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How does the desert locust *Schistocerca gregaria* behave in its environment? - A study within the *Zygophyllum waterlotii*-vegetation complex in proximity to the Atlantic Ocean in Mauritania (West-Africa)

Abstract

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In proximity to the Atlantic Ocean, the dune-wadi ecosystem of south-western Mauritania is characterized by the *Zygophyllum waterlotii*-vegetation complex. Within this habitat, the feeding and migration behaviour of the desert locust *Schistocerca gregaria* is investigated.

Introduction

The semi-desert of Mauritania (West-Africa) is one of the major breeding regions of the desert locust *Schistocerca gregaria* (Acrididae: Orthoptera, Forssk.). Under favourable conditions, locusts gregarize and form huge hopperbands of up to several million individuals ending up in swarms infesting other areas. Little is known to which extent patterns in landscape and vegetation and the occurrence of specific plant communities influence the migration and feeding behaviour of the gregarious larvae.

Methods

Over three weeks, the migration route of a small desert locust larvae band, containing approximately 20000 individuals, was followed using the Global Positioning System (GPS). Food consumption of the hoppers was examined in 25 frequency analyses combined with an estimation of feeding damage in five categories (Fig. 2). For investigations on the vegetation, the phytosociological approach of Braun-Blanquet (1964), modified for studies in semi-arid regions as proposed by Deil (1984), was used together with structural analyses and a large scale landscape-transect.

Study area

The study area is situated in proximity to the Atlantic Ocean close to Nouakchott (N 18°) in south-western Mauritania (West-Africa). With annual summer rainfalls of 100 to

