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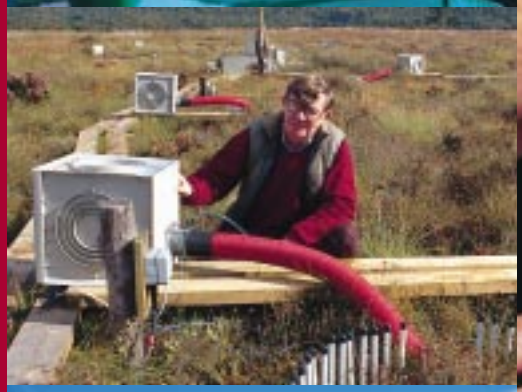
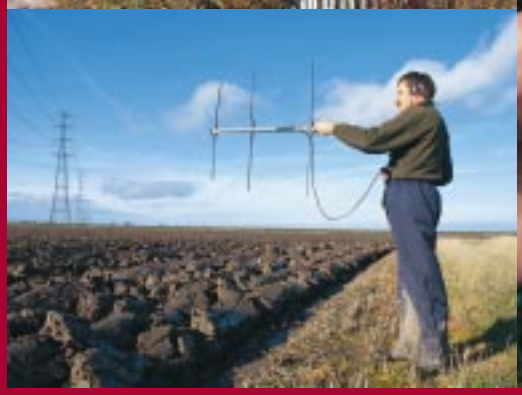
Laccophilus poecilus Klug Col., Dytiscidae

Species Recovery Programme report March 2000-August 2001

Monitoring on the Lewes Levels and surveys in Yorkshire

English Nature Research Reports





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Laccophilus poecilus Klug Col., Dytiscidae
Species Recovery Programme
Report – March 2000–August 2001
Monitoring on the Lewes Levels and surveys in Yorkshire

Peter J. Hodge

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Contents

Acknowledgements

I would like to thank Bob Marsh, who accompanied me to Thorne moor and also provided some useful historical data, Martin Hammond for information relating to John Flint's Yorkshire record of *L. poecilus* and Bob Merritt for his useful species lists and sketch map of Thorne moor. I also thank Roy Crossley for providing excellent accommodation during my brief stay in Yorkshire in August 2000.

Summary

Laccophilus poecilus is a small water beetle (3.5 mm long) in the family Dytiscidae. One of three British *Laccophilus* species, it has distinctly patterned elytra and is considered to be sufficiently distinct, so far as the British fauna is concerned, to confidently permit the acceptance of historical records. However, it is worth noting that four different names have been applied during the 20th century: *L. variegatus* (Germ.), *L. obsoletus* West., *L. ponticus* Sharp and *L. poecilus* Klug. A summary of the nomenclatorial history is given by Ahmed & Angus, 1998.

The species' status is currently listed as **Red Data Book 2 - Vulnerable** (RDB2). It is also a **Biodiversity Action Plan** (BAP) species (Foster 1999a & 1999b). There are recent (post-1970) records for only the Pevensey levels (up to 1972) and the Lewes levels, where a small population is still present. A 1970 published record for Thorne moor requires confirmation.

There are strong grounds for recommending that the status be upgraded to **Red Data Book 1 - Endangered** (RDB1) since just a single British population is currently known to exist, at Lewes, East Sussex.

This report aims to bring our knowledge of the species up to date and also to highlight additional historical information.

1. Introduction

The stated objectives of this contract are as follows:

1. Survey for *L. poecilus* at the historical sites where these are identifiable and retain suitable habitat.
2. Surveillance of ditches on the Lewes Levels where *L. poecilus* has been recorded.
3. Collection of environmental variables that help to define the habitat requirements of *L. poecilus*.
4. Provide advice on further actions (both for practical management and research).

2. Additional historical data

The following information has been assembled since the reports by Hodge (2000) and Hodge (undated) were published. Unfortunately the source of a 1977 record by the late John Flint for Barmston Main Drain near Bridlington, reported by Martin Hammond (Foster, ed. 2000), cannot be located (see paragraph 2.1b below).

2.1 Information from R.J. Marsh

a. The following extract from a draft of "A biodiversity audit of Yorkshire and the Humber - the included beetle species in a Doncaster context" by R.J. Marsh conveniently summarises the recorded history of *L. poecilus* in Yorkshire …
"**Laccophilus poecilus Klug, 1834**
(= ponticus Sharp, 1882, = variegatus (Germar, 1817), = obsoletus Westhoff, 1881)
An estuarine species typical of marshes near the sea, but not in brackish conditions. Recorded from Thorne moor in 1970 [Skidmore et al., 1985] William Bunting collected specimens ('at Thorne') in 1950 which were subsequently identified by Prof. F. Balfour-Browne [Bunting, 1955]. The species was also taken on Thorne moor by E G Bayford in July 1907 [Bayford, 1907]. Specimens of this insect from Spurn originally documented as variegatus [Hincks, 1952] were later shown [Hincks & Shaw, 1954] to be misidentifications. The name of this insect has been the subject of much change and has caused confusion."

b. In a letter from Bob Marsh dated 12 October 2000 the following information relating to specimens of *L. poecilus* in the Leeds Museum main collection at Moorfield Road, Yeaden LS19 7BN. He writes … "Further to my visit to Leeds yesterday, here are the details of the *L. obsoletus* specimens there:

> "Drawer 21 labelled '5. Dytiscidae 1': 3 specimens standing over *Laccophilus variegatus* (Germar).
> Specimen 1 bears a label '*Laccophilus variegatus*' and a label 'LEEDM.C.1988.18'. Underside of card mount has written '327 Pevensey'.
> Specimen 2 bears a label 'LEEDM.C.1988.18' and on the underside of card mount is written 'Lewes 4 v 25'.
> Specimen 3 bears a label 'LEEDM.C.1988.18' and on the underside of card mount is written '15 v 25'.

" 'LEEDM.C.1988.18' refers to the Basil Kitchen collection now amalgamated in the general collection.

