THE STATUS OF DOLOMEDES PLANTARIUS (CLERCK) ON PEVENSEY LEVELS, EAST SUSSEX IN AUGUST 1990.

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CONTENTS

INTRODUCTION

DOLOMEDES PLANTARIUS IN BRITAIN PRIOR TO THIS SURVEY

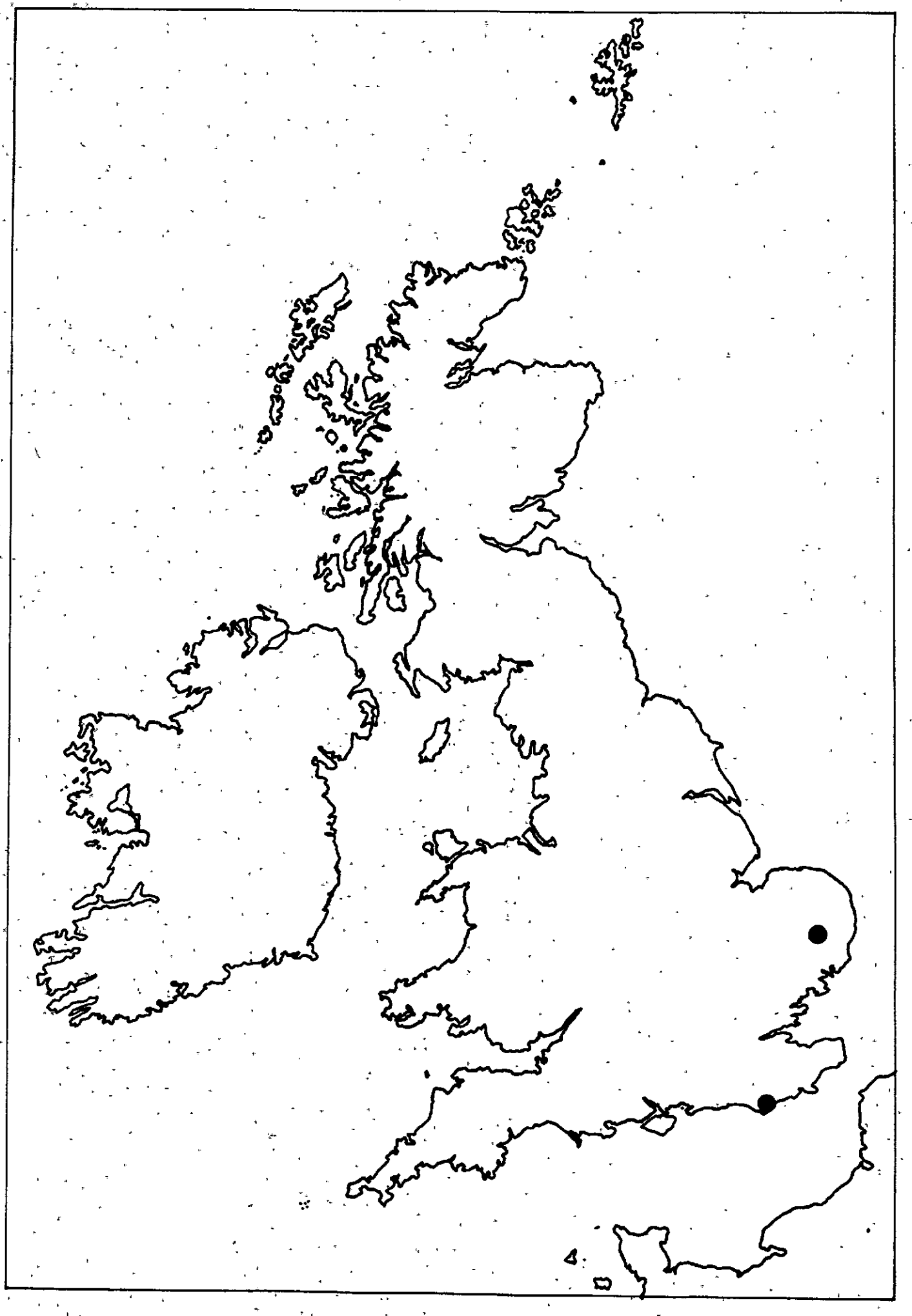
Eric Duffey found *Dolomedes plantarius* in Redgrave and Lopham fens in 1956 (Duffey 1958). This was the first certain record of this species in Britain.

Previously Pierre Bonnet had found the species amongst the collection of the early English arachnologist John Blackwall (1790-1881) but there was a possibility that it had been collected in mainland Europe (Bristowe 1971).

Redgrave and Lopham Fen remained the sole British locality until 1988 when a single female was noticed and collected at Pevensey by Peter Kirby (Kirby 1990). The indication of a second British population was exciting, particularly so from a conservation point of view as the numbers surviving at the first site are seriously low and in decline.

Map 1 shows the occurrence of *D. plantarius* in Britain as currently known.

Prior to 1988 *Dolomedes* had not actually gone unnoticed on the Levels. Several local naturalists, including myself, knew it was there but assumed that it was *D. fimbriatus*. It was recorded as such in an N.C.C. report in 1984 (Palmer 1984).



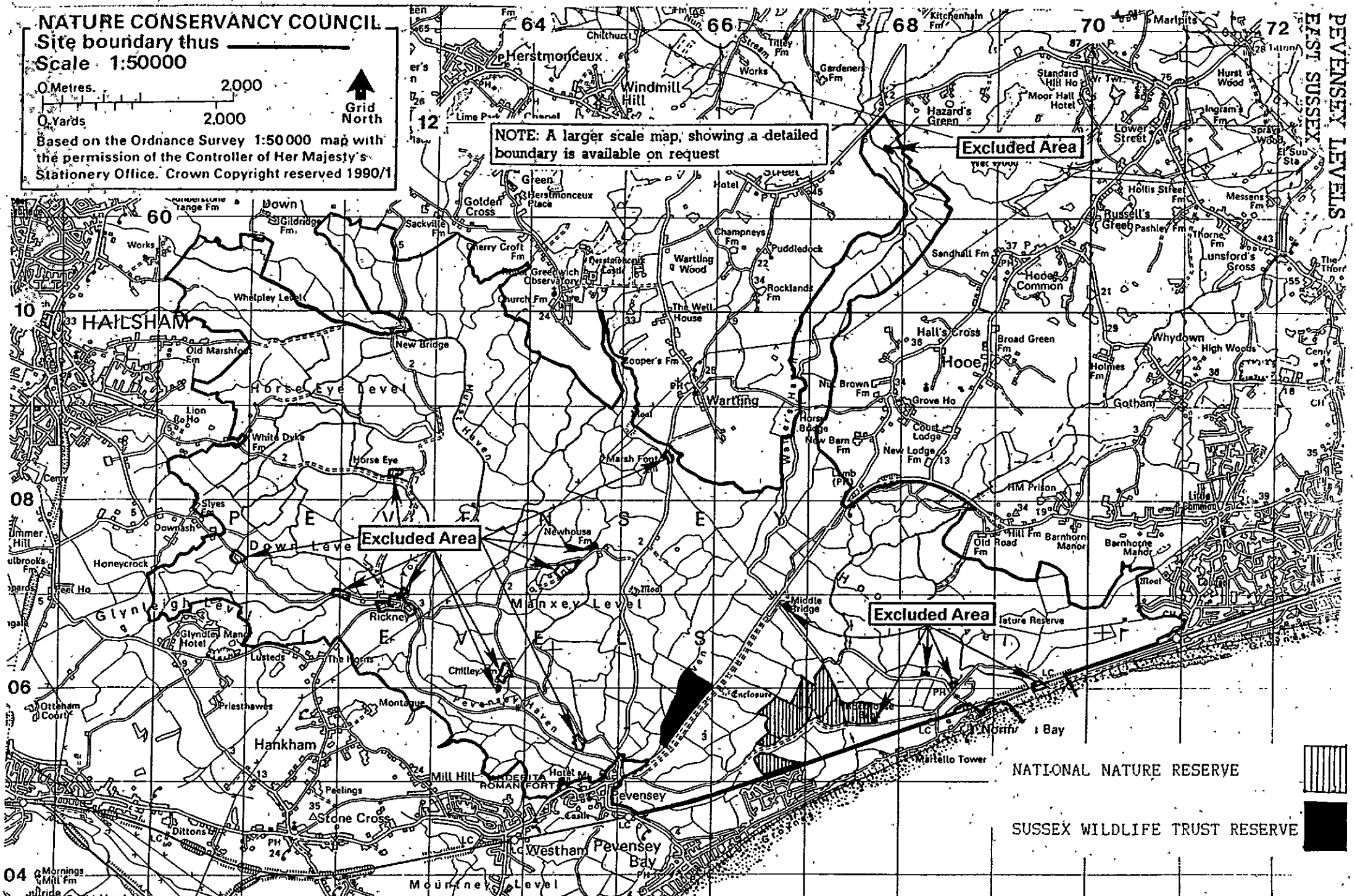
MAP 1 DISTRIBUTION OF DOLOMEDES PLANTARIUS IN THE BRITISH ISLES.

THE NEW SITE

Pevensey Levels is a large, low-lying area (over 35 square kilometres) of coastal grazing meadows drained by a complex network of narrow ditches, many centuries old, connected to a few large dykes. The water is largely unpolluted and the ditches support rich neutral wetland communities including many uncommon animals and plants. Although next to the coast, only the ditches immediately behind the beach and the seaward end of the main dykes show obvious signs of saline influence.

