REVIEW OF INDIAN LEPIDOPTERA COLLECTIONS AND THEIR SIGNIFICANCE IN CONSERVATION

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ABSTRACT

Indian butterfly and moth collections contain less than 50% of the estimated 11,300 species found in India. This deficiency has negatively impacted research as well as popularization and conservation efforts for this group of insects. The validity of governmental initiatives in this field is examined. Steps to improve the study of Lepidoptera in India are recommended.

INTRODUCTION

The process of naming the Lepidoptera is based on specimens. From the time that Linnaeus (1758) described the very first butterflies using the binomial system, pinned Lepidoptera have formed the basis of the science. The Linnaean collection of butterflies is in the custody of the Linnaean Society in London.

Specimens from all over the world, including India, were described on a large scale during the 19th century, so that by the 20th century, most of the commoner species had been described, sometimes under several names by different workers.

For the Indian Lepidoptera, much of this work was carried out in London. Collections in the custody of the East India Company and, later, the British Museum (Natural History), in London, and Lord Walter Rothschild's museum at Tring, housed vast collections of Lepidoptera from all over the world. Some Indian taxa were also described based on material in the Indian Museum, in Calcutta, by Lionel de Nicéville. These type specimens are the pride of the National Collection, at the Zoological Survey of India, Calcutta, today.

The process of defining species, distinguishing synonyms and separating similar looking species by examining the internal organs occupied most of the 20th century. Most of this work concerning Indian Lepidoptera was carried out in Europe, North America and, to a lesser extent, Japan.

The reason for this geographical bias is not far to seek – European workers had access to continent-wide or even global collections, while their Indian counterparts had access to nation-wide collections, mostly left over from the pre-Independence period.

At present, there are four important collections of Lepidoptera in India. These are the National Collection, at the Zoological Survey of India; the National Forest Insect Collection, at the Forest Research Institute, Dehradun; the National Agricultural Insect Collection, at the Indian Agricultural Research Institute, New Delhi; and the collection at the Bombay Natural History Society, Mumbai. There are collections of Lepidoptera, as well as other insects, at most agricultural universities in the country as well as at the Madras Museum and the National Museum of Natural History, New Delhi, but few of these are of any importance. The collection at the Punjabi University, Patiala, contains some type material and much recently collected material. Similarly, the collection at the Indian Institute of Sciences, Bangalore contains some recent material but nothing of particular importance. Besides, there are small, unidentified collections at the Forest Museum in Darjeeling and at the Jesuit Museum at Shembaganur near Kodaikanal. There are two private collections, one the Sircar Collection in Shillong and the second the Smetacek Collection in Bhimtal.

In addition to the above collections, there are a few smaller collections in various towns of India, such as a part of the Wynter-Blyth collection at St. George's Home, Ketti, Tamil Nadu, and the Patna Museum collection.

All these collections contain material collected in India, with the exception of the National Collection, which houses some South-East Asian material from the de Nicéville collection, and the Sircar collection, at Shillong, which houses some commercially available specimens from other continents.

METHODS

Over the past 25 years, I have sought out and examined Lepidoptera collections throughout India. It has not been possible to examine the National Collection, at the Zoological Survey of India, Calcutta, and the smaller collections at various agricultural universities throughout the country, the Patna Museum, the Madras Museum, etc. However, discussion with those who have seen these collections clarified that the smaller collections contain little that is unique, while the collection in the custody of the Zoological Survey of India, while it is extensive, is in relatively poor condition due to its age and the climate.

There are practically no reference collections of moths besides those contained in the four important national level collections mentioned above, the Punjabi University Collection and the Smetacek Collection.

RESULTS

A very rough estimate would suggest that less than 50% of the Indian Lepidoptera is represented in Indian collections. Approximately 70% of the total of around 1300 species of Indian butterflies is represented, and perhaps 40% of an estimated 10,000 species of moths is represented. The relatively high percentage of butterflies represented is largely in the National Forest Insect Collection, which contains approximately 3800 species of Lepidoptera (Dr. Sudhir Singh, pers. comm.), while the National Agricultural Insect Collection has 3302 species (Dr. V.V. Ramamurthy, pers. comm.), mainly moths. The Bombay Natural History Society Collection houses around 1500 species of Lepidoptera, half of them butterflies (Dr. Rahul Khot, pers. comm.).

