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978-1-107-04833-1 - Wood Ant Ecology and Conservation

Edited by Jenni A. Stockan and Elva J. H. Robinson

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Wood Ant Ecology and Conservation

Wood ants play an ecologically dominant and conspicuous role in temperate boreal forests, making a keystone contribution to woodland ecosystem functions and processes. Wood ant taxonomy and global distributions set the scene for this text's exploration of wood ants as social insects, examining their flexible social structures, genetics, population ecology and behaviour; from nestmate recognition to task allocation. Wood ants' interactions with their environment and with other organisms are essential to their success: competition, predation and mutualism are described and analysed. Bringing together the expertise of ecological researchers and conservation practitioners, this book provides practical and theoretical advice about sampling and monitoring these insects, and outlines the requirements for effective conservation. This is an indispensable resource for wood ant researchers, entomologists, conservationists and ecological consultants, as well as anyone interested in social insects, keystone species and the management and conservation of forest ecosystems.

JENNI A. STOCKAN is an entomologist and environmental researcher at the Department of Environmental and Biochemical Sciences, James Hutton Institute, Aberdeen, UK. Her research covers tree–insect interactions, and riparian and wetland ecology.

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This book is dedicated to our families

Mark

Steve and David

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Foreword

Ants are everywhere. They are dominant components in much of the terrestrial world as premier soil turners, predators of other arthropods, dispersers of seeds and, in neotropical regions, the attine leafcutter ants must be considered the major herbivores in rainforests and cultivated fields. Approximately 14 000 species of ants are known to science, but the number continues to grow and it is hard to say how many species actually live on our planet.

Science has revealed many unique and fascinating natural histories for a large diversity of ant species, but certain groups stand out. Clearly, the pinnacles in ant evolution include the army ants of the neotropics and the driver ants of Africa, the tree-dwelling weaver ants of Africa, Asia and Australia, the fungus growers of the tribe Attini in Central and South America, and the migrating herdsmen of the genus *Dolichoderus* of the Malaysian peninsula. The mound-building wood ants, the so-called *Formica rufa* group, must also be considered one of the pinnacles of ant evolution.

In 1960, as an advanced biology student at the University of Würzburg in Germany, I was charged with the wonderful task of spending about 2 months in Finland collecting wood ants in forests from the south to the north beyond the Arctic Circle to send these samples to the Institute of Applied Zoology at the University of Würzburg. The general abundance of *Formica* mounds in Finnish forests, especially in primeval forests, was most impressive. Unfortunately, wood ant mounds are now rare or totally absent in most Central European forests mostly due to negligence, despite the fact that entomologists had already recognised in the nineteenth century the decisive role wood ants play in biological pest control. The undisputed founder of forest entomology, Julius Theodor Christian Ratzeburg (1801–71), observed that the surrounds of wood ant mounds resembled green islands during pest insect outbreaks. According to Auguste Forel (1848–1931) the inhabitants of a single large *Formica rufa* nest can retrieve 100 000 insects in one day; this adds up to 10 million prey insects in one

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summer. These numbers are astonishing and perhaps somewhat exaggerated, or perhaps not? In any case, mound-building wood ants are very beneficial to the health of forests, and therefore Ratzeburg proposed to propagate and resettle *Formica* nests by artificial fission. Ever since Ratzeburg's proposal, subsequent generations of forest entomologists, such as Karl Escherich (1871–1951) followed by Gustav Wellenstein (1906–97) and Karl Gößwald (1907–96) have worked to develop methods for wood ant propagation. He designed clever techniques for collecting hundreds to thousands of alate queens and males before the nuptial flights and let them mate under controlled conditions in the laboratory. He then introduced freshly mated queens to several thousand workers taken from established colonies in nature and after some incubation time released the newly created colonies in forests devoid of wood ants at what he considered appropriate nest sites. Though some of these introduced wood ant colonies settled well and subsequently flourished, many perished. What was missing was a sufficient scientific foundation for such artificial propagation. Karl Gößwald and many of his collaborators made a number of important contributions to several facets of the natural history and ecology of the *Formica rufa* group, summarised by Gößwald in two volumes published in 1989 and 1990. More recently multiple researchers have made substantial progress in understanding the systematics, ecology, population biology, behaviour, conservation biology and management of the *Formica rufa* group. A number of them are contributors to this book *Wood Ant Ecology and Conservation*.

This book is a very welcome volume because it synthesises a large amount of literature scattered in many journals and it sets the stage for future research that serves the conservation, and hopefully propagation, of the mound-building wood ants.

Bert Hölldobler

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