Distribution of grasshoppers (Othoptera: Acridoidea) in the Tapacurá ecological station (São Lourenço da Mata, PE / Brazil)

Almeida, AV.[a]* and Câmara, CAG.*[b]

[a]Área de Zoologia, Departamento de Biologia, Universidade Federal Rural de Pernambuco, Rua Dom Manoel de Medeiros, s/n, Dois Irmãos, CEP 53130-030 Recife, PE, Brazil

[b]Programa de Pós-gradução em Entomologia Agrícola, Laboratório de Produtos Naturais Bioativos, Universidade Federal Rural de Pernambuco, Rua Dom Manoel de Medeiros, s/n, Dois Irmãos, Recife, PE, Brazil

*e-mail: argus@db.ufrpe.br

Received February 2, 2006 – Accepted March 17, 2006 – Distributed February 29, 2008

Abstract

Over the last five years, collection and periodic observation in the Tapacurá Ecological Station, São Lourenço da Mata, Pernambuco, Brazil, have been carried out to produce a systematic ecological inventory of grasshopper distribution within the station based on the classifying criteria for Acridoidea, providing new data on families, subfamilies, tribes, genera and species related to the various types of vegetation and environments the station affords.

Keywords: Orthoptera, Acridoidea, grasshopper distribution, Tapacurá ecological station.

Distribuição de gafanhotos (Othoptera: Acridoidea) na estação ecológica do tapacurá (São Lourenço Da Mata, PE)

Resumo

Através de procedimento de coletas e observações periódicas, ao longo de cinco anos, na Estação Ecológica do Tapacurá, São Lourenço da Mata, PE, procedeu-se a um inventário sistemático-ecológico da distribuição dos gafanhotos da estação, adotando-se critérios classificatórios de Acridoidea com novos assinalamentos de famílias, subfamílias, tribos, gêneros e espécies, relacionados aos diversos tipos de vegetação e ambientes da estação.

Palavras-chave: Orthoptera, Acridoidea, distribuição de gafanhotos, estação ecológica do Tapacurá.

1. Introduction

Since the 1970's, what we know about neotropical grasshoppers has been considerably revised and modified, especially thanks to the initiative of French acridologists such as Descamps (1977, 1978), and subsequent bio-ecological research conducted by Duranton et al. (1987) and Lecoq (1991).

South-American grasshoppers have been the subject of intensive study by Amedegnato (1974), Carbonell (1978), Carbonell and Descamps (1978), Roberts and Carbonell (1979), Roberts and Carbonell (1980), and Roberts and Carbonell (1981), resulting in overall revisions of South-American Acridoidea, principally in relation to Acrididae and Romaleidae.

In Brazil the following families are important: Pyrgomorphidae, Pauliniidae, Ommexechidae, Romaleidae and Acrididae, in addition to the Eumastacoidea and Proscopioidea superfamilies. Romaleidae are found exclusively in the new world, and Ommexechidae, Pauliniidae and the Proscopioidea superfamily are endemic in South America (Lecoq, 1991).

The first systematic samples of insects from the Tapacurá Ecological Station were collected by Dom Bento Pickel at the beginning of last century (Almeida, 1998). As head of the entomology faculty at the São Bento Agricultural College, his objective was to organize a didactic collection. This insect collection, of enormous value to our region has been carefully conserved and can still be found in the Biology Department of Pernambuco Federal Rural University (UFRPE). The collection includes a considerable number of grasshoppers, the majority of which are either unidentified or incorrectly identified on the basis of outdated taxonomy.

Ecological studies of grasshoppers are essential to gather enough objective information for taxonomical revision. It no longer makes sense in the field of acridology to publish taxonomical lists without the necessary basic environmental species distribution data (Lecoq, 1991). For this reason, our study is aimed at providing a preliminary inventory of Acridoidea groups in relation to the diverse vegetation types in the Tapacurá Ecological Station.

