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SHORT COMMUNICATION

Light-Trap Catch of Scarce Bordered Straw (*Helicoverpa armigera* Hübner) Depending on the Sunspot Numbers between Years 1993 and 2011

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ABSTRACT

The study examined the light-trap catch of the Scarce Bordered Straw (*Helicoverpa armigera* Hübner) (Lepidoptera, Noctuidae) depending on the sunspot numbers. The catching data of examined species were taken from the light-trap registers of the Hungarian Light-trap Network. During the years between 1993 and 2011, 25,531 moths were caught by the 36 light-traps. Our results show that there is low Sun's activity (the number of sunspots is between 0 and 30); there is no verifiable effect on the efficiency of light trapping of Scarce Bordered Straw. However, in other years, when the number of sunspots is between 30 and 100 and when it is higher than 100, high sunspot numbers cause an increase in the catch.

Keywords: *Helicoverpa armigera*, sunspots, light trapping

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1. 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.

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 overproduction 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.

2. MATERIAL AND METHODS

The catching data of Scarce Bordered Straw (*Helicoverpa armigera* Hübner, 1808, Lepidoptera: Noctuidae) were taken from the light-trap registers of the Hungarian Light-trap Network. During these years between 1993 and 2011), 25,531 moths were collected by the 36 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 1,837 nights. However, because more light-trap worked during one night, we could work up 6,754 observation data.

The sunspot data were taken from the World Data Center SILSO, Royal Observatory of Belgium, Brussels. 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 divisions were formed from the years in accordance to the average sunspot numbers were in swarming period of less than 30 (7 years), between 30-100 (7 years), or was there more than 100 (5 years).

The individual number is not the same in the divergent years and regions regarding to the same species. Because of this, relative catching (RC) values were calculated from number of collected individuals. RC value means the sampling time unit (generally it is one night) and the average individual number in unit time of sampling [5].

Within the three divisions, 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.

No significant differences were found in the first division; therefore, the result of this is not shown.

3. RESULTS AND DISCUSSION

Our results are shown in Figures 1-2.

Figure 1 Light-trap catch of Scarce Bordered Straw (*Helicoverpa armigera* Hübner) in connection with sunspot numbers
(The averages of sunspots are higher than 30 and lower than 100)

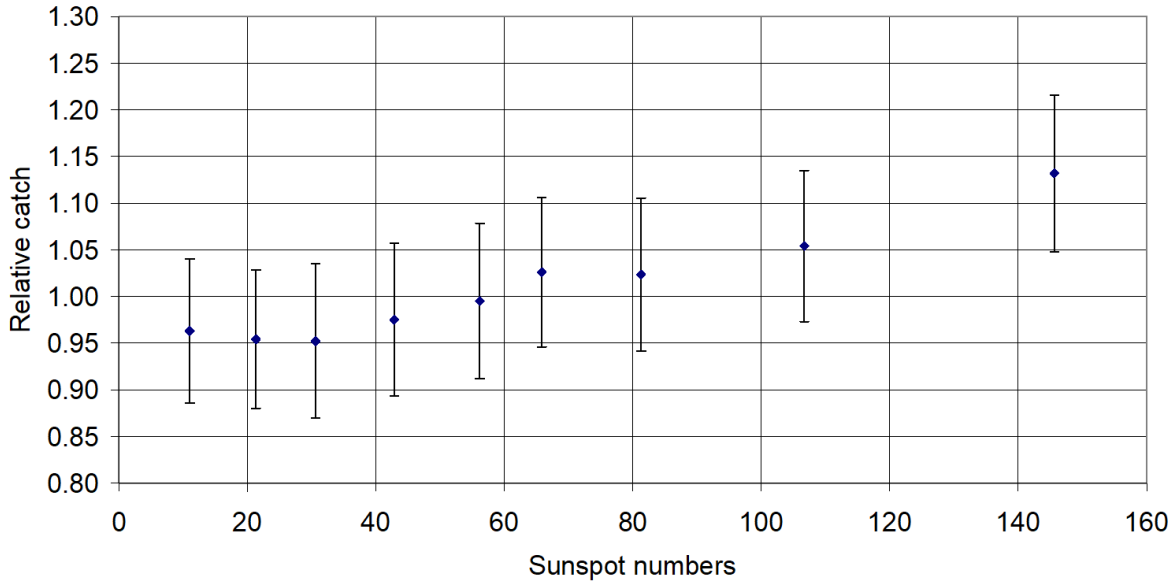
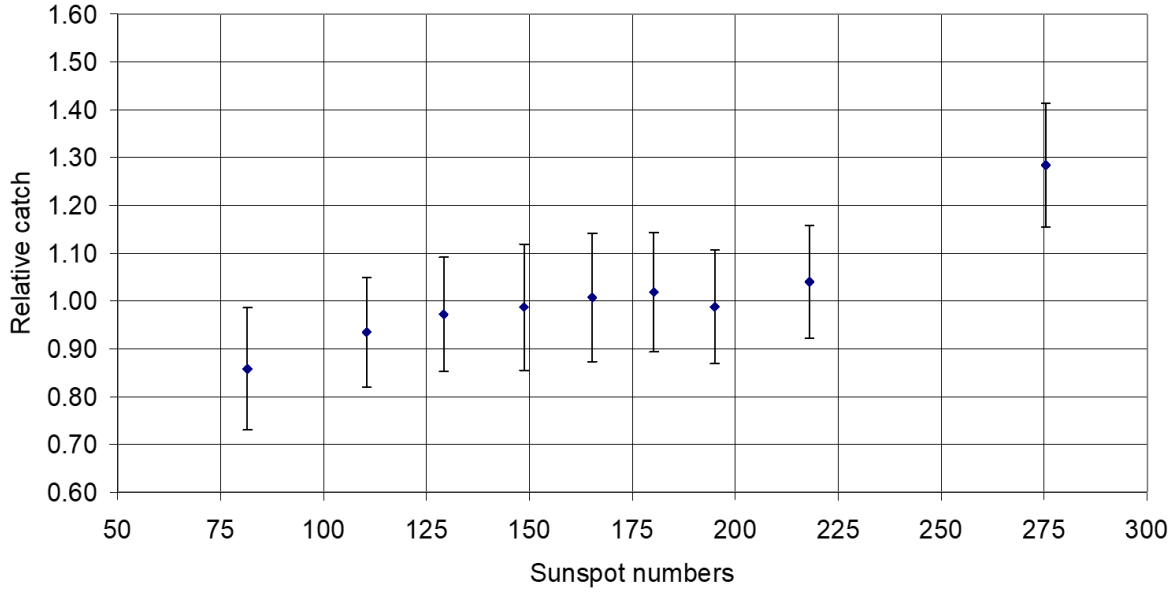


Figure 2 Light-trap catch of Scarce Bordered Straw (*Helicoverpa armigera* Hübner) in connection with sunspot numbers
(The averages of sunspots are higher than 100)



4. CONCLUSIONS

The light-trap catch of *Helicoverpa armigera* Hübner. increase parallel with the increased of sunspot numbers when they are between 30 and 100 and when it is higher than 100, high sunspot numbers cause an increase in the catch.

It is assumed 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 [7-11].

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