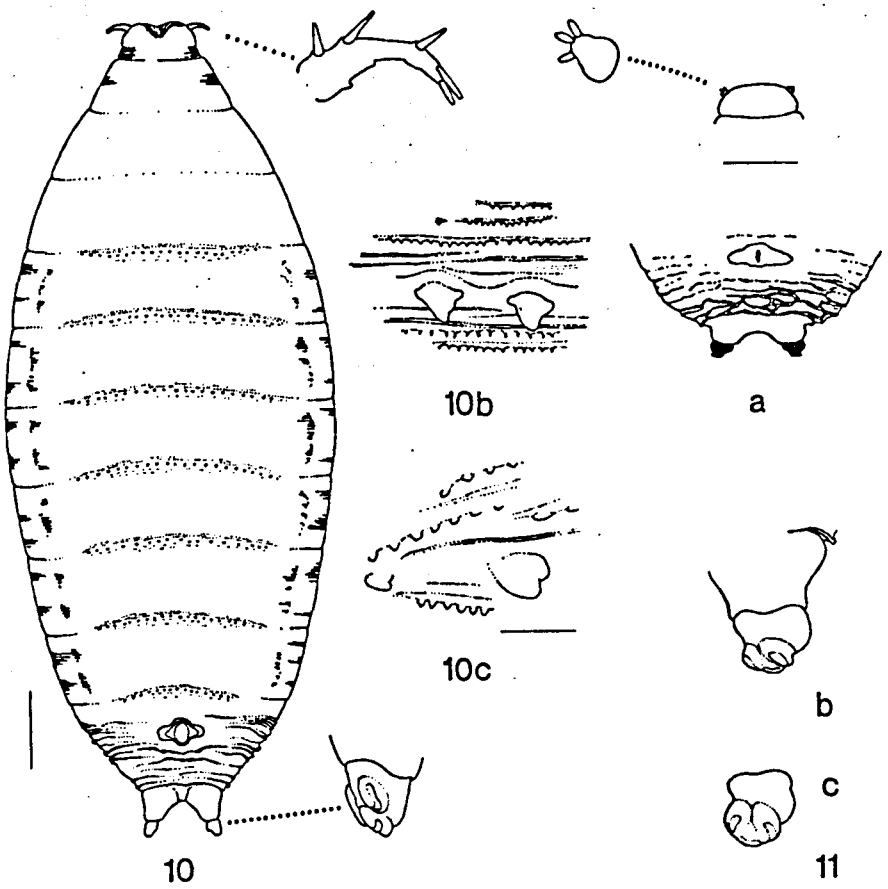

Fig. 10-11. 10 *Telomerina flavipes*, a, puparium (ventral) showing details of prospiracular lobes and anal spiracle, b and c, median and lateral section respectively of ventral ambulatory welt on abdominal segment 4. **11** *Terrilimosina racovitzai*, a, prothoracic and caudal segments of puparium in dorsal and ventral aspect respectively, showing detail of prospiracular process, b and c, two views of anal spiracle. (Scales: 10a and 11a, 0.12mm; 10b,c, 0.03mm) (Orig.)

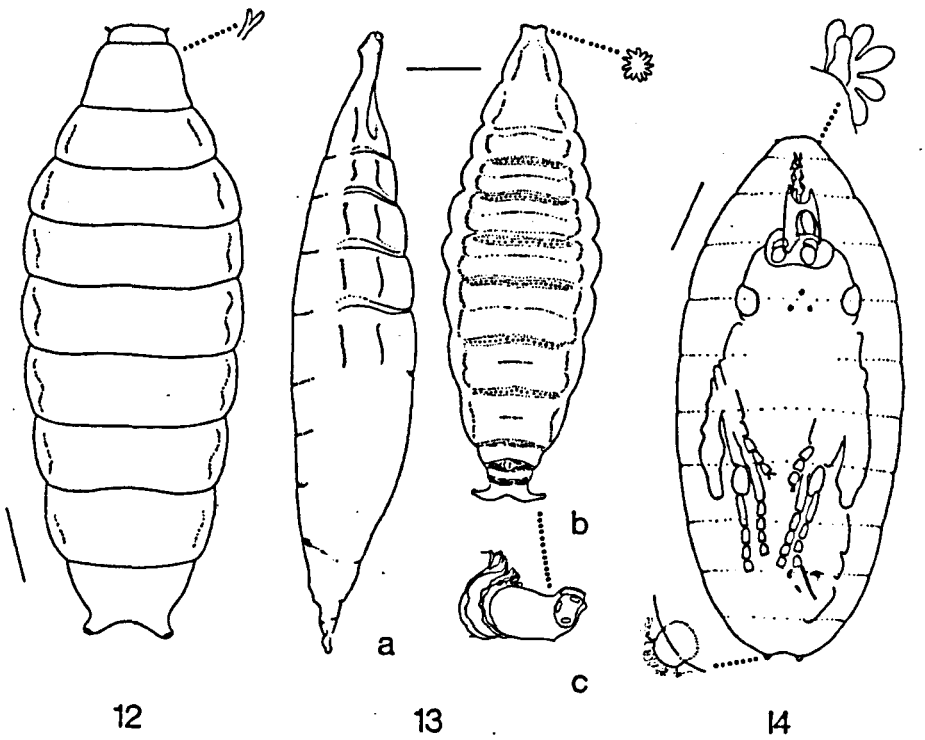

Fig. 12-14. 12 *Thoracochaeta brachystoma*, puparium (dorsal). **13** *T. zosterae*, a, puparium (lateral), b, same (ventral), showing details of prospiracular process, c, detail of anal spiracle. **14** *Trachyopella (s.str) coprina*, puparium with outline of adult inside, showing details of prospiracular process and anal spiracle. (Scales: 0.12mm) (Orig.)

Dimensions of puparia and adults

Apart from the superb works of Rohácek (1982-5) and Marshall & Rohácek (1984), which have set the very highest standards in taxonomic work in this family, most workers have omitted biometric details for adults, invoking an argument of extreme variability. Although most sphaerocerids vary in size intraspecifically, there are nevertheless considerable interspecific differences within the family. Rohácek & Marshall not only give the adult size range for each sex, but state the number of specimens examined. In puparial descriptions a single figure has usually been given but the number of specimens studied is rarely stated. The author has found some evidence to suggest that the ratio of adult to puparial length (A/P ratio) is not constant and there may be differences in this ratio between certain genera. Clearly these ratios can only be calculated from a large amount of biometric data. The details for puparia provided in this paper result mainly from material from archaeological excavations. The A/P ratio in the species studied lies mainly in the range 0.61-0.78:1. The puparial length given by Okely for *Opalimosina (s. str.) mirabilis* appears wildly excessive, especially when compared with the available details for *O. (Pappiella) liliputana* (Rondani) (see table 1). Also the bent form of the puparium of *O. mirabilis* figured by him is not a specific character but a malformation seen very commonly in many limosinines.

Table 1 Calculated Adult/Puparium Ratios for certain British species of Limosininae. Mean dimensions for adults calculated from the size-ranges given in Rohácek. Puparial lengths marked with an * from Okely, the remainder calculated from specimens examined by the current author.

Species	L. (Adult) mm	L. (Puparium) mm	A/P ratio
O. liliputana	1.45	2.28	.64
O. mirabilis	1.34	2.9*	.46
P. heteroneura	1.25	1.74	.70
P. moesta	1.50	2.1*	.71
P. pullula	1.39	2.0*	.70
S. rufilabris	1.64	2.16	.76
T. flavipes	1.41	2.31	.61
T. zosterae	2.34	3.5	.67

Prospiracular processes

These structures are clearly of great taxonomic significance as has been recognised by previous students of the group. Goddard (1938) and Okely rely almost wholly on these in

their keys to puparia. They range from short stellate or palmate structures to very long dendriform ones adorned with lateral, usually translucent linear papillae (see figs. 14, 1c and 9 for stellate, palmate and elongate dendriform types respectively). In the dendriform type the length of the processes relative to the space separating them provides a useful character (the P/P ratio). The British Limosininae are broadly categorised below on the calculated P/P ratios of their puparia. Whilst the papillae arising from the dendriform types are brittle and prone to loss, their points of attachment remain as distinct alveoli. As noted by Ferrar (1987) the pupal spiracles are internal.

Prospiracular process very short (P/P = up to 0.3:1):

Apteromyia claviventris; Chaetopodella scutellaris; Coproica (hirtula, ?lugubris); Herniosina bequaerti; Leptocera (s. str.) (caenosa, fontinalis, oldenbergi); L. (sg. Rachispoda) (fuscipennis); Limosina silvatica; Minilimosina (fungicola); Pteremis fenestralis; Thoracochaeta (brachystoma, zosterae); Trachyopella (s.str.) (coprina, lineafrons).

Prospiracular process medium to very long (P/P = 0.5-1.5:1):

Coproica (pusio, vagans); Elachisoma aterrima; Halidayina spinipennis; Opalimosina (s.g Pappiella) liliputana; O. (s.str.) (mirabilis); Pullimosina (heteroneura, moesta, pullula); Spelobia (Bifronsina) bifrons; S.(s.str.) (all known puparia including *rufilabris); Spinilimosina brevicostata; Telomerina (flavipes); Terrilimosina (racovitzai); Trachyopella (Nudopella) leucoptera.*

Anal spiracles

The taxonomic importance of these structures has been largely overlooked. Although the clear differences between the forms found in the three subfamilies has been long recognised, in the Limosininae they appear to have been ignored. It will be clear from the descriptions given below that they provide very promising characters.

Lateral muscle scars

The grooves along the sides of sphaerocerid puparia have been used as features of taxonomic importance but their utility in this regard is highly dubious as they result from differentials in cuticular tensions during pupariation. The parallel dorsal muscle scars on the caudal segment are similarly unlikely to be of major taxonomic significance.

Ventral ambulatory welts

These appear to be remarkably uniform throughout the family, consisting of a median row of 12-20 large rounded spicules with 3-5 rows of minute serrations before and 2-5 rows behind; laterally the large median spicules may diminish in size and the serrations increase so that all spicules become more nearly uniform in size (see fig. 10b,c).

Key to subfamilies The key in Okely requires some amendment as follows.

1. Anal spiracles on dorsal surface of caudal segment and hence invisible from ventral view (fig. 2a,3a,4a); anal spiracular slits encircling the scar which is central (fig. 4b) or inferior (fig. 2a,3a). Prospiracular process stellate (fig. 3a) or dendriform (fig. 2a).....*Sphaerocerinae*

- Anal spiracles on posterior surface of caudal segment, so visible from ventral and dorsal view.....2

2. Anal spiracle large, usually barely exserted, the peritreme usually in contact with the posterior face of caudal segment (fig. 1a); anal spiracular slits convergent upon median scar (fig. 1b). Prospiracular processes very short dendriform, stellate or palmate (fig. 1c), never elongate.....*Copromyzinae*

- Anal spiracles usually on tubercles exserted from posterior surface of caudal segment (figs. 5-14); respiratory slits peripheral, scar median. Prospiracular horns often very elongate, with lateral papillae (figs. 9a, 10), but sometimes stellate (fig. 13b) or palmate (fig.11a) .....*Limosininae*

Copromyzinae

The puparia of this family are surprisingly little known considering the extreme abundance of many of the species and the fact that our largest sphaerocerids belong here. *Alloborborus* is undescribed in the puparial state and only one *Borborillus* (i.e *sordidus* (Zett.)) is known. It is not yet possible to distinguish the described puparia of *Copromyza, Crumomyia* or *Lotophila.* The anal spiracles may sometimes appear to be slightly exserted (c.f *C. pedestris*) but their large size and convergent slits are diagnostic.

Copromyza (s.str.) similis (fig. 1) typifies the known puparia found in this subfamily. Prospiracular process palmate or very short dendriform with 5 to 7 dark lobes. Ventral ambulatory welts usually indiscernible apart from the row of large spicules. Intersegmental margins, dorsally and laterally with a conspicuous series of cuticular knots which, on the sides delimit the pleural sclerites. Anal spiracular plates large with very conspicuous convergent slits. Length, puparia 3.60-4.38mm (n=9); adults 3.12-3.78mm (n=9); A/P = .86. [Material studied, 6 puparia *ex* cow dung, Bentley Common, Doncaster (England), em. April 1974 and May 1976 (PS); 3 puparia *ex* dung Salterforth, Yorks., (England), em. 2 April 1949 (A. Brindle, coll. Manchester Museum). Many puparia from archaeological excavations at Hen Domen, Montgomery (Wales), Tuquoy, Westray (Orkney) and Stóraborg (Iceland) also examined, but these probably include *C. (s.str.) equina.*]

Dimensions given in the literature for puparia of other copromyzines are:

Copromyza (s.str.) equina, 3.5-3.8mm (n = 6, Goddard)
C. stercoraria, 3.64mm (n = 1, Goddard)
C. fimetaria, 3.3mm (Okely)
Crumomyia (s.str.) nigra, 4.5mm (Okely)
C. notabilis, 3.4mm (Goddard, *sub nom. glacialis*)

C. (Apterina) pedestris, 3.5mm (Deeming & Knutson, 1966)
Ferrar (1987) figures the third instar larva, showing details of anal spiracles and cephalopharyngeal skeleton, of *Borborillus sordidus*.

Sphaerocerinae

The described sphaerocerine puparia (i.e *Ischiolepta pusilla* and *scabricula*, and *Sphaerocera curvipes* and *monilis*) are unlikely to be confused with those of the other subfamilies. The unusual position of the anal spiracles, on the dorsal surface of the caudal segment, with their central or inferior scar and the arrangement of their slits (when visible) are characteristic of this subfamily. Prospiracular processes often of aberrant form (figs. 2a,3a). *S. curvipes* is the largest species, exceeding 3mm in length, shiny black in colour with small, stellate 8-lobed prospiracular processes. *I. scabricula* is the smallest at about 1.8mm. Okely separates *S. monilis* and *I. pusilla* on the number, colour and shape of prospiracular processes. In *I. pusilla* the form is of an aberrant stellate type and the lobes (up to 5) are remarkably broad, leaf-like and pale in colour (fig. 3a). Okely's figure of *I. scabricula* shows that this structure is similar in that species. In stark contrast are the processes seen in *S. monilis* and *I. denticulata* (fig. 2a) which are truly dendriform with long stout black spiniform papillae.

The details for the specimens figured here are as follows:
Ischiolepta denticulata (fig. 2), Length, puparium 2.20mm; adult 1.85mm *ex* old cow-dung, Bentley Common, Doncaster (England) em. May 1976 (PS)
I. pusilla (fig. 3), Length, puparium 2.22mm; adult 1.95mm Victoria Park, Manchester (England), em. 10 June 1924 (L.W. Grensted; Manchester Museum)
Sphaerocera curvipes (fig. 4), Length, puparia 3.36-3.85mm (n = 7) (Goddard); adults 3.05-4.20mm (n = 9) [Material studied, 7 incomplete puparia from Tuquoy excavation on Westray (Orkney).]

Limosininae

The puparia of six genera are unknown (i.e *Gigalimosina, Kimosina, Opacifrons, Philocoprella, Paralimosina* and *Puncticorpus*). Goddard and Okely emphasised the taxonomic significance of the prospiracular processes and the P/P ratios, but unfortunately their descriptions and figures gave little information on the anal spiracles. In all species examined by the author however, and in the better published figures, the slits appear to be peripheral, the median one lying parallel with the edge of the peritreme. Furthermore, the slits are often on raised bosses, separated from each other by deep fissures. In *Spelobia* these bosses are peculiarly angulate giving a very distinctive uneven hoof-like silhouette to the spiracular plate (fig. 9b).

Most authors have commented upon the whitish or very pale colour of some limosinine puparia. This is particularly the case in *Pullimosina* (perhaps all species), but is also noted by Okely in *Coproica pusio* and *Spelobia (Bifronsina) bifrons*.

In the treatment below dimensions for adults are mostly from Rohácek.

Genus *Apteromyia* Vimmer

Okely and Rohácek figure the puparium of the single species *A. claviventris*, pointing out that the figure in Richards (1930) was drawn from a damaged specimen. Prospiracular processes elongate dendriform (P/P = 0.3:1) with 4 short lobes. Anal spiracles on short, thick tubercles, their slits on low rounded protuberances and apparently peripheral. Ventral ambulatory welts with usual transverse row of large rounded spicules, preceded and succeeded by 3 rows of much smaller ones. Length, puparium (not stated by Okely); adults (male) 1.49-2.08mm (n = 171), (female) 1.47-2.50mm (n = 157).

Genus *Chaetopodella* Duda

Rohácek figures details of all three larval instars and the prospiracular horns and anal spiracles of the mature larva of the single species *C. scutellaris*, but the puparium remains undescribed. Prospiracular horns short dendriform with 9 lobes. Anal spiracles with the typical peripheral alignment of the slits. Length of adults (male) 1.43-1.85mm (n = 243), (female) 1.51-1.87mm (n = 380).

Genus *Coproica* Rondani

Okely figures the puparia of two species (i.e. *C. hirtula* and *pusio*), whilst Goddard figures *C. vagans*. Anal spiracular slits clearly peripheral but the species differ in the length of the prospiracular horns (see below). Also, Okely says that whilst *C. hirtula* is black, *pusio* is white. Goddard does not give the colour of *C. vagans*.

P/P = over 1:1. Length 2.1mm *C. pusio* (= *pseudolugubris* (Duda))
P/P = *c.*0.5:1. Length 2.4-2.62mm *C. vagans*
P/P = *c.* 0.25:1. Length 1.5-1.75mm *C. hirtula.*

Ferrar gives spiracular details of *C. lugubris*; prospiracular horns long dendriform with 12 close-set lobes and anal spiracular slits again peripheral. P/P not calculable from his figure.

Genus *Elachisoma* Rondani

Okely figures *E. aterrima* stating that it is very like *Halidayina spinipennis* but smaller. Prospiracular horns extremely long (P/P = *c.* 1.5:1) with 7 short pale papillae. Length, puparium 1.6mm (Okely); adults 0.6-1.2mm (Rohácek).

Genus *Halidayina* Duda

According to Okely this differs from the previous one only in the larger size. His figures suggest a very strong resemblance to *Spelobia s. str.* with a P/P about 1:1 and anal spiracles similarly exserted. Length, puparium 1.95mm (Okely); adults (male) 1.01-1.28mm (n = 982), (female) 1.03-1.63mm (n = 1252).

Genus *Herniosina* Rohácek

H. bequaerti, the only species, is one of the larger limosinines. Prospiracular process subpalmate with 6 lobes; anal spiracles rather inflated and situated on broad tubercles (fig. 5). Length, puparia 2.54-3.51mm (n = 14) (Goddard gives 3mm); adults (male) 2.26-2.72mm (n = 32); (female) 2.22-3.05mm (n = 34). [Material studied - 13 puparia, Stóraborg farm excavation (Iceland); 1 puparium Buiston Crannog excavation, Kilmarnock (Scotland). Males were dissected from unhatched puparia from both sites.]

Genus *Leptocera* Olivier

Four species are known in the puparial state (i.e *L. (s. str.) caenosa, fontinalis* and *oldenbergi*, and *L. (Rachispoda) fuscipennis*. In *L. fontinalis* (fig. 6), which is a rather large species, prospiracular lobes extremely short, simple (?palmate), with very short lobes; anal spiracles shiny black, abruptly contracted below peritremes but swollen basally and situated on prominent, widely separated tubercles. Length, puparia 3.19-3.78mm (n = 18) (Okely gives 3-3.3mm); adults 2.40-3.48mm (n = 4). [Material studied - 8 puparia 4 Bessastaðir and Stóraborg excavations (Iceland); 7 puparia from Tuquoy, Westray (Orkney); 3 puparia Papa Stour (Shetland).]

L. oldenbergi is according to Okely smaller than *fontinalis* with similarly extremely short prospiracular processes. Length 2.85mm. Ferrar figures *L. (Rachispoda) fuscipennis*, again showing very short prospiracular horns.

Genus *Limosina* Macquart

L. silvatica, the only species, reaches a rather larger size than any other limosinine. Prospiracular horns very short, subpalmate with 7 lobes. Goddard says that the anal spiracular discs are flattened and directed inwards. Length, puparia 3.42-3.82mm (n = 5, Goddard); adults (male) 2.86-3.61mm (n = 144); (female) 3.02-3.73mm (n = 157). [Material examined, 9 incomplete puparia from Tuquoy, Westray (Orkney); 4 from Bessastaðir (Iceland); 1 from Stóraborg (Iceland).]

NB. *Gigalimosina flaviceps* is only slightly smaller than *silvatica* so should have a large puparium. Length, adults 2.66-3.50mm (n = 236).

Genus *Minilimosina* Rohácek

The only species known in the puparial stage is *M. (s. str.) fungicola*, in which the prospiracular processes are very small, palmate, and 3-lobed. Anal spiracles minute, on distinct though short tubercles. Length, puparia 1.68-1.86mm (n = 3) (Goddard gives 1.8mm); adults (male) 1.03-1.35mm (n = 93); (female) 1.14-1.61mm (n = 113). [Material studied, 3 puparia from Tuquoy excavation, Westray (Orkney) tentatively referred to this species on the form of the female spermathecae and cerci.]

Genus *Opalimosina* Rohácek

Puparia of two species are known although Okely's description of *O (s. str.) mirabilis* is based on a deformed specimen and there is clearly some mistake with the dimensions given. P/P = *c.*0.6:1 with up to 4 elongate lobes. It appears likely that the species is extremely similar to the next one. Length, puparium "2.9mm" (Okely); adults (male) 1.04-1.45mm (n = 142); (female) 1.05-1.65mm (n = 127).

O. (Pappiella) liliputana (fig. 7) has elongate dendriform prospiracular horns curved backwards, with 6 long pale lobes; P/P = *c.* 0.5:1. Anal spiracles noticeably slender triangular in dorsal view, on long, distally narrowed tubercles (very similar to *Telomerina flavipes* but slits relatively smaller). Length, puparia 2.16-2.40mm (n = 48); adults (male) 1.23-1.58mm (n = 83), (female) 1.34-1.81mm (n = 102). [Material studied, 48 puparia, including unhatched males showing genital characters perfectly, Tuquoy excavation, Westray (Orkney).]

Genus *Pteremis* Rondani

The puparium of *P. fenestralis* is figured and described by Okely. Prospiracular horns palmate, with up to 3 lobes. Anal spiracles clearly exserted, but more detailed structure indiscernible from his figures. Length, puparium 2.6mm (Okely). Rohácek regards this as a subgenus of *Leptocera.*

Genus *Pullimosina* Rohácek

The puparia of three species have been described and figured (i.e *P. heteroneura, moesta* and *pullula*). The writer has also examined puparia of *P. heteroneura.* Okely says puparia of *heteroneura* are white, a fact which my experience confirms, whilst in *moesta* they are pale yellow. Goddard gives the colour of *heteroneura* as light yellowish brown, but possibly some discolouration may emanate from their environment. In all three species the prospiracular processes are elongate dendriform (P/P up to 0.6:1). Goddard's figure for *heteroneura* differs from mine (fig. 8) in the degree of exsertion of the anal spiracles but the disparity is inconclusive. Rohácek gives electroscan photographs of the anal spiracles of *pullula*; here the slits appear to be on slightly raised prominences and peripherally arranged. Okely details his laboratory rearing of *pullula*, stressing the parthenogenesis found in this species. Lengths for the three species are as follows.

P. heteroneura, puparia, 1.56-1.92mm (n = 75)(Goddard gives 2-2.1mm, n = 8); adults (male) 0.95-1.44mm (n = 220), (female) 1.04-1.56mm (n = 252). [Material studied, 75 puparia, some containing male adults, from excavation at Tuquoy, Westray (Orkney).]

P. moesta, puparia, 2.1mm (Okely); adults (male) 1.14-1.52mm (n = 137), (female) 1.26-1.87mm (n = 155).

P. pullula, puparia, 2.0mm (Okely); adults (male) 1.11-1.23mm (n = 2), (female) 1.07-1.71mm (n = 294).

Genus *Spelobia* Spuler

Puparia of 9 species are known, the most aberrant being *S. (Bifronsina) bifrons*, the smallest member of the genus and the only one in the subgenus. In this species the puparium is white (Okely). The dimensions for this species are given below.

Puparia of *Spelobia s.str.* are exceedingly similar and probably indistinguishable on external characters. In all known puparia the prospiracular horns are elongate dendriform with a P/P ratio about 1:1 (except *S. pseudosetaria* at 0.6:1 (Richards) and *parapusio* at 0.8:1 (Roháček); all have conspicuous lateral translucent papillae. Anal spiracles strongly exserted, on conspicuous basal tubercles. Figure 9 shows the puparium of *S. rufilabris* and attention is drawn to the peculiar shape of the anal spiracles in which the slits are arranged on sharply raised bosses separated by very deep fissures. *Spelobia (s.str.) luteilabris* has an identical anal spiracle and the electroscan photograph of *S. parapusio* in Roháček shows the same structure. It is impossible to conclude anything from the figures in Okely and Goddard in this feature but it is most likely that all members of this subgenus will be identical in the form of the anal spiracles. Dimensions for members of the genus are as follows.

S. (Bifronsina) bifrons, puparia 1.6mm (Okely); adults (male) 1.07-1.26mm (n = 51), (female) 1.19-1.56mm (n = 81)
S. (s.str.) clunipes, puparia 2.16-2.55mm (Goddard and Okely *sub nom. crassimana* and *manicata*); adults (male) 1.51-2.58mm (n = 1007), (female) 1.59-2.50mm (n = 1136)
S. luteilabris, puparia 2.58(PS)-2.6mm(Okely); adults (male) 1.55-2.08mm (n = 115), (female) 1.59-2.30mm (n = 140). [Material studied, 1 puparium with unhatched male adult, Tuquoy excavations, Westray (Orkney).]
S. palmata, puparium 2.66mm (Goddard); adults (male) 1.70-2.18mm (n = 122), (female) 1.69-2.62mm (n = 146)
S. parapusio, puparia 2.2mm (Okely); adults (male) 1.67-1.81mm (n = 2), (female) 1.58-2.22mm (n = 259). A parthenogenetic species.
S. pseudonivalis, puparia 2.6mm (Okely); adults (male) 1.98-2.78mm (n = 7), (female) 1.82-2.58mm (n = 17)
S. rufilabris, puparia 1.92-2.40mm (n = 959); adults (male) 1.50-1.79mm (n = 25), (female) 1.70-2.06mm (n = 21). [Material studied, 959 puparia, many with unhatched male adults, Tuquoy excavation, Westray (Orkney)]. NB. It is highly likely that some of the hatched puparia from Tuquoy belonged to *S. luteilabris* although in such localities the present species appears much commoner. Some wings from the same site were more like *S. clunipes* in the broad alula so puparia of that species too may have been present.
S. talparum, puparia 2.35mm (Goddard); adults (male) 1.52-2.10mm (n = 112); (female) 1.61-2.24mm (n = 215)

Genus *Spinilimosina* Roháček

Ferrar figures the prospiracular horns of *S. rufifrons* (Duda), showing them to be elongate dendriform (P/P = 1.5:1).

Genus *Telomerina* Roháček

The puparium of *T. flavipes* (fig. 10) is very like that of *Opalimosina liliputana* but of a rather larger average size and with anal spiracular slits relatively larger. Length, puparia 1.74-2.88mm (n = 1536); adults (male) 1.15-1.43mm (n = 32), (female) 1.31-1.67mm (n = 54). [Material studied, 1119 puparia from various farmstead sites in the Western Settlement at the head of Godthaabsfjord (West Greenland); 28 puparia from Stóraborg excavation and 13 from that at Bessastaðir (Iceland); 360 puparia from Pluscarden Priory, Nairn (Scotland); 1 puparium from Hen Domen, Montgomery (Wales); 6 puparia from Buiston Crannog, Kilmarnock (Scotland); 3 from "Barrel Latrine", Worcester (England); 4 from Taunton excavation, Somerset (England). Unhatched males were dissected from puparia from all of the above sites]

NB. This fly appears to have been the commonest limosinine eusynanthrope of the Viking settlements in Iceland and probably the only one to reach West Greenland. The species is unknown in Greenland today (Henrikson, 1937) and it presumably shared the demise of the early nordic settlers who took it there from Iceland.

Genus *Terrilimosina* Roháček

The puparium of *T. racovitzai* is figured here (fig. 11) for the first time and no other species has been described in the literature. Prospiracular processes very short palmate with 3 lobes (fig. 11a). Anal spiracles bulbous basally and constricted below peritreme (fig. 11a,b,c), shiny black in colour, on short broad tubercles. Length of puparia 2.19-2.68mm (n = 43); adults (male) 1.35-1.79mm (n = 26), (female) 1.63-2.22mm (n = 41). [Material studied, 43 puparia, 3 containing unhatched males, Pluscarden Priory, Nairn (Scotland).]

Genus *Thoracochaeta* Duda

Puparia of two British species have been described and figured and are treated here. Confusion between them is unlikely due to their great disparity in size and morphology. *T. brachystoma* (fig. 12)) is a very small species with simple bilobed prospiracular processes (fig. 12b); anal spiracles on rather long processes which are directed outwards distally. *T. zosterae* is much larger and has been figured by many authors (eg. Richards 1930, Egglishaw 1961, Pitkin 1988, Smith 1989, Belshaw 1989 etc.), being a very familiar and easily recognised inhabitant of littoral wrack beds. The integument is thick and often opaque blackish in colour whilst the long outwardly directed anal spiracular processes and generally flattened form with "crimped margins" give a highly distinctive appearance (fig. 13a,b). Prospiracular processes stellate with up to 12 radially arranged lobes (fig. 13b). Anal spiracular slits peripheral (fig. 13d). Dimensions are as follows.

T. brachystoma, puparia 1.73-2.17mm (n = 17); adults 1.32-1.68mm (n = 3).[Material studied, 17 puparia, some with unhatched adults, collected from decaying seaweed on foreshore at Howbeg, South Uist (Scotland).]

NB. According to Tenorio (in Ferrar, *op. cit.*) the larvae of the two species dealt with here are very alike but in this one there are 6 prospiracular lobes and in the next one 9.

T. zosterae, puparia 3.02-4.2mm (n = 362); adults (male) 1.74-2.40mm (n = 10); (female) 2.04-2.94mm (n = 5). [Material studied, 27 puparia from rotting seaweed on Howbeg foreshore, South Uist (Scotland); 27 from Tuquoy excavation, Westray (Orkney); 302 from Taunton excavation, Somerset (England); 4 from "Barrel Latrine" excavation, Worcester (England); 2 from Bessastaðir palace excavation (Iceland).]

NB. Despite the highly distinctive appearance of the puparium of this fly it has been the cause of much confusion in an archaeological context. Belshaw (*op. cit.*) noted that records of the Urinal fly *Teichomyza fusca* Macquart from archaeological sites in Britain had proved to belong to *T. zosterae*. This discovery has provoked considerable consternation amongst historians. Why was this fly, which is only known to breed in seaweed, so common around human habitations in medieval England ? Had there been a widespread trade in seaweed throughout the country, or has the biology of the fly undergone some major change ? Pitkin draws attention to modern inland records of this fly, but these are very rare and probably the result of casual importations.

Genus *Trachyopella* Duda

Descriptions of the puparia of three species occur in the literature and one of these is here figured (fig. 14). Okely figures and describes *T. (Nudopella) leucoptera* in which the prospiracular horns are elongate dendriform (P/P = *c.*0.6:1), with 4 pale lobes. Anal spiracles on very long, broad-based processes, similar to *T. zosterae* in relative length. Length 2.1mm (Okely).

The other two described puparia belong to *Trachyopella s.str.* Like the previous one they are translucent, pale yellowish brown. In *T. lineafrons* according to Okely the prospiracular processes are very small, palmate with up to 4 lobes, whilst the anal spiracles are strongly exserted on large tubercles. Tenorio (in Ferrar, *op. cit.*) showed that the larval mouth-hooks are strongly serrate; an unique feature amongst known sphaerocerids and usually regarded as indicating a phytophagous mode of life. Length 1.8mm (Okely).

Assuming the reliability of Okely's figure for the last species, *T. coprina* differs very strikingly in the absence of anal spiracular tubercles, for here the spiracles are hardly exserted at all (fig. 14). Goddard's figure for this species agrees perfectly with specimens seen by the present writer in this regard, but he states that the prospiracular processes are only 3 lobed. The number clearly varies and often reaches 6 (fig. 14), arranged in a stellate fashion. Length of puparia 1.32-1.74mm (n = 9313). [Material studied, 9313 puparia, many containing adults (both sexes), Tuquoy excavation, Westray (Orkney).]

Acknowledgements

This work is part of a doctorate generously funded by the Archaeological Operations and Conservation section, Historic Buildings and Monuments, Scottish Development Department, Edinburgh, through the kind offices of Dr. P.C. Buckland of Sheffield University, my tutor in this course of study. It is to them that my greatest debt of gratitude is acknowledged. It is also through Dr. Buckland that material from archaeological excavations in which he has been involved has reached me. Amongst others to whom I offer thanks are Dr. B.R. Pitkin of the Natural History Museum, London, for confirmation of

some of my identifications, Dr. J. Sadler of Sheffield University for information on excavation details and to my long-standing friend Colin Johnson of Manchester Museum for the loan of some material from the collections of that institution.

References

Baker, P. & Higham, R. (1982) Hen Domen Montgomery. A Timber Castle on the English-Welsh Border *The Royal Archaeological Institute* **1**: 67-71

Belshaw, R. (1989) A Note on the Recovery of *Thoracochaeta zosterae* (Haliday) (Diptera: Sphaeroceridae) from Archaeological Deposits *Circaea* 6(1): 39-41

Buckland, P.C. (1983) Norsemen at Nípáitsoq, Greenland. A Palaeoecological Investigation *Norw. Arch. Rev.* 16(2): 86-98

Egglishaw, H.J. (1961) The Life History of *Thoracochaeta zosterae* (Hal.) (Dipt., Sphaeroceridae) *Entomologist's mon. Mag.* 96: 124-128

Ferrar, P. (1987) A Guide to the Breeding Habits and Immature Stages of the Diptera Cyclorrhapha *Entomonograph* 8; 907pp

Greig, J. (1981) The Investigation of a Medieval Barrel-latrine from Worcester *Journal of Archaeological Science* 8: 265-282

Henriksen, K.L. (1937) A Revised Index of the insects of Greenland *Medd. om Gronland* 119(10); 111pp

Leach, P. (1984) The Archaeology of Taunton *Western Archaeological Trust Excavation Monograph* 8; 202pp

McGovern, T.H. et al (1983) A Study of the Faunal and Floral Remains from the Norse farms in the Western Settlement, Greenland *Arctic Archaeology* 20(2): 99-120

Marshall, S.A & Rohácek, J. (1984) A Revision of the Genus *Telomerina* Rohácek (Diptera, Sphaeroceridae) *Systematic Entomology* 9: 127-163

Okely, E.F. (1974) Description of the puparia of twenty-three British species of Sphaeroceridae (Diptera, Acalyptratae)

Trans. R. ent. Soc. Lond. 126(1): 41-56

Pitkin, B.R. (1988) Lesser Dung Flies (Diptera, Sphaeroceridae) *Handbk. Ident. Br. Ins.* 10(5e); 175pp

Richards, O.W. (1930) The British Species of Sphaeroceridae (Borboridae, Diptera) *Proc. Zool. Soc. Lond.* 2(18): 18-348

Rohácek, J. (1982-5) A monograph and reclassification of the previous genus *Limosina* Macquart (Diptera, Sphaeroceridae) of Europe *Beitrage zur Entomologie* Pt. 1 (1982) 32(1): 195-282; Pt. 2 (1983) 33(1): 3-195; Pt. 3 (1984) 33(2): 203-255; Pt. 4 (1985) 35(1): 101-179

Skidmore, P. (1984) The Biology of the Muscidae of the World *Series Ent.* 29; 550pp

Smith, K.G.V. (1986) A Manual of Forensic Entomology. Brit. Mus. (Nat. Hist.); 206pp

Smith, K.G.V. (1989) An Introduction to the Immature Stages of British Flies *Handbk. Ident. Br. Ins.* 10(14); 280pp

Sveinbjarnardóttir, G. et al (1981) Excavations at Stóraborg: a palaeoecological approach *Arbók hins Islenska fornleifarfélags* 1980; 17pp

P. Skidmore *169 Carr House Road, Doncaster, South Yorkshire, DN4 5DP*

22

APPENDIX TWO SITE ANALYSES

Introduction In this section are included the detailed analyses of all of the major sites discussed in this Thesis. The minor sites merely appear in brackets here, their content being limited to a very few specimens and hence not warranting inclusion here. They appear in the main body of the Thesis. A rigid format is adhered to here in which the numerical totals relate only to the Minimum Number of Individuals (MNI) of Dipterous material. Total MNI numbers for samples, subgroups and total sites are given.

ENGLAND

(1 BRIGG RAFT)

(2 CATTERICK CAMP)

3 LEICESTER CAUSEWAY

Table 40 Diptera of the Leicester Causeway Excavation

Taxon	1,16	1,23				1,24		1,25	1,26	1,28		1,31	1,42	1,45	
	405	230	318	343	358	376	432	463	325	221	390	412	240	784	763	MNI
Scatopse notata															1	1
Oxycera sp.			1													1
Eristalis tenax	100	3														103
Sepsid sp.						20										20
Limosinine sp.						40										40
Thoracochaeta zosterae									1						1	2
?Telomerina flavipes															4	4
Sphaerocerid sp.	2															2
Agromyzid sp.														2		2
Drosophilid sp.								1								1

?Chloropid sp.			2																	2
Fannia ?scalaris	16		7																	23
Puparia indet. A										1										1
" " B										1										1
" " C										1					1	1				3
" " D			1	1							1									3
Total MNI	118	13	2	-	-	60	-	4	2	-	-	1	1	2	6	290				

Taxon	2,01					2,03				2,04					2,13	2,14	
	510	521	540	568	579	604	615	503	509	513	537	570	587	766	245	482	MNI
Scatopse notata						1											1
?Hayetiola sp.							1										1
Chloromya formosa			3		8												11
Eristalis tenax					60												60
Sepsid sp.		2															2
?Tephrochlamys rufiventris					1												1
?Ischiolepta sp.									1								1
Limosinine sp.		1	2														3
Thoracochaeta zosterae					2	36				18			1				57
?Telomerina flavipes		5	9											3			17
?Trachyopella sp.					1												1
Agromyzid sp.							1	2		2							5
?Scatella sp.	1	28						2									31
Drosophilid sp.		1															1
Acalypterate sp.		1										1					2
?Botanophila fugax		1															1
Anthomyiid sp.										1		1					1

Fannia scalaris		1	1	1	1	2				2	1						9
?Hydrotaea dentipes		1															1
?Spilogona sp.		1															1
?Muscid sp.		1															1
Total MNI=	1	43	15	1	73	39	2	4	1	23	1	2	1	3	-	-	209

Taxon	2,13	2,14	2,15			2,16			2,33	2,34	3	Ph,?			
	245	482	206	207	213	218	231	235	257	703	704	234	342	371	F?	MNI
Scatopse notata			9	2												11
Megaselia ?rufipes			2													2
M. ?nigra							1									1
Sepsid sp.										1						1
?Tephrochlamys rufiventris			23													23
Heleomyza ?captiosa				11												11
?Ischiolepta sp.										1						1
Limosinine sp.			8	1												9
Thoracochaeta zosterae			170	161						1		1				333
?Telomerina flavipes			3	8						1						12
Hydrellia sp.								1								1
?Scatella sp.	1		30							1	1					33
?Chloropid sp.			1													1
Acalypterate sp.			1													1
Anthomyiid sp.			1													1
Fannia canicularis															1	1
F. scalaris			68	26												94
?Hydrotaea dentipes		1														1
Puparium C	1		1		1	5										8

D									1					2	1		4
E				1			1										2
F					1												1
Total MNI=	2	1	318	210	1	6	1	1	1	5	1	1	2	1	1		552

Total MNI for Leicester Causeway= 970

NB. Upper line of figures give the Phase categories which relate to main dating periods thus- 1,16 (50-120); 1,23, 1,24, 1,25, 1,28, 1,42, 1,45 (120-200); 1,26, 1,31 (250-300); 2,01, 2,04, 2,13, 2,14, 2,15 (pre-1100); 2,03 (1100-1250); 2,16, 2,33, 2,34 (pre-1400); 3 (early post-medieval). Phase not given for samples 342, 371 and F ?(3664 686). The lower figures refer to the sample numbers, prefixed F in Appendix

---

Samples from this site are interpreted below as uncontaminated or as putrid on the basis of the presence or absence of species indicative of cess (see Table 2, page 153). Feature descriptions and dates etc. were provided with the specimens.

Box- Area 1 Med. RB.

[Phase 1,23- 120- 200] [Uncontaminated]

F318 1553 067 [Roman well]

Stratiomyid (?*Oxycera* sp.) 1 larva; 1 Julid; 1 Polydesmid, MNI= 1

F343 860 384,1 [Roman ditch]

c.30 small Julids; 1 Elaterid larval anal segment

F358 824 370 [Roman pit]

indet.sp.D 1 puparium MNI= 1

[Phase 1,24- 120- 200] [Uncontaminated]

F432 [Roman post-hole]

c.50 small Julids

F463 1507 670

Cyclorrhapha puparia indet. sp.A 1, sp.b 1, sp.C 1; 3 Julids MNI= 3

F463 1554 675 [Roman pit]

Drosophilid sp. 2 puparia; 3 small Julids MNI= 2

[Phase 1,25- 120- 200] [Uncontaminated]

F325 701 305 [Roman linear feature spread]

Thoracochaeta zosterae 1 puparium MNI= 1

[Phase 1,26- 250- 300] [Uncontaminated ?]

