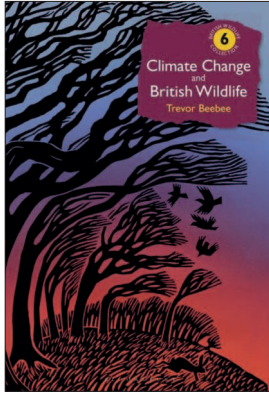


within the tradition of British natural history recording.

Despite the worrying long-term decline of invertebrate populations, as ectotherms being wholly dependent upon external heat sources to remain active, one might have thought that invertebrates potentially stand much to gain from global warming. Indeed, there are many UK examples of recent northern range expansion as suitable



‘climate envelopes’ widen for previously southern species. Holly Blue *Celastrina argiolus* and Small Skipper *Thymelicus sylvestris* for instance have recently turned up in Scotland; Jersey Tiger *Eupalagia quadripunctaria* is no longer restricted to its stronghold in the far south-west; and post-1985 records show that 34 (of 37) resident Odonata species have moved, on average, 74km further north. Coupled with this there are the new arrivals with, for instance, at least 27 new moth species recently established and 50 new species added to the British bug list since 1990. However, as

Beebe reminds us, care must be taken in interpreting these apparently positive trends. Northern range expansion for the above species may yet be accompanied by southern range contraction; meanwhile cold-adapted species at their southern limit in the UK, such as Northern Brown Argus *Aricia artaxerxes*, Northern Emerald *Somatochlora arctica* and White-faced Darter *Leucorrhinia dubia* are likely to come under increasing pressure as the amount of suitable habitat available shrinks. Earlier emergence of many species (up to two whole months for some Lepidoptera such as Peacock *Aglais io*) also has the worrying potential to disrupt predator-prey relationships, having a knock-on effect on complex food chains and the wider ecosystem.

The reality of course is that the situation is complicated and Beebe cautions us against viewing the situation through the lens of a single species or particular group. In recognition of this, later chapters looking at freshwater, terrestrial, coastal and marine habitats respectively attempt to gain a more complex understanding of climate change at ecosystem level. Finally, there are valuable chapters at the end of the book dealing with the human response to climate change, our efforts to anticipate what the future may hold through computer modeling, and to mitigate the impacts of climate change on habitats and species.

In common with other volumes in the now well-established British Wildlife Collection this book is engaging, accessible and above all highly readable.

John Sproull

Birdwing Field Guide To Indian Moths by
Vaylure Shubhalaxmi. Birdwing Publishers,
Mumbai, 2018. 460pp., 1,000+ colour photos.
Sbk, 115 x 180mm. ISBN 978-81-931736-0-2.
₹3500**

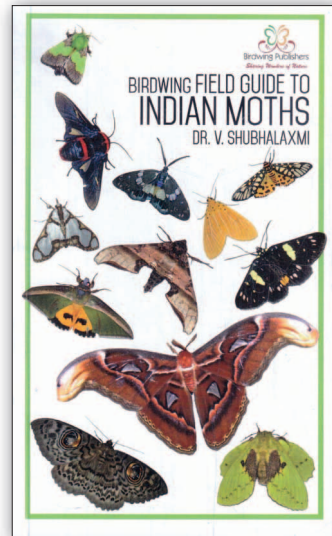
This new field guide represents a major step forward in identifying the moths

which occur in India, and it will also be useful for nearby countries such as Nepal and Bangladesh. In fact it may encourage Europeans to explore the moths of Asia more generally. It is a fat little book of 462 pages but it will fit into a jacket pocket. The reason this book is a substantial step forward is that there was nothing else

remotely comparable prior to this publication. As a moth-trapper who has made three expeditions to India, I know that I had to resort to two ancient publications and to various visits to the Natural History Museum, London, to identify the moths I collected or photographed in India. One of the works I used was Seitz's multi-volume *Macrolepidoptera of the World* (Seitz, 1909–1954) and fortunately there was a full set for me to consult at my local museum, but this is a rare and expensive series, not available to many, and the nomenclature is way out of date. The other publication on Indian moths I was able to consult was Hampson's four-volume work on moths of India (Hampson, 1892–1896), which is even more out of date. A third work, which I did not have access to, is Cotes & Swinhoe (1887–1889). Bernard D'Abrera's *Sphingidae Mundi* (D'Abrera, 1985) and three-volume *Saturniidae Mundi* (D'Abrera, 1995, 1998 & 2012) provide means of identifying the hawk-moths and emperor moths but for the other families of moths things become rapidly more difficult and uncertain, mostly involving works on single families and from other parts of Asia. In very recent years, Hampson has been made available online at the Biodiversity Heritage Library, which is a help. In the last three years, since my expeditions, the *Moths of India* website (Sondhi, Sondhi & Roy, 2017) has been developed and is expanding annually. At the time of writing this review, the website covers 1,022 species and is building into a useful means of identifying moths. This new field guide provides a shortcut to all the above for identifying many distinctive species, and can of course be used in the field, taken on expeditions and annotated.