It may be pointed out that reference collections should contain about eight pairs of each taxon so that the range of variation can be adequately covered (Evans 1932). In the National Forest Insect Collection, most species, especially the rarer ones, are represented by a single pair. So although the butterfly species count is greater than those of other Indian collections, the possibility of this collection being of taxonomic use for comparing potential new taxa is low due to the paucity of specimens. I experienced this difficulty in describing *Neptis miah varshneyi* Smetacek 2004, when I discovered that the National Forest Insect Collection housed only a pair each of *N. miah miah* and *N. miah nolana*, which did not cover individual variations, seasonal differences, etc.

DISCUSSION

Around 250 butterfly taxa have been described from India, the Himalaya and associated mountain ranges during the past 60 years. Of these, the first valid taxon to be described by an Indian citizen was *Neptis miah varshneyi* Smetacek (2004). Even this was described in consultation with the late Lt. Col. J.N. Eliot of the U.K., and the comparative material used was from Col. Eliot's collection and the Natural History Museum, London, rather than any Indian collection. No valid butterfly species has been described so far by an Indian in the post-Independence period. (The taxon *Ypthima kedarnathensis* A.P. Singh (2007) is not unlikely a synonym of *Y. hannyngtoni* Eliot.)

In moths, fewer than 50 taxa have been described by Indian workers, which is a pitiably small number compared with the number of moths described from the area during the post-Independence period by international workers, which is estimated to be over 700 taxa. In the period between 1990 and 2010, a dozen new hawkmoth species (Sphingiidae) were added to the Indian fauna. None of these were either reported or described by Indian workers. Rather, they were described by German, Japanese and British workers in the field (list available on www.flutters.org).

In the case of the giant silk moths (Saturniidae), 23 new species have been described and added to the known fauna of the sub-region comprising India, Bhutan, Nepal and Sri Lanka between 1993 and 2010. None have been described by Indian workers. Rather, they have been described by German, British, Russian and Chinese workers (list available on www.flutters.org).

The main reason for this discrepancy is that Indian workers are constrained by the lack of identified material available for comparison in India. The best collection of Indian Lepidoptera is at the Natural History Museum, London. It is, however, far from complete. The next best collection of Indian Lepidoptera is the Hope Collection at the University Museum, Oxford, which houses over 5 million insect specimens.

It should be noted that all the above collections consist largely of a mosaic of smaller collections donated by private individuals, either as presents or bequests. Inputs from agricultural scientists and foresters usually consist of species of immediate interest to their professions rather than compilations of the fauna of an area. For the latter, the usual source was from resident private individuals. For example, I have donated a large number of identified Lepidoptera from the Kumaon Himalaya to the national collections over the years.

It is only when collectors in different areas study the fauna of their area, note changes, obtain voucher specimens of rare species and communicate their findings that there is progress in the field. Government scientists usually manage much less time in the field due to the burden of desk work entrusted to them. Nor are they able to be in the field at odd times, seasons, etc, when rare creatures are usually sighted, since they have to justify their field trips on the basis of existing information and thus tend to conduct surveys at seasons when there are a greater number of species known to be on the wing rather than explore the unsurveyed seasons and areas.

In Nepal, where surveys have been actively undertaken over the years with international help, the figures speak for themselves: in 1978, 567 species of butterflies were known from Nepal. By 1980, this figure had risen to 592. Today, 640 species are known from Nepal. Of these, 58 species are unrepresented in Nepalese collections, i.e. the collections at the Pokhara Museum and the Natural History Museum, in Kathmandu (Smith 2006). This is less than 10% of the total number of butterfly species known from Nepal. Almost all these specimens were collected recently, *i.e*. within the last 40 years.

