

(1.)

The University Museum,  
Oxford.

April 4<sup>th</sup> 1947.

My dear Ron,

I am really writing to you from Yorkshire, but am giving the Oxford address as I am returning there on Monday for 3 days, before going to Street.

You will remember the data on the Meadow Brown Butterfly, obtained on Tean last August and early September, which you so kindly looked on when I was with you three weeks ago. I now send you some further data which we also obtained.

In order to put the matter in its setting, as it were, it may be helpful just to remind you of the points (I always find that a

convenience myself). The island consists of a central mass (now called "area III") which is hilly and rocky, and supports the largest colony of ~~the~~ the butterfly. From this run out two long low arms (now called "areas II & IV"). These are low, very wind-swept, sandy, and covered with short turf. They do not support colonies of the butterfly, which may only occasionally be seen venturing out along them and - rarely - migrating from one end of them to the other.

At the end of "area II" is a considerable rocky and hilly peninsula, where we camped. This is "area I", and supports the colony of intermediate size. At the end of

area IV" is a smaller rocky and hilly peninsula (area V"), which supports the very small colony.

I enclose a rough pencil sketch, from memory, with these areas marked. There is an accurate map in our joint Annals of Eugenics (1940) paper (where the areas, for a different purpose, have different numbers).

The other mark-mud, you found the maximum numbers alive on any one day were something like (I have not the figures with me in Goldstone):-

<u>Area.</u>	<u>Max. alive on a day.</u>
<u>III.</u>	12,000
<u>I</u>	3,000
<u>V</u>	200

You will remember you got the exceedingly interesting indication that while ~~the~~ the average length

(4)

of life of an individual was approximately the same in the two larger colonies, it was decidedly less in the smaller one — So fitting in perfectly with one point about quite small colonies in the dominate paper.

Here are the additional data:-

I decided, at the same time as obtaining data on numbers and migration between colonies, to get some measure of variability. On the underside of the hind-wings is a row of spots which may vary from 1 to 5, or may be absent; pretty obviously a multifactorial character. These are counted for each sex in each colony. I enclose herewith the daily results and totals, which I hope will be clear as set out.

On attacking rough means to the values for each sex per colony, it seems clear that they are very close to each other. As any indication of differentiation ~~is~~ between the 3 colonies, the test therefore fails — though I think it was a reasonable thing to try. (Had a difference been evident, it might have been that colonies III & V were more alike than III & I).

Yet there does seem some interest in the sexual comparison between these distributions. The histograms for the males look like a 'normal' distribution (if one may use the expression for a value restricted to the whole numbers).

It is at once obvious that the ♀'s are more variable, and that this is chiefly due to something having

gone wrong with the left-hand sides of the histograms.

From the central mode (in the same place as that of the  $\sigma^2$ ) the numbers with more numerous spots decline much as in the  $\sigma^2$ . But these histograms ~~are unimodal~~ are actually bimodal, with a second mode at 0. (Seen in the case of area V, where the numbers are small, the situation is pretty evidently potentially bimodal).

It looks as if, physiologically, there were 2 types of control for these spots.

1. A set of genes acting in  $\sigma^2$  &  $\sigma^2$  alike.
2. A sex-controlled set, active only in the  $\sigma^2$ , and affecting the spots <sup>at the top</sup> ~~in the middle~~ of the row only ( $\therefore$  not working quantitatively,

in the sense that they can influence whether 0 or 1 spots are present - but cannot raise the number from (e.g.) 3 spots to 4).

For it occurs to me now that there is not an equal probability of any spot appearing.



A



B



C.

Here are 3 kind worms. A has the (rare) full set of 5 spots. B & C both have 2 spots, but they are not equally probable: type C is either rare or absent.

I wish I had more fully realized this at the time, and could have explored the distribution of the

five spots.

We have of course no indication why some of the genes controlling certain spots should act only in the ♀. Sex-controlled genes are frequent in the Lepidoptera, and among those with clear-cut effects they seem much more often (but not invariably) to restrict characters to the ♀. (You remember we found the ♀'s the more variable among night-flying moths).

