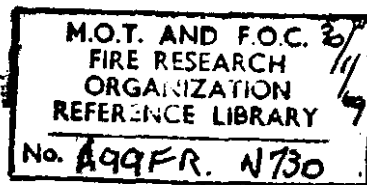


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Fire Research Note No. 730

MEASUREMENTS OF COTTON FLY
DEPOSITS IN A MILL

by

M. J. O'DOGHERTY, R. A. YOUNG, and A. LANGE

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FIRE
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MEASUREMENTS OF COTTON FLY DEPOSITS IN A MILL

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SUMMARY

Measurements are described of the quantity of cotton fly accumulating on sprinklers installed in an opening and beating room in a cotton mill over periods of time ranging up to 12 months.

KEY WORDS : Sprinkler, system, cotton, survey, rate, time.

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1. Introduction

The measurements were made to determine the amounts of cotton fly which accumulated on sprinkler heads over periods of time varying from one to twelve months. The location chosen was the opening and beating room of a cotton mill where the tightly compressed raw cotton bales were opened and mechanically beaten as the first stage in the separation of the fibres. These processes are those which are likely to produce the greatest concentration of airborne fibres, and the particular room selected was considered representative of the highest concentrations likely to be met.

2. Description of premises

The room in which the measurements were made had plan dimensions of 18.3 m by 13.7 m (60 ft by 45 ft) and was 3.66 m (12 ft) in height to a flat ceiling. The sprinklers were of the fusible strut pendent type mounted with the deflector plates at 15.3 cm (6 in) below the ceiling. The positions of the sprinklers are shown in Figure 1, the array consisting of four rows spaced 3.66 m (12 ft) apart with a distance of 2.44 m (8 ft) between the sprinklers on each row. The positions of the two beating machines in relation to the sprinklers are shown in Figure 1.

3. Measurements

All the sprinklers were cleaned of their initial accumulations of fly before the series of measurements began. Visits were made to the mill at the end of 1, 3, 7, 10 and 12 calendar months and the fly carefully collected from selected sprinklers using a soft brush. The fly was placed in marked paper bags and brought back to the Fire Research Station and accurately weighed. The sequence of collection is shown in Figure 2 for each of the sprinkler references given in Figure 1. For example, for sprinkler A1, the fly was collected only once, at the end of the 12 month period. In the case of sprinkler A4, the fly was collected after 1 month, 3 months, 7 months and 12 months. The selection of the sprinkler in relation to the collection periods was made so as to give a representative coverage of the area for each period.

4. Results

The weights of cotton fly collected are given in Table 1 for the various collection periods applicable to each sprinkler. The results are given as histograms in Figure 3 for each collection period, taking a group interval of 10 mg. The logarithms of the weights of fly collected are given as histograms in Figure 4 for each collection period.

The mean values of the weights of fly collected are plotted against time in months in Figure 5.

5. Discussion and conclusions

The quantities of fly collected after one month were higher than expected in relation to those collected after two, four and five months, which were made on the same sprinklers subsequently to the first month's collection (see Figure 2), and these quantities were generally considerably smaller. The amounts collected for the ten and twelve month periods, however, which would have been expected to include any residue following the initial cleaning, were not significantly greater than those after one month.

The quantities of fly which accumulated were very small, and interpretation of the results is difficult, with the exception of those applicable to collection after two, four and five months. These results are plotted on logarithmic scales in Figure 6, together with the single result obtained over a six month interval, and they show a good linear relationship. This graph shows that a mean quantity of 29.5 mg would be expected after a 12 month period, which is in close agreement with the observed values, suggesting that the initial contamination on the sprinklers may not have been significant as in the case of those used for the first month's collection.

All the weights of fly collected are plotted in Figure 7 on a cumulative percentage basis, against the half-range weights of the intervals used in the histograms of Figure 3, irrespective of the collection period. Only 7 per cent of the samples exceeded 100 mg in weight, and half of these results were obtained for the first one month samples.

The results indicate an average quantity of about 30 mg of fly accumulating on a sprinkler in a 12 month period, with a very low percentage of quantities more than 100 mg. The fly was generally observed to be in the form of a small "beard" below the deflector plate of the sprinkler, and there was no fly on the deflector or around the fusible strut.