This rather respectable figure may be compared with the more than 30% of Indian butterflies unrepresented in Indian collections. Of the less than 70% represented, most specimens are around a century old and not in good condition. Of the taxa that are represented in Indian collections, roughly 40% of the species are represented by fewer than six specimens each in different collections, which is not enough to conduct any meaningful taxonomic studies.

In addition, these older specimens were usually collected by what were known as “native collectors”, who were usually village boys trained to collect and preserve specimens. The specimens they brought back lacked proper data such as the date and locality, and so most of the butterflies they brought back are merely labeled “Assam” or “Sikkim”. Both these places are very varied in terms of butterfly habitats, with the result that for a number of species, we have no idea of their preferred habitats or flight time (Wynter-Blyth 1957). It is only recently that enthusiasts armed with digital cameras have re-discovered a number of species that had not been reported for a century, such as *Symbrenthia silana* de *Nicéville (Nymphalidae)*, *Euthalia iva* Moore and *Creteus cyrina parca* de Nicéville (Hesperiidae).

In this respect, the current rules, laws and usages are heavily skewed against the collection of insects, whether for scientific use or other purposes. Prior to 1986, there was no bar on collecting insects. In that year, many butterflies and beetles were inexplicably included in the schedules of the Wildlife (Protection) Act 1972. No studies, surveys or other forms of information gathering appear to have been carried out prior to this exercise. Rather, the basis appears to be the status ascribed to the various species and subspecies in Evans (1932), so that those believed to be “very rare” by Evans were placed in Schedule 1, bringing them on par with the tiger, rhinoceros and other large mammals, while those believed by him to be “rare” were included in Schedule 2. This unreasoned approach led to the inclusion of the Pea Blue (*Lampides boeticus* Linnnaeus) and the Gram Blue (*Euchrysops cnejus* Fabricius) in Schedule 2, although they are known to damage leguminous crops and the Ministry of Agriculture has supported studies for controlling the populations of these butterflies. Prashanth Mohanraj and Veenakumari (1996) commented further on the shortcomings of the schedules in this Act.

Due to the grave lack of knowledge about insects at the policy making level, butterflies, moths and other insects have come to be viewed as “wildlife” and, bringing them on par with vertebrates, the emphasis is on the protection of the adult individual. However, butterflies live for a fortnight, spending most of their lives in the egg, larval and pupal stages. There is no provision for the protection of the early stages. This would entail protection of the habitats of the insect rather than the adult individual. This is not possible at the present time since we have no idea about the habitats of many lesser known species, which would arguably need protection most, if at all.

While collectors are viewed with suspicion, damage to habitats is being encouraged by various governmental ministries and departments, through cattle loans to marginal farmers and attempts to improve the genetic configuration and population of domesticated animals such as sheep, goats and buffaloes, with very little emphasis on reducing the dependence of this unjustifiably large cattle population on Indian forests and common lands.

With the inclusion of many butterflies and some beetles in the schedules of the Wildlife (Protection) Act 1972 and by imposing curbs on collections under the Biodiversity Act, the real issues of insect conservation have been ignored and, in fact, grievously side tracked. The main result of including some butterflies in the schedules of the Wildlife (Protection) Act has been that practically no studies have been published on those species since 1986. I can think of only two meaningful studies, those carried out by Veenakumari *et al*. (1997), in the Andaman Islands, and Singh (2009), in the Kedarnath Musk Deer Reserve, Garhwal. Other studies talk of catch-and-release methods for studying butterflies. Given the paucity of good reference books on Indian butterflies and the relative inexperience of the authors of such studies, such publications are at best unreliable, especially when one considers that the nomenclature of difficult groups is likely to change with the distinguishing of new taxa, but there will be no specimens to examine and apply the revised nomenclature since they were released at the time of the studies. Thus, invaluable time spent in the field and published results are reduced to unreliable statements due to unenlightened legislation.