F221 315 31 [Roman pit]

Cyclorrhapha puparium indet.sp. 1; c.10 Julids MNI= 1

[Phase 1,28- 120- 200] [Uncontaminated ?]

F390 993 453 [Roman pit]

Cyclorrhaphan puparium indet.sp.D 1 MNI= 1

F412 [Roman pit]

Cyclorrhaphan puparium indet.sp.C 1; 1 Julid MNI= 1

[Phase 1,31- 250- 300] [Uncontaminated]

F240 349 90

Cyclorrhaphan indet.,sp.C 1 puparium MNI= 1

F240 381 89 [Roman linear feature]

c. 50 Julids

[Phase 2,13- pre 1100] [Uncontaminated]

F245 437 142 [Medieval pit]

?Ephydrid sp.indet. 1 puparium (superficially very like *Thoracochaeta* but anal plate much further from bases of posterior spiracles), MNI= 1

[Phase 2,14- pre 1100] [Putrid ?]

F482 127 588 [Medieval pit]

Hydrotaea (Hydrotaeoides) ?dentipes 1 puparium MNI= 1

[Phase 2, 16- pre 1400] [Uncontaminated ?]

F213 341 51 [Medieval ?cess pit]

Cyclorrhaphan indet. sp. C 1 puparium MNI= 1

F218 305 68

Cyclorrhaphan indet. sp. C 3 puparia; 1 Julid MNI= 3

F218 305 68.3 [Medieval well]

Cyclorrhapha puparia indet. sp. C 2, sp. E 1 MNI= 3

F231 395 86 [Medieval pit]

Megaselia ?nigra 1 puparium; 2 Julids MNI= 1

F235 383 850 [Medieval rubbish pit]

Hydrellia sp. 1 puparium; 1 Julid; 2 Polydesmids; 1 *Acicula* MNI= 1

F257 (476) [201]

indeterminate concretion

F257 491 204 [Medieval well]

Cyclorrhaphan indet. sp. D 1 puparium MNI= 1

[Phase 3- post early-medieval] [Putrid]

F234 374 72 [Post-medieval pit]

Thoracochaeta zosterae 1 puparium MNI= 1

[Phase ?- not stated] [Uncontaminated ?]

F342 845 379 [Not stated]

Cyclorrhaphan puparia indet. sp. D 2 MNI= 2

F371 908 396 [Not stated]

Cyclorrhaphan indet. sp. D 1 puparium MNI= 1

Subtotal for Box Area 1 Med, 11 phases; 24 samples; 185 specimens

Box Area 1 Priority‡ F106, F207, F230, F376, F405

[Phase 1, 16- 50- 120] [Putrid]

F405 Area 1RB-

F405 1753 775

Fannia ?scalaris 6 puparia, Sphaerocerid sp. 2 puparia; 1 Julid MNI= 8

F405 1753 775.3

Fannia ?scalaris 10 puparia, puparium sp.D 1, 2 Julids MNI= 11

F405 1753 775.4 [Roman well]

Eristalis tenax, c.100 larvae, including at least 2 prepupae MNI= 100

[Phase 1, 23- 120- 200] [Putrid]

F376 Area 1 RB-

F376 (1038) [508] [Roman pit]

Indeterminate, totally mineralised concretions but one possibly a *Fannia* puparium and another a different Cyclorrhaphous puparium. In a third tube under same coding c.60 puparia apparently of Sepsidae and Limosininae MNI= 62

Bag F230 RB Area 1-

[Phase 1, 23 120- 200] [Putrid]

F230 1627 782

Fannia sp. 5 puparia MNI= 5

F230 1627 782

Eristalis sp. 3 calcified larvae MNI= 3

F230 1627 782

Puparium sp.D 1, ?Chloropid puparia 2, 2 Julids, 1 Polydesmid MNI= 3

F230 1228 575 [Roman well]

Fannia sp. 2 puparia MNI= 2

Bag F206 MED From Flots-

[Phase 2, 15 pre 1100] [Putrid]

F206 757 747

Thoracochaeta zosterae 132 puparia, 1 mineralised adult showed the very strong mid-tibial dorsal bristles; 10 Julid and Polydesmid fragments MNI= 132

F206 757 765

Acalypterate sp.indet. 1 puparium MNI= 1

F206 760 737

Cyclorrhaphan puparium indet.sp.E 1; *Thoracochaeta zosterae* 16 puparia MNI= 17

F206 895 761

Fannia sp. 1 puparium; puparia indet.sp.C 1, sp.E 1, Ephydrid sp. c.30 puparia closely resembling *Thoracochaeta zosterae* MNI= 33

F206 895 761

Scatopse notata 9 pupae; Limosinine sp. 8 puparia fused into concretion MNI= 17

F206 1238 706

?*Tephrochlamys rufiventris* 18 puparia, *Megaselia ?rufipes* 2 puparia, ?*Telomerina flavipes* 3 puparia, *Fannia* sp. c.30 puparia; 6 Julid fragments; 4 woodlouse heads MNI= 53

F206 1238 766

?Fannia scalaris, 2 heads of adults, male and female MNI= 2

F206 1238 766

Fannia sp. 18 puparia; ?*Porcellio scaber*, 1 tergal fragment , 1 head fragment; *Blaps* sp., 1 head fragment MNI= 18

F206 1238 766

Heleomyzid sp. 5 puparia MNI= 5

F206 1238 766),

Fannia sp. 17 puparia; 1 Julid; *?Porcellio scaber*, 1 head MNI= 17

F206 1606 740

?Chloropid sp. 1 puparium, puparium sp.D 2, Anthomyiid sp. 1 puparium MNI= 3

F206 1610 745 [Medieval well]

Thoracochaeta zosterae, c.22 puparia MNI= 22

Bag % A1 1991 AREA 1 MED. F207 from FLOTS

[Phase 2,16 pre 1400] [Putrid]

F207 238 32

Scatopse notata, 1 pupa, Thoracochaeta zosterae, 4 puparia, *?Telomerina flavipes,* 1 puparium

MNI= 6

F207 252 35 1 small Julid,

Thoracochaeta zosterae, 8 puparia, ?Telomerina flavipes, 2 puparia, *Fannia* sp. 1 puparium

1 small Julid MNI= 11

F207 257 53

Limosinine sp. 1 puparium, *Heleomyza ?captiosa,* 10 puparia (1 em); 1 Julid MNI= 11

F207 257 53,2,

Thoracochaeta zosterae, 3 puparia, *Fannia* sp., 1 puparium; 1 *Aglenus brunneus;* 3 minute Julids

MNI= 4

F207 287 41 c.6 small Julids

Scatopse notata, 1 pupa, puparium indet.sp.F 1, *Heleomyza ?captiosa,* 1 puparium, *Thoracochaeta zosterae,* 105 puparia, *?Telomerina flavipes,* 3 puparia, *Fannia* sp., 13 puparia; 6 small Julids

MNI= 124

F207 287 41

Thoracochaeta zosterae, 1 puparium, *Fannia* sp., 1 puparium; 1 small Julid; *Armadillidium vulgare,* 1 tergal fragment MNI= 2

F207 288 120

Thoracochaeta zosterae, c.30 puparia, *Fannia* sp.,1 puparium MNI= 31

F207 288 120

Fannia sp., 5 puparia; woodlouse sp., 1 tergal fragment MNI= 5

F207 417 125

Thoracochaeta zosterae, 7 puparia, *Fannia* sp., 1 puparium MNI= 8

F207 420 126

Fannia sp., 2 puparia MNI= 2

F207 475(or 495) 173 [Medieval pit]

Thoracochaeta zosterae, 5 puparia, ?*Telomerina flavipes*, 2 puparia, *Fannia* sp., 1 puparium

1 small Julid MNI= 8

Subtotal for Box Area 1 Priority- 5 phases; 34 samples; 764 specimens

AREA 2

Box A1 1991 AREA 2 PRIORITY * F521, 540, 579

Bag * F521 AREA 2 MED F521 from FLOTS

[Phase 2.01 pre 1100] [Putrid]

F521 2072 107

1 indet.calcified larval fragment

F521 2073 110

?Drosophilid sp. 1 puparium(median segments only) MNI= 1

F521 2084 108

?Limosinine sp. 1 puparium(without end segment) MNI= 1

F521 2138 118

indet.organic fragment

F521 2140 236

?*Telomerina flavipes*, 5 puparia, Drosophilid sp. 1 puparium, *Fannia sp. 2* puparia

MNI= 8

F521 2219 193

4 indet.cuticular fragments

F521 2219 193

?*Spilogona* sp. 1 puparium, ?*Hydrotaea dentipes*, 1 puparium indet; 4 indet cuticular fragments

MNI= 2

F521 2365 221

?*Scatella* sp. 28 puparia (superficially like *T. zosterae* but less flattened, anal segment longer and anal segments different), ?*Botanophila fugax*, 1 puparium MNI= 29

F521 2267 220

?sepsid sp. 2 puparia, *Fannia* sp. 1 puparium MNI= 3

F521 2365 221

1 ?Muscid puparium, 1 puparium indet, MNI= 1

Bag # F579 AREA 2 MED NB,

[Phase 2,01 pre 1100] [Putrid]

F579 2500 289

Thoracochaeta zosterae, 1 puparium, *Fannia* sp. 17 puparia; 1 small Braconid cocoon, like *Apanteles* MNI= 18

F579 2500 289

Fannia sp. 1 puparium MNI= 1

F579 2501 288

Thoracochaeta zosterae, 1 puparium, ?Trachyopella sp. 1 puparium, ?*Tephrochlamys rufiventris*, 1 puparium, *Fannia* sp. 1 puparium MNI= 4

F579 2502 291

Fannia sp. 1 puparium MNI= 1

F579 2504 292

1 indet.mineralised fragment

F579 2510 298

Muscid sp. 1 puparium(a cast in a calcareous nodule) MNI= 1

F579 2510 298 CF

Eristalis tenax, c.30 calcified larvae, at least 3 of them in prepupal stage MNI= 30

F579 2512 324

?*Chloromya formosa*, 4 calcified larvae, ?*Tephrochlamys rufiventris*, 1 puparium MNI= 5

F579 2514 325

Chloromya formosa, 1 larva MNI= 1

F579 2536 299

Chloromya formosa, 3 larvae MNI= 3

F579 2536 299 [plastic box]

Eristalis tenax, c.25 calcified larvae, some in early prepupal stage but no sign of "tails" though many with pupal horns indicated by smoothed elevations MNI= 25

F579 2536 299 [Medieval pit]

Cyclorrhaphous puparium indet.sp.D 1; 2 Ichneumon or sawfly cocoons MNI= 1

Bag F540 * AREA 2 MED 2

[Phase 2.01 pre 1100] [Putrid]

F540 2137 103

?Telomerina flavipes, 2 puparia MNI= 2

F540 2143 167

Stratiomyiid sp. 3 small larvae, ?Telomerina flavipes, 2 puparia MNI= 5

F540 2144 106

Limosinine sp. 2 puparia MNI= 2

F540 2166 169

?Telomerina flavipes, 2 puparia, *Fannia* sp. 2 puparia MNI= 4

F540 2230 168 [Medieval pit/well]

?Telomerina flavipes, 3 puparia, *Fannia* sp. 7 larva MNI= 10

Subtotal for Area 2- 4 phases; 30 samples; 164 specimens

BOX A1 1991 AREA 2 MED AREA 3 MED & ROMAN

Bag Roman Area 3

[Phase ?; not stated] [Putrid?]

F--- 3664 686

Fannia sp.(not *F.scalaris*) 1 puparial end segment MNI= 1

[Phase 1.42 120- 300] [Uncontaminated]

F784 3908 791 [Roman pit]

?Agromyzid sp. 2 puparia(fragments only) MNI= 2

[Phase 1,45 250- 300] [Putrid]

F763 3912 758 [Roman gravel working

Scatopse notata, 1 pupa, ?*Telomerina flavipes*, 4 puparia, *Thoracochaeta zosterae*, 1 puparium]

MNI= 6

F766 3904 748 [Roman pit]

?*Telomerina flavipes*, 3 puparia MNI= 3

Bag Area 2 Med F503

[Phase 2,04 pre 1100] [Uncontaminated]

F503 2005 1 [Medieval pit

?Ephydrid sp. 2 puparia, Agromyzid sp. 2 puparia MNI= 4

Bag Area 2 Med F509

[Phase 2,04 pre 1400] [Putrid ?]

F509 2023 5 [Medieval pit]

?*Ischiolepta* sp. 1 puparium MNI= 1

Bag Area 2 Med F510

[Phase 2,01 pre 1100] [Uncontaminated]

F510 2029 36 [Medieval lined pit]

?Ephydrid sp. 1 puparium (as before) MNI= 1

Bag Area 2 Med. "Insects from flots" F513

[Phase 2,04 pre 1400] [Putrid]

F513 2034 10

Anthomyiid sp. 1 puparium in perfect condition though emerged, complete with all necessary diagnostic larval characters; the only such specimen and probably a modern contaminant.

MNI= 1

F513 2088 55

Thoracochaeta zosterae, 4 puparia, Agromyzid sp. 1 puparium MNI= 5

F513 2088 93 FF [Medieval pit

Fannia scalaris, 2 puparia] MNI= 2

F513 2088 93

Thoracochaeta zosterae, 13 puparia(1 em), Agromyzid sp. 1 puparium MNI= 14

Bag Area 2 Med F537

[Phase 2.04 pre 1400] [Putrid]

F537 "BUG ?" [Medieval pit

Fannia ?scalaris, 1 puparium] MNI= 1

Bag Area 2 Med F568

[Phase 2.01 pre 1100] [Putrid?]

F568 2559 308 [Medieval pit/well]

1 totally mineralized concretion, possibly centred on a *Fannia* puparium

Bag Area 2 Med F570

[Phase 2.04 pre 1400] [Uncontaminated]

F570 2481 280

Acalypterate sp.indet. 1 fossilized puparium MNI= 1

F570 2481 280.2 [Medieval pit]

Anthomyiid sp. 1 puparium (in good condition) MNI= 1

Bag Area 2 Med F587

[Phase 2.04 pre 1400] [Putrid]

F587 2460 262 [Medieval pit]

?*Thoracochaeta zosterae*, 1 puparium MNI= 1

Bag Area 2 Med F604

[Phase 2.01 pre 1100] [Putrid]

F604 2615 368 [Medieval pit]

Scatopse notata, 2 pupae, *Thoracochaeta zosterae*, 35 puparia (plus one totally mineralised larva),

Fannia scalaris, 1 puparium, 1 mineralized larva MNI= 38

Bag Area 3 Med

[Phase 2,03 1100- 1250] [Uncontaminated]

F615 2657 413 [Structure medieval ?]

?*Mayetiola* sp, 1 puparium, ?Agromyzid sp, 1 puparium MNI= 2

[Phase 2,33 pre 1400] [Putrid]

F703 3345 619

Ischiolepta sp, 1 puparium(minute one), ?*Telomerina flavipes*, 1 puparium MNI= 2

F703 3507 608

Ephydrid sp, 1 puparium (as above) MNI= 1

F703 3556 620 [Medieval pit]

Sepsid sp, 1 puparium, ?*Thoracochaeta zosterae*, 1 puparium(mineralized) MNI= 2

[Phase 2,34 pre 1400] [Uncontaminated]

F704 3509 611 [Medieval pit]

?Ephydrid sp, 2 puparia MNI= 2

F726 3574 722 [Medieval pit]

?Ephydrid sp, 5 puparia (as above) MNI= 5

Subtotal for Box A1 1991- 9 phases; 24 samples; 98 specimens

Total material- 28 phases; 112 samples; 1211 specimens

(4 LINDOW MAN II)

5 LINDOW MAN III

a) LM3, 0-10

Limonia s.lst, 6 larval head capsules, *Pedicia s.lat*, 3 larval head capsule, *Stilpon sublunatum*, 1 head of adult; also numerous fragments of *Plateumaris discolor*, ?*Cyphon* etc,, mites etc,

MNI= 10

b) LM3, 100-110cm,

Limonia s.lat, 2 larval head capsules, *Pedicia* s.lat, 1 larval head capsule; also numerous

fragments of *Plateumaris* but also with 1 elaterid larval end-segment

MNI= 3

c) LM3, 110-115,

Limonia s.lat, 1 larval head capsule, Orthocladiine midge, 1 adult thoracic fragment *Stilpon sublunatus*, 1 adult head capsule and 2 thoraces; also *Myraica ?ruginodis*, 1 head capsule and 1 thoracic fragment, *Scolopostethus* sp, 1 pronotal fragment, Cicadellid sp.indet, 1 adult facial mask and clypeus MNI= 4

d) LM3 115-130cm,

Limonia s.lat, 18 larval head capsules; also *Hebrus ruficeps*, 3 incomplete adults, and numerous fragments of Coleoptera MNI= 18

e) LM3,140-150cm,E sect,

?Prionocera sp, 1 pupal respiratory horn and 2 pupal tergal fragments, *Limonia* s.lat, 18 larval head capsules, *Limnophila* s.lat, 18 pupal tergites, Tipulid sp, 12 pupal end segments(8 males 4 females), Orthocladiine midge, 1 adult thoracic fragment, *Dilophus febrilis*, 1 adult female head capsule,(Post-occipital lobes much larger than in *D.femoratus*), *Also Hebrus ruficeps*, 5 incomplete adults *Formica* sp, 1 adult head capsule(worker), ?Alysiine wasp, 1 adult head capsule also 1 cocoon and fragments of many adults of *Plateumaris*, MNI= 35

f) LM3,Frag,3, Skin and bones from elevator,

Limonia s.lat, 1 larval head capsule, Also a few indet,fibrous and small Coleopterous fragments,

MNI= 1

g) LM3 AE Body sample,

Limonia s.lat, 15 larval head capsules, *Pedicia* s.lat, 2 larval head capsules, Dolichopodid sp.a, 1 adult head fragment, sp.b 1 adult head fragment, sp.c 1 male genital segment most resembling a *Rhaphium* sp, but cannot be related to any of the currently known British species, Also [*Hebrus ruficeps*, 1 incomplete adult and numerous Coleopterous fragments- *Plateumaris* etc,]

MNI= 20

h) LM3,39,1508,Feb,87, From start one moss,

Limonia s.lat. 1 larval head capsule, *Stilpon sublunatus*, 1 adult head capsule and 1 thorax. Also *Myrmica ?ruginodis*, 1 head of adult (worker) MNI= 2

i) LM3,LW/BJ,30,3,88,

Limonia s.lat. 84 larval head capsules, *Pedicia* s.lat. 1 larval head capsule, Tipulid sp.indet. 2 male pupal end segments(as in sample e), *?Phryxe* sp. 1 fragment of adult head. This consists merely of the vibrissal angle with the facial ridges and the occipital dilation. In chaetotactic and other details it very closely resembles members of this genus but could belong to a related one). Also Lepidopteron sp.indet., 1 incomplete *Hebrus ruficeps*, 7 incomplete adult *Aphrodes* sp. 1 fragment of adult head capsule *?Psammotettix* sp. 1 fragment of adult head capsule *Formica ?lemani*. 1 adult head capsule (worker) *Lasius ?niger*, 1 adult head capsule (worker), *Myrmica ?ruginodis*, 1 adult head capsule (worker), *?Clinocentrus* sp. 1 fragment of adult head capsule. Also 12 cocoons of *Plateumaris* and many fragments of this and other Coleoptera etc. MNI= 88

j) LM3,LW/BJ

Stygnocoris sp. 1 head capsule and 1 pronotal fragment *Ulopa reticulata*, 1 complete forewing]

Total samples 9 Total Dipterous Taxa 11 Total MNI= 196

---

6 MINISTRY (LONDON)

Apart from the first one listed below, the samples were in extremely poor condition similar to those from the Leicester Causeway. No data were provided by the archaeologist concerned.

86 (3998) (355)

Heleomyza ?captiosa 6 puparia (2 unh., but not males), *Thecnira putris* 3 puparia(em), *Thoracochaeta zosterae* 975 puparia (c. 5% unhatched; in very good conditon, the ventral ambulatory welts clearly identical with confirmed material of the species), *Fannia* sp. 8 puparia (totally fossilized)

Stomoxys calcitrans 2 puparia (em) MNI=994

86 (3998) ‹364›

Heleomyza ?captiosa 5 puparia (unh.), *Thoracochaeta zosterae* c.140 puparia (extremely poor condition, at least 50 per cent unhatched and fossilised just like the Leicester material), *Fannia* sp. 20 larvae/puparia (unh.), *Muscina ?stabulans* 1 puparium (unh.) MNI= 166

86 (3998) ‹363›

Heleomyza ?captiosa 1 puparium (unh.,subfossilised), *Thoracochaeta zosterae* c.350 puparia (almost all unh.,subfossilised), *Fannia* sp. 68 puparia (unh.,all fossilised), *Stomoxys calcitrans* 6 pup.(unh.,, mineralised but ceph.skel.mounted) MNI= 425

Total samples 3 Total Taxa 6 Total MNI= 1585

---

7 NEWARK DITCH

Tipula sp. 1 pupal fragment, *Ptychoptera albimana* 1 male genital segment (complete), *P.minuta* 1 male genital segment (complete); 5 adult heads, 22 dorsums and 3 abdominal tergites, Psychodid sp. 3 pupae (incomplete), *Chironomus* s.lat. sp. 1 adult thorax, *Thenira ?putris* 4 puparia(em), *Sphaerocera curvipes* 11 puparia (em) and 1 adult thorax, *Ischiolepta ?pusilla* 19 puparia(3 unh) *Copromyza* sp. 45 puparia (2 unh.,clearly showing hind tibial spurs), *Opalimosina liliputana* 14 puparia (2 unh.males in good condition), Limosinine sp.1 9 puparia(em), Limosinine sp.2 1 puparium (2mm.long), Agromyzid sp. 3 puparia (em) (long dorsal postspiracular processes), Calliphora/Lucilia sp. 1 puparial anal spiracular plate. Total taxa 14 Total MNI= 145

‹8 OWSLEBURY›

‹9 OXFORD: St.Budoc's Church›

‹10 PLYMOUTH›

---

11 RUDSTON WELL

RW/QO. 660118

Bibionid sp. 1 small larval head-capsule, *?Spelobia* sp. 2 wings (badly bleached), Limosinine sp.1

4 puparia, Limosinine sp.2 3 puparia, Piophilid sp. 1 puparium, ?Anthomyzid sp.1 1 puparium; sp.2 1 puparium (fragment only) MNI= 9

660112

Tipula sp. 1 pupal fragment, Psychodid sp. c.50 pupae (Buckland, lc.), *Sylvicola cincta/fenestralis* 1 wing, *Scatopse notata* 1 pupa (with larval skin), *Megaselia** *?rufipes* type* 1 puparium, *Thaira* sp. 1 wing, *Thoracochaeta zosterae* 2 puparia, ?Anthomyzid sp. 6 puparia, *?Delia* sp. 1 puparium (rather like *D.fabricii*), Coenosiine sp. 1 puparium (small sp. with fluted cuticle), Acalypterates and Anthomyiids indet. 20 puparia MNI= 85

Total taxa c.21 Total MNI= 94

---

12 SHIRLEY POOL

Bottom

Psychodid sp. 22 pupal wing-covers, with tergal segments and 1 facial mask, Chironomid sp.a (large species) 5 adult thoraces, Chironomid sp.b (medium species) 2 adult thoraces, Chironomid sp.c(small species) 2 adult thoraces, Bibionid sp. 1 female adult head, *Tetanocera* sp. 1 fragment of adult head ?Chloropid sp. 1 adult thorax, [Also Corixids numerous fragments; *Microvelia* sp. many fragments; Saldid sp. fragment of a large species; *Aphrophora* sp. several wings and body fragments; *Megamelus notula* many wings etc, *?Phryganea* sp. 1 fragments of adult; *?Formica* sp. 1 head capsules of a large species; *Myrmica* sp. several adult heads; also some fragments of *Plateumaris*.] MNI= 34

10- 5cm

[*Gerris* sp. several fragments of hemielytra; *Aphrophora* sp. wing fragments, Philaenus spumarius wing fragments; also some complete Oribatid mites, perhaps modern contaminants]

0-20cm

Tipulid sp. 1 fragment of larval head-capsule. [Also Lepidopterous/Trichopterous sp., several indeterminate larval fragments including part of head capsule which appears to be lepidopterous].

MNI= 1

Total samples 3 Total Dipterous Taxa 7 Total MNI= 35

13 SOUTHAMPTON PIT)

---

14 TAUNTON

PM 19 (77) <120> (Tube 1)

Psychodid sp. 1 pupa, *?Scatopse notata* 1 pupal tergite, *Copromyza* sp. 1 puparium(em), Ischiolepta sp. 7 puparia, *Thoracochaeta zosterae* 10 puparia, *Spelobia* sp.1 26 puparia(em)(long porrect prosp.horns), *?Spelobia* sp.2 1 puparium(minute but with similar prosp.horns), *?Telomerina flavipes* 44 puparia (7 unh), Limosinine sp. 2 puparia (em) (very small species), *?Madiza glabra* 1 puparium

MNI= 94

(Tube 2)

Themira putris/Nemopoda nitidula 3 puparia MNI= 3

(Tube 3)

Scatopse notata 13 pupae (em) (lacking larval skins), Limosinine sp. 1 puparia (em) MNI= 14

(Tube 4)

Sciarid sp. 1 wing, *?Scatopse notata* 1 pupal fragment, *Themira putris/Nemopoda nitidula* 2 puparia, *Sepsis* sp.c (smaller sp.) 1 puparium, *?Sphaerocera* sp. 3 puparia, Limosinine sp. 8 puparia (em) (very short prosp.horns), *Thoracochaeta zosterae* 275 puparia (40 unh.,but adult features only remotely discenible in 6) MNI= 291

(Tube 5)

?Thoracochaeta zosterae 5 puparia(em), Limosinine sp. 6 puparia(em), Anthomyiid/Scathophagid sp. 1 puparium(em), *Hydrotaea dentipes* 1 puparium(em), *Musca domestica* 1 puparium(em), *Stomoxys calcitrans* 5 puparia(em) MNI= 19

(Tube 6)

Heleomyzid sp. 3 puparia(em), *Copromyza* sp. 1 puparium(em), *Scathophaga* sp. 1 puparium(em), *?Hydrotaea* sp. 1 puparial fragment MNI= 6

Total samples 6 Total dipterous Taxa 20 Total MNI= 427

---

15 THORNE MOOR TRACKWAY

1 Thorne Moor Tree 1 Bottom

Pedicia rivosa 15 large head capsules(uniform size); 2 medium sized, [Also elaterid sp, 1 larval end-segment and Ichneumonid sp, 1 large cocoon (?*Banchus* sp,) MNI= 17

2 Thorne Moor Tree 1 Top, "root and hole dregs"

Tipulid sp,, 3 pupal end-segments, Psychodid sp,,1 wing, Chironomid sp, 2 larval head-capsules, Ceratopogonid sp, 1 pupal thorax very like that of *Sphaeromias* as figured in Smith (1989); possibly *Palpomyia*, or closely related genus, 3 adult thoraces, *Hayetiola* sp, 1 puparium, *?Empis* sp, 1 almost complete adult thorax, *?Brachyopa* sp, 1 adult thorax, *Phaonia ?errans* 1 wing fragment (costal cell only but extremely like this species), [Also a mass of Coleopterous, Hemipterous and Hymenopterous fragments; also Oribatids- in excellent preservation] MNI= 14

3 Thorne Moor Trackway Cranberry horizon

Pedicia rivosa 11 larval head capsules (4 very large, 6 medium, 1 very small), Leptocerine sp, 1 puparial end segment, ?Anthomyzid sp, 4 puparia(em); *Cordilura/Pogonota hircus* 1 puparium(em), *?Spilogona* sp, 1 puparium(em) MNI= 18

4 Thorne Moor Trackway over Fen peat

Pedicia rivosa 4 large larval head-capsules, Anthomyiid sp, 1 puparial end-segment of large species

?Spilogona/Coenosia sp, 2 puparia(em), About size of *Phaonia subventa* but end-segment concentrically folded and longitudinally fluted, MNI= 7

5 Thorne Platform C 14 Birch Bark

Pedicia rivosa 2 larval head capsules, 1 of them large MNI= 2

Total samples 5 Total Dipterous Taxa 13 Total MNI= 58

---

16 WORCESTER BARREL LATRINE

Scatopse notata 1 pupa(em)(lacking larval skin), ?Heleomyzid sp. 1 puparium(em), Sepsids puparia (Greig *lc.*), *Leptocera* sp. 7 puparia, *Thoracochaeta zosterae* 19 puparia(em), Limosinine sp.1 7 puparia(unh.but immature), Limosinine sp.2 2 puparia(em), *Muscina ?stabulans* 1 puparial end-segment Total taxa 8 Total MNI= 40(+)

(17a, 17b YORK)

WALES

18 HEN DOMEN

12e

Coenosiine sp. 1 puparium(em), *Hydrotaea dentipes* 2 puparia,[Also numerous fragments of millipede] MNI= 3

13s

?Themira sp. 1 puparium(em), *Sphaerocera curvipes* 1 adult fragment; 10 puparia(em), *Copromyza* sp. 36 puparia(em), *Spelobia* sp. 4 puparium(1 unh), Limosinine sp.indet. 1 puparium (near *Telomerina* but smaller), *Musca domestica* 8 puparia, *Stomoxys calcitrans* 1 puparium. MNI= 58

Total Taxa 9 Total MNI= 61

SCOTLAND

19 BUISTON CRANNOG

Descriptions of phase, contexts and soils from Kenward *et al*,(1994)

PHASE I Group 2 [Wood litter on primary mound]

Context 115 [Wood litter]

Chironomus ?plumosus, 1 larval head-capsule, 4 adult thoraces; *Hilara chorica*, *1 wing; Drosophila* sp. 1 wing (very like *D.andalusiaca*). [Also Mayfly sp., 1 subimaginal wing; Hymenoptera Parasitica, c.10 fragments.] MNI= 7

[Deposit Fine silt with plant and large cut wood remains] Interpretation The larval chironomid shows this was an aquatic sediment, *Hilara* and mayflies also aquatic in immature stages. The *Drosophila* was adventitious. Exophilous community with no evidence of human presence

Context 119 [Wood litter]

Tipulid sp., 1 pupal end-segment; *Chironomus ?plumosus*, 1 adult thorax. [Also corixid and Trichopteron fragments. MNI= 2

[Deposit Coarse organic material, with much wood (cut-marks evident)] Interpretation Probably semi-aquatic, lake-margin habitat. Adults of aquatic insects present but no larvae. The tipulid pupa could be *Prionocera*, which can be found amongst mosses etc.in shallow water. Exophilous community with no sign of human presence. PHASE I MNI= 9

PHASE II Group 3 [Submergence layer]

Context 110 [Sediment over uppermost turf layer of Phase I]

[Corixid sp. 1 wing and 2 abdomens]

[Deposit Dark brown silty organic material] Interpretation Probably an aquatic habitat but since Corixids are active fliers inconclusive without further evidence.

PHASE III Group 5 [Dumping over primary mound]

Context 108 [Small spread of peat]

Bibionid sp. 1 thorax; ? Anthomyiid spp., 1 puparium, 1 adult head; acalypterate sp. 1 adult head. [Also fragments of Hemiptera Heteroptera and Parasitica Hymenoptera] MNI= 3

[Deposit Highly organic, with much wood (cut-marks evident) and some charcoal] Interpretation Wholly inconclusive, the only Dipteron being an adult Bibionid of which the larvae are humicolous but the adults very active fliers. Absence of Dipterous immatures remarkable if this was a site of active organic decomposition.

PHASE III Group 7 [Early inhabitation to the south-east; occupation level 1]

Context 59 [Moss litter]

Sepsid sp., 1 pupal end-segment; *Hydrellia* sp. 1 puparium; *?Anthomyza* sp. 5 puparia, one which contained remains of unhatched adult also contained a Pteromalid parasite. MNI= 7

[Deposit Moss-peat with small pieces of wood and a little sand] Interpretation Two dipterous taxa breed in grasses, mainly wetland species, and pupariate in the substrate. Sepsids breed in rotting plant matter, including masses of algae, and in dung. A waterside habitat would be inferred but there is no unequivocal indication of human presence. An exophilous community. The presence of an adult fly and a Pteromalid parasite inside a puparium is inexplicable; they were both facing forwards inside the puparium so had not entered after emergence. Often insects seek shelter inside empty puparia, but this had clearly not been the case here

PHASE III Group 8 [Early inhabitation to the south-east; occupation level 2]

Context 50 [Fill over stone-built hearth]

Musca domestica, 3 puparia [Also Corixid sp. 1 thorax; Delphacid sp., 1 abdominal section containing male genitalia; Trichopteron sp., 1 thoracic fragment; *Drymus* sp., 1 head] MNI= 3

[Deposit Brown organic soil with little clay and some sand. Wood macrofossils (birch?) and charred/burnt bone were present] Interpretation Whilst there is strong evidence of an hygrophilous assemblage, the presence of *Musca* puparia show there was a positive domestic refuse content

Context 55 [Clay floor abutting hearth]

Meromyza sp. 1 puparium; *Musca domestica*, 1 puparium(em.); *Helina evecta*, 1 puparium; *?Spilogona* sp., 4 puparia [Also 1 head of Cicadellid adult] MNI= 7

[Deposit Active soil with live worms present. Moderate brown silty deposit with wood (<25 mm), some stones (>300 mm), and bone fragments)] Interpretation The only immatures were the *Musca* puparia, showing that there was a domestic refuse content. The other taxa are non-synanthropic hygrophilous exophiles

Context 56 [Twig-layer in floor associated with hearth]

Chloromyia formosa, 1 larval skin (almost complete); empid sp. 1 pupal tergal fragment; Acalypterate sp., 5 puparia; *Scathophaga/Botanophila* sp. 1 puparial end-segment; Musca domestica, 5

puparia(em) MNI= 13

[Deposit A detrital peat] Interpretation In that the dominant taxon was *Musca*, this contained a strong domestic refuse content, possibly, as suggested by Kenward *et al.*, containing rotting hay-like material. *Chloromyia* would breed in such material or in dung

Context 209

Musca domestica, 14 puparia(em.) MNI= 14

[Not included in Kenward *et al.*, *1994*] Interpretation Endophilous eusynanthropic community comprising *Musca* only.

Context 233 [Fill of stone-built hearth 51]

Prionocera turcica 1 pupa (male); *Tipula cf. vernalis*, 2 pupae (females); *Pilaria discicollis*, 1 adult head (identical to this species); *Erioptera* sp. 1 pupal wing sheath; chironomid sp. 2 larval heads-capsules; *Ischiolepta ?pusilla*, 1 thorax; *Copromyza* sp. 1 adult head; *Hydrellia* sp. 1 puparium containing alysiine parasite; *Meromyza* sp. 1 puparium; *Musca domestica*, 24 puparia(em.) [Also 4 *Conomelus anceps*, *4* forewings; 1 *Javesella* sp. 1 foreving; *Psylla alni*, 1 forewing; *?Baetis sp.*, 2 thoraces; trichopteron sp. 1 wing fragment; 4 *Phryganea ?obsoleta*, 4 adult heads; parasitic hymenopterous, 6 adult heads (incl. Alysiines and Diapriid)] MNI= 35

[Deposit Brown organic silt with blue-grey inclusions, large amounts of plant macrofossils, charcoal and wood] Interpretation The assemblage, being dominated by *Musca*, supports the second of the suggestions in Kenward *et al.*,(*op. cit.*) that this was "an occupation deposit to which aquatic insects had been added by flooding or redeposition of waterlain sediment" The Hompoterons *Conomelus* and *Javesella* infer rushes (*Juncus* spp.) and grasses respectively, whilst alders were also present (ie. *Psylla alni*). Alysiines and Diapriids are parasitic on Dipterous larvae and puparia

Context 234 [Sand below hearth]

?Hayetiola sp., 1 "false puparium"; Cyclorrhaphan sp. 2 puparial front upper caps only (*Musca* size or larger) [Also *?Baetis* sp., 1 thorax; Corixid sp., several fragments; Trichopteron sp., 1 thoracic fragment; parasitic Hymenopteron, 1 head; *Myrmica* sp., 1 head] MNI= 3

[Deposit "Dark brown peat with fragments of bone evident" Interpretation Too little dipterous

material but probably as suggested by Kenward *et al.*(1994). An exophilous, non-synanthropic assemblage

Context 235 [Clay below hearth]

Prionocera turcica, 1 adult head, 1 pupal end segment; Tipulid sp.(*?Prionocera*), 5 larval heads-capsules(various sizes); Limosinine sp. 1 adult head; Ephydrid sp., 1 puparium containing Alysiine parasite; *Limnellia* sp. 1 adult head; Acalypterate sp., 5 pupal fragments [Also *?Baetis* sp., several thoraces; *Mystacides* sp. 1 thorax; Trichopteron sp. 1 adult head; *Elasmucha/Elasmostethus*, 1 scutellar fragment; Saldid sp., 1 thorax; *Philaenus spumarius*, several thoracic and wing fragments; 1 thorax; *Idiocerus* sp., 1 wing; *Javesella* sp., 1 wing; Psyllid sp., 1 wing; several head capsules of Proctotrupoids, Braconids and Pteromalids; *Formica lemani*, 1 head] MNI= 14

[Deposit Brown organic silt with blue-grey inclusions, large amounts of plant macrofossils, charcoal and wood] Interpretation A rich hygrophilous non-synanthropic exophilous assemblage typical of a waterside habitat with wet mud and silt etc. Grassland with birch and carrlands. No evidence of any human presence

PHASE III Group 9 [Early inhabitation to south east; occupation level 3]

Context 48 [Clay floor abutting hearth; over context 60]

Haematopota/Chrysops sp. 1 pupal tergal fragment; *Loxocera* sp. 1 puparium; *?Anthomyza* sp. 1 puparium; ?Agromyzid sp. 1 puparium; *Hydrellia* sp. 1 puparium; *Meromyza* sp., 1 puparium; *Musca domestica*, 3 puparia; *?Spilogona* sp. 1 puparium; *Helina evecta*, 1 puparium; *Phaonia ?angelicae* puparial fragment [Also Corixid sp. 1 pronotum; *Idiocerus* sp. 1 forewing; *Myrmica* sp. 1 head]

MNI= 12

[Deposit Clay floor layer with ash, thin fibrous seams and burnt bone fragments Interpretation A predominantly exophilous hygrophilous assemblage with indicators of decaying sodden grasses, organic mud and drier humus and foliage of Salicaceae, but with *Musca* showing a presence of domestic refuse

Context 71 [Wood chips and twigs]

Erioptera lutea v. taenionota, 1 wing fragment; *Scatopse notata*, 3 pupal fragments MNI= 4

[Deposit (as above)] Interpretation Inconclusive though *Scatopse* suggests some decaying organic matter

Context 207 [Peat and twigs- a floor material ?]

Limosina silvatica, 4 puparia; *?Trachyopella* sp. 1 puparium; *Musca domestica*, 5 puparia [Also *Philaenus spumarius*, 1 forewing; *Conomelus anceps*, 5 wings; *Javesella* sp. 1 forewing; *Psylla cf. pulchra*, 1 adult head; Pteromalid sp. 2 heads; Ceraphronid sp. 1 head; Diapriid sp. 1 head]

MNI= 10

[Deposit Dark brown to black humic material with much wood, a little bone and charcoal and some hazel nuts] Interpretation The dominance of *Musca* and *Limosina* strongly suggest this was a floor but there was a strong presence of Homoptera associated with grasses and rushes, possibly brought in with hay

Context 213 [Redeposited peat extending westward from hearth]

?Spilogona sp. 1 puparium [Also *Fannia lemani*, 1 head] MNI= 1

[Deposit Detrital organic material] Interpretation Probably mud or silt deposit with no sign of human influence

Context 215 [Wood chips and twigs...Was it a floor deposit?]

Musca domestica, 11 puparia(em) MNI= 11

[Deposit Wood fragments, charcoal, seeds and hazel nuts were evident in this sample] Interpretation The presence of *Musca* alone shows that this was an endophilous eusynanthropic assemblage. Almost certainly a floor deposit

Context 223 [Underlying hearth 32...Was it a floor deposit?]

Musca domestica, 1 puparium(em.) MNI= 1

[Deposit This silty sample contained wood and very fragmented bone material] Interpretation The presence of only a single *Musca* suggests this was an endophilous eusynanthropic assemblage, probably a floor

Context 224 [Mixed dump of moss, peat and twigs...Was it a floor surface?]

?Anthomyza sp. 1 puparium(em.); *Musca domestica*, 1 puparium(em.) MNI= 2

[Deposit Woody peat] Interpretation *Musca* indicates a presence of domestic refuse, whilst *Anthomyza* would infer presence of a species of grass (eg. *Phragmites, Phalaris, Dactylis* etc.). Possibly from a floor surface

Context 227 [Mixed dump of moss, peat and twigs...Was it a floor surface?]