Acknowledgements

Thanks are due to Mr. J.L. Oldham and Mr. H.F. Waldron of the Royal Insurance Group for arranging the conduct of the experiments, and for Mr. D.M.C. Ball, a Director of Bowker and Bull (Successors) Ltd., for his co-operation in enabling the measurements to be made at the firm's premises at Dukinfield, Cheshire.

Table 1 - Quantity of fly collected in mg.

Sprinkler reference	Collection period (months)						
	1	2	4	5	6	10	12
A 1							57
2							13
3	42	4	8	29			
4	30	5	11	11			
5		15				57	
6							
7	138	34	19	6			
8	200	122	36	32			
B 1							325
2	9	4	40	84			
3							39
4							22
5							30
6							7
7		7				56	
8						24	
C 1	40	1	1	29			
2		53				106	
3		10				48	
4		3				7	
5	61			9	15		
6							31
7		21				97	
8							34
D 1							20
2							22
3	2	2	7	4			
4	4	2	3	0			
5		4				60	
6	110	0	30	6			
7							75
8							7

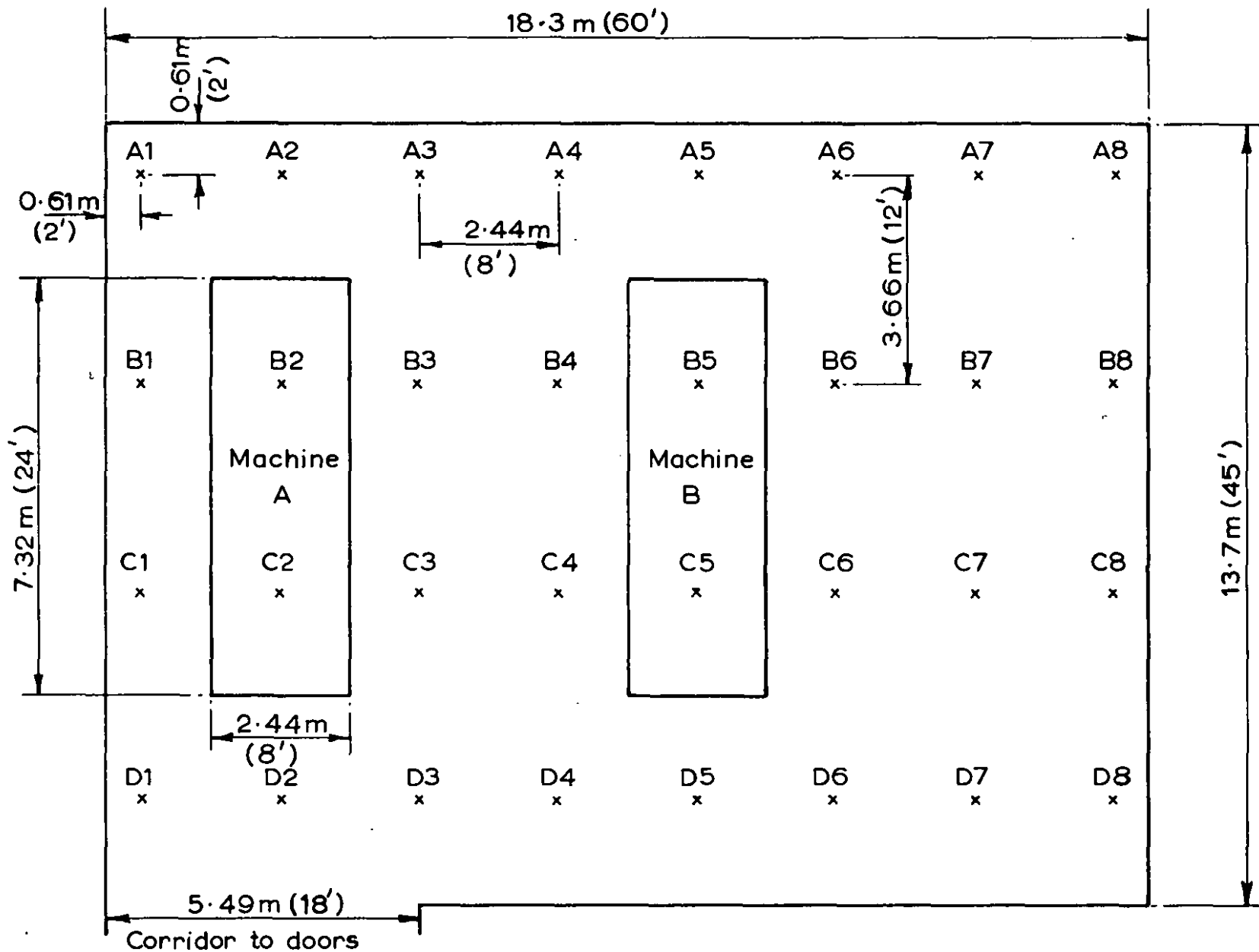