Most of the area is notified as an S.S.S.I. within which there are a few areas with additional conservation status. A National Nature Reserve is sited on part of Pevensey Bridge Level and the Sussex Wildlife Trust have small reserves nearby. English Nature is currently implementing a scheme to enhance the level of cooperation with farmers that already exists in encouraging traditional management of grazing meadows. Map 2 shows Pevensey Levels, the Site of Special Scientific Interest, the National Nature Reserve and Sussex Wildlife Trust Reserves

Threats to the quality of the wetland habitats exist from arable farming and from cattle slurry. The latter is becoming more important and it is notable that a few ditches thickly covered by *Lemna gibba* and *Azolla* were encountered during this survey, an indication of significant pollution. A central core of traditionally managed grazing meadow on Manxey and Pevensey Bridge Levels holds the best concentration of rich wetland communities largely free from adverse influences but ditches forming good wetland habitat can be found over the whole area


NATURE CONSERVANCY COUNCIL
Site boundary thus
Scale 1:50000
0 Metres 2,000
0 Yards 2,000
Grid North
Based on the Ordnance Survey 1:50000 map with the permission of the Controller of Her Majesty's Stationery Office. Crown Copyright reserved 1990/1
NOTE: A larger scale map, showing a detailed boundary is available on request
PEVENSEY LEVELS
EAST SUSSEX
Excluded Area
Excluded Area
Excluded Area
HAILSHAM
Herstmonceux
Hooe
Wartling
Hankham
Pevensey
Pevensey Bay
Horse Eye Level
Pevensey Levels
Glyndley Level
Manxey Level
Mountney Level
NATIONAL NATURE RESERVE
SUSSEX WILDLIFE TRUST RESERVE

AIMS OF THE SURVEY

This survey was undertaken to gain an understanding of the status of *Dolomedes plantarius* on Pevensey Levels. Prior to the survey there was only one certain record of one individual of the species from this area. The objectives were broadly as follows.

1) To gain a picture of the distribution of the spider on the Levels and some idea of its abundance.

2) To gain knowledge of the habitat requirements of the species and the optimum habitat on the Levels.

3) To acquire some understanding of how the needs of the species can be met through future conservation strategy.

METHODS

TIMING OF THE SURVEY

The survey was begun in late July and work was carried out mainly in August but also during September and early October.

No living adult males were seen during this period, only females and young.

The presence of the obvious nursery-webs during this period was useful in quickly indicating the occurrence of the spider and August seems a good time to conduct a distribution assessment for this species.

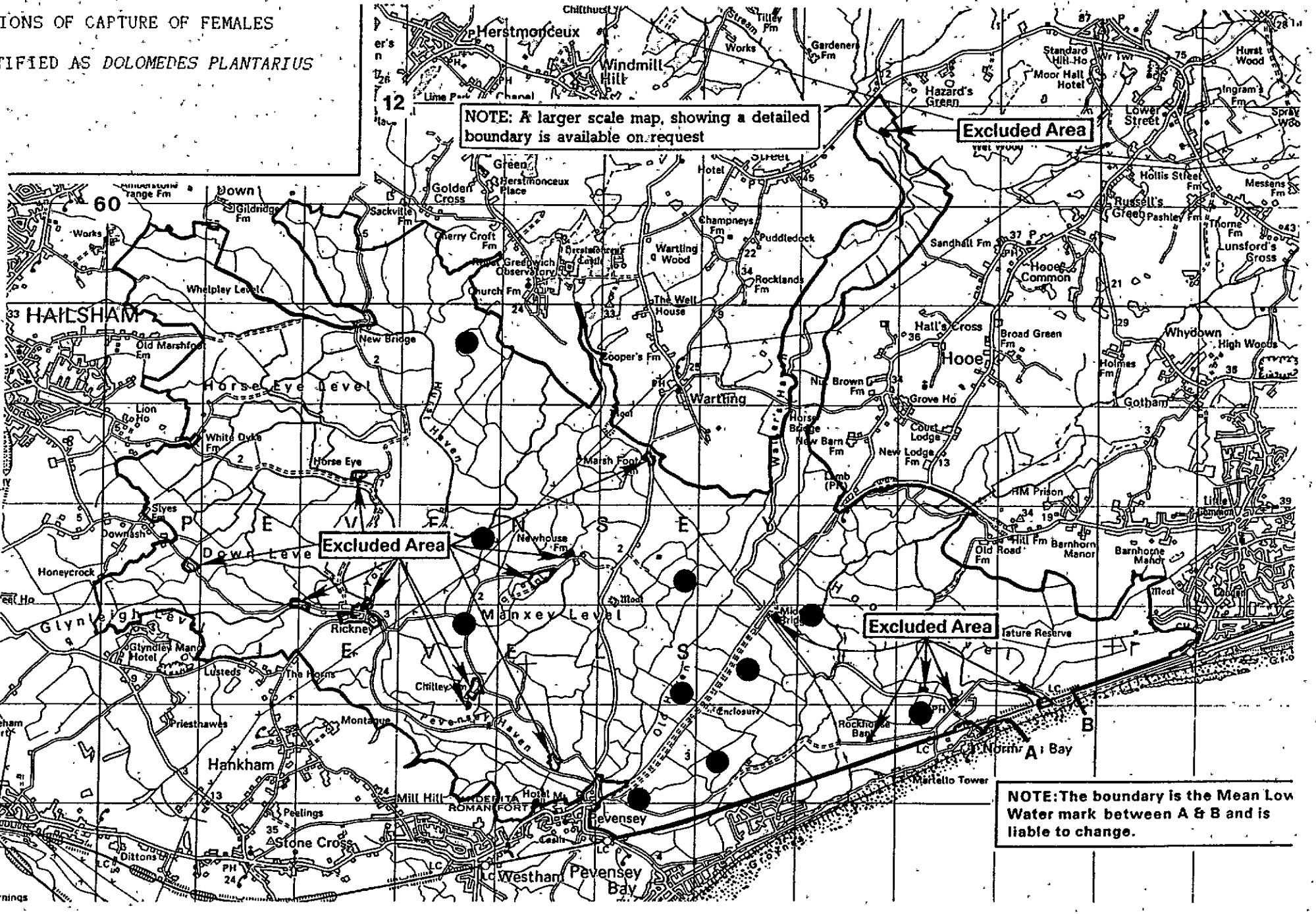
1) IDENTIFICATION

Ten adult female spiders were collected from nursery webs in different parts of the Levels (see map 3) before they were about to die at the end of their life cycle. Each was identified by microscopic examination of the epigyne. No males were available for identification, the survey beginning after they had died in early summer.

MAP 3

LOCATIONS OF CAPTURE OF FEMALES

IDENTIFIED AS *DOLOMEDES PLANTARIUS*



DISTRIBUTION SURVEY

INITIAL ASSESSMENT: As *Dolomedes* was only previously known from a few places on the Levels a reconnaissance of the area was made by visiting roadside ditches in the centre and around the edge of the extensive S.S.S.I. This indicated a fairly wide distribution within the S.S.S.I.

THE MAIN DISTRIBUTION SURVEY: The survey was then planned to cover as great an area as practicable but including good cover of Pevensey Bridge Level (where the National Nature Reserve is sited) and Manxey Level.

Initially the prospect of hunting for an elusive spider along many kilometres of ditch habitat was daunting. Fortunately the survey was begun in mid-summer when the female spiders construct their large nursery-webs. It was noted that wherever careful, time consuming searching revealed the presence of *Dolomedes*, nursery-webs were almost always in evidence. In the linear ditch habitat the webs are relatively easy to see.

It was decided to use nursery-webs as an indicator of the presence of the spider and to cover as great an area as possible by slowly walking the lengths of suitable ditches spotting the webs by sight. Nursery webs give a certain indication of a breeding population and their frequency is related to population density and viability.

The position of webs and adult spiders was marked on a map and the presence or absence of young spiderlings and a guarding female spider noted. All

spiders seen incidentally during the survey were recorded and their colour form was also noted.

The selection of ditches surveyed was not random. Dry and very overgrown ditches were initially regarded as completely unsuitable habitat. Early investigations confirmed this. Only areas which seemed to have some chance of harbouring *Dolomedes* were investigated in detail. The ditches were divided into rather arbitrary sections based using bends and junctions as end markers for each section. The pattern of coverage was chosen to sample locations around the periphery of the Levels as well as in the central area in an attempt to delineate areas of occurrence. Access limitations, particularly difficulty in traversing ditches, governed the routes walked. (See map 4).

DISTRIBUTION OUTSIDE THE PEVENSEY LEVELS S.S.S.I.

ADJACENT AREAS

In addition to locations within the S.S.S.I areas of Pevensey Levels adjacent to but outside the S.S.S.I. were investigated.

