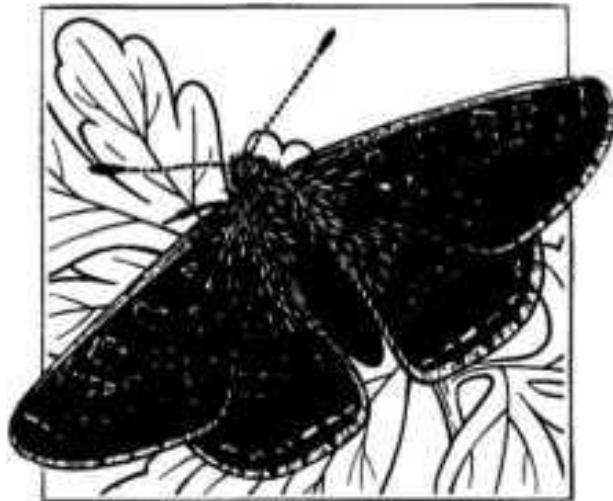
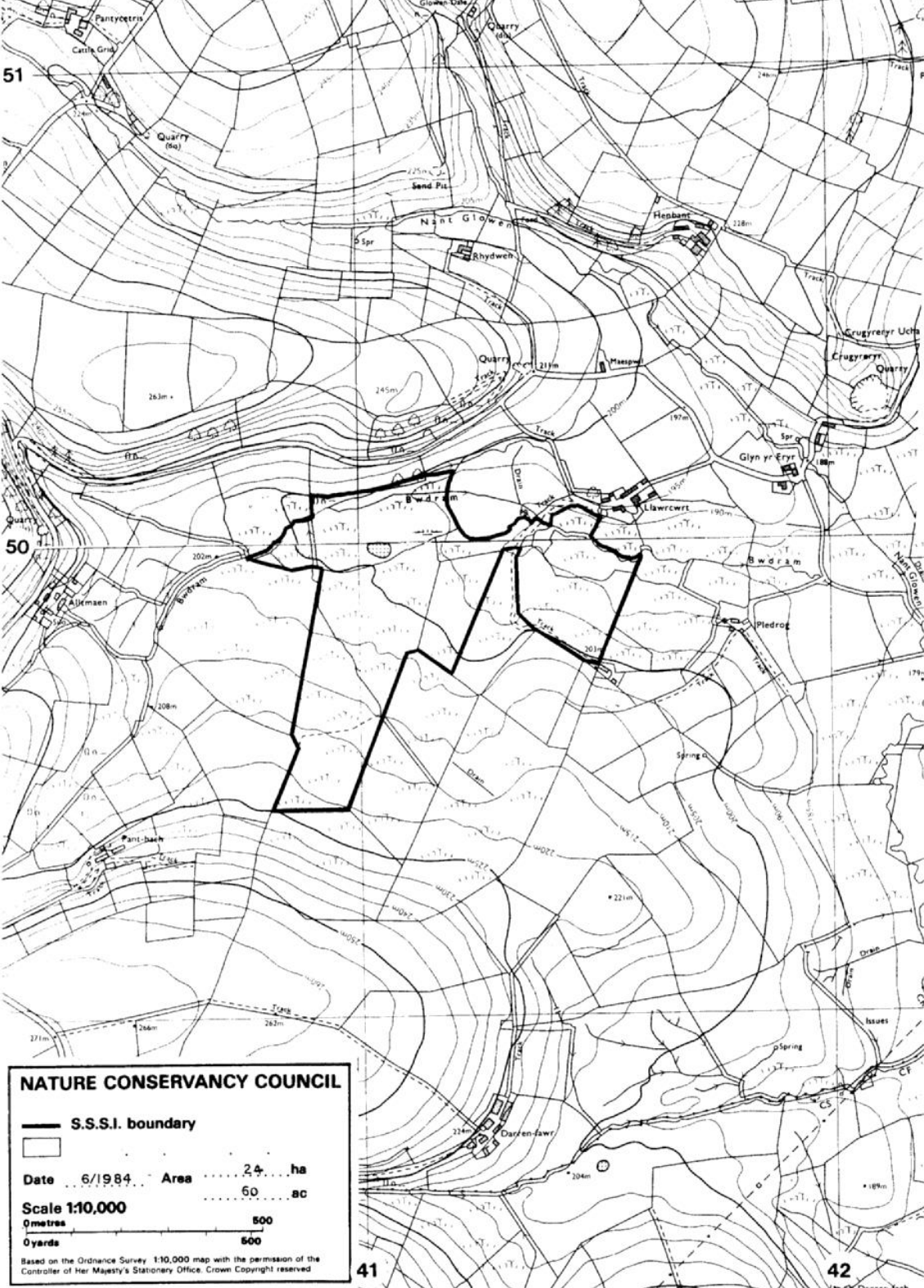


Population Studies
of the Marsh Fritillary Colony
at Rhos Llawr-cwrt NNR,
Dyfed.. . .1984.



AP Fowles

RHÔS LLAWR-CWRT
Ceredigion - DYFED



NATURE CONSERVANCY COUNCIL

— S.S.S.I. boundary

□

Date 6/1984 Area 24 ha
 60 ac

Scale 1:10,000

0 metres 500
 0 yards 500

Based on the Ordnance Survey 1:10,000 map with the permission of the Controller of Her Majesty's Stationery Office. Crown Copyright reserved

41

42

POPULATION STUDIES OF THE MARSH FRITILLARY Eurodryas aurinia COLONY AT RHOS LLAWR-CWRT NNR, DYFED.

INTRODUCTION

In the past forty years the British distribution of the Marsh Fritillary has changed alarmingly as agricultural improvement has taken its toll of the boggy habitats it prefers. Although the species also occurs on a few downland sites it has always been most common in wet meadows and marshes where a luxuriant growth of the larval foodplant, Devil's-bit Scabious Succisa pratensis, predominates. Formerly widespread over much of England and Wales, the Marsh Fritillary has declined throughout its range - most noticeably in the highly-cultivated areas of central and eastern England. It is now considered that the butterfly is almost extinct in the eastern half of Britain and is only widely distributed in Argyllshire, Cumbria, West Wales and southern England from Hampshire westwards. A national survey in 1983 (D Simcox pers. comm.) indicated that there are currently about two hundred colonies in England and Wales, sixty of them in the Principality. Further declines are inevitable as more marginal land faces drainage and local extinctions result from natural causes, particularly as an estimated ninety per-cent of all colonies are on sites of less than four hectares.

The situation in Ceredigion, undoubtedly one of the species' strongholds in Britain, has to a large extent mirrored the fortunes of the Marsh Fritillary elsewhere. The district of Ceredigion, corresponding to the Watsonian Vice-County 46, has traditionally responded slowly to advances in farming technology and it is really only in the last fifteen years that government grants for agricultural improvement have had a significant impact on the abundance of suitable habitat. The high rainfall and poor soils of the region have combined to produce land which had previously been too expensive, or uneconomic, to drain and large areas were blanketed by wet pasture. This is particularly true of much of the land lying between 150m and 250m a.s.l. south of Afon Ystwyth where a unique grassland community, known as 'rhos', is a common feature. Rhosydd is the collective title given to a range of communities centred around Molinia caerulea pasture; typical components are Calluna vulgaris heath, basin mires, and poor-fen. Characteristically the Molinia forms an even sward with much Succisa pratensis, Potentilla erecta, and Dactylorhiza ericetorum, only rarely (usually where the grazing pressure has been relaxed) is the Molinia tussock-forming. Traditionally these pastures have been stocked with horses and cattle and the wet conditions have, in the past, discouraged attempts at drainage. This position has changed dramatically in recent years and the total acreage of this extremely interesting habitat in Ceredigion has been reduced considerably.