Recently, there was a case where a worker in a protected area in Tripura found a butterfly that represented a new species record for India . He took it, photographed it and released it since, according to the rules governing protected areas, he could not take the specimen. The result is that, today, although we have a new addition to the Indian fauna, we do not have a specimen of the species. Surely, the rules would be more to the benefit of our nation if workers who discovered something new for science could take the specimen and hand it over to the person in charge of the protected area, who could be charged with forwarding the specimen to the Forest Research Institute so that it could become part of our national knowledge base? Meanwhile, agriculturists and pastoralists within such protected areas are legitimately doing much more damage than the taking of some insect specimens for research. Why is the uneducated villager permitted to do damage (read "cut fuel wood and fodder indiscriminately, graze livestock") and the educated researcher not permitted to do damage (read "take specimens of importance to science"), especially when the latter would be of long term benefit to our nation and little harm to the environment?

The lack of good reference books on Indian butterflies can be directly traced to the lack of collections on which such books are usually based. Today, the only work that covers all Indian butterflies is Evans (1932), with an outdated taxonomy and nearly a century old. For moths, the story is even worse, for the last work dealing solely with Indian moths is part of the Fauna of British India series, Volumes 1-4, by George Hampson (1892-1896), and Volume 5 of the same series, by Bell and Scott (1937). I am at present trying to make a list of Indian moths, and the task is proving extremely difficult and only possible with help from international experts. The first parts of this list, covering hawkmoths (Sphingidae) and giant silk moths (Saturniidae) are posted on the website www.flutters.org.

Although no Indian butterfly is known to be extinct, the only justification for this statement is that there are no studies on the relatively lesser known taxa, and their existence, in several cases, is yet to be confirmed. There are a relatively high number of endemic butterflies in the Himalaya and south India, around 8% of Indian butterflies, according to some estimates.

There is no conservation plan, no plan to tackle potential emergencies, no recognised pool of expertise to deal with challenges, no formal group of authorities who can take new developments into consideration and formulate appropriate policies, no empowered committee on Lepidoptera or even insects who can take up legal and legislative issues, no up-to-date literature on the subject, no complete, taxonomically up-to-date collection – in fact, the only thing that has been done for Lepidoptera appears to be legislation. While this legislation has prevented private enthusiasts from collecting insects, it appears to have had little effect on the international trade in Indian butterflies since many butterflies protected under Indian law are freely available on the Internet. So the end effect of including butterflies in the schedules of the Wildlife (Protection) Act 1972 appears to have been to hamstring Indian research on the subject and create a 20 year gap in our knowledge of the butterflies involved. International research has progressed, as noted above, in the cases of the butterflies, the hawkmoths and the giant silk moths.

From the above, it is evident that governmental efforts in the field of Lepidoptera research and conservation are a dismal failure. The efforts appear to be based more on the emotional and/or unsupported personal beliefs of concerned officials rather than the interests of our nation in particular or Lepidoptera in general. With the burgeoning human population and rapid scale of resource exploitation called development, the threat perception for many lepidopteran communities has increased many-fold. There is still time to consolidate what we have, but time is running out, and escapist policies and blanket bans simply do not work. What is needed is an educated approach to the long term conservation and proliferation of Indian insects.

RECOMMENDATIONS

It is urgently required that several complete collections of Indian Lepidoptera be made. Some projects are under way to improve Indian taxonomic abilities in the field of Lepidoptera, but these projects seem to be having little effect on the field in general. It is urged that rules and laws that give the government the sole right to undertake research in this field be amended to return the right to study insects to the people of India, as was the status before 1986. It is urged that the indiscriminate curfew on the field imposed in the name of conservation efforts by policy-makers and bureaucrats unfamiliar with the Lepidoptera be withdrawn and the opinion of persons familiar with the field be used to formulate policies in the best interests of the continued survival of Indian Lepidoptera. The excuse that there is a trade in Lepidoptera cannot be used to impose a virtual ban on this field. If the police were to impose an analogous curfew on the general public to prevent a few thieves operating, it would not be tolerated in any court of law. Why then should a similar, unjustified curfew that is detrimental to the interests of Indian Lepidoptera be imposed and tolerated?

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