FIG.1. LAYOUT OF SPRINKLERS

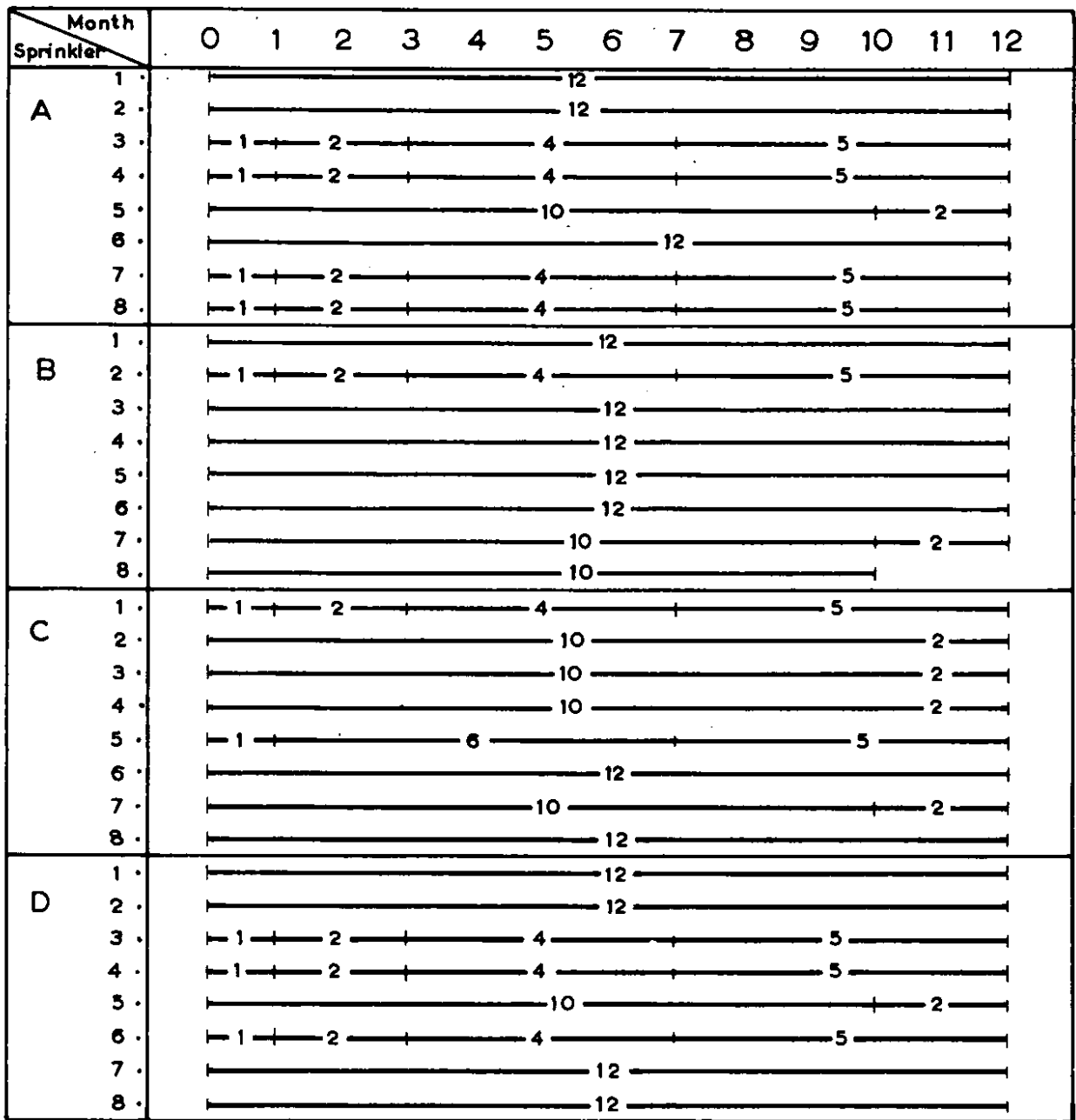


FIG. 2. SEQUENCE OF COTTON FLY COLLECTION

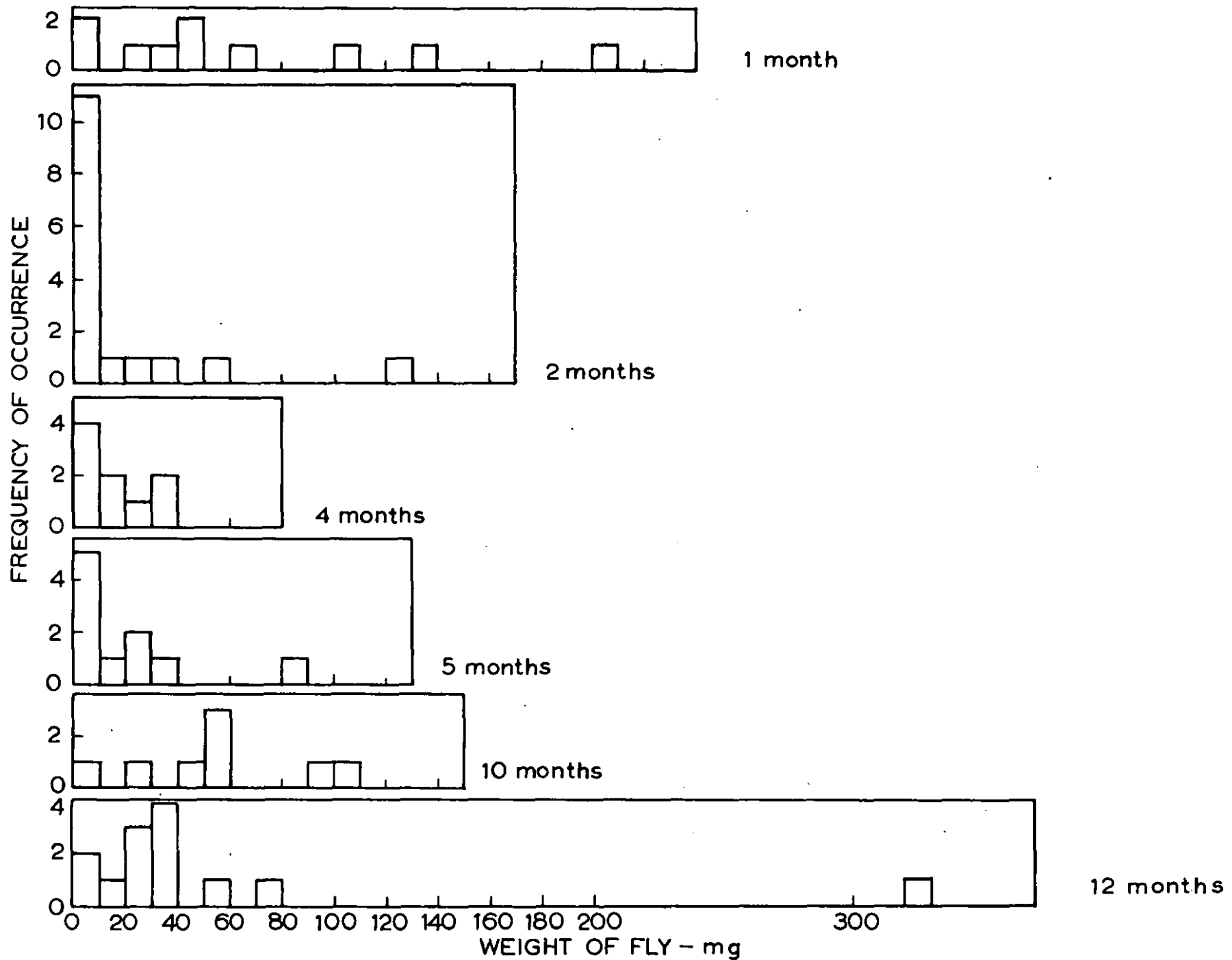


FIG. 3. DISTRIBUTION OF WEIGHTS OF COTTON FLY COLLECTED