Haematopota/Chrysops sp. 1 pupal fragment; ?*Spelobia* sp. 1 puparium(em); ?*Trachyopella* lineafrons, 2 puparia(em); ?*Limosina silvatica*, 1 puparium(em);; ?*Anthomyza* sp. 1 puparium; *Musca domestica*, 643 puparia(em.), 2 adult thoraces [Also Corixid sp. 1 thorax; *Conomelus anceps*, 8 forewings; *Strophingia ericae*, 1 forewing; Myrmica sp. 1 head; 2 Alysiines and 1 Hymenopterous cocoon]

MNI= 649

[Deposit Detrital peat with much wood and some hazel nuts] Interpretation The huge breeding population of *Musca* and virtual absence of all else indicates an endophilous eusynanthropic assemblage such as one would expect from a fouled domestic floor. *Trachyopella* and *Limosina* could share such a habitat, whilst the Tabanid pupa could have been brought in with peat or rush litter along with the Corixid and *Conomelus anceps*, a *Juncus*-feeding Homopteron. Alysiine Braconids parasitise Dipterous larvae, whilst *Strophingia* is a Psyllid bug associated with *Erica*

Phase III MNI= 794

PHASE IV Group 14 [Occupation to the north, First hearth]

Context 327 [Ash and burnt bone]

Trichocera sp. 2 pupal wing-sheaths; *Dilophus* sp. 1 thoracic fragment; *Scatopse notata*, 14 pupae(em); *Psila (Chamaepsila)* sp. 1 puparium; ?*Tephrochlamys* sp. 1 puparium; ?*Spelobia* sp. 1 puparium(em); ?*Trachyopella* lineafrons, 1 puparium(em); ?*Limosina silvatica*, 1 puparium(em); Ephydrid sp. 1 puparium; Calliphorid sp. 1 puparial end segment; Acalypterate sp. 1 puparium; *Eudasyphora ?cyanicolor*, 1 puparium; *Neomyia cornicina*, 1 puparium; *Musca domestica*, 4 puparia(em), 1 adult thoracic fragment; *Melophagus ovinus*, 1 head [Also *Conomelus anceps*, 2 wings; Ichneumonid sp. 1 head; Elaterid sp. 1 larval end-segment] MNI= 31

[Deposit Dark brown organic matter with small amounts of stones] Interpretation A complex of materials including rushes, umbels (or composites) contaminated by decaying vegetable matter, cow-

dung and perhaps sheep-dung. Sheep or fleeces indicated by *Melophagus ovinus*. The low count for *Musca domestica* but higher numbers of *Scatopse notata* and *Trachyopella* (compared with F312) suggests that although fermenting organic matter existed in both samples, the materials were different. This sample possibly consisted mainly of ungulate dung whilst F312 may have been mainly of human origin.

PHASE IV Group 15 [Second hearth]

Context 12 [Spread of ash, part of complex around hearth]

Tipulid sp. 1 pupal fragment; *?Psila (Chamaepsila)* sp., 2 puparia; *Heleomyza ?borealis*, 1 puparium; Ephydrid sp. 1 puparium; *Musca domestica*, 11 puparia (10 em) [Also *Conomelus anceps*, 2 wings; *Javesella* sp. 1 wing; Proctotrupid sp. 1 thorax; *Myrmica* sp. 1 head and alitrunk]

MNI= 1615

[Deposit Brown sandy soil with charred bone fragments Earlier described as "hearth and food (domestic) debris in early roundhouse, with ash, charcoal and burnt bone] Interpretation A complex of sodden *Juncus* and grass litter with umbels (or composites), rich humus and fermenting organic material including faecal and animal protein components With *Musca* predominating the matrix shows a strong endophilous eusynanthropic element and hence the deposit was most likely a fouled floor deposit. Non-synanthropic elements probably introduced with the floor litter material or, as Kenward *et al*,(1994) suggest, subsequent strays from wetland habitats adjacent to, or superimposed upon, the site. The conclusion in Kenward *et al*,(*op.cit.* p.34) is supported by the Dipterous material, except that the "House fauna", which includes *Musca* and *Heleomyza*, greatly dominates the Diptera.

PHASE IV Group 16 [Associated with uppermost hearth]

Context 312 [Thin compacted spread of straw]

Scatopse notata, 10 pupae(lacking larval skins but one pupa contained male genitalia so identity verified); *Limosina silvatica*, 1 puparium; *Trachyopella ?coprina* 1 puparium; *Telomerina flavipes*, 1 puparium; *Psila (Chamaepsila)* sp. 1 puparium; *Musca domestica*, 553 puparia(545 em); *Melophagus ovinus* 1 head and thorax; *Calliphora* sp. 1 puparial end segment [Also *Anthocoris* sp. 1 head; Deltocephalid

sp, 1 wing; *Conomelus anceps*, 4 wings; Lepidopteron sp, 1 larval skin] MNI= 569

[Deposit Dark brown organic material Earlier report descibes this as alayer of compacted straw(? reeds)- straw floor litter in early roundhouse] Interpretation A deposit totally dominated by fermenting organic material with at least a trace of animal protein which suggested fouled floor-material and(or) stable manure; predominantly an endophilous, eusynanthropic assemblage. Subsidiary contents included grass and rush-litter, some herbaceous plants (umbels or composites) and some carrion. Sheep indicated by presence of the Sheep Ked *Melophagus ovinus*.

Context 316 [Extensive layer of brush, under 312]

?Hayetiola sp, 16 "false puparia"; *Scatopse notata*, 1 pupa; *Ischiolepta* sp, 3 puparia(em); *?Limosina silvatica*, 1 puparium(em); *Musca domestica*, 2 puparia(1 em) MNI= 23

[Deposit "A woody peat" Earlier report describes this as a layer of brash in thick bundles-? sub-floor twig litter in early (?4th century) roundhouse]. Interpretation Possibly predominantly grass-litter, strongly inferred by the dominant taxon, but contaminated by faecal component and including fermenting organic matter from house or stable floor;

Context 341

Scatopse notata, 10 pupae(with larval skins); *Ischiolepta ?pusilla*, 9 puparia(one containing Alysiine parasite), 1 adult head; ; *Telomerina flavipes*, 5 puparia; *?Spelobia* sp, 6 puparia (incomplete); *Trachyopella ?coprina*, 34 puparia(30 em); *?Anthomyza* sp, 2 puparia; Acalypterate sp, 1 puparium; *Musca domestica*, 8 puparia(em) [Also 1 Deltocephalid wing] MNI= 75

[Deposit Dark brown peat with much wood (large amounts of which had never been cut), hazel nuts and some charcoal, Small amounts of quartz grains, sandstone and fine gravel were present" Earlier report states it was floor of early roundhouse] Interpretation A complex of grass and *Juncus* litter dominated by an assemblage including eusynanthropic endophiles which bred in fermenting organic matter and dung, including some animal protein accumulated in a dark situation The conclusion in Kenward *et al*,(1994) that this was an occupation surface is supported by the dipterous evidence, but note that the 62 *Limosina silvatica* puparia were not from this sample but from 402

Phase IV Total MNI= 714

PHASE V Group 21 [Consolidation]

Context 39 [Compressed reeds or straw,..Is there a human influence?]

Musca domestica, 1 puparium(em.) MNI= 1

[Deposit The unhumified peat contained no charcoal or wood] Interpretation The only Dipteron recovered, *Musca domestica*, shows irrefutable evidence of human occupation as it is eusynanthropic

Context 41 [Dark fibrous roots; redeposited turf, to 20cm thick, extent about two square metres,..Is there human influence?]

Limoniid sp. 1 adult head; *?Limosina silvatica*, 1 puparium; *Musca domestica*, 1 puparium; *Hydaea/Hyospila* sp. 1 puparium [Also *Cononelus anceps*, 1 wing; *Trioza ?urticae*, 1 wing]

MNI= 4

[Deposit Peat, rich in moss and containing hazel nuts and small bone fragments] Interpretation *Musca* again gives clear evidence of human presence and *Hydaea/Hyospila* and *Limosina* suggest a faecal component Could be site of reduced human activity as suggested by Kenward *et al.(op.cit.)*.

Context 45 [..Is there a human influence?]

Prionocera/Tipula, 2 larval head-capsules, 3 pupal fragments, 1 adult abdominal sternite; *Dilophus* sp. 1 head and 1 thorax (of female); *Rhegmoclena cookii*, 1 pupa (containing adult male); Acalypterate spp. 4 puparia (all different species); *Phaonia ?errans*, 1 puparium [Also *Aphrophora alni*, 1 forewing; E laterid sp. 1 larval anal segment] MNI= 11

[Deposit A detrital peat with some large wood fragments] Interpretation A humicolous, non-synanthropic assemblage *Prionocera* would indicate a wet depositional site but the specimens could equally have belonged to one of the humicolous *Tipula* species. *Aphrophora* indicates proximity of *Alnus glutinosa* or a *Salix* species but, being an adult, it could be adventitious. No Dipterous evidence of any human presence

Context 308 [Source unknown]

Tipulid sp. 1 pupal tergal fragment; *Eristalis arbustorum/abusivus*, 1 head and thorax; Scathophagid

or *Botanophila* sp. 1 puparium(em.); *?Spilogona* sp. 2 puparia(em). [Also *Conomelus* sp. 1 wing]

MNI= 5

[Deposit This dark brown peat contained large quantities of wood, some with cut-marks evident" Earlier report describes this as deep organic deposit (moss, twigs, reeds, branches, peat)-organic dump] Interpretation Organic mud with some humus, *Juncus* litter and a possible trace of faecal material (if *Scathophaga* was present, but this uncertain) Otherwise a non-synanthropic assemblage

Context 402 [Source of material unknown]

Prionocera/Tipula sp. 1 larval head-capsule); Ceratopogonid sp. 1 pupa(front half only); *Scatopse notata*, 1 pupa; *?Hayetiola* sp. 2 "false puparia"; Sepsid sp. 1 puparium; *Copromyza* sp. 1 puparium (containing male genitalia); *Limosina silvatica*, 62 puparia(61 em); Sphaerocerid sp. 7 puparia (very like *Telomerina flavipes* and *Herniosina bequaerti*); *Drosophila ?subobscura*, 1 puparium(em); *?Scathophaga* sp. 3 puparia(em); *Hydrotaea ?albipuncta* 3 puparia(em); *?Spilogona* sp. 1 puparial end segment [Also *Fannia ?flemani*, 3 heads; Proctotrupid sp. 1 thorax] MNI= 84

[Deposit Dark brown peat with much wood (some cut) and some moss" Earlier report describes this deposit as a dump of medium- dark brown fibrous peat with moss and wood-chips- a levelling or consolidating dump] Interpretation Traces of humus and grass-litter but dominated by dung and (or) fouled, sodden plant litter, which had probably accumulated in a dark place- possibly a stable. Ungulate dung is inferred with at most very low fermentation, the thermal levels probably below threshold for *Musca domestica*, which was replaced by *Limosina silvatica* as the most numerous species At most a semi-synanthropic assemblage.

Context 310 [Source of material uncertain]

Tipulid sp. 1 pupal fragment; Scatopsid sp. 1 pupal end segment; *Haematopota/Chrysops* sp. 1 pupal anal segment; *Empis/Rhamphomyia* sp. 1 pupal abdominal section; ?Anthomyiid sp. 2 heads (with many orbitals and strong crossed frontals); *Helina evecta*, 1 puparium [Also heads of Lygaeid bugs and *Myrmica* sp.]

MNI= 7

[Deposit Very dark brown fibrous peat with small pieces of cut wood] Interpretation a mixed waterside and drier humus non-synanthropic assemblage with absolutely no evidence of human presence

Phase V Total MNI= 112

PHASE VIII [Not stated]

Context F2 [Not stated]

Prionocera/Tipula sp. 6 larval head-capsules; Scatopsid sp. 2 pupae(no larval skins); *Chloromyia formosa*, 1 larval head-capsule; *Ceroxys urticae*, 7 puparia; *Psila (Chamaepsila)* sp. 62puparia; *Heleomyza ?serrata*, 19 puparia; ?*Leptocera* sp. 42 puparia; *Herniosina bequaerti*, 13 puparia; *Telomerina flavipes*, 88 puparia; ?Piophilid sp. 1 puparium; ?Ephydrid sp. 60 puparia; ?Drosophilid sp. 1 puparium; Anthomyiid sp. 1 puparium; *Phaonia s.str.* 1 puparium; *Melophagus ovinus*, 1 thorax; Calliphorid, 1 puparial end-segment [Also 3 *Drymus* sp. 3 thoraces; *Myrmica* sp. 1 head]

MNI= 307

[Deposit No information] Interpretation Probably the most complex of the Buiston Crannog samples, this was dominated by two communities inferring different origins. There was a very rich synanthropic assemblage in which the most abundant species was the thermophilous, endophilous necrophage, *Telomerina flavipes*. Together with *Herniosina bequaerti* and *Heleomza* these infer a dark breeding environment, such as would be ideal for *Musca domestica*. Yet that species was wholly absent ! *Ceroxys urticae* , the Ephydrids and *?Leptocera* sp. testify to a wet, though still foul environment such as occurs in the organic mud around manure heaps or cess-pits. *Phaonia* is primarily humicolous and may have entered the system initially amongst litter, or subsequently during the humifying process. A possible scenario for this deposit was that it was a floor deposit which had been dumped into a marshy area. The curious absence of *Musca* however, in view of its abundance in other horizons, may suggest that it could have died out locally before this material was deposited

Phase VIII Total MNI= 307

PHASE ? [No information]

Context 005 [No information]

Dilophus sp. 2 male thoraces MNI= 2

[Deposit No information] Interpretation Inconclusive since *Dilophus* males are very active fliers

Peat above arch [No information]

Limoniid sp. 13 larval head-capsules; Dolichopodid sp. 1 pupal fragment; *Loxocera* sp. 2 puparia; Sepsid sp. 1 puparium; *Copromyza* sp. 1 puparium, 1 wing; *?Spilogona* sp. 8 puparia [Also *Drymus* sp. 3 pronota; 2 *Conomelus anceps*, 2 forewings; *Javesella* sp. 1 forewing

Elaterid sp. 38 larval end-segments]

[Deposit No information] Interpretation Could be a natural waterside assemblage, there being no unequivocal indication of human presence. MNI= 27

TOTAL MNI= 1979

Taxonomic List of Diptera from Buiston Crannog

Prionocera turcica 1(233); 4(235) MNI= 5

Prionocera/Tipula sp. 2(45); 1(308); 1(402); 6(2) MNI= 10

Tipula ?vernalis 2(233) MNI= 2

Tipulid sp. 1(119); 1(12) MNI= 2

Pilaria discicollis 1(233) MNI= 1

Erioptera lutea taenionota 1(71) MNI= 1

Erioptera sp. 1(233) MNI= 1

Limoniid sp. 1(41); 5(POA) MNI= 6

Ceratopogonid sp. 1(402) MNI= 1

Chironomus ?plumosus 4(115); 1(118) MNI= 5

Chironomid sp. 2(233) MNI= 2

Trichocera sp. 1(327) MNI= 1

Dilophus sp. 1(327); 1(45); 2(005) MNI= 4

Bibionid sp. 1(108) MNI= 1

Scatopse notata 3(71); 14(327); 10(312); 10(341); 1(402); 2(2) MNI= 40

Rhegmoclema cooki 1(45) MNI= 1

?Mayetiola sp. 1(234); 16(316); 1(402) MNI= 18

Chloromyia formosa 1(56); 1(2) MNI= 2

Haematopota/Chrysops sp. 1(48); 1(227) MNI= 2

Empid sp. 1(56) MNI= 1

Hilara chorica 1(115) MNI= 1

Dolichopodid sp. 1(POA) MNI= 1

Eristalis abusivus/arbustorum 1(308) MNI= 1

Ceroxys urticae 7(2) MNI= 7

Loxocera sp. 1(48); 2(POA) MNI= 3

Psila(sg.Chamaepsila) sp. 1(327); 2(12); 1(312); 62(2) MNI= 66

Sepsid sp. 1(59); 1(402); 1(POA) MNI= 3

?Tephrochlamys sp. 1(327) MNI= 1

Heleomyza ?borealis 1(12) MNI= 1

H. ?serrata/captiosa 19(2) MNI= 19

Copromyza sp. 1(233); 1(402); 1(POA) MNI= 3

Ischiolepta ?pusilla 1(233); 3(316); 9(41) MNI= 13

Leptocera sp. 42(2) MNI= 42

Limosina silvatica 4(207); 1(227); 1(327); 1(312); 1(316); 1(41); 62(402) MNI= 71

Herniosina bequaerti 13(2) MNI= 13

?Spelobia sp. 1(227); 1(327); 6(341) MNI= 8

Trachyopella ?coprina 1(207); 1(312); 34(341) MNI= 36

T. ?lineafrons 2(227); 1(327) MNI= 3

Telomerina flavipes 1(312); 5(341); 88(2) MNI= 94

?Telomerina/Herniosina 7(402) MNI= 7

Limosinine sp. 1(235) MNI= 1

Piophilid sp. 1(2) MNI= 1

?Anthomyza sp. 5(59); 1(48); 1(224); 1(227); 2(341) MNI= 10

Agromyzid sp. 1(48) MNI= 48

Hydrellia sp. 1(59); 1(233); 1(48) MNI= 3

Linnellia sp. 1(235) MNI= 1

Ephydrid sp. 1(235); 1(327); 1(12); 60(2) MNI= 63

Drosophila sp. 1(115); 1(402- *?subobscura*); 1(2) MNI= 3

Meromyza sp. 1(55); 1(233); 1(48) MNI= 3

Acalypterate sp. 1(108); 5(56); 5(235); 1(341); 4(4 species- 45) MNI= 16

Scathophaga sp. 3(402); MNI= 3

Scathophaga/Botanophila sp. 1(56); 1(308) MNI= 2

Anthomyiid sp. 1(108); 1(2) MNI= 2

Hydrotaea ?albipuncta 3(402) MNI= 3

Eudasyphora ?cyanicolor 1(327) MNI= 1

Neomyia cornicina 1(327) MNI= 1

Musca domestica 3(50); 1(55); 5(56); 14(209); 24(233); 3(48); 5(207); 11(215); 1(223); 1(224); 643(227); 4(327); 11(12); 553(312); 2(316); 8(341); 1(39); 1(41) MNI=1291

?Spilogona sp. 4(55); 1(48); 1(213); 2(308); 1(402); 8(POA) MNI= 17

Mydaea/Myospila sp. 1(41) MNI= 1

Helina evecta 1(55); 1(48) MNI= 2

Phaonia ?angelicae 1(48) MNI= 1

P. ?errans 1(45) MNI= 1

P.(s.str.) sp. 1(2) MNI= 1

Melophagus ovinus 1(327); 1(312); 1(2) MNI= 3

Calliphora sp. 1(312) MNI= 1

Calliphorid sp. 1(327); 1(2) MNI= 2

Cyclorrhaphan sp. 1(234) MNI= 1

Total Dipterous Taxa Total MNI=1981

(20 DUN VULAN)

21 LOCH DRUIDIBEG (SOUTH UIST) [Organic silts from islet in lake]

a 0-2cm.

Tipula ?oleracea/paludosa 2 pupal fragments, 1 larval head-capsule; *Limonia ?trivittata* 1 *pupal wing-cover; ?Limonia* s.lat. sp. 1 larval head-capsule (very small); *Limnophila ?meigeni* numerous pupal fragments, including pupal horns, pupal facial-shield containing head of adult; Psychodid sp. 1 pupal skin, 1 pupal wing-cover; Chironomid sp. 4 larval head-capsules, pupal wing-covers, several adult thoraces and wings (at least two different species); *Bibio ?nigriventris* 2 wings; sciarid sp. 1 wing; *Trichina ?clavipes* 1 wing; Empid sp.1 (?*Trichina*) 3 pupal fragments (with short tergal spines); empid sp. 2a pupal fragments; empid sp. 2b pupal fragments; *Hilara chorica* 1 wing; *Rhaphium* sp. 2 incomplete pupae, 1 containing anterior half of adult male; *Campsicnemus ?loripes* 1 wing; *Lonchoptera lutea* 1 wing (male), 1 adult head; *Megaselia* sp. 2 puparia(em), 1 wing; *Coelopa* sp. 1 adult head; *Hydrellia* sp. 14 puparia(em); *Scatella subguttata* 1 wing [Also Psocopteran sp. 1 head capsule; Anthocorid sp. 3 adult heads; Corixid sp.indet. 1 wing; Deltocephalid sp. 1 wing; *Livia juncorum* 1 wing; *Psylla* sp. 10 wings, 1 adult head; *Tuberolachnus viminalis* 1 wing; Lepidopterous spp. 5 larval head-capsules; *Limnephilus ?vittatus* 1 wing; *Mystacides azurea* complete genital capsule of male adult; *Tinodes waeneri* 2 wing fragments; complete adult male genital capsule; Coleopterous spp. 19 larval head-capsules (at least two different species); *Aspilota* sp. 1 wing; several small Alysiine adult heads, possibly of same species.] MNI= 42

b 2-6cm

Limnophila ?meigeni many pupal fragments; *Limonia ?trivittata* 2 pupae; Limoniid sp. 1 larval head-capsule (closer to *L.modesta* than *macrostigma*); ?*Molophilus* sp. 1 adult head; Chironomid sp. 1 larval head-capsule; *Bibio ?johannis/nigriventris* 1 wing, 1 female adult head; Empid sp. 1 (?*Trichina* sp.) 2 pupae(with short-spined tergal margins); Empid sp. 2 1 pupal fragment; Empid sp. 3 (?*Hilara* sp.) .. incomplete pupae (with long tergal hair-fringe); Dolichopodid sp. 1 incomplete pupa containing adult; *Coelopa frigida* 3 wings; *Geomyza balachovskii* 1 wing; *Hydrellia* sp. 2 puparia(em); *Hyadina ?guttata* 1 wing; *Calliphora* sp. 1 wing fragment; *Zaphne caudata* 1 puparium containing complete male genitalia; Anthomyiid sp. 1 puparium(em) (similar ones in other horizons);

Dipterous sp.indet. 1 adult thoracic fragment [Also mayfly sp. 1 nymphal wing-cover; *Saldula* sp. 1 wing; Corixid sp. 1 forewing; *Philaenus spumarius* 1 wing fragment (clavus); *Psylla* sp. .. wings; *Myrmica* sp. 1 wing; *Tuberolachnus viminalis* 2 forewings; 1 hindwing; Lepidopterous sp. 3 pupal fragments; *Tinodes waeneri* 1 wing fragment] [Seem to have no record of numbers of some taxa]

c 6-10cm.

Tipula ?oleracea/paludosa 1 pupal fragment; *Limonia* sp. 4 larval head-capsules; *Limnophila ?meigeni* many pupal fragments; Chironomid sp.(as in a) several larval head-capsules, 1 larva found complete and in perfect condition as in life- presumably modern contaminant; Bibionid sp. 1 male adult head; Empid sp.1 (*?Trichina* sp.) 1 pupal fragment containing adult; Empid sp. 2b 1 incomplete pupa; Hemerodromiine sp. 2 pupal abdominal segments; Dolichopodid sp.1 1 pupa; *Megaselia* sp. 2 wings; *Platycheirus clypeatus* s.lat. 1 adult tergal fragment; *Scatella* sp. 1 pupal end segment; *Cetema* sp. 1 adult head; Acalypterate sp. (?Chloropid or Opomyzid) 1 puparium; *Phaonia ?incana* 2 wings; ?Muscid sp. 1 egg; Calyptrate sp. 1 puparium containing Ichneumonid cocoon [Also Psocopteran sp. 1 adult head; *Anthocoris* sp. 1 adult head; *Philaenus spumarius* 2 wings(? large dark form); *Aphrodes* s.lat.sp. 1 wing; Deltocephalid sp. (as in a) 1 wing; *?Delphacodes* sp. 1 wing; Delphacid sp. 1 wing (venation obscure); *Livia juncorum* 1 wing; *Psylla* sp. several wings; 2 adult heads; *Trioza* sp. 1 wing; Lepidopterous spp. 1 pupal fragment, several larval head-capsules; *Limnephilus* sp. 2 wings; Coleopterous spp.(same two as in a) many larval head-capsules; Parasitica spp. many adult heads of Alysiinae, Pteromalidae etc.] MNI= 23

d 10-14cm.

Limnophila ?meigeni 1 pupal head shield containing adult head intact, numerous pupal tergal fragments and 10 end-segments (6 male,4 female); Tipulid sp. 6 larval head-capsules; *Bibio ?nigriventris* 1 wing; Chironomid spp. many larval head-capsules, 1 adult thorax; Empid sp.1 (*?Trichina* sp.) 1 pupa; Empid sp.2a 1 pupa; Empid sp.2b 1 pupa (has long respiratory processes from metathoracic spiracle); Dolichopodid sp.1 1 pupa; *Megaselia* sp. 1 wing; *Themira ?leachii* 1 wing; *Copromyza* s.lato.sp. 1 wing (about 2mm.long); *Hydrellia* sp. 1 puparium(em); ?Ephydrid sp. 1 thorax

about size of *Philygria* but with single line of acrostichals which end at level of penultimate postsutural (3 postsutural dorsocentrals); *Neomyia cornicina* 2 adult thoracic fragments- incl.right side of scutellum and left side of presutural and postsutural areas showing bristle alveoli clearly, 1 wing; Dipterous sp.indet. 1 adult head fragment [Also *Anthocoris* sp. 2 adult pronota; *?Sigara dorsalis* 1 forewing; Delphacid sp. 10 wings (venation obscure, some with dark diagonal suffusion); *Livia juncorum* 1 wing; *Psylla* sp. 4 wings; 2 adult heads (closest to *P.brunneipennis* or *muscovita*); Lepidopterous spp. 13 larval head-capsules, pupal fragments; *Limnephilus ?flavicornis* 2 wing fragments; *Myrmica* sp. 1 right forewing, MNI= 32

e 14-17cm

Tipula ?oleracea/paludosa several pupal fragments; *?Limonia* sp. 1 larval head capsule; *Limnophila ?meigeni*, numerous pupal fragments; Psychodid sp. 2 pupal wing-covers; Chironomid spp.(at least 2 species), few larval head-capsules, 3 thoraces; *Bibio* sp. 1 incomplete larval skin; Empid sp.1 (*?Trichina* sp.) several pupae; Empid sp.2a; 1 pupa; Hemerodromiine sp. pupal tergites; Dolichopodid sp. pupal abdominal fragment; *?Scatella* sp. 1 puparium; *?Neomyia cornicina* 1 fragment of adult head; *Phaonia ?incana* 2 wings; Muscid sp. 1 egg (as in 6-10; 01) [Also Corixid sp. 1 female ovipositor and thoracic fragment; *Philaenus spumarius*; many adult heads and wings; *Aphrodes* s.lat.sp. 1 head and 3 wings; *?Euscelis* sp. 1 wing; Delphacid sp. 2 heads, many thoracic and abdominal fragments (1 including male genitalia as in another horizon(?), also numerous wings; *Psylla* sp. 2 wings; *Trioza* sp. 1 wing; Aphid sp. 2 fragments; Lepidopterous spp. few larval head-capsules; many pupal fragments, including 2 wing-covers; parasitic Hymenopteron; 1 thorax; *Myrmica* sp. 1 adult head; Coleopteron sp. 2 larval head capsule (sinuate clypeus)] MNI= 30

f 17-20cm.

Limnophila ?meigeni; several pupal fragments; Chironomid sp. 1 larval head-capsule; *Bibio* sp. 1 wing; *?Trichina* sp. 1 pupa; Cyclorrhaphan sp. 1 wing [Also Corixid sp. 1 wing; *Philaenus spumarius*; 1 adult head and 1 wing; Deltocephalid sp. 3 wings; Delphacid sp. numerous wings; *Livia juncorum* 1 wing; *Psylla* sp. 2 wings; Platygasterid sp. 1 wing; Coleopteron sp. 1 larval head capsule (sinuate clypeus)] MNI= 9

g 20-24cm

Limnophila ?meigeni numerous pupal fragments; Sepsid sp. 1 puparial end-segment; *Hydrellia* sp. 1 puparium containing remains of Alysiine parasite; Cyclorrhaphan sp.(either Acalypterate or Anthomyiid with stellate anal spiracles); 2 puparial end-segments [Also *Delphacodes* sp. many wings and heads; *Psylla* sp. 1 wing] MNI= 9

Total samples 7 Total Dipterous Taxa 41 Total MNI= 215

---

22 LOCH OLABHAT (North Uist)

a Context 563 Eilean Domhnuille a Spionnaidh, C.623, ED.89"; 9;1.

Tipulid sp. 3 puparial respiratory horns (fragments only); *Scatopse notata,* 4 pupal end segments; Limosinine spp. 3 pupal fragments (different species); *Scathophaga* sp. 2 puparia (fragments only); ?*Nupedia/ Paregle* sp. 1 puparium (incomplete); *Eudasyphora cyanella* 1 puparial end segment; *Neomyia cornicina* 1 puparial end-segment MNI= 14

b Context 1008, Underwater excavation Sample 8, C.1008, ED.89," 1989

?Psychodid sp. 1 pupal end-segment; *Orygma luctuosum* 1 puparial end-segment; *Leptocera ?fontinalis* 2 puparia(em); *Thoracochaeta zosterae* 11 puparia(em); *Limosina silvatica* 17 puparia(15 em); ?*Telomerina flavipes* 1 puparium(em); *?Trachyopella* sp. 3 puparia(unh); *Hydrotaea dentipes* 2 puparia(em) MNI= 38

Total samples 2 Total dipterous Taxa 17 Total MNI= 52

(23 PAPA STOUR, Shetland)

---

24 PLUSCARDEN PRIORY (Moray)

Trichocera sp. 1 larval head capsule; Psychodid sp. 6 pupal fragments; Phorid sp. 1 puparium (em); *Terrilimosina racovitzai* 403 puparia (5 unh), 3 wings, 18 adult heads, 19 thoraces; *Heleomyza ?captiosa/serrata* 14 puparia(em) (smaller with non-spiculate end-segment); *?Scoliocentra* sp. 5 puparia(em) (larger with spiculate end-segment); *Fannia ?scalaris* 8 puparia(em); *?Helina*

reversio, 3 puparia(em) MNI= 3

Total Taxa 8 Total MNI=436

---

25 SKARA BRAE (Mainland, Orkney)

Tipula sp. 12 larval head-capsules of various instars, probably all same species; Bibionid sp. 7 female adult head (*Dilophus* or *Bibio*); *Heleomyza borealis* 1 puparium with male genitalia; ?*Spelobia* sp. 6 puparia(em); ?*Allopiophila vulgaris* 5 puparia (one with male genitalia); Drosophilid sp. 1 puparial fragment; *Calliphora uralensis* 1 puparium(em); *Scathophaga* sp. 1 puparium(em); Anthomyiid sp. 1 puparium(em); *Phaonia* ? *incana* 1 puparium MNI= 1

Total taxa 10 Total MNI= 28

---

26 SOUTH LOCH BOISDALE (South Uist)

a 90-95cm [Dark brown poorly humified peat with twigs and wood fragments]

Tipula/Prionocera sp. 1 larval head-capsule; *Pedicia ?rivosa* 3 larval head-capsule fragments; *Limnophila* sp. 2 tergal fragments, 3 female end-segments; *Cordilura* sp. 1 puparial end-segment [Also *Drymus* sp. 1 adult head; *Delphacodes* sp. 19 wings; *Conomelus anceps* 8 wings; Hymenopterous spp.(*?Lagynodes* and Belytids) 5 adult heads] MNI= 7

b 110-115cm [Medium brown poorly humified fibrous peat]

Limnophila sp.(as before) 3 pupal end-segments and 2 tergal fragments; Cyclorrhaphan sp. 1 large puparial spiracle [Also *Conomelus anceps* 2 wings; *Livia juncorum* 1 wing; Lepidopterous sp.indet. 1 fragment of a larval head-capsule (larva would have been about 1 inch long) MNI= 4

c 140-145cm [Medium brown poorly humified peat with large wood fragments and twigs]

?Limonia (Dicranomya) ?modesta 90 larval head-capsules; *Pedicia rivosa* 5 larval head-capsules; 1 pupal prospiracular lobe; *Limnophila* s.lat.sp. 34 male and 6 female pupal end-segments; 22 pupal fragments; 1 pupal wing-flap; *Tipula/Prionocera* sp 1 larval head-capsule; ?Ceratopogonid sp.indet. 2 thoraces; *Dilophus* sp. 4 adult thoraces, 2 female adult heads; *Opomyza germinationis (or petrei)* 1 wing; Acalypterate spp.indet. 2 puparial end-segments (both different); Coenosiine sp.

2 puparial end-segments [Also *Drymus* sp. 2 adult heads and 5 pronota; ?*Aphrophora alni* fragment of adult; *Cixius ?nervosus* 1 wing tip; *Delphacodes* sp.indet. 105 wings; *Conomelus anceps* 8 wings; Hymenopterous spp.(at least 6 species) 10 adult heads; *Formica ?lemani* 1 adult head; *?Myrmica* sp. 1 adult thoracic fragment; Lepidopterous sp.indet. 1 larval head-capsule] MNI= 97

d 145-150cm [Medium brown poorly humified peat with large wood fragments and twigs]

?Tipula/Prionocera sp. 3 larval head-capsules; *Pedicia rivosa* 3 larval head-capsules; *Limnophila* sp. 8 male and 6 female pupal end-segments; 1 pupal wing-flap fragment; ?Ceratopogonid sp. 2 adult thoraces; *Cordilura* sp. 2 puparia [Also *Drymus* sp. 2 adult heads and thoracic fragments; *Saldula* sp. adult pronotum; *Conomelus anceps* 5 wings; *?Delphacodes* sp. 100 wings (simple venation); *Strophingia ericae* 2 wings; parasitic Hymenoptera 6 adult heads (at least 3 diferent species); Chalcid sp.indet. 1 adult head; *Formica lemani* 3 adult heads] MNI= 24

e 150-155cm [Medium brown poorly humified peat with large wood fragments and twigs]

Tipula/Prionocera sp. 1 larval head-capsule and pupal fragments; *Limonia (Dicranomya) ?modesta* 1 larval head-capsule; *Pedicia rivosa* 17 larval head capsules (probably full range of instars); *Limnophila* sp. 90 pupal tergites, 4 pupal wing-covers, 1 pupal facial mask, 23 pupal end segments (incl.15 males); Psychodid sp.indet. 3 pupal wing-covers [Also *Drymus* sp. 3 fragments of adults; *Philaenus spumarius* 1 wing; *?Thamnotettix* sp. 1 wing; *Cixius* sp. 1 adult clypeus; 1 wing fragment (base darkened); *Delphacodes* sp. 180 wings (veins simple, all dark, non-tuberculate); *?Delphacodes* sp. 20 wings (veins slightly tuberculate and more furcated towards apex; *Conomelus anceps* 2 wings of brachypters, 1 macropter wing; *Formica lemani* 2 adult heads] MNI= 49

Total samples 5 Total Dipterous Taxa 13 Total MNI= 153

---

27 TUQUOY

a TQ 801J.

Calobata petronella, 1 puparium; *Orygma luctuosum*, 1 puparium; *Spelobia ?rufilabris*, 1 puparium; *?Hydrellia* sp., 2 puparia; ?Calliphorid sp., 1 puparium; Cyclorrhaphan sp. 1 puparium MNI= 7

b TQ 803J.

Scatopse notata, 1 pupa; *?Halaconyia sciomyzina*, 2 adult heads; *Copromyza equina/similis*, 2 wings, 2 puparia; *Opalimosina liliputana*, 1 puparium; *Spelobia ?rufilabris*, 8 puparia; *Trachyopella coprina*, 3 puparia MNI= 17

c TQ 803- 88 Pitf.

Bibionid sp. 2 larval head-capsules; *?Scatopsciara vivida*, 1 adult head and 1 wing; *Scatopse notata*, 1 larva and 6 pupae; *Copromyza equina/similis*, 2 wings, 1 head, 64 puparia; *?Thoracochaeta zosterae*, 13 puparia; *Trachyopella coprina*, 201 puparia; *Opalimosina liliputana*, 9 puparia; *Spelobia ?rufilabris*, 332 puparia; *"Limosina* sp. vi" 2 puparia; *Pullimosina heteroneura*, 14 puparia; Limosinine sp. indet. 4 adult heads; Cyclorrhaphan sp. 1 puparium MNI= 649

d TQ 804

Haematopota/Chrysops sp. 1 pupal fragment; *Copromyza equina/similis* 14 puparia; *Thoracochaeta zosterae*, 6 puparia; *Trachyopella coprina*, 5 puparia; *Spelobia ?rufilabris*, 15 puparia

MNI= 41

e TQ 806 (NB, J. Sadler suggests horizons 806 and 803 synchronous)

Tipula sp. 1 larval head-capsule; *Pedicia (Tricyphona) immaculata*, 2 adult heads; ?Bibionid sp. 1 adult head; *?Scatopsciara vivida*, 1 wing; *Scatopse notata*, 15 pupae; *Sympycnus desoutterri*, 1 wing *Lonchoptera lutea*, 1 wing of female; *Calobata ?petronella*, 1 puparium; *Coelopa ?frigida*, 1 thorax; *Heterocheila buccata*, 2 puparia; *Sphaerocera curvipes*, 10 puparia, 3 adult heads; *Copromyza equina/similis*, 137 puparia, 27 wings, 10 heads, 2 thoraces; *Opacifrons humida*, 1 wing; *?Thoracochaeta zosterae*, 7 puparia; *Minilimosina ?fungicola*, 3 puparia; *Opalimosina liliputana*, 38 puparia, 3 wings; *Spelobia ?rufilabris*, 304 puparia; *Pullimosina heteroneura*, 45 puparia; *Trachyopella coprina*, 8351 puparia; Sphaerocerid spp. 1 puparium, 6 heads, 3 thoraces; *?Scatella* sp. 2 puparia; *Limnellia quadrata*, 1 wing; *Scaptomyza graminum* (or *Drosophila* sp.) 1 puparium; Acalypterate sp. 1 puparium; Cyclorrhaphan spp. 3 puparia; *Scathophaga ?furcata*, 3 wings; Anthomyiid sp. 2 puparia; *Coenosia mollicula*, 1 wing; *Helina evecta*, 1 puparium, 1 adult scutellum (this species?)