"Nowhere could I find a specimen labelled Barmston, or specimens collected by Bunting or Corbett from Thorne. In John Flint's notebooks and diaries there is reference to a visit to 'Barmston' on 15.7.77. Some carabids were noted but no water beetles.

"If you need any more information the contact at Leeds is Adrian Norris and he can be contacted on 0113 214 6526. Adrian, who is a good freshwater biologist specialising in molluscs, mentioned that Barmston drain further south, referred to on the OS map as 'Beverley and Barmston drain', has several sites which may prove to harbour the water beetle."

2.2 Information from R. (Bob) Merritt

A letter from Mr Merritt dated 22 August 2000 gave useful information relating to the most recent records for *L. poecilus* at Thorne moor, South-west Yorks (V.C. 63). He included a sketch map (Appendix 5) of the part of the moor where Peter Skidmore found a specimen in 1970.

The precise location of 'Skidmore's pond' is not known but, quoting from Bob Merritt's letter, it was apparently "a pond at the southern edge of Inkle moor (north of Moorends). He says the pond was just outside the moor itself and about a quarter the way between there and Bell's pond". This would be in the region of SE706174, where there are currently no suitable ponds. Inkle moor is shown on early OS maps as being just north of the Thorne to Goole railway line, but is not marked on the modern editions.

The only ponds that still hold permanent water are Bell's pond, SE712158 and a borrowpit close to the Thorne to Goole railway line at approximately SE707182. The borrowpit is not marked on the 1974 edition of the 1:50,000 OS map but it is not known if it is a recently created feature.

As a result of several visits to the borrowpit Bob Merritt has recorded an extensive list of Coleoptera (Appendix 3). Bell's pond is apparently very saline and supports relatively few species of aquatic Coleoptera.

2.3 Specimens in the Joy collection (BENHS, Reading)

In the collections of the British Entomological and Natural History Society at Dinton Pastures Country Park, Winnersh near Reading, two specimens of *L. poecilus* are labelled as follows.

327 Pevensey (possibly March 1927)
Deal, v.1900, A.J. Chitty

3. The 2000 survey

The 2000 survey was divided into two parts, with different objectives. Monitoring aquatic beetles and bugs at Lewes was carried out between March and October (see paragraph 3.1 below). In addition, two days were spent sampling sites on Thorne moor and at Barmston Main Drain in Yorkshire, where relatively recent records have been reported (see paragraph 3.2 below).

3.1 Celery sewer, Lewes Brooks SSSI, E. Sussex, Mar - Oct 2000

This ditch (ditch 5, Lewes Brooks SSSI: TQ407090) is currently the only known breeding site for *L. poecilus* in Britain. It is located at the northernmost end of Celery sewer and is fed through a sluice from the Cockshut stream. The water level in the Cockshut stream varies considerably and is at its highest during the winter months. In particularly dry summers it becomes dry. Water only flows into Celery sewer when the water level in the stream is high.

a Site description

Celery sewer is a main drain, 4 m wide at the northern end, with a varied aquatic flora. The central channel is dominated by common water starwort *Callitriche stagnalis* and there is a large patch of mare's-tail *Hippuris vulgaris* near the culvert from the Cockshut stream. Floating sweet-grass *Glyceria fluitans* is common along both banks. The western bank profile is very steep but the eastern bank has a narrow shelf which is shallowly flooded when the ditch level high. Weed cutting is carried out annually in late summer, but the submerged vegetation usually recovers very quickly. There is a culvert from the Cockshut stream, which has a water level one to two metres higher than Celery sewer. This allows calcareous spring water to flow from the north during the winter period, when the Cockshut is at peak flow.

b Monitoring

Regular monitoring commenced in 1998, when ditch 5 was sampled five times, at approximately one month intervals during the period when adults of *L. poecilus* were most likely to be present. This resulted in the capture of just three specimens, two on 20 February and one on 30 August 1998. In 1999, ditch 5 was sampled seven times but only one specimen of *L. poecilus* was caught, on 13 August 1999.

During 2000, because the small population of *L. poecilus* might be vulnerable to excessive disturbance, ditch 5 was sampled just three times, on 9 March, 21 August and 23 September 2000. A fourth sample, planned for late October was postponed due to severe flooding, which devastated the town of Lewes on 11/12 October 2000.

With Lewes divided in two by the river Ouse it was virtually impossible to reach the brooks by road from Ringmer for several days. However, it was considered highly desirable to obtain a photographic record of Celery sewer (ditch 5) at the height of the flood and an eight mile round trip by bicycle was made on 13 October 2000 in order to achieve this goal. Most of the Lewes Brooks SSSI was flooded to a depth of one metre or more, but ditch 5 had scarcely overflowed, even though the field to the east was totally flooded. It was possible to walk to ditch 5 along the bank of the Cockshut stream from the west and a series of photographs was taken.

On 13 October 2000 the water level in the Cochshut stream, immediately north of ditch 5, was very high and was just starting to overflow into adjacent fields. However, it is interesting to note that the farmer had made no attempt to remove his sheep from the brooks so total flooding was evidently not expected to occur.

c Results

L. poecilus was not found during the 2000 survey. Although the reasons for its apparent absence are not clear, it is worth noting that the water beetle species diversity in the Celery sewer (ditch 5) was lower than in the previous two years. Furthermore the central channel did not develop the usual dense weed growth during summer 2000 and optimum water beetle habitats were confined to marginal vegetation. Floating green algae was more evident than in past years. Results are shown in Appendix 2.

A worrying observation was made on 21 August 2000 when a shoal of *c*20–30 fish (tentatively identified from the ditch bank as either rudd or perch), estimated to be about 15 cm long, were seen about halfway along ditch 5. Because the presence of predatory fish could affect water beetle populations, I informed Jason Lavender, the local fisheries officer at the Worthing Environment Agency office (Tel: 01903 832000) immediately. He agreed that the fish might cause damage to the *L. poecilus* population and intended to pursue the matter further. Whether it will be possible to exclude all predatory fish from the northernmost section of Celery sewer is not clear, but a way of reducing their numbers is definitely needed.