NEARBY AREAS

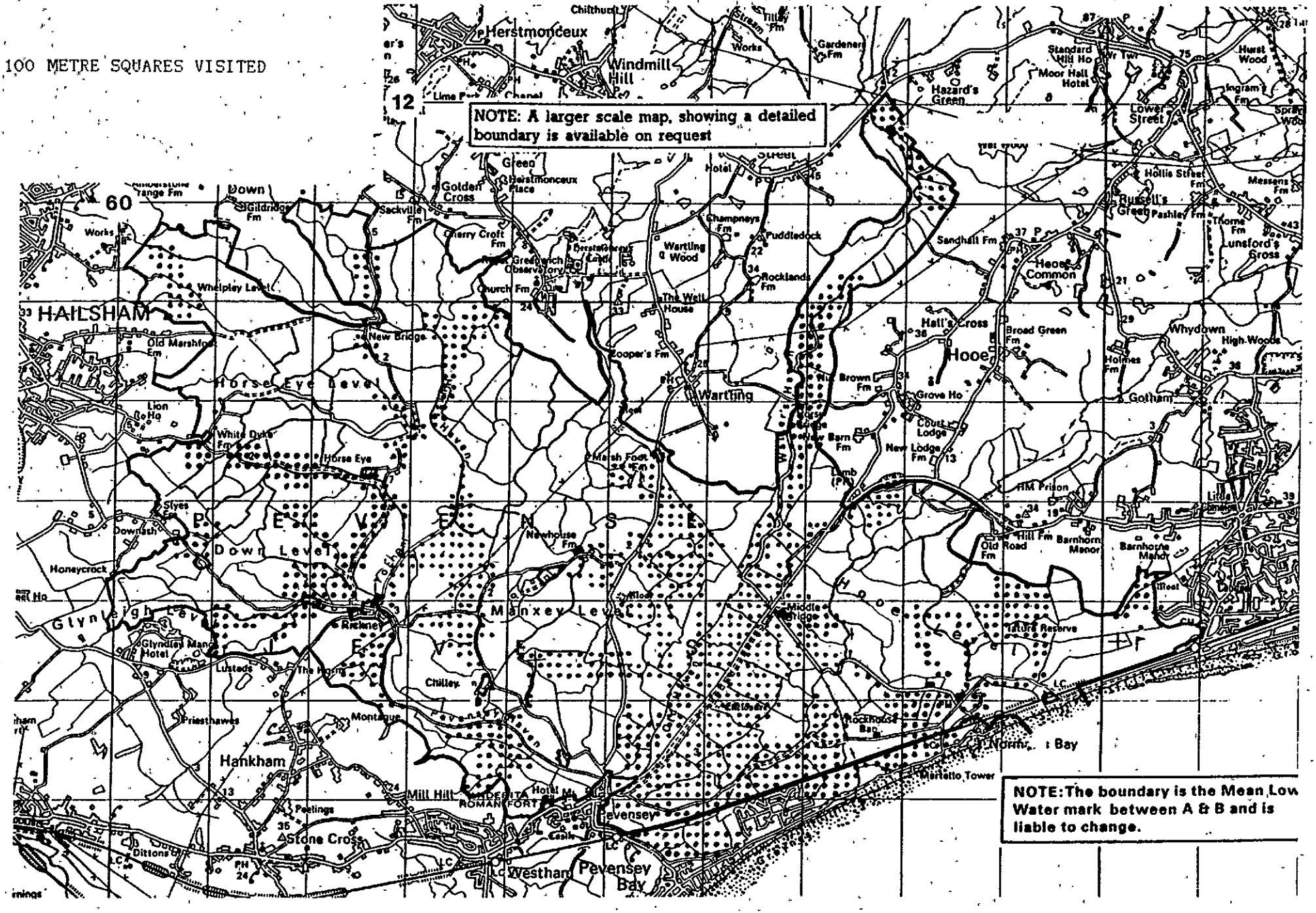
Some of the smaller areas of grazing marsh to the west of Pevensey Levels and north and east of Eastbourne were visited briefly.

THE NEAREST RECORDS FOR *DOLOMEDES FIMBRIATUS*

To spot check that *Dolomedes* known from other parts of Sussex were correctly identified, the nearest known site to Pevensey, thirty miles north of the Levels in Ashdown Forest, was visited.

MAP 4 SURVEY COVER.

100 METRE SQUARES VISITED



HABITAT RECORDING

When *Dolomedes* was found to inhabit a section of ditch a record of the habitat was made for an area of the ditch where the spider seemed most abundant. The record refers to a transect across the ditch and the area immediately adjacent to it. A record sheet was designed for this purpose. The following aspects of the ditch habitat were noted.

TOPOGRAPHY: A scale cross section including bank profile, water level and vegetation height and pattern was sketched.

VEGETATION: The dominant species of bank and water-course were noted and their abundance estimated using a modified Braun-Blanquet scale for a releve extending two metres either side of the transect. (Submerged aquatics were not identified but noted as a single cover record.)

1 1-5% cover
2 6-25% cover
3 26-50% cover) Modified Braun-Blanquet Scale
4 51-75% cover
5 75% + cover

OPEN WATER: Water free from floating vegetation, was recorded as a percentage of the total water surface area.

WATER QUALITY: The turbidity, colour and flow of the ditch water was recorded. A pH reading was taken 5cm. below the surface in as open water as possible using a Gallenkamp digital pH stick. (Early in the survey

temperature was also recorded but this was abandoned due to large variations between records that were more related to weather and time of day than the characteristics of the habitat.)

ADJACENT LAND USE: This was noted as either arable or pasture.

GRAZING: Livestock grazing damage to bank vegetation was noted as absent(0), moderate(+), or severe(*). Flattening of the vegetation by animals was also recorded(F).

POACHING: The shallow, lumpy shelf caused by poaching was recorded as absent(0), moderate(+) or very marked(*). Recent, trampling-produced muddy margins were noted (R).

TUSSOCKS: As the development of tussocky, swamp-like margins seemed important this was noted as either no tussocks or pools(0), some tussocks(+), tussocks well developed and abundant(*) or swamp-like margin with tussocks and pools of water between(P).

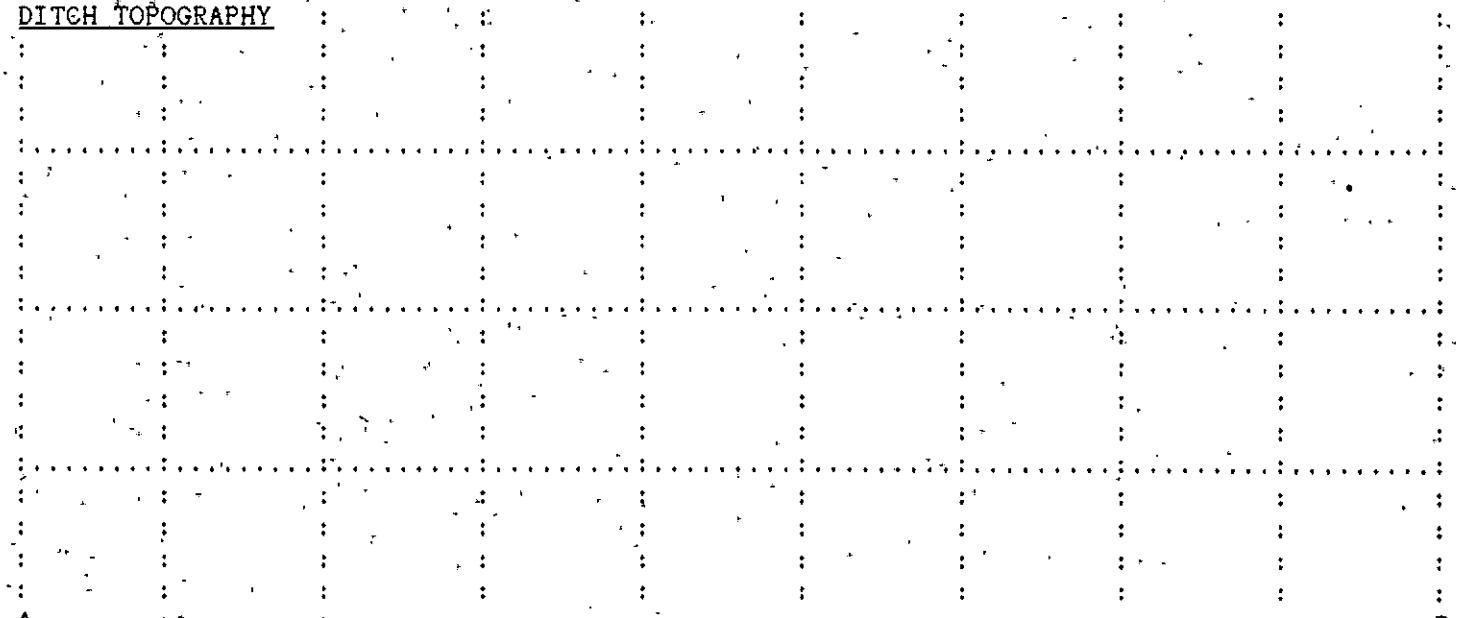
SPIDERS: The spiders and webs seen along the whole of the ditch length were noted.

NOTES: Any other notable features were recorded on the back of the sheet.

HABITAT RECORD SHEET

SURVEY REF. DATE

DITCH TOPOGRAPHY



Use	A	P
Poaching	0 + *	R
Grazing	0 + *	F
Tussocks	0 + *	P

OPEN WATER 0% 10% 20% 30% 40% 50% 60% 70% 80%+

SUBMERGED VEGETATION 12345

Use	A	P
Poaching	0 + *	R
Grazing	0 + *	F
Tussocks	0 + *	P

MAIN VEGETATION

BANK A		FLOATING AND EMERGENTS				BANK B	
Juncus	12345	Hydrocharis	12345	Sparganium	12345	Juncus	12345
Carex	12345	Lemna t.	12345	Phalaris	12345	Carex	12345
Short herb	12345	Stratiotes	12345	Glyceria m.	12345	Short herb	12345
Tall herb	12345	Potamogeton	12345	Phragmites	12345	Tall herb	12345
Tall grasses	12345	Spirodela	12345	Sagittaria	12345	Tall grasses	12345
Scrub	12345	Lemna g.	12345	Alisma p.	12345	Scrub	12345
Trees	12345	Azolla	12345	Butomus	12345	Trees	12345
Bare soil	12345	Filamentous algae	12345	Typha	12345	Bare soil	12345
Short grass	12345	Enteromorpha	12345	Iris	12345	Short grass	12345
		Oenanthe f.	12345	Equisetum	12345		
Nuphar	12345	Eleocharis	12345	Hydrocotyle	12345	Glyceria f.	12345
Nymphaea	12345	Lycopus	12345	Agrostis	12345	Callitriche	12345
Lemna m.	12345	Scirpus l.	12345	Scirpus m.	12345	Juncus	12345
Carex	12345	Utricularia	12345	Hottonia	12345	Crassula	12345

WATER

TURBIDITY	Clear	Slightly turbid	Turbid	Scum	Fe
COLOUR	Colourless	Red-brown	Peaty	Green	Milky
FLOW	None	Slight	Substantial	Tidal	

pH METER READING

DOLOMEDES spiderlings immature sub-adult adult m. f. eggsac nursury hatchlings

RESULTS

DISTRIBUTION ON THE PEVENSEY LEVELS S.S.S.I.

The survey revealed that the species is widely distributed over the site. See map 5.