Rhos Llawr-Cwrt NNR is a prime example of the habitat type and has accordingly been scheduled as a Grade 1 site. Until recently it was merely part of a huge area of similar pasture in the Clettwr valley below Tal-garreg but following agricultural improvement it has become an isolated fragment. Conservation interest in the site began in 1978 when its botanical diversity was greatly admired and informal discussions were initiated in 1982 to sound out the possibility of establishing a nature reserve. Unfortunately this was not deemed financially viable at the time. Meanwhile the remaining pastures were slowly being reclaimed such that only forty-one hectares were still intact up to 1983. In that year the owners arranged to drain all

but the five hectares then scheduled as a Site of Special Scientific Interest and in March an extensive series of one-metre deep ditches were dug through the centre of the site. Timely negotiations resulted in the purchase of 23.4 hectares as a National Nature Reserve in March 1984 (a further 0.63 ha on the western edge of the reserve retaining SSSI status) whilst the remaining seventeen hectares were drained and re-seeded later that autumn.

Historically, the Marsh Fritillary has always been considered an uncommon insect in Ceredigion although it has undoubtedly been under-recorded due to a lack of observers. In the entomological journals and field notebooks of local naturalists a total of nineteen colonies had been reported up to 1982. In conjunction with the national survey organised by the Joint Committee for the Conservation of British Insects seventeen of these colonies were visited during 1983 (Fowles 1984). The majority of these sites no longer sustain populations and whilst agricultural improvement has caused the extinction of many colonies it is clear that several sites are becoming unsuitable due to natural changes in the vegetation structure. Eight of the former colonies still support Marsh Fritillaries, five have undergone improvement, one has been lost as a result of reed-bed encroachment, and three others are apparently extinct from unknown causes. On a more positive side, three new colonies were discovered in 1983 and a further four were found in 1984. Additional fieldwork will undoubtedly reveal several more colonies, particularly in the central districts.

It is encouraging that the species maintains its status as being widely distributed in Ceredigion but, regrettably, of the fifteen colonies currently in existence only six can be considered as supporting healthy populations. In this context the Marsh Fritillaries of Rhos Llawr-Cwrt NNR are of considerable importance and it is highly probable that more butterflies emerge at this one site than at all of the other fourteen together. The Llawr-Cwrt colony was first reported on 20 June 1978 when the botanical importance of the pastures was first realised but the magnitude of the Marsh Fritillary population was not assessed until five years later. An extensive survey on 21 June 1983 indicated that this was indeed an extremely strong colony, probably of national significance. It has now been shown (D Simcox pers. comm.) that Rhos Llawr-Cwrt is one of the biggest populations in England and Wales.

METHODS

An attempt was made during the 1984 season to establish base-line data in order to monitor future changes which may result from alterations in the grazing pattern. Foremost was the initiation of a Pollard Walk along the lines of the national Butterfly Monitoring Scheme (Pollard 1977). A transect route of approximately 1.7 kms, representatively sampling all of the major zones, was walked daily from 7-20 June during favourable weather conditions. Mark-and-recapture studies were carried out from 9-23 June to provide an estimate of the total population. This work was based on the familiar procedures outlined by Fisher and Ford (1947) and subsequently regarded as the standard method for such studies on Lepidoptera by many authors, eg Sheppard (1951), Turner (1963). In the autumn a series of 100m² (50m x 2m) transects were surveyed to ascertain the chief breeding areas, the communal larval webs being particularly conspicuous at this time.

BUTTERFLY MONITORING SCHEME

Marsh Fritillaries were first recorded on the wing in 1984 at Rhos Llawr-Cwrt on 27 May and by the following day several individuals had emerged (E & D Woolley pers. comm.). By 7 June emergence was in full swing and peak numbers were probably flying just a couple of days later. Figure 2 depicts the transect route that was established to provide an index of abundance for the site. The flight period for 1984 extended from 27 May to 30 June so unfortunately the survey did not sample the peripheral dates. Details of the counts can be found in Table 1 (data for other butterfly species recorded on the transects is included in Appendix 1).

RHOS LLAWR-CWRT BMS : MARSH FRITILLARY SIGHTINGS

	SECTIONS											TOTALS
	1	2	3	4	5	6	7	8	9	10	11	
JUNE 7	-	-	15	9	25	1	81	1	16	9	2	159
JUNE 8	1	2	32	30	15	3	64	9	19	18	1	194
JUNE 9	-	2	23	25	10	1	55	1	11	5	4	137
JUNE 10	-	1	18	18	21	5	49	1	10	8	1	132
JUNE 11	-	1	9	4	10	1	16	1	4	6	-	52
JUNE 15	-	-	19	9	7	-	21	1	3	9	-	69
JUNE 16	-	-	19	9	4	1	24	1	2	4	-	64
JUNE 17	-	2	5	11	3	-	10	-	-	3	-	34
JUNE 18	-	2	14	8	6	-	21	1	1	4	-	57
JUNE 19	-	-	8	14	6	-	9	-	2	3	-	42
JUNE 20	-	-	11	9	3	-	8	-	-	3	-	34
	1	10	173	146	110	12	358	16	68	72	8	974

TABLE 1.

The results indicate that peak emergence occurred around 8 June with a notable decline three days later, numbers continuing at a low level until the end of the survey. It is suggested that future Pollard Walks should cover weeks 7-12 of the Butterfly Monitoring Scheme, ie 20 May- 7 July. The three-week period surveyed in 1984 yields an index of abundance of 284.4

WEEK	7	8	9	10	11	12
INDEX	-	-	163.3	79.3	41.8	-

Most butterflies were recorded in Sections 3,4,5,7 and, to a lesser extent, 9 and 10. This coincides with observations made in 1983 and largely substantiated by the distribution of larval webs (see below). The striking exception is Section 3. Although adults are abundant amongst the floristically rich flushes on the lower slopes of the pasture very few webs have been found here, no doubt due to the flooding which occurs each winter. In 1983, following a late spring, the adults were strongly attracted to the stands of Bogbean Menyanthes trifoliata which were flowering in profusion but in 1984 the Bogbean had set seed before the main Marsh Fritillary emergence. During the butterfly transects a note was kept of all the flowers visited by Marsh Fritillaries (Table 2) which shows that Buttercups Ranunculus acris and R. repens were the most favoured nectar sources. Buttercups are widespread throughout the reserve and at present the reasons for the attractiveness of this area are unclear.