MNI= 8993

f TQ 808

Tipula oleracea/paludosa, 1 pupa; Chironomids, 5 adult thoraces; Psychodid sp. 1 pupal fragment; *Scatopse notata* 3 pupae; Nematoceran sp. 1 larval head-capsule; *Copromyza equina/similis* 58 puparia(em), 10 wings, 14 heads, 5 thoraces, (NB, 1 of thoraces positively identifiable as *equina,* the mesopleuron being in perfect condition,); *Limosina silvatica* 2 wings, 4 puparia; *Spelobia clunipes,* 3 wings; *S.?rufilabris* 193 puparia; *Trachyopella coprina* 588 puparia (573 em); *Opalimosina liliputana* 1 wing (NB, Tthere may have been some badly fragmented puparia amongst the total given for *Spelobia* above); *Pullimosina heteroneura* 5 puparia; Limosinine spp.indet, 3 heads, 1 thorax; *?Scatophila* sp. 1 puparium; Cyclorrhaphan spp. 2 puparia (different species) [Also heads of 3 species parasitic Hymenoptera] MNI= 901

g TQ 810

?Limonia sp. 2 larval head-capsules; *Pedicia (Tricyphona) ?immaculata* 4 larval head-capsules; *Limnophila* sp.(pupal fragments of a male and female); *Erioptera ?lutea* v. *taenionota* 2 larval head-capsules, 1 pupal fragment; Ceratopogonid sp. 1 thorax; *Bibio nigriventris* 2 wings; *Lycoriella/Bradysia* sp. 1 wing; *Scatopse notata* 1 pupa; ?Syrphid sp. 1 fragment of pupa; *Leptocera fontinalis* 3 puparia, 1 adult head, 2 thoraces, and 1 wing; *Copromyza* sp. 2 puparia, 5 adult heads and 2 wings; *C.similis* 2 thoraces; *?Limosina silvatica* 5 puparia; *Thoracochaeta zosterae* 1 puparium; *Trachyopella coprina* 15 puparia; *Spelobia ?rufilabris* 9 puparia; *Pullimosina heteroneura,* 4 puparia; Limosinines spp.indet, 5 adult heads; Sphaerocerid sp.indet, 6 puparia; *Scatophila* sp. 13 puparia; *?Scaptomyza graminum* 2 puparia; *?Thricops* sp. 1 puparium; *Helina* sp. 2 puparia; Cyclorrhaphan spp. 6 puparia [Also head of Trichopterous adult] MNI= 105

h TQ 813

Tipulid sp. 1 larval head-capsule; *Copromyza equina/similis* 1 puparium; *Spelobia ?rufilabris,* 5 puparia; "*Limosina* sp." 2 adult heads, 2 thoraces; Agromyzid sp. 8 puparia; *Coenosia* sp. 1 puparium [Also heads of parasitic Hymenoptera- 8 Pteromalids, 1 Ichneumonid, 2 Ceraphronids, and 1 indet.thorax] MNI= 18

i TQ 814

Limonia sp. 5 larval head-capsules; *Pedicia (Tricyphona) immaculata*, 2 larval head-capsules, 3 wings, 3 adult heads; *Erioptera v. taenionota*, 5 larval head capsules; Chironomids, 3 thoraces; *Bibio nigriventris*, 1 thorax, 2 wings; *Dilophus febrilis/femoratus*, 5 adult heads, 1 thorax; *Copromyza equina/similis*, 1 wing, 1 head; *Leptocera fontinalis*, 1 thorax; *Limosina silvatica*, 1 wing; *Trachyopella coprina*, 17 puparia(em); *Spelobia ?rufilabris*, 2 puparia(em); *Pullimosina heteroneura*, 2 puparia; "*Limosina* sp." 3 thoraces; Sphaerocerid sp. 1 puparium; *Scathophaga* sp. 1 puparium; *Fucellia ?fucorum*, 2 adult male heads MNI= 62

j TQ 815

Chironomids, 8 thoraces; *Scatopse notata*, 1 pupa; *Copromyza equina/similis*, 2 wings; *Trachyopella coprina*, 1 puparium; "*Limosina* sp." 1 adult thorax; Ephydrid sp. 1 puparium; *Scaptomyza graminum*, 1 puparium; *Scathophaga ?furcata*, 1 wing; Cyclorrhaphan sp. 1 puparium

MNI= 17]

k TQ 816

Tipulid sp. 2 larval head capsules; *Erioptera lutea v. taenionota*, 1 pupa, 3 wings, 1 thorax; *Scatopse notata*, 2 larval skins; *Spelobia ?rufilabris*, 13 puparia MNI= 22]

l TQ 817

Tipulid sp. 16 larval head-capsules; *Pedicia (Tricyphona) ?immaculata* 3 larval heads, 1 adult head; Chironomids, 4 thoraces; Ceratopogonid sp. 1 thorax; *?Scatopsciara vivida*, 1 wing; *Lycoriella/ Bradysia* sp. 1 wing; *Bibio nigriventris*, 1 male wing; *Scatopse notata*, 1 pupa; *Copromyza equina/similis*, 11 puparia, 1 wing, 4 heads, 1 thorax; *Leptocera fontinalis*, 1 wing; *Trachyopella coprina*, 132 puparia; *Pullimosina heteroneura*, 5 puparia(em); *Spelobia ?rufilabris*, 63 puparia(em); *Scaptomyza graminum*, 2 puparia, 1 wing; *Hydrellia ?modesta*, 2 thoraces; *Scathophaga* sp. 1 puparium; *Coenosia* sp. 3 puparia; *Helina evecta*, 1 puparium; *Helina* sp. 1 puparium; Cyclorrhaphan sp. 2 puparia [Also 3 adult heads of parasitic Hymenoptera, incl. 1 Pteromalid] MNI= 260

Total samples 12 Total Dipterous Taxa 55+ Total MNI= 11,101

ICELAND

28 BESSASTAÐIR

Bessastaðir 10 (pre 1226)

Scatopse notata 5 larval skins, 5 pupal fragments; *Heleomyza serrata* 190 puparia(em); *?Allopiophila vulgaris* 1 puparium; *Copromyza* sp. 1 wing; *Leptocera ?fontinalis* 6 puparia(em); *?Thoracochaeta zosterae* 2 puparia(em); *Limosina silvatica* 2 puparia; *Telomerina flavipes* 226 puparia; *Scathophaga* sp. 3 puparia(em); (*Melophagus ovinus* ♂) MNI= 439

Bessastaðir 11 (pre 1485)

Trichocera sp. 3 wings, 1 pupal fragment, 4 larval head-capsules; Psychodid sp. 1 pupal fragment; *Scatopse notata* 3 wings, 56 pupae, 7 larval skins, 1 larval head-capsule; Sciarid sp.(large species having estimated wing length of c.5mm) 1 wing fragment (basal third only); *Dolichopus plumipes* 1 pupal facial mask; *Megaselia cf. rufipes* 1 puparium(em); *Heleomyza serrata* 2 adult heads, 14 wings, 94 puparia; *Copromyza* sp. 4 wing, 5 adult heads, 2 puparia; *Leptocera ?fontinalis* 3 wings, 2 puparia(em); *Thoracochaeta zosterae* 1 puparium; *?Limosina silvatica* 3 puparia; *?Herniosina bequaerti* 4 wings; *Telomerina flavipes* 229 puparia; *?Allopiophila vulgaris* 1 puparium; Acalypterate sp.indet. 2 puparia(em); *Scathophaga calida* 1 adult head; *S.calida/litorea* 4 wings; *S.furcata/stercoraria* 13 puparia(em); *?Nupedia* sp. 1 wing; (*Melophagus ovinus* ♀) [Also 3 heads of adult parasitic Hymenoptera including 1 Ichneumonid] MNI= 429

Bessastaðir 14

(*Melophagus ovinus* 1) MNI= 1

Bessastaðir 15

Scatopse notata 1 pupa; (*Melophagus ovinus* 1) MNI= 2

Bessastaðir 17

Heleomyza serrata 2 wings, 1 puparium; *Copromyza* sp. 1 puparial fragment; *Telomerina flavipes* 3 puparia; *Scathophaga calida/litorea* 1 wing [Also 1 Trichopteron wing-fragment] MNI= 6

Bessastaðir 18 Sym.

Telomerina flavipes 1 puparium MNI= 1

Bessastaðir 19 Sym.

Trichocera sp. 1 wing-fragment; *Scatopse notata* 1 pupa (in larval skin); *Heleomyza serrata* 1 adult abdominal fragment, 2 wings, 1 puparium(em); *Herniosina bequaerti* 2 puparia; *Telomerina flavipes* 10 puparia; *Scathophaga* sp. 1 wing, 1 puparium [Also 1 head of an adult Alysiine Braconid wasp and 1 Linyphid spider cephalothorax] MNI= 16

Total samples 7 Total Dipterous Taxa 18 Total MNI= 891

(29 EYNHYRNINGUR)

---

30 FINNBOGASTAÐIR

A "4901 Sv 1" [Specimens all fragmentary and strongly bleached]

Megaselia sp. indet. 1 puparium(em); *Heleomyza borealis* 348 puparia(em); *Scatella* sp. 1 wing; *Scathophaga* sp. 2 puparia(em); 1 wing; ?*Pegoplata infirma* 1 puparium(em) MNI= 354

B "4901-39 21/7/90 Road cut profile Col. SU 9

Heleomyza borealis 21 puparia(em); *H. serrata* 1 puparium(em); ?*Allopiophila* 1 puparial fragment(em); *Calliphora* sp. 1 larval skin [There were two modern contaminants in this sample, namely a perfect male Sciarid and a female Psychodid] MNI= 24

C "4901-30 Road cut Profile C12 sample"

Heleomyza borealis 7 puparia(em) (length 3.0- 5.4mm); ?*Copromyza* sp. 1 puparial end-segment possibly belonging to this genus; *Allopiophila* sp. 1 puparium(em); ?*Botanophila fugax* sp. 1 puparium(em) MNI= 10

D "4901-39 21/7/901 Road cut profile Col.Sample SU11"

Heleomyza borealis sp. 7 puparia(em); *Allopiophila* sp. 1 puparial fragment(em)

MNI= 8

E "4901-39 SU11"

Heleomyza borealis 51 badly fragmented puparia(em) (mostly small but three decidedly larger, possibly belonging to *H. serrata*); *Allopiophila* sp. 4 puparia(em); *Scathophaga* sp. 1 puparium(em) MNI= 56

F "4901-39 Road cut(12 SAM) 7,12,90"

Heleomyza borealis 163 puparia (141 em) (length 3,42- 5,4mm); *Allopiophila* sp. 10 puparia(em) (length 3,42- 3,90mm); *Scathophaga* sp. 9 puparia(7 em, 2 unh, with remains of female terminalia) MNI= 182

G R,C,Prof,col Sam SU 14 21/7/90"

Heleomyza borealis 307 puparia(279 em) (remarkably constant in size and including no large specimens; presumably all *borealis*); *?Copromyza* sp. 1 puparium(unh); *Allopiophila* sp. 45 puparia(41 em, 4 unh); *Scathophaga* sp. 6 puparia(em) MNI= 359

H "49011-39 21/7/90 Road cut prof,column Sample SU 14" [3 tubes- a,b,c]

Heleomyza borealis puparia as follows- a) 338(302 em), b) 393(321 em), c) 324(263 em) = 1055(886 em) (another empty puparium 6,0mm long was perhaps *H. serrata*); *Allopiophila* sp. puparia as follows- a) 23(21 em), b) 22(21 em, 1 unhatched one , on the structure of the female genital segments looks more like a *Scaptomyza* sp.), c) 21(em) = 66(63 em); *Scathophaga* sp. puparia as follows- a) 8(em), b) 2(1 em), c) 11(em)= 21(20 em); *?Pegoplata infirma* 1 puparium(em) MNI= 1144

Total samples 8 Total Dipterous Taxa 10 Total MNI= 2136

---

31 GJÖGUR

A "4901-7 Gjogur SU 38 J,S,"

Heleomyza borealis 1 puparium MNI= 1

B "4091-7 Gjogur SU 40 J,S,"

Heleomyza borealis 15 puparia(14 em); *H. ?serrata* 2 puparial end-segments probably this species, being much larger than previous 15 specimens; *?Calliphora* sp. fragments of 1 puparium MNI= 18

C "4901-7 Gjogur SU 47/48 J.S." [bleached and in poor state of preservation

Heleomyza borealis 12 puparia(em); *Allopiophila* sp. 66 puparia(em); ?Ephydrid sp.indet. 1 puparial end-segment; *Scathophaga* sp. 8 puparia(em) MNI= 87

D "4901-7 Gjogur SU 60- 61 J.S." [bleached, fragmented and in poor preservation]

Heleomyza borealis 6 puparia(em); *Allopiophila* sp. 1 puparial fragment; *Scathophaga* sp. 1 puparial end segment MNI= 8

E "4901-7 Gjogur SU 67 J.S."

Allopiophila sp. 1 puparium(em); *?Calliphora* sp. 1 puparial anterodorsal cap MNI= 2

Total samples 5 Total Dipterous Taxa 6 Total MNI= 116

(32 HOLT)

(33 ÓSABAKKI)

(34 PAPEY)

---

35 REYKHOLT

[Passage]

Sym.4 9207 60-80 7123 30-70 28.2.88

Megaselia cf. *rufipes* 1 puparium(em); (*Melophagus ovinus 19*) MNI= 20

Sym.14 28.2.88 x 207.60-80, y 123.5-70

Prionocera turcica 1 female pupal end-segment, 8 larval head-capsules of uniform size(this species?); *Rhamphomyia ?simplex* 2 pupae; *Megaselia* cf. *nigra* 3 puparia(em); M. cf. *rufipes* 1 puparium(em); *Heleomyza ?borealis* 11 puparia(10 em); *?Allopiophila vulgaris* 4 puparia(em); *?Philygria vittipennis* 1 puparium; *Drosophila/Scaptomyza* sp. 1 puparium; *Scathophaga furcata/stercoraria* 1 wing, 4 puparia(em); *Botanophila ?fugax* 4 puparia(em); anthomyiid sp. 1 puparium(em); *?Spilogona* sp. 2 puparia(em) [Also Saldid sp. 1 hemielytron fragment; Trichopteron sp. 3 larval cases containing larval sclerites, 1 adult wing fragment] MNI= 38

Sym.15

Tipula confusa/rufina 1 larval head capsule (1.5mm long); *Heleomyza ?borealis* 1 puparium(em); *?Spilogona* sp. 1 puparial end-segment; *(Melophagus ovinus 3)* MNI= 3

Sym.32

?Tipula sp. 1 pupal fragment; *Megaselia* cf. *rufipes* 1 pupal end-segment; *Dolichopus ?plumipes* 1 pupal facial mask; *Heleomyza ?borealis* 4 puparia; *?Allopiophila vulgaris* 22 puparia(em); *(Melophagus ovinus 2)* MNI= 31

Sym.33

Melophagus ovinus 5 adult heads, 8 thoraces MNI= 8

[Room 2]

Sym.19

Megaselia cf. *rufipes* 1 puparium(em); Sphaerocerid sp. 1 puparium(em); *?Allopiophila vulgaris* 1 puparium(em); *?Spilogona* sp. 1 puparium(em); *(Melophagus ovinus 10)* MNI= 4

Sym.20

Scatopse notata 1 pupa with larval skin(em); *Megaselia* cf. *rufipes* 33 puparia(em); *Heleomyza borealis* 7 puparia(1 male unh.) MNI= 41

Sym.21

Melophagus ovinus 43 [Also *Pediculus* sp. many fragments] MNI= 43

Sym.22

Trichocera sp. 15 pupal facial masks; *Scatopse notata* 1 pupa, 3 larval head-capsules, 5 pupal antennal sheaths; *Bibio pomonae* 2 larval skins (1 almost complete); *Dolichopus ?plumipes* 1 pupal facial mask; *Megaselia* cf. *rufipes* 26 puparia(em); *Copromyza* sp. 5 wings; limosinine sp. 1 puparium(em); *?Allopiophila vulgaris* 1 puparium(em); *Melophagus ovinus* 50 [Also Trichopteron sp. 2 adult heads. The sample also contained a mass of Coleopterous fragments mixed with hairs and feathers] MNI= 102

Sym.30

Megaselia cf. *nigra* 1 puparium; *Heleomyza ?borealis* 19 puparia(em); Sphaerocerid sp. 1 puparium; *Scathophaga* sp. 2 puparia; *(Melophagus ovinus 2)* MNI= 23

[Room 1] Sym.36

Megaselia cf. *rufipes* 2 puparial end-segments; *Melophagus ovinus* 1 adult thorax [Also Lepidopteron sp. 1 larval head-capsule] MNI= 3

[Room ?] Sym.? x 208, 60-209, y 123,18-57

Melophagus ovinus 4 adult heads, 9 thoraces MNI= 9

(R98%)

(Melophagus ovinus 210) MNI= 210

Total samples 11 Total Dipterous Taxa c 21 Total MNI= 554

---

36 STÓRABORG

1 1981 Hús 14 Pit [Icelandic Hús= room]

Dilophus sp. 2 female adult heads; ? *Hayetiola* sp. 8 puparia; *Heleomyza serrata* 1 puparium; *?Copromyza* sp. 2 puparia; *Scathophaga* sp. 4 puparia; *Fannia* sp. 1 puparium(em); *?Spilogona* sp. 1 puparium(em) [Also 1 Lepidopterous larval head capsule and many Coleopterous fragments- *Tachinus, ?Philonthus, Hypnoides, Otiorrhynchus* etc.] MNI= 19

2 1984 Under passage HÚS T 30

Heleomyza serrata 9 puparia MNI= 9

3 1984 Hús 31/7

Sciarid sp.indet. 1 wing; *Hydrellia* sp. 1 puparium(em); *Drosophila* sp. 1 puparium(em); *Scathophaga* sp. 1 puparium(em); *?Spilogona* sp. 1 puparium(em) MNI= 5

4 (12) 13-17 Hús

Heleomyza serrata 1 puparium; Hydrellia sp. 1 puparium [Also fragment of large insect wing.] MNI= 2

5 20/8 Layer below west part of Hús 33

Anthomyiid sp.indet. 1 puparium(em) [Also Ichneumonid adult head.] MNI= 1

6 85 Hús 34 Floor

Heleomyza serrata 2 puparia; Melophagus ovinus 1 puparium MNI= 3

7 1981 Hús 14 under floor

?Mayetiola sp. 120 puparia; *Dilophus* sp. 5 adult heads and 2 thoraces; *Heleomyza serrata* 3 puparia; Sphaerocerid spp. 7 puparia (at least 3 species, 1 very small; larger ones possibly *Copromyza* sp.); *Hydrellia* sp. 3 puparia; *Scathophaga* sp. 10 puparia; *Fannia* sp. 2 puparia; ?*Thricops* sp. 1 puparium; ?*Spilogona* sp. 1 puparium [Also 1 Ichneumon cocoon, 1 ?sawfly cocoon, 1 very small Lepidopterous larval head-capsule and 5 different parasitic Hymenopterous adult heads.]

MNI= 152

8 Hús 18 Floor

Mayetiola sp. 4 puparia; *Scatopse notata* 1 pupa(em); *Heleomyza serrata* 3 wings; 31 puparia; *?Copromyza* sp. 1 puparium(em); *Herniosina bequaerti* 8 puparia(em) MNI= 45

9 1981 F Trench S,Profile Column 40-45cm, 3,825 Kg, 12,9,81

Heleomyza serrata 96 puparia; *Copromyza* sp. 2 puparia; *?Calliphora* sp. 4 puparia; ?*Hydrotaea dentipes* 1 puparium(em) MNI= 103

10 Pit under Hús 14

Scatopse notata 6 pupae with larval skins(em); *Heleomyza serrata* 250 puparia; *Telomerina flavipes* 9 puparia(em); *Herniosina bequaerti* 1 puparium MNI= 266

11 1981 F,Trench W,Profile Column 35-40cm,

Heleomyza serrata 3 puparia(em); *?Themira dampfi* 1 puparium; Limosinine sp.indet. 1 puparium; *Fannia* sp. 1 puparium MNI= 6

12 F Trench S,Pofile 10-15cm,

Heleomyza serrata 2 puparia; *?Themira dampfi* 2 puparial end segments; Acalypterate sp. 3 puparia; *Scathophaga* sp. 2 puparia; Cyclorrhaphan spp. 3 puparial fragments MNI= 12

13 1981 F Trench/W,Profile Column 40-45cm, 3,49kg,

Heleomyza serrata 1 puparium; ?*Scathophaga* sp. 1 puparium MNI= 2

14 1981 F Trench

Chironomid sp.indet. 1 adult thorax; *Heleomyza serrata* 26 puparia; 1 adult thorax; *Scathophaga* sp. 2 puparia; anthomyiid sp. 2 puparia MNI= 31

15 G Trench N Profile 65-70cm,

Scatopse notata 2 pupal end-segments; *Heleomyza serrata* 9 puparia; *Scathophaga* sp. 5 puparia; *Telomerina flavipes* 6 puparia; ?Agromyzid sp.no.7 1 puparium; Calliphorid/Scathophagid sp.no.6 1 puparium; Cyclorrhaphan sp.no.5 1 puparium MNI= 25

16 Drain under H14: Upper Layer

Trichocera maculipennis 9 wings, 6 adult thoraces and 2 heads, 2 pupal wing-sheaths; *Dilophus* sp. 1 adult thorax; *Scatopse notata* 34 pupae(em), mostly in larval skins, 9 adult thoraces, 9 larval head-capsules; *Heleomyza serrata* 201 puparia, 17 wings, 7 adult heads; *Copromyza* sp. 6 wings; *Herniosina bequaerti* 14 puparia; *Telomerina flavipes* 48 puparia; *?Spelobia* sp. 1 wing; *?Scaptomyza* sp. 1 puparial end-segment; *Melophagus ovinus* 2 adult heads and 4 thoraces [Also 4 *Otiorhynchus ?nodosus* and 1 Lepidopterous larval head-capsule] MNI= 313

17 F Trench S Profile column 25-30cm, 12,8,81

Heleomyza ?borealis 1 puparium(em) (very small one); *?Copromyza* sp. 9 puparia(em) MNI= 10

18 Hús 18 Floor E-W

Scatopse notata 3 pupae with larval skins; *Heleomyza* sp. 84 puparia em, Further 9 unh.comprised 2 *serrata* and 2 *borealis; Telomerina flavipes* 3 puparia; Limosinine sp. 1 puparium(em) MNI= 91

19 Hús 14 Pit

Heleomyza sp. 1 puparium MNI= 1

20 F Trench Profile Column 35-40cm W7,

Heleomyza sp. 6 puparia(em); *Copromyza* sp. 3 puparia(2 em); *Leptocera fontinalis* 12 puparia(7 em) MNI= 21

21 1981 F Trench S Profile 25-30cm,

Scatopse notata 1 larva; *Heleomyza* sp. 1 puparium(em); *?Copromyza* sp. 33 puparia; Limosinine spp.(*?Minilimosina* and *?Trachyopella) 2 puparia(em); Allopiophila ?vulgris* 1 puparium(em); *Scathophaga* sp. 1 puparium(em) MNI= 39

22 STÓRABORG C

Trichocera maculipennis 2 wings and possibly pupal fragments; *Heleomyza* sp. 8 puparia(em); 2 wings (prob. *serrata*); Limosinine spp.(*?Minilimosina* and *Trachyopella*) 2 puparia MNI= 11

23 STÓRABORG E

Scatopse notata 1 pupa with larval skin; *Heleomyza* sp. 9 puparia(1 unh. female); *?Minilimosina* sp. 10 puparia(em); *Allopiophila ?vulgaris* 1 puparium(em); *?Spilogona* sp. 1 puparium(em); *Melophagus ovinus* 1 adult head MNI= 23

24 STÓRABORG F

Scatopse notata 3 pupae, 1 with larval skin; *Heleomyza* sp. 1 wing; 89 puparia(83 em)(of 6 unh. males, one 3,6mm,long); *Herniosina bequaerti* 22 puparia(18 em); *Scathophaga* sp. 3 puparia(2 with perispiracular papillae shorter, more uniform in size; other has them larger and outermost largest) MNI= 117

25 STÓRABORG K

Heleomyza sp. 13 puparia(em); *Copromyza* sp. 1 wing; Sphaerocerid sp. 2 puparia(em) MNI= 16

26 F TRENCH(W) 0-5 STO

Heleomyza sp. 64 puparia(63 em; 1 unh.female); *Scathophaga* sp. 1 puparial end-segment; *?Spilogona* sp. 1 puparial end-segment (anal spiracles missing but could be a *Spilogona* sp.) MNI= 66

27 Charcoal I Pit uner Hús 14

Heleomyza sp. 2 puparia(em); *?Leptocera* sp. 1 puparium(em); *?Spilogona* sp. 1 puparial end-segment MNI= 4

28 STO 1

?Hayetiola sp. 8 puparia; *Scatopse notata* 5 pupae; *Heleomyza* sp. 23 puparia(21 em); *?Copromyza* sp. 2 puparia(em); *?Leptocera fontinalis* 3 puparia(em); *Allopiophila* sp. 4 puparia(em); *??Meonura* sp. 1 puparium(em); Anthomyiid/Scathophagid sp. 1 puparium(em) MNI= 47

29 STO 2

Trichocera maculipennis 1 pupal wing-cover; *Hayetiola* sp. 8 puparia; *Heleomyza* sp. 3 puparia(em);

Herniosina bequaerti 5 puparia(em); Anthomyiid sp.indet, 2 puparia(em); *Melophagus ovinus* 1 adult head; *?Calliphora* sp.indet, 1 puparial fragment MNI= 21

30 F TRENCH(W) STO 95-100

Heleomyza sp, 11 puparia(em); 3 adult heads and 2 thoraces; *Telomerina flavipes* 1 puparium(em); *?Hydrellia griseola* *1 puparium(em)* *MNI= 13*

31 1982 Hús 19

Trichocera maculipennis 1 wing and 1 adult head; *Scatopse notata* 1 pupa(em); *Heleomyza serrata* 41 puparia(37 em; 1 of unhatched ones a male); *Copromyza* sp, 4 puparia(em); *Herniosina bequaerti* 25 puparia(em); *Telomerina flavipes* 55 puparia(em); *Scathophaga* sp, 2 puparia(em); *Melophagus ovinus* 1 adult head [Also hind leg of *Gyrinus* sp.] MNI= 130

32 Drain under Hús 17

Trichocera maculipennis 4 pupal fragments; 13 adult heads, 20 thoraces and 14 wings; *Dilophus* sp, 1 adult head(male); *Scatopse notata* 4 pupae (with larval skins), 7 larval head-capsules, 3 adult thoraces; *Heleomyza serrata* 50 puparia; 28 adult heads, 19 thoraces, 38 wings and 3 basal abdominal tergites (2 of these darker in colour when in spirit but yellowish when dry, so probably all this species.); *Copromyza* s.str.sp, 1 puparium(em), 2 wings (not from same specimen) and 2 thoraces *Crumomyia nitida* 1 thorax, showing conspicuously striated mesopleurae; *Herniosina bequaerti* 5 puparia(em), 4 wings; Limosinine sp, 31 puparia(em), 3 adult heads *Scathophaga* sp, 2 puparia(em); *Melophagus ovinus* c.10 adult heads and thoraces [Also c.20 *Pediculus*] MNI= 126

33 Drain under Hús 17

Melophagus ovinus 1 puparium; 3 adults MNI= 3

34 F Trench 20-25cm ST 13-81

?Mayetiola sp, 1 puparium; *?Copromyza* sp, 1 puparium(em); *?Hydrellia griseola* 1 puparium(em); *Melophagus ovinus* 1 adult thorax MNI= 4

35 Hús 18 Pit

Scatopse notata 1 pupa(em); *Hel, borealis* 8 puparia(1 unh.); *Mel, ovinus* 2 adult heads, MNI= 11

36 Hús 18 Floor

Heleomyza sp. 78 puparia(em)(size range 3.9- 6.6mm; smaller ones probably including *H. borealis*); *Herniosina bequaerti* 2 puparia(1 perfect unh.male); *Telomerina flavipes* 7 puparia(em) MNI= 87

37 1982 Hús 7 Drain

Trichocera maculipennis 1 pupal wing-cover; *Scatopse notata* 1 pupal fragment; *Heleomyza* sp. 16 puparial end-segments(4 of these larger than others so presumably *H. serrata*; remainder probably including *H. borealis*.); *?Copromyza* sp. 1 puparial end-segment; *Telomerina flavipes* 16 puparia(em); *?Trachyopella* sp. 1 puparium(em); *Scathophaga* sp. 2 puparial end segments MNI= 38

38 STÓRABORG (1982) 3

Copromyza s.str.sp. 1 wing; *?Herniosina bequaerti* 1 puparial end-segment MNI= 2

Total samples 38 Total Dipterous Taxa 35 Total MNI= 1875

GREENLAND

36 QEQERTASUSSUK

1 Qt 87 B4

Neoleria prominens 7 puparia(em); *Heleomyza borealis* 25 puparia(em) (all large, c.5.7mm); *Allopiophila vulagaris* 11 puparia(em); *Lasiopiophila pilosa* 5 puparia(em); *Phornia terrae-novae* 7 puparia(em); *Hydrotaea anxia* 2 puparia(em); *Phaonia* sp. 2 puparia(em) MNI= 59

2 Qt 87 B6

Heleomyza borealis 51 puparia(em); *Allopiophila vulgaris* 49 puparia(em); *Lasiopiophila pilosa* 38 puparia(em); *Phornia terrae-novae* 40 puparia(em); *Hydrotaea anxia* 6 puparia(em) MNI= 184

3 Qt 87 B9

Neoleria prominens 14 puparia(13 em); *Heleomyza borealis* 40 puparia(em); *Allopiophila vulgaris* 49 puparia(1 unh); *Lasiopiophila pilosa* 70 puparia(1 unh); *Scathophaga* sp. 1 puparium(em); *Phornia terrae-novae* 123 puparia(2 unh.); *?Fucellia* sp. 38 puparia(em); *?Fucellia* sp. 32 puparia(31 em); Cyclorrhaphan sp. 1 puparium(em) MNI= 368

4 Qt 87 B 19/19 2 Greenland

Sciarid sp. 1 adult head; *Neoleria prominens* 63 puparia(em); *Heleomya borealis* 323 puparia(em; length 3,6-5,8mm), c,12 head and thoracic fragments; *Allopiophila vulgaris* 229 puparia(em, 3,12-5,4mm); *Lasiopiophila pilosa* 108 puparia(em, length 4,5-5,1mm); *?Fucellia/ ?Paregle)* 126 puparia(2 unh); *Hydrotaea anxia* 1 puparium(em); *Spilogona* sp. 1 puparium (an,sp. 0,05mm); *Phormia terrae-novae* 21 puparia(em), c, 2 tergal fragments [Also parasitic Hymenoptera 2 fragments; *Psylla* sp. 3 wings MNI= 876

5 Qt 87 B24

Neoleria prominens 3 puparia(em); *Heleomyza borealis* 6 puparia(2 unh, 3,6-5,6mm); *Allopiophila vulgaris* 6 puparia(1 unh); *Lasiopiophila pilosa* 1 puparium(em); *Scathophaga* sp. 1 puparium(unh); *?Paregle* sp. 8 puparia(unh); *Phormia terrae-novae* 24 puparia(4 unh) MNI= 49

6 Qt 87 C10

Neoleria prominens 3 puparia(em); *Heleomyza borealis* 1 puparium(em); *Allopiophila vulgaris 29 puparia*(em); ?Fucellia sp. 2 puparia(em); *Hydrotaea anxia* 1 puparium(em); *Phormia terrae-novae* 26 puparia(em) [Also Lepidopteran sp. 1 pupal end-segment] MNI= 62

7 Qt 87 C14

Neoleria prominens 170 puparia(em); 2 Heleomyzid thoracic fragments; *Heleomyza borealis* 22 puparia(em; 3,9-4,5mm); *Allopiophila vulgaris* 126 puparia(em); *Scatella ?stagnalis* 1 puparium(em); *?Paregle* sp. 21 puparia(em); *?Fucellia* sp. 7 puparia(em); *Hydrotaea anxia* 1 puparium(em); *Spilogona* sp. 2 puparia(em); *Phormia terrae-novae* 34 puparia(em) MNI= 386

8 Qt 87 C19

Heleomyza borealis 1 puparium(unh, 3,6mm); *Allopiophila vulgaris* 62 puparia(1 unh); *Lasiopiophila pilosa* 2 puparia(em); *?Fucellia* sp. 24 puparia(2 unh); *Delia fabricii* 1 puparium(em); *Zaphne* sp. 1 puparium(em); *?Paregle* sp. 2 puparia(em); *Spilogona* sp. 4 puparia(em); Muscid sp. 1 puparium(em); *Phormia terrae-novae* 11 puparia(em) [Also Lepidopteran sp. 1 pupal end-segment] MNI= 108

9 Qt 87 C20

Neoleria prominens 4 puparia(em); *Heleomyza borealis* 17 puparia(em); *Allopiophila vulgaris* 56

puparia(em); *Lasiopiophila pilosa* 5 puparia(em); *Scatophila* sp. 1 puparium(em); *Zaphne* sp. 1 puparium(em); *?Fucellia* sp. 9 puparia(em); *?Paregle* sp. 1 puparium(em); *Spilogona* sp. 7 puparia(em); ?Tachinid sp. 1 puparium(em); *Phormia terrae-novae* 4 puparia(em) MNI= 106

Total samples 9 Total Dipterous taxa 11 Total MNI= 2198

NORSE WESTERN SETTLEMENT

37 EGALUGIALIK: HEAD OF ITIVDLEQ, 15 km NW OF SANDNES (V.45)

1 V45 MF1

Heleomyza borealis 2 puparia(em) MNI= 2

2 V45 MF2

Heleomyza borealis 3 puparia(em) [Also Alysiine Braconid sp. 1 end-segment] MNI= 3

3 V45 MF3

Heleomyza borealis 2 puparia(em); *Delia fabricii* 1 puparial end-segment MNI= 3

4 V45 MF4

Heleomyza borealis 11 puparia(em); *Telomerina flavipes* 1 puparium(em); *Delia fabricii* 3 puparial end-segments; *Hydrotaea anxia* 1 puparium(em) [Also Hymenoptera Parasitica sp.1 1 adult thorax (larger species without notauli); Parasitica sp.2 1 adult thorax (smaller species with distinct notauli)] MNI= 16

5 V45 MF5

Heleomyza borealis 10 puparia(2 unh) (smallest about 3mm. long); H.?serrata; 1 puparium (incomplete, em) (would have measured about 6mm. when complete; dark reddish rather than dirty ochreous and with very strong transverse ridges along each intersegmental boundary and across middle of each segment- just as in typical specimens of this species) MNI= 11

6 V45 MF6

Simulium sp. 1 adult female head; *Heleomyza borealis* 26 puparia(3 unh); *Delia fabricii* 2 puparial end-segments MNI= 29

Total samples 6 Total dipterous Taxa 5 Total MNI= 64

38 NIÁQUSSAT (V. 48)

1 NA 1, 77 V48 # GREENLAND

Heleomyza borealis 11 puparia(9 em); *Telomerina flavipes* 2 puparia(em); *?Allopiophila vulgaris* 44 puparia(em); *Calliphora uralensis* 1 puparium(unh); *Scathophaga furcata* 2 puparia(em); *Delia fabricii* 12 puparia(em); *Botanophila ?betarum* 47 puparia(43 em); *Melophagus ovinus* 1 puparial fragment MNI= 120

2 NA V48 -1-77 C9 14C SAMPLE

Heleomyza borealis 1 wing, 1 puparium(em); *Telomerina flavipes* 1 adult head; *?Allopiophila vulagaris* 5 puparia(em); *Lasiopiophila pilosa* 1 puparium(em); *?Calliphora uralensis* 1 puparium(em); *Scathophaga litorea* 1 adult thorax; *S. furcata* 6 puparia(em); *Delia fabricii* 1 puparium(em) [Also *Psylla* sp. 2 wings (2,7mm long); ?Alysiine sp. 2 adult thoraces] MNI= 17

3 NA V48 -1-77 C9 20-30cm

Neoleria prominens 1 puparial end-segment; *Heleomyza borealis* 157 puparia(153 em); *Telomerina flavipes* 76 puparia(74 em); *Scathophaga furcata* 2 puparia(em); *Delia fabricii* 4 puparial end-segments; *?Pegomya* sp. 1 puparium(em) (posterodorsal cornu with linear window); *Botanophila ?betarum* 1 puparium(em); *Hydrotaea anxia* 2 puparia(em) [Also *Nysius groenlandicus* 4 heads, 3 thoracic fragments] MNI= 244

3b NA-1-77/ C9 30- 40cm

Neoleria prominens 3 puparia(em); *Heleomyza borealis* 97 puparia(95 em); *Telomerina flavipes* 9 puparia(em); *Botanophila ?betarum* 11 Puparia(em); *Delia fabricii* 2 puparia(em); *Spilogona* sp. 1 puparium(em) MNI= 123

4 NA-1-77/ C9 60-70cm

Simulium sp. 1 adult thorax; *Heleomyza borealis* 341 puparia(325 em); *Neoleria prominens* 2 puparia(em); *Telomerina flavipes* 174 puparia(167 em); *Scathophaga furcata* 6 puparia(em); *Botanophila ?betarum* 7 puparia(em); *B. profuga* 1 puparium(em); *Delia fabricii* 5 puparia(em); *D. ?platura* 2 puparia(em); *Hydrotaea anxia* 4 puparia(3 em); *Phaonia ?pallidisquama* 1 puparium(em)

[Also *Nysius groenlandicus* 1 adult head; Deltocephalid sp. 1 adult head; *Psylla* sp. 1 adult thorax]

MNI= 54

4b NA-1-77/ C9 90-100cm

Trichocera sp. 1 larval head capsule; *Neoleria prominens* 3 puparia(em); *Heleomyza borealis* 251 puparia(244 em., an one containing parasitic Hymenopteron), 2 adult heads; *Telomerina flavipes* 130 puparia(120 em); Agromyzid sp. 1 puparium(em); *Scathophaga furcata* 5 puparia(em); *Pegomya* sp. 1 puparium(unh. contained cocoon of parasite but only very few fragments of an adult wasp- evidently decomposed *in situ*); *Delia fabricii* 2 puparia(em); *Hydrotaea anxia* 1 puparium(em); *Melophagus ovinus* 1 puparium(em) MNI= 396

4c NA-1-77/ C9 120-130cm

Tipula arctica 1 male pupal end-segment; *Heleomyza borealis* 15 puparia(em); *Telomerina flavipes* 22 puparia(21 em); *Philygra ?vittipennis* 1 puparium(unh.); *Scatella ?stagnalis* 1 puparium(em); *Scathophaga furcata,* 2 puparia(em); *Botanophila ?betarum* 1 puparium(em); *?Lasiomma* sp. 1 puparium(unh.); *Delia fabricii* 9 puparia(em); *D. ?platura* 2 puparia(em); *Spilogona* sp. 1 puparium(em) [Also 1 small microlepidopterous pupal end-segment] MNI= 56

4d NA-1-77/ C9 127.5-130cm

Neoleria ?prominens 1 adult thorax (but mesopleurae with extremely fine alveoli); *Heleomyza borealis* 49 puparia(em); *Telomerina flavipes* 1 puparium(unh.); *?Allopiophila vulgaris* 20 puparia(18 em); *Scatella ?stagnalis* 2 puparia(em); *Scatophila cribrata* 1 puparium(em); *Scathophaga furcata* 2 puparia(em); *Pegomya* sp. (posterodorsal cornu with large fenestra, see Plate 27 fig. 4) 2 puparia(1 unh.); *Botanophila ?betarum* 4 puparia(em); *?Lasiomma* sp. 11 puparia(en); *Zaphne* sp. 1 puparium(em);

Delia fabricii 16 puparia(em; but one of these contained a *Botanophila* puparium facing same direction. It is not clear how this happened); *Phaonia ?pallidisquama* 1 puparium(em)

[Also 8 indet. segmented pupae(1 unh.); 2 end-segments of Lepidopterous pupae(one ending in two spines, other in a group of long stiff hairs) MNI= 112

4d NA-1-77/ C9 130-140cm

Neoleria prominens 2 puparia(em); *Heleomyza borealis* 10 puparia(9 em); *Telomerina flavipes* 8 puparia(em); *Allopiophila vulgaris* 1 puparium(em); *Scatella ?stagnalis* 1 puparium(em); *Scatophila cribrata* 1 puparium(em); *Scathophaga furcata* 3 puparia(em); *?Fucellia* sp. 1 puparium(em); *?Lasiomma* sp. 3 puparia(em); *Delia fabricii* 13 puparia(em); *Spilogona* sp.(minute an. sp.) 1 puparium(em) [Also 3 end-segments of microlepidopterous pupae (ending in stiff hairs); ?Noctuid sp. 1 large larval head-capsule; 1 Ichneumonid or sawfly 1 cocoon (as in some other samples- very puparium- like)] MNI= 44

5 NA-1-77/ C9 140-Base

Simulium sp. 2 adult thoraces; *Heleomyza borealis* 11 wings, 6 adult heads, 12 puparia(10 em); *Neoleria prominens* 1 puparium(em); *Telomerina flavipes* 16 puparia(15 em); *?Allopophila vulgaris* 3 wings; 47 puparia(40 em); *Scathophaga furcata* 2 wings; 28 puparia(25 em); *Delia fabricii* 12 puparia(11 em); *D.?platura* 2 puparia(em); *Pegomya* sp. 4 puparia(em); *?Spilogona* sp. 1 puparial end-segment(em) (minute anal spiracles); ?Muscid sp. 1 wing [Also ?Ichneumonid sp. 2 cocoons] MNI= 126

6 NA-1-77 C10 67,5cm

Heleomyza borealis 92 puparia(91 em) (NB,Some of smallest specimens hardly larger than largest *Telomerina*); *Telomerina flavipes* 34 puparia(33 em); *Hydrotaea anxia* 1 puparium(em) MNI= 127

7 NA-1,77/ C10 117,5cm

Heleomyza borealis 19 puparia(em); *Telomerina flavipes* 1 puparium(em); *Botanophila ?profuga* 2 puparia(em); *Hydrotaea anxia* 1 puparium(em) MNI= 23

8 NA-1-77/ 120 cm

Heleomyza borealis 166 puparia(162 em) (NB, size range confirmed by surstyli 3,12- 4,98mm); *Telomerina flavipes* 54 puparia(53 em); *Scathophaga furcata* 1 puparium(em); *?Pegomya* sp. 1 puparium(em); *Melophagus ovinus* 1 puparium(em) MNI= 223

9 NA-1-77/ D9 112,5-115cm

Neoleria ?prominens 1 puparium(em); *Heleomyza borealis* 2 puparia(1 em); *Telomerina flavipes* 2 puparia(em); *?Pegomya* sp. 2 puparia(em); *Botanophila ?betarum* 8 puparia(em); *Delia fabricii* 31

puparia(em); *D.?platura* 1 puparium(em); *?Lasiomma* sp. 1 puparium(em) [Also Ichneumonid/sawfly sp. 1 cocoon (very puparium-like; as above)] MNI= 48

10 NA-1-77 D9 125cm.

Heleomyza borealis 22 puparia(21 em); *Telomerina flavipes* 1 puparium(em); *Allopiophila vulgaris* 7 puparia(em); *Botanophila ?betarum* 1 puparium(em); *Delia fabricii* 1 puparium(em) [Also Ichneumon/ sawfly sp 1 cocoon (puparium-like as above)] MNI= 32

11 NA-1-77 D9 127.5-130cm

Heleomyza borealis 1 puparium(em); *Scatella ?stagnalis* 27 puparia(25 em); *Scatophila cribrata* 48 puparia(em); *?Pegomya* sp. 1 puparium(em); *Botanophila ?betarum* 5 puparia(em); *?Lasiomma* sp. 13 puparia(em); *Zaphne* sp. 1 puparium(em); *Delia fabricii* 18 puparia(em); *D.?platura* 2 puparia(em); *Spilogona* sp. 1 puparium(em),(an.sp.0.07mm) [Also Deltocephalid sp. 1 adult head; *Psylla* sp. 1 adult head; Lepidopterous sp. 4 large larval mandibles; Hymenoptera parasitica sp. 1 metasternum; Ichneumonid sp. 1 large black petiole] MNI= 117

12 NA-1-77 D9 130cm "Wet above underground"

Neoleria ?inscripta 3 puparia(em); *Heleomyza borealis* 26 puparia(23 em., one unhatched one with empty cocoon of Hymenopterous parasite); *Allopiophila vulgaris* 5 puparia(em); *Scatella ?stagnalis* 6 puparia(1 unh.); *Scatophila cribrata* 5 puparia(em); *Calliphora uralensis* 1 puparium(unh.but incomplete); *Scathophaga furcata* 1 puparium(em); *?Pegomya* sp. 1 puparium(em); *Botanophila ?betarum* 42 puparia(41 em); *?Lasiomma* sp. 40 puparia(1 containing fragments of parasite); *?Fucellia* sp. 3 puparia(em); *Delia fabricii* 73 puparia(72 em); *D.?platura* 1 puparium(em); *?D.* sp. 1 puparium(em) MNI= 208