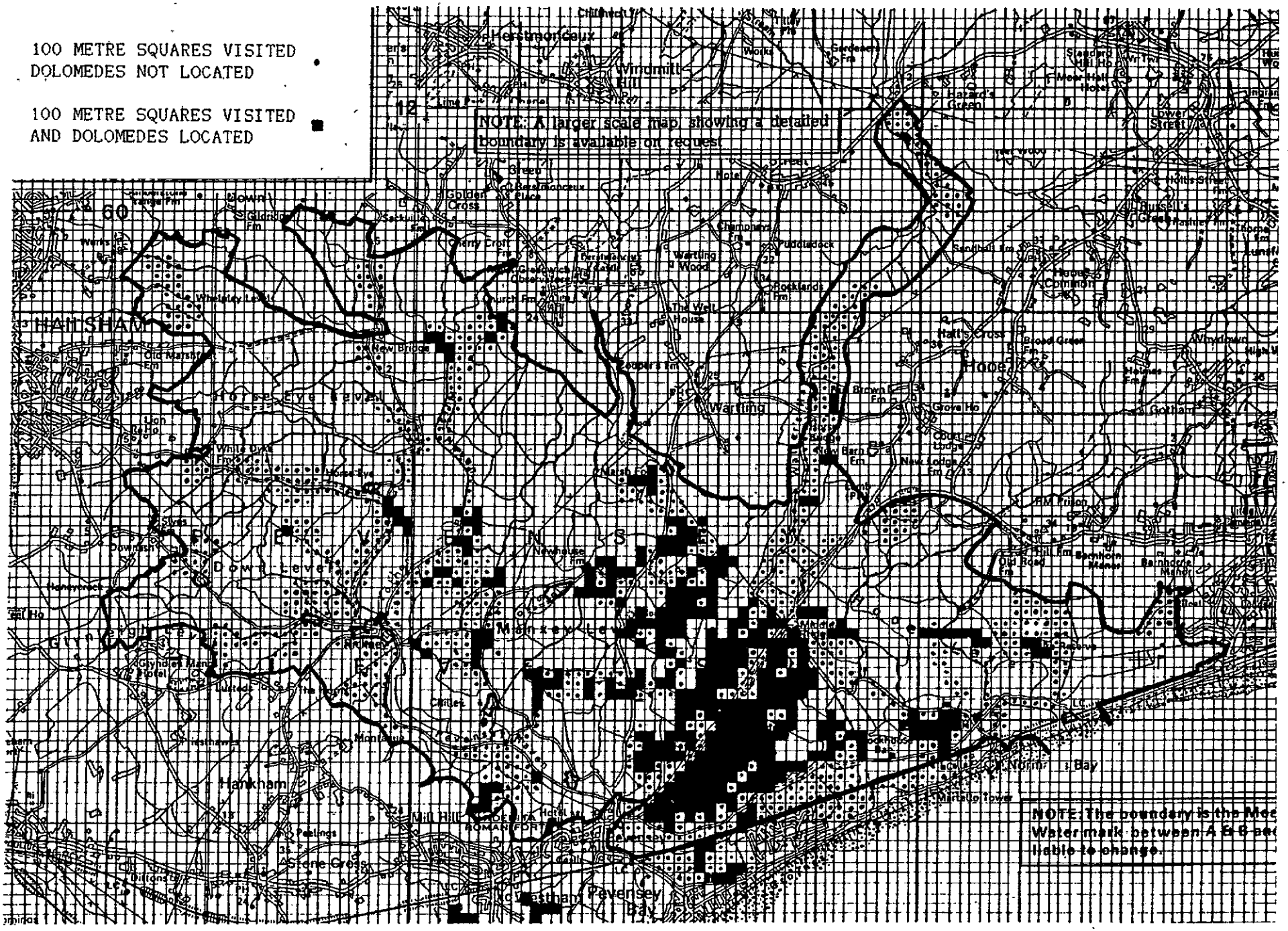
It is most abundant on gravity drained pasture on Pevensey Bridge and Manxey Levels. These areas form a central core of the range of the spider on the Levels. Within this core almost all suitable habitat is occupied and in addition the spiders seem to be common in habitat that is far from optimum. For example the poorly vegetated banks of Wallers Haven in this area support the species. The same watercourse does not support the spider where it's identical banks are adjacent to fields where no spiders were seen.

Away from the core area of Manxey and Pevensey Bridge Levels suitable habitat is less common and *Dolomedes* is more difficult to find even where there is good habitat.

ADJACENT AREAS

Part of Pevensey Bridge Level outside the S.S.S.I. was found to contain *Dolomedes*. This area is south of the railway line adjacent to the site boundary (Map).

MAP 5 DISTRIBUTION ON PEVENSEY LEVELS S.S.S.I.

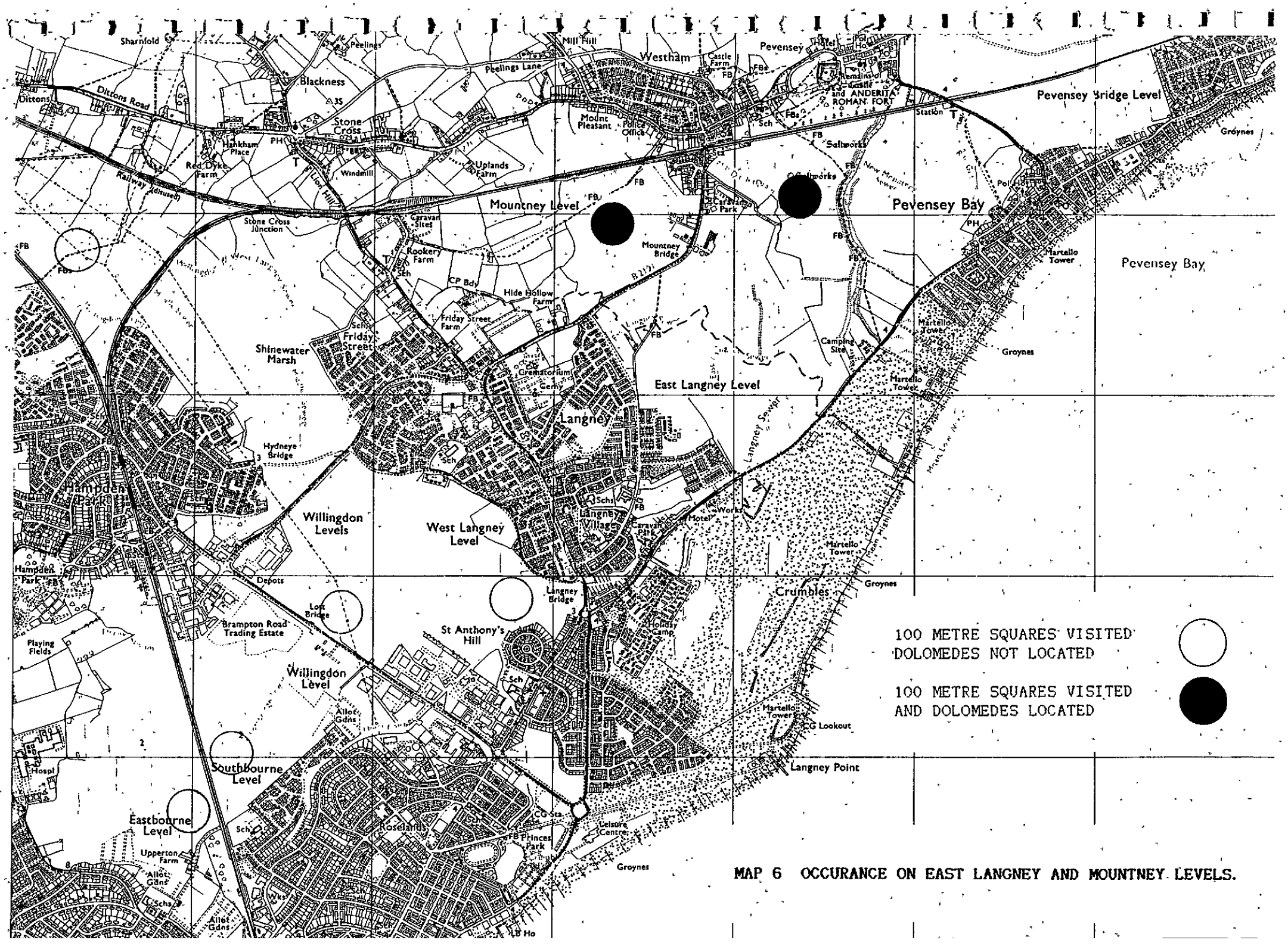


NEARBY WETLANDS

The spider was located on Mountney and East Langney Levels to the south-west of and contiguous with Pevensey Levels. (See map 6).

ASHDOWN FOREST

Wet heath in Ashdown Forest was visited as this was the nearest location where *D. fimbriatus* is recorded. I confirmed this identification. No *D. plantarius* were found.



MAP 6 OCCURANCE ON EAST LANGNEY AND MOUNTNEY LEVELS.

ABUNDANCE AND POPULATION DENSITY

Population Size

The records of spiders and nursery-webs collected in this survey permit only a very rough estimate of the size of the population on the Levels.

547 occupied nursery-webs were counted during the survey. These were webs containing a ball of spiderlings and which are normally guarded by a female. (Only 402 females were actually seen in the webs but their presence is inferred). An additional 62 female spiders were seen incidentally often carrying an egg-sac(39). The total adult female count was therefore 609. (Map 7 shows the number of females counted in 500 metre squares.)

Assuming a detection rate for adult females of 50% (they are hard to find) then a figure of about 1,200 is arrived at. (No adult males were found as the survey was conducted too late in the season.) Given that only part of the levels was covered in the survey then the total population could be about three or four thousand adult females, probably more, over the whole of the levels in summer.