NECTAR SOURCES BY SECTION

	3	4	5	7	8	9	10	11	Totals
Ranunculus spp.	25	1	21	64		2	3	1	117
Potentilla erecta	5	1		7		9	3		25
Hypochaeris radiata		4		3		1	1		9
Hieracium pilosella				5	1	2			8
Pedicularis sylvatica		3	1	1		1	1		7
Cardamine pratensis	2						2		4
Lotus corniculatus				3		1			4
Potentilla anserina				3					3
Dactylorhiza ericetorum	3								3
Myotis secunda	2								2
Menyanthes trifoliata							2		2
Trifolium pratense			1						1
Bellis perennis					1				1
Totals	37	9	23	86	2	16	12	1	186

MARK AND RECAPTURE

From 9 June until 23 June adults were captured, marked and released to provide an estimate of the magnitude of the population. On suitable days the reserve was randomly walked for a duration of 1-2 hours and all possible individuals were captured. The butterflies were netted and marked in situ on the underside of the wings with a felt-tip pen, a different colour or wing each day. Re-captures were marked again with the appropriate colour and released. There were no fatalities during this procedure and the dye did not appear to impair flight in any way. A total of 815 imagines were marked and there were 71 recaptures. The life-expectancy computed from these results is 3.957 days. Specimens were sexed by genitalia examination from 11 June onwards and recapture data gives the following differences in longevity - Male 4.33 days; Female 3.83 days. These figures correspond closely with published life-span estimates (Porter 1983). Tables 3, 4, and 5 present the data generated by the mark-recapture study as interpreted by the standard methods applied by Fisher and Ford (1947) and Sheppard (1951). These results indicate that 6638 Marsh Fritillaries emerged during the survey.

Sampling errors were, hopefully, kept to a minimum by a strict adherence to the principles of the earlier studies already quoted but it was noticeable that females were captured much less frequently than males (158:357), due to their tendency to spend most of their time at ground level. The conspicuous and active males were easily caught but most females were taken either during courtship or mating. Analysis of the results for the males alone (Tables 6 and 7) will, therefore, probably provide a more reliable estimate - indicating that 2418 male Marsh Fritillaries emerged during the fourteen days surveyed out of the 34-day flight-period. Given that the Butterfly Monitoring Scheme transects suggested that peak emergence occurred immediately prior to the mark-recapture study (and assuming that males and females reach the adult stage in equal proportions) a conservative estimate of the total population on Rhos Llawr-Cwrt NNR in 1984 would be in the order of 10,000 imagines.

LARVAL COUNTS

From mid August until late September the communal webs of the larvae are a conspicuous feature of Marsh Fritillary colonies and as such strongly indicate which sections of the habitat constitute the most important breeding areas. Between 7 and 10 September a series of fifty-three 100m² transects were scrutinised for larval webs. In order to representatively sample all potential breeding habitat on Rhos Llawr-Cwrt a ratio of approximately one transect per 0.5 hectares in each compartment was determined. So that future comparisons can be made if necessary, each transect started from a clearly definable topographical feature and were plotted on a map before the study began (Figure 3). This procedure also avoided the possibility of bias in the field towards favourable areas. This thorough survey was necessary as a small proportion of webs are concealed beneath Molinia tussocks and hence population estimates derived from quick surveys (as used for Glanville Fritillaries Melitaea cinxia, Thomas and Simcox 1982) are not applicable.

The majority of the larvae were still in their second instar, occupying a communal web derived from a single batch of eggs. A small number of webs had divided, despite the abundance of Succisa, but these are readily identifiable as coming from the same batch by the interlinking pathways of silk. Hibernation webs had been adopted in a few instances, these are generally formed close to the ground and are partly hidden by the surrounding vegetation.

Ninety-five webs were found in the 5300m² surveyed and extrapolation from the densities in each compartment indicate a total population of 3870 webs. Transect counts are presented in Table 8. Mark-and-recapture studies (see above) suggested that 5000 females could possibly have emerged in 1984 and an average of one egg-batch per female is considered normal (Hancock 1982).

DISCUSSION

Observations on Marsh Fritillary colonies throughout Ceredigion have revealed that rhos pasture only provides suitable breeding conditions while moderate grazing pressure is maintained. In a very short time, following the exclusion of livestock, rhos pasture rapidly becomes overgrown by Molinia and sometimes Bracken Pteridium aquilinum. This leads to the shading-out of Succisa and female Marsh Fritillaries are apparently reluctant to deposit eggs in such situations. The type of stock grazing the pasture also seems to have a significant effect on the status of the colony. At present there are no known colonies regularly grazed by sheep and on Rhos Pil-bach, WWTNC reserve, the presence of a herd of goats is probably responsible for the very weak colony despite an abundance of Succisa. Rhos has traditionally been grazed by horses and cattle, although the densities of grazing animals per hectare required to maintain ideal conditions for Marsh Fritillaries has still to be investigated.

The national significance of Rhos Llawr-cwrt NNR, in terms of its Marsh Fritillary population, lies in its large area - at twenty-three hectares it is certainly one of the biggest colonies in Britain. Colonies based on small sites are vulnerable to local extinction for a variety of reasons (parasitism, starvation, loss of habitat, etc...) and the absence of adjacent colonies precludes re-colonisation. At Llawr-Cwrt the population can be flexible and escape some of these threats by moving to different areas of the reserve, returning as and when conditions improve. There is, therefore, potential for some experimentation in management to discern the most appropriate stock levels and the above studies have been carried out to establish a base-line by which to monitor such trials.

Formerly Rhos Llawr-Cwrt was primarily grazed by horses with a small number of cattle but currently up to 120 cattle graze the site and sheep are also occasionally present. The stocking levels can only be determined by trial and error, although experience from other rhos pastures would indicate that it is inadvisable to allow regular grazing by substantial numbers of sheep. Ideally horses should eventually be returned to the pastures.

During the flight-period it was apparent that adult Marsh Fritillaries utilise all areas of the reserve although they are only rare visitors to Compartments 1 and 2 (see Figure 1). Compartment 3, on which Barley was grown during World War II, has low densities of larval webs though many adults visit the flower-rich flushes in the north-western corner. Unusually high concentrations of female imagines were recorded in the hollows of Compartment 4 (which is known as Waun Pwll-y-bladwr) and this was reflected by the abundance of larval webs.

It is probable that this Compartment has historically been regarded as a hay meadow and may have always escaped improvement. This pasture undoubtedly holds the core of the colony and could be used as an indicator of the health of the population. Compartments 5 and 6 (together known as Waun Hadau) also support good breeding densities and large numbers of adults can be found roosting here at the base of the clumps of Soft Rush Juncus effusus. The southernmost pasture, Compartment 7, is mainly Calluna-heath with little Succisa but larval webs are fairly frequent amongst the ridge-and-furrow sections. The turf on the pingo banks in Compartment 8 (called Gors-las) is too short and the Succisa too stunted to support breeding but the lush vegetation between the pingos and Afon Bwdram provide suitable conditions. The wet heath immediately east of the pingos is heavily grazed and no larvae were found here. Compartment 9 consists of Willow carr and was not surveyed. Compartment 10 appears to be suffering from Gorse Ulex scrub encroachment but a handful of larval webs are present.