13 NA-1-77 D9 130-140cm "old ground surface"

Neoleria ?prominens 1 puparium(em); *Heleomyza borealis* 5 puparia(3 em., an unhatched one with cocoon containing adult parasitic Hymenopteron); *Scatophila cribrata* 35 puparia(28 em); *Scatella ?stagnalis* 24 puparia(21 em.,an unhatched one containing parasite); *Scathophaga furcata* 5 puparia(4 em., an unhatched one containing cocoon of parasitic Hymnopteron); *Botanophila ?profuga* 4 puparia(em); *?Lasiomma* sp. 12 puparia(11 em., an unhacted one containing male surstyli); *Delia*

fabricii 10 puparia(em) [Also *Otiorrhynchus ?arcticus* 1 adult head]

MNI= 96

Total samples 18 Total Dipterous Taxa 28 Total MNI= 2661

---

39 NIPÁATSOQ (V.54)

1 Ni V54 77-2 555 JORD FRA OMRÁDE OMVRING MOSENS

Heleomyza borealis 9 puparia(5 em); *Telomerina flavipes* 27 puparia(25 em); *Calliphora uralensis* 1 puparium(em) MNI= 37

2 Ni V54 77 RUM III 1977

Aedes sp. 1 adult head; *Heleomyza borealis* 2 puparial end-segments; *Telomerina flavipes* 441 puparia(431 em) MNI= 444

3 Ni V54 77-2 RUM IV Dipt.

Heleomyza borealis 26 puparia(em); *?Scoliocentra fraterna* 3 puparia(em); *Telomerina flavipes* 2 puparia(em) MNI= 31

4 Ni V54 77-2 RUM VI

Heleomyza borealis 67 puparia(em); *H.?serrata* 20 puparia(17 em.,mostly darker, larger and more strongly transverse-ridged than previous); *?Scoliocentra fraterna* 103 puparia(102 em); *Telomerina flavipes* 5 puparia(4 unh.); *Cynomya mortuorum* 1 adult head fragment; *?Phormia terrae-novae* 2 puparial fragment; *Scathophaga* sp. 1 puparium(em); *Delia fabricii* 2 puparia(em); *?Spilogona* sp. 1 puparium(em) [Also Ichneumonid sp. 1 cocoon] MNI= 202

NB. Dissection of the unhatched specimens showed that 2 Heleomyzid taxa were present, namely *Heleomyza borealis* and *?Scoliocentra fraterna*. Puparia of the two differed as follows:-

- a generally with more or less conspicuous transverse ridges across segments, ambulatory welts less conspicuously spiculate ventrally and posterior spiracles smaller (0,12-0,15mm in vertical diameter) *Heleomyza borealis*
- without transverse ridges across segments; welts more distinctly spiculate, sometimes vaguely protuberant. Posterior spiracles larger (vertical diameter 0,16-0,20mm)

?Scoliocentra fraterna

On this basis a sample recounted gave 40 *?Scoliocentra* and 26 *Heleomyza*

5 Ni V54 77-2 RUM VI

Aedes sp. 1 adult thorax; *Heleomyza borealis* 2 puparia(em); *Telomerina flavipes* 370 puparia (354 em) MNI= 373

Total samples 5 Total taxa 10 Total MNI= 1087

---

40 SANDNES (V.51)

FELT I [21 samples] (NB. Danish Felt= Trench)

AU I

1070 Unit P8 Level 5 v 50 (Twig)

Simulium sp. 3 thoraces; *Heleomyza borealis* 27 puparia(26 em); *?Copromyza* sp. 1 puparium(em); *Telomerina flavipes;* 1 puparium(em); *Scathophaga* sp. 2 wing fragments; *Delia* sp. 1 puparium(em); *?Botanophila* sp. 3 puparia(em); (*Melophagus ovinus* 3 fragments of adults) [Also *Nabis flavomarginatus* 1 adult pronotum] MNI= 40

1158 T5 54-59cm (Twig)

Heleomyza borealis 11 puparia(10 em); *Delia fabricii* 3 puparia(em); *?Fucellia* sp. 1 puparium(em) MNI= 15

1204 Unit T10 Level SU 65 (Fire place)

Forcipomyia sp. 3 thoraces; *Heleomyza borealis* 3 adult heads; 1 wing; 325 puparia(295 em); *?Allopiophila vulgaris;* 1 puparium(em); *Scathophaga furcata* 1 adult head fragment, 1 puparium(em); *S. litorea* 1 adult thorax; *Delia fabricii* 6 puparia(em); *Botanophila ?betarum* 1 puparium(em); *B. profuga* 1 puparium(em)); (*Melophagus ovinus* 2 fragments of adults) [Also Lepidopteron sp. 1 pupal end-segment; *?Philonthus* sp. 1 adult pronotum] MNI= 341

1277 Unit P8 Level SU 64 (Wood)

Delia ?platura 1 puparial end segment [AU I 397] MNI= 1

(No AU II)

AU III

673 Unit Q10 Level SU47 (Charcoal)

Simulium sp. 2 adult heads and 26 thoraces; *?Bradysia* sp. 1 wing; *Heleomyza borealis* 4 puparia(1 unh); *Fucellia* sp. 1 puparium(em); *Botanophila* sp. 1 puparium(em) (*Melophagus ovinus* 1 adult fragment) MNI= 34

856 Unit T9 Level 75-80cm (TURF)

Scathophaga furcata 2 larval anal regions; *Botanophila* sp. 1 larval skin [Also lepidopteron sp. 2 fragments of 2 large pupae; parasitic Hymenopteron; 1 adult thorax] MNI= 3

1013 Unit P9 Level SU 19 (TURF)

Cyclorrhaphan sp. 2 puparial fragments(unidentiable) [Also Hymenopteron sp. 1 cocoon fragment] MNI= 1

1052 Unit Q8 SU 19

Heleomyza borealis 2 puparia(em); *Telomerina flavipes* 1 puparium(em); *?Phytomyza* sp. 1 puparium; *Scathophaga furcata* 50 puparia(43 em., 3 unhatched ones containing Ichneumonid adults); *Botanophila ?betarum* 7 puparia(em) [AU III 97] MNI= 61

AU IV

302 Unit Q10 Level 20-25cm

Heleomyza borealis 3 wings, 5 puparia(em); *H. ?serrata* 1 puparium(unh); *Scatella ?stagnalis* 2 puparia(em); *Delia fabricii* 2 puparia(em) MNI= 10

633/ R8 80-85cm

Simulium sp. 6 adult thoraces; *Heleomyza borealis* 3 wings, 42 puparia(39 em); *Telomerina flavipes* 3 puparia(em); *Scatella ?stagnalis* 2 puparia(em); *Scatophila ?cribrata* 1 puparial fragment; *Phorma terrae-novae* 1 puparial fragment; *Scathophaga furcata* 3 puparia(em)
Delia fabricii 2 puparia(em); *Fucellia* sp. 1 puparium; *Botanophila ?profuga* 2 puparia(em)(sp.06) (*Melophagus ovinus* 1 adult fragment) [Also ?psychid sp. 1 pupa inside transparent cocoon- has anterior appendages or wing-covers; ?trichopteron sp. 1 wing; *Pediculus* sp. 5 specimens] MNI= 64

736 15/8 65-70cm (Peat)

Heleomyza borealis 2 puparia(em); *Telomerina flavipes* 1 puparium(em); *Scathophaga furcata* 1 puparium(em); *Pegomya* sp. 4 puparium(em); *Botanophila ?profuga* 3 puparia(em); *Delia fabricii* 1 puparium(em) [Also Lepidopteron sp. 1 pupal end segment and some tergal fragments (as in sample 856 KNK 4 79; not at all spiny)] MNI= 12

783 Unit R8 Level SU 15 [should this be 763 ?] (Hay)

Heleomyza borealis 2 puparia(em); *Delia fabricii* 2 puparia(em); *Zaphne* sp. 1 puparial end segment MNI= 5

1041 Unit 128 Level SU 56

Heleomyza borealis 1 wing, 13 puparia(em); *Scatella ?stagnalis* 6 puparia(em); *Phytomyza* sp. 2 puparia(1 em); *Scathophaga furcata* 3 puparia(em) [AU IV 115] MNI= 24

AU V

350 Unit 59 Level 25-30 (Twig)

Heleomyza borealis 24 puparia(em); *Telomerina flavipes* 3 puparia(em); *Scatophila ?cribrata* 9 puparia(em); *Scathophaga furcata;* 2 puparia(em); *Delia fabricii* 1 puparium(em); *Botanophila* sp. 1 puparial end-segment; *Spilogona cf, surda* 1 puparium(em) MNI= 41

367 Q10 Level 30-35cm (Twig)

Heleomyza borealis 13 puparia(12 em); *H, ?serrata* 2 puparia(1 em); *Neoleria prominens* 1 puparium; *Telomerina flavipes* 1 puparium MNI= 17

369/ R9/ level 30-35 (Twig)

Megaselia sp. 1 puparium(em); *Heleomyza borealis* 6 puparia(em); *Telomerina flavipes* 2 puparia(em); *Scatophila ?cribrata* 12 puparia(em); *Scathophaga* furcata 1 puparial end-segment; *Delia fabricii* 3 puparia(em); *Fucellia* sp. 1 puparial end-segment [Also parasitic Hymenopteron sp. 1 thorax(small species)] MNI= 26

372 Unit 510 Level 30-35cm (Twig) (All specimens badly bleached in this sample)

Heleomyza borealis 5 puparia(4 em); *Neoleria prominens* 1 puparium(em); *Telomerina flavipes* 2 puparia(em); *Scatella ?stagnalis* 33 puparia(32 em); *Botanophila* sp. 2 puparia(em); *Delia fabricii* 4

puparia(3 em) MNI= 47

373 Unit 310 Level 30-35cm (Twig)

Heleomyza borealis 15 puparia(em); *Scatella ?stagnalis* 18 puparia(15 em); *Scatophila ?cribrata* 3 puparia(em); *Scathophaga furcata* 1 puparia(unh); *?Zaphne* sp. 1 puparium(em); *Delia fabricii* 5 puparia(1 unh); *Botanophila* sp. 1 puparium(em); *?Fucellia* sp. 1 puparium(em) MNI= 45

374/ 10/ Level 30-35cm (Twig)

Heleomyza borealis 7 puparia(em); *Delia fabricii* 1 puparium(em) MNI= 8

399 Unit Q 10 Level 25cm (Twig)

Heleomyza borealis 13 puparia(em); *Scatella ?stagnalis* 1 puparium(em); *Philygra vittipennis* 1 puparium(em); *Scathophaga furcata* 1 puparium(em); *Fucellia* sp. 1 puparium(em); *Spilogona* cf. *surda* 1 puparium(em); *S.*sp.b 2 puparia(em) MNI= 20

540 T9 45-50cm (Turf)

Heleomyza borealis 4 puparia(em); *Telomerina flavipes;* 33 puparia(31 em); *Scatophila ?cribrata* 45 puparia(44 em); *Scatella ?stagnalis* 1 puparium(unh); Agromyzid sp. 1 puparium(em); *Scathophaga furcata* 20 puparia(18 em); *Pegomya* sp. 3 puparia(em); *Botanophila betarum* 2 puparia(em); *B. ?profuga* 1 puparium(em); *Delia fabricii* 11 puparia(em); *D. ?platura* 1 puparium(em), *Spilogona* sp.b 2 puparial end segments MNI= 124

591 Unit 59 Level 35-40cm (Twig)

Simulium sp. 2 thoraces; *Heleomyza borealis* 25 puparia(em); *Telomerina flavipes* 4 puparia(1 unh) *?Allopiophila vulgaris* 2 wings; *Scatophila ?cribrata* 25 puparia(22 em); Agromyzid sp. 1 puparium(em); *Scathophaga furcata* 1 puparium(em); *Botanophila betarum* 12 puparia(em); *Delia fabricii* 5 puparia(4 em), 4 wings; *?Lasiomma* 1 puparial end segment [AU V 403] MNI= 77

AU VI

029 Unit R6 Level SU 3 (Grey sand layer)

Heleomyza borealis 16 puparia(em); *Telomerina flavipes* 1 puparium(em); *Delia fabricii* 1 puparium(em); *Botanophila ?profuga* 1 puparium(em); *Fucellia* sp. 2 puparial end-segments(em) [AU VI

21] MNI= 21

?AU

1287/R8/SU 60

Heleomyza borealis 1 adult head, 34 puparia(31 em); *?Allopiophila vulgaris* 2 puparia(em); *Scatella ?stagnalis* 1 puparium(em); *Scathophaga furcata* 10 puparia(9 em); *Delia fabricii* 15 puparia(14 em., unhatched one containing parasitic Hymenopteron); *D. ?platura* 8 puparia(6 em); *Botanophila ?profuga* 2 puparia(em); *Thinoscatelia quadrisetosa* 1 puparium(em); *?Lasiomma* sp. 1 puparium(em) MNI= 74

Total MNI(Felt 1)= 1107)

FELT II [3 samples]

044 N15 "Profile Cleaning"

Heleomyza borealis 6 puparia(em); *Scatella ?stagnalis* 1 puparium(em) [Also Lepidopteron sp. 1 pupal end-segment with pale, fine short spines in transverse bands)] MNI= 7

877 Felt II Grøft B

Heleomyza borealis 12 puparia(10 em) [Also Lepidopteron sp. 2 pupal end segments(same as type in as in "Profile Cleaning" sample)] MNI= 12

1046 FELT II GRØFT B LAG 7

Heleomyza borealis 133 puparia(115 em); *H. ?serrata* 1 puparium(em); *?Allopiophila vulgaris* 1 puparium(em); *Scatella ?stagnalis* 1 puparial end-segment; *Scathophaga furcata* 1 adult head fragment, 1 larval skin fragment, 5 puparia(em); *S. litorea* 3 male adult hypopygia with strong surstyli; *Zaphne* sp. 1 puparial fragment; (*Melophagus ovinus* 1 adult fragment) [Also *Psylla* sp. 1 thorax; Ichneumonid sp. 2 thoraces] MNI= 147

1238/ U 1 ?

Heleomyza borealis 2 adult heads 7 wings, 568 puparia(523 em); *H. ?serrata* 1 puparium; *Calliphora uralensis* 3 puparia(em); *Delia fabricii* 1 puparium(em); *D. ?platura* 1 puparium(em)% MNI= 574

Total MNI(Felt II)= 740

FELT III [3 samples]

236 Unit D1 Level 30-35cm (Possible dung/stable waste)

Heleomyza borealis 11 puparia(em); *Scatella ?stagnalis* 3 puparia(em); *Scathophaga furcata* 1 puparium(em) MNI= 15

237 + 240 Unit C1 Felt III 32-35cm (Possible dung/stable waste)

Tipula arctica 1 fragment of pupa; *Heleomyza borealis* 9 puparia(em); *Telomerina flavipes* 8 puparia(em); *Scatella ?stagnalis* 5 puparia(em); *Delia fabricii* 5 puparia(4 em); *Botanophila ?betarum* 1 puparium(em); *B. ?profuga* 4 puparia(em) MNI= 33

500 Unit D1 Level 20-25cm Felt III

Heleomyza borealis 12 puparia(em); *Scathophaga furcata* 2 puparia(em); *Delia fabricii* 2 puparia(em); *Botanophila ?profuga* 2 puparia(em) MNI= 18

Total MNI(Felt III)= 66

FELT V [1 sample]

SARQAQ 510/298

Orygma luctuosum 1 puparium(em) MNI= 1

Total MNI(Felt V)= 1 1

FELT VI [8 samples]

989 Felt VI COL,SAM,14, 64-68cm

Heleomyza borealis 4 puparia(em); *Scathophaga furcata* 3 puparia(em); *Delia fabricii* 3 puparia(em) [Also ?Microlepidopteron sp, 1 pupal end segment; Lepidopteron sp, 1 end-segment (spinose on as in other samples); parasitic Hymenopteron sp, 1 thorax (Sp,1)] MNI= 10

991 Felt VI COL,SAM, 68-73cm,

Philygria vittipennis 1 puparium(em); *Botanophila ?profuga* 3 puparial end-segments; *Delia fabricii* 5 puparia(4 em); *?Phaonia pallidisquama* 1 puparial end-segment [Also Lepidopteron sp, 12 pupal end-segments (larger, spiny ones, as before); Ichneumonid sp, 2 cocoons; Hymenopteron sp, 1 thorax (Sp,5)] MNI= 10

991 Felt VI Col,Sam, no,15

Simulium sp, 1 thorax; *Heleomyza borealis* 1 wing; *Botanophila ?betarum;* 1 puparium(em)* [Also *Psylla* sp, 15 wings] MNI= 3

992 Level 33-36cm, Felt vi

Botanophila sp, 1 puparial end segment (as sample 17 above) MNI= 1

994 Felt VI Level 39-42cm Col,Sam,

(1 indet, cuticular fragment, possibly from a puparium)

995 column Sample no,3 Felt VI depth 24-27cm

Simulium sp, 11 thoraces; *Delia fabricii* 1 puparium(em) [Also insect sp, 1 complete genital capsule] MNI= 12

998 Felt VI Col,SAM, 10 D46-52cm

Heleomyza borealis 1 puparium(em); *Delia fabricii* 6 puparia(em) [Also Lepidopteron sp; 1 pupal end segment] MNI= 7

S,A,R,P, COL SAMPLE 9, FELT VI 42-46 (SAND)

Orygma luctuosum 1 adult thorax; *Delia fabricii* 1 puparial end-segment MNI= 2

S,A,R,P, COLUMN SAMPLE 12 FELT VI 55-60cm,

Heleomyza borealis 5 puparia(em); *Scathophaga furcata* 5 puparia(em); *Delia fabricii* 7 puparia(6 em); *Botanophila ?profuga* 2 puparia(em) MNI= 19

Total MNI(Felt VI)= 64

FELT VII [3 samples]

981 Felt VII 38-39 (Natural)

[Single leaves of *Betula nana* and *?Salix herbacea*]

984 Unit Felt vii Level 33-38cm (Natural)

Simulium sp, 2 thoraces MNI= 2

985 Felt VII/ 26,5,83 (Natural)

Simulium sp, 1 adult thorax [Also parasitic Hymenopteron; 1 thorax; *Quedius* sp, 1 adult head; (also 1 leaf of *?Betula nana*)] MNI= 1

Total MNI(Felt VII)= 3

?FELT

364/R91/Level 30-35cm [*Philonthus* sp. 1 adult head]

1070 Unit P8 Level SU 50

?Scathophaga sp. 2 wing-fragments MNI= 1

Total MNI(Felt ?)= 1

Total samples 40 Total Dipterous Taxa 33 Total MNI= 1986

---

41 TUMERALIK (V.35)

1a 1981 V35 TP1 35cm

Simulium sp. 2 adult thoraces; *Heleomyza borealis* 231 puparia(215 em; unhatched ones comprised 5 males, 10 females and one containing cocoon of Hymenopterous parasite); *Telomerina flavipes* 2 puparia(em); *Scathophaga furcata* 6 puparia(5 em); *Delia fabricii* 1 puparium(em) MNI= 242

2 GREENLAND '81 V35 TP1 35cm

Heleomyza borealis 752 puparia(744 em; 8 unhatched ones queried as *H. serrata*); *Telomerina flavipes* 32 puparia(20 em); *Scathophaga furcata* 10 puparia(7 em); *Botanophila ?betarum* 1 puparium(em) [Also ?Ichneumonid sp. 1 cocoon(incomplete)] MNI= 795

3 V35 TP1 45cm

Simulium sp. 1 adult head and 3 thoraces; *Heleomyza borealis* 31 puparia(em); *H. ?serrata* 1 puparial end-segment (much larger than previous); *Telomerina flavipes* 1 puparium(unh) [Also Alysiine sp. 2 "anal segments"(Sp.1); indet sp. pupal fragments(Sp.2); Coleopterous sp. 2 larval clypeolabrum] MNI= 36

4 TP1 135cm

Heleomyza borealis 7 puparia(em); *Neoleria prominens* 1 puparial end-segment; *Telomerina flavipes* 1 puparium; *Scatella ?stagnalis* 1 wing, 1 puparium(em); *Scathophaga furcata* 2 puparia(em); *Fucellia* sp. 31 puparia(em); *Botanophila ?profuga* sp. 1 puparium(em) MNI= 44

Total samples 4 Total Dipterous Taxa 6 Total MNI= 1117

42 LAKE 5 km NNE OF SANDNES, 2km E OF TUMERALIK (V.36)

1 V36 TP1 35cm

Simulium sp. 1 adult head MNI= 11

Total samples 1 Total Dipterous Taxa 1 Total MNI= 1

For Western Settlement sites; Total samples 66 Total Taxa 38 Total MNI= 6916

APPENDIX THREE

THE MUSCIDAE OF NORTH ATLANTIC

Table 41 The Muscidae of the Canadian Arctic Archipelago, Greenland and the coastal areas of north-western Quebec and Labrador

Species	1	2	3	4	5	6	7	8	9	10	
Rheinwardtiinae											
Muscina levida (Harris)		x	x								H
M. stabulans (Fallén)				x							*H*
Azeliinae											
Thricops albibasalis (Zetterstedt)			x								H
T. coquilletti (Malloch)		x									
T. innocuus (Zetterstedt)		x	x								H
T. septentrionalis (Stein)		x	x								
T. spiniger (Stein)		x	x								
T. subrostratus (Zetterstedt)						x					H
Dryneia alpicola (Rondani)			x								H
D. cantabrigiensis (Huckett)					x						
D. groenlandica (Lundbeck)		x		x		x			x	x	AH
D. neoborealis (Snyder)					x				x		AH
D. pribiloffensis (Malloch)	x	x		x		x		x			
D. quadrisetosa (Malloch)		x	x								
D. segnis (Holmgren)	x	x		x	x	x			x	x	AH
D. setibasis (Huckett)	x				x	x					
Hydrotaea anxia (Zetterstedt)		x	x	x						x	H
H. armipes (Fallén)(=*occulta*)		x	x								H
H. bimaculata (Meigen)										x	H
H. cristata Malloch			x								

Species	1	2	3	4	5	6	7	8	9	10	
H. dentipes (Fabricius)		x									H
H. floccosa (Macquart)(=*araipes*, auctt.)			x								H
Muscinae											
Mesembrina latreilli R.-D.			x								H
Musca domestica Linnaeus			x							x	H
Mydaeinae											
Mydaea affinis (Meade)(=*discimana*)			x								H
M. furtiva Stein			x								
M. nubila Stein			x								H
M. obscurella Malloch (=*bengtssoni*)			x								H
M. orichalcea (Zetterstedt)		x	x								H
M. palpalis Stein		x	x								H
Myospila meditabunda (Fabricius)			x								H
Hebecnema vespertina (Fallén)			x								H
Graphomya maculata (Scopoli)		x	x							x	H
Coenosiinae											
Spilogona acuticornis (Malloch)			x								H
S. aenea Huckett		x	x								H
S. aerea (Fallén)			x								H
S. aestuarium Huckett			x	x							A
S. albisquama Ringdahl			x	x							AH
S. albinepennnis Huckett	x	x		x	x						AH
S. almqvistii (Holmgren)	x			x		x	x	x	x	x	AH
S. alpica (Zetterstedt)		x	x							x	H
S. alticola (Malloch)		x	x								
S. arcticola (Zetterstedt)				x		x					A

Species	1	2	3	4	5	6	7	8	9	10	
S. arenosa (Ringdahl)		x									H
S. baltica (Ringdahl)										x	H
S. bifimbriata Huckett		x									A
S. calcaria Huckett			x								
S. compacta Huckett			x								
S. contigua Huckett	x	x		x							A
S. contractifrons (Zetterstedt)		x	x							x	H
S. deflorata (Holmgren)	x	x	x		x	x	x			x	A
S. denudata (Holmgren)	x	x		x	x	x				x	AH
S. dorsata (Zetterstedt)	x	x	x	x	x	x	x	x	x	x	AH
S. empeliogaster Huckett		x	x								A
S. extensa (Malloch)	x				x	x			x	x	A
S. fatima Huckett			x								A
S. forticula Huckett		x	x								
S. genualis Huckett		x									
S. glauca (Stein)		x									H
S. humeralis Huckett	x	x		x		x					A
S. hypopygialis Huckett			x								
S. instans Huckett			x								
S. latipennis Huckett		x									
S. leucogaster (Zetterstedt)			x								H
S. limnophorina (Stein)			x								
S. malaisei (Ringdahl)		x	x			x				x	H
S. negastona (Boheman)	x	x			x	x				x	AH
S. melanosoma Huckett	x	x		x	x	x	x	x	x	x	A
S. nicans (Ringdahl)			x	x		x				x	H

Species	1	2	3	4	5	6	7	8	9	10	
S. ainicalyptrata Huckett						x					A
S. monacantha Collin	x	x		x	x	x			x	x	A
S. narina (Walker)			x								
S. nigriventris (Zetterstedt)			x								H
S. nitidicauda Schnabl (=*imitatrix*, Mall.)		x	x			x					AH
S. norvegica Ringdahl		x	x								H
S. novemmaculata (Zetterstedt)		x	x								H
S. nutaka Huckett		x	x								A
S. obscura (Malloch)	x			x	x	x					A
S. obscuripennis (Stein)		x	x								H
S. obsoleta (Malloch)	x	x		x		x	x	x	x	x	AH
S. opaca Schnabl		x	x			x				x	AH
S. pacifica (Meigen) (=*vana*, Zetterstedt)			x								H
S. perambulata Huckett		x									
S. princeps Huckett				x							A
S. projecta Huckett	x					x					A
S. pseudodispar (Frey)		x		x		x					AH
S. pusilla Huckett		x	x								
S. robusta Huckett	x				x	x					A
S. rostrata (Ringdahl)		x	x								AH
S. sanctipauli (Malloch)	x	x		x	x	x	x	x	x	x	AH
S. semiglobosa (Ringdahl)	x	x		x						x	H
S. setinervis Huckett		x	x								
S. suspecta (Malloch)			x								A
S. tornensis (Ringdahl)	x	x			x	x			x	x	AH
S. triangulifera (Zetterstedt)	x	x			x	x					H

Species	1	2	3	4	5	6	7	8	9	10	
S. trigonata (Zetterstedt)			x								H
S. trigonifera (Zetterstedt)		x	x							x	
S. trilineata Huckett		x	x								
S. tundrae (Schnabl)	x	x	x	x	x	x				x	AH
S. turbidipennis Huckett	x	x				x					A
S. zaitzevi Schnabl(=*latilamina*)	x		x	x	x	x	x	x	x	x	AH
S. zetterstedtii (Ringdahl)		x	x								H
Lispoides aequifrons (Stein)		x									
Lianophora groenlandica Malloch										x	
L. nigripes (R.-D.)		x	x							x	H
L. rotundata Collin										x	
L. sinuata Collin										x	H
L. uniseta Stein	x	x				x					H
Lispe canadensis Snyder			x								
L. cotidiana Snyder			x								
L. tentaculata (De Geer)			x								H
L. uliginosa Fallén										x	H
Pseudocoenosia brevicauda Huckett			x								
P. solitaria (Zetterstedt)			x								H
Caricea alma (Meigen)			x								H
C. brevitarsis (Malloch)			x								
C. erythrocera R.-D.			x								H
C. varians (Malloch)			x								
Schoenomyza chrysostoma Loew			x								
S. dorsalis Loew		x	x								
S. litorella (Fallén)		x	x								H

Species	1	2	3	4	5	6	7	8	9	10	
Macrorchis alone (Walker)			x								
Coenosia apicata Huckett	x		x		x	x					
C. anthracina Malloch			x								
C. atritibia Ringdahl		x	x								H
C. canadensis Curran			x								
C. comita (Huckett)		x	x								H
C. conforma Huckett			x								
C. conflicta Huckett			x								
C. demoralis Huckett		x									
C. minor Huckett		x	x								
C. mollicula (Fallén)			x								H
C. morrisoni Malloch			x								
C. nigrescens Stein		x	x								
C. octopunctata (Zetterstedt)	x	x	x								H
C. oregonensis Malloch			x								
C. tarsata Huckett			x			x					
C. triseta Stein			x								H
C. tendipes Huckett		x	x								H
C. verralli Collin		x	x								H
Phaoniinae											
Helina annosa (Zetterstedt)			x								H
H. basalis (Zetterstedt)			x								H
H. cinerella (van der Wulp)			x								H
H. evecta (Harris) (=*laetifica*, R.-D.)		x	x								H
H. fulvisquama (Zetterstedt)		x	x								H
H. luteisquama (Zetterstedt)		x	x	x							H

Species	1	2	3	4	5	6	7	8	9	10	
H. maculipennis (Zetterstedt)			x								H
H. marguerita Snyder			x								
H. nigribasis (Walker)		x									
H. obscurata (Meigen)			x								H
H. reversio (Harris) (=*duplicata*, Mg.)			x								H
H. rothi Ringdahl (=*subvittata* Séguy)		x	x								H
H. spinosa (Walker)			x								
H. squalens (Zetterstedt)			x								H
Lophosceles frenatus (Holmgren)		x	x			x				x	H
L. minima (Malloch)						x					
Phaonia atrocitrea Malloch		x									
P. atrocyanea Ringdahl			x								H
P. bidentata Ringdahl			x			x				x	A
P. consobrina (Zetterstedt)		x									H
P. errans (Meigen)			x								H
P. lugubris (Meigen) (=*norio*, Zetterstedt)										x	H
P. monticola Malloch			x								
P. pallidisquama (Zetterstedt)		x				x				x	AH
P. protuberans Malloch			x								
P. rugia (Walker)		x	x								
P. serva (Meigen)			x								H
P. subfuscinervis (Zetterstedt)		x								x	H
168 Species	78	81	114	26	38	20	7	7	12	37	

Key to Table 44; This list gives the species recorded in Huckett (1965) from the islands of the Canadian Arctic Archipelago, Boothia Peninsula, north coastal areas of Quebec and coastal areas of Labrador (all north of 10° C. July mean isotherm), 1 Melville and Boothia Peninsula; 2 Quebec(Fort

Chimo, Payne Bay, Sugluk and Nottingham Island.; 3 Labrador coast from Cartwright to northernmost cape; 4 Southampton Island(Coral Harbour); 5 Victoria Island; 6 Baffin Island; 7 Cornwallis Island; 8 Prince Patrick Island; 9 Ellesmere Island 10 Greenland. (H indicates Holarctic species; A indicates Arctic species. Casual records of no zoogeographical significance are bracketed.)

Table 42; The Muscidae of the Atlantic seaboard and Islands of the Palaearctic

Species	a,b,c,d,e,f,g,h,i,j,k,l,m,n,o,p:,1,2,3,4,5,6,7,8,	
Achanthipterinae; (one palaearctic species only)		
Achanthiptera rohrelliformis (R,-D)	. . . . . ,x, .x,x, .x,x,x,x,x,x,	
Rheinwardtiinae;		
Muscina levida (Harris)	. .x,x,x,x,x,x, .x,x, .x,x,x,x,x,x,.x, ...	H
M.pascuorum (Meigen)	. . . . . ,x,x, ...x,x,x,x, ...	H
M.prolapsa (Harris)	. .x,x,x, .x,x,x,x,x,x, .x,x,x,x,x,.x, ...	H
M.stabulans (Fallén)	.x, .x,x,x,x,x,x, .x,x,x,x,x,x,x,x,x,. . . . . ,x, . .	H
Synthesiomyia nudiseta (v.d.Wulp)	. .x,x,x, ...	H
Azeliinae		
Azelia aterrima (Meigen)	. . . . . ,x, .x,x,x,x,x,x,x,x,x,.x, ...	
A.cilipes (Haliday)	. . . . . ,x, .x,x,x,x,x,x,x,x,x,.x,x,x,x, ...	H
A.gibbera (Meigen)	. . . . . ,x, .x,x, . .x, .x,x,.x,x, ...	H
A.monodactyla Loew	. . . . . ,x, ...	
A.nebulosa R,-D, (=*macquarti* Staeger)	. . . . .?,x, .x,x,x,x,x,x,x,x,x,.x, .x,x, ...	
A.parva Rondani	. . . . . ,x, ...x, ...	
A.trigonica Hennig	. . . . . ,x, ...x, .x,.	
A.triquetra (Wiedemann)	. . . . . ,x, .x,x,x,x,x,x,x, ..x, . . .x, . . .	H
A.zetterstedti Rondani	. . . . . ,x, .x,x,x,x,x,x,x,x,.x,x,x, .x, . . .	H

Species	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o	p	1	2	3	4	5	6	7	8	
Thricops aculeipes (Zetterstedt)	.	.	.	.	.	.	.	X	.	X	.	.	X	.	.	X	.	.	.	.	.	.	.	.	
T. albibasalis (Zetterstdt)	.	.	.	.	.	.	.	X	.	.	.	.	X	X	.	.	.	.	.	.	.	.	.	.	H
T. beckeri (Pokorny)	.	.	.	.	.	.	.	X	.	.	.	.	X	.	.	.	.	.	.	.	.	.	.	.	
T. coquilleti (Malloch)	.	.	.	.	.	.	.	.	.	.	.	.	X	.	.	.	.	.	.	.	.	.	.	.	H
T. cunctans (Meigen) (=*hirsutula*, Zett.)	.	.	.	.	.	X	X	.	X	X	X	.	X	X	X	X	.	X	X	.	.	X	.	.	
T. diaphanus (Wiedemann)	.	.	.	.	.	X	X	.	X	X	X	X	X	X	X	X	.	X	.	.	.	.	.	.	H
T. foveolatus (Zetterstedt)	.	.	.	.	.	.	.	X	.	.	.	.	X	X	.	.	.	.	.	.	.	.	.	.	
T. furcatus (Stein)	.	.	.	.	.	.	.	a	.	.	.	.	.	X	X	.	.	.	.	.	.	.	.	.	H
T. genarum (Zetterstedt) (=*sundevalli*, Zett.)	.	.	X	X	.	X	.	.	.	.	.	X	X	.	.	.	.	.	.	.	.	.	.	.	
T. hirtula (Zetterstedt) (=*subrostratus*, Zett.)	.	.	.	.	X	.	.	.	.	.	.	X	X	.	.	.	.	.	.	.	.	.	.	.	H
T. innocua (Zetterstedt)	.	.	.	.	.	.	.	X	.	.	.	.	X	X	.	X	.	.	.	.	.	.	.	.	H
T. lividiventris (Zetterstedt)	.	.	.	.	.	.	.	a	.	.	.	.	X	X	.	.	.	.	.	.	.	.	.	.	H
T. longipes (Zetterstedt)	.	.	.	.	.	X	X	.	X	X	.	.	X	X	X	X	.	X	X	X	X	X	X	.	
T. nigrifrons (Robineau-Desvoidy)	.	.	.	.	.	X	X	.	X	X	X	.	X	X	X	X	.	.	.	.	.	.	.	.	
T. nigritellus (Zetterstedt)	.	.	.	.	.	X	X	.	X	X	X	.	X	.	X	X	.	X	X	.	X	X	.	.	
T. rostratus (Meade)	.	.	.	.	.	.	.	X	.	X	X	.	X	X	X	X	.	X	X	.	.	X	.	.	
T. semicinereus (Wiedemann)	.	.	.	.	.	X	X	.	X	X	X	X	X	X	X	X	.	X	X	X	.	.	.	.	
T. separ (Zetterstedt)	.	.	.	.	.	.	.	X	.	X	.	.	.	.	X	X	.	.	.	.	.	.	.	.	
T. simplex (Wiedemann)	X	.	.	.	.	X	X	.	X	.	X	.	X	X	X	X	X	X	.	.	.	.	.	.	
T. sudeticus (Schnabl)	.	.	.	.	.	.	.	X	.	X	.	.	.	X	.	X	X	.	.	.	.	.	.	.	
Dryneia alpicola (Rondani)	.	.	.	.	.	.	.	a	.	.	.	.	.	a	.	.	.	.	.	.	.	.	.	.	H
D. brumalis (Rondani)	.	.	.	.	.	.	.	X	.	X	.	.	.	X	.	.	.	.	X	.	X	.	.	.	
D. fasciculata (Stein)	.	.	.	.	.	.	.	a	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	
D. hamata (Fallén)	.	.	.	.	.	.	.	X	.	X	X	.	X	X	X	X	X	X	.	X	X	X	.	.	
D. tetra (Meigen)	.	.	.	.	.	.	.	.	.	.	.	.	X	.	X	X	.	.	.	.	.	.	.	.	
D. vicana (Harris)	.	.	.	.	.	.	.	X	.	X	X	.	X	X	X	X	X	.	X	.	.	.	.	.	

Species	a,b,c,d,e,f,g,h,i,j,k,l,m,n,o,p;.1,2,3,4,5,6,7,8.	
Hydrotaea aenescens (Wd.) [intr.]	. . . . . ,x,x, ,x, . . ,x,x,x,x,.	H
H. albipuncta (Zettertstedt)	. . . . . ,x, ,x,x, ,x,x,x,x,x,. . ,x, ...	
H. anxia (Zetterstedt)	. . . . . ,x,x,.	H
H. armipes (Fallén) (=*occulta*,Mg.)	,x,x, ,x, ,x,x,x,x,x, ,x,x,x,x,x,,x, ,x, . ,x, . .	H
H. atrisquama Ringdahl	. . . . . ,x,. . . . ,x. . . .	
H. basdeni Collin	. . . . . ,x,x, . ,x, ... ,x, ...	H
(H. cristata Malloch Casual	. . . . . .i. . .	Nea)
H. borussica Stein	. . . . . ,x, ,x, . . ,x,x,x,x,.	
H. capensis (Wiedemann)	,x,x, . . ,x,x, ,x, . ,x,x, . ,x,.	H
H. cinerea Robineau-Desvoidy	,x, . . . ,x,x, ,x, . ,x, . ,x, ...	
H. cyrtoneurina (Zetterstedt)	. . . . . ,x,x, ,x,x, ,x,x,x,x,x,.	
H. dentipes (Fabricius)	,x, . ,x,x,x,x,x,x,x,x,x,x,x,x,x,,x,x,x,x,x, . .	H
H. diabolus (Harris)	. . . . . ,x,x, ,x,x,x,x,x,x,x,x,,x, ,x, ...	H
H. floccosa (Macquart)	,x, . . . ,x,x, ,x,x,x,x,x,x,x,x,.	H
H. glabricula (Fallén)	,x, . . . ,x,x, ,x, . ,x,x,x,x,x,.	
H. hirticeps (Fallén)	. . . . . ,x,x, ... ,x, ...	
H. ignava (Harris)	,x,x,x,x,x,x,x,x,x,x,x,x,x,x,x,x,.	H
H. irritans (Fallén)	. . . . .?,x,x,x,x,x,x,x,x,x,x,x,x,,x,x,x,x, ...	
H. lundbecki Michelsen	. . . . . ,x, . . . ,x, ...	
H. meridionalis Portchinsky	. . . . . ,x,x, ,x, ,x,x,x,x,x, ...	
H. meteorica (Linnaeus)	. . . . . ,x,x, ,x,x,x,x,x,x,x,x,. . ,x, ...	H
H. militaris (Meigen)	. . . . . ,x,x, ,x,x,x,x,x,. . ,x, ...	H
H. nidicola Malloch	. . . . . ,x, . . ,x, ...	H
H. palaestrica (Meigen)	. . . . . ,x, ,x, ,x,x,x,x,x, ...	?
H. pandellei Stein	. . . . . ,x,x, ,x, . . ,x,x,x,x,. . .?, ...	
H. parva Meade	. . . . . ,x, ,x, . . ,x,x,x, ...	