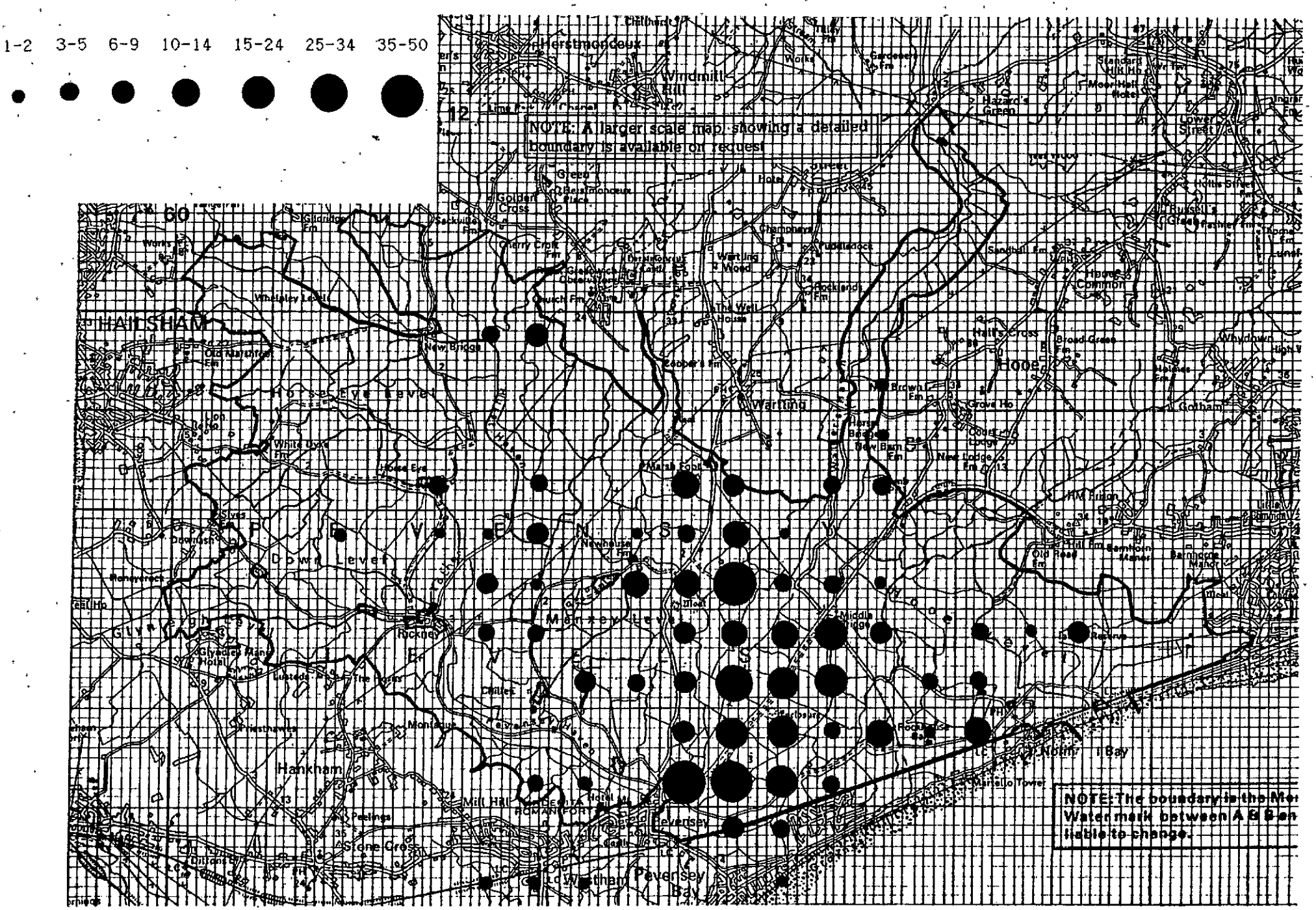
Population Density

The density of the spider population in terms of the number of spiders seen in a given length of ditch was very variable. The variation seems to be related to habitat quality and ranges from a minimum of 1 spider seen in ditch section of 300 metres to a maximum of 34 spiders seen in a section 75 metres long.

This places the maximum observed density at about 1 female per 2 metres. (As stated above a detection rate in the current survey may be as low as 50% and so in the optimum ditch habitat the density may approach 1 adult female per metre of length.) Such densities can only be found where the actual area available to the spiders is greatly increased compared with the narrow margins of most ditches. Three or four square metres or more of swampy margin and floating vegetation may be present per metre of ditch length in the best habitat. Such ditches are very uncommon except in the central core area and an average frequency of sighting (calculated by dividing the total length of the ditch sections in which the spider was recorded (approximately 30km.) by the total number of spiders found(609)) is about 1 per 50 metres.

The overall frequency with which spiders were met during the survey calculated by dividing the total length of ditch walked (approximately 90km.) by the total number of spiders seen (609) was about 1 per 150 metres. Given that the route walked was not random but guided towards ditches that looked as though they might hold *Dolomedes* it can be supposed that the likelihood of an observer meeting the species over the total ditch length of the Levels is much less than this.

MAP 7 NUMBERS OF SPIDERS SEEN TOTALLED IN 500 METRE SQUARES



HABITAT RESULTS

140 records were completed. The records collected forms a series of snapshots of *Dolomedes* habitat on the Levels. The noted trends in terms of the preferred habitat were perceived after careful consideration of the data but without detailed statistical analysis. The raw field data forms Appendix 1 of this report.

IMPORTANT ELEMENTS IN THE HABITAT OF *Dolomedes plantarius.*

The elements in the habitat of the spider that seem to be important are as follows. Figure 1 illustrates some of these.

1) Open sunny location. *Dolomedes* was not found in areas of ditch shaded by high, steep banks or by tall, dense vegetation. In good weather the spiders are almost always seen basking in a sunny spot. This is particularly true of females before and after egg-laying. Nursery-webs are invariably located in the sunniest places.

2) Permanent standing water supporting a diverse and abundant aquatic animal community. The spiders are not found in the extensive areas of grazing marsh which are temporarily flooded even where there are well developed *Juncus* tussocks. They seem to require proximity to more or less permanent relatively deep water although they were found in four ditches which had dried to wet mud at the end of summer. It is possible that the aquatic component of the habitat is an important source of food, the spiders, particularly the adults, taking prey from several centimetres

below the surface as well as hunting on the water surface and amongst marginal vegetation. Large areas of open water were not a major feature with a mean cover in small ditches of about 20% and this normally present as a mosaic of small open fragments between floating plants. This underlines the actual habitat of *Dolomedes* as marginal and floating vegetation rather than on the open water surface as it is sometimes popularly portrayed. (The spider can certainly run across the surface film and does so when darting out from a leaf to capture prey or when escaping capture itself.)

3) Tussocky field layer bankside vegetation close to water level. At least some development of tussocks of grasses, rushes or sedges along the water's edge was a constant feature in the recorded locations. The dense clumped form and development of litter provides cover from predators, winter and bad weather refuge, hunting areas and also structures to support nursery-webs. Vegetation less than a metre tall is favoured possibly because the spiders prefer to stay as near to the water surface as possible and because they move more easily amongst the matted network of low tussocks than on the vertical stems of plants such as reeds. The low, tussocky vegetation is sunnier, offers better shelter and supports more abundant prey than tall stands of, say, reeds.

4) Floating vegetation spreading out from the bank creating a mosaic of open water surface and surface plants is a feature of the ditches which reaches maximum development in late summer and virtually disappears in the winter. Almost all of the sites noted possessed this feature, *Hydrocharis* usually being the dominant species. Floating plants greatly extend the

summer habitat of the spider. Where the raft of plants is extensive and encompasses emergents or emergent floating plants, particularly *Stratiotes*, this vegetation can become the main summer habitat and favoured nursery-web support as the spiders move out from bankside tussocks on to the sunny water-level platform. There they have abundant prey which they can hunt efficiently by detecting water-surface vibrations and they can escape predators by hiding underwater.

5) Water quality. Apparently unpolluted water was the norm. pH ranged from 6.10 to 7.31 with a mean of 6.86. Pollution probably from slurry may have been the cause of *Lemna gibba* thickly covering the water surface as noted in a few records but the spider was still present despite this. Water quality, unless the surface tension of the water is affected or a substance such as oil which could adhere to the spiders is present, is possibly only indirectly important in that it could affect, say, plant growth and prey organism abundance.

6) Water flow. All of the records were for ditches with a flow that was very slow or negligible except for a few places on main channels where the spider occurred in bankside areas protected from water currents by the bank shape or by vegetation. Significant flow would tend to sweep the spiders out of their habitat and is not favourable.

Interestingly the records show that whilst there are typical associations of plant species forming the ditch vegetation where *Dolomedes* occurs it not closely associated with particular plant species. Any plants providing the

appropriate bankside and water surface structures described above form suitable habitat.

Nor is *Dolomedes* restricted to pasture ditches although it is most commonly found in them. It occurs in arable ditches when the structure of the habitat is suitable.