Sorry to bother you with such a long letter - I wish this character had varied from colony to colony!

Yours truly,  
Henry



## Area I.

Date	males No. of spots						Total.	females No. of spots						Total.
	0	1	2	3	4	5		0	1	2	3	4	5	
16.viii.	1	-	2	1	-	-	4	1	-	-	1	-	-	2
17.	2	10	7	6	1	-	26	5	2	4	2	1	-	14
18.	3	1	18	4	-	-	26	3	3	5	-	-	1	12
19.	1	4	13	3	2	-	23	4	5	6	2	-	-	17
20.	-	1	14	3	2	-	20	4	1	5	3	1	-	14
21.	1	2	12	3	1	-	19	5	5	5	2	-	-	17
22.	-	1	14	4	-	-	19	2	3	9	2	1	-	17
23.	1	5	6	3	3	-	18	2	2	6	3	1	-	14
24.	-	1	10	6	-	-	17	4	2	10	2	1	-	19
25.	-	-	4	1	1	-	6	6	5	9	1	1	1	23
27.	-	2	3	1	-	-	6	12	8	5	2	-	-	27
28.	-	1	7	3	-	-	11	5	5	8	3	-	-	21
1.ix.	1	2	4	1	1	-	9	5	4	9	4	4	1	27
2.	-	2	3	2	-	-	7	5	6	10	3	-	-	24
	10	32	117	41	11	-	211	63	51	91	30	10	3	248