2. Material and Methods

2.1. Description of the area

The Tapacurá Ecological Station was created by Resolution nº 51/75 in March of 1975, and set up in April of that year. It has a total area of 776 hectares, land previously occupied by the São Bento sugar plantation, and where the São Bento Agricultural College operated for 19 years. The College was moved to Dois Irmãos and gave rise to Pernambuco Federal Rural University (UFRPE), in the municipality of São Lourenço da Mata, (formerly the Tapera Station, as it is called in Dom Bento Pickel's records), at latitude 8° 10', longitude 35° 11' and altitude 102 m.

The mission of the Tapacurá Ecological Station is to carry out research in the fields of botany, zoology and ecology. Work at the station is aimed at developing habitats for conserving forest resources and fauna in the Brazilian Atlantic Forest. Station activities also include the commercial cultivation of seedlings of the fruit and forest trees of the Brazilian Atlantic Forest (brazil wood or pau-brasil, pau-jangada and ipê). The site also includes a river basin, formed by the Tapacurá river. The aims of the University are quite compatible with incentives for environmental education, in the form of ecological visits and serving as a research base for conducting studies in areas such as the spontaneous recuperation of soils; re-use of soils that have been fallow for lengthy periods and reintroduction of plant and animal species now extinct in the region. The station also has a seed bank providing support for reforestation agencies.

Based on the classification in Andrade and Rodal (2004), the climate at the station is As', with average annual rainfall of 1300 mm and forest of the seasonal semi-deciduous type (FETB) on seasonally dry lowland.

In terms of its external features, the station consists of two extensive forests: Camocim and Toró, separated by the Tapacurá dam reservoir.

2.2. Field procedures

This study was carried out by periodic sampling between 1999 and 2003, during both rainy and dry seasons. Samples were collected using insect nets, sweep nets, dip nets, beating trays and traps. The insects were collected in the field, killed in a killing bottle and placed in boxes for transport to the laboratory.

2.3. Laboratory procedures

On reaching the laboratory, the insects were fixed and mounted on entomological pins, dried in a bacteriological oven for 48 hours and then labeled and placed in collection boxes.

The insects were identified using identification keys and diagnostic references; by comparison with already identified species in the entomological collection, or through sending specimens to specialists.

2.4. Sampling area

Sampling in this type of vegetation, albeit within an ecological station and therefore that should have been conserved in its original state, is justified due to the long period over which it has been influenced by human activity, starting from the 17th century when it was turned into a sugar plantation. It became an agricultural college only in the 20th century, with permanent staff who had their animal stock, dwellings and plots of land to grow what they needed. The University was founded in the 1970s, inheriting all the problems its current organization faces.

Grasshoppers were found in the following widely varying types of vegetation:

1) Vegetation around dwellings; 2) Agricultural areas; 3) Arboreal and herbaceous vegetation bordering trails and pathways; 4) Aquatic vegetation; 5) Semi-aquatic vegetation; 6) Vegetation at the boundary between forest and 7) other vegetation types and forest vegetation.

3. Results and Discussion

There is a close ecological relationship between grasshoppers and types of environmental vegetation. Since they are both phytophagous and polyphagous, their feeding preferences often encompass entire plant families, as in the case of *Chromacris speciosa* in relation to Solanaceae (Table 1).

Vegetation of types 1 and 2 in the Tapacurá Ecological Station is highly influence by human activity and the majority of grasshoppers collected in these locations were not exclusively from the ecological station. Examples include the Romaleidae: *T. collaris, C. speciosa, B. gigas* and *Xyleus* sp., as well as the Acrididae: *A. flavolineata, A. dilecta, S. flavofasciata* and *O. punctata*.

Type 1 vegetation consists basically of fruit and ornamental plants; type 2 of corn, beans, cassava, sugar cane and grasses, within areas more or less restricted to the station. Type 3 vegetation has been subjected to some degree of human influence, usually in the form of periodic grass-cutting. The diversity of shrubs and plants and the fact that the environment allows in plenty of light means that grasshopper species can be found in large numbers and in all development stages.