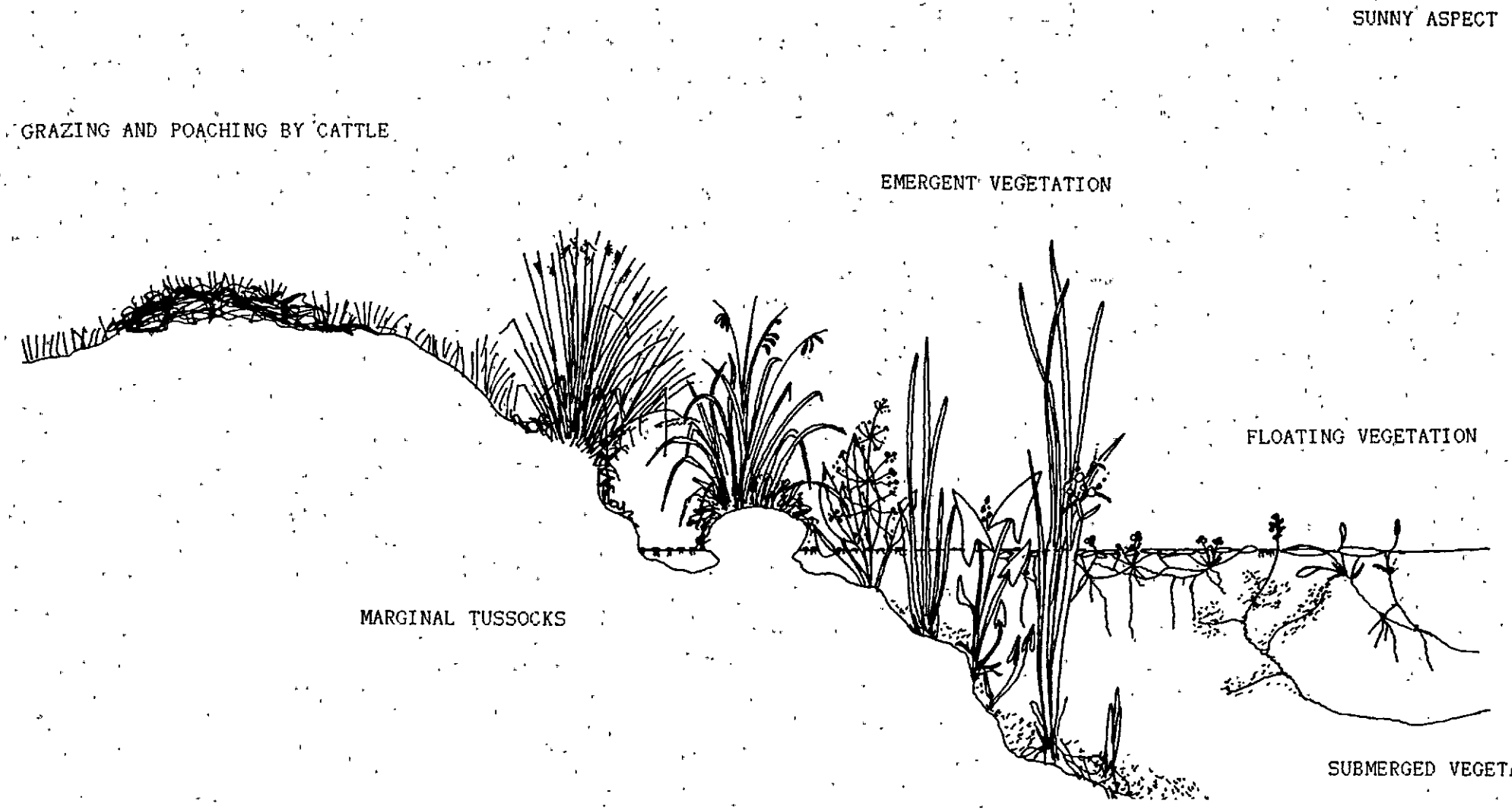
Detailed records of ditches without *Dolomedes* were not collected but the types of such ditches were noted and are summarised below.

1. Ditches shaded by trees or scrub or other tall, dense vegetation.
2. Phragmites dominated ditches with poor aquatic and marginal vegetation.
3. Recently cleared ditches with poorly developed marginal vegetation.
4. Deep ditches where the marginal vegetation is shaded.
5. Most wide main drainage channels with flow and fluctuating water level.
6. Ditches near the sea with noticeable saline influence.

Dolomedes was apparently absent from many ditches that appeared to be good habitat. This phenomenon was most common away from the central area of distribution (eg. on Horse Eye Level on the western margin of the S.S.S.I.) and unusual within it (ie. on Manxey and Pevensey Bridge Levels).

ELEMENTS OF DOLOMEDES PLANTARIUS HABITAT ON PEVENSEY LEVELS

FIGURE 1



EXAMPLES OF *DOLOMEDES* HABITAT ON PEVENSEY LEVELS

TYPICAL GOOD HABITAT

Ditches that are sunny and have a margin dominated by tussocky rushes and perhaps sedges growing on a lumpy poached shelf are favoured. Floating vegetation is typically well developed. Emergent vegetation is advantageous but not so dense and tall as to create too much shading.

In such a situation the spiders are normally found in sunny spots at the edge of the water at the bank or on floating or emergent plants. Nursery webs are found higher on the bankside vegetation again in sunny places typically less than a metre above water level. See figure 2.

TYPICAL BUT LESS FAVOURABLE HABITAT

As the vegetation in the ditch grows dense and tall as succession progresses Dolomedes is increasingly restricted by a reduction in the area of open sunny habitat. It seems to survive even if there are only a few sunny corners and fringes available. Junctions between ditches and the gate-ends of sections often provide open areas.

It is likely that *Dolomedes* born into fairly good habitat may themselves be breeding in a much more vegetated ditch due to rapid overgrowth. Eventually there comes a time when, although early in the year there may be some open areas, by the time that females are carrying egg-sacs they are forced to climb high into the marginal vegetation to warm them in sunshine. The future of their young is probably doubtful unless there is clearer ditch nearby.

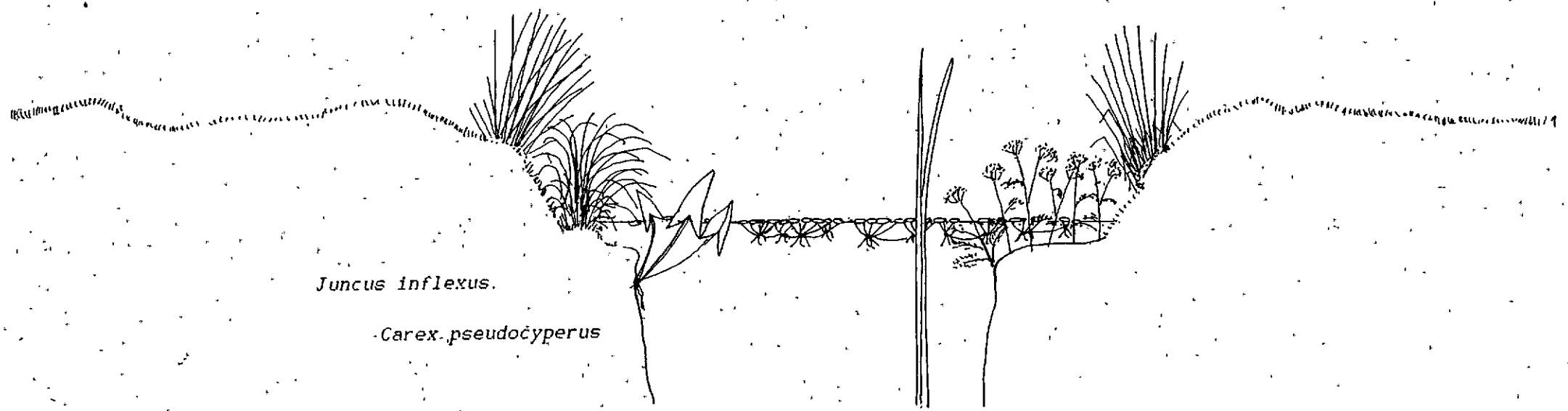
In overgrown ditches where emergents grow tall and dense the spiders are confined to the few sunny patches. These may be in grazed bank vegetation, often well over a metre from the water. Usually only a few individuals are seen but sometimes several spiders crowd a single, small, open area in an otherwise overgrown ditch. See figure 3.

THE BEST DITCH HABITAT SURVEYED

A few sections of ditch had an apparently ideal structure and vegetation. The water level was up near the top of the banks and cattle grazed the margins with ease. Wide poached shelves with very well developed tussocks of sedges and rushes growing in shallow water fringed the deep ditches. The structure of the bank gives an impression of having been developed over many years by grazing and trampling cattle although the central channel must have been cleared within that time. See figure 4.

The water surface in the main channels was almost covered by *Stratiotes*. This plant offers a very good environment for the spider as it's tough, spiky leaves stand clear of the surface but lead down to small areas of open water at their base. The plant provides a good hunting platform, protection from predators and in this habitat most spiders were observed away from the bank on the floating vegetation. In addition nursery-webs were found mainly on the *Stratiotes* just above the water surface. This was the only occasion that webs were seen so near the water. The plant was especially suitable as any change in water level would not affect the position of the webs on the raft of vegetation. The combination of the excellent swampy margin and the well developed *Stratiotes* floating habitat was obviously a good one for the spider.

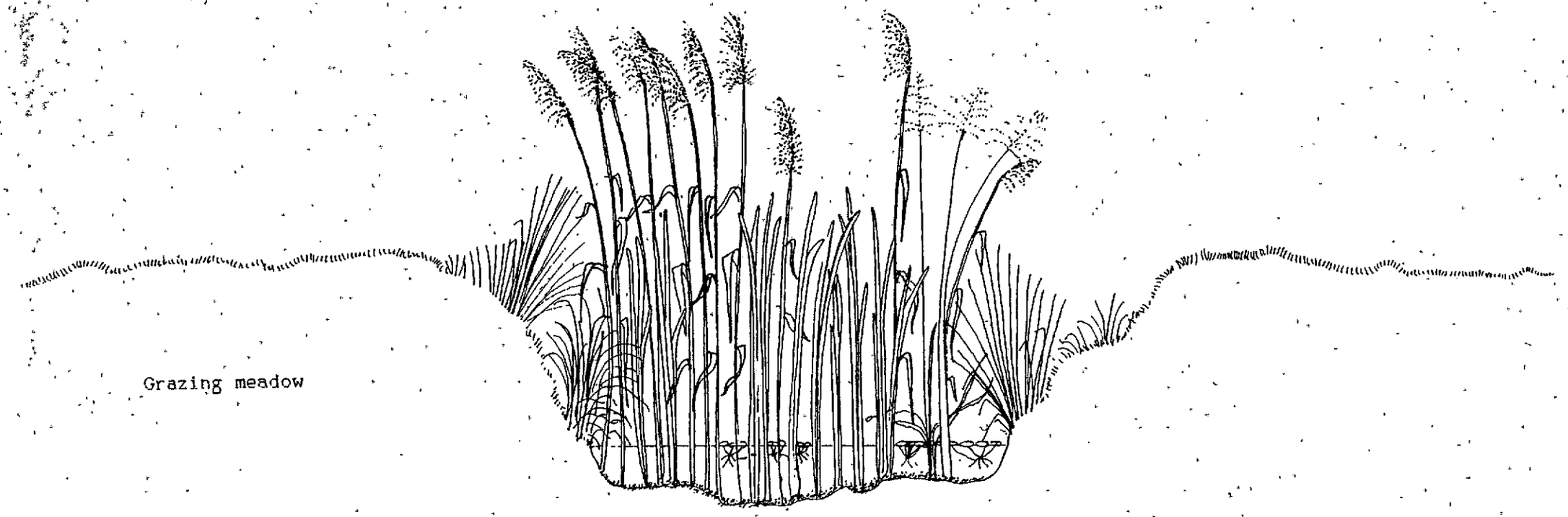
FIGURE 2 GOOD TYPICAL PASTURE DITCH PROFILE.