On 5 February 2000, in very wet weather, I met Daniel Hurford (Environment Agency) and we visited the *L. poecilus* site in the Celery sewer. The atrocious weather meant that no attempt to observe the fish could be made and another meeting had to be arranged. The possibility of electro-fishing was discussed but a final decision has still to be made.

Although the revised strategy of clearing just the central channel of ditch 5 (see '3.1d - Weed cutting' below) should have provided more shelter and hence a better breeding opportunity for *L. poecilus*, the 2000 monitoring results indicate that an increase in the population has not occurred. Predatory fish may well be responsible for unacceptably high mortality rates in aquatic invertebrates generally (see '3.1c - Results' above) and an attempt should be made to eradicate them as soon as possible.

d Weed cutting

The annual weed cut along the entire length of the Celery sewer was carried out by the Environment Agency during August 2000. As in 1999, for the first 100 m of the sewer (ie, ditch 5) only the central channel was cleared of aquatic vegetation.

e Management of ditches on Lewes Brooks SSSI

Jon Curson, the English Nature conservation officer based at Lewes, is proposing to introduce rotational ditch management on the Lewes Brooks SSSI. The first ditch to be cleared in August/September 2000 was ditch 19 (the ditch running east from the southern end of ditch 5). It is hoped that if one ditch per year is cleared, *L. poecilus* may be encouraged to spread into the new habitat created. It is proposed to monitor the aquatic Coleoptera in ditch 19 as from March 2001 (pending the lifting of foot and mouth disease restrictions).

3.2 Yorkshire (V. C.'s 61 & 63), August 2000

There are apparently three recent (ie, for the period from 1970-onwards) Yorkshire records for *L. poecilus* as follows.

1. One specimen found by Peter Skidmore in 1970 at Thorne moor in a pond at the southern edge of Inkle moor, north of Moorends, SE706174 (see paragraph 2.2).

2. Barmston Main Drain near Bridlington, V.C. 61, TA174587 on 15 July 1977 by the late John Flint. This record requires confirmation (see paragraph 2.1b).

3. One specimen collected from a pitfall trap set in the Will Pitts area of Thorne moor (SE7415 or SE7416) during an English Nature survey in 1990. Mike Denton confirmed the identification and the specimen is preserved in his personal collection

a. Thorne Moor, South-west Yorks (V.C. 63), 29 August 2000

Swinefleet Warping Drain was visually examined and assessed for its potential as a likely *L. poecilus* habitat no sample was taken. It is a large drain that runs northwards along the eastern margin of Thorne moor, eventually meeting the river Ouse after crossing arable land. The structure varies from mainly open water to sections heavily shaded by willows, indicating that it is periodically cleared out a section at a time.

Samples of aquatic insects were taken from three locations as follows. A list of species recorded is given in Appendix 2.

Site 1 Shearburn and Pitts Drain, Thorne moor, SE745160. An acidic drain, 3 m wide and 1 m deep containing broad-leaved pondweed *Potamogeton natans* and reed sweet-grass *Glyceria maxima*, running through a broad glade in one of the most thickly wooded parts of Thorne moor.
Although ten species of aquatic Coleoptera were recorded, including the **provisionally Red Data Book 3** *Acilius canaliculatus* which is sometimes common on Thorne moor, the only *Laccophilus* species found was *L. minutus* (Appendix 2: Table 3 Site 1).

Site 2 A large open scrape, *c*50–100 m across, near English Nature's Thorne moor equipment storage shed, SE743150. It was apparently excavated about ten years ago and on 29 August 2000 the water level was high with several shallow pools, partially cut off from the main scrape. These contained a dense growth of water-starwort *Callitriche* (species not determined).

Although only a few species of aquatic Coleoptera were recorded (Appendix 2: Table 3 Site 2), this was considered to be a potentially suitable habitat for *L. poecilus*, with its large expanse of well oxygenated water and shallow well-vegetated margins.

Site 3 Borrow-pit near the Thorne to Goole railway line, north-west of Thorne moor, SE707182, containing yellow water-lily *Nuphar lutea*, amphibious bistort *Polygonum amphibium*, broad-leaved pondweed *Potamogeton natans* Canadian pondweed *Elodea canadensis* and surrounded by a dense growth of common reed *Phragmites australis*.
Access was restricted to the bank adjacent to the railway where there was evidence of use by anglers. The water level was low which made sampling difficult. No attempt was made to penetrate the reed-beds and no species of aquatic insects were recorded.
This pond has been sampled by Bob Merritt over a period of several years and a list of species recorded by him is given in Appendix 3.

b Barmston Main Drain, South-east Yorks (V.C. 61), 30 August 2000

This drain originates just north of Hornsea mere at approximately TA194491, it then runs in a northward direction passing west of Atwick and Skipsea. Its course is roughly parallel to the coastline before turning to the east and entering the sea about half a mile south of Barmston at TA169585.

The drain consists of little more than a narrow ditch for most of its length and only the section between Skipsea and the estuary at Barmston is likely to suit *Laccophilus* species. From Skipsea to just past Lissett the drain passes through grazed meadows but fields either side of the last mile are arable and here the drain forms a straight, deep and canal-like engineered channel.

In the 1970s, when John Flint's visit took place, the drain flowed naturally into the sea, but it now terminates in a concrete sluice and the last 100 m is piped to prevent the excessive build-up of silt in the estuary. An Environment Agency officer who was on-site on 30 August 2000 thought the 'improvement' was carried out at least 20 years ago.

The water level in the last section of the drain, close to the sluice, fluctuates daily due to the rapid build-up of weed that clogs an iron grid where water runs into the final pipe to the sea. This weed is regularly cleared by hand, using a long-handled rake, twice a week. This task was carried out during my visit and the water level dropped by half a metre within a few minutes.

One aquatic invertebrate sample was taken in the last 50 m of Barmston Main Drain. Here the drain is 15 m wide and up to about 1 m deep (although this varies, being dependent upon the amount of weed clogging the metal grid). Aquatic vegetation in the centre of the channel is virtually non-existent although green algae are plentiful. The banks are overgrown with dense stands of several wetland plants, the dominant species being reed canary grass *Phalaris arundinacea*, common reed *Phragmites australis* and sea club-rush *Bolboschoenus maritimus*. There was a tiny patch of water-cress *Rorippa nasturtium-aquaticum* close to the concrete sluice.