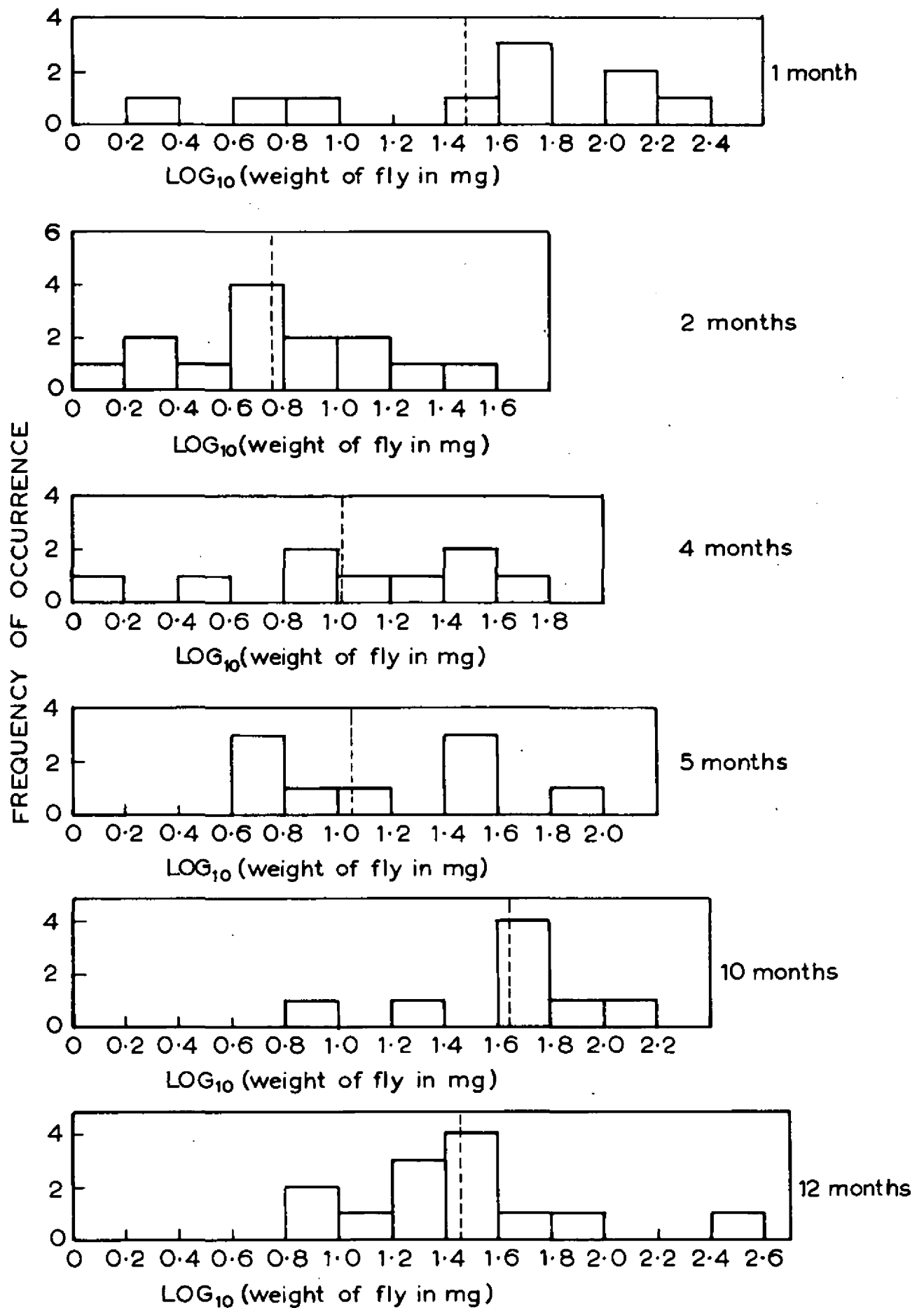


FIG. 4. DISTRIBUTION OF WEIGHTS OF COTTON FLY COLLECTED

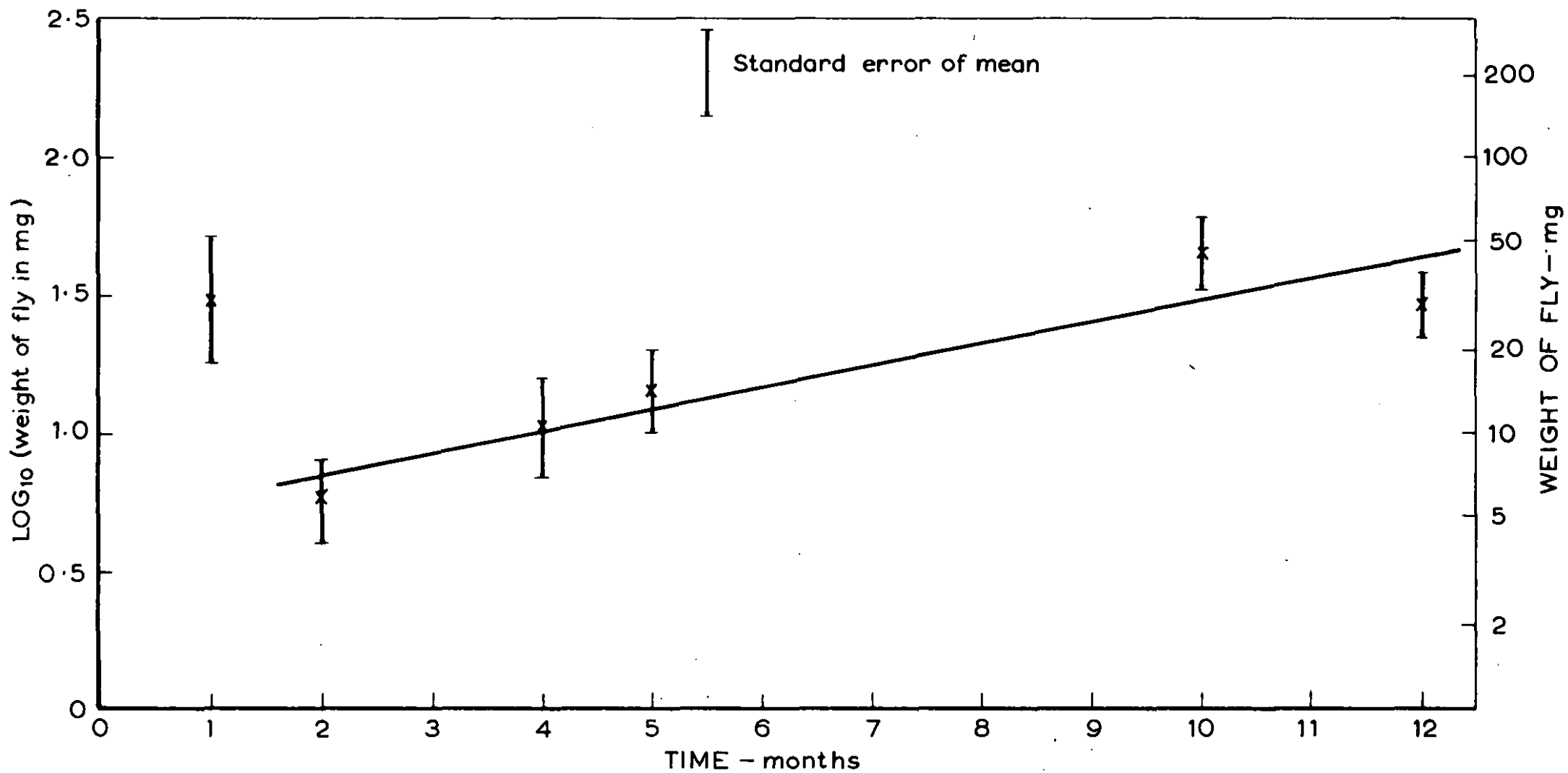


FIG. 5. VARIATION IN MEAN WEIGHT OF FLY COLLECTED WITH TIME