Hydrocharis morsus-ranae
Spirodela polyrhiza
Lemna trisulca
Sagittaria sagittifolia
Oenanthe fistulosa
Alisma plantago-aquatica

1 METRE

FIGURE 3. OVERGROWN, LESS GOOD DITCH PROFILE.



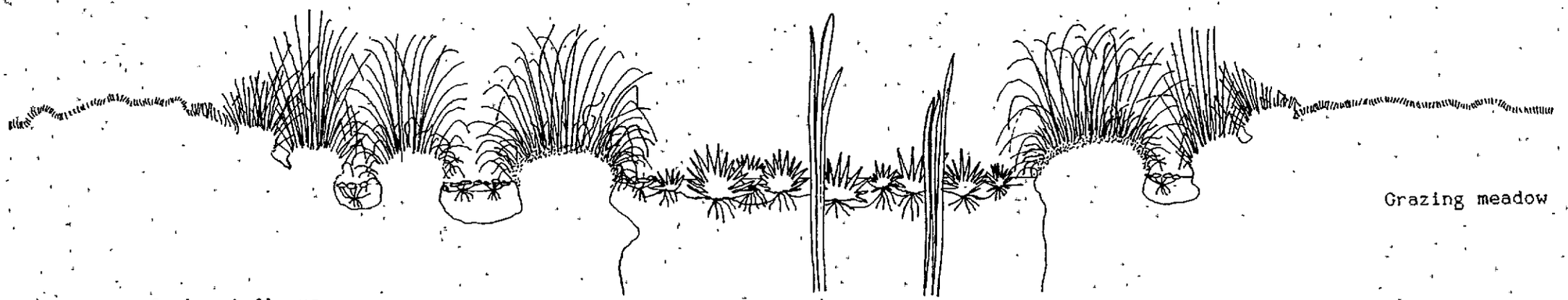
Grazing meadow

Juncus inflexus

Sparganium erectum
Glyceria maxima
Phragmites australis
Oenanthe fistulosa
Hydrocharis morsus-ranae

1 METRE

ROFILE OF THE BEST DITCH HABITAT SURVEYED.



Grazing meadow

Juncus inflexus

Carex pseudocyperus

Stratiotes aloides
Hydrocharis morsus-ranae
Spirodela polyrhiza
Lemna trisulca

Sparganium erectum
Oenanthe fistulosa
Alisma plantago-aquatica

1 METRE

DISCUSSION

IDENTIFICATION

The distinction between the two species is clear and an easy one to make with microscopic examination. All specimens examined were *Dolomedes plantarius* and this further confirms the species in this site. Given the relative uniformity of habitat it is unlikely that both species of *Dolomedes* are present.

Many of the spiders seen on the Levels were without noticeable stripes and this does seem to be a feature of this species. I made records of the appearance of the adult female spiders that I saw and considered about 28% of them to be without stripes. There is also considerable variation in the background brown colour ranging from a light tan to almost black.

The concept of distinct colour morphs was sometimes confounded by experience. I often had difficulty in allocating individuals to one of several colour forms described by other workers and there could be more or less continuous variation. It may be that dulling of the colour of already more sombrely coloured females late in the season obscured the true colours. Survey early in the year to include males and fresher colours would be useful in this context.

This variation in colour does occur in *D. fimbriatus* (I have seen completely unstriped specimens of this species) but very rarely. The

presence of a significant proportion of all-brown spiders would seem to be good field indicator of *D. plantarius*.

DISTRIBUTION

Pevensey Levels is a large area to cover in a short space of time and this survey only reached part of it. There are probably populations in the areas not reached especially on Hooe and Horseye Levels. The method of counting nursery-webs, while quite reliable, certainly left some populations overlooked in the areas that were covered but without the speed provided by this approach the surveyed area would have been much smaller.

DISTRIBUTION ON THE S.S.S.I:

Enough ground was covered to indicate the overall pattern of the distribution on the levels. The spider appears well established in the parts of the Levels that are still managed more or less traditionally as grazing marsh. It is found in the small, swampy ditches rather than main drains. The high, steady water levels, unpolluted water, a rich aquatic flora and fauna combined with moderate poaching and grazing create good habitat for the spider It seems to be occupying most available habitat in the central area formed by Pevensey Bridge and Manxey Levels. The National Nature Reserve contains a healthy Dolomedes population as does the main Sussex Wildlife Trust Reserve.

Away from the central core of gravity drained Levels good habitat is rarer due to lowered water levels and different farming practice and the

available areas of good ditch are more isolated and not all colonised. This may be due to some factor not yet identified or to local extinctions in the past due to management changes and the inability of the spider to move into now isolated habitat. This pattern of distribution may indicate that the spider was formerly common over the whole of the levels but that recent drainage and land use practices are contracting it's range to the areas that are still largely traditionally managed

OCCURRENCE OUTSIDE THE S.S.S.I.:

The spider was found in an area not currently included in the S.S.S.I. south of the railway line on Pevensey Bridge Level. This area is grazing meadow with fairly good ditch communities and may be worth including in the S.S.S.I. See map

The occurrence of the spider on Mountney and East Langney Level highlights the biological interest of the complex of smaller Levels between Pevensey and Eastbourne. It is possible that the spider occurs in several places on these Levels in addition to the two sites located by brief visits. The conservation value of these areas should be considered as they are likely to be (if they are not already) under threat from development in the near future.

The way in which *Dolomedes plantarius* was overlooked at Pevensey suggests the possibility that it occurs on other wetlands either unnoticed or misidentified as *Dolomedes fimbriatus*.

ABUNDANCE AND DENSITY

The information acquired during the survey permits only very rough estimates of numbers and and population densities on the Levels.

The unpredictably patchy nature of the ditch habitat over the levels makes extrapolation from the survey data difficult. A conservative estimate is a population of adult females over the whole Levels of over three thousand.

The spiders are thinly spread in low density and/or small colonies over most of the Levels. In the central area of gravity drained pasture, better habitat permits denser populations and a maximum frequency of about one female adult spider for each metre of ditch length but only in the best ditch habitat.

HABITAT

This survey collected data on the ditches in which *Dolomedes* was found. A notable feature of it's occurrence is a lack of close association with particular plant species. Nor is the spider found only in areas with good floristic diversity, although it usually is.

It appears that the structure of the habitat is important rather than particular plant species. This pattern is emphasised by comparison between the habitats in Redgrave and Lopham Fen and on Pevensey Levels where somewhat different plant communities provide similar habitat structure.

The spider obviously needs to be near more or less permanent water but next to this the form of the bank and marginal vegetation seems most important. The spider needs the shelter provided by tussocky plants such as sedges and rushes and also their particular field layer structure on which to build nursery-webs. The bank must be open and sunny, the spiders seem to require the warmth. Given such a bank next to permanent water which is steady in level the spiders can probably maintain a viable population. The habitat is made much more favourable if the marginal zone is expanded into a swampy area and better still if floating vegetation further expands summer hunting area. Certain plants appear to be more favourable than others. Sedges, often *Carex pseudocyperus*, grow in good tussocks on poached swampy shelves and Water Soldier (*Stratiotes*) provides the best floating raft although Frogbit (*Hydrocharis*) is normally dominant and useful to the spider.

THE INFLUENCE OF SUCCESSION AND CLEARANCE

Natural vegetational succession in the watercourse leading to taller emergent communities gradually shades the water surface and bank and reduces the amount of open habitat available to the spiders. The process is reversed when the ditch is cleared but in the initial phase after clearance the bankside vegetation may not offer enough shelter for the spiders. Optimum habitat is only present in the intermediate stages after the bank vegetation has developed enough to shelter the spider but before the ditch is overgrown by tall and dense emergents. Grazing of the ditch margins probably extends this phase significantly.

WATER QUALITY

It is likely that water quality is indirectly important in that unpolluted

water tends to support richer a fauna and hence a better food supply. (One of the reasons that such a large, active spider is found at the water's edge is probably that in the transition zone between terrestrial and unpolluted aquatic habitat there is an abundance of prey animals.) Eutrophication tends to spoil the spiders aquatic habitat as dense filamentous algae and duckweeds clog the water surface.

THE SIZE OF THE SITE

Small areas of open swampy habitat are common in many wetland sites but the spider is not. A possible explanation for this could be in the interaction between the size of the site, the natural vegetational succession and the management of the site influencing the historical continuity of good habitat. On a small site it is much more likely that open sunny habitat could disappear for a few years due to growth of tall dense plants such as reeds. This would cause temporary local extinction of the spider which could then become permanent if the recolonising ability of the spider was too limited

On Pevensey Levels the size and complexity of the area leads to a constantly changing mosaic of ditches at different phases of succession. Good spider habitat is both destroyed and created at any one time. Over the large area this dynamic pattern must have provided some habitat without a break since the Levels were formed. The spiders probably find newly suitable habitat by dispersing along the ditch network. Management maintaining open habitat was also practiced at Redgrave and Lopham Fen where peat and sedge cutting was important and probably the reason for it's survival there.

POSSIBLE HABITAT PREFERENCES IN DOLOMEDES

Dolomedes fimbriatus is usually associated with acid heath and bog wetlands being most abundant where plants, especially tussocks of *Molinia* grow in a swampy habitat very similar in structure to open sedge swamp in higher pH environments.

D. plantarius may have originally inhabited open swamp or fen in which tussocks of various sedges and rushes formed islands surrounded by permanent water. Pevensey is a wetland with surface water around pH 7 and the area of Redgrave and Lopham Fen which is the only other British site may originally have had surface water of similar or higher pH. (Although now it is markedly acid.)

