

## Book review

### The Ants of Central and North Europe

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Bernhard Seifert 2018: *The Ants of Central and North Europe*. Hardcover, 408 pp. ISBN 978-3-936412-07-9. Lutra Verlags- und Vertriebsgesellschaft, Tauer, Germany; [info@lutra-verlag.de](mailto:info@lutra-verlag.de), postal address: Foerstgener Str. 9, D-02943 Boxberg, GER. Price 63 EUR, excluding shipping.

*Complex questions have simple, easy to understand, wrong answers* – Anonymous

Bernhard Seifert is one of the most industrious ant taxonomists and ecologists of our time. He has shared his encyclopaedic knowledge in a series of successively upgraded and expanded books, the two first ones in German (1996, 2007) and now this latest one in English.

The book is divided into two main parts, the General Part and the Special Part. The first one is an overview of the life of ants, starting with their body structure and the function of various outer and inner body structures. The concise chapter on the ontogeny and caste differentiation of ants is followed by chapters on their habitats and nests. The dominance of ants in the ecosystem obtains its due emphasis, where only 1–6% of the food brought to the nest goes to the production of offspring. “The rest is lost” (sic!), even though one can easily understand that this “loss” is the very key to the success of ants, where security is paid by high behavioural and energetic redundancy.

The colony cycle is described from swarming and mating through various means of colony foundation. The basic means, independent claustral founding (where the female does not leave its nest, closed from the outer world), has in many species been substituted by various alternative ways, e.g. by formation of daughter nests by

mature colonies, leading to local expansion where the habitat and competing colonies allow it. One third of the ant species in Central and North Europe found their colony through social parasitism. In many, this is a temporary phase in the life cycle of the species, but some have evolved an obligate relation with their host species. In the ultimate social parasites, the inquiline, the worker caste has disappeared completely (or at least functionally) – thus, calling such species eusocial would break against the definition of eusociality.

The ways of ants to harvest food are very diverse, and these obtain a good share in the book, including among others zoophagy, mutualism with honeydew producers, distribution of seeds by ants, granivory and stealing food of other ants. The most fascinating relation of ants with lycaenid butterflies is illuminated in depth. The chapters on myrmecophiles (ant guests which are not ants) and enemies of ants end the General Part. In all, its 48 pages constitute a most recommendable introduction to the life of ants, indispensable for newcomers to myrmecology.

There is little to complain in the General Part; let the following examples suffice. On p. 12 “Queen is the designation used for a mated female who is either aspiring to a central reproductive function in an ant colony (founding young queen) or has reached this state (established queen).” On p. 349, however, it is stated that “mated foundresses without having enclosed workers are no queens by definition”. On p. 24, one may read of “the sterile worker caste” (a notoriously common notion in myrmecological literature), although in many ant species workers produce males – e.g. in *Myrmica* it may be a rule rather than an exception that the male offspring are pro-

duced by the workers. Another notorious term, “strategy”, is often used in contexts which refer to a “tactic”, and where often e.g. “behaviour” would be perfect. Surprisingly, even though the list of references includes over a thousand items, the general part lacks references to due literature; only occasionally the source is given.

The Special Part of the book introduces to collecting and preparation of ants, and choice of optical equipment for studying the samples. Let it be enough here to remind that the choice of equipment depends on the aims of the ant student, but for the identification of most species covered in the book, a stereomicroscope with a magnification range of 15–150× will suffice. I myself, however, would encourage an amateur interested in ants to go ahead even with a maximum magnification of 30–50×, with due caution). The list of ants with permanent outdoor occurrence in the area covered in the book (and defined in the map on p. 62) includes 180 species. The list of German ants adds details on their vulnerability, distribution and basic ecology. The chapter on the ecological preferences (sic!) and tolerances of ant species builds on huge data sampled by Seifert himself. Even though the data originate from studies in Central Europe, they are useful also in other areas, especially if the student looking for specific species has experience on how to accommodate information of one geographical area to another.

When discussing the relation between morphology, genetics and species identities, Seifert concludes: “Species identities, accordingly, are best indicated by the totality of coding and regulatory nuclear genes and/or their expression products.” He condemns “DNA barcoding”, which uses a standardised sequence of mitochondrial DNA (mtDNA) and – at least as comes to ants – is of no use in identification of many morphologically difficult groups of species (e.g. *Myrmica* and the *Formica rufa* group species). Seifert’s uncompromising language has already been accused of including *ad hominem* attacks against the users of DNA barcoding, as quite the contrary conclusions based on scientific facts are most welcome, be they about myrmecology itself or science policy. Seifert’s own approach is NUMOBAT (numeric morphology-based alpha-taxonomy), which has yielded a high rate of suc-

cess in revealing and delimiting species. In Germany, the number of known outdoor-living species increased from 79 in the year 1980 to 118 in 2018, i.e. by 49%. None of these were found by DNA barcoding, and I am afraid that few if any of these can be identified to species by barcoding. Of course, also the most sophisticated morphological approaches may go astray. The elevation of *Myrmica lonae* to species level by Seifert (2000) was recently doubted by Ebsen *et al.* (2019) on the basis of mtDNA data, which may be fatally misleading when two good species hybridise as many ant species do. It may, however, be possible that *M. lonae* is rather an ecomorph or ecotype of *M. sabuleti* as indicated by cuticular chemistry (K. Veepsäläinen, T. Akino, R. Savolainen & P. Puntila, unpublished manuscript).

The chapter on maintaining Linnean binomial nomenclature and the functionality of scientific language takes a strong stand against synonymising of highly differentiated taxa (often socially parasitic ant genera) with their very species-rich “mother” genera. For example, six genera of socially parasitic genera of the subfamily Myrmicinae were recently brought under the umbrella of two phylogenetically basal genera (Ward *et al.* 2015).