Twelve species of aquatic Coleoptera (including *Haliplus apicalis* **Nationally Scarce Nb**) and seven species of aquatic Hemiptera-Heteroptera were recorded (Appendix 2: Table 3 Site 4).

Robert Merritt is of the opinion that John Flint's *L. poecilus* record from Barmston Main Drain may be in error, since no voucher specimen can be found, and the record should be regarded as unconfirmed.

4. The 2001 survey

Projected work consisted of monitoring at the Lewes site, but due to the foot and mouth disease outbreak, survey work during the first half of 2001 had to be cancelled.

I eventually surveyed two ditches on the Lewes brooks on 20 August: ditch 5 (the *L. poecilus* site) and ditch 18, which was dredged by the Environment Agency in August/September 2000.

The shoal of fish, first noted about halfway along ditch 5 on 21 August 2000, were still present in the same place on 20 August 2001. This has been reported to Mark Elliott (Conservation and Recreation Officer at the Worthing Environment Agency office, Tel: 01903 703850) and he agrees that the fish may pose a threat to invertebrates in the ditch. He has promised to investigate the possibility of controlling them but is not sure if an effective remedy can be found.

L. poecilus was not found during the 2001 survey. As in the 2000 survey the reasons for its apparent absence are not clear. The grassy marginal vegetation at Celery sewer site looked ideal although the central channel contained more floating brown algae than in previous years. This is possibly due to recent weed cutting operations by the Environment Agency. Results are shown in Appendix 2.

5. Conclusions

a Monitoring

- No *L. poecilus* were found in 2000 or 2001, either in the Celery sewer at Lewes or in Yorkshire, the most recent British record being for a solitary example in Celery sewer on 16 August 1999.
- Fixed point photographs of Celery sewer, Lewes were taken on 9 March 2000, 23 September 2000, 13 October 2000, and 20 August 2001. The 13 October 2000 visit coincided with the height of the floods that devastated the low lying parts of Lewes.

b Weed cutting

- Weed cutting at Celery sewer was carried out in August 2000 and August 2001.
- Cutting was mainly confined to the central channel, unlike in previous years and a substantial proportion of the marginal vegetation was conserved.
- A substantial amount of brown algae was present in the centre on the ditch when it was sampled for aquatic invertebrates on 20 August 2001.

c Ditch clearance

- A programme of rotational ditch clearance at Lewes Brooks SSSI is planned. English Nature staff (Lewes office) are responsible for co-ordinating this work. Ditch 19 was cleared in August 2000 and it was sampled for aquatic invertebrates on 20 August 2001.

d Fish

- The shoal of *c*20–30 fish, first observed on 21 August 2000, could affect water beetle populations. Mark Elliott (Conservation and Recreation Officer at the Worthing Environment Agency office, Tel: 01903 703850) has been informed. He has agreed to investigate the matter further.

e Surveys

- Results of surveys at Thorne moor and Barmston Main Drain in Yorkshire during August 2000 were unsuccessful in locating *L. poecilus*.

e Vulnerability of habitat

- In common with most species of insects, the need periodically to move to new breeding locations nearby may be vitally important and it is probably unrealistic to expect *L. poecilus* to survive as a viable breeding population at Lewes in a short stretch of a single drainage ditch.
- Weed cutting in the northernmost section of Celery sewer has recently been reduced to dredging just the central channel and the apparent disappearance of *L. poecilus* since 1999 might be linked to the increase in density of marginal vegetation.
- The number of unpolluted ditches containing the required amount of open water habitat at Lewes brooks was greater in the past than it is today.
- In view of the lack of modern records from Yorkshire, Kent and East Sussex (excluding the Lewes brooks), the limited extent of the habitat at Lewes brooks must have increased the possibility of *L. poecilus* becoming totally extinct in Britain in the near future.

6. Future monitoring

It is suggested that monitoring should be continued in the Celery sewer site and in any recently cleared ditches in the surrounding area that are judged as containing potentially suitable habitat for *L. poecilus*.

Also, more research needs to be carried out in the south-eastern part of Yorkshire, especially around Thorne moor.

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Appendix 1. Habitat Quality Assessment using water beetles

Foster and Eyre (1992) outline the methods currently used for the classification and ranking of water beetle communities. Species lists are classified into assemblage types and then used to rank sites by applying a point scoring system. The numbers of points awarded to each species of water beetle are listed by Foster and Eyre (1987, unpublished).

Sites are ranked using the following hierarchy of factors:

- The number of **Red Data Book (RDB)** species.
- The **Species Quality Score (SQS)** for the site. This is defined as the mean score per species, scores for each species having been awarded according to their rarity. Scores range from **1** for the commonest species to **32** for the rarest.

In the event of a tie on **SQS**:

- The number of **Nationally Scarce (Nb)** species present.

In the event of a tie on **Nb**:

- The total **Number of Species** present **(NOS)**.

The **Aggregate of Points** for the species present in a site **(WET)**, ie, the sum of the scores awarded to each species, gives a good measure of habitat quality. A score of more than **100** generally indicates a top site.

The **Aggregate of Points (WET)** may also be calculated as follows:

$$\mathbf{WET = SQS \times NOS}$$

The **Species Quality Score (SQS)** for a site may be calculated as follows:

$$\mathbf{SQS = \frac{WET}{NOS}}$$

A **SQS** of **2·0** or higher usually indicates a good site as do high species numbers and the presence of **Red Data Book** or **Nationally Scarce** species.

The system may be of limited use for sites where very few species are recorded since the results can easily be distorted by the chance presence of one or more rare species.

