Functional Ecosystems and Communities

Abbreviation: Func. Ecosyst. Commun.
Print: ISSN 1749-0502

Scope and target readership: *Functional Ecosystems and Communities* explores the dynamic nature of populations, communities and ecosystems in all organisms. Particular emphasis will be placed on the ecology of vascular plants and bryophytes in terrestrial, aquatic, wetland, marine, brackish, estuarine or freshwater ecosystems. Papers reporting on experimental, descriptive, and historical studies of any aspect of plant population, physiological, community, ecosystem and landscape ecology as well as on theoretical ecology are within the scope of the journal. Studies on molecular plant systematics and taxonomy, encompassing evolutionary, phylogenetic and biogeographical studies at the populational, specific, higher taxonomic levels in all kingdoms (but focusing primarily on higher plants) are also welcome. We encourage manuscripts on physiological ecology, evolutionary ecology, mechanistic community ecology, ecological functional genomics, and ecosystem function.

One of the main focuses of *Functional Ecosystems and Communities* will be on molecular genetic techniques to address ecology, evolution, behaviour and conservation. Studies may employ neutral markers for inference about ecological and evolutionary processes or examine ecologically important genes and their products directly. Research areas of interest to the journal include: analytical methods, conservation genetics, ecological interactions, evolutionary dynamics of QTLs, genetic marker development, impact of GMOs and GMPs, individual and species identification, microbial biodiversity, molecular adaptation and environmental genomics, population genetic theory, relatedness and kin selection, reproductive strategies, sex allocation, speciation genetics.

We also encourage studies on:

1) Aquatic Ecology (limnology and oceanology), the structure and organization of lower levels into higher levels (intraspecific and interspecific interactions). Food web studies including ecophysiological investigations on kairomones and infochemicals, and their influence on matter and energy transfer are acceptable.
2) Biological Invasions: analytical syntheses and overviews of invasive biotas; ecological consequences of invasions relative to alterations in community-ecosystem structure (including energy flow, biodiversity, and invasion-mediated extinction); evolutionary consequences of invasions in both historical and geological time are especially encouraged; factors that influence inoculation, establishment, and persistence of invasions; mechanisms that control the abundance and distribution of invasive species, biogeography, genetics, dispersal vectors; patterns and processes of biological invasions (human-mediated introductions and natural range expansions) in terrestrial, freshwater, and marine (including brackish) ecosystems.
3) Biology, Fertility and Productivity of Soils: the link between, and impact of agriculture, deforestation and industrialization on ecological systems.
4) Management and policy issues related to conservation programs and global amelioration or control of invasions.
5) Population structure and phylogeography.
6) Weeds: biology and control, herbicides, invasive plant species in all environments, population and spatial biology, modelling, genetics, biodiversity and parasitic plants.

Global Science Books, Ltd.
46 Syon Lane, Isleworth, Middlesex
TW7 5NQ, United Kingdom

Editorial Office: Takamatsu, Japan
Accounting: Lagos, Portugal

GSB homepage: www.globalsciencebooks.com
Journal page: http://gsbjournals.client.jp/FEC.html
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Cover photos: Top right: A *Daceton armigerum* worker capturing a locust. Center left and bottom right: *Crematogaster gabonensis* hunting an army ant *Dorylus nigricans* soldier (in Cameroon) on the ground. More details in Dejean *et al*., pp 105-120.

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Printed in Japan on acid-free paper.

CONTENTS

ABSTRACT

Invited Mini-Review: The Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) contributes to nature conservation by regulating international trade in listed species by means of a permit system. Through this control system all parties assist in maintaining the listed rare and threatened species in the wild. CITES allows trade in wild specimens up to a level that is not detrimental for the survival of the species in the wild, that is, a use of nature commonly referred to as sustainable use. The basis of CITES are discussed with special emphasis on the Cactaceae and other succulent plants included in the Convention. The framework of regulation of plants in trade is outlined and the impact of illegal trade is discussed. The definition of artificial propagation used by CITES is explained. Additional references and resources for an in-depth study of the convention are provided.