The book provides colour photographs of 773 species of live Indian moths, mainly macro-moths, but also a selection of species from the Crambidae, including a large number of colourful pyrales. The photos are largely of moths at rest on vertical

sheets when attracted to mercury vapour lights. The majority were photographed by the author, Vaylure Shubhalaxmi (who likes to be known as Shubha), during the 24 years that she has been studying Indian moths, and for which ultimately she gained her PhD. However, 94 additional photographers are also credited with supplying photographs. The photographs are arranged on the right hand page of every spread. They are variable in scale, often larger than life-size for small to medium-sized species, but somewhat reduced for the many very large moths found in India. Brief accounts for each species are arranged on the facing page.



These include the wingspan of the male and female in millimetres, although forewing length would have been better because the aim of the guide is to identify live moths—the total wingspan can only be guessed unless the specimen is set. The photos and the text are clearly presented and the colour reproduction is good.

A field guide to Indian moths faces many problems. There is no comprehensive checklist of moths for India, which would be a huge job to compile. The total number

of species present is not known, although at least 12,000 species have been recorded so far. The 773 species illustrated are clearly the most frequently encountered of the distinctively marked, larger species. There are few 'small brown jobs' amongst the noctuid moths illustrated, for example, but then these would certainly require genitalia dissection for species identification and so are beyond the scope of a field guide.

The hawk-moths and emperors are disproportionately well-represented in comparison to other families, but I suspect these are the two families most enthusiasts are likely to try and identify comprehensively to start with, and is thus welcome coverage.

Simply identifying all the moths photographed has been a massive job, in which Shubha has been assisted by staff at the Natural History Museum (NHM), London, as well as lepidopterists working in Asia, including Roger Kendrick, who has been based in Hong Kong for many years. Arranging the species into the correct taxonomic order would also be a time-consuming job in itself. In getting this book together for publication in 2018, so that it

can be out in the field being used, the author has taken various practical shortcuts to overcome these problems. The moths are arranged alphabetically within families and the families are arranged in alphabetical order through the book, from Bombycidae to Zygaenidae.

For many species the precise habitat requirements, larval foodplants and geographical distributions of these moths in India are unknown. The author has done the best she can by simply listing the basic large geographical areas from which the species has been reported. Many evidently widespread species get the comments "India, Nepal, Bhutan, Bangladesh, Sri Lanka". Others are frequently listed as only known from the north-east of India, where the natural forests are more intact than elsewhere on the Indian subcontinent. The Western Ghat Mountains are another special area in which Shubha and others have seen species not so far reported from elsewhere. As to habitat, the most that Shubha has been able to do at the moment is to have three categories, namely "undisturbed", "disturbed" and

"mixed". These three options are represented by symbols at the top of the accounts, for brevity, as are whether the species is nocturnal, comes to light, feeds as an adult, or impacts on agriculture at some stage in its lifecycle. The flight periods of these moths vary greatly with location and altitude within India and are imprecisely known. No attempt is made to specify them. Instead, Shubha has taken a practical line and simply gives the



Gloriana ornata. Lama Camp, Eaglenest, Arunachal Pradesh, north-east India, 19 May 2011 (Photo: P. Waring).

month in which the photograph of the moth was taken. Under a subheading of Biology, larval foodplants are given for some species, where known, and some behavioural observations about the adults are also provided. For a few species, such as Indian Moon Moth *Actias selene* the list of larval foodplants is quite extensive. The remainder of the species account is taken up with a brief description of the adult and any differences between the male and female. For the less distinct species, confusion species of somewhat similar appearance are sometimes mentioned.

There are useful introductory sections on the external anatomy of moths, the lifecycle, and how to rear adult moths from the caterpillars you may find. There is also a Glossary of terms, two pages of published references to books and papers for further reading, a page of online sources and a taxonomic checklist.

With at least 12,000 species of moths known from India and only 773 illustrated, this field guide is clearly far from comprehensive, but it will provide identifications for a surprisingly high number of those you are likely to encounter and wish to name. For example before this book was published, I happened to have already made a list of a dozen strikingly marked moths for which I had identifications, with help from Sanjay Sondhi, to help illustrate an article about my third mothing expedition to India (see Waring & Sondhi, 2018). In the event, the editor of the journal did not use the photos of all the species I supplied, but the important point here is that only one of this small sample of striking species is not included in this field guide. This is the large orange and blue-black noctuid moth *Gloriana ornata*. Because a photo of this spectacular and distinctive species was omitted from both my article and the field guide, it is included in this review. Hopefully it may provide a further stimulus to encourage readers of *Atropos*

to explore the moths of Asia, which is already a popular region with birders.

If one thing is needed more than anything to start improving knowledge of the distribution and habits of Indian moths, it is this book. Hopefully it will stimulate an army of recorders, both resident in India and visiting tourists, to take up moth identification, and to photograph the moths they cannot identify from the guide. These can then be added to the Moths of India website, and to subsequent editions of this book, to provide an ever more comprehensive collection. Voucher photographs of identified moths can be submitted to the website to back up records from new localities. *The Butterflies and Moths of North America* (BAMONA) website is a good example of how this information can be used to build better distribution maps. I trust this field guide sells well and I thoroughly recommend it for developing interest in the moths of India.

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