Type 4 vegetation consists mainly of "water hyacinth" (Pontederiaceae), found in large numbers in reservoirs and watercourses in the ecological station. The two species of grasshopper found there are *P. acuminata* and *C. aquaticum*, both well adapted to aquatic surroundings with their enlarged tibia on the back legs adapted for swimming. These species are seen to be by some authors, including Duranton et al. (1987), as biological control agents for *Eichornia grassipes* (Mart.) and *E. azurea* (Kunth), considered acquatic weeds. Guido and Perkins (1975) arrived at the same conclusion regarding *C. aquaticum* in Uruguay, Argentina and the U.S.A. In Brazil, in the state of Mato Grosso, Ferreira and Vasconcelos-Neto (2001) confirmed these conclusions both in the field and in the laboratory.

Table 1. Collected/observed grasshopper groups in various vegetation types of the Tapacurá Ecological Station.

Grasshoppers	Vegetation types
PYRGOMORPHIDAE	
Algete bruneri Bolivar, 1905	3; 6
PAULINIIDAE	
Pauinia acuminata (De Geer, 1773)	4
ROMALEIDAE	
Helionotus mirabilis Rehn, 1909	6
Tropidacris collaris (Stoll, 1813)	2; 3
Chromacris speciosa (Thunberg, 1824)	2; 3; 6
Brasilacris gigas Rehn, 1940	2; 3
Agriacris scabra (Thunberg, 1824)	3
Xyleus sp.	1; 3
PHAEOPARINI	
Homalosaparus sp.	6; 7
ACRIDIDAE	
MELANOPLINAE	
Dichroplus punctulatus (Thunberg, 1824)	3; 6
LEPTYSMINAE	
LEPTYSMINI	
Belosacris coocineipes (Bruner, 1906)	3; 5
Cylindroyyetix riverae orientalis Roberts, 1975	3; 5
Stenacris cylindrodes (Stal, 1860)	5
TETRATAENIINI	
Cornops aquaticum (Bruner, 1906)	4
Stenopola pallida (Bruner, 1908)	5
OMMATOLAMPINAE	
OMMATOLAMPINI	
Lagidacris hebes	6
ABRACRINI	
Abracris flavolinetata (De Geer, 1773)	1; 3; 6
Abracris dilecta Walker, 1870	1; 3; 6
Orthoscapheus rufipes (Thunberg, 1824)	3; 6
SYNTOMACRINI	
Osmiliola aurita Giglio-Tos, 1897	6
Syntomacrella sp.	6
CYRTACANTHACRIDINAE	
Schistocerca flavofasciata (De Geer, 1773)	1; 2
GOMPHOCERINAE	
Amblytropidia ferruginosa Stal, 1873	3
Orphulella punctata (De Geer, 1773)	1; 3
Rhammatocerus borelli	3; 6

Type 5 vegetation consists mainly of Graminae and Cyperaceae, found on the banks of rivers and reservoirs. The grasshopper species found here are the Acrididae (sub-family Leptysminae), including *B. coccineipes*, *C. riverae orientalis, S. cylindrodes* and *S. pallida*, all common in this environment and morphologically adapted with features such as enlarged tibias on the back legs and in some cases endophytic oviposition (Lecoq, 1991).

Type 6 vegetation is extremely diversified. In the Camocim forest, the boundary vegetation consists mainly of shrubs native to the recovering forest and herbaceous plants consisting of Compositae and Poaceae. The grasshopper species found here are either exclusive to this type of vegetation such as Acrididae *L. hebes, O. aurita* and *Syntomacrella* sp. and Romaleidae *H. mirabilis*, or with oviposition and development differentiated to suit the vegetation as evidenced by the presence of young *C. speciosa, A. bruneri, D. punctulatus, A. flavolineata, A. dilecta, O. rufipes* and *R. borelli* after the first rainfall of the year.

Type 7 is the vegetation inside the forest, consisting of herbaceous plants, shrubs and trees. This is a high humidity, low light environment. Most of the Acridoidea found are considered as dendrophilous living inside the canopy. Descamps (1977, 1978) collected and classified many new Acridoidea species in South American forests during the deforestation of the region. These arboreal grasshopper species seldom come down to ground level except possibly to lay eggs and are therefore quite difficult to collect and the majority have morphological adaptations. An example is brachyptery in *Homalosaparus* sp.; only young forms were found in type 6 vegetation and the adults in vegetation type 7 on tree trunks and with strong mimicry.