Species	,a,b,c,d,e,f,g,h,i,j,k,l,m,n,o,p,,1,2,3,4,5,6,7,8,	
H, pellucens Portchinsky	,x, ...,x,x, ,x, ,x,x,x,x,x, ...	
H, penicillata (Rondani)	. . . . . .?,x, ...	
H, pilipes Stein	. . . . . ,x, ,x, . . .,x, ,x,x,.	H
H, pilitibia Stein	. . . . . ,x, ...,x,x,.	H
H, ringdahli Stein	. . . . . ,x,x,x,.	H
H, scambus (Zetterstedt)	. . . . . ,x,x,.	H
H, similis Meade	. . . . . ,x, ,x,x, . .,x,x,x,x,.x, ...	
H, tuberculata Rondani	. . . . . ,x,x, ,x, . . .,x,x,x, ...	H
H, velutina Robineau-Desvoidy	,x, ...,x,x, ,x, ,x,x,x,x,x,x,.	
Potamia littoralis Robineau-Desvoidy	. . . . . ,x, ,x, ,x,x,x,x,x,x,.	H
P, setifemur (Stein)	. . . . . ,x, ...,x, ...	
Muscinae		
Mesembrina intermedia Zetterstedt	. . . . . ,x, ...	
M, meridiana (Linnaeus)	. . . . . ,x,x, ,x,x,x,x,x,x,x,x,x,.x, ...	
M, mystacea (Linnaeus)	. . . . . ,x,x, . . .,x, ,x,x,x,x,.	
M, resplendens Wahlberg	. . . . . ,x, ... ,x, ...	
Polietes domitor (Harris)	. . . .,x, ,x,x, ,x,x,x,x,x,x,x,x,.x, ...	
P, hirticrura Meade	. . . . . ,x,x, ...	H
P, lardaria (Fabricius)	. . . . . ,x,x, ,x,x,x,x,x,x,x,x,.,x, ,x, ...	
P, major (Ringdahl)	. . . . . ,x, ...	
P, meridionalis Peris & Llorente	,x, . . .,x,x,x, ...	
P, nigrolimbata (Bonsdorff)	. . . . . ,x,x,.	
P, steinii (Ringdahl)	. . . . . ,x, . . .,x,x,x,x,.	
Musca autumnalis De Geer	. . . . .,x,x,x,x,x,x,x,x,x,x,x,x,.	I
M, biseta Hough	,x,x,x, ...	
M, domestica Linnaeus	,x,x,x,x,x,x,x,x,x,x,x,x,x,x,x,.,x,x,x, ,x,x, . .	H

Species	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o	p	1	2	3	4	5	6	7	8	
M. larvipara Portchinsky						X	X	X																	
M. osiris Wiedemann	X	X	X	X	X	X	X	X		X			X	X		X									
M. sorbens Wiedemann	X	X	X	X	X	X																			
M. tempestiva Fallén	X	X			X	X	X	X			X	X	X	X	X	X									
M. vitripennis Meigen	X	X			X	X	X																		
Morellia aenescens Robineau-Desvoidy					X	X		X	X	X	X	X	X	X	X	X									
M. asetosa Baranoff							X																		
M. hortorum (Fallén)							X	X		X	X	X	X	X	X	X	X	X	X	X	X				
M. podagrica (Loew)							X	X				X		X		X	X								H
M. simplex (Loew)	?				X	X	X	X		X	X	X	X	X	X		X		X	X					
Neomyia cornicina (Fabricius)	X	X	X		X	X	X		X	X	X	X	X	X	X	X	X	X	X	X					H
M. viridescens (Robineau-Desvoidy)							X	X		X	X	X	X	X	X	X	X								
Pyrellia rapax (Harris)							X	X		X	X		X	X	X	?									
P. vivida Robineau-Desvoidy	X					X	X				X	X			X	X	?	X							?
Eudasyphora cyanella (Meigen)						X	X	X		X	X	X	X	X	X	X		X		X		X			
E. cyanicolor (Zetterstedt)							X	X		X	?		X	X	X	X	X	X							(H)
E. zimini (Hennig)										X						X			X	X					
Dasyphora albofasciata (Macquart)	X	X	X		X	X	X	X				X	X												
D. penicillata (Egger)	X					X	X				X			X		X									
D. pratorum (Meigen)			X		X	X	X				X			X		X									
Stomoxyinae																									
Stomoxys calcitrans (Linnaeus)	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X								H
Haematobia irritans (Linnaeus)	X			X		X	X		X		X	X	X	X	X				X						(H)
Haematobosca stimulans (Meigen)							X	X		X	X	X	X	X	X	X	X	X		X	X				
Atherigoninae																									
Atherigona humeralis (Wiedemann)			X																						

Species	a b c d e f g h i j k l m n o p 1 2 3 4 5 6 7 8	
A. naqvii Steyskal	. . x	
A. orientalis Schiner	. . x	
A. pulla (Wiedemann)	. x	
A. soccata Rondani	. x	
A. varia (Meigen)	. x x x x . . . . . x x	
A. yorki Deeming	. x	
Nydaeinae		
Nydaea affinis Meade (=*discimana* Mall.)	. . . . . x x . . x x x x	H
N. ancilla Meigen	. . . . . x . x x . x x x x	
N. anicula (Zetterstedt)	. . . . . x x . . x x x x . x	
N. corni (Scopoli) (=*scutellaris* R.-D.)	. . . . . x . x x x x x x x x x . x	?
N. deserta (Zetterstedt)	. . . . . x . x . . . . . x x . x	
N. electa (Zetterstedt)	. . . . . x x . x x . . x x . x	H
N. humeralis R.-D. (=*tincta*, Zett.)	. . . . . x x . x x . x x x x x x . x	
N. lateritia (Rondani) (=*riedeli* Stein)	. . . . . x	
N. maculiventris (Zetterstedt)	. . . . . x . . . x . x	
N. micans (Ringdahl)	. . . . . x	
N. nebulosa (Stein)	. . . . . x . x . . . x x x	
N. nitidiventris (Ringdahl)	. . . . . x	
N. obscurella Malloch	. . . . . x . . . . . x x	H
N. orichalcea (Zetterstedt)	. . . . . x x	H
N. orthonevra (Macquart) (=*detrita*, Zett.)	. . . . . x . x x . . x x x x . x	
N. palpalis Stein	. . . . . x x . . . . . x . .	H
N. rufinervis (Pokorny)	. . . . . a	H
N. setifemur Ringdahl	. . . . . x . x x . . x x x x	
N. sootryeni Ringdahl	. . . . . x x	H

Species	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o	p	1	2	3	4	5	6	7	8	
M. urbana (Meigen)							x	x	x	x	x	x	x	x	x	x			x	x	x				H
Myospila alpina Hendel							a						a												
M. bimaculata (Macq.) (=*hennigi* Greg. & Pov.)							x		x	x			x	x	x	x									
M. meditabunda (Fabricius)				x	x	x		x	x	x		x	x	x	x	x	x	x	x	x	x	x			H
Hebecnema anthracina Stein							x																		
M. fumosa (Meigen)				x	x	x	x	x	x	x		x	x		x	x									?
M. nigra (R.-D.) (=*vespertina*, auctt.)							x		x	x	x		x	x	x	x	x	x	x	x	x	x			H
M. nigricolor (Fallén)							x		x	x	x	x	x	x	x	x	x								H
M. umbratica (Meigen)							x	x		x	x	x	x	x	x	x	x	x	x		x				H
M. vespertina (Fallén) (=*affinis* Mall.)				x		x	x		x	x	x	x	x	x	x	x	x		x						H
Coenosiinae																									
Spilogona aerea (Fallén)							x	x		x	x		x	x	x	x	x		x						H
S. acrostichalis (Stein)																	a		x						
S. albisquama (Ringdahl)																	x								AH
S. almqvistii (Holmgren)																	x								AH
S. alpica (Zetterstedt)							a		x				a		x	x		x				x	x		H
S. arenosa (Ringdahl)															x	x									H
S. atrisquamula Hennig															x	x									AH
S. baltica (Ringdahl)									x				x	x	x	x						x			H
S. biseriata (Stein)									x				x	x	x										
S. brunneifrons Ringdahl (=*dorsata* Rgd.)															x	x									
S. brunneisquama (Zetterstedt)							a		x	x			x	x		x									
S. carbonella (Zetterstedt)							x	x					x		x	x									
S. contractifrons (Zetterstedt)							x		x	x			x	x	x	x						x			H
S. denigrata (Meigen)							x	x		x	x		x	x	x	x									
S. denudata (Holmgren)																								x	AH

Species	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o	p	.	1	2	3	4	5	6	7	8	.
S. depressiuscula (Zetterstedt)	.	.	.	.	.	.	.	a	.	x	.	.	.	.	.	x	x	.	.	.	.	.	.	x	.	.
S. depressula (Zetterstedt)	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	x	x	.	.	.	.	.	.	.	.	.
S. dispar (Fallén)	.	.	.	.	.	x	x	.	.	.	.	x	x	x	x	x	.	.	.	.	.	.	.	.	.	.
S. dorsata (Zetterstedt)	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	x	x	.	.	.	.	.	.	x	.	AH
S. falleni Pont	.	.	.	.	.	.	.	.	x	x	.	x	?	x	x	x	.	x	x	x	.	.	.	.	.	.
S. griseola (Collin)	.	.	.	.	.	.	.	.	x	.	.	.	.	.	?	.	.	.	.	.	.	.	.	.	.	.
S. krogerusi (Ringdahl)	.	.	.	.	.	.	.	.	.	.	.	.	.	.	x	.	.	.	.	.	.	.	.	.	.	.
S. lapponica (Ringdahl)	.	.	.	.	.	.	.	.	.	.	.	.	.	.	x	.	.	.	.	.	.	.	.	.	.	.
S. leucogaster (Zetterstedt)	.	.	.	.	.	.	.	.	.	.	.	.	.	.	x	.	.	.	.	.	.	.	.	.	.	H
S. litorea (Fallén) (=*longipes* Rgd.)	.	.	.	.	.	.	.	.	x	.	.	.	.	x	x	.	.	.	.	.	.	.	.	.	.	.
S. magnicauda Ringdahl	.	.	.	.	.	.	.	.	.	.	.	.	.	.	x	.	.	.	.	.	.	.	.	.	.	.
S. malaisei (Ringdahl)	.	.	.	.	.	.	.	.	.	.	.	.	.	x	x	.	.	.	.	.	.	.	.	.	.	H
S. marginifera Hennig (=*marginalis*, Fln.)	.	.	.	.	.	.	.	.	.	.	.	.	.	.	x	x	?	.	.	.	.	.	.	.	.	.
S. marina (Collin)	.	.	.	.	.	.	x	.	x	x	.	x	x	x	.	.	x	.	.	.	.	.	.	.	.	.
S. meadei (Schnabl)	.	.	.	.	.	.	x	.	x	x	.	.	x	.	x	x	.	x	.	x	.	x	.	.	.	.
S. megastoma (Boheman)	.	.	.	.	.	.	.	.	.	.	.	.	.	.	x	.	.	.	.	.	.	x	x	x	.	AH
S. micans (Ringdahl)	.	.	.	.	.	.	.	.	.	.	.	.	.	.	x	x	.	.	.	.	.	x	.	.	.	H
S. nigriventris (Zetterstedt)	.	.	.	.	.	.	.	.	.	.	.	.	.	.	x	a	.	.	.	.	.	.	.	.	.	H
S. nitidicauda (Schnabl) (=*depressa*)	.	.	.	.	.	.	.	.	.	.	.	.	.	.	x	x	.	.	.	.	.	.	.	.	.	AH
S. norvegica (Ringdahl)	.	.	.	.	.	.	.	.	.	.	.	.	.	.	x	x	.	.	.	.	.	.	.	.	.	H
S. novemmaculata (Zetterstedt)	.	.	.	.	.	.	.	.	.	.	.	.	.	.	x	.	.	.	.	.	.	.	.	.	.	H
S. obscuripennis (Stein)	.	.	.	.	.	.	.	.	.	.	.	.	.	.	x	x	.	.	.	.	.	.	.	.	.	H
S. opaca (Schnabl)	.	.	.	.	.	.	.	.	.	.	.	.	.	.	x	x	.	.	.	.	.	.	x	.	.	AH
S. pacifica (Meigen) (=*vana*, Zett.)	.	.	.	.	.	.	.	.	x	.	.	x	x	x	x	x	.	.	.	.	.	.	x	.	.	H
S. placida (Huckett) (=*glaucella*, Rgd.)	.	.	.	.	.	.	.	.	.	.	.	.	.	.	x	.	.	.	.	.	.	.	.	.	.	H
S. pseudodispar (Frey)	.	.	.	.	.	.	.	.	.	.	.	.	.	.	x	.	.	.	.	.	.	.	.	.	.	AH

Species	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o	p	1	2	3	4	5	6	7	8	
S. puberula (Ringdahl)																		x	x						H
S. pusilla (Huckett) (=*subfuscisquama*, Rgd.)																		x							H
S. pygmaea Ringdahl																		x							
S. quinquelineata (Zetterstedt)																		x	x						AH
S. sanctipauli (Malloch)																		x	x						AH
S. scutulata (Schnabl)									x				x	x	x										
S. semiglobosa (Ringdahl)																		x	x						H
S. septemnotata (Zetterstedt)									x						x	x									
S. septentrionalis (Ringdahl)																		x							
S. setigera (Stein)									x	x			x	x	x	x									H
S. setulosa (Ringdahl)																		x	x						
S. sjöstedti (Ringdahl)																		x	x						
S. solitariana (Collin)						x	x		x	x			x						x	x					
S. sororcula (Zetterstedt)																		x	x						
S. surda (Zetterstedt)							x		x	x		x		x	x	x	x	x	x						H
S. tenuis Hennig																		x							
S. tornensis (Ringdahl)																		x							AH
S. triangulifera (Zetterstedt)									x					x	x									x	H
S. trianguligera (Zetterstedt)									x						x	x									
S. trigonata (Zetterstedt)															x	x									H
S. trilineata (Huckett)																x									H
S. tundrae (Schnabl)																x	x								AH
S. tundrica (Schnabl)																x	x								AH
S. varsaviensis Schnabl														x	x		x						?		H
S. veterrima (Zetterstedt)									x				x	x	x	x									
Villeneuvia aestuum (Villeneuve)							x		x	x	x	x	x	x			x								

Species	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o	p	1	2	3	4	5	6	7	8	
Graphomya maculata (Scopoli)	.	.	.	.	.	X	X	.	X	X	.	X	X	X	X	X	X	.	X	X	X	X	.	X	H
G. v. minor Robineau-Desvoidy	.	.	.	.	.	.	X	.	X	X	.	.	X	X	X	.	X	.	.	.	.	.	.	.	H
Neolimnophora maritima (Roder)	.	.	.	.	.	?	X	.	X	.	.	X	X	.	.	.	.	.	.	.	.	.	.	.	
N. virgo (Villeneuve)	.	.	.	.	.	.	X	.	X	.	.	.	X	.	.	.	.	.	.	.	.	.	.	.	
Limnophora beckeri (Stein)	.	.	X	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	
L. bipunctata (Stein)	.	X	X	X	.	.	X	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	
L. caesia (Villeneuve)	.	.	.	.	.	X	X	.	.	.	.	.	X	.	.	.	.	.	.	.	.	.	.	.	
L. exuta (Kowarz)	.	.	.	.	.	.	X	.	X	.	.	X	X	.	.	X	.	.	X	.	X	.	.	.	
L. flavitarsis Stein	.	.	X	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	
L. maculosa (Meigen)	.	.	.	.	.	X	X	.	X	X	.	.	X	.	X	X	.	.	X	.	.	.	.	.	
L. nigripes (Robineau-Desvoidy)	.	.	.	.	.	.	X	.	X	.	.	X	.	X	X	X	.	X	.	.	.	.	.	.	H
L. nitidithorax (Stein)	.	.	X	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	
L. obscurisquama Stein	.	.	X	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	
L. obsignata Rondani	.	X	X	.	.	X	X	X	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	
L. olympiae Lyneborg	.	X	.	.	.	X	X	X	X	X	.	.	.	.	.	.	.	.	X	X	.	.	.	.	
L. pandellei Séguy (=*rondanii* Hennig)	.	.	.	.	.	X	X	.	.	.	.	.	.	.	X	X	.	.	.	.	.	X	.	.	
L. pollinifrons Stein	.	.	.	.	.	X	X	.	.	.	.	.	X	.	X	.	.	.	.	.	.	.	.	.	
L. pulchriceps (Loew)	.	.	.	.	.	?	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	
L. quaterna (Loew)	.	.	X	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	
L. riparia (Fallén)	.	X	X	X	.	.	X	X	.	X	X	X	X	X	X	X	X	.	.	X	.	X	X	.	
L. rufimana (Strobl)	.	X	.	.	.	.	X	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	
L. scrupulosa (Zetterstedt)	.	.	.	.	.	.	X	.	X	.	.	.	X	X	X	.	.	.	X	.	.	.	.	.	
L. setinerva Schnabl	.	.	?	.	.	X	X	X	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	
L. sinuata Collin	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	X	.	.	.	.	X	X	.	G
L. tigrina (Am Stein)	.	.	.	.	.	X	X	.	X	X	.	X	X	X	X	.	.	.	.	.	.	.	.	.	
L. triangula (Fallén)	.	.	.	.	.	X	X	.	X	X	.	X	X	X	X	X	.	X	X	.	X	.	.	.	

Species	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o	p	q	1	2	3	4	5	6	7	8	
L. uniseta Stein	.	.	.	.	.	.	.	.	x	.	.	.	.	x	x	.	.	x	.	.	.	.	.	.	.	
Lispe apicalis Nik	x	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	
L. assimilis Wiedemann	x	.	.	x	.	x	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	
L. caesia Meigen	.	.	.	.	.	x	x	.	x	.	.	x	x	x	x	.	.	.	.	.	.	.	.	.	.	
L. candicans Kowarz	.	.	x	.	.	x	x	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	
L. consanguinea Loew	.	.	.	.	.	x	x	.	x	.	.	x	x	.	x	.	.	.	.	.	.	.	.	x	.	
L. flavicincta Loew	.	.	.	.	.	x	x	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	
L. frigida Erichson	.	.	.	.	.	.	.	.	.	.	.	.	?	.	.	.	.	.	.	.	.	.	.	.	.	H
L. halophila Becker	.	.	?	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	
L. hydromyzina Fallén	.	.	.	.	.	.	?	.	.	.	x	x	x	.	x	.	.	.	.	.	.	.	.	.	.	
L. litorea Fallén	.	.	.	.	.	.	.	x	x	.	x	x	x	x	.	.	.	.	.	.	.	.	.	.	.	
L. loewi Ringdahl	x	x	.	.	.	x	x	.	x	.	.	x	x	x	x	.	.	.	.	.	.	.	.	.	.	
L. longicollis Meigen	.	.	.	.	.	x	.	.	.	.	.	x	.	.	.	.	.	.	.	.	.	.	.	.	.	
L. marina Becker	.	.	x	.	.	.	x	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	
L. melaleuca Loew	x	.	.	.	.	x	x	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	
L. nana Macquart	x	x	x	x	x	x	x	x	.	x	.	.	.	x	x	.	.	.	.	.	.	.	.	.	.	
L. nivalis Wiedemann	x	x	.	.	x	x	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	
L. pectinipes Becker	x	x	.	.	.	x	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	
L. persica Becker	x	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	
L. pygmaea Fallén	x	x	.	.	.	x	x	.	x	.	x	x	x	x	x	x	x	x	.	.	.	.	.	.	.	H
L. quaerens Villeneuve	.	.	.	.	.	.	x	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	
L. rigida Becker	x	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	
L. scalaris maroccana Canz. & Men.	x	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	
L. tentaculata (De Geer)	x	x	x	.	x	x	x	.	x	x	.	x	x	x	x	x	x	.	x	.	.	.	.	.	.	H
L. uliginosa (Fallén)	.	.	.	.	.	.	.	x	.	x	.	.	x	x	x	x	x	.	x	.	.	.	.	.	.	H
Limnospila albifrons (Zetterstedt)	.	.	.	.	.	.	x	x	.	x	.	.	x	x	x	x	x	.	x	x	.	.	.	.	.	H

Species	a,b,c,d,e,f,g,h,i,j,k,l,m,n,o,p;.1,2,3,4,5,6,7,8.	
Pseudocoenosia abnormis Stein	. . . . . ,x,x, . .,x,x,x,x,.,x,x, .x, ...	
P. solitaria (Zetterstedt)	. . . . . ,x,x,x, .x,x,x,x,.,x, ...	H
Caricea alna (Meigen)	. . . . . .?,?, .x,x, .?, .x,x,x,.,x, ...	H
C. bistriata Stein	. .x, ...	
C. brachialis (Rondani)	.x, ...x,x, .x, . .,x,x, ...	
C. erythrocera Robineau-Desvoidy	. . . . . .x, .x,x,x,x,x,x,x,x,.,x, ...	H
C. falculata (Collin)	. . . . . .x, ...x, ...	
C. fuscitibia (Collin)	. . . . . .x, ...	
C. nikii (Strobl)	.x,x,x, .x,x,x, ...	
C. pallipalpis (Zetterstedt)	. . . . . .x, .x, ...x,x,x,.	
C. rubricornis (Zetterstedt)	. . . . . .x, ...x,x, ...	
C. spuria (Zetterstedt)	. . . . . .x, .x, ...x,x,x,.	
C. ungulata (Rondani)	.x, . . .x,x, ...	
C. verna (Fabricius)	. . . . . .x,x, .x,x, .x,x,x,x,x,.x, ...	H
Orchisia costata (Meigen)	.x, .x,x, .x,x, .x, ...	
Spanochaeta dorsalis (Roser)	. . . . . .x, .x,x,x,x,x,x, ...	
Schoenomyza litorella (Fallén)	.x, ...x,x, .x,x,x,x,x,x,x,x,.x,x,x,x,x, . . .	H
(S. litorella v. major Tiensuu	. . . .x, ...)	
Macrorchis meditata (Fallén)	. . . . . .x, .x,x, .x,x,x,x,x,.x, ...	
Dexiopsis flavipes Stein	. .x, ...	
D. lacustris Karl	. . . . . .x,x, . .x,x, ...	
D. lacteipennis (Zetterstedt)	. . . . . .x,x, .x,x,x,x,x,x,x,x,.x,x,x, .x, . . .	
D. litoralis (Zetterstedt)	. . . . . .x, .x, . .x,x,x,x, ...?, ...	
D. minutalis (Zetterstedt)	. . . . . .x, .x,x,x,x,x,x,x,x,.	
D. ruficornis (Macquart)	. . . . . .x, .x,x, .x,x,x,x,x,.	
Coenosia acuminata Strobl	. . . . . .x, .x,x,.	

Species	a,b,c,d,e,f,g,h,i,j,k,l,m,n,o,p; 1,2,3,4,5,6,7,8.	
C. agromyzina (Fallén)	. . . . . ,x,x, ,x,x, ,x,x,x,x, ...	
C. albicornis Meigen	. . . . . ,x, ,x,x, . ,x,x,x,x,. .?.	
C. ambulans Meigen	. . . . . ,x, . . ,x,x,x,x,x, ...	
C. antennata (Zetterstedt)	. . . . . ,x,x, ,x,x, . ,x,x,x, ...	
C. atra Meigen	. . . . . ,x,x, ,x, ,x,x,x,x,x, ...	
C. atritibia Ringdahl	. . . . . ,x, ...	H
C. attenuata Stein	,x,x,x, . ,x, ...	
C. bilineella (Zetterstedt)	. . . . . ,?, . ,x, ,x,x,x, ,x,x,.x, ...	
C. bivittata Stein	. ,x, ...	
C. brevisquama Fonseca	. . . . . ,x, ...	
C. campestris (R.-D.) (=*sexnotata* Mg.)	. . . . . ,x, ,x,x, ,x, ,x,x,x,. ,x, ...	H
C. cingulipes (Zetterstedt)	. . . . . ,x, ...	
C. comita Huckett	. . . . . ,x, ...	H
C. dealbata (Zetterstedt)	. . . . . ,x,x,.	
C. distinguens Collin	. . . . . ,x, . . ,x,x, ...	
C. dubiosa Hennig	. . . . . ,x, ,x,x, . ,x, ...	
C. femoralis (Robineau-Desvoidy)	. . . . . ,x, ,x,x,x,x,x,x,x,x,.x,x, ...	
C. flavicornis (Fallén)	. . . . . ,x, ,x, ...	
C. flavimana (Zetterstedt)	. . . . . .?, ,x,x, ,x,x,x,x, ...	
C. freyi Tiensuu	. . . .x, ...	
C. freyi semicandida Frey	. . . .x, ...	
C. genualis Rondani	. . . . . .?,x, ...	
C. gracilis Stein	. . . . . .a, ...	
C. graciliventris Ringdahl	. . . . . ,x, ... ,x,.	
C. hispaniensis Hennig	. . . . . ,x, ...	
C. humilis Meigen	,x,x,x,x, ,x,x, ,x, ,x,x,x,x,x,x,.?, ...	H

Species	a b c d e f g h i j k l m n o p | 1 2 3 4 5 6 7 8	
C. infantula Rondani	. . . . . x x . . x	
C. intermedia (Fallén)	. . . . . x x . x x . x x x x x x x	
C. lyneborgi Pont	. . . . . x	
C. means Meigen	. . . . . x x . x x x x x x x x x . x x	
C. mixta Schnabl	x . . . x x	
C. mollicula (Fallén)	. . . . . x x x x x x x x x x x x x . x x . x	H
C. nevadensis Lyneborg	x . . . . x	
C. nigridigita Rondani	. . . . . x ? . . . . . x	
C. obscurella (Rondani)	. . . . . x . . . . . x	
C. octopunctata (Zetterstedt)	. . . . . x x	H
C. octosignata Rondani	. . . . . x	
C. paludis Tiensuu	. . . . . x . . . x	
C. patelligera Rondani	. . . . . x	
C. pedella (Fallén)	. . . . . x . x x x x x x x x x . x x	
C. perpusilla Meigen	. . . . . x . x . . . x x . . . x	
C. praetextata Pandellé	. . . . . x x	
C. pudorosa Collin	. . . . . x . . . x . . x . . x	
C. pulicaria (Zetterstedt)	. . . . . x . . . . x x x	H
C. pumila (Fallén)	. ? . . . . . x . x x x x x x x x x . x x x x . x . .	H
C. pygmaea (Zetterstedt)	. . . . . x . x . . x x x x	
C. rufipalpis Meigen	. . . . . x x x x x x . x x x x x x . x x	
C. sexmaculata Meigen	. . . . . x x . . . x	
C. sexpustulata Rondani	. . . . . a	
C. stigmatica Wood	. . . . . x	
C. strigipes Stein	. . . . . x x	
C. testacea (R.-D.) (= *tricolor*, Zett.)	x . . x x x x x x x . x x x x x x . x x x	

Species	a,b,c,d,e,f,g,h,i,j,k,l,m,n,o,p|.1,2,3,4,5,6,7,8.	
C. tigrina (Fabricius)	,x, . . .x,x,x, .x,x,x,x,x,x,x,x,x,.x,x,x,x, ...	H
C. trilineella (Zetterstedt)	. . . . . ,x, .x, .x,x,x,x,x, ...	
C. verralli Collin	. . . . . ,x, .x,x, . . .x,x,x,.	H
C. vibrissata Collin	. . . . . .x,x,x, ...	
Phaoniinae		
Brontaea eremophila (Brauer & Berg.)	,x,x, ...x, ...	
B. genurufa (Pandellé)	,x, ...x,x, ...	
B. humilis (Zetterstedt)	. . . . . ,x, .x,x, .x,x,x,x, ...	
B. polystigma (Meigen)	. . . . . .x, ...	
B. tonotrui (Wiedemann)	,x,x,x, ...	
Dichaetomyia doubleti (Pandellé)	. . . . . ,x, ...	
Helina abdominalis (Zetterstedt)	. . . . . ,x, .x, ...x,x, ...	
H. allotalla (Meigen)	. . . . . ,x, .x,x, .x,x,x,x, ...	
H. almeriensis (Strobl)	. .x, . . .x, ...	
H. annosa (Zetterstedt)	. . . . . ,x,x, .x, .x, .x,x,x,x,. . . . . .x, . .	H
H. arctata Collin	. . . . . .x, ...x, ...	
H. atlantica (Tiensuu)	. . .x, ...	
H. atricolor (Fallén)	. . . . . .x,x, .x, . . .x,x,x,x,.	
H. balsaci (Séguy)	. . . . . .x, ...	
H. bohemanni (Ringdahl)	. . . . . ,x,x,.	H
H. calceata (Rondani)	. . . . . ,x,x, .x, . .x,x,x,x, .. .x, ...	
H. calceatiformis (Schnabl) (=*parcepilosa*)	,x, . .x,x,x, .x,x,x, .x,x,x, ...	
H. celsa (Harris)	. . . . . ,x, .x,x, .x,x,x,x,x,.	
H. ciliata Karl	. . . . . ,x, ...	
H. ciliatocosta (Zetterstedt)	. . . . . ,x,x, .x, .x,x, .x,x,x,.	
H. cilipes (Schnabl)	. . . . . ,x, . .x, ...x,x,.	

Species	a,b,c,d,e,f,g,h,i,j,k,l,m,n,o,p;.1,2,3,4,5,6,7,8.	
H. cinerella (van der Wulp)	. . . . . .x. . . . .x. .x.x.x..	H
H. clara (Meigen)	.x.x.x. . .x.x.	
H. concolor (Czerny)	. . . . . .x. .?. . . .x.	
H. confinis (Fallén)	. . . . . .x.x. .x.x. .x.x.x.x.x.. .x. . .x. . . .	?H
H. consimilis (Fallén)	. . . . . .x. .x.x. . . . .x.x..x. . .x. . . .	
H. cothurnata (Rondani)	. . . . . .?. .x.x. . . . .x.x.. .x. .x.	H
H. crinita Collin	. . . . . .x.	
H. czernyi Lyneborg	. . . . .x.x.	
H. daicles (Walker)	. . . . . .x.x..	
H. deleta (Stein	. . . . . .x.	
H. depuncta (Fallén)	. . . . . .x.x.x.x.x.x.x.x.x.x.x..x.	
H. evecta (Harris)	.x.x.x. . .x.x. .x.x.x.x.x.x.x.x.x..x.x.x. .x. . . .	H
H. flavisquama (Zetterstedt)	. . . . . .x.x..	H
H. fratercula (Zetterstedt)	. . . . . .x. .x.x.x. . .x.x.x..x.	
H. impuncta (Fallén)	. . . . . .x.x. .x.x. .x.x.x.x.x.x..x.x.x.	
H. intermedia (Villeneuve)	. . . . . .x. .x. . .x. .x.	
H. lasiophthalma (Macquart)	. . . . . .x.x. .x.x. .x.x.x.	
H. latitarsis Ringdahl	. . . . . .x.x. .x.x. .x.x.x.x.x..	
H. laxifrons (Zetterstedt)	. . . . . .a.x.x.x..	H
H. longicornis (Zetterstedt)	. . . . . .x.x..	H
H. lundbladi Tiensuu	. . .x.	
H. luteisquama (Zetterstedt)	. . . . . .x.x..	H
H. maculipennis (Zetterstedt)	. . . . . .x.x. .x.x. . .x.x.x.x..x.x.	H
H. moedlingensis (Schnabl)	. . . . . .x. . . . .?.	
H. nevadannosa Lyneborg	. . . . . .x.	
H. nevadensis Lyneborg	.x. . . . .x.	

Species	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o	p	1	2	3	4	5	6	7	8	
H. obscurata (Meigen)	.	.	.	.	.	x	x	.	x	x	.	x	x	x	x	x	x	.	x	x	.	.	.	.	H
H. obscuratoides (Schnabl)	.	.	.	.	.	.	x	.	.	.	.	.	x	.	.	.	.	.	.	.	.	.	.	.	
H. obscurisquama (Stein)	.	x	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	
H. obtusipennis (Fallén)	.	.	.	.	.	.	x	.	.	.	.	.	x	.	.	.	.	.	.	.	.	.	.	.	
H. pandellei (Villeneuve)	.	.	.	.	.	.	x	.	.	.	.	.	.	x	.	.	.	.	.	.	.	.	.	.	
H. pendula (Pandellé)	.	.	.	.	.	.	x	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	
H. perexigua (Pandellé)	.	.	.	.	.	.	x	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	
H. pertusa (Meigen)	.	.	.	.	.	x	x	.	x	x	.	x	x	x	x	.	.	.	.	.	.	.	.	.	
H. pollinosa (Stein)	.	.	.	.	.	x	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	
H. protuberans (Zetterstedt)	.	.	.	.	.	.	x	.	x	x	x	x	x	x	x	x	.	x	x	.	.	.	.	.	
H. pubescens (Stein)	.	.	.	.	.	x	x	.	x	.	.	x	x	x	x	.	.	.	.	.	.	.	.	.	
H. pubiseta (Zetterstedt)	.	.	.	.	.	x	x	.	x	x	x	.	x	x	x	x	.	x	x	.	.	.	.	.	
H. pulchella (Ringdahl)	.	.	.	.	.	.	.	.	.	.	x	.	.	.	.	x	.	.	.	.	.	.	.	.	
H. quadrinotata (Meigen)	.	.	.	.	.	x	x	.	x	x	.	x	x	x	x	.	.	.	.	.	.	.	.	.	
H. quadrum (Fabricius)	x	x	.	.	.	x	.	x	x	x	x	x	x	x	x	x	.	x	x	.	x	.	.	.	
H. reversio (Harris)	x	x	x	.	x	x	x	x	x	x	x	x	x	x	x	x	.	x	x	x	x	.	.	.	H
H. subvittata (Séguy)	.	.	.	.	.	x	x	.	x	x	.	.	x	x	x	x	.	x	x	.	.	.	.	.	H
H. rufitibialis Hennig	.	.	x	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	
H. setiventris Ringdahl	.	.	.	.	.	x	x	.	x	x	x	x	x	x	x	x	.	.	.	.	.	.	.	.	
H. sexmaculata (Preyssler)	.	.	x	.	x	x	x	x	.	x	.	.	x	x	x	x	.	.	.	.	.	.	.	.	H
H. simulatrix (Séguy)	.	.	.	.	.	.	.	p	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	
H. spinicosta (Zetterstedt)	.	.	.	.	.	.	.	.	.	.	.	.	.	.	x	x	.	.	.	.	.	.	.	.	H
H. squalens (Zetterstedt)	.	.	.	.	.	.	.	.	.	.	.	.	.	.	x	x	.	.	.	.	.	.	.	.	H
H. tetrastigma (Meigen) (= *flagripes*, Rd.)	.	.	.	.	.	.	x	.	x	.	x	x	x	x	?	.	.	.	.	.	.	.	.	.	
H. trivittata (Zett.) (= *atripes*, Meade)	.	.	.	.	.	.	x	.	x	.	.	x	x	x	x	x	.	x	.	.	.	.	.	.	
H. veterana (Zetterstedt)	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	x	x	.	.	.	.	

Species	a,b,c,d,e,f,g,h,i,j,k,l,m,n,o,p,1,2,3,4,5,6,7,8,	
H. vicina (Czerny)	. . . . . ,x, ,x,x, . . ,x, ,x,x, ...	
H. vilissima Hennig	. . ,x, ...	
H. villositarsis (Pandellé)	. . . . . ,x, ...	
H. vockerothi Lyneborg	. . . . . ,x, ...	
Lophosceles cinereiventris (Zett.)	. . . . . ,x, ,x,x, . . . ,x,x,x, ,x, ...	H
L. frenatus (Holmgren)	. . . . . ,x,x, ...	H
L. hians (Zetterstedt)	. . . . . ,x,x, ...	H
L. mutatus (Fallén)	. . . . . ,x,x, . . . ,x,x, ,x, ...	
Phaonia aeneiventris (Zetterstedt)	. . . . . ,x, ... ,x,x, ...	
P. alpicola (Zetterstedt)	. . . . . ,a, ... ,a, ,x,x, ...	
P. amabilis (Meigen)	. . . . . ,x, . . . ,x, ,x, ...	
P. amicula Villeneuve	. . . . . ,x, ...	
P. angelicae (Scopoli) (=*basalis*, Zett.)	. . . . . ,x,x, ,x,x,x,x,x,x,x,x,x, ,x,x,x, ...	
P. angulicornis (Zetterstedt)	. . . . . ,x, ,x,x,x,x, ...	
P. apicalis Stein	. . . . . ,x, . . ,x, ,x, ...	H
P. atriceps (Loew)	. . . . . ,x, ,x, . . ,x,x,x,x, ...	
P. atrocyanea Ringdahl	. . . . . ,x, ...	H
P. bitincta (Rondani)	. . . . . ,x, ,x, . . . ,x, ...	
P. boleticola (Rondani)	. . . . . ,x, ...	
P. candicans (Pandellé)	. . . . . ,x, ...	
P. canescens Stein	. . . . . ,x, ,x, ... ,x, ...	
P. chalinata (Pandellé)	. . . . . ,x, ...	
P. cincta (Zetterstedt)	. . . . . ,x,x, ,x, . . ,x,x,x,x, ...	
P. colbrani Collin	. . . . . ,x, ...	
P. consobrina (Zetterstedt)	. . . . . ,x, . . . ,x, ,x,x, ,x, . . ,x, ...	H
P. czernyi Hennig	. . . . . ,x, ,x, ...	

Species	a,b,c,d,e,f,g,h,i,j,k,l,m,n,o,p;,1,2,3,4,5,6,7,8,	
P, errans (Meigen)	. . . . . ,?,x, ,x,x,x,x,x,x,x,x,,x,x,x, ,x,x, . .	H
P, erronea (Schnabl)	. . . . . ,x, ,x,x,x, ,x,x,x,x,.	
P, exoleta (Meigen)	. . . . . ,x, ,x,x, . ,x,x,x, ...	
P, falleni Michelsen	. . . . . ,x, ,x,x, ,x,x,x,x,x,.	
P, fugax Tiensuu	. . . . . ,x, ...	
P, fusca (Meade)	. . . . . ,x, . .x, ...	
P, fuscata (Fallén)	. . . . . ,x, ,x,x, ,x,x,x,x, ...	
P, gobertii (Mik)	. . . . . ,x, ,x,?, ,x, ,x,x,x,.	
P, gracilis Stein	. . . . . ,x, . .?,x,x,x,x,.	
P, grandaeva (Zetterstedt)	. . . . . ,x, ...	
P, halterata (Stein)	. . . . . ,x, ,x,x, ,x,x,x,x, ...	
P, hennigi Lyneborg	. . . . . ,x.	
P, hybrida (Schnabl)	. . . . . ,x, ... ,x,x,.	H
P, incana (Wiedemann)	. . . . . ,x, ,x,x,x,x,x,x,x,x,,x,x,x,x,x, . . .	
P, jaroschewskii (Schnabl)	. . . . . ,x, . . .?, ,x, ...	
P, kowarzii (Schnabl)	. . . . . ,x, ...	
P, laeta (Fallén)	. . . . . ,x, ,x, . . .,x,x,x,x,.	
P, latipalpis Schnabl	. . . . . ,x, ... ,x,,x, ...	
P, longicornis Stein	. . . . . ,x,x,x,.	
P, lugubris (Meigen)	. . . . . ,x, ,x, ...,x,x,.	
P, magnicornis (Zetterstedt)	. . . . . ,x, ,x, ,x,?,x,x,x,x,. . . .?, ...	
P, mediterranea Hennig	,x, . . .x,x,x, ,x, . . .x, ...	
P, meigeni Pont	. . . . . ,x, ,x,?,x, ,x,x,x,x,.	
P, mystica (Meigen)	. . . . . ,x,x, ,x,x,x,x,x,.	
P, nigrisquama Stein	. ,x, ...	
P, nymphaearum (Robineau-Desvoidy)	. . . . . ,x, ,x, ...,x,x, ...	

Species	a,b,c,d,e,f,g,h,i,j,k,l,m,n,o,p;,1,2,3,4,5,6,7,8,	
P, pallida (Fabricius)	. . . .X, .X,X, .X,X,X,X,X,X,X,X,X,.X, ...	
P, pallidisquama (Zetterstedt)	. . . . . .X,X,.	H
P, palpata (Stein)	. . . . .X, .X, .X,X,X,X,X,X,X,X,X,.X, . .X, ...	
P, perdita (Meigen)	. . . . . .X, .X,X, .X,X,X,X, ...	
P, pratensis (Robineau-Desvoidy)	. . . . . .X, .X, . .X,X,X,?,X,.	H
P, profugax (Pandellé)	. . . . . .X, ...	
P, pullata (Czerny)	. . . . . .?.	
P, pura (Loew)	. . . . . .X,X, ...	
P, rufipalpis (Haquart)	. . . . . .X,X, .X,X,X,X,X,X,X, ...	
P, rufiventris (Scopoli)	. . . . . .X,X, .X,X,X,X,X,X,X,X,.X, .X, ...	
P, scutellata (Zetterstedt)	. . . . .?,X, . .X, ...X,X,.	
P, serva (Meigen)	. . . . . .X,X, .X,X, .X,X,X,X,X,. . . .X, ...	H
P, siebecki Schnabl	. . . . . .X, .X, . . .X, .X,X,.	
P, sordidisquama Stein	.X,X, ...	
P, steinii (Strobl)	. . . . . .X,X,X,.	
P, subfuscinervis (Zetterstedt)	. . . . . .X, ...X,X,. . . .X, ...	H
P, subventa (Harris)	. . . .X, .X,X,X,X,X,X,X,X,X,X,X,.X, ...	
P, suecica Ringdahl	. . . . . .X, ...	
P, tiefii (Schnabl)	. . . . . .X, ...X, ...	
P, trimaculata (Bouché)	.X,X,X,X, .X,X, .X, . .X,X,X,X, ...	
P, tuguriorum (Scopoli)	.X, . . .X,X,X, .X,X,X,X,X,X,X,X,.X, .X, ...	
P, valida (Harris)	. . . . . .X,X, .X,X,X,X,X,X,X,X,.?, ...	
P, villana Robineau-Desvoidy	. . . . . .X, .X,X, . .X, .X,X,.X, ...	
P, wahlbergi Ringdahl	. . . . . .X, ...	
P, zugmayeriae (Schnabl)	. . . . . .X, .X, . . .X, .X,X,.	H

Key to Table 42; a, Morocco; b, Canaries; c, Madeira; d, Azores; e, Portugal; f, Spain; g, France;

h, Channel Isles; i, Britain; j, Ireland; k, Belgium; l, Netherlands; m, Germany; n, Denmark; o, Sweden; p, Norway. 1 Inner Hebrides; 2 Outer Hebrides; 3 Orkney; 4 Shetland; 5 Faroes; 6 Iceland; 7 Jan Mayen; 8 Spitzbergen. (Species marked H also occur in the Nearctic, whilst A indicates an Arctic species. Brackets indicate casual importations of no zoogeographical significance.)

7 CONCLUSIONS

This study has investigated aspects of the Quaternary history of the Dipterous fauna of the North Atlantic region and has combined two broad approaches, both requiring an ecological base. The taxonomic path can only commence with the oldest specimens available for study, but the zoogeographical route allows extrapolation to earlier times.

In the course of this research programme over 35,000 Dipterous specimens belonging to 45 families have been identified from 43 sites in West Greenland, Iceland and the United Kingdom. These sites cover a spread of dates over the last 5000 years. The great durability of Cyclorrhaphous puparia is demonstrated by the fact that these comprised about 87 percent of all Dipterous specimens examined.

Since most of the area concerned in this study was ice-covered during the last glaciation, a state of *Tabula rasa* prevailed throughout as the ice-sheets retreated. These newly exposed areas were then available for biotic colonisation. The period discussed in this Thesis commences with the retreat of the ice from this area.

