Poster 16
Diel Activity Patterns of Ground Beetles on a Sandy Grassland

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Abstract

1. The diurnal activity of the carabid community in an East-European dry sandy grassland was studied from April to October.
2. Soil and air temperature, relative air humidity and light intensity were measured and beetles were collected using 2 m long gutter traps.
3. In summer beetle activity was high for only a short period during the night. In spring and autumn activity was restricted to the day with no clear peak and with decreasing activity in the early afternoon.
4. Soil temperature and light intensity seem to be the most important factors in regulating of activity of carabids on sandy grassland.

Introduction

The daily activity patterns of carabids has been studied in numerous investigations involving field trapping and laboratory studies (Thiele 1977). A comprehensive review of this subject was published by Thiele & Weber (1968). Only a few data are known on East European dry natural sandy grasslands.

After studying the composition of the assemblage (Preiszner & Karsai 1988), our purpose was to study the general diel activity of a carabid assemblage of a sandy grassland. We studied possible environmental factors that influence diel activity and seasonal activity of these species.

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Materials and Methods

Investigations were carried out in the Bócsa-Bugac region of the Kiskunság National Park (Central Hungary). The average annual rainfall is 500 mm, falling mostly in spring and autumn with very dry and hot summer (Körmöczi, Bodrogközy & Horváth 1981).

Carabid beetles were collected using 2 m long gutter traps from April to October on a sandy grassland which had not been grazed for eight years.

We measured soil temperature (at 5 cm depth), air temperature, relative air humidity and light intensity, as possible factors influencing daily activity.

Results and Discussion

Annual and daily rhythms are apparently closely connected (Weber 1983), and both may be related to reproduction (Thiele & Weber 1968). Our results (Fig. 1) coincide with the conclusions of Novák (1972): the daytime activity of carabids is higher in the spring.

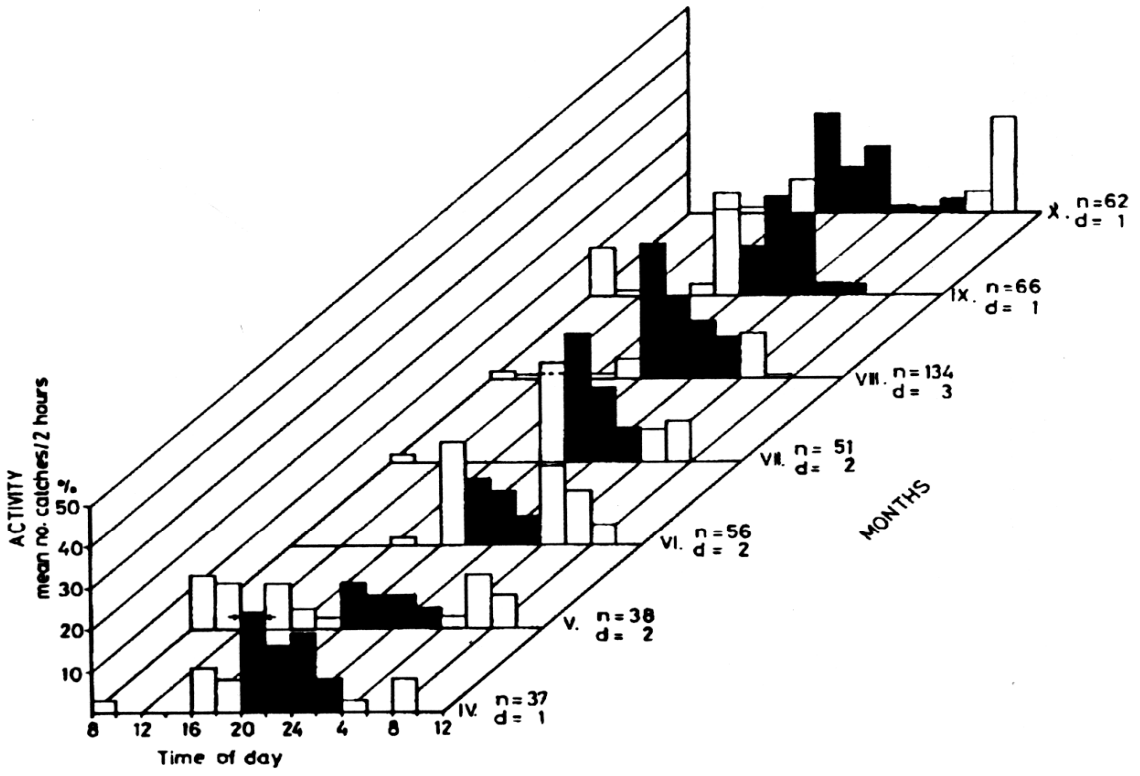

Figure 1. Diel activity patterns of the carabid assemblage is tested with gutter traps. n: number of individuals caughts; d: duration of catchig in days; black column: light intensity < 20 lux; empty column: light intensity > 20 lux.