This encroachment of scrub will clearly have to be held in check in this north-western corner of the reserve and horse-grazing would clearly contribute to this. There is also another, less obvious, argument for the re-introduction of horses. During the larval counts it was apparent that several webs had been smothered by cow-pats, and with up to 120 cattle on site there are a lot of cow-pats! The problem seems to be exacerbated by the freedom the stock have at present as they also have access to OS Parcel 1442, an improved pasture under private ownership. The cattle tend to feed on the pasture and then move onto the reserve to ruminate, usually in Compartment 4. I am assured that grazing on improved pasture results in larger cow-pats than come from stock feeding on rough pasture. Certainly there are many pats in excess of 50cms diameter. This problem could be reduced directly by fencing off OS Parcel 1442. Horses do not pose such a threat to Marsh Fritillary larvae as they invariably defecate in the same place each night.

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FIGURE 1. RHOS LLAWR-CWRT NNR - COMPARTMENTS.

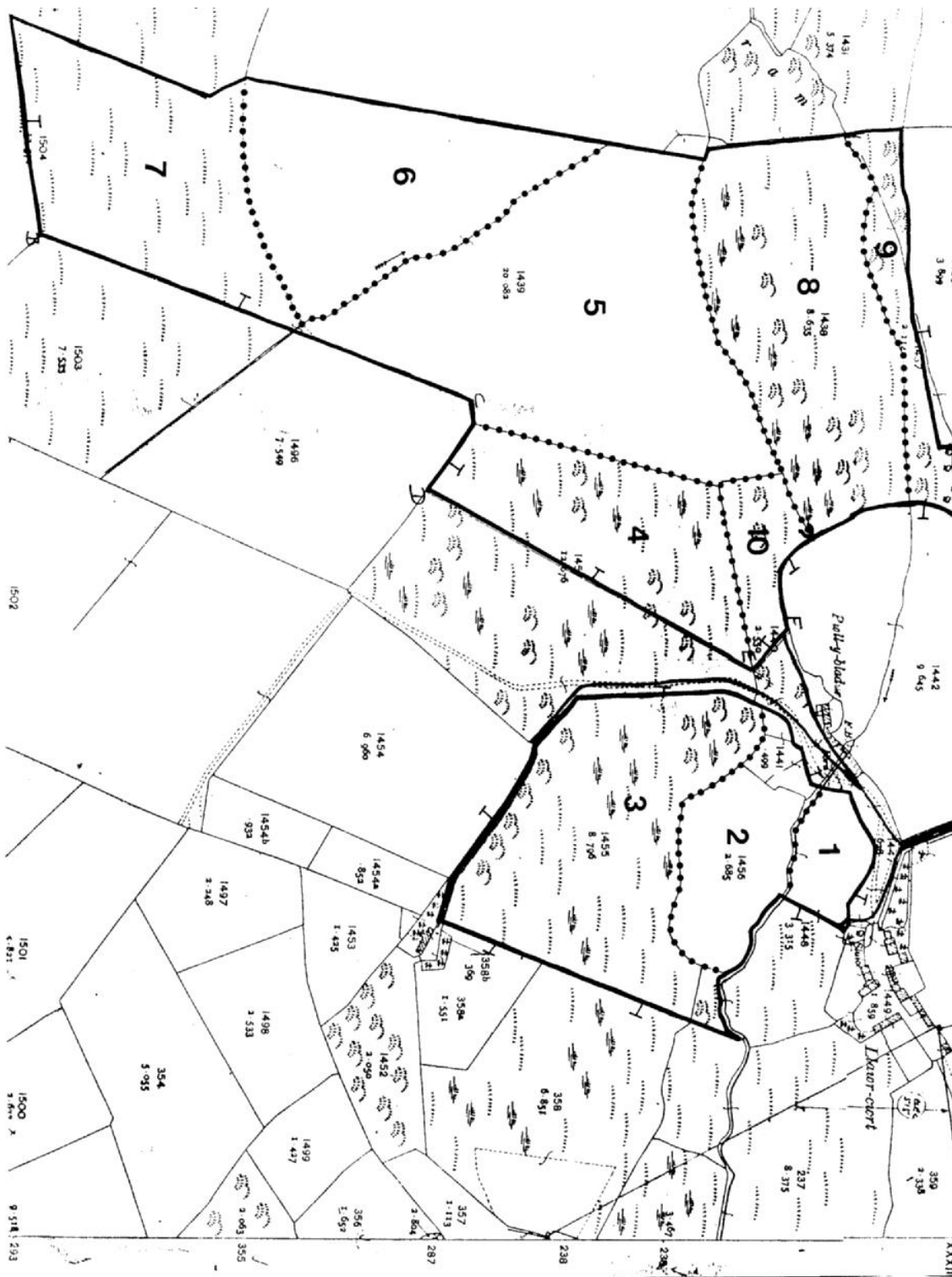
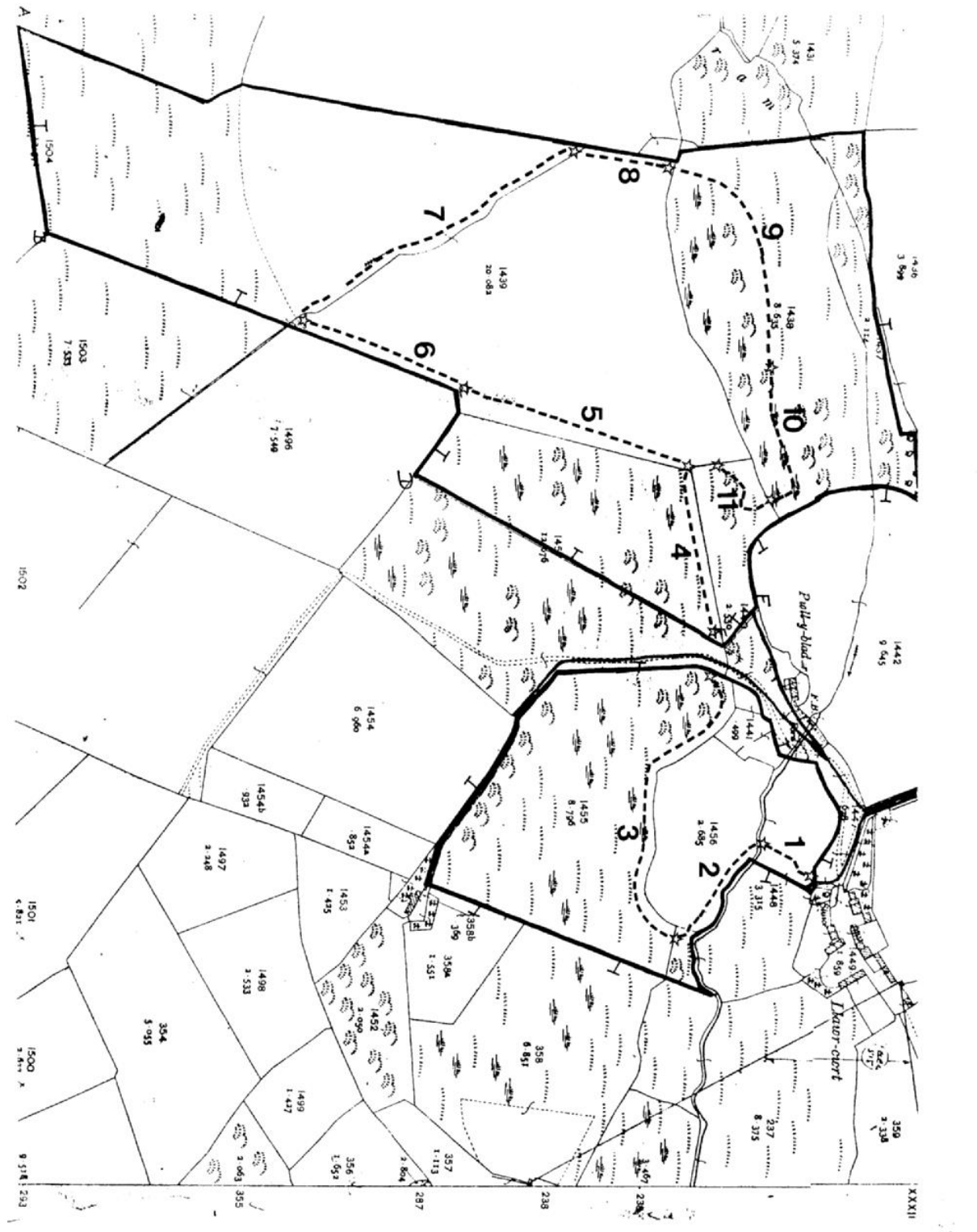