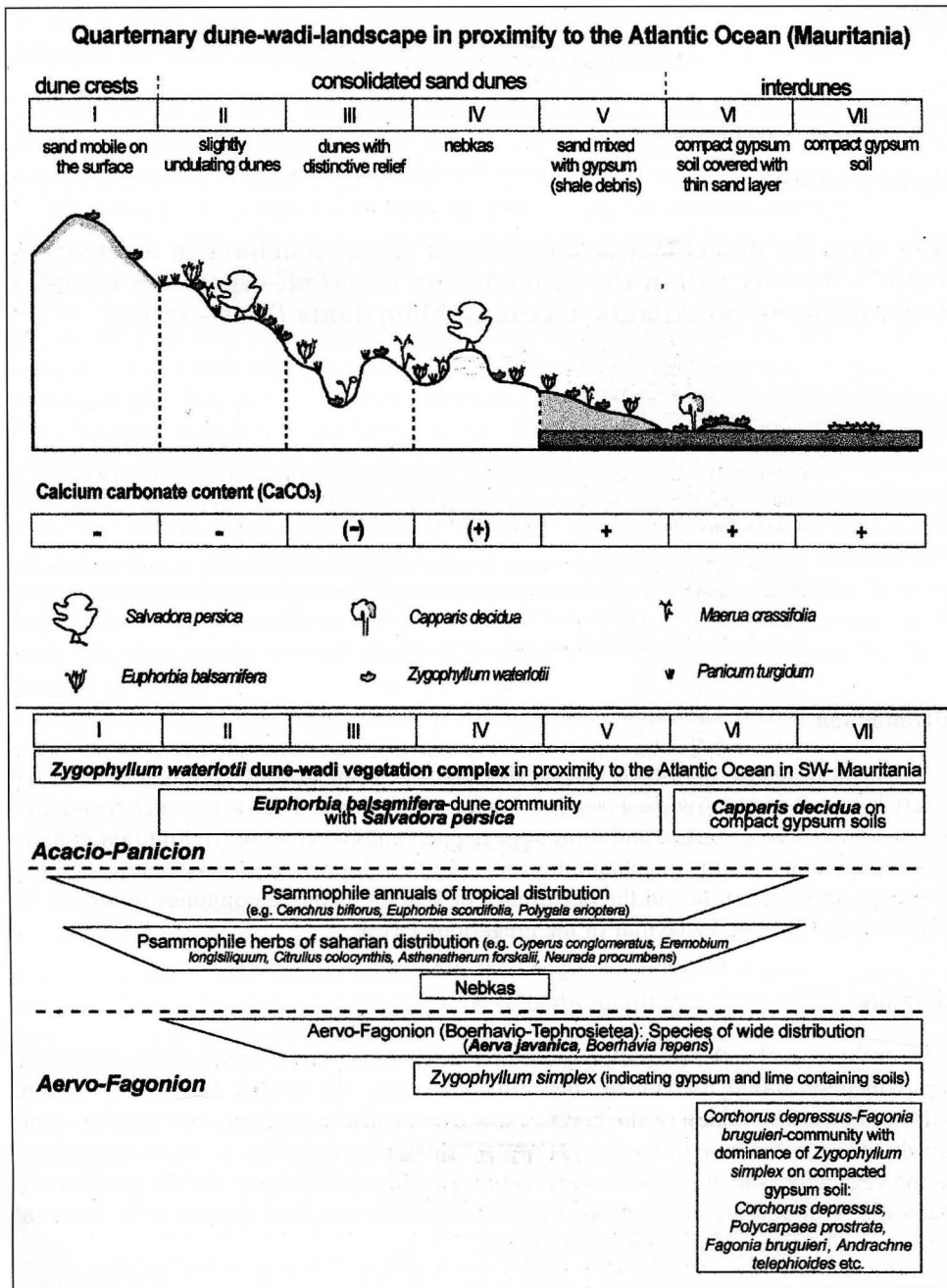


Fig. 1. Plant communities of the *Zygophyllum waterlotii*-vegetation complex in proximity to the