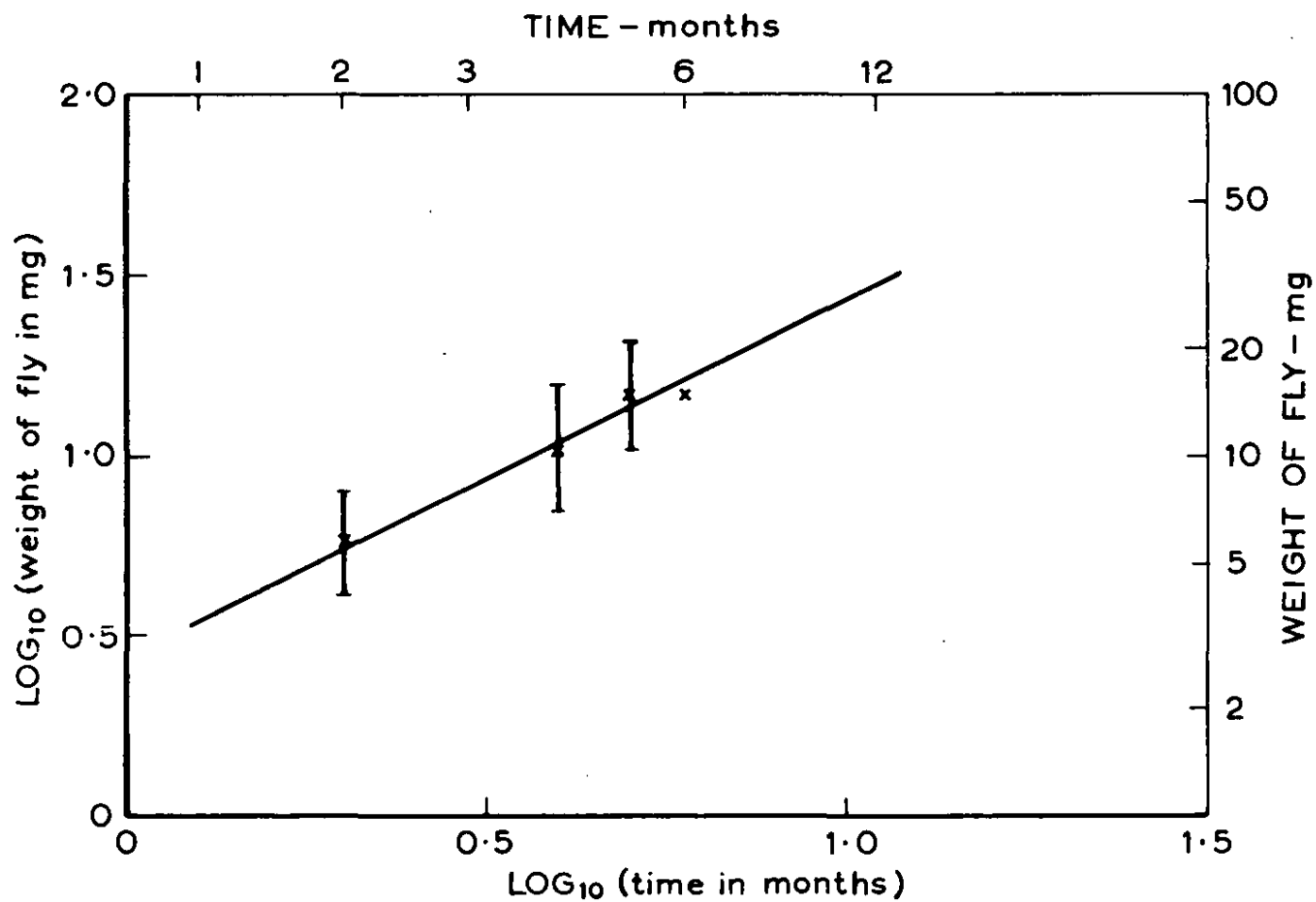


FIG. 6. VARIATION IN MEAN WEIGHT OF FLY COLLECTED WITH TIME

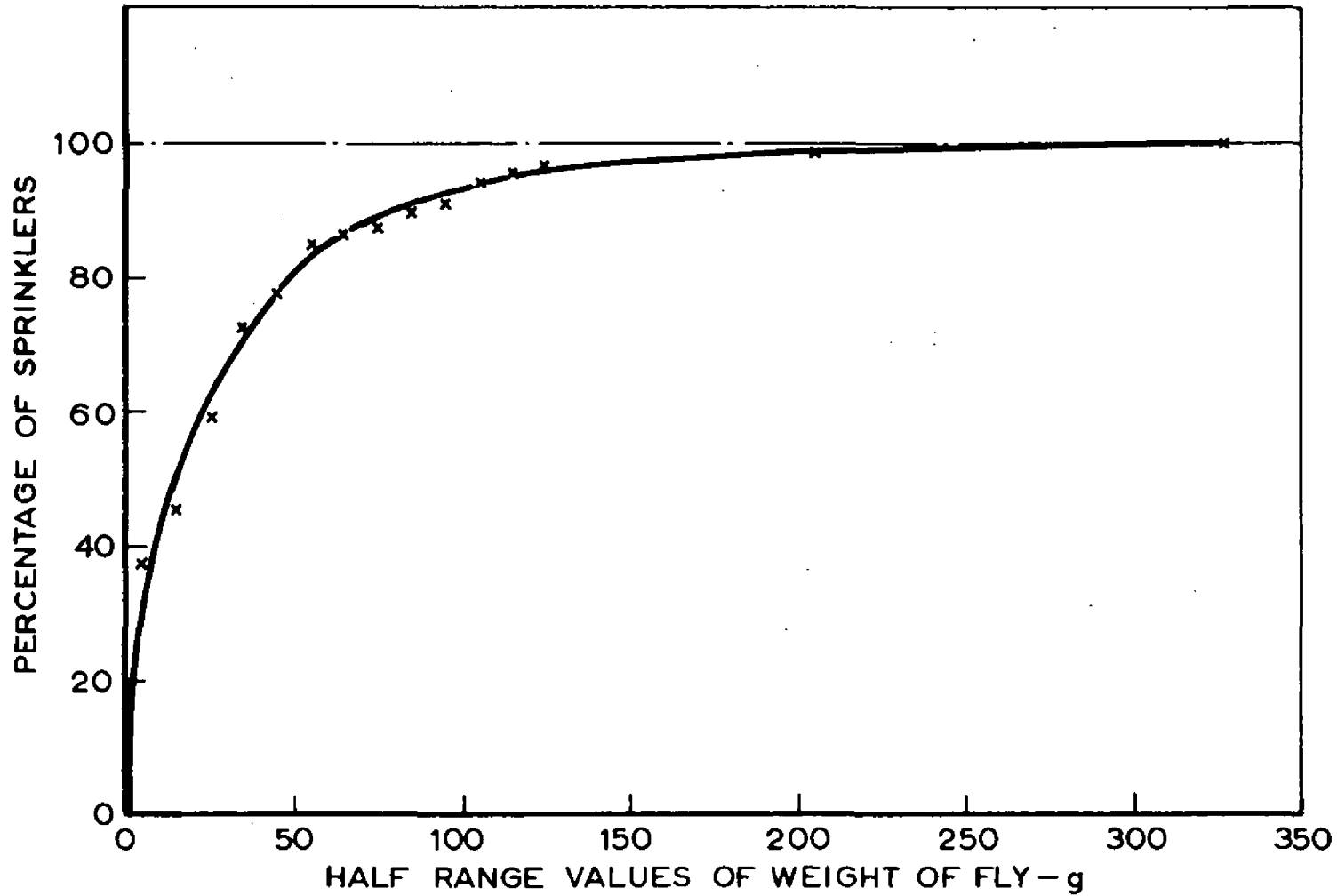


FIG. 7. CUMULATIVE PERCENTAGE OF SPRINKLERS PLOTTED AGAINST WEIGHT OF FLY COLLECTED