ABSTRACT

Invited Mini-Review: Modern agriculture has greatly altered and fragmented natural habitats globally. This has led to extensive loss of biodiversity and ecosystem services such as biological control. The provision of key components of biodiversity through ecological engineering can partially restore these ecosystem services. Many natural enemies of agricultural pests are omnivores that feed not only on prey but also on plant material such as nectar and pollen. It is possible to improve biological control through the integration of such alternative food sources into agro-ecosystems. We will here review how provision of flowering plants can increase the fitness and abundance of natural enemies, enhancing their suppression of populations of arthropod pests. We will discuss factors that need to be considered to optimise the likelihood of success for this type of ecological engineering. The plant resources provided should increase the fitness and abundance of the targeted natural enemies, but not benefit pests or higher order carnivores. They should be integrated into the agro-ecosystems in a way that is spatially and temporally favourable for natural enemies as well as practical and cost-effective for producers. We will present practical examples of progress and discuss prospects for the adoption of this more sustainable approach to pest management.

ABSTRACT

Original Research Paper: Our aim is to assess the main problems in the studies of tree communities in the Brazilian Atlantic Coastal Rainforest by analyzing methods and sampling criteria used by different authors. We surveyed the literature and built a databank, which included 225 phytosociological tables obtained from 113 publications. Most publications are theses and papers published in non-indexed journals of restricted circulation. The studies concentrate in the southeastern states, and there are large non-surveyed stretches, mainly in the northeastern states. Botanical families with identification problems were always among the ten most abundant ones in every survey. The size of the smallest individual sampled exerted more influence on the results than the sampling method (plots or point-centered quarters), thus making a standardization necessary in future studies. Considering a similar sampling effort, the quarter method sampled a larger number of species than the plot method. The number of individuals sampled was a better indicator of sampling effort than the area sampled. Considering our present knowledge, there is still a great need to survey the Brazilian Atlantic Rainforest and publish the results in adequate journals. However, each survey should obey a minimum set of criteria that yields reliable data. Analyzing the variation of community structure in space and its relation to abiotic variables allows for hypothesis testing and provides key information for planning conservation of natural areas and remediation of degraded vegetation.

ABSTRACT

Invited Review: After first being ground-nesters and predators or scavengers, ants became arboreal with the rise of angiosperms and provided plants a biotic defense by foraging for prey on their foliage. Plants induce ants to patrol on their leaves through food rewards (e.g., extra-floral nectar and food bodies), while ants attend hemipterans for their honeydew. Most arboreal-nesting ants build their own nests, but myrmecophytes, plants that offer hollow structures that serve as nesting places to specialized “plant-ants”, illustrate the tight evolutionary bonds between ants and plants. In tree-crop plantations and in some rainforest canopies territorially-dominant arboreal ants have large colonies with large and/or polydomous nests. Their territories are defended both intra- and interspecifically, and are distributed in a mosaic pattern, creating what has become known as “arboreal ant mosaics”. They tolerate non-dominant species with smaller colonies on their territories. Arboreal ant mosaics are dynamic because ant nesting preferences differ depending on the species and the size and age of supporting trees. Because the canopy is discontinuous, arboreal-foraging ants can be found in ant mosaics; invasive ants can affect also the structure of the mosaic. We discuss here the methods that permit us to study these mosaics. Territorially-dominant arboreal ants are good predators that use group ambushing to catch flying insects on their host tree foliage. When producing winged sexuals they also forage for prey on the ground and plunder the colonies of non-dominant species sharing their host tree. When expanding their

territories, the workers of the victorious colony raid the defeated colony. Because territorially-dominant arboreal ants prey on herbivores and strongly affect their general activity, ants are frequently used as biological control agents.