FIGURE 2. BUTTERFLY MONITORING SCHEME - TRANSECT.



BUTTERFLY MONITORING SCHEME: TRANSECT ROUTE.

SECTION 1. Follow the slope down from the track to Llawr-Cwrt and bear right to the ditch, following this down to the stream, Afon Bwdram.

SECTION 2. After crossing Afon Bwdram turn left and follow the reserve boundary to the ditch.

SECTION 3. Cross the ditch and turn right, following the left-hand side of the ditch southwards. Follow along the ditch as it bears west but where it angles north-west head towards the left-hand side of the willow ahead. Cross the D. purpurella flushes to the Bramble bush in the corner of the field next to the flush. Follow along the left-hand side of the flush to the gap in the bank.

[On the farm track, turn right and walk around the fence, cross the drainage ditch at the junction with the Bwdram to the large Willow tree.]

SECTION 4. Turn right and walk along the left-hand side of the bank to the gap in the next bank.

SECTION 5. Turn left, walking along the right-hand side of the bank towards the top of the bank (where the turf is short) and bear slightly right to meet the corner of the fence.

SECTION 6. Walk along the fence-line to the junction with the old drainage ditch. Cross the ditch.

SECTION 7. Walk along the left-hand side of the ditch, heading north-westwards to the reserve boundary fence.

SECTION 8. Walk along the right-hand side of the fence to the next bank.

SECTION 9. Walk along the top of the rampart around the north side of the pingos to the ditch at the north-east corner of the open pingo.

SECTION 10. Walk directly towards the string of vegetated pingos, left of the gorse bushes. Continue along the south side of these small pingos (the northern edge of the wet heath) to the path by the reserve boundary. Turn right and walk to the gap in the bank.

SECTION 11. Turn right and follow the path through the gorse bushes, taking the left-hand fork to the gap in the bank near the junction of Sections 4 and 5.

MARK-RELEASE-RECAPTURE DATA FOR RHOS LLAWR-CWRT, 1984.

		JUNE 1984															
		9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	
DAYS FROM RELEASE	1		7	4	.	.	.	0	1	1	1	6	2	.	.	.	
	2			2	.	.	.	.	0	2	5	0	4	.	.	.
	3				.	.	0	.	.	0	5	0	0	.	.	1	
	4					.	1	5	.	.	0	2	1	.	.	0	
	5						0	1	2	.	.	0	4	.	.	0	
	6							7	1	1	.	.	1	.	.	1	
	7								3	1	2	.	.	.	.	0
	8									1	0	2	.	.	.	1	
	9										1	0	1	.	.	0	
	10											1	0	.	.	.	
	11												1	.	.	.	
	12													.	.	0	
	13														.	0	
	14																0
	CAPTURES		200	107	56	.	.	21	173	52	36	119	62	63	.	.	7
RELEASES		200	107	56	.	.	21	173	52	36	119	62	63	.	.	7	

TABLE 3

COMPUTATION OF RECAPTURE DATA (AFTER FISHER & FORD 1947)

JUNE	n	r ^t			Total recap- tures	Total days sur- vived	Excess over ex- pectation	Total cap- tures	Estimated numbers	JUNE
22	1	....	112.6843	628.8479	3	17	0.2581	10	502.6	23
21	2	....	112.6843	516.1636	.	.	....	.	....	22
20	3	26.7094	112.6843	403.4793	.	.	....	.	....	21
19	4	19.3363	85.9749	290.7950	14	60	12.6475	64	1260.2	20
18	5	27.7346	66.6386	204.8201	11	62	6.1904	62	1611.6	19
17	6	6.2701	38.9040	138.1815	14	49	-0.7260	119	1898.6	18
16	7	6.7681	32.6339	99.2775	6	26	7.7470	36	1504.4	17
15	8	16.8270	25.8658	66.6436	7	38	19.9644	52	1975.5	16
14	9	1.5264	9.0388	40.7778	13	67	8.3516	173	1654.8	15
13	10	....	7.5124	31.7390	1	4	-0.2249	21	2904.3	14
12	11	....	7.5124	24.2266	.	.	....	.	....	13
11	12	1.6987	7.5124	16.7142	.	.	....	.	....	12
10	13	2.4256	5.8137	9.2018	6	8	-1.4967	56	2393.6	11
9	14	3.3881	3.3881	3.3881	7	7	0	107	3057.1	10
							52.7114			
Daily Survival 74.73%										

TABLE 4.

SEXUAL DIFFERENCES IN LONGEVITY

	MALES		FEMALES	
	Number Captured	Total days Survived	Number Captured	Total days Survived
1	11	11	1	1
2	11	22	.	.
3	4	12	2	6
4	5	20	1	4
5	5	25	.	.
6	8	48	2	12
7	6	42	.	.
8	4	32	.	.
9	2	18	.	.
10	1	10	.	.
11	1	11	.	.

Life-expectancy - Male...4.33, Female...3.83.

TABLE 5.

MARK-RELEASE-RECAPTURE DATA FOR RHOS LLAWR-CWRT, 1984.
 MALE MARSH FRITILLARIES ONLY.

	11	12	13	14	15	16	17	18	19	20	21	22	23
1		.	.	.	0	1	1	1	6	2	.	.	.
2			.	.	.	0	2	5	0	4	.	.	.
3				0	.	.	0	3	0	0	.	.	1
4					5	.	.	0	1	1	.	.	0
5						2	.	.	0	4	.	.	0
6							1	.	.	0	.	.	1
7								2	.	.	.	.	0
8									2	.	.	.	1
9										1	.	.	0
10											.	.	.
11												.	.
12													.
CAPTURES	29	.	.	8	113	36	30	89	46	47	.	.	6
RELEASES	29	.	.	8	113	36	30	89	46	47	.	.	6

TABLE 6

COMPUTATION OF RECAPTURE DATA (AFTER FISHER & FORD 1947) MALE
MARSH FRITILLARIES ONLY.