Appendix 2. Aquatic insects recorded from Lewes Brooks SSSI

Table 1 Aquatic Coleoptera (water beetles) from Celery sewer (TQ407090)

Species	SQS	Date				National Status
		2000			2001	
		09/03	21/08	23/09	20/08	
DRYOPIDAE (Water beetles)						
Dryops luridus	**1**		+			Common
DYTISCIDAE (Water beetles)						
Acilius sulcatus	**4**				+	Local
Agabus bipustulatus	**1**		+	+	+	Common
Agabus didymus	**4**			+		Local
Agabus sturmii	**1**		+	+	+	Common
Colymbetes fuscus	**1**				+	Common
Copelatus haemorrhoidalis	**2**			+		Local
Dytiscus marginalis	**1**	+				Common
Dytiscus semisulcatus	**2**				+	Common
Graptodytes pictus	**2**	+	+	+	+	Local
Hydaticus seminiger	**4**		+			**Nationally Scarce (Nb)**
Hydroporus angustatus	**1**	+	+	+		Common
Hydroporus erythrocephalus	**1**	+	+		+	Common
Hydroporus palustris	**1**	+	+	+	+	Common
Hydroporus planus	**1**			+	+	Common
Hygrotus inaequalis	**1**		+	+	+	Common
Hyphydrus ovatus	**1**	+	+	+	+	Common
Ilybius fuliginosus	**1**		+			Common
Laccophilus minutus	**1**		+	+	+	Common
Laccophilus poecilus	**32**	0	0	0	0	**Red Data Book 2 Vulnerable**
Porhydrus lineatus	**2**	+	+	+	+	Local
Rhantus suturalis	**2**	+		+		**Nationally Scarce (Nb)**
HALIPLIDAE (Water beetles)						
Haliplus immaculatus	**2**		+	+	+	Local
Haliplus lineatocollis	**1**	+	+	+	+	Common
Haliplus mucronatus	**8**				+	**Nationally Scarce (Na)**
Haliplus ruficollis	**1**		+	+	+	Common
Peltodytes caesus	**4**	+		+		**Nationally Scarce (Nb)**
HYDRAENIDAE (Water beetles)						
Ochthebius nanus	**4**	+	+			**Nationally Scarce (Nb)**
HYDROPHILIDAE (Water beetles)						
Anacaena bipustulata	**4**		+	+		**Nationally Scarce (Nb)**
Anacaena limbata	**1**	+	+	+	+	Common
Anacaena lutescens	**2**				+	Common
Berosus affinis	**4**		+	+	+	**Nationally Scarce (Nb)**
Enochrus testaceus	**2**		+	+	+	Local
Helochares lividus	**2**		+	+	+	**Nationally Scarce (Nb)**
Helophorus aequalis	**1**			+		Common
Helophorus brevipalpis	**1**				+	Common
Helophorus granularis	**2**			+	+	Local
Helophorus minutus	**1**	+		+	+	Common
Helophorus obscurus	**1**				+	Common
Hydrobius fuscipes	**1**	+				Common
Hydrophilus piceus	**8**	+	+			**Red Data Book 3 - Rare**
Laccobius bipunctatus	**1**		+	+		Common
Laccobius striatulus	**2**			+	+	Local
Limnoxenus niger	**8**	+	+	+	+	**Nationally Scarce (Nb)**
NOTERIDAE (Water beetles)						
Noterus clavicornis	**2**	+	+	+		Common
RDB + NAT SCARCE SPECIES	**10**	5	7	6	4	
POINTS AGGREGATE (= WET)	**98**	41	58	58	57	
NUMBER OF SPECIES (= NOS)	**44**	17	26	29	28	
SPECIES QUALITY SCORE (= SQS)	**2.23**	**2.41**	**2.23**	**2.0**	**2.04**	

Table 2 Aquatic Hemiptera-Heteroptera (water bugs) from Celery sewer (TQ407090)

Species	Date				National Status
	2000			2001	
	09/03	21/08.	23/09	20/08	
CORIXIDAE (Corixid bugs)					
Corixa punctata			+		Common
Hesperocorixa linnei	+	+			Common
Hesperocorixa sahlbergi				+	Common
Sigara dorsalis				+	Common
HEBRIDAE (Sphagnum bugs)					
Hebrus pusillus				+	**Nationally Scarce (Nb)**
NAUCORIDAE (Saucer bugs)					
Ilyocoris cimicoides	+		+	+	Common
NEPIDAE (Water scorpions)					
Nepa cinerea	+	+	+	+	Common
NOTONECTIDAE (Water boatmen)					
Notonecta glauca	+	+	+	+	Common
PLEIDAE (Lesser Water-boatmen)					
Plea minutissima	+	+	+	+	Common
VELIIDAE (Water crickets)					
Microvelia reticulata	+		+	+	Common
Number of species recorded = 10	6	4	6	8	

Table 3 Aquatic Coleoptera (water beetles) from ditch 19 (TQ409089)

Species	SQS	Date 20/08/2001	National Status
DYTISCIDAE (Water beetles)			
Hygrotus inaequalis	**1**	+	Common
Hyphydrus ovatus	**1**	+	Common
Ilybius fuliginosus	**1**	+	Common
Ilybius quadriguttatus	**4**	+	Local
Laccophilus minutus	**1**		Common
Laccophilus poecilus	**32**	0	**Red Data Book 2 Vulnerable**
HALIPLIDAE (Water beetles)			
Haliplus flavicollis	**2**	+	Local
Haliplus immaculatus	**2**	+	Local
Haliplus ruficollis	**1**	+	Common
HYDROPHILIDAE (Water beetles)			
Berosus affinis	**4**	+	**Nationally Scarce (Nb)**
Helophorus minutus	**1**	+	Common
Limnoxenus niger	**8**	+	**Nationally Scarce (Nb)**
NOTERIDAE (Water beetles)			
Noterus clavicornis	**2**	+	Common
RDB + NAT SCARCE SPECIES	**3**	3	
POINTS AGGREGATE (= WET)	**28**	28	
NUMBER OF SPECIES (= NOS)	**12**	12	
SPECIES QUALITY SCORE (= SQS)	**2.33**	**2.33**	

Table 4 Aquatic Hemiptera-Heteroptera (water bugs) from ditch 19 (TQ409089)