In terms of the site-studies discussed here, most have been from human occupation locations of post-Bronze Age date, carried out during archaeological excavation work. Consequently none relate to a *Tabula rasa* situation, and many excavations of immediate post-glacial deposits need to be carried out before the early stages of insect colonisation of the *Tabula rasa* can be adequately understood. However, recent work in the High Arctic is valuable in providing models. Thus, it has been shown that the pioneer Dipterous colonisers of newly exposed areas there are ones whose larvae are aquatic, notably Chironomidae and

muscid predators belonging to the genus *Spilogona* (McAlpine 1965b). It is further widely recognised that as the July mean decreases to a level inadequate for life-processes, which in this context is very crudely correlated with increasing latitude, the proportion of hygrophilous members of the invertebrate fauna also increases (Downes 1988). It could therefore be reasonably postulated that these groups might have formed the vanguard of insect colonists following the northward retreat of the ice-sheets across the Holarctic at the close of the last glaciation. Subfossil evidence is awaited from relevant site-studies in temperate regions to test this hypothesis.

Whilst the main emphasis of this Thesis is concentrated upon the interpretation of subfossil Dipterous assemblages, it is for the reasons outlined above that a strong supporting aspect has been an appraisal of the biogeography of Diptera in the North Atlantic region, and in this connection a publication is in preparation on the Diptera of the Western Isles of Scotland as part of a wider, North Atlantic, coverage.

A knowledge of the present distributional range of Diptera may help in the creation of models of probable origins of the faunas of particular regions through the occurrence of faunal harmonies. This Thesis includes distribution tables of the Muscidae of the North Atlantic region, including the European Atlantic seaboard countries from Spain to Spitsbergen, westwards to the eastern Nearctic from Newfoundland to Ellesmere Island. Also an updated annotated Check List of the Muscidae of Greenland has been incorporated in response to particular interest in that island. " Arctic species" are defined as those species known mainly, or solely, from areas north of the 10

degree Centigrade July mean Isotherm, which is now widely recognised as marking the southern boundary of the Low Arctic. On the basis of the Muscid genus *Spilogona*, it is evident that the Greenlandic fauna is of Nearctic origin. There were probably two main routes of colonisation, namely a northern one via Ellesmere Island across the Robeson and Kennedy channels, and a southern one, in aerial planktonic drift, across the Davis Strait from the Labrador coast. The Icelandic *Spilogona* fauna, on the other hand, is of European origin and a surface-rafting mechanism of colonisation appears perfectly feasible, assuming transportation of larvae or unhatched puparia. On the basis of Arctic elements in the Muscid fauna, Iceland has a higher proportion than any other European country; a conclusion which could be predicted geographically, but which is at variance with the traditional view as expressed by Nielsen *et al.* (1954). On the other hand, and again contrary to popular belief, Scotland has no Arctic elements.

Prompted by the interest in the High Arctic insect fauna which was generated during the preparation of this Thesis, an intensive pitfall and water trap survey was undertaken in north-western Ellesmere Island by Capt. R. Godfrey during the summer of 1994 and a joint report is in preparation. This was part of the first ecological survey ever carried out in this pristine, uninhabited High Arctic location, and it will supplement the exhaustive work already completed around Lake Hazen, some 150 miles to the north-east by successive teams from the Canadian government. Although Capt. Godfrey's locality is clearly a rich area well advanced beyond the raw *Tabula rasa* state, the 1994 study spectacularly demonstrates that Chironomidae and *Spilogona* still massively dominate the fauna.

Previous work on the "Cow-dung Community" (Skidmore 1991) and an interest in Arctic ecology, prompted a fruitless literature search for information on possible insect coprophages in Arctic environments. Capt. Godfrey undertook an investigation of Musk Ox and Caribou dung in his survey area on Ellesmere Island during 1994. Despite prolonged searches through copious quantities of this material, he found no invertebrates whatsoever, and he concluded that breakdown was achieved purely through weathering processes. Is herbivore dung then just another of the many niches referred to by Downes (1964) which are unoccupied in the Arctic environment, and if so, what inhibitory processes are operative? Also, was there a period after the retreat of ice-sheets much further south, throughout the Holarctic, when no coprophagous faunas existed there either? If so, how long was it before such taxa as *Aphodius* appeared in these areas?

In the High Arctic the endophilous Dipterous necrophages are Piophilidae and the Calliphorids *Phormia terrae-novae* and *P. (=Boreellus) atriceps; Calliphora* species do not occur so far north. Interestingly, the multitudes of Calliphorid puparia found in the Covenden (Shropshire) mammoth were all *P. terrae-novae* (pers. comm. Y. Z. Erzinçlioglu).

Since a major part of this study involved the identification of fragmented Dipterous adults and immature stages, the inadequacies of the available literature for this work were inevitably revealed. An important section of the Thesis highlights morphological details which are relevant in subfossil, as distinct from modern, material. Regarding immature stages two examples will suffice.

1 Tipuloid larval head-capsules are often very numerous in site-

samples, but their identification is impossible with existing literature. This is because the extensive taxonomic publications on Tipuloid larvae focus on the morphology of the posterior spiracular and anal regions. Extremely few Tipuloid larval head-capsules have been figured. For the purposes of this Thesis a limited study of these structures, in a range of Tipuloid genera, was undertaken. This revealed an astonishing range of forms which wholly justified the traditional view of continental authors that the Tipulidae as understood by British workers comprises a number of distinct families. The limited study undertaken here sufficed to show that even in the genus *Tipula* the larval head-capsule exhibits a diversity which points to a great potential for taxonomic study.

2 Initial attempts to identify Sphaerocerid puparia also proved the inadequacy of extant literature and precipitated a re-appraisal of the group, the results of which were published (Skidmore 1992). Traditionally, puparial descriptions were based on specific identities obtained from emerged adults. Work on subfossil puparia of necessity emphasised a preferred option, namely that identifications should be founded on unemerged adults, thus eradicating the constant danger of incorrect correlation of puparia with hatched imagines. The present study has shown that in large assemblages of subfossil puparia, up to ten percent contained dead adults at the point of emergence. In specimens showing a good state of preservation, specific identification on male genitalic and other characters can be achieved.

Whilst there is an extensive literature on Dipterous puparia, there remains a great need for comparative morphological studies across a wide range of families. Surprisingly for instance, a comprehensive

survey of the papillar arrangement of the "end-segments" of Cyclorrhaphous puparia has not been produced. An initial examination for this work suggests that the characteristic arrangement found in many Calyptrates (eg. *Scathophaga*, Calliphorinae and many Anthomyiidae) appears to be very rare in the Acalyptrates. In some families unique patterns occur (eg. Piophilidae). The great range of puparial form found in the Ephydridae is of particular interest and further work may demonstrate a need to re-evaluate familial concepts in the superfamily Drosophiloidea, to which the Ephydridae belongs. The Anthomyiidae is the most problematical Calyptrate family in terms of puparial taxonomy. A vast amount of work needs to be done here before puparia can be identified with any degree of certainty since so many taxa remain unknown in this stage of development. Also, the biological and ecological requirements of very few species are well-known. In the present connection, advances in our knowledge of Anthomyiid puparia are particularly important since they are often abundant in subfossil assemblages.

During the study of the Western Settlement sites in Greenland, many interesting questions arose from the analysis of Dipterous material in the middens. The analysis of puparia from these features exposed a remarkable scarcity of heliophilous necrophages compared with the Palaeoeskimo site at Qeqertasussuk studied by Böcher and Fredskild (1993). This inferred not only an absence of decaying meat on the Norse middens, but of bone-marrow too. This prompted Dr. T. H. McGovern to re-assess his data on bone fragmentation levels in the Western Settlement middens. He found that these levels were in fact exceptionally high, strongly suggesting that the inhabitants habitually extracted the

marrow. This discovery in turn led to a re-appraisal of the annual round of activity on the Norse farms which revealed problems of fat deficiency in the human diet.

It is possible that the unmistakable puparia of the Anthomyiid fly *Delia fabricii* in Norse farm deposits in the Western Settlement reflected pasture quality. This being so, the scarcity in the Nipaatsoq samples may be highly significant. Analysis of the far more copious samples from the nearby farm of Gus collected during 1995 may shed more light on this question. Also, the pitfall and water trap survey carried out around Gus by Phil Buckland at the same time should provide an invaluable modern insect fauna against which the subfossil assemblage can be contrasted.

In the Western Settlement middens, the occurrence of *Telomerina flavipes* and *Heleomyza borealis*, and absence of Piophilids and Calliphorids was clearly indicative of discarded floor material from the farm living quarters. In that situation *Telomerina flavipes* was a highly thermophilous troglodytic eusynanthrope, and in the analysis of puparia from the Nipaatsoq bedroom it helped to paint a picture of a macabre end to the human occupation of the farm. The room temperature dropped and the carrion presence, as indicated by troglodytic necrophages, rose. Later, it appears that sun-loving necrophages moved in, perhaps as a result of roof collapse.

Another curious feature of the Western Settlement middens was the discovery of a predominance of *Fucellia* puparia, indicating a presence of seaweed, at a farm site which was most distant from the shore. Elsewhere there was no Dipterous evidence for the utilization of seaweed on any of these Norse farms, despite their close proximity to

the coast.

It would be extremely interesting if excavated and modern pitfall and water trap material could be obtained from the Eastern Settlement, as possible differences between the faunas of the Eastern and Western Settlement areas could be predicted.

It has been clearly demonstrated that at least two species of Diptera (ie. *Telomerina flavipes* and *Melophagus ovinus*) were eusynanthropic associates of the Norsemen in the Western Settlement and that their demise coincided with that of the settlement. That they had been transported thence from Iceland appears to be beyond doubt.

The studies of the Norse domestic sites in the Western Settlement and Iceland show that that by far the commonest household flies belonged to the genus *Heleomyza* (*serrata* and *borealis*). The true "Housefly ", *Musca domestica* was clearly absent from these islands, and during this study no specimens from anywhere north of the Scottish Lowlands were see. It is therefore suggested that the "Viking Housefly" was one or other of these *Heleomyza* species, dependant on the area concerned. *H. serrata* was replaced in the colder parts of northern Iceland and in Greenland by *H. borealis*. *M. domestica* was thought to have originated from the eastern Mediterranean. It is markedly thermophilous in northern Temperate regions and is probably merely a casual import through commerce further north (Skidmore 1985).

Identification of fragments of adult Diptera relies heavily on comparison with modern material. Very seldom are the "key characters" used in the literature available in subfossils, and this study has demonstrated the vital need to re-examine those more durable parts of the adult Dipteron which persist in subfossil states. Thus, head and

thoracic fragments occur commonly, whilst legs are hardly ever found except in unhatched puparia. Although bristles have usually been lost, their alveoli remain as conspicuous clear dots, different thicknesses of bristles being indicated by a range of alveolar diameters. So, chaetotactic and other details of heads and thoraces can be extremely useful. A study of modern Bibionid adult heads, which are common in some terrestrial habitats, including samples from the Falkland Islands where the family appears to be extinct, showed considerable differences which have not been highlighted in the literature. Similarly, in the Tipulidae, the adult frons was found to possess hitherto apparently unrecognised features whereby *Prionocera* can be clearly distinguished from *Tipula*. The morphology section of this Thesis discusses these matters more fully, noting limitations in our current knowledge and pointing out research areas of great potential taxonomic value.

In interpretive work based on subfossil material, a cautionary tale is offered by *Thoracochaeta zosterae*. Today this is regarded as an exclusively coastal fly where it breeds only in decaying seaweed. However, from Roman times until about the eighteenth century it was apparently an ubiquitous member of the cess-fauna, as clearly demonstrated by its great abundance in many archaeological excavations throughout the United Kingdom and on the Continent. The correct identity has been established beyond doubt on male genitalic features of unhatched adults. Formerly specimens from such deposits were misidentified as the Urinal fly *Teichomyza fusca*, the puparia of which have some superficial resemblance to those of *T. zosterae* (Belshaw 1989). The reason for the sudden disappearance of this fly from inland sites, and its modern restriction in Britain to accumulations of

seaweed, remains unexplained.

This research programme has sought to demonstrate that Diptera can provide a most valuable tool in the interpretation of past environments, and undoubtedly Diptera will prove to be of increasing importance in archaeological and post-glacial studies. Indeed, it is recommended that all future excavation projects into such deposits should include an investigation of the Dipterous remains. Although the number of Dipterous taxa from a given excavation rarely approaches that of the Coleoptera, the flies usually testify to different aspects of the biotope. They can be particularly useful in providing windows into the human living conditions in a way very seldom possible with other groups of Invertebrates. On the other hand, the Coleoptera are generally far superior to Diptera in helping paint a broad canvas of the wider vegetational environment. This is because the phytophagous Dipterous families which include highly host-specific taxa (eg. Cecidomyiidae, Tephritidae and Agromyzidae) rarely appear in subfossil assemblages. In one respect the Diptera excel however; since with Diptera one normally deals with the immature stages, the subfossil matrix is usually that in which the live insects were breeding. A knowledge of the ecological requirements of the immature Diptera provides a clear statement on the nature of the matrix.

An unexpected dividend from this research has been the realisation of the great value of studies of subfossil material in the taxonomy of the immature stages of modern Diptera.

PAGE
MISSING
IN
ORIGINAL

9 BIBLIOGRAPHY

Ackland, M. 1964 Taxonomic notes on two species of *Pegomyia* R.-D. (Dipt.,Muscidae) from Iceland *Ent.Medd.* 32; 354-356, 8 figs.

Amorosi, T., Buckland, P.C., Ólafsson, G.,Sadler, J.P. and Skidmore, P. 1992 Site Status and the Palaeoecological Record; A Discussion of the Results from Bessastaðir, Iceland. In C.O.Morris and D.J.Rackham (eds.) *Norse and Later Settlement and Subsistence in the North Atlantic* 169- 191, Glasgow University, 4 figs., 3 tbls.

Andersson, H. 1967 Faunistic, ecological and taxonomic notes on Icelandic Diptera *Opusc. ent.* 32(1-2); 101-120, 6 figs.

Andersson, H. 1976 Revision of the *Anthomyza* species of Northwest Europe (Diptera; Anthomyzidae) I. The *gracilis* group *Ent. scand.* 7 (1976); 41-52, 48 figs.

Andrew, R.H. MS. List of Diptera from Hoy.

Anthon, H. 1943 Der Kopfbau der Larven einiger Nematoceren Dipteren Familien: Rhyphidae, Trichoceridae, Psychodidae und Ptychopteridae *Spolia Zoologica Musei Hauniensis* III; 61pp., 11 pl

Assis-Fonseca, E.C.M. 1968 Diptera Cyclorrhapha sect.(b) Muscidae. *Handb.Ident. Br.Ins.* 10(4(b)); 199pp; 16 figs., 6 pls.

Assis-Fonseca, E.C.M. 1978 Diptera Orthorrhapha Brachycera Dolichopodidae *Handbk. Ident. Br. Ins. 9(5);* 90pp., 220 figs.

Backlund, H.O. 1945 The Wrack-fauna of Sweden and Finland, Ecology and Chorology *Opusc. Ent. Suppl.* 5; 236pp.

Ball, S.G. and McLean, I.F.G. 1986 Sciomyzidae Recording Scheme, Preliminary Atlas, *Newsletter* 2; 1-36

Barber, J. 198., Buildings and Quays. In C.G.Brown Plymouth Excavations, The Medieval Waterfront, Woolster Street, the Finds. *Plymouth Museum Archaeological Series* 3; 11-12

Barfod, P., Borneman, C. and Petersen, H. 1962 *Bogen om Grønland Kalâdlit-nanâmik alaugkiak.* Politikens Forlog, København, 384pp.

Barker, P. and Higham, R. 1982 Hen Domen Montgomery. A Timber Castle on the English Welsh Border *Royal Archaeological Institute* 1; 67-71, 1 fig., 2 tbls.

Barnes, H.F. 1946-56 *Gall Midges of Economic Importance* Agricultural and Horticultural Handbooks Crosby Lockwood & Sons Ltd., London 7 vols.

Basden, E.B. 1956 Drosophilidae(Diptera) within the Arctic Circle I. General Survey *Trans.R.ent.Soc.Lond.* 108(1); 1-20, 2 tbls.

Basden, E.B. and Harnden, D.G. 1956 Drosophilidae(Diptera) within the Arctic Circle II. The Edinburgh University Expedition to Subarctic Norway, 1953 *Trans.R.ent.Soc.Lond.* 108; 147-162, 7 figs., 2 pls.

Beaver, R.A. 1969 Anthomyiid and Muscid flies bred from snails *Entomologist's mon.Mag.* 105; 25-26

Becker, T. 1897 Beitrag zur Dipterenfauna von Nowaja Zemlja *Ann. Mus. Zool. St.Petersbourg* 2; 396-404

Bedding, R.A. 1973 The immature stages of the Rhinophorinae(Diptera; Calliphoridae) that parasitize British Woodlice. *Trans.R.ent.Soc.Lond.* 125(1); 27- 44, 63 figs.

Belshaw, R. 1989 A Note on the Recovery of *Thoracochaeta zosterae* (Haliday) (Diptera; Sphaeroceridae) from Archaeological deposits *Circaea* 6(1); 39-41, 1 fig.

Bergerson, R. (in press) Is Greenland a Zoogeographic Unit of its own ?

Berry, R.J. 1985 *The Natural History of Orkney* New Naturalist Library, Collins, London. 304pp.,113 figs.,20 pls.

Birkett, N. 1983 Chironomidae (Dipt., Nematocera) from the Isle of Handa, West Sutherland *Entomologist's mon. Mag.* 121; 26

Bland, K.P. 1992 The Plant-mining Diptera of the Isle of Coll, Inner Hebrides (Vc,103) *Dipterists Digest* 11; 35-38

Bliss, L.C.(ed.) 1977 *Truelove Lowland, Devon Island, Canada; A High Arctic Ecosystem* University of Alberta Press, Edmonton

Bliss, L.C., Heal, O.W. and Moore, J.J. (eds.) 1981 *Tundra Ecosystems; A Comparative Analysis* Cambr.Univ.Press

Block, W. 1988 South Georgia Entomology *Antenna* 12(3); 97-102

Bloomfield, E.N. 1904 Diptera from Shetland *Entomologist's mon. Mag.* 40; 88

Böcher, J. 1988 The Coleoptera of Greenland *Meddelelser om Grønland Bioscience* 26; 100pp; 53 figs.

Böcher, J. & Fredskild, B. 1993 Plant and arthropod remains from the palaeo-Eskimo site on Qeqertasussuk, West Greenland. *Meddelelser om Grønland, Geoscience*, 30; 3-33, 23 figs.

Böcher, T.W. 1933 Studies on the Vegetation of the East Coast of Greenland between Scoresby Sound and Angmagssalik (Christian IX's Land) *Meddeleser om Grønland* 104(4); 132pp.

Bolwig, N. 1940 The description of *Scatophila unicornis* Czerny 1900 (Ephydridae, Diptera) *Proc.R.ent.Soc.Lond. B* 9(8); 129-144, 8 figs.

Bovien, P. 1935 The Larval stages of *Scatopse* (Diptera nematocera) Vidensk.Medd.fra *Dansk.naturh.Foren.* 99; 3-43, 3 figs.

Bratt, A.D., Knutson, L.V., Foote, B.A. and Berg, C.O 1969 Biology of *Pherbellia* (Diptera: Sciomyzidae) *Cornell University Agric. Exp.Sta. Mem.* 404; 247pp., 184 figs., 8 tbls.

Brauns, A. 1954 *Terricole Dipterenlarven Untersuchungen zur Angewandten Bodenbiologie* 1; Wissenschaftlicher Verlag, Gottingen, Frankfurt, Berlin 1-179, 96 figs.

Brauns, A. 1954 *Puppen Terricoler Dipterenlarven* 2 "Masterschmidt", Wissenschaftlicher Verlag, Gottingen, Frankfurt, Berlin

Brindle, A. 1958 Notes upon the identification of *Limnophila* larvae (Diptera- Tipulidae) *Trans.Soc.Brit.Ent.*13(4); 58-68, 23 figs.

Brindle, A. 1959 Notes on the Larvae of the British Rhagionidae and Stratiomyiidae *Ent.Rec.* 71; 126-133, 29 figs.

Brindle, A. 1960 The Larvae and Pupae of the British Tipulinae (Diptera, Tipulidae) *Trans.Soc.Brit.Ent.* 14(3); 63-114, 179 figs.

Brindle, A. 1961 Notes on the Life-History of the Genus *Hexatoma* (Dipt., Tipulidae) *Entomologist's mon.Mag.* 96; 149-152, 9 figs.

Brindle, A. 1962a The Genus *Pachygaster* Meigen (Stratiomyiidae) *Entomologist* 1962; 77-82, 6 figs.

Brindle, A. 1962b Taxonomic Notes on the Larvae of British Diptera No.11 Trichoceridae and

Anisopodidae *Entomologist* 95; 285-288, 11 figs.

Brindle, A. 1962c Taxonomic Notes on the Larvae of British Diptera No.12. The genus *Rhagio* F.(Rhagionidae) *Entomologist* 95; 311-315, 12 figs.

Brindle, A. 1964 Taxonomic Notes on the Larvae of British Diptera. No.16 The Stratiomyiinae(Stratiomyiidae) *Entomologist* 1964; 91-96, 15 figs.

Brindle, A. 1965a Taxonomic Notes on the Larvae of British Diptera. No.19 The Micropezidae(Tylidae) *Entomologist* 98; 83-86, 6 figs.

Brindle, A. 1965b Taxonomic Notes on the Larvae of British Diptera No.21 The Piophilidae *Entomologist* 98; 158-160, 8 figs

Brindle, A. 1965c Taxonomic Notes on the Larvae of British Diptera. No.22 Psilidae *Entomologist* 98; 169-173, 12 figs.

Brindle, A. 1965d Taxonomic Notes on the Larvae of British Diptera. No.23 The Geosarginae (Stratiomyiidae) *Entomologist* 98; 208-216, 15 figs.

Brindle, A. 1967 The Larvae and Pupae of the British Cylindrotominae and Limoniinae (Diptera,Tipulidae) *Trans.Soc.Brit.Ent.* 17(7); 151-216, 173 figs.

Brindle, A. 1969 Taxonomic Notes on the Larvae of British Diptera. No.27. Hemerodromiinae (Empididae) *Entomologist* 102; 35-39, 10 figs.

Bruun, D. 1917 Oversigt over Nordboruiner i Godthaab- og Frederiks- haab- Distrikter *Meddelelser om Grønland* 50(3); 55-147

Bryce, D. and Hobart, A. 1972 The Biology and Identification of the Larvae of the Chironomidae (Diptera) *Ent.Gazette* 23; 175-217

Buckland, P.C. 1976 The Environmental Evidence from the Church Street Roman Sever System *The Archaeology of York. The Past Environment of York* 41(1); 44pp., 3 figs, 8 tbls. C.B.A., London

Buckland, P.C. 1979 Thorne Moor: A Palaeoecological Study of a Bronze Age Site *Dept. of Geography Occ .Publ. no.8, Birminghan University* 174pp., 24 figs., 4 tbls.

Buckland, P.C. 1980 Insect Remains from the Well, in I. M. Stead, *Rudston Roman Villa Yorkshire Archaeological Society)*; 162-167, 1 tbl.

Buckland, P.C. 1981 Insect Remains from beneath the Brigg "Raft", in S. McGrail, *The Brigg Raft and and her Prehistoric Environment*, British Series 89; 155-175

Buckland, P.C. 1986 An Insect Fauna from a Roman Well at Empingham, Rutland *Trans. Leics. History & A Archaeol. Soc.* 60; 1-6, 2 tbls.

Buckland, P.C. 1988 North Atlantic connections; introductions or endemics ? *Ent. Scand. Suppl.* 32; 7-29

Buckland, P.C. (in press) Peat Stratigraphy and the Age of the Lindow Bodies. In R.C. Turner and R. Schaife (eds.) *Bog Bodies*, British Museum, London

Buckland, P.C., Beal, C.J. and Heal, S.V.E. 1990 Recent work on the archaeological and palaeoenvironmental context of the Ferriby boats. In S. Ellis anf D. Crowther (eds) *Humber Perspectives* 10; 132-146, 1 fig., 2 tbls. Hull University Press.

Buckland, P.C. and Coope, G.R. 1991 *A Bibliography and Literature Review of Quaternary Entomology* J.R. Collis publ., Sheffield 96pp.

Buckland, P.C. and Dugmore, A. 1991 "If this is a refugium, why are my feet so bloody cold ?" The origins of the Icelandic biota in the light of recent research *Environmental Change in Iceland; Past and Present* 107-125, 3 figs. Kluwer Publ., Dordrecht.

Buckland, P.C., Dugmore, A., Perry, D.W. , Savory, D. and Sveinbjarnar dóttir, G. 1991 Holt in Eyjafjallasveit, A Palaeoecological Study of Impact of Landnám, in C. Bigelow, The Norse of the North Atlantic *Acta Archaeologica* 61; 252-271, 7 figs, 6 tbls.

Buckland, P.C., Edwards, K.J., Blackford, J., Sadler, J.P. and Sveinbjarnardóttir, G. (in press) Palaeoecological research on Papey, Eastern Iceland. In R. Butlin and N. Roberts (eds.) *Human Impact and Adaptation; Ecological Relations in Historic Time*, Institute of British Geographers., Blackwell, Oxford.

Buckland, P.C., Holdsworth, P. and Monk, M. 1976 The Interpretation of a Group of Saxon Pits in Southampton *Journ. Archaeol. Sc.* 3; 61-69, 2 figs., 2 tbls.

Buckland, P.C., McGovern, T.H., Sadler, J.P. and Skidmore, P. (1994) Twig-layers, Floors and Middens. Recent Palaeoecological research in the Western Settlement, Greenland. In B.Ambrosiani and H.Clarke (eds) *Proceedings of the XII Viking Congress, Stockholm, Birka Studies3*; 132-143. Stockholm.

Buckland, P.C. and Perry, D.W. 1989 Ectoparasites from Sheep at Stóraborg, Iceland and their palaeoecological significance (Piss, parasites and people: a palaeoecological perspective). *Hikuin*, 15; 37-46

Buckland, P.C. and Sadler, J.P. 1976 The Nature of Late Flandrian Alluviation in the Humberhead Levels *The East Midlands Geographer* 8; 239-251, 3 figs, 2 tbls.

Buckland, P.C., Sadler, J.P. and Smith, R.F. (in press) Contrasting Patterns of Polar Biogeography, North versus South in Atlantic Insect Populations. In M.J.Biscioti (ed.) *Proceedings of the Ist Symposium, Flora and Fauna of the Atlantic Islands*, Funchal, Madeira.

Buckland, P.C., Sadler, J.P. and Sveinbjarnardóttir, G. 1992 Palaeoecological Investigations at Reykholt, Western Iceland *Norse and Later Settlement and Subsistence in the North Atlantic* 149-167, 8 figs, 2 tbls. Glasgow University.

Buckland, P.C., Sveinbjarnardóttir, G., Savory, D., McGovern, T.H., Skidmore, P. and Andreasen, C. 1983 Norsemen at Nipáitsoq, Greenland: A Palaeoecological Investigation *Norw. Arch. Rev.* 16(2); 86-98, 2 figs., 3 tbls.

Burbridge, A., Owen, J. and Fowler, J.A. 1988 Some records of hoverflies (Dipt., Syrphidae) in Shetland *Entomologist's mon.Mag.* 124; 44.

Campbell, J.A. and Pelham-Clinton, E.C. 1960 A Taxonomic Revision of the British species of *"Culicoides"* Latreille (Diptera, Ceratopogonidae). *Proc.Royal Soc.Edinburgh Sect.B (Biology)* 67(3); 181-302, 291 figs.

Campbell, J.L. 1991 Rum, Roum or Rhum. *Entomologist's Record* 103; 209

Carlsson, G. 1962 Studies on Scandinavian Blackflies *Opusc.ent. Suppl.* 21; 280pp., 43 figs., 40 tbls.

Carpenter, G.D.Hale, and Holm, A. 1939 Insecta and Araneae collected in the Kangerdlugsuak Region of East Greenland by the British Expedition,1935-36 *Ann.& Mag.Nat.Hist.* 11(3): 60- 80, 4 figs.

Carpenter, G.D.Hale and Roman, A. 1938 Notes on Insects collected in West Greenland by the Oxford University Greenland Expedition, 1936 *Ann.& Mag.Nat.Hist.* 11(1): 529- 553.

Carvalho, C.J.de Barros, 1989 Classificação de Muscidae (Diptera); uma proposta através da análisa cladistica *Revta. bras. Zool.* 6 (4); 627-648, 12 figs., 1 tbl.

Chandler, P.J. 1972 The distribution of Snail-killing Flies (Diptera: Sciomyzidae) in Ireland *Proc.Brit.ent.nat.Hist.Soc.* 5(1): 1-21

Chillcott, J.G. 1960 A Review of the Nearctic species of Fanniinae (Diptera: Muscidae) *The Canadian Entomologist Suppl.* 14; 295 pp., 289 figs.

Chiswell, J.R. 1956 A taxonomic account of the last instar larvae of some British Tipulinae (Diptera, Tipulidae) *Trans.R.ent.Soc. Lond.* 108(1); 409-484, 110 figs.

Christensen, K.M. 1991 Aspects of the Norse Economy in the Western Settlement in Greenland, *Acta Archaeologica* 61; 158-165

Chung, In-Cho 1989 *Eastern North America as seen by a Botanist, I The Arctic Region*, Samhwa Printing Co. Ltd., Seoul, Korea, 112pp., 287 pls.

Clastrier, J. 1961 Notes sur les Ceratopogonidés XV. *Ceratopogon et Alluaudomyia* de la region Palaearctique *Arch. Inst. Pastuer Algér.* 39; Algiers, 401-437, 20 figs.

Coe, R.L., Freeman, P. and Mattingley, P.F. 1950 Diptera 2 Nematocera: families Tipulidae to Chironomidae *Handb.Ident.Br.Ins.R.E.S.* 9(2); 216pp., 199 figs.

Coffey, M.D. 1966 Studies on the Association of Flies (Diptera) with Dung in South-eastern Washington *Ann.ent.Soc.Am.* 59(1); 207-218

Collin, J.E. 1923a IX.- Diptera (Orthorrhapha Brachycera and Cyclorrhapha) from Spitsbergen and Bear Island, Results of the Oxford University Expedition to Spitsbergen, 1921.- No.22 *Ann.& Mag. Nat.Hist.* 49(11); 116-123.

Collin, J.E. 1923b XIX- Diptera (Cyclorrhapha) from Spitsbergen, Results of the Merton College Expedition to Spitsbergen, 1923, No.5, *Ann. & Mag. Nat. Hist.* 9(14): 201- 203.

Collin, J.E. 1930 Some species of the Genus *Meoneura* (Diptera) *Entomologist's mon. Mag.* 66: 82-89, 11 figs.

Collin, J.E. 1931 Diptera (Orthorrhapha Brachycera and Cyclorrhapha) from Greenland, *Ann. Mag. Nat. Hist.* 10(7): 67-91

Collin, J.E. 1937 Two new Species of the Genus *Meoneura* (Diptera, Carnidae) *Entomologist's Mon. Mag.* 73: 250-252, 2 figs.

Collin, J.E. 1948 A short synopsis of the British Sapromyzidae (Diptera) *Trans. R. ent. Soc. Lond.* 99(5): 225-242, 3 figs.

Collin, J.E. 1954 The genus *Chiastochaeta* Pokorny (Diptera, Anthomyiidae) *Proc. R. ent. Soc. Lond.* B 23(5-6): 95-102, 3 figs.

Collis, J. 1969 Owslebury *Antiquaries Journal* 48: 18-31

Coope, G.R. 1986 The invasion and colonization of the North Atlantic Islands; a palaeoecological solution to a biogeographical problem *Phil. Trans. R. Soc. Lond.* B 314 1: 619-635, 7 figs.

Cotton, M.J. 1979 Records of insects from North-East Greenland *Entomologist's mon. Mag.* 113(1977): 213-217

Crisp, G. and Lloyd, L.L. 1954 The community of insects in a patch of woodland mud *Trans. R. ent. Soc. Lond.* 105: 269-314, 3 pls., 1 tbl.

Crosskey, R.W.(ed) 1980 *Catalogue of the Diptera of Afrotropical Region* Trustees of the British Museum (Nat. Hist.), London Publ. No.821: 1438pp.

Crosskey, R.W. and Taylor, B.J. 1986 Fossil blackflies from Pleistocne interglacial deposit in Norfolk, England (Diptera: Simuliidae) *Syst. Ent.* 11:401-412, 19 figs.

Curran, C.H. 1927 Synopsis of the Canadian Stratiomyidae (Diptera), *Trans. R. S. C.* 5: 191-228.

Curry, A. 1979 The Insects associated with the Manchester Mummies. In R. A. David (ed) *The Manchester Mummy Project*, Manchester University Press 113-118, 9 figs., 1 tbl.

Cuthbertson, A. 1926 Crane-flies of the Inner Hebrides *Scot. Nat.* 158: 53-68.

Cuthbertson, A. 1929 Studies on Clyde crane-flies VIII. The seasonal prevalence of some crane-flies (Tipuloidea, Dipt.) in the west of Scotland *Entomologist* 192; 270-273

Dahl, C. 1966 Notes on the taxonomy and distribution of Swedish Trichoceridae (Dipt. Nemat.) *Opusc. Ent.* 93-118

Dahl, C. 1967a Notes on the taxonomy and distribution of Arctic and Subarctic Trichoceridae (Dipt. Nem.) from Canada, Alaska and Greenland *Opusc. Ent.* 32(1-2); 49-78, 83 figs.

Dahl, C. 1967b Additional notes on the taxonomy and ditsribution of Swedish Trichoceridae (Dipt. Nemat.) *Opusc. Ent.* 32(3); 188-200, 36 figs.

Dahl, C. 1970 Diptera Trichoceridae of Kerguelen Island *Pacific Island Monograph* 23; 274- 273

Dale, C.W. 1893 Shetland Diptera *Entomologist's mon. Mag.* 29; 93

Darlington, A. 1969 *Ecology of Refuse Tips* Heineman Educational Books Ltd., London 138pp.

Davies, L. 1966 The Taxonomy of British black-flies (Diptera: Simuliidae) *Trans. R. ent. Soc. Lond.* 118(14); 413-511, 49 figs.

Davies, L. 1981 Additions to the list of Diptera for Hirta, St.Kilda group, Scotland *Entomologist's mon. Mag.* 16; 216-218

Degerbøl, M. 1937 A contribution to the investigation of the fauna of the Blosseville coast, East Greenland, with special reference to zoogeography *Meddelelser om Grønland* 104(19); 1-35, 1 fig.,2 tbls.

Dennell, R.W. 1986 Medieval Faunal Remains from Drain D1 (G58). In C. Gaskell-Brown, *The Medieval Waterfront Woolster Street, The Finds*, Plymouth Excavations, Plymouth Museum Archaeological Series. 3; 80- 809.

Dennis, R. 1977 *The British Butterflies, their Origins & Establishment*, E.W. Classey Ltd., Farringdon.

Deonier, D.L. 1974 Biology and descriptions of immature stages of the shore fly *Scatophila iowana* (Diptera, Ephydridae) *Iowa St. J. Res.* 49; 17-22

Dinnin, M.H. and Skidmore, P. (in press) The Insect Assemblages associated with Lindow III and their Environmental Implications *Z. - morph. Ökol. Tiere.* 6pp.

Disney, R.H.L. 1975 A Key to British Dixidae *Freshwater Biol. Assoc. Scientific Publications No. 31;* 1-78, 23 figs.,14 maps.

Disney, R.H.L. 1976 Some Diptera and Tineidae (Lepidoptera) associated with dog dung on the Yorkshire Pennines, with some comments on animal habitat classification *Entomologist's mon. Mag.* 111 (1975); 41-45

Disney, R.H.L. 1988 Three New Species of Megaselia (Dipt.Phoridae) from the British Isles, plus new synonyms *Entomologist's mon.Mag.* 124; 7-14

Downes, J.A. 1962 What is an Arctic Insect? *Can.Ent.* 94; 143-164, 1 tbl.

Downes, J.A. 1964 Arctic Insects and their Environment *Can. Ent.* 96; 279-307, 2 pls., 1 tbl.

Downes, J.A. 1988 The post-glacial colonisation of the North Atlantic Islands *Mem. ent. Soc. Can.* 144; 55- 92, 1 fig., 2 tbls.

Drake, C.M. 1990 Provisional Atlas of the Larger Brachycera (Diptera) of Britain and Ireland *Biological Records Centre, NERC Institute of Terrestrial Ecology, Monks Wood Exp. Sta.* 131pp., 63 maps

Duda, O. 1925 Monographie der Sepsiden (Dipt.) *Ann.Nat.Hist.Mus.Wien* 39; 1-153, 40; 1-110

Dyte, C.E. 1967 Some distinctions between larvae and pupae of Empididae and Dolichopodidae (Diptera) *Proc.R.ent.Soc.Lond. (A)* 42(7-9); 119-128, 11 figs.

Edwards, F.W. 1923 On the Nematocerous Diptera of Jan Mayen Island. *Ann.& Mag.Nat.Hist.* 9(11); 235-240.

Edwards, F.W. 1924 XIII.- Results of the Merton College Expedition to Spitsbergen, 1923.- Diptera Nematocera *Ann. & Mag. Nat. Hist.* (9); XIV, 162-174

Edwards, F.W. 1924 Results of the Oxford University Expedition to Spitsbergen 1921, No.14, Diptera Nematocera *Ann. & Mag. Nat. Hist.* (9) X, 193-215, 16 figs.

Edwards, F.W. 1931 Oxford University Greenland Expedition 1928, Diptera Nematocera. *Ann. & Mag. Nat. Hist.* 10(8); 617-18

Edwards, F.W. and Collin, J.E. 1932 A Revised List of the Diptera of St.Kilda *Entomologist's mon.Mag.* 68; 263-266.

Egglishaw, H.J. 1960a Studies on the family Coelopidae *Trans. R. ent. Soc. Lond.* 112(6): 109- 140, 24 figs.

Egglishaw, H.J. 1960b The Life history of *Helcomyza ustulata* Curt. (Dipt.Dryomyzidae) *Entomologist's mon.Mag.* 96; 39-42, 6 figs.

Egglishaw, H.J. 1960c The life-history of *Fucellia maritima* (Haliday) (Diptera, Muscidae) *Entomologist* 93; 225-231

Egglishaw, H.J. 1961 The Life history of *Thoracochaeta zosterae* (Hal.) (Dipt.,Sphaeroceridae) *Entomologist's mon.Mag.* 96; 124-128, 9 figs.

Egglishaw, H.J. 1965 Observations on the Fauna of Wrack-beds *Trans. Soc. Brit.Ent.* 16(8); 189-216

Elias, S.A. 1994 *Quaternary Insects and their Environments* Smithsonian Inst.Press, Washington and London i-xiii, 284 pp., figs., tbls.

Emden, F.van 1954 Diptera Cyclorrhapha Calyptrata (1) Section (a) Tachinidae and Calliphoridae *Handbk.Ident.Br.Insects* 10(4a); 1-133, text figs.

Erzinçlioğlu, Y.Z. 1980 On the role of *Trichocera* larvae (Diptera, Trichoceridae) on the decomposition of carrion in winter *Naturalist* 105; 113-114

Erzinçlioğlu, Y.Z. 1981 First record of the Genus *Lucilia* (R.-D.) (Dipt., Calliphoridae) from Iceland *Entomologist' mon.Mag.* 117; 232.

Erzinçlioğlu, Y.Z. 1983 The Application of Entomology to Forensic Medicine *Med.Sci.Law* 23(1); 57-63

Erzinçlioğlu, Y.Z. 1985 Immature stages of British *Calliphora and Cynomya*, with a re-evaluation of the taxonomic characters of larval Calliphoridae (Diptera) *Journ.Nat.Hist.* 19; 69-96; 4 tbls, 43 figs.

Erzinçlioğlu, Y.Z. 1987 Recognition of the early instar larvae of the genera *Calliphora and Lucilia* (Dipt.,Calliphoridae). *Entomologist's mon.Mag.* 123(1987); 97-98, 3 figs.

Fabricius, O. 1780 *Fauna Groenlandica* 452pp.