JUNE	r	r ^t			Total recap- tures	Total days sur- vived	Excess over ex- pectation	Total cap- tures	Estimated numbers	JUNE	
22	1	....	89.0762	457.3006	3	17	1.5986	6	231.6978	23
21	2	....	89.0762	368.2244	.	.	.	.	.	22
20	3	21.3652	89.0762	279.1482	.	.	.	.	.	21
19	4	16.0782	67.7110	190.0720	12	43	9.3147	47	758.7459	20	
18	5	23.9188	51.6328	122.3610	9	26	4.6715	46	981.9571	19	
17	6	6.1993	27.7140	70.7282	11	34	5.9272	89	1085.1204	18	
16	7	5.7199	21.5147	43.0142	4	11	3.0028	30	1015.5661	17	
15	8	13.8050	15.7948	21.4995	3	11	6.9165	36	1551.4505	16	
14	9	0.7515	1.9898	5.7047	5	20	5.6651	113	478.7282	15	
13	10	....	1.2383	3.7149	0	0	0	8	∞	14
12	11	....	1.2383	2.4766	.	.	.	.	.	13
11	12	1.2383	1.2383	1.2383	.	.	.	.	.	12
							37.0964				
Daily Survival 76.89%											

TABLE 7

FIGURE 3. LARVAL WEB TRANSECTS.

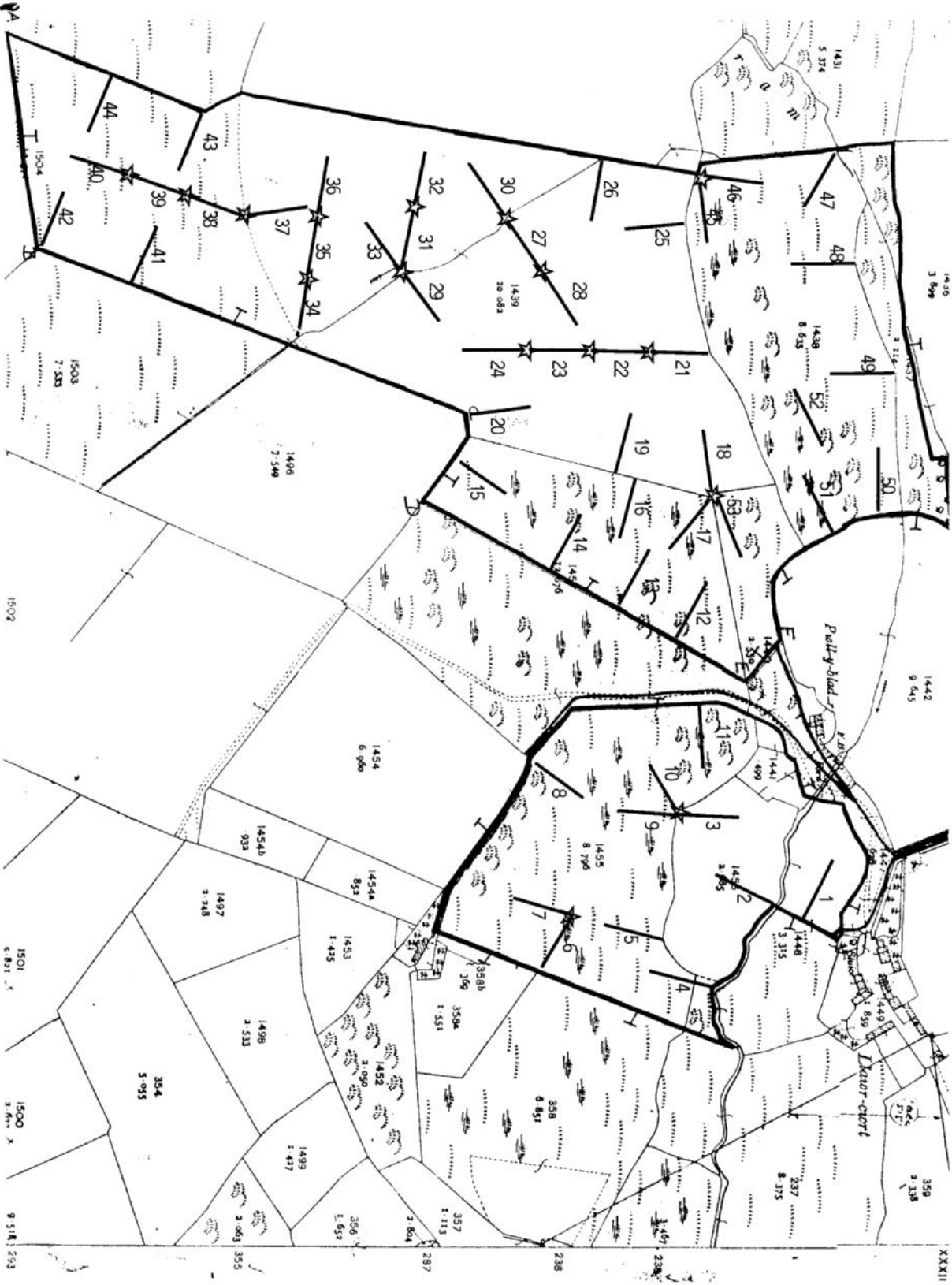


TABLE 8.DISTRIBUTION OF LARVAL WEBS

COMPARTMENT	AREA(ha)	TRANSECT	NUMBER OF WEBS	DENSITY	ESTIMATED TOTAL
1	0.50	1	0	0	0
2	1.29	2 3	0 0	0	0
3	3.65	4 5 6 7 8 9 10 11	1 1 2 0 0 0 0 0	1:200m ²	182
4	2.24	12 13 14 15 16 17	2 10 11 0 2 4	1:20.69m ²	1084
5	5.34	18 19 20 21 22 23 24 25 26 27 28 29	2 0 2 1 7 0 0 5 6 2 0 2	1:44.44m ²	1201
6	2.79	30 31 32 33 34 35 36 37	1 1 0 2 2 2 0 3	1:72.73m ²	383

TABLE 8 (Cont.)

COMPARTMENT	AREA(ha)	TRANSECT	NUMBER OF WEBS	DENSITY	ESTIMATED TOTAL
7	2.90	38	1	1:77.78m ²	373
		39	0		
		40	3		
		41	2		
		42	2		
		43	0		
		44	1		
8	3.24	45	1	1:61.54m ²	526
		46	0		
		47	0		
		48	3		
		49	4		
		50	4		
		51	0		
		52	1		
9		NOT SURVEYED			
10	0.61	53	2	1:50m ²	121
TOTALS:	22.56	53	95	1:55.79m ²	3870