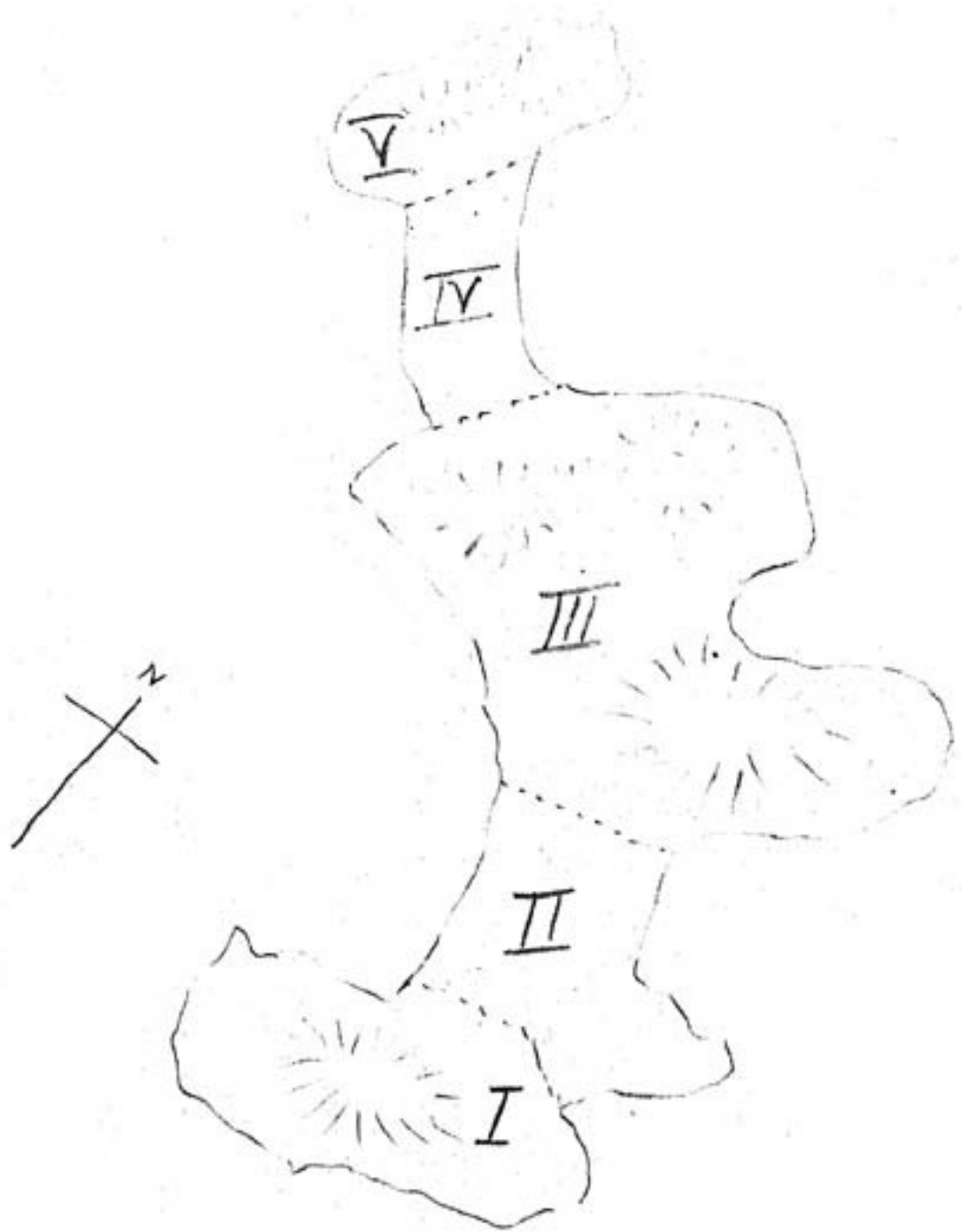
Date

## Area III.

16.viii.	-	1	4	-	-	-	5	-	-	-	1	-	-	1
17.	3	6	21	6	2	-	38	4	5	4	5	-	1	19
18.	3	2	22	5	3	-	35	4	7	10	2	-	-	23
19.	1	2	23	2	-	-	28	9	8	8	4	-	-	29
20.	-	3	21	4	1	-	29	5	4	12	5	2	-	28
21.	1	3	25	4	1	-	34	3	9	10	2	1	-	25
22.	1	10	13	5	1	-	30	6	6	10	5	1	-	28
23.	-	-	20	4	1	-	25	13	4	10	4	-	-	31
24.	2	5	16	6	-	-	29	3	7	12	4	1	-	27
25.	-	5	15	3	-	1	24	9	5	12	7	1	-	34
27.	-	5	7	2	1	1	16	8	1	22	8	1	-	40
28.	-	-	-	-	-	-	.	.	.	.	.	.	.	.
1.ix.	-	3	11	1	-	-	15	8	10	19	3	2	-	42
2.	-	2	5	3	2	-	12	10	7	16	6	1	-	40
	11	47	203	45	12	2	320	82	73	145	56	10	1	367

## Area V.

Date	males						Total	females						Total
	No. of spots							No. of spots						
	0	1	2	3	4	5		0	1	2	3	4	5	
16-viii.	-	1	3	2	-	-	6	1	2	-	1	-	-	4
17.	-	2	6	2	-	-	10	1	3	1	-	1	-	6
18.	-	1	-	1	1	-	3	4	2	2	1	1	-	10
19.	-	1	3	-	-	-	4	3	1	4	-	-	-	8
20.	-	1	3	1	-	-	5	2	2	1	3	1	-	9
21.	-	-	1	-	-	-	1	1	1	6	4	1	-	13
22.	-	-	1	-	-	-	1	3	3	3	1	-	-	10
23.	-	-	-	1	1	-	2	3	1	5	-	-	-	9
24.	-	-	-	-	-	-	0	2	2	3	1	-	-	8
25.	2	-	2	-	-	-	4	-	2	6	-	-	-	8
27.	-	-	1	-	-	-	1	2	2	7	2	-	-	13
28.	-	-	-	-	-	-	0	-	-	4	-	-	-	4
1-ix.	-	-	1	-	-	-	1	2	5	-	-	-	-	7
2.	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	2	6	21	7	2	-	38	24	26	42	13	4	-	109



Total length about 1/2 mile