freedom from competition, since it is growing on a substance which few other organisms are able to attack. It is possible that saprophytic stages of ringworm fungi may one day be found in Nature on various substrata other than fallen hairs. However, it may well be that cast-off hairs and epidermal scales are the most important natural substrata on which ringworm fungi pass their saprophytic existence and produce spores capable of infecting new human and animal hosts.

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¹ Sabouraud, R., "Les Teignes", Paris, pp. 583-724; 1910.
² Langeron, M., and Milchevitch, S., *Ann. Parasit.*, 8, 422-436, and 465-508; 1930.

³ Sabouraud, R., *loc. cit.*, pp. 725-727.

A Fly Pest of Timothy Grass

ATTENTION has been directed in recent years to the occurrence of a partial 'stripping' of the flower-heads of Timothy Grass (*Phleum pratense*) before these have emerged from the sheath. In Norway, 1914¹, Sweden, 1912-1916², Austria, 1921-1923³, and Russia, 1928-1929⁴, this damage has been traced to the maggots of Cordylurid Diptera, especially *Amaurosoma armillatum* Zett. Similar attacks have been noticed in Scotland and in 1931 Macdougall⁵ suggested that "a species of *Amaurosoma*" might be the cause.

In June and July 1931 we received, from the neighbourhood of Stirling, specimens of the grass showing the damage in progress. The larvæ, which were then feeding, afterwards pupated in soil and were kept in the laboratory until flies emerged in April and May of 1932. These were submitted to the Imperial Institute of Entomology and were identified by Sir Guy Marshall as *Amaurosoma armillatum* Zett. With them were sent flies caught by us, in the original locality, on June 8, 1932, which proved to be of the same species. Some of the latter mated and laid eggs, on Timothy grass, in the laboratory.

The egg is approximately 1 mm. in length, pale yellow in colour, tapering towards both ends, convex and smooth below, having four longitudinal ridges above and a reticulate pattern between these. Similar eggs on Timothy grass were brought in from the field on June 1, 1932. In all cases the egg was laid at the base of a leaf-blade, just above the ligule, long axis parallel to the veins of the leaf, and on a plant of which the flower-head had not yet appeared. We have never found more than one egg on a leaf, seldom more than one on the same plant.

The eggs laid in the laboratory hatched in four to five days and the larvæ gained access to the head, in most cases between the edges of the folded leaves, in one case by perforation of the leaves. Usually not more than one larva has been found in one head. The larva was seen to work round the head and downwards, devouring the flower-buds and cutting off the glumes. As much as one third of the head might be stripped.

When full-fed the insect drops to the ground and pupates immediately beneath the surface of the soil among the roots. It remains in the puparium throughout the following winter. We have found no evidence of a second generation in the year.

Further investigations are being made, in the laboratory and in the field.

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¹ *Review of Applied Entomology*, 3, A. 107; 1915.

² *Ibid.*, 6, A. 150; 1918.

³ *Ibid.*, 13, A. 100; 1925.

⁴ *Ibid.*, 19, A. 283; 1931.

⁵ *Trans. Highland and Agric. Soc.*, 43, 139; 1931.

Effect of Rainfall-Evaporation Ratio on Insects Inhabiting the Soil Surface

CERTAIN insects inhabiting the soil surface are markedly affected by soil moisture, largely owing to its influence on the humidity of their surroundings. Soil moisture is primarily dependent on the ratio of rainfall to evaporation (R/E); important secondary factors being soil type and its vegetative covering. If values for the R/E ratio in an area are known, a useful index to the conditions in the micro-environment at the soil surface is available for ecological studies¹. Evaporation from a free water surface is

FIG. 1.

nearly proportional to the saturation deficit of the air, other variables being constant. Saturation deficit is available for stations where temperature and relative humidity are recorded, and evaporation values can be determined approximately by reference to evaporation records for comparable stations. Owing to the variables involved, particularly wind and the character of the soil surface, the computed values can be only roughly approximate.

I have used a method with reference to *Sminthurus viridis* L. (Collembola), in South Australia, to show the months in which the species will occur and its probable geographical distribution over the State.