APPENDIX 1. BUTTERFLY MONITORING SCHEME, RHOS LLAWR-CWRT 1984

	JUNE 1984														TOTAL
	7	8	9	10	11	12	13	14	15	16	17	18	19	20	
MARSH FRITILLARY	159	194	137	132	52	.	.	.	69	64	34	57	42	34	974
SMALL HEATH	32	45	42	49	35	.	.	.	38	47	36	40	40	33	437
COMMON BLUE	5	3	8	12	8	.	.	.	14	13	1	13	10	10	97
ORANGE TIP	4	0	3	1	0	.	.	.	0	0	0	2	0	0	10
WALL BROWN	2	0	0	2	0	.	.	.	0	0	2	1	1	0	8
SMALL PEARL-															
BORDERED FRITILLARY	3	4	2	1	3	.	.	.	7	7	7	3	6	11	54
GREEN-VEINED WHITE	1	2	3	0	1	.	.	.	2	1	0	1	1	4	16
LARGE WHITE	1	0	0	2	1	.	.	.	1	0	0	1	0	1	7
SMALL COPPER	2	0	1	0	1	.	.	.	0	0	2	2	2	2	12
MEADOW BROWN	0	1	0	0	0	.	.	.	0	1	1	1	7	4	15
GREEN HAIRSTREAK	0	0	0	0	0	.	.	.	1	0	0	0	0	0	1
LARGE SKIPPER	0	0	0	0	0	.	.	.	2	0	0	2	3	5	12
SMALL WHITE	0	0	0	0	0	.	.	.	0	0	0	1	0	3	4
SMALL TORTOISESHELL	0	0	0	0	0	.	.	.	0	0	0	0	0	1	1

BUTTERFLY MONITORING SCHEME, RHOS LLAWR-CWRT 1984

	SECTIONS											TOTAL
	1	2	3	4	5	6	7	8	9	10	11	
LARGE SKIPPER	1	0	5	2	1	0	1	0	0	2	0	12
ORANGE TIP	3	1	4	0	0	0	1	0	0	0	1	10
LARGE WHITE	1	0	1	0	2	0	1	0	0	2	0	7
GREEN-VEINED WHITE	4	4	3	1	1	1	0	1	0	0	1	16
SMALL WHITE	0	0	3	0	0	0	0	0	0	1	0	4
GREEN HAIRSTREAK	0	0	0	0	0	0	0	0	0	1	0	1
COMMON BLUE	3	1	17	9	5	4	16	0	30	12	0	97
SMALL COPPER	0	0	6	1	1	0	2	0	2	0	0	12
SMALL TORTOISESHELL	0	0	0	0	0	0	1	0	0	0	0	1
SMALL PEARL-												
BORDERED FRITILLARY	1	2	31	4	2	0	0	0	2	11	1	54
MARSH FRITILLARY	1	10	173	146	110	12	358	16	68	72	8	974
WALL BROWN	2	1	2	0	2	1	0	0	0	0	0	8
MEADOW BROWN	1	3	1	5	2	0	2	0	0	0	1	15
SMALL HEATH	0	4	39	95	61	0	102	16	59	46	15	437

APPENDIX 2

FAUNAL OBSERVATIONS FROM RHOS LLAWR-CWRT NNR, 1984.

BUTTERFLIES

LARGE SKIPPER *Ochlodes venata*
ORANGE TIP *Anthocharis cardamines*
LARGE WHITE *Pieris brassicae*
SMALL WHITE *Pieris rapae*
GREEN-VEINED WHITE *Pieris napi*
GREEN HAIRSTREAK *Callophrys rubi*
COMMON BLUE *Polyommatus icarus*

SMALL COPPER *Lycaena phlaeas*
PEACOCK *Inachis io*
SMALL TORTOISESHELL *Aglais urticae*
SMALL PEARL-BORDERED FRITILLARY *Boloria selene*
MARSH FRITILLARY *Eurodryas aurinia*
WALL BROWN *Lasiommata megera*
MEADOW BROWN *Maniola jurtina*
SMALL HEATH *Coenonympha pamphilus*

Previously recorded - CLOUDED YELLOW *Colias croceus* (1983); RINGLET *Aphantopus hyperantus* (1982).

MOTHS

A portable actinic light-trap was operated nightly from 11-22 June and again from 3-9 September, mainly in Compartment 1 but also in Compartment 2 (19 June), Comp 3 (18 June), Comp 8 (14 & 21 June). Observations were also made of species encountered during the day and Rhos Llawr-cwrt clearly has an interesting selection of diurnal moths. Of local significance are Scarlet Tiger, Forester, and Small Yellow Underwing and, amongst the nocturnal species, Devon Carpet, Striped Wainscot, Anomalous, and Silver Hook. The figures in brackets refer to the number of individuals captured at artificial light.

MAP-WINGED SWIFT *Hepialus fusconebulosa* (1)
FORESTER *Adscita statices*
FIVE-SPOT BURNET *Zygaena trifolii*
BROWN CHINA-MARK *Nymphula nympeata*
FOX MOTH *Macrothylacia rubi*
CHINESE CHARACTER *Cilix glaucata*
COMMON LUTESTRING *Ochropacha duplaris* (5)
GRASS EMERALD *Pseudoterpna pruinata* (1)
RIBAND WAVE *Idaea aversata* (1)
OBLIQUE CARPET *Orthonama vittata* (6)
FLAME CARPET *Xanthorhoe designata* (1)
DARK-BARRED TWIN-SPOT CARPET *Xanthorhoe ferrugata* (1)
SILVER-GROUND CARPET *Xanthorhoe montanata* (2)
GARDEN CARPET *Xanthorhoe fluctuata* (3)
LEAD BELLE *Scotopteryx mucronata* (4)
COMMON CARPET *Epirrhoe alternata*
WATER CARPET *Lampropteryx suffumata* (1)
DEVON CARPET *Lampropteryx otregiata* (1)
PURPLE BAR *Cosmorhoe ocellata* (7)

SMALL PHOENIX Ecliptoptera silacea (1)
COMMON MARBLED CARPET Chloroclysta truncata (4)
GREEN CARPET Colostygia pectinataria (5)
JULY HIGHFLYER Hydriomena furcata (6)
MAY HIGHFLYER Hydriomena impluviata (2)
GRASS RIVULET Perizoma albulata (1)
FOXGLOVE PUG Eupithecia pulchellata (8)
COMMON PUG Eupithecia vulgata (2)
CLOUDED BORDER Lomaspilis marginata (3)
LATTICED HEATH Semiothisa clathrata (2)
BRIMSTONE MOTH Opisthograptis luteolata (4)
SPECKLED YELLOW Pseudopanthera macularia
CANARY-SHOULDERED THORN Ennomos alniaria (4)
PEPPERED MOTH Biston betularia (6)
WILLOW BEAUTY Peribatodes rhomboidaria (3)
ENGRAILED Ectropis bistorta
COMMON WHITE WAVE Cabera pusaria (2)
CLOUDED SILVER Lomographa temerata (2)
BARRED RED Hylaea fasciaria (1)
POPLAR HAWKMOTH Laothoe populi (12)
BUFF-TIP Phalera bucephala (8)
PEBBLE PROMINENT Eliogmodonta ziczac (2)
COXCOMB PROMINENT Ptilodon capucina (1)
PALE PROMINENT Pterostoma palpina (3)
MARBLED BROWN Drymonia dodonaea (1)
PALE TUSSOCK Calliteara pudibunda (1)
WHITE ERMINE Spilosoma lubricipeda (179)
BUFF ERMINE Spilosoma luteum (62)
SCARLET TIGER Callimorpha dominula
HEART & DART Agrotis exclamationis (194)
FLAME Axylia putris (3)
FLAME SHOULDER Ochropleura plecta (3)
LARGE YELLOW UNDERWING Noctua pronuba (9)
DOUBLE DART Graphiphora augur (1)
INGRAILED CLAY Diarsia mendica (5)
SMALL SQUARE-SPOT Diarsia rubi (6)
SHEARS Hada nana (11)
PALE-SHOULDERED BROCADE Lacanobia thalassina (8)
BROOM Ceramica pisi (23)
CAMPION Hadena rivularis (12)
TAWNY SHEARS Hadena perplexa (3)
FEATHERED GOTHIC Tholera decimalis (4)
HEBREW CHARACTER Orthosia gothica (1)
STRIPED WAINSCOT Mythimna pudorina (1)
PINK-BARRED SALLOW Xanthia togata (2)
KNOT GRASS Acronicta rumicis (1)
CORONET Craniophora ligustri (2)
COPPER UNDERWING Amphipyra pyramidea (2)
BROWN RUSTIC Rusina ferruginea (17)
SMALL ANGLE SHADES Euplexia lucipera (1)
DARK ARCHES Apamea monoglypha (8)
CLOUDED-BORDERED BRINDLE Apamea crenata (4)
DUSKY BROCADE Apamea remissa (5)
MIDDLE-BARRED MINOR Oligia fasciuncula (4)
SMALL WAINSCOT Photedes pygmina (17)

