A NOTE ON THE RELATIONSHIP BETWEEN OUTBREAKS
OF THE ORIENTAL TUSSOCK MOTH, *Euproctis
Flava* AND WEATHER CONDITIONS

Kazuyoshi Miyashita
National Institute of Agricultural Sciences, Tokyo

INTRODUCTION

The oriental tussock moth, *Euproctis flava*, a well known pest insect for causing eruptive dermatitis by poisonous wing scales, is a very common species in Japan. It is known that, although its population density is relatively low in usual years, in some years it occurs in tremendous numbers so as to inflict injury upon men. However, characteristics and cause of outbreaks are little studied. The author attempted in this paper to analyze a relationship between outbreaks of this insect in Akita Prefecture and weather conditions.

Before going further, the author wishes to express his sincere thanks to Mr. K. Watanabe, Akita Prefectural Agricultural Experiment Station, who kindly gave help for collecting light trap records of the oriental tussock moth. The author is also indebted to Dr. S. Takaki, chief of the Second Laboratory of Insect Control, Division of Entomology, National Institute of Agricultural Sciences, for reading manuscript and giving valuable suggestions.

INTERVALS OF OUTBREAKS

According to literature and many documents written by Japanese authors, it is known that Akita Prefecture, an area locating in the northern part of the mainland of Japan, has experienced 7 to 10 instances of outbreaks of the oriental tussock moth in the past. The outbreak in 1889 recorded in the literature, is regarded as the oldest one. Recently it has been clarified that the outbreak of this moth tends to continue for 2 to 4 years, but the outbreak continued longer than 2 years was not found in literature. This fact is probably due to the fact that only the years with heavy injuries were recorded in literature. Such recorded outbreak-years in the literature are, therefore, thought to be peak years of outbreaks.

In Fig. 1 these recorded outbreak-years arranged by chronological order and their intervals were shown. As shown in Fig. 1, the outbreak of this insect have occurred 7 to 8 times in the past, and the intervals from an outbreak to the next are generally 7-9 years, except the period from 1897 to 1915. Therefore, there arises a question whether the outbreaks of this moth occurred with a certain periodicity or not.
According to the light trap record from 1947 to 1962 shown in Fig. 2, the number of captured moths showed a strong fluctuation, and peaks of fluctuation appeared every 7 years, although there were considerable differences in the height of peaks. In 1961 the population fluctuation reached a peak, but it did not develop to an outbreak.

If we suppose that there was such a small population rise in 1906, as in 1961 in Fig. 2, every interval between respective peaks of population fluctuation from 1889 to 1962 becomes 7-9 years, without exception. This supposition may not be unreasonable, because such a small population rise is apt to be unrecorded owing to minor injury. Under the reliable supposition, we can say that the moth population tends to fluctuate regularly, peaks of its fluctuation appearing every 7-9 years.

In random phenomena, it is possible to calculate the theoretical frequency distribution for the interval between 2 consecutive peaks (KAMEDA, 1916, and COLE, 1951). Thus, if we make a comparison between the theoretical distribution and observed one in an event, as made by UTIDA (1958) in the population fluctuation of the rice stem borer, *Chilo suppressalis*, we can get an information as to whether the event occurred in random way or not.

Table 1 shows the theoretical distribution for the random occurrence calculated from KAMEDA's formula and observed ones for the interval between peak years of outbreaks of the moth and for year to year fluctuations of temperatures and sunny hours in spring and summer. Here the year to year fluctuations of spring and summer temperatures and sunny hours are represented by the deviations from the averages calculated for 1886 to 1962 in the case of temperature and for 1904 to 1962.