Species	Date 20/08/2001	National Status
NAUCORIDAE (Saucer bugs)		
Ilyocoris cimicoides	+	Common
NEPIDAE (Water scorpions)		
Nepa cinerea	+	Common
NOTONECTIDAE (Water boatmen)		
Notonecta glauca	+	Common
PLEIDAE (Lesser Water-boatmen)		
Plea minutissima	+	Common
VELIIDAE (Water crickets)		
Microvelia reticulata	+	Common
Number of species recorded = 5	5	

Appendix 3. Aquatic insects from Yorkshire (V.C.s 61 & 63) on 29–30 August 2000

Sample Site locations

Site 1 - Thorne moor, Shearburn and Pitts drain, V.C. 63, SE745160, 29 August 2000
Site 2 - Thorne moor, scrape near English Nature shed, V.C. 63, SE743150, 29 August 2000
Site 3 - Thorne moor, borrow-pit near railway, V.C. 63, SE707182, 29 August 2000
Site 4 - Barmston Main Drain, V.C. 61, TA169585, 30 August 2000

Table 5 Aquatic Coleoptera (water beetles)

Species	SQS	Sample Site Number				National Status
		1	2	3	4	
DYTISCIDAE						
Acilius canaliculatus	**32**	+				**p Red Data Book 3 - Rare**
Agabus bipustulatus	**1**	+	+			Common
Agabus didymus	**4**				+	Local
Agabus paludosus	**1**				+	Common
Agabus sturmii	**1**	+	+			Common
Coelambus impressopunctatus	**2**		+			Local
Dytiscus marginalis	**1**	+				Common
Hydroporus erythrocephalus	**1**	+				Common
Hydroporus palustris	**1**	+				Common
Hygrotus inaequalis	**1**	+				Common
Hyphydrus ovatus	**1**	+	+			Common
Ilybius fuliginosus	**1**				+	Common
Ilybius	**4**		+			Local
Laccophilus minutus	**1**	+			+	Common
Nebrioporus depressus elegans	**1**				+	Common
Platambus maculatus	**2**				+	Local
Rhantus exoletus	**4**		+			Local
ELMIDAE						
Elmis aenea	**1**				+	Common
HALIPLIDAE						
Haliplus apicalis	**4**				+	**Nationally Scarce Cat. B (Nb)**
Haliplus fluviatilis	**1**				+	Common
HYDROPHILIDAE						
Anacaena globulus	**1**				+	Common
Anacaena limbata	**1**				+	Common
Hydrobius fuscipes	**1**		+		+	Common
RDB + NAT SCARCE SPECIES	**2**	1	0	0	1	
POINTS AGGREGATE (WET)	**68**	40	14	0	19	
NUMBER OF SPECIES (NOS)	**23**	9	7	0	12	
SPECIES QUALITY SCORE (SQS)	**3.0**	4.4	2.0	0	1.6	

Table 6 Aquatic Hemiptera-Heteroptera (water bugs)

Species	Sample Site Number				National Status
	1	2	3	4	
CORIXIDAE (Corixid bugs)					
Calicorixa praeusta				+	
Corixa punctata				+	Common
Hesperocorixa linnei	+			+	Common
Sigara dorsalis				+	Common
Sigara falleni				+	Common
Sigara lateralis				+	
Sigara stagnalis				+	
NEPIDAE (Water Scorpions)					
Nepa cinerea	+	+			Local
NOTONECTIDAE (Water boatmen)					
Notonecta glauca	+	+			Common
Notonecta obliqua	+				
VELIIDAE (Water crickets)					
Velia caprai					Common
Number of species recorded	**4**	**2**	**0**	**7**	

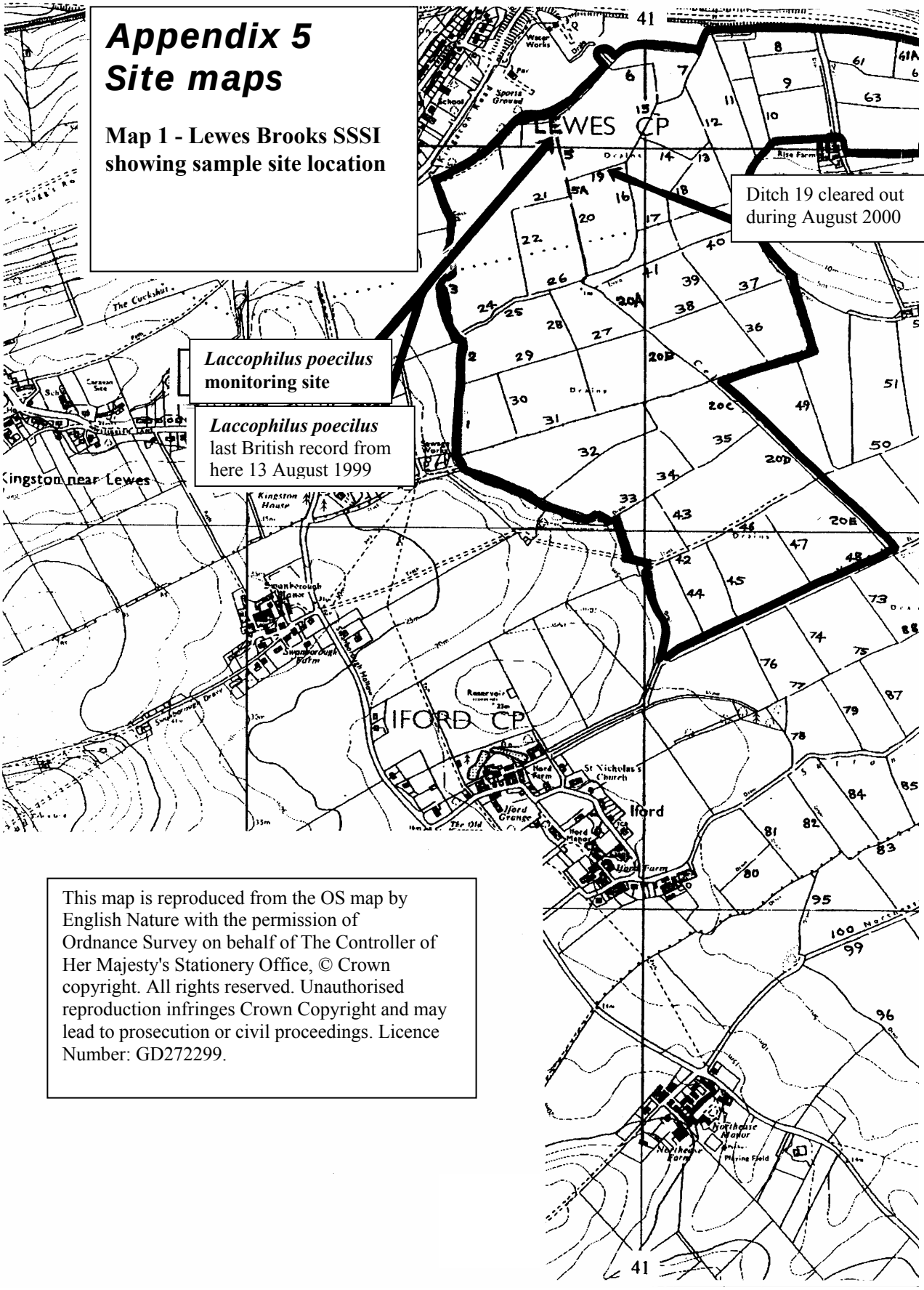
Appendix 4. Aquatic insects recorded by Robert Merritt from Thorne moor, Yorkshire