It is possible that pH of the water with the consequent differences in otherwise structurally similar communities is a key element delineating the niches of the species, Dolomedes plantarius preferring less acid habitat.

The current restricted distribution of *D plantarius* may be due to a combination of the history of extensive neutral and alkaline wetland destruction and the very transitory nature of open fen-swamp in the absence of grazing, due to rapid succession to shadier reed-bed or carr, in any remaining fragments. *Dolomedes fimbriatus* survives on peatlands and wet heaths which, although much reduced, are still better represented than substantial areas of open fen-swamp.

It seems likely that *Dolomedes* and much of the rich fauna and flora of the Levels has survived in this region from pre-history. There has probably

been suitable ditch habitat on the levels for hundreds of years and before that more natural wetlands were in the region, including peat generating fen, for thousands.

Dolomedes plantarius may have been widespread in southern Britain before wetland such as swamp, fenland and latterly grazing marsh was reduced and fragmented in recent centuries.

THE POSSIBILITY MORE RECENT ARRIVAL ON THE LEVELS

Although the idea may be less attractive there is also the possibility that *Dolomedes plantarius* has arrived on the levels since they became grazing marsh. It could have arrived from the continent as ballooning young or been introduced with water plants from abroad (*Stratiotes* is thought to be introduced and is an important plant in *Dolomedes plantarius* habitat in Holland.)

EFFECTS OF LAND USE AND DITCH MANAGEMENT

On Pevensey Levels Dolomedes is living in habitat created and constantly modified by agricultural management. It's populations are very affected by a range of management processes.

1) Drainage regimes: Water tables on the Levels are regulated by gravity drainage, pumped drainage and sluices acting within the network of ditches. Overall the trend is to hold water in the ditch system in the late spring and summer and to prevent flooding in the winter. This tends to keep levels in many ditches fairly constant (allowing for some fluctuation often due to heavy rainfall and long periods of drought.) This probably works in the

spider's favour as water-side habitat is available through the months when the spider is active and flooding is rare. The effects of temporary flooding in winter or summer on Dolomedes is not known. It may be an important factor.

The height of the water table is important. The nearer the water level in the ditch is to the top of the banks, the less the ditch is shaded by the banks and the warmer the marginal and water surface habitat. Water low in the ditch also makes the development of a favourable, broad marginal zone less likely than when the water laps the lower gradient slopes near the top of the ditch. Poaching by livestock enhances the habitat whatever the water level but tends to create a very favourable, broad, swampy shelf in situations where a high water level approaches the field level. For these reasons pasture where high levels are maintained in the ditches to form wet hedges provide the best habitat. Deeper ditches and low water levels commoner in arable areas are less good.

Land use: Livestock, especially cattle, grazing the marginal vegetation and trampling the banks enhances the habitat for Dolomedes. Grazing keeps the plants low, preventing the ditch becoming too shady and favours tussocky growth of sedges and rushes. However overgrazing tends to degrade the lusher optimum vegetation and could reduce the reproductive success of the spider if nursery-webs are destroyed in the process.

Trampling of the bank especially if there is a shallow slope into the water may lead to the formation of a wet shelf, expanding the width of the marginal vegetation and increasing the area available to the spider many

times. Of course over-trampling can reduce the bank to bare mud destroying the habitat.

Over several years poaching and grazing can favour the formation of ideal habitat with well developed, large, dry tussocks, often of sedges, with pools between.

Arable fields, apart from tending to have deepened ditches and low water levels, are usually bordered by a ditch bank of tall, ungrazed herbs and grasses which shades the wet habitat in the ditch. The arable ditches seem to be more commonly overgrown by tall emergents which may be due to infrequent clearance or to lower water levels. All of these factors decrease the likelihood of finding *Dolomedes* in arable ditches.

Ditch management: Ditch clearance is obviously essential to the survival of Dolomedes on the Levels but it is initially damaging to any population resident in the ditch being cleared. The various methods employed in ditch clearance have different effects on the subsequent quality of the ditch habitat.

Clearance techniques affect 1) The aquatic vegetation and ditch bottom.
2) The bank and marginal vegetation.
3) The shape of the bank.

Traditional methods involve dredging out the mud and plants from the channel and perhaps cutting any tall bankside and marginal vegetation. the largely organic dredgings are dumped along the edge of the field. The ditch profile including the poached shelf is largely unmodified and marginal

plant roots intact. The aquatic community soon recovers, many plants and animals surviving the operation.

Modern dredging often using large plant also takes out bottom mud and vegetation but the banks often receive a heavier mauling and the bank profile tends to be modified, poached shelves being smoothed out by a scraping action of powerful machinery. Plant roots in the bank can also be removed or damaged. The ditch may take a few years to grow over enough to support viable Dolomedes populations and much longer before poaching creates an optimum swampy shelf.

Recutting and deepening the ditch combined with lowering water tables to favour arable land use is most damaging. The sides of the new ditch are cut back to bare substrate and are usually steep. This type of modification may result in poor development of marginal vegetation for many years and may never form optimum habitat unless the shape of the ditch is altered radically by, say, cattle over decades.

Spiders probably recolonise cleared ditch by moving along the watercourse from adjacent uncleared habitat rather than by the ariel dispersion of spiderlings. If this is the case it follows that large lengths of ditch network cleared together will not be recolonised quickly. Isolated habitat destroyed in clearance may never be recolonised.

CONCLUSIONS

1. *Dolomedes plantarius* is well established on much of Pevensey Levels and it also occurs on East Langney and Mountney Levels.

2. It is most abundant on the traditionally managed Pevensey Bridge and Manxey Levels

3. Recent agricultural practice is contracting it's range on the Levels and it is uncommon or absent in areas most affected.

4. The adult female population is probably at least three thousand in summer.

5. A density of one female per metre of ditch length is likely in the best ditch habitat. Typically it is much less.

6. The spider is dependant on the regular clearance of ditches to maintain favourable open habitat and the best habitat is found on traditionally managed grazing marsh.

7. On the gravity drained, traditionally managed Levels the populations seem very healthy and there is a good possibility of maintaining or improving their current status in the immediate future. However it appears that the spiders are vulnerable to alterations in land use, ditch management or drainage regime. It would not take much more than a

few years of unfavourable land use to eradicate the spider from part of, or even the whole of, the Levels.

8. The habitat of the spider on the levels is amongst tussocky field layer vegetation in open, sunny locations along the margins of commonly narrow, deep ditches. Floating and emergent vegetation is an important element in the summer. Relatively still, neutral, unpolluted water which maintains a fairly constant level and supports a rich fauna is typical. The optimum ditch-margin habitat is effectively tussocky sedge-swamp enhanced by many years of poaching and grazing. *Stratiotes* growing in the watercourse seems particularly favourable.

RECOMMENDATIONS FOR FUTURE CONSERVATION

PEVENSEY LEVELS

1. Water levels should be maintained up near the top of ditch banks. Constant levels through the year are probably advantageous especially avoiding flooding in winter and drying in summer.

2. Livestock especially cattle should be able to graze and poach the banks but not excessively

3. Overgrown ditches should be cleared in a way that maintains a favourable ditch profile and regenerative capacity. Long standing marginal tussocks especially of sedges such as *Carex pseudocyperus* should be preserved. It would be possible to collect spiders prior to a clearance to recolonise another area. If long sections of ditch are to be cleared it could be helpful to leave vegetated refuges at least partly intact.

4. Water quality should be guarded particularly against contamination by fertilizer, herbicides, pesticides and slurry .

5. *Stratiotes* forming a major element in the floating vegetation seems particularly favourable to the spider. Careful consideration could be given to artificially increasing it's abundance in some ditches to increase spider populations. (*Stratiotes* can dominate the aquatic flora at the expense of other plant species and can reduce diversity if over abundant.)

6. Ditches with a poor bank profile could be cut back to create a shallow shelf mimicking the shelf produced by decades of poaching.

7. Purchase of more substantial areas of grazing marsh particularly on Manxey and Pevensey Bridge level should be considered

8. More detailed ecological investigations should be undertaken to clarify aspects of habitat requirement and biology of the spider.

REDGRAVE AND LOPHAM FEN

The following thoughts stem from one visit to this site and are based on my aquaintance with Dolomedes spiders at Pevensey and elsewhere rather than a knowledge of Redgrave and Lopham Fen.

I was surprised by the acidity of the pools in the fen and also by the occurrence of acid heath wetland in some areas. *Dolomedes fimbriatus* would not be out of place in the wet acid heath and I wonder whether both species occurred (or occur!) on the site.

The aim should be to re-establish areas of fen-swamp with open standing water separating tussocks of sedge. This could be achieved by raising the current water table and thinning out the vegetation or making cuttings into the peat and ensuring the development of field layer tussocky vegetation around the margins. (I have a limited knowledge of fenland ecology but I wonder whether the current acid conditions may hinder Cladium sedge-fen development. It may be that recent efforts to raise the water table may ameliorate this problem.)

Cuttings could be made in the *Cladium* fen. The shape is important. The aim would be to create a maximum length of sunny water margin bounded by sedge tussocks. The water should be up against the base of the vegetation with no margin of bare substrate. If there is a problem with low water table leading to a cliff-like bank then the bank should be cut back to a gentle slope and sedge clumps planted along the new margin with bases submerged. The water should be deep enough to be permanent and to support aquatic animal and plant communities and to slow colonisation by marsh species

Experiments could be made with cuttings running east-west about 4 metres wide and perhaps 20 metres long. A large area of open water is not really of great value to the spiders and clumps of sedge could be transplanted to create occasional islands. Water plants with floating leaves should introduced. Any tall vegetation around the cutting should be cut back to field layer height to prevent shading

INTRODUCTION TO OTHER SITES FROM THE PEVENSEY POPULATION

It is very likely that suitable habitat could be found in other sites. The Pevensey population seems successful enough to supply animals for introduction elsewhere or to reinforce the population at Redgrave and Lopham Fen (although the population there should increase rapidly if the habitat improves.)

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