Ruth Mony (Cameroun), Brian L. Fisher (USA), Martin Kenne, Maurice Tindo (Cameroun), Alain Dejean (France) Behavioural Ecology of Bark-digging Ants of the Genus *Melissotarsus* (pp 121-128)

ABSTRACT

Original Research Paper: In *Melissotarsus beccarii* and *M. weissi*, two ant species which damage trees by digging nest galleries in bark, we observed numerous egg-producing physogastric queens situated more than one meter from each other, but within the same colony, making this the first record of oligogyny in this genus. Our analysis of ovarian development and degree of mandible wear reveals that a temporal polyethism exists and that gynes perform the worker duty of digging galleries. This is a new and previously unreported case of worker-like behaviour in gynes. These ants appear to follow a dynamic process wherein newly-inseminated gynes accepted by colonies perform worker-like tasks and do not produce eggs until they have the opportunity to dominate their own section of the colony and become physogastric. Workers that elude the queen's influence and produce chorioned, viable eggs probably play a role in the control of reproduction by non-physogastric gynes. Intraspecific aggressiveness between colonies was low. While spreading beneath the bark, both incipient and mature colonies can merge, forming very large colonies over vast areas of bark. This study demonstrates that *Melissotarus* should be of special concern for the management of forest and tree crop plantations.

Wesley A.C. Godoy (Brazil) Dynamics of Blowfly Populations (pp 129-139)

ABSTRACT

Invited Mini-Review: Blowflies have been recognised as useful biological experimental models for studies of population dynamics. These flies have received special attention because some species typically show an oscillatory behaviour, as reported for *Lucilia cuprina* by A. J. Nicholson. About 30 years ago, four Old World species of blowflies of the genus *Chrysomya* were introduced to the Americas, where they apparently displaced native species. Laboratory experiments were combined with mathematical models in an attempt to better understand the population dynamics of blowflies in the context of this biological invasion. The application of mathematical modelling has revealed different patterns of oscillation for the native and the exotic species. Experiments focussed on interspecific interactions have also provided important results in the context of the dynamics of interactions between native and exotic species. This mini-review is an attempt to synthesise results centred on the dynamics of blowflies during recent years, focussing primarily on the connection between experiments and mathematical modelling and considering the biological invasion scenario.

Nelice M. Batistelli, Karina S. Paduan, Paulo E.M. Ribolla, Wesley A.C. Godoy (Brazil) Population Variability of Exotic and Native Blowflies in Brazil, Based on Mitochondrial DNA Sequences (pp 140-144)

ABSTRACT

Original Research Paper: A molecular phylogeny analysis was performed on blowfly species. Molecular analyses entailed the comparative sequence analysis of the cytochrome oxidase subunit I (COI) DNA, amplified from individuals by means of the polymerase chain reaction (PCR). The 310 base pairs of the mitochondrial COI sequences analysis were analysed, and revealed the existence of 235 invariant sites and 75 polymorphic sites, with 71 parsimony informative sites. Invariant positions in the sequence were removed, and the remaining variant positions in the sequence indicated the number of substitutions supporting the divergence of the taxa. The gene analyses revealed the existence of different haplotypes in *Chrysomya albiceps*, *Cochliomyia macellaria*, and *Lucilia eximia*. Phylogenetic analyses through tree topology showed the existence of well-defined mitochondrial lineages among exotic and native blowflies. Seven distinct congeneric clusters were formed based on the sequence data. The results are discussed in genetic and ecological contexts.

Nelice M.B. Serbino, Wesley A.C. Godoy (Brazil) Seasonal Abundance and Distribution of Necrophagous Diptera in Western São Paulo State, Brazil (pp 145-149)

ABSTRACT

Original Research Paper: The diversity and abundance of necrophagous Diptera were investigated in urban, farm and wild areas in Botucatu, São Paulo State, Brazil, from March 2003 through February 2004, in order to evaluate the current distribution and abundance of flies important in a forensic context. Members of the family Sarcophagidae were most abundant, followed by Drosophilidae, Calliphoridae and Phoridae. Members of Muscidae were least abundant. Flies were more abundant in spring and summer than in fall and winter. Members of Sarcophagidae, Calliphoridae and Phoridae were most abundant in urban areas. *Chrysomya albiceps* was the most abundant calliphorid species, followed by *Lucilia eximia*, *Chrysomya megacephala*, *Cochliomyia macellaria* and *Lucilia cuprina*. The implications of these results for the necrophagous fauna structure are discussed.