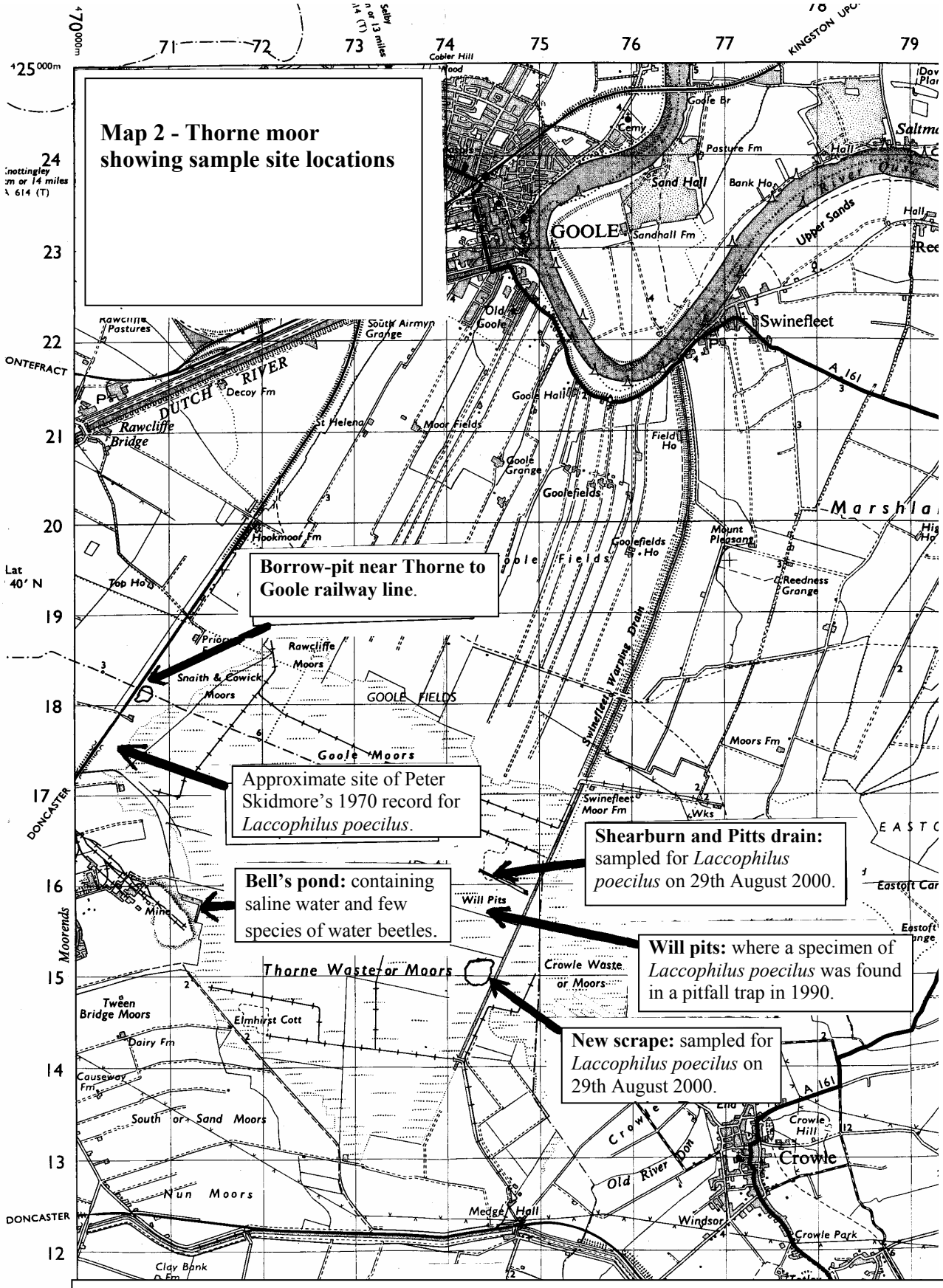
a Recent Coleoptera records from Moorends: Railway pond, SE698168
List compiled 22 August 2000

