7th. October, 1936.

My dear Henry,

You may recall that in my first analysis of the 1935 recapture data, assuming a constant death rate, I found that the death rate this year was a little higher than usual, the total days interval between release and recapture observed being 371 days, and expected 390.312. In making trial of other theories of survival I therefore aimed at somewhat higher death rate, e.g. about five instead of six days expectation of life, (but I actually tried it at 4½ observable).

If the death rate were effectively constant the expectation of life would be the same at all ages, which would be a great convenience, as the age since emergence is necessarily unknown, though, of course, this is not presumably exactly true. I next supposed that each day the expectation of life was diminished by half a day. This gives a very simple survival curve, e.g. of an expectation of 4½ days, the fraction surviving 1, 2, 3, ... days would be 9/10ths., 8/10ths., 7/10ths., etc., all having disappeared after 10 days. Necessarily I have to count from the date of first capture, and in the enclosed I have been sufficiently incorrect as to count each marking separately, as if the two marks had been on two separate moths, so somewhat exaggerating the expectation of survival of moths released twice relative to those released once only. Anyway I hoped an exploratory trial might show whether such a change in the form and intensity of the death rate would make much difference

in two respects, firstly on the estimated numbers at different dates, on their absolute values which seem surprisingly low, and on the relative values which showed an unreasonable tendency to be higher at the beginning and end than in the middle of the season. Secondly on the distribution of time interval between marking and recapture, which in my first examination you will remember gave too few observations for one day interval, too many from two to six days and too few again for more than six days.

In the first respect the recalculation makes surprisingly little difference. I have not overestimated the rate to about the same extent as I underestimated it before, having an expectation 394.472 for the total days interval between marking and recapture, where 371 was observed. The estimates of numbers flying are almost unchanged, being:-

Date	~~Old~~ New Calculation	~~New~~ Old Calculation.
16 July	3452.2	3153.0
18 "	1469.0	1324.2
19	1460.6	1357.5
20 "	1756.8	1657.4
21 "	1692.1	1580.4
22 "	1517.8	1404.8
24 "	3286.8	2937.5
26 "	4591.1	4245.5

It seems pretty clear that the alteration I have made in the form and intensity of the death rate curve has made quite

insignificant differences to this series. The general tendency is to be a trifle higher, and as one would expect a higher death rate to lead to lower estimates, this change must be ascribed to the fact that I am now supposing the death rate to increase fairly rapidly. The high value on the 16th. is reasonably ascribable to chance, in that rather few animals had been marked before this date, and the expectation of recapture may have been three or four, although only one marked insect was caught. The high values on 24th. and 26th. are much more difficult, since on those caught on 24th. there were 19 marks and actually there were 17 different insects, while on 26th. there were four, and it is difficult to suppose that the proportion of marked insects in the population at these dates was such as to give expectations of 34 and 12 respectivley, as one would have to suppose if the numbers were really no greater than in the well determined period from 18th. to 22nd. Is it possible to believe that the process of catching a d marking is much more injurious to the chances of life late in the season and with old insects than it is earlier? That marking and release does not do them any good seems an almost inevitable inference from the shortage of recaptures after one day as compared with two to six days, for this discrepancy still remains in the new calculations. Although, of course, by making sure that nothing is expected to survive so long as ten days the discrepancy at the other end of the table is largely removed.

Interval between marking and recapture.	Observed frequency.	Constant death rate.	Expected increasing death rate.
1 day	33	49.336	49.226
2 days	41	42.934	34.497
3 "	30	19.879	21.514
4 "	16	11.762	13.009
5 "	8	6.962	7.701
6 "	8	6.503	6.807
7 "	2	2.807	2.645
8 "	0	2.123	1.579
9 "	0	2.297	1.020
10 "	0	1.565	
11 "	0	.838	
12 "	0	.775	
13 "	-	-	
14 "	0	.196	
15 "	-	-	
16 "	0	.024	
	138	138.001	137.998

It should, I am sure, be borne in mind that there was no discrepancy in the time interval series in the first five years of the work, when actually you handled all the insects yourself, and that it has only appeared, and that inconspicuously, by this year, when much of the marking and releasing may have been done by assistants

without your previous experience. It is possible that this could be checked by comparing the later history of the insects you actually handled, marked and released yourself, with those released in your absence, but I do not think I have the data to distinguish them.

Yours sincerely,