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Light Trapping of Microlepidoptera Spec. Indet. Depending on Sunspot Numbers

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Abstract

The study examined the light trapping of Microlepidoptera spec. indet. in connection with the sunspot numbers. The catching data of moths (Microlepidoptera spec. indet.) were taken from the light-trap registers of the Hungarian Light-trap Network. During these years (1962, 1963, 1964, 1966, 1967, 1968 and 1969), 590,139 moths were caught during 1,479 nights by the 49 light-traps. Number of observing data are 21,761. Three divisions were formed from the years in accordance to the average sunspot numbers were in swarming period of less than 30, between 30-100, and was there more than 100. Our results show that in different years, the result of light trapping is different, according to the intensity of solar activity.

Keywords: Light-trap; Moths; Sunspots

Introduction

The activity of the Sun is the common name of the larger local disturbances of the sun's radiation. Electromagnetic and corpuscular radiation from the Sun changes the geophysical parameters on Earth. The coincidence or delay of the appearance of a terrestrial phenomenon depends on whether electromagnetic or corpuscular radiation is caused. Such events may be changes in the ionosphere and the upper atmosphere's magnetosphere, the formation of weather fronts, and sudden changes in the characteristics of ground magnetism. These can be followed by changes in the biosphere's phenomena. The solar activity, such as solar flares, may cause irregular departures from typical climatic conditions.

Blunck & Wilbert [1] assumes that insect gradations may be related to solar activity.

Polgár [2] found that the dry and the inland water years coincide with the sunspot with maxima or minima. Manninger [3] made observations on the gradation of harmful insects during a long period. There was a connection between gradations and dry and rainy periods that are related to the activity of the Sun. It has been shown that in the second half of the dry season there was gradation for drought-loving species, while at other times the gradation occurred in wet habitats for moisture-loving species. Richmond [4] suggests the sunspots affect the weather, which in turn affects the abundance of insects. There is not any study with relationship between sunspot numbers and light trapping of insects in the literature.

Material

Lepidoptera (Macro- and Microlepidoptera) is the best-processed group. Until now, however, no studies were published on the most injured moths. The reason for this is understandable that the unidentified specimens were recorded as "Microlepidoptera spec. indet." name. Because they were not known according to by species, it was not possible for further investigations. However, if we consider that there is a huge amount of collection data, we could see possibility for this research.

The catching data of Microlepidoptera spec. indet. were taken from the light-trap registers of the Hungarian Light-trap Network. During seven years (1962, 1963, 1964, 1966, 1967, 1968 and 1969) 590,139 moths were caught by the 49 light-traps. Of course, not all light-traps operated full years, but some of them were ceased, others sited later. This many moths were trapping in 1,479 nights. However, because more light-trap worked during one night, we could work up 21,761 observation data. The sunspot data were taken from the World Data Center SILSO, Royal Observatory of Belgium, Brussels.

Methods

The daily values of the sunspot numbers showed significant differences in the various years therefore we looked into the question of whether sunspot numbers that show significant differences from one year to the other modifies the number of the caught of examined moths collected in the different years. Three classes were formed from the years in accordance to the average sunspot numbers were in swarming period of less than 30 (1962, 1963, 1964), between 30-100 (1966), or was there more than 100 (1967, 1968, 1969).

The individual number is not the same in the different years and regions concerning to the same species. Because of this, relative catching (RC) values were calculated from number quotient of individuals caught during the sampling time unit (generally it is one night) and the average individual number in unit time of sampling [5]. Within the three groups, we made divisions using Sturges' method [6]. Finally, we averaged within groups the sunspot and relative catch data pairs. In the figures are plotted the results and in them were shown the confidence intervals.

Result and Discussion

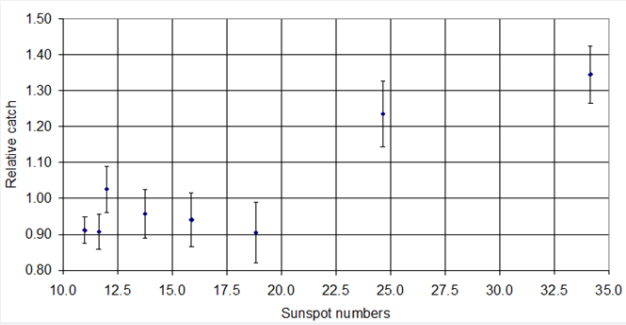

Figure 1: Light-trap catch of Microlepidoptera spec. Indet. In connection with the sunspot numbers (1962, 1963, 1964) (Average number of sunspot is between 0 and 30).

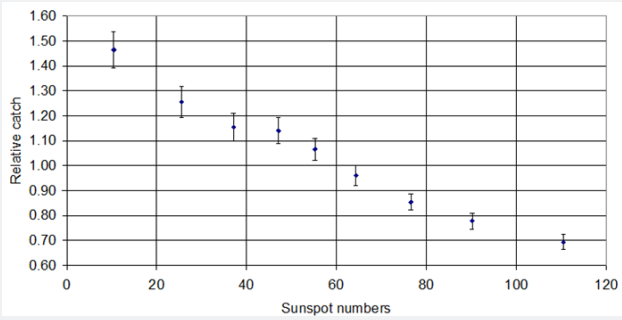

Figure 2: Light-trap catch of Microlepidoptera spec. Indet. In connection with the sunspot numbers (1966) (Average number of sunspot is between 30and 100).

Our results are shown in Figures 1-3. The flight activity and light-trap catches of Microlepidoptera species increased in those years when the average of sunspot numbers less than 30. By contrast, they are decrease in the year, when the averages of sunspots are between 30 and 100. The catch first increases in those years when the sunspot average higher than 100 and then deceases.

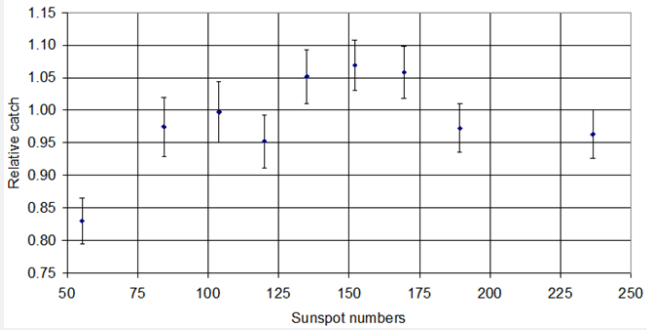

Figure 3: Light-trap catch of Microlepidoptera spec. Indet. In connection with the sunspot numbers (1967, 1968, 1969) (Average number of sunspot numbers are higherthan100).

It seems in this last groups, therefore, that during the swarming periods it is favourable for these moths if the number of sunspots is the same as the average. Both the smaller and the higher number of sunspots reduce the flying activity. We do not know exactly why. However, we assume that the influence of solar activity is related to a change in terrestrial weather conditions and geomagnetic disturbances or other environmental factors. These all affect the life phenomena of insects, including their flying activity.

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