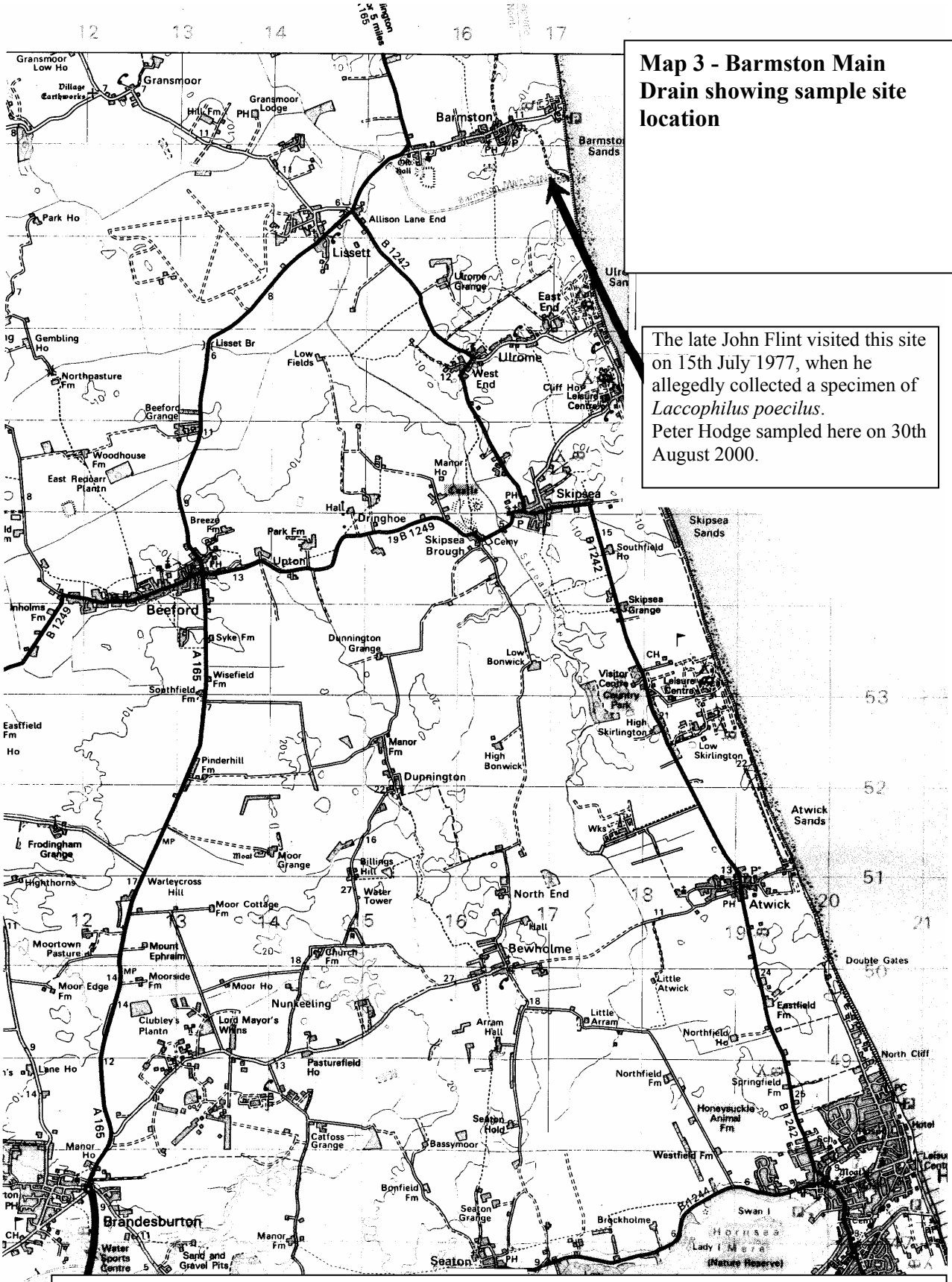
COLEOPTERA (Beetles)
CARABIDAE (Ground beetles)
Agonum thoreyi
Bembidion assimile
Pterostichus diligens
Pterostichus minor
CHRYSOMELIDAE (Leaf beetles)
Phaedon cochleariae
CURCULIONIDAE (Weevils)
Ceutorhynchus picitarsis
DYTISCIDAE (Water beetles)
Acilius canaliculatus
Agabus sturmii
Graptodytes granularis
Graptodytes pictus
Hydroporus angustatus
Hydroporus gyllenhali
Hydroporus incognitus
Hydroporus memnonius
Hydroporus neglectus
Hydroporus planus
Hydroporus striola
Hydroporus tessellatus
Hygrotus inaequalis
Hyphydrus ovatus
Ilybius ater
Ilybius subaeneus
Laccophilus minutus
Porhydrus lineatus
ELATERIDAE (Click beetles)
Dalopius marginatus
GYRINIDAE (Whirlygig beetles)
Gyrinus paykulli
HALIPLIDAE (Water beetles)
Haliplus confinis
Haliplus immaculatus
Haliplus lineolatus
Haliplus ruficollis
HYDRAENIDAE (Water beetles)
Hydraena riparia
Hydraena testacea
Limnebius nitidus
Ochthebius minimus
HYDROPHILIDAE (Water beetles)
Anacaena limbata
Anacaena lutescens
Cercyon convexiusculus
Cymbiodyta marginella
Enochrus coarctatus
Enochrus testaceus
Helochares punctatus
Helophorus brevipalpis
Helophorus minutus
Hydrobius fuscipes
Laccobius bipunctatus
PSELAPHIDAE
Rybaxis longicornis
STAPHYLINIDAE (Rove beetles)
Atheta graminicola
Dochmonota clancula
Ocyusa maura
Pachnida nigella
Stenus bifoveolatus
Stenus juno
Stenus nitens
Stenus solutus

Appendix 5
Site maps

Map 1 - Lewes Brooks SSSI showing sample site location







Map 3 - Barmston Main Drain showing sample site location

The late John Flint visited this site on 15th July 1977, when he allegedly collected a specimen of *Laccophilus poecilus*.
Peter Hodge sampled here on 30th August 2000.

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Top left: Using a home-made moth trap.
Peter Wakely/English Nature 17,396
Middle left: Co_2 experiment at Roudsea Wood and Mosses NNR, Lancashire.
Peter Wakely/English Nature 21,792
Bottom left: Radio tracking a hare on Pawlett Hams, Somerset.
Paul Glendell/English Nature 23,020
Main: Identifying moths caught in a moth trap at Ham Wall NNR, Somerset.
Paul Glendell/English Nature 24,888