4. Conclusions

This study contributes to a better understanding of grasshoppers, indicating that they are not randomly distributed in the different environments in which they are found. They have distribution patterns associated primarily with feeding on the vegetation types, anthropic factors, amount of light and shade, and can evidence a distribution pattern characteristic of the transition between young and adult forms on the boundaries of vegetation types.

However, there is a fairly significant difference in the number of grasshoppers found in the rainy season and the dry season. Some Romaleidae species can only be found in the field after the first rainfall of the year primarily because they are subject to diapause, which affects the number of generations of each species.

References

AMEDEGNATO, C., 1974. Les genres d'acridiens néotropicaux, leur classification par familles, sousfamilles et tribus. Paris: *Acrida*, vol. 3, p. 193-204.

ANDRADE, KVSA. and RODAL, MJN., 2004. Fisionomia e estrutura de um remanescente de floresta estacional semidecidual de terras baixas no nordeste do Brasil. *Revista Brasileira de Botânica*, vol. 27, no. 3, p. 463-474.

CARBONELL, CS., 1978. Origin, evolution and distribution of the neotropical acridomorph fauna (Orthoptera): a preliminary hypothesis. Buenos Aires: *Revista de la Sociedad Entomológica Argentina*, no. 36, p.153-175.

CARBONELL, CS. and DESCAMPS. M., 1978. Revue des Ommatolampae (Acridoidea, Ommatolampinae). Paris: *Annales de la Société Entomologique de France*, vol. 14, no. 1, p. 1-35.

DESCAMPS, M., 1977. Étude des écossistèmes guyanais. I. Eumastacoidea and Acridoidea dendrophiles (Orthoptera). Paris: *Annales de la Société Entomologique de France*, vol. 13 no. 2, p.193-236.

-, 1978. La faune dendrophile neotropicale. II Revue de Taeneophorini et Ophthalmolampini (Orthoptera, Romaleidae). Paris: *Bulletin du Museum National d'Histoire Naturelle*, no. 355, p. 371-416.

DURANTON, JF., LAUNOIS, M., LAUNOIS-LUONG, MH. and LECOQ, M., 1987. *Guía Práctico de Luta contra os Gafanhotos Devastadores no Brazil*. Rome, Montpellier: FAO-CIRAD-PRIFAS, 161 p.

FERREIRA, SA. and VASCONCELOS-NETO, J., 2001. Ecology, behavior and bionomics: host plants of the grasshoper *Cornops aquaticum* (Bruner) (Orthoptera: Acrididae) in the wetland of Poconé, MT, Brazil. Londrina: *Neotropical Entomology*, vol. 30, no. 4, p. 523-533.

GUIDO, AS. and PERKINS, D., 1975. Biology and host specificity of *Cornops aquaticum* (Orthoptera: Acrididae), a potential biological control agent of waterhyacint. *Environmental Entomology*, vol. 4, no. 3, p. 400-404.

LECOQ, M., 1991. *Gafanhotos do Brasil. Natureza do Problema e Bibliografía.* CIRAD-PRIFAS, France-EMBRAPA/NMA, Brazil. 157 p.

ROBERTS, HR. and CARBONELL, CS., 1979. A revision of the genera *Stenopola* and *Cornops* (Orthoptera, Acrididae, Leptysminae. *Proceedings of the Academy of Natural Sciences of Philadelphia*, no. 131, p. 104-130.

-, 1980. Concluding revision of the subfamily Leptysminae (Orthoptera, Acrididae). *Proceedings of the Academy of Natural Sciences of Philadelphia*, no. 132, p. 64-85.

-, 1981. A revision of the neotropical genus Abracris and related genera (Orthoptera, Acrididae, Ommatolampinae). *Proceedings of the Academy of Natural Sciences of Philadelphia*, no. 133, p. 1-14.