FLOUNCED RUSTIC Luperina testacea (79)
ROSY RUSTIC Hydraecia micacea (1)
FROSTED ORANGE Gortyna flavago (5)
ANOMALOUS Stilbia anomala (1)
SMALL YELLOW UNDERWING Panemeria tenebrata
SILVER HOOK Eustrotia uncula
BURNISHED BRASS Diachrysia chrysis (2)
SILVER Y Autographa gamma (3)
MOTHER SHIPTON Callistege mi
BURNET COMPANION Euclidia glyphica
HERALD Scoliopteryx libatrix (3)

In July 1981 Dr ANB Simpson recorded the following moths at Rhos Llawr-cwrt: LESSER CREAM WAVE Scopula immutata, STRAW DOT Rivula sericealis; and the microlepidoptera - Argyresthia goedartella, A. albistria, A. bonnetella, Elachista atricomella, Bryotropha terrella, Aphelia paleana, A. viburnana, Olethreutes lacunana, Bactra lancealana, Epinotia immundana, E. signatana, Crambus pascuella, C. pratella, C. perlella, Agriphila straminella, Catoptria margaritella, Stenoptilia bipunctidactyla.

DRAGONFLIES

Previous visits have determined that the Odonata of Rhos Llawr-cwrt are of regional importance, particularly those species which breed in the pingos. To date, fifteen species have been recorded, eleven during the survey period. Rhos Llawr-cwrt is currently the third most important dragonfly site in Ceredigion, after Cors Fochno NNR and Cors Caron NNR.

SPECIES RECORDED IN 1984.

Calopteryx virgo	Ceriagrion tenellum
Lestes sponsa	Aeshna cyanea
Pyrrhosoma nymphula	Libellula quadrimaculata
Ischnura elegans	Sympetrum striolatum
Enallagma cyathigerum	Sympetrum danae
Coenagrion puella	

SPECIES RECORDED PRIOR TO 1984.

Aeshna juncea	Cordulegaster boltonii
Anax imperator	Orthetrum coerulescens

ORTHOPTERA

Four species were recorded in 1984 - Chorthippus parallelus, Omocestus viridulus, and Tetrix undulata were widespread and common whilst Chorthippus brunneus appears only to be a scarce vagrant from drier habitats adjacent to Llawr-cwrt Farm.

DERMAPTERA

Forficula auricularia

COLEOPTERA

Necrophorus humator, Necrophorus vespilloides, Coccinella 7-punctata.

DIPTERA

BEEFLIES - Bombylius canescens (or possibly B.minor) det. Dr I M^cLean.
CRANEFLIES - Tipula maxima
HORSEFLIES - Haematopota pluvialis

HYMENOPTERA

SAWFLIES - Abia sericea det. Dr I M^cLean
SOLITARY WASPS - Trypoxylon figulus

OPILIONES

Nemostoma bimaculatum

WOODLICE

Oniscus asellus
Trichoniscus pusillus

MOLLUSCS

Discus rotundatus
Arion ater agg.
Nesovitrea hammonis (det. AO Chater)
Aegopinella pura "
Aegopinella nitidula "
Oxychilus cellarius "
Euconulus alderi "
Pisidium obtusale (det. MP Kerney)

REPTILES AND AMPHIBIANS

Common Lizard Lacerta vivipara
Common Frog Rana temporaria
Common Toad Bufo bufo
Palmate Newt Triturus helveticus

MAMMALS

Hare Lepus capensis
Grey Squirrel Sciurus carolinensis
Fox Vulpes vulpes

Numerous small Bats hawked over the open pingo in the evenings but were not specifically identified. Natterer's Bat Myotis nattereri bred in one of the barns at Llawr-cwrt Farm in 1983.

BIRDS

[KEY: Breeding confirmed in 1984 (B); Breeding suspected (b); Non-breeding visitor (V);
Recorded flying overhead (F).]

Cormorant <u>Phalacrocorax carbo</u> (F)	Willow Warbler <u>Phylloscopus trochilus</u> (B)
Grey Heron <u>Ardea cinerea</u> (V)	Goldcrest <u>Regulus regulus</u> (V)
Mallard <u>Anas platyrhynchos</u> (V)	Whinchat <u>Saxicola rubetra</u> (B)
Buzzard <u>Buteo buteo</u> (V)	Stonechat <u>Saxicola torquata</u> (V)
Golden Plover <u>Pluvialis apricaria</u> (F)	Redstart <u>Phoenicurus phoenicurus</u> (b)
Lapwing <u>Vanellus vanellus</u> (b)	Robin <u>Erithacus rubecula</u> (b)
Curlew <u>Numenius arquata</u> (b)	Blackbird <u>Turdus merula</u> (b)
Snipe <u>Gallinago gallinago</u> (V)	Mistle Thrush <u>Turdus viscivorus</u> (B)
Herring Gull <u>Larus argentatus</u> (F)	Long-tailed Tit <u>Aegithalos caudatus</u> (B)

Stock Dove Columba oenas (F)
Woodpigeon Columba palumbus (V)
Cuckoo Cuculus canorus (b)
Tawny Owl Strix aluco (V)
Swift Apus apus (V)
Great-spotted Woodpecker Dendrocopos major (V)
Skylark Alauda arvensis (b)
Swallow Hirundo rustica (V)
House Martin Delichon urbica (V)
Tree Pipit Anthus trivialis (b)
Meadow Pipit Anthus pratensis (B)
Pied Wagtail Motacilla alba (b)
Grey Wagtail Motacilla cinerea (V)
Garden Warbler Sylvia borin (b)

Great Tit Parus major (B)
Blue Tit Parus caeruleus (B)
Willow Tit Parus montanus (B)
Nuthatch Sitta europea (V)
Yellowhammer Emberiza citrinella (b)
Chaffinch Fringilla coelebs (b)
Goldfinch Carduelis carduelis (V)
Linnet Acanthis cannabina (b)
Jay Garrulus glandarius (V)
Magpie Pica pica (b)
Raven Corvus corax (V)
Carrion Crow Corvus corone (V)