Fabritius, K. & Klunker, R. 1991 Merkblätter über angewendte Parasitenkunde No.32, Die Larven- und Puppenparasitoïde von Synathropen Fliegen in Europa *Angewandte Parasitologie* 32(1); 1-8, 1

pl,, 2 tbls,

Falk, S,J, 1985 A Provisional Review of the Status of British Diptera, Invertebrate Site Register *Nature Conservancy Council* 62; 61p,

Ferrar, P 1987 A Guide to the Breeding Habits and Immature Stages of Diptera Cyclorrhapha *Entomomograph* 8 (1987), Copenhagen; E,J, Brill, Scandinavian Science Press, pt,1 text, 1-478, 85 tbls, pt,2 figs, 479-907, numerous figs,

Fluke, C,L, 1952 The *Metasyrphus* species of North America (Diptera, Syrphidae) *Amer, Mus, Novitates* 1590;-1-27, 54 figs,

Foote, B,A, 1983 Biology and immature stages of *Nostima approximata* (Diptera; Ephydridae), a grazer of the blue-green algal genus Oscillatoria *Proc, ent, Soc, Wash,* 85; 472-484

Forrest, J,E,, Waterston, A,R, and Watson, E,V, 1936 The Natural History of Barra, Outer Hebrides *Proc, Royal Phys, Soc,* 241-296, 1 fig,

Freeman, P, 1983 Sciarid Flies - *Handbk, Ident, Br, Ins,* 9(6); 68pp,,162 figs,

Freeman, P, and Lane, R,P, 1985 Bibionid and Scatopsid Flies Diptera; *Handbk, Ident, Br, Ins,* 9(7); 1-74, 189 figs,

Frey, R, Tiensuu, L, and Stora, R, 1941 Diptera *Enumeratio Insectorum Fenniae* vi; 63 pp,

Froese, A, 1993 Ein Beiträg zur Morphologie und Biologie von *Philygria* spp,(Diptera, Ephydridae) *Beitr, Ent,* 43(1); 89-96, 6 figs,,2 tbls,

Garrett, W,B, & Foote, B,A, 1966 Notes on the biology of certain heleomyzid flies of eastern North America (Diptera; Heleomyzidae) *J, Kans, ent, Soc,* 39; 552-555

Gill, G,D, 1962 The heleomyzid flies of America north of Mexico *Proc, S, natn, Mus,* 113(3465); 495-603

Glen, R, 1956 Entomology in Canada up to 1956, A Review of Developments and Accomplishments *The Canadian Entomologist* 88; 290-371

Goddard, W,N, 1938 The Description of the puparia of fourteen British species of Sphaeroceridae (Borboridae, Diptera) *Trans, Soc, Brit, Ent,* 5(6); 235-258, 13 figs,

Gorodkov, K,B, 1962 Obzor palearktičeskich vidov roda *Leria* R,-D, (Diptera Heleomyzidae) *Ent, Obozr,*

41/3; 643-671

Gorodkov, K.B. 1986 Scathophagidae. In A. Soós and L. Papp *Catalogue of Palaearctic Diptera*. 11. Elsevier.

Graham Smith, G.S. 1916 Observations on the habits and parasites of some common flies *Parasitology* 8; 440-554

Greenberg, B. 1971- 73 *Flies and Disease*. Princeton Univ. Press, New Jersey. 2 vols.

Gregor, F. and Povolny, D. 1961 Výsledky Stacionárního Výkumu synantropních much okolí východoslovenské vesnice *Zoologické Listy* 10(24); 17-44, 34 figs., 6 tbls.

Gregor, F. and Povolny, D. 1964 Eine Ausbeute von Synanthropen Fliegen aus Tirol *Zoologické Listy* 13(3); 229-248, 67 figs.

Greig, J.R.A. 1981 The Investigation of a Medieval Barrel-Latrine from Worcester *Journal of Archaeological Science* 8; 265-282, 6 figs., 3 tbls.

Greig, J.R.A., Girling, M.A. and Skidmore, P. 1982 The plant and insect. In P. Barker and R. Higham (eds.) *Hen Domen, Montgomery, A timber castle on the English-Welsh Border* 60-71 Royal Archaeological Institute, London

Gressitt, J.L. 1970 Subantarctic Entomology and Biogeography *Pacific Islands Monograph* 23; 295- 374

Grimshaw, P.H. 1905a Diptera Scotica: IV.- Orkney and Shetland *Ann. Scot. Nat. Hist.* 22-35.

Grimshaw, P.H. 1905b On the Diptera of the Flannan Islands *Ann. Scot. Nat. Hist.* 218-220.

Grimshaw, P.H. 1906a The Diptera of Fair Isle *Ann. Scot. Nat. Hist.* 207-209

Grimshaw, P.H. 1907 The Diptera of St. Kilda *Ann. Scot. Nat. Hist.* 150-158.

Grimshaw, P.H. 1914, 1916 Diptera Scotica: VI.- The Western Isles. *Scot. Nat.* (1914); 205-281, (1916); 116-119, 134-138.

Gutsevich, A.V., Mouchadskii, A.S. and Stackelberg, A.A. 1971 Mosquitoes Family Culicidae. *Fauna U.S.S.R.* 3(4); 376pp., 261 figs.

Hackman, W. 1956 The Scathophagidae (Diptera) of eastern Fennoscandia. *Fauna Fennica* II; 67p, 165 figs.

Hackman, W. 1956 A Study of the variability in *Scatophaga litorea* Fall. (Dipt. Scatophagidae)

Notulae Entom. 36; 1-8, 3 figs.

Hackman, W. and Meinander, M. 1979 Diptera feeding as larvae on macrofungi in Finland *Annls. zool. Fennica* 16; 50-83, 6 figs.,5 tbls.

Hall, R.E. 1952 Some Chironomidae (Diptera) from the Shetland Islands. *J. Soc. Brit. Ent.* 4(3); 66

Hancock, E.G. 1989 Notes on the Window Gnats, Genus *Sylvicola* (Diptera Anisopodidae), in Scotland *The Scottish Naturalist* 3-13, 8 figs.

Harrison, J.W.H. 1941 More Hebridean days, 2. The Isle of Benbecula. *Entomologist* 74(932); 1-5

Harrison, J.W.H. 1948 Zoocecidia in the Scottish Western Isles. *Entomologist's mon. Mag.* 84; 113-116

Haupt, A. and Busvine, J.R. 1968 The effect of overcrowding on the size of houseflies (*Musca domestica* L.) *Trans. R. ent. Soc. Lond.* 120(15); 297-311, 9 figs., 7 tbls.

Hewitt, C.G. 1914 *The House Fly*, Cambridge University Press 382pp., 104 figs., tbls.

Hennig, W. 1952 *Die Larvenformen der Dipteren. Eine Übersicht über die bisher bekannten Jugendstadien der zweiflügeligen Insekten*, Berlin Akademie-Verlag. 3 vols.,628pp.,numerous figs.

Hennig, W. 1955-64 63b Muscidae, in E.Lindner, *Fliegen palaearkt. Reg.* 7; vol.1 1-624, text figs. 1-221, pls.1-30; vol.2 625-1110, text-figs. 222-429, pls. 31-32

Henriksen, K.L. 1939 A Revised List of the Insects of Greenland *Meddelelser om Grønland.* 119(10); 1- 101.

Henriksen, K.L. & Lundbeck, W. 1917 Conspectus Fauna Greenlandica, Pars Secunda, II Landarthropoder (Insecta et Arachnida) *Meddelelser om Grønland* 22; 481-823

Hildyard, E.J.W. 1952 Catterick Roman Camp *Yorkshire Archaeological Journal* 39; 224-5

Hill, D.S. 1963 The Life history of the British species of *Ornithomyia* (Diptera; Hippoboscidae) *Trans. R. ent. Soc. Lond.* 115(13); 391-407, 7 figs.

Hirjenova, M. 1967 Chironomyiidae and Culiciidae (Diptera) from Spitsbergen *Ann. Ent. Fenn.* 33; 52-61

Hobby, B.M. and Smith, K.G.V. 1961a The Bionomics of *Empis tessellata* F.(Dipt., Empididae) *Entomologist's mon. Mag.* 97; 2-10, 8 figs.

Hobby, B.M. and Smith, K.G.V. 1961b The Bionomics of *Empis opaca* Mg.(Dipt.,Empididae) *Entomologist's mon.Mag.* 97: 204-208, 3 figs.

Hobby, B.M. and Smith, K.G.V. 1962 The immature stages of *Chrysopilus cristatus* (F.) (Dipt., Rhagionidae) *Entomologist's mon.Mag.* 97: 190-192, 8 figs.

Horsfield, D. 1988 *Spilogona alpica* (Zett.) (Dipt. Muscidae) on the Isle of Skye *Entomologist's mon.Mag.* 124: 6

Huckett, H.C. 1965 The Muscidae of Northern Canada, Alaska and Greenland (Diptera) *Mem. Ent. Soc. Canada* (42): 1-370, 280 figs.

Hutson, A.M., Ackland, D.M. and Kidd, L.N. 1984 Mycetophilidae (Bolitophilinae, Ditomyiinae, Diadocidinae, Keroplatinae, Sciophilinae and Manotinae) Diptera, Nematocera *Handbk. Ident. Br. Ins.* 9(3): 1-112, 290 figs.

Ismay, J.W. 1985 The Identity of *Cetema elongata* (Meigen) (Dipt., Chloropidae *Entomologist's mon.Mag.* 121: 35-38, 2 figs.

Johansen, T.J. 1989 Description of the Immature stages of *Delia fabricii* Holmgren (Diptera, Anthomyiidae) *Fauna Norvegica* B 36: 75-86

Johnson, C.W. 1929 Diptera of Labrador *Psyche* 36: 129-146

Jones, G. 1986 *The Norse Atlantic Saga* Oxford University Press (2nd. edn) 337pp.,30 text figs., 24 pls., 8 maps

Karandikar, K.R. 1931 The early stages and bionomics of *Trichocera maculipennis* (Meigen) (Diptera, Tipulidae) *Trans. ent. Soc. Lond.* 79(2): 249-260, 4 pls.

Keilin, D. 1912 Recherches sur les Dipteres du genre *Trichocera. Bull.Sci.Fr.Belg. (7).* 46: 172-190

Keilin, D. & Tate, P. 1940 The early stages of the families Trichoceridae and Anisopodidae (= Rhyphidae) (Diptera: Nematocera) *Trans. R. ent. Soc. Lond.* 39-62, 87 figs.

Kenward, H.K. 1975 The Biological and Archaeological Implications of the beetle *Aglenus brunneus* (Gyllenhal) in Ancient Faunas *Journ. Archaeol.Sci.* 2: 63-69

Kenward, H.K. 1985 "Outdoors- Indoors?" The Outdoor component of Archaeological Insect Assemblages. In N.R.J. Fieller, D.D. Gilbertson and N.G.A. Ralph (eds.) *Palaeobiological Investigations;*

Research Design, Methods and Data Analysis British Archaeological Reports S266; 97-104

Kenward, H.K., Hill, M., Jacques, D., Kroupa, A. and Large, F. (in press) Insect remains from excavations at Buiston Crannog, Ayrshire. *Buiston Report by A.O.C.Ltd., Edinburgh* Section 3.2.

Kevan, D.K.McE. 1941 The Insect fauna of the Isle of Eigg *Entomologist*, 74; 247- 254.

Kidd, L.N. and Brindle, A. 1959 The Diptera of Lancashire and Cheshire Pt.1 *Lancashire and Cheshire Fauna Committee* 136pp.

Kieffer, J.J. 1915 Fauna Faroensis VI Dipt. 2. Tendipedidae (Chironomidae) *Zool.Jb.Syst.* 39; 103-120

Kieffer, J.J. 1922 Chironomides de la Nouvelle-Zemble. Report of the Scientific Results of the Norwegian Expedition to Novaya Zemlya, 1921. No.2. 1-24

Kieffer, J.J. and Thienemann, A. 1919 Chironomiden gesammelt von Dr.A. Koch auf den Lofoten, der Bäreninsel und Spitzbergen *Entomologischen Mitteilungen* 8; 38-48, 110-120, 1 sketch-map, 18 figs.,

Kloet, G.S. and Hincks, W.D. 1975 A Check List of British Insects (2nd edn.(completely revised) Part 5 Diptera and Siphonaptera *Handbk. Ident. Br. Ins.* 9(5); 139 pp.

Knutson, L.V. 1966 Biology and immature stages of malacophagous flies: *Antichaeta analis, atriseta, brevipennis* and *obliviosa* (Diptera: Sciomyzidae) *Trans. Amer. Ent. Soc.* 92; 67-101, 8 pls.

Knutson, L.V. and Berg, C.O. 1967 Biology and Immature Stages of malacophagous Diptera of the genus *Knutsonia* Verbeke (Sciomyzidae). *Bull. Inst. r. Sci. nat. Belg.* 43(7); 1-60, 52 figs.

Knutson, L.V., Stevenson, J.W. and Berg, C.O. 1970 Biosystematic studies of *Salticella fasciata* (Meigen), a snail-killing fly *Trans. R. ent. Soc. Lond.* 122(3); 81-100, 3 pls.,27 figs.

Krémer, M. 1965 Contribution a l'étude du genre *Culicoides* Latreille, particulièrement en France *Encycl. Ent., Paris (A)* 39; 1-299, 479 figs.

Lack, D. 1932 Notes on the Diptera of St.Kilda *Entomologist's mon. Mag.* 68; 262-263.

Laurence, B.R. 1956 On the life history of *Trichocera saltator* (Harris) (Diptera, Trichoceridae) *Proc. zool. Soc. Lond.* 126(2); 235-243, 8 figs, 2 tbls.

Laurence, B.R. 1957 The British species of *Trichocera* (Dipt., Trichoceridae). *Proc. R. ent. Soc. Lond. (A)* 32(7-9); 132-138, 2 figs., 1 tbl.

Laurence, B.R. 1991 *Calliphora uralensis* Ville. (Dipt., Calliphoridae) in the Northern Isles *Entomologist's mon. Mag.* 127; 139- 143; 1 fig., 2 tbls.

Laurence, B.R. 1988 The behavious of *Rhamphomyia morio* Zett. (Dipt., Empididae) in Orkney *Entomologist's mon. Mag.* 124; 103-105

Laurence, B.R. MS. List of Diptera of Orkney, Shetland and Uist.

Lawson, J.W. 1951 The anatomy and morphology of the early stages of Culicoides nubeculosus Meigen (Diptera: Ceratopogonidae + Heleidae) *Trans. R. ent. Soc. Lond.* 102(9); 511-570, 46 figs., 1 pl.

Lawton, J.H. 1976 The structure of the arthropod community on bracken. *Bot. Journ. Linn. Soc.* 73; 187-216, 11 figs.

Leach, P. 1984 The Archaeology of Taunton *Western Archaeological Trust Excavation Monograph* 8; 202 pp., numerous figs. and tbls.

Lindner, E. 1959 Beitrage zur Kenntnis der Larven der Limoniidae (Diptera) *Z. Morph. Okol. Tiere.* 48; 209- 319, 84 figs.

Lindroth, C.H., Andersson, H., Bödvarsson, H. and Richter, S.H. 1973 Surtsey, Iceland. The Development of a New Fauna, 1963-1970, Terrestrial Invertebrates *Entom. Scandinavica Suppl.* 5. 280pp., 50 figs., 44 tbls.

Lobanov, A.M. 1960 Contribution to the Biology and Ecology of *Trepidaria petronella L.* (Diptera, Tylidae) *Zool. Journ.* 39; 889-891, 1 fig., 5 tbls. [In Russian]

Lobanov, A.M. 1964 Data on ecology and morphology of the preimaginal phases of *Ceroxys urticae* (L.) (Dipt., Otitidae) *Ent. Obozr.* 43; 67-70,., figs. [In Russian]

Lobanov, A.M. 1970 On the larval morphology of last instar larva of Heleomyzidae (Diptera) *Zool. Journ.* 49(11); 1671-1675, 2 figs. [In Russian]

Longstaff, T.G. 1936 LI- Entomological Note on Mr. J.M. Wordie's Expedition to N.W. Greenland and E. Baffinland in 1934 *Ann. & Mag. Nat. Hist.* 10 (18); 531-532.

Lundbeck, W. 1898 Diptera groenlandica *Vid. Medd. Nat. For. f. 1898*, 236-314.

Lyneborg, L. 1965 The Fucellia maritima-group in North Europe, with description of a new species (Dipt.,Anthomyiidae) *Entomologiske Meddellser* 34; 19-29, 12 figs.

Lyneborg, L. 1965b On Muscidae and Anthomyiidae (Diptera) from Iceland, with descriptions of two new species. *Opusc. Ent.* 30;211-212

Lyneborg, L. 1968 Diptera Brachycera & Cyclorrhapha XLIIa. In R. Sparck and S.L. Tuxen, *The Zoology of the Faroes 2(2). Insecta II, Arachnida* And. Fred Host & Son, 1928-71., 79 pp.

MacGowan, I. 1985 Notes on the Diptera of the Western Isles *Entomologist's mon. Mag.* 121; 24

MacGowan, I. 1986a *Sciapus contristans* (Wied.) (Dolichopodidae) in Scotland and other Diptera new to the Western Isles *Entomologist's mon. Mag.* 122; 213

MacGowan, I. 1986b A Preliminary Survey of Dolichopodidae (Diptera) in Scotland *Nature Conservancy Council Publ.* 48pp., 18 maps

MacGowan, I. 1987 Dolichopodidae and Syrphidae (Diptera) new to Lewis *Hebridean Naturalist* 9; 14-16

MacGowan, I. 1994 Additions to the List of Diptera from the Western Isles *Dipterists Digest* 14; 28-31

MacLeod, J. 1937 The species of Diptera concerned in Cutaneous Myiasis of sheep in Britain *Proc. R. ent. Soc. Lond. (A)* 12(10-12); 127-133, 4 tbls.

Mangam, R.L. 1977 A key and selected Notes for the identification of larvae of Sepsidae (Diptera) from temperate regions of North America *Proc. Entomol. Soc. Washington* 79(3); 338-342, 9 figs.

Martinek, V. 1969 Zajímavější druhy dvoukřídlého hmyzu z čeledi Helomyzidae (Diptera - Acalyptrata) v Krkonoších. *Opera Corcontica* 6; 51- 75, 3 figs.

McAlpine, J.F. 1964 Arthropods of the Bleakest Barren Lands; Composition and Distribution of the Arthropod Fauna of the Northwestern Queen Elizabeth Islands *Canadian Entomologist* 96(1-2); 127-129, 1 tbl.

McAlpine, J.F. 1965a Observations on Anthophilous Diptera at Lake Hazen Ellesmere Island *Can. Fld. Nat.* 79(4); 247-252

McAlpine, J.F. 1965b Insects and related terrestrial invertebrates of Ellef Ringnes Island *Arctic* 18(2); 72-103, 7 figs., 2 tbls.

McAlpine, J.F. 1979 Diptera. In H.V. Danks (ed.) Canada and its insect fauna *Mem. Ent. Soc. Canada* 108; 389-424, 1 tbl.

McGovern, T.H. 1992 Bones, Buildings and Boundaries: Palaeoeconomic approaches to Norse Greenland. In C.D.Morris and J.Rackham (eds.) *Norse and Later Settlement and Subsistence in the North Atlantic* Glasgow University Press 157-186

McGovern, T. 1994a Rooms and Refuse in Norse Greenland *NABO Coop. Report* (unpubl.draft)

McGovern, T.(ed) 1994b Bioarchaeology of Sandnes and the Neighboring Farms. A Report of the Bioarchaeological Results from the 1984 Sandnes Archaeological Rescue Project (SARP) *NABO Coop.Report* (unpubl.draft)

McGovern, T.H. and Bigelow, G.F. 1984 Sandnes Archaeological Rescue Report: Initial 1984 Report submitted to National Museum of Greenland, Nuuk

McGovern, T.H., Buckland, P.C., Savory, D., Sveinbjarnardóttir, G., Andreasen, C. and Skidmore, P. 1983 A Study of the Faunal and Floral remains from two Norse farms in the Western Settlement, Greenland *Arctic Anthropology* 20(2); 93-120, 8 figs., 8 tbls.

Madsen, H. 1936 Investigations on the shore fauna of east Greenland with a survey of shores of other arctic regions *Meddelelser om Grønland* 100; 8

Marshall, S.A. and Roháček, J. 1984 A Revision of the genus *Telomerina* Roháček (Diptera, Sphaeroceridae) *Systematic Entomology* 9; 127-163

Meijere, J.C.H. De 1910 Die Dipteren der arktischen inseln. *Fauna Arctica* V(1); 72pp.

Messersmith, D.H. 1971 Extension of the distributional range of *Aedes triseriatus* (Say) to Greenland *Mosq. Syst. newsletter* 3(1); 7

Messersmith, D.H. 1982 A report on a collection of Diptera from Iceland and Greenland *Fauna norv. Ser. B.* 29; 36-39

Norge, G. 1956 Uber Morphologie und Lebensweise der bisher unbekannten Larven von *Palloptera usta* Meigen, *Palloptera ustulata* Fallén und *Stegana coleoptrata* Scopoli (Diptera) *Beitr. zur*

Entomologie 6; (1/2); 124-137, 25 figs.

Morris, H.M. 1918 The Larval and Pupal Stages of *Scatopse notata* (L.) *Annals of Applied Biology* 5(2); 102-111, 7 figs.

Muir, D.A. 1954 A note on insects from the Garvellach Islands *Glasgow Naturalist* 17; 140-141

Munroe, E. 1956 Canada as an Environment for Insect Life *The Canadian Entomologist* 84; 372-476, 61 figs.

Nash, R. and Chandler, P.J. 1978 The Irish species of two-winged flies (Diptera) belonging to the families Fanniidae and Muscidae *Proc. R. Irish Academy* 78 B (2); 13-43

Nash, R. and Irwin, A.G. 1973 A Provisional list of Soldier-flies flies (Diptera: Stratiomyidae) from Cos. Antrim and Down *Irish Naturalists J.* 17(11); 388-390.

Nielsen, J.C. 1910 A Catalogue of the insects of north-east Greenland with descriptions of some larvae *Meddelelser om Grønland* 43(2); 55-67, 14 figs.

Nielsen, P., Ringdahl, O, and Tuxen, S.L. 1954 Diptera I (exclusive of Ceratopogonidae and Chironomidae) *The Zoology of Iceland* 3(48a); 189p. 49 figs., 1 tbl.

Nørlund, P. & Stenberger, M. 1934 Researches into Norse Culture in Greenland: Brattahlið *Meddelelser om Grønland*, 88(1); 1-161.

Norrbolm, A.L. and Ke Chung Kim 1985 Systematics of *Crumomyia* Macquart and *Alloborborus* Duda (Diptera: Sphaeroceridae) *Syst. Ent.*10; 167-225

Nye, I.W.B. 1958 The external morphology of some of the dipterous larvae living in the Gramineae of Britain *Trans. R. ent. Soc. Lond.* 110(15); 411-487, 109 figs.

Okely, E.F. 1974 Descriptions of the puparia of twenty-three British species of Sphaeroceridae (Diptera Acalypterae) *Trans. R. ent. Soc. Lond.* 126(1); 41-56, 61 figs.

Olafsson, E. 1991 Taxonomic revision of the western Palaearctic species of genera *Scatella* R.-D. and *Lamproscatella* Hendel, and studies on their phylogeny and position within the subfamily Ephydrinae (Diptera, Ephydridae) *Ent. Scand.* Suppl.37; 6-100, 48 figs.,13 tbls.

Oliver, D.R. 1963 Entomological Studies in the Lake Hazen Area, Ellesmere Island incuding Lists of species of Arachnida, Collembola, and Insecta *Arctic* 16; 175- 180.

Osborne, P.J. 1971 The Insect Fauna from the Roman Harbour (*in Excavations at Fishbourne 1961-1969) Reports of the Research Committeeof the Society of Antiquaries of London* 27; 393-396

Owen, O. 1988 Tuquoy, Orkney 1988: Further Assessment and Tapestry Excavation of the Norse and Medieval Settlement Site *AOC (Scotland).*

Panelius, S. 1965 A Revision of the European gall midges of the subfamily Porricondylinae (Diptera: Itonididae) *Acta Zool. Fenn., Helsinki* 113; 1-157, 43 figs.

Papp, L. 1978 Contribution to the Revision of the Palaearctic Lauxaniidae *Ann. Hist. nat. Mus. Nat. Hung.* 70; 213-231, 41 figs.

Pedersen, B.V. 1971 Diptera Nematocera XLIIb. In R. Sparck and S.L. Tuxen, *The Zoology of the Faroes* 2(2); 1928-1., 71 pp.

Perris, M.F. 1847 Sur les metamorphoses de la *Trichocera annulata* (Mg.) et de la *Scatopse notata* (L.) pour servir a l'histoire des Tipulaires *Ann. Soc. Ent. France* (2)

Perry, D.W., Buckland, P.C. and Snaesdottir, M. 1985 The Application of Numerical Techniques to Insect Assemblages from the Site of Stóraborg Iceland, *Journ. Archaeol. Sc.* 12: 335-345, 2 figs., 2 tbls.

Phipps, J. 1989 The Archaeological remains of flies *Circaea* 5(2); 65-66

Pitkin, B.R. 1988 Lesser Dung Flies Diptera: Sphaeroceridae. *Handb. Ident. Br. Ins.* 10(5e); 175pp., 614 figs.

Pont, A.C. 1971 Some Muscidae from Lake Tarraure, *Ent. Tijdskr.* 92(1-2); 100- 122, 3 figs.

Pont, A.C. 1972 *A Catalogue of the Diptera of the Americas South of the United States Family Muscidae* Published by Museu de Zoologia Universidade de Sao Paulo 97; 111pp.

Pont, A.C. 1980 Family Muscidae, in Crosskey, R.W.(ed) *Catalogue of the Diptera of the Afrotropical Region* British Museum (Nat.Hist) 721-761

Pont, A.C. 1986a Family Muscidae. In A. Sóos and L. Papp (eds.) *Catalogue of the Palaearctic Diptera.* Hung. Nat. Hist. Museum. 11; 57- 215

Pont, A.C. 1986b Provisional Atlas of the Sepsidae (Diptera) of the British Isles *Biological Records Centre, NERC Institute of Terrestrial Ecology, Monks Wood Exp. Sta., Huntingdon* 33p.,

28 maps, 1 tbl.

Portchinsky, J.A. 1911 *Hydrotaea dentipes* F., sa biologie et la destruction par ses larves de celles de *Musca domestica* L. *Trudy Bur. Ent.* 9(5); 1-30 [In Russian]

Portchinsky, J.A. 1913 *Muscina stabulans* Fall., mouche nuisible à l'homme et à son ménage, en état larvaire destructeuse des larves de *Musca domestica* *Trudy Bur. Ent.* 100; 1-39. [In Russian]

Povolny, D. 1962 Versuch einer Klärung des Begriffes der Synanthropie von Tieren *Zool. Listy* 11 (25/2); 105-112, 1 fig.

Povolny, D. 1963 Einige Erwägungen über die Beziehungen zwischen den Begriffen "Synanthrop" und "Kulturfolger" *Beitr.Ent.* 13; 439-444, 1 fig.

Qvick, U. 1985 The Mating Activity of *Rhagas unica* Walker (Dipt.,Empididae) *Entomologist,s mon. Mag.* 121; 39-43, 1 tbl.

Ravenscroft, N.O.M., Faulkner, C.G.N., Oxley, J.R., Pumphrey, C.J., Rogers, L.M. and Thomas, J.L. 1991 Some Hoverflies (Diptera; Syrphidae) of Rhum National Nature Reserve, Western Scotland *Dipterists Digest* 8; 25-28

Réaumur, R.A.F.de 1734-42 *Memoires pour servir a l'histoire des Insectes* I-VI, Paris

Remm, H. 1965 The genus *Dasyhelea* Kieffer in Estonia (Diptera: Heleidae) *Uchen. Zap. tartu gos. Univ. Tartu (Zool.)* 120(1962); 108-133, 6 figs.

Rhynehart, J.G. 1924 The larva and pupa of *Trichocera regelationis* L. (Diptera, Rhyphidae) *Proc. Belfast nat. Hist. Soc.* 1922-23; 36-47

Richards, O.W. 1930 The British Species of Sphaeroceridae (Borboridae, Diptera) *Proc. Zool. Soc. Lond.* 2(18); 18-348, 21 figs., 1 pl.

Ringdahl, O. 1954-59 Tvövingar- Diptera Cyclorrhapha Schizophora Schizometopia. *Svensk Insektfauna, Stockholm.* II; 1954, 1-91; 1956, 92-195; 1959, 194-334; many pls. and figs.

Rognes, K. 1982 Some interesting captures of Muscidae (Dipt.) from Norway *Fauna norv.* Ser.B 29; 40-44

Roháček, J. 1982-85 A monograph and reclassification of the previous genus *Limosina* Macquart (Diptera, Sphaeroceridae) of Europe. *Beiträge zur Entomologie* Pt.1 (1982) 32(1); 195-282; Pt.2

(1983) 33(1); 3-195; Pt.3 (1984) 33(2); 203-255; Pt.4 (1985) 35(1); 101-179., numerous figs.

Roháček, J. and Marshall, S.A. 1985 The genus *Trachyopella* Duda (Diptera, Sphaeroceridae) of the Holarctic Region Monografie III, *Museo Regionale di Scienze Naturali, Torino*, 109 pp.

Rotheray, G.E. 1986 The larva and puparium of *Epistrophe grossulariae* (Meigen) (Dipt., Syrphidae) with a note on overwintering behaviour *Entomologist's mon.Mag.* 122; 215-218

Rotheray, G.E. 1987 The larvae and puparia of five species of aphidivorous Syrphidae (Dipt.) *Entomologist's mon.Mag.* 123; 121-125

Roussell, A. 1941 Farms and Churches of the Medieval Norse settlement in Greenland *Meddelelser om Grønland* 89(1)

Rozkosný, R. 1973 The Stratiomyidae (Diptera) of Fennoscandia and Denmark *Fauna Ent.Scand.* 1: 152 pp., 456 figs.,1 map, 1 tbl.

Sadler, J.P. 1987 The analysis of the insect remains from Norse sites in the former Western Settlement of Greenland, (Unpublished MSc Thesis, University of Birmingham)

Sage, B. 1986 *The Arctic and its Wildlife* Croon Helm, Beckenham 190pp., 125pls., 38 text-figs., 30 tbls., 2 Appends.

Seddon, A.M. 1985 Life History and Population Biology of *Apiloscatopse scutellata* (Loew) (Dipt.,Scatopsidae) with notes on the final instar larva *Entomologist's mon. Mag.* 191: 45-53, 4 tbls., 3figs.

Séguy, E. 1923 Diptères Anthomyiides *Faune de France* 6; 394p., 813 figs.

Séguy, E. 1926 Diptères (Brachyceres) (Stratiomyiidae-Omphralidae) *Faune de France* 13; 308 pp.,685 figs.

Séguy, E. 1934 Diptères (Brachyceres) Muscidae Acalypterae et Scatophagidae *Faune de France* 28; 832 pp., numerous figs.

Séguy, E. 1965 Le *Sarcophaga nigriventris*, parasite de l'abeille domestique en Europe occidentale (Insecte Diptere Calliphoridae) *Bull. Mus. Nat. d'Hist. Naturelle* 2e Ser. 37(3): 407-411, 1 fig.

Sharov, A.G. 1948 *Fucellia fucorum* Mg.(Diptera, Muscidae) na rybnych promyslach daljnego vostoka *Ent.Obozr.* 30(1-2); 124-131, 9 figs. [In Russian]

Shorrocks, B. and Charlesworth, P. 1980 The distribution and abundance of British fungal-breeding *Drosophila* *Ecol. Entomology* 5; 61-78, 11 figs. 5 Appends.

Skidmore, P. 1962 Notes on the Heleomyzidae of Lancashire and Cheshire, including Records from other Parts of Northern England. *Entomologist* 95(1191-1192); 193-198, 226-236

Skidmore, P. 1970 The Biology of *Scoliocentra villosa* (Mg.) (Dipt., Helomyzidae) *Entomologist's mon. Mag.* 102; 94-98, 8 figs.

Skidmore, P. 1978 Dung. *In* A.E.Stubbs, P.J. Chandler, A Dipterist's Handbook *Amateur Entomologist* 15; 73-79.

Skidmore, P. 1985 The Biology of the Muscidae of the World. *Series Entomologica* 29; 550 p., Dordrecht; Dr.W.Junk Publishers. 160 figs.,2 tbls.

Skidmore,P. 1986 The Dipterous Remains. In I.M. Stead, J.B. Bourke and D. Brothwell (eds.) *Lindow Man. The Body in the Bog.* 92 British Museum, London.

Skidmore, P. 1991 Insects of the British Cow-dung Community. *AIDGAP Series Occ. Publ.* 21; Field Studies Council, Shrewsbury, 160 pp.,numerous figs., tbls.

Skidmore, P. 1992 Notes on the taxonomy of the puparia of British Sphaeroceridae *Dipterists Digest* 13; 6-22, 14 figs.

Skidmore, P. 1994 Composite List of Diptera collected in South Uist, Benbecula and North Uist in August 1989 *Dipterists Digest* 14; 44-52

Skidmore, P. (in press) The Diptera of Buiston Crannog AOC (Scotland) Ltd.

Smith, K.G.V. 1955 Some records of Syrphidae (Dipt.) from the Hebrides and Westerness *Entomologist's mon. Mag.* 91; 274.

Smith, K.G.V. 1971 *Eustalomyia hilaris* (Fallén) (Diptera, Anthomyiidae) confirmed as British, with notes on other species of the genus. *Ent. Gazette* 22; 55-60, 8 figs.

Smith, K.G.V. 1986 *A Manual of Forensic Entomology* British Museum (Nat Hist.), London, 206 pp.,402 figs.

Smith, K.G.V. 1989 An Introduction to the Immature Stages of British Flies *Handbk. Ident. Br. Ins.* 10(14); 280pp.,1333 figs.

Smith, A.P.L. and K.G.V. 1991 Some insect records from Tanera More, Summer Isles, Ross. *Entomologist's mon. Mag.* 127; 34

Snæsdóttir, M. 1993 Stóraborg- an Icelandic Farm mound *Acta Archaeologica* 116-119, 2 figs.

Snyder, F.M. 1954 A review of Nearctic *Lispe* Latreille (Diptera, Muscidae). *Amer. Mus. Novit.* 1675; 1- 40

Speight, M.C.D. 1969 The prothoracic morphology of Acalypterates (Diptera) and its use in systematics. *Trans. R. ent. Soc. Lond.* 121 9; 325-421, 68 figs.

Speight, M.C.D., Chandler, P.J. and Nash, R. 1975 Irish Syrphidae (Diptera) Notes on the species and an account of their known distribution *Proc. R. Irish Acad.* 75 (B 1); 80 pp., 2 figs.

Spencer, K.A. 1976 The Agromyzidae (Diptera) of Fennoscandia and Denmark. *Fauna ent. Scand.* 5; 2 vols., 1-304, 305-606, numerous figs, tbls.

Stork, M. 1936 A contribution to the knowledge of the puparia of Anthomyiidae *Tijdschr. Ent.* 79; 94-168, 35 figs.

Stubbs, A.E. 1992 Provisional atlas of the long-palped Craneflies (Diptera Tipulinae) of Britain and Ireland *JNCC NERC Institute of Terrestrial Ecology, Monks Wood Exp.Sta., Huntingdon* 134pp., 89 maps, 3 tbls.

Stubbs, A.E. and Chandler, P.J. 1978 A Dipterist's Handbook *The Amatuer Entomologist* 15; ix, 1-255, text figs.

Stubbs, A.E. and Falk, S.J. 1983 *British Hoverflies* Brit. Ent.& Nat. Hist. Soc.,London 253pp., 12 pls., text-figs.

Summers, G. 1977 Treshnish Isles *Ent.Rec.J.Var.* 89(6); 173

Sveinbjarnardóttir, G., Buckland, P.C., Gerrard, A.S., Grey, J.R.A., Perry, D., Savory, D. and Snæsdóttir, M. 1981 Excavation at Stóraborg a palaeoecological approach *Árbok hins Íslenska Forleifarfelags* 1980; 17 pp., 5 figs., 3 tbls.

Taylor, B.J. and Coope, G.R. 1985 Arthropods in the Quaternary of East Anglia -their role as indices

of local palaeoenvironments and regional palaeoclimates *Modern Geology* 9; 159-185, 9 figs.

Teskey, H.J. and Turnbull, C. 1979 Diptera Puparia from Pre-historic Graves. *The Canadian Entomologist* 3; 527-528

Theowald,B. 1957 Die Entwicklungsstadien der Tipuliden (Diptera, Nematocera), insbesondere der West-Palaearktischen Arten. *Tijdschrift voor Entomologie* 100(2); 195-308, 332 figs, 2 tbls.

Thompson, Sir A.L. 1964 *A New Dictionary of Birds* Nelson, 928 pp., 48 pls.

Thompson, R.C.M. 1939 The Natural History of Canna and Sanday, Inner Hebrides: A Report upon Glasgow University Canna Expeditions, 1936 and 1937 *Proc. R. Phys. Soc. Edinb.* 23(1); 60-65.

Torre-Bueno, J.R.de la. 1989 *A Glossary of Entomology* Brooklyn Entomological Society, New York i-ix, 336 pp., 9 pls.

Tuomikoski, R. 1960 Zur Kenntnis der Sciariden (Dipt.) Finnlands *Ann. Zool. Soc. "Vanamo"*. 21(4); 164 pp., 33 figs.

Tuomikoski, R. 1967 Mycetophilidae and Sciaridae from Spitsbergen, collected by Dr. Kaisila in 1965 (Notes on the arthropod fauna of Spitsbergen I; 6 *Ann. Ent. Fenn.* 33; 43-52

Vaurie, C. 1959(-1965) *The birds of the Palaearctic fauna, a systematic reference.* Witherby, London. 2 vols.

Vibe, C. 1950 Some insects new to Greenland *Ent. Medd.* 25; 419-20

Wacher, J.S. 1971 Yorkshire towns in the fourth century. In R.M. Butlin (ed.) *Soldier and Civilian in Roman Yorkshire.* Leicester Univ. Press, 165-178

Walker, I.R. 1987 Chironomidae (Diptera) in Palaeoecology. *Quaternary Science Reviews* 6; 29- 40.

Wallace, A.R. 1876 *The Geographical Distribution of Animals.*

Waterston, A.R. 1939 Insects from Colonsay, South Ebudes *Scot. Nat.* 239; 128-131.

Waterston, A.R. 1981 Present Knowledge of the non-marine invertebrate fauna of the Outer Hebrides Royal Society of Edinburgh. Proceedings section B. 79(4); 215-321

Weber, N.A. 1954 Arctic Alaskan Diptera *Proc. Ent. Soc. Washington* 56(2); 86-91

Westwood, J.O. 1840 *An Introduction to the Modern Classification of Insects* Longman, Orme, Green & Longmans, London 2 vols.

Wharton, R.A. and Moon, R.D. 1979 Puparia of cyclorrhaphous Diptera from bovine dung in open pasture and rangeland in the transition zone of western North America. *Ann. ent. Soc. Am.* 72; 80-89, 18 figs.

White, I.M. 1988 Tephritid Flies Diptera: Tephritidae *Handbk. Ident. Br. Ins.* 10(5a); 134pp., 285 figs.

Whiteley, D. 1987 Hoverflies of the Sheffield Area and North Derbyshire. *Sorby Record Special Series* 6; 56pp., 8 maps

Whiteley, D., Garland, S.P. and Hancock, E.G. 1994 A Survey of Diptera on South Uist and Adjacent Hebridean Islands. *Dipterists Digest* 14; 32-43, 3 maps

Withers, P. 1987 The British species of the Genus *Suillia* (Diptera: Heleomyzidae), including a species new to science *Proc. Trans. Br. ent. Nat. Hist. Soc.* 20; 91-104, 52 figs., 1 tbl.

Withers, P. 1989 Moth Flies Diptera: Psychodidae *Dipterists Digest* 4; 83pp., 180 figs.

Wormell, P. 1977 Woodland Insect Population Changes on the Isle of Rhum in relation to Forestry history and Woodland Restoration. *Scottish Forestry* 31(1): 36pp., 8 pls., 2 tbls., 1 map, 1 Apps.

Wormell, P. 1982 The Entomology of the Isle of Rhum National Nature Reserve *Biol. Journ. Linn. Soc.* 18; 291-401, 1 fig.

Zetterstedt, J.W. 1838- 1840 *Insecta Lapponica*. Leipzig. 1140pp.

Zuska, J. and & Laštovka, P. 1965 A review of the Czechoslovak species of the family Piophilidae with special reference to their importance to the food industry (Diptera, Acalyptrata) *Acta ent. bohemslovaka* 62; 141-157, 8 figs.

ADDITIONS AND CORRECTIONS

p. 5 Insert- 10 Additions and Corrections 470

p. 8 Insert under Text figures- 19 Map of North Atlantic area showing various islands etc. referred to in the Zoogeographical section. 314

p. 15, 20 *Thoracochaeta zosterae* and *Musca domestica* were also found in profusion in Viking deposits in York (*pers. comm.* Y. Z. Erzinçlioglu).

p. 33 In a very small number of Aschiza a ptilinum and ptilinal suture have been recognised (Disney 1991).

p. 36 The caption for text-figure 10 is incomplete. It should read as follows- an, antenna; e, compound eye; fl, front femur; fh, hind femur; fm, mid femur; gc, genital capsule; h, humeral callus; p, prosternum, with prosternal bristles; pr, proboscis; ss, surstyli; vb, vibrissa; w, wings.

p. 40 Minute pupal respiratory horns are present in Calliphoridae (*pers. comm.* Y. Z. Erzinçlioglu).

pp. 40, 143 In *Calliphora* the darkened rod between the mouth-hooks is not an accessory oral sclerite. It is a normally translucent ridge on the roof of the oral cavity which forms attachment for the mouth-closing muscle, and is probably present in all cyclorrhaphous larvae. It is however sclerotised distally, and hence very conspicuous, in *Calliphora* (*pers. comm.* Y. Z. Erzinçlioglu).

p. 65 Broadhead (1980) records *Trichocera* larvae from a human corpse.

p. 77 Larvae of *Scatopse notata* have been found in abundance in a human corpse (*pres. comm.* Y. Z. Erzinçlioglu).

p. 145, 174 *Phormia terrae-novae* puparia were abundant in the Condover mammoth, and it has been reared from urine-soaked soil beneath chicken-

runs in Siberia (*pers. comm.* Y. Z. Erzinçlioğlu).

p. 181 *Calliphora* have a tendency to oviposit in low light intensity and low temperature and will do so in the dark (*pers. comm.* Y. Z. Erzinçlioğlu).

pp. 195, 196 Dr. Y. Z. Erzinçlioğlu tells me that he knows of no evidence that *Calliphora* can breed in dung, as stated by Smith (*l.c.*).