This gross transfer, and wrecking of taxonomic nomenclature, is a consequence of the cladistic principle, in which classification based on monophyly bans para- and polyphyletic groups. The practice fits well under the epigraph of this review. By sacrificing information on differentiation for the sake of monophyly, clarity is lost. There is no biological reason, why cladistic rules should overrule nomenclature which signifies drastic adaptive differentiation. In its extreme, cladistics has led to “speciation by remote control” (Templeton 1998).

Here, as argued by Mishler and Donoghue (1982), monophyly must be preserved by elevating two isolated mountain populations of *Nesticus minimus* spiders to separate species only because a morphologically and ecologically highly differentiated cave population *N. carolinensis* is the sister lineage of one of the mountain populations. Note that no biological speciation has taken place in the ground-living *N. minimus*; there is no evidence of their ecological or morphological diversification or change in their mate

recognition system, and no evidence of reproductive isolation. Clearly, theoretical frameworks (including cladistics and barcoding) should be road maps to solutions, rather than solutions themselves. Their usefulness depends on their success in increasing our understanding, not in forcing reality to fit the theory (Vepsäläinen & Spence 2000).

The identification keys to workers and gynes of ant subfamilies, genera and species include a huge amount of information on diverse traits which are needed or useful to key out the species. Line drawings of critical features abound in hundreds. For difficult species pairs, nest samples and diligent measurements with high magnification and resolution are mandatory to reach reliable identification with the provided discriminant functions (here, pitfall samples are of no use). This is not possible without expensive, advanced optics, a lot of training and determination. Understandably, such keys may be criticised as being far from user-friendly – but again, the epigraph of this review should remind one that there is no easy solution to complex problems (e.g. to “cryptic species”).

Several more “user-friendly” regional books on European ants have recently been published, and using at least one of those together with Seifert’s book will with increasing experience soon teach, when The Ants of Central and North Europe comes mandatory. I myself have used Seifert’s keys in ecological and faunistic work (often side by side with alternative ones), and mostly managed without a plethora of measurements. Practising scientists suspecting that they may have an undescribed (often “cryptic”) species, will find the NUMOBAT-based discriminants (and measurements needed for them) useful. Moreover, a common difficulty in identification is caused by hybridisation between species of ants. For example, wood ant species are notorious for their hybridisation and introgression of genes from one species to another, the consequences of which have been explained on pages 75–76. The decades long discussions whether one’s study colonies belong to *Formica rufa* or *F. polyctena* may now obtain a plausible solution (p. 135): perhaps to neither one, if they are characterised by a set of hybrid traits.

In the keys, my definitive favourite is how to

look at the base of the scape of *Myrmica* species to reach a reliable identification (p. 99). Depending on the species, the base shows various bends and extensions, e.g. carinae and lobes. How the base and its extensions look, depends crucially on the view used to study them. The different viewing positions ought to be understood and used (mind the epigraph!). Another clear and mandatory part, which should be consulted before using any Seifert’s key, is the explanation of acronyms and recording rules (p. 399–407) – much time may be spilled in vain if these are ignored.

The longest chapter on the life histories and profiles of all 180 ant species in the reference area covers 204 pages. It provides for each species, wherever known, rich up-to-date information on the taxonomy, geographical range, habitat, abundance, nest construction, colony demography, population structure, sexuals, mating, colony foundation and development, nutrition, behaviour, a list of due references and finally, morphometric data. The chapter is richly illustrated with full-colour photographs. There is no way to describe in short how much new understanding and insight in the ecology, behaviour, genetics and evolution of ants has been squeezed into a concise format. For example, reading through the texts of selected *Formica rufa* group species (and the hybrid *F. aquilonia* × *F. polyctena*), one will understand why hybridisation of species is not always deleterious, but on occasion may start a new evolutionary lineage, perhaps leading to a new species. As Seifert plausibly suggests, *F. paralugubris* in the Alps may be such a species, a result of hybridisation between *F. lugubris* and *F. aquilonia*.

In the species texts, some critical comments may be at place. For example, when comparing the ranges of *Myrmica lonae* and *M. sabuleti*, it reads that only *lonae* lives in southern Scandinavia, whereas on the previous page it is quite rightly told that *sabuleti* does occur in South Scandinavia. Males of *Formica truncorum* found in the nest in October are suggested to have missed swarming. A supplementary explanation would suggest that the workers have lost their queen earlier in the summer and started to produce males. *Formica polyctena* is told to start reproduction with the help of conspecifics and rarely through social parasitism in a *Serviformica* col-

ony. I may add here adoption of mated gynes by orphaned colonies of heterospecific related species, e.g. *F. rufa* and *F. lugubris*.

Considering potential user groups of the book, I would guess that the general part will entice amateur and aspiring myrmecologists. The identification keys may avert even experienced (sic!) myrmecologists, but in difficult cases perhaps no alternative is available. User-friendliness always includes a risk of misidentification, and it needs a lot to balance between these risks and simplicity of keys. With growing experience, one may find a personal way of using the keys by deciding how much time one spends in mounting and measuring specimens – at own risk. Using sound judgement, one may decide not to force species names to too demanding samples. Luckily, there are still experts willing to help. For those who have decided to learn more of ants (and this should be true also for non-beginners), “the life histories and profiles” of all ant species in the reference area will be most rewarding.

**Kari Vepsäläinen**

Ecology and Evolutionary Biology  
University of Helsinki  
kari.vepsalainen@helsinki.fi

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