In the summer the daylight hours are simply too warm for carabids, as Rensch (1957) also found in the tropics. The main activity occurs during the first few hours of the evening. The pronounced early evening activity may be caused by strongly decreasing temperature (Brunsting 1983) and/or the growing activity of nocturnal species, whose locomotion is blocked during the period of illumination (Weber 1983).

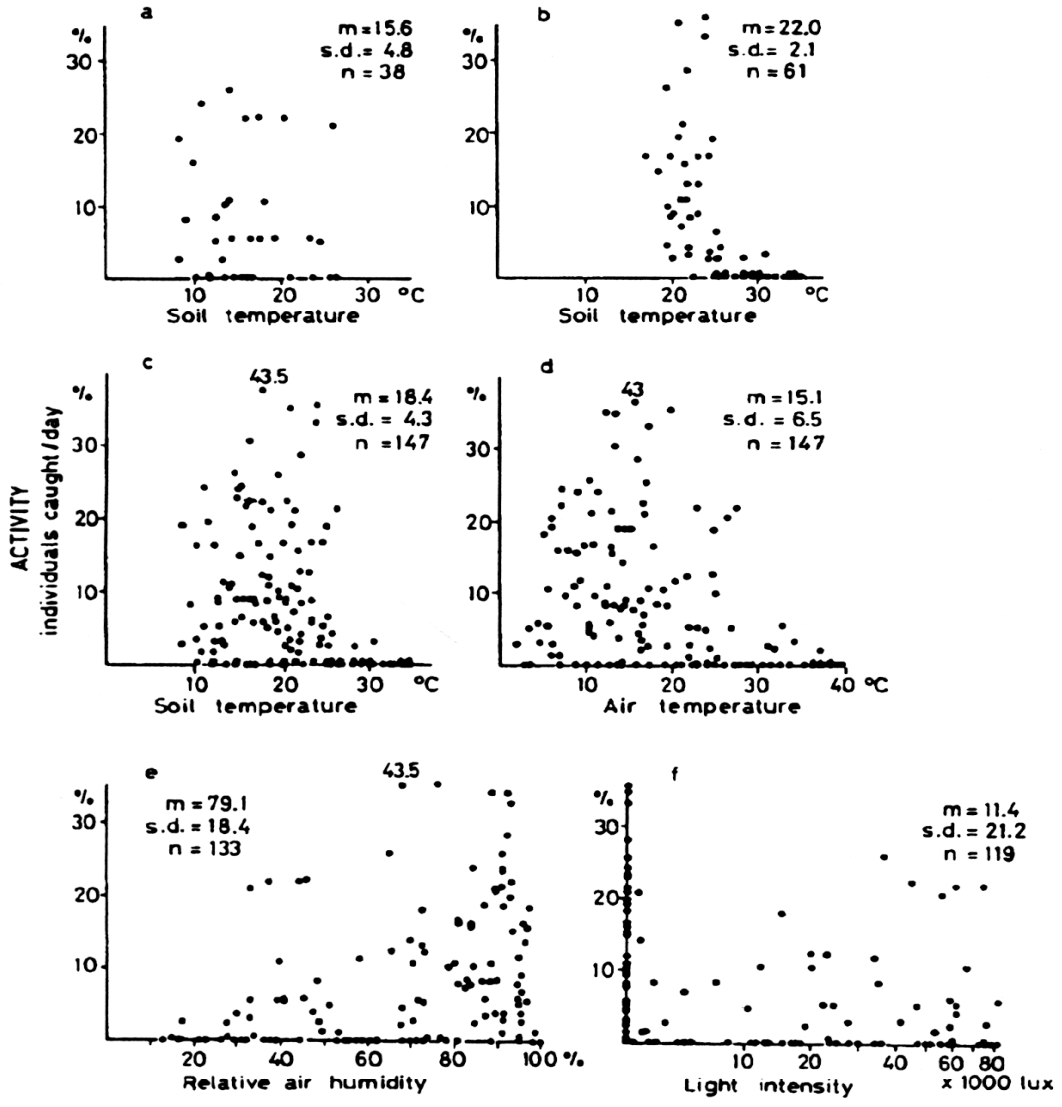

Figure 2. Effects of factors on diel activity of carabids.
(a) soil temperature in spring; (b) soil temperature in summer; (c) soil temperature all year; (d) air temperature all year; (e) relative humidity all year; (f) light intensity all year; n: number of records, m: mean, s.d.: standard deviation of activity calculated on the basis of the positive values.

In the studied period, carabid beetles were active in a narrow soil temperature range, which is indicated by the low values of standard deviations in (Fig. 2). It can easily be recognized especially in the summer period (Fig. 2b), when beetles were active only in 5–7°C range because of the high soil temperature values.

Carabids were active in a wide range of air temperature (Fig. 2d) and relative humidity (Fig. 2e) conditions. Activity-light intensity curves were bimodal (Fig. 2f). Direct and indirect effects of light and its relation to the circadian rhythms is well known (Lamprecht & Weber 1982, 1985).

Acknowledgements

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