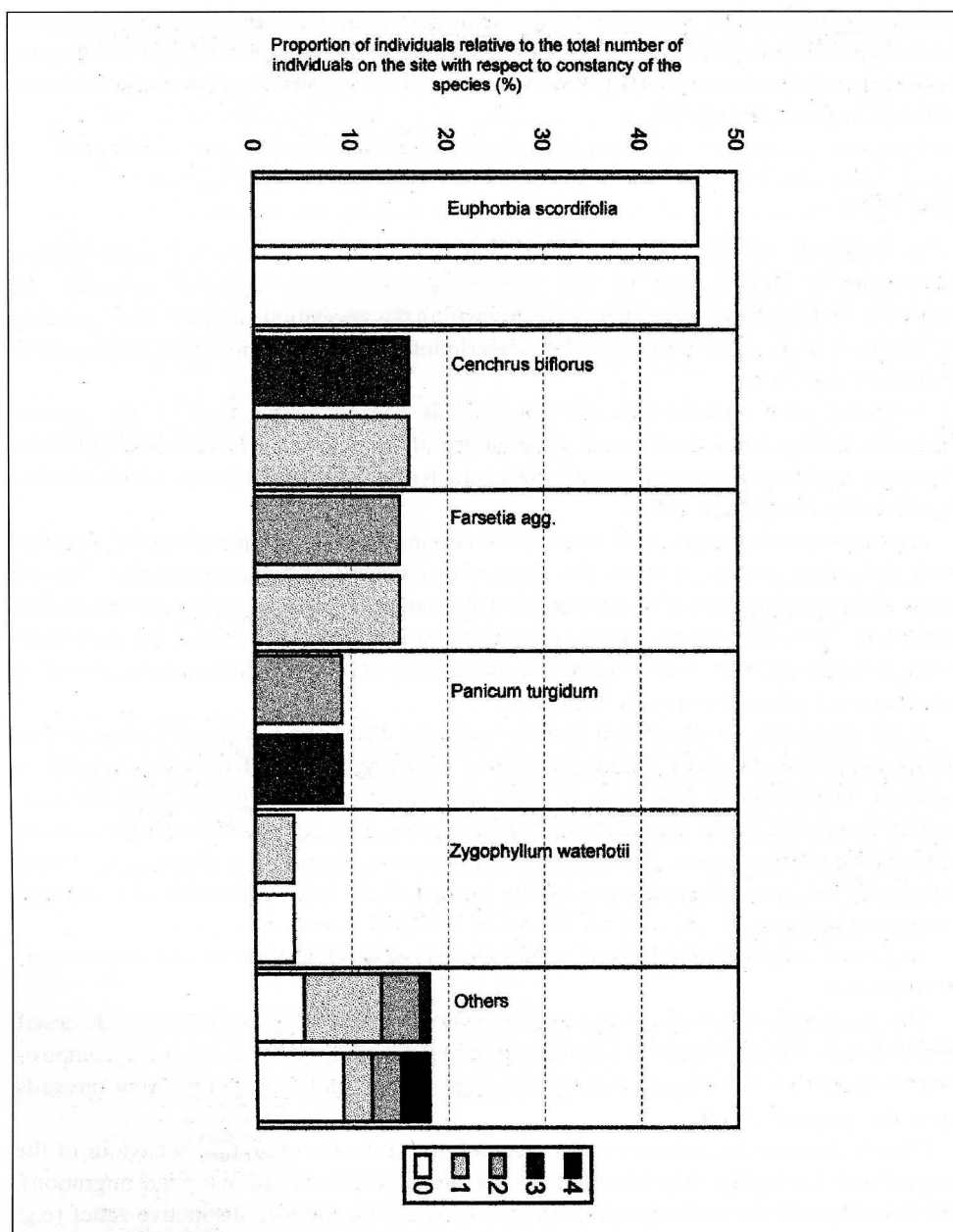


Fig. 2. Quantitative analysis of damage caused by larvae (4th instar) feeding on the herb layer of the *Euphorbia balsamifera*-dune community. Number of plants damaged distinguishing damage of generative organs (left column) and reproductive organs (right column) with respect to dominance and constancy of the different plant species. Median of 5 frequency analyses. Feeding damage categories: 0 = not damaged (0-10 %), 1 = lightly damaged (11-25 %), 2 = moderately damaged (26-60 %), 3 = heavily damaged (61-99 %), 4 = dead (100 %).

250 mm (Barry 1989) it is part of the semi-desert. In this region of the Senegalo-Mauritanian Basin, the landscape is characterized by Quarternary sand dunes mostly consolidated, and Quarternary ocean, lake and river deposits which form plains in the interdunes (Caruba & Dars 1991).

Vegetation

In proximity to the Atlantic Ocean, the dune-wadi ecosystem of south-western Mauritania is characterized by the *Zygophyllum waterlotii*-vegetation complex. An overview of the plant communities occurring within the vegetation complex corresponding to landscape units is given in Fig. 1. Full descriptions and phytosociological tables will be published elsewhere.

Perennial plant communities are classified as oceanic components of the *Acacio-Panicion* distinguished from inland communities of the alliance. *Maerua crassifolia* and *Panicum turgidum* are counted towards the character species of the alliance which was first described by Barry & al. 1981.

Physiognomically, *Euphorbia balsamifera* dominates the consolidated dunes. Together with *Salvadora persica* it forms the *Euphorbia balsamifera*-dune community. Varying types of the community can be differentiated depending on edaphic and geomorphological conditions. With dune crests, slightly undulating parts, valleys and nebkas, the dune landscape is highly variable. A rich therophyte-community of psammophile annuals, as well of sahelian as of saharian origin, is associated.

In the interdunes on compacted gypsum soils, the dwarf shrub *Zygophyllum waterlotii* forms vegetation stands in a contracted mode with single trees of *Capparis decidua* in between. Superimposed is a facies of the *Corchorus depressus-Fagonia bruguieri*-community dominated by the annual *Zygophyllum simplex*. This community has to be counted towards the alliance *Aervo-Fagonion* (class *Boerhavia-Tephrosietea*, Barry & al. 1986). Species of the *Aervo-Fagonion* are mainly located in the wadis, but parts of it can also extend to the dunes.

Migration and feeding behaviour of larvae depending on patterns in and composition of vegetation

The *Zygophyllum waterlotii*-vegetation complex presents a typical habitat of the desert locust (Popov 1997). Migration and feeding behaviour related to patterns in and composition of vegetation was studied following a small hopperband from fourth instar onwards up to the imaginal moult.

Clearly, patterns in landscape and vegetation influence the migration behaviour of the hopperband. Generally, migration follows the direction of wind (down-wind migration), but deviations of the main direction are based on canalization by distinctive relief (e.g. deep dune valleys) or orientation towards dense vegetation clusters like the contracted *Zygophyllum waterlotii*-wadi vegetation.

During migration, the phytophagous larvae primarily feed on plants of the herb layer which consist mainly of annuals, but they also feed on low perennial herbs and shrubs as well as seedlings of trees and shrubs. The qualitative analysis of food consumption shows that the larvae polyphagously feed on most of the plants. Species of more than 11 families

are consumed. Nevertheless, a small group of plants is consistently rejected, so that feeding also is selective. Species avoided mainly come from the families *Euphorbiaceae* (e.g. *Euphorbia scordifolia*), *Asclepiadaceae* (*Calotropis procera*), *Tiliaceae* (*Corchorus* sp.), *Cucurbitaceae* (*Citrullus colocynthis*) and *Poaceae* (hard grasses like *Aristida* sp.). The selective food choice is reflected in the total number of plant individuals damaged in a plant community with respect to dominance and constancy of the different plant species. The result of the quantitative analysis of damage caused by desert locust larvae (4th instar) within the herb layer of the *Euphorbia balsamifera*-dune community is presented in Fig. 2. Since the annual herb *Euphorbia scordifolia*, which is one of the plant species rejected by the larvae, occurs in huge quantities (about 45 % in average), the total feeding damage in these stands is low. Only about 50 % of the total number of individuals is consumed, mainly the leaves of the annuals *Cenchrus biflorus*, *Farsetia* agg. and the flowers of the perennial tussock grass *Panicum turgidum*. Consequently, feeding behaviour and damage depend on composition, constancy and dominance of species in the different plant communities.

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References

- Barry, J. P. 1989: Le problème des divisions bioclimatiques et floristiques au Sahara. Note VII: Les confins saharo-sahéliens en Mauritanie. — Bull. Soc. Bot. Fr. Actual. Bot., **136**(3-4): 67-84.
- , Celles, J. C., Maniere, R. 1981: Le problème des divisions bioclimatiques et floristiques au Sahara algérien. Note III: L'analyse de la végétation de la région d'In-Salah et de Tamanrasset (Sahara Central et Méridional). — *Naturalia monopeliensia*, Ser. Bot. **44**: 1-48.
- , —, Musso, J. 1986: Le problème des divisions bioclimatiques et floristiques au Sahara. Note V: Du Sahara au Sahel. Un essai de définition de cette marche africaine aux alentours de l'Adrar des Iforas. — *Ecol. Medit.* **12**: 187-235.
- Braun-Blanquet, J. 1964: *Pflanzensoziologie*. — Wien.
- Caruba, R. & Dars, R. 1991: *Geologie de la Mauritanie*. — Nice.
- Deil, U. 1984: Zur Vegetation der Gebirgstihamah am Beispiel des Beckens von At Tur. — Pp. 225-235 in: Kopp, H. & Schweizer, H. (ed.), *Jemen-Studien*, **1**. — Wiesbaden.
- Popov, G. B. 1997: *Atlas of Desert Locust Breeding Habitats*. — Rome.

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