

## NOTES ON NEW RECORDS OF HOOKTIP MOTHS, LEPIDOPTERA: DREPANIDAE, FROM THE KUMAON AND GARHWAL HIMALAYA

**Key words:** Hooktip moths, Drepanidae, Kumaon, Garhwal, Himalaya, Lepidoptera

Five genera and nine species are added to the known fauna of the Kumaon and Garhwal Himalaya. Information on the behaviour, ecology and distribution of ten Drepanid species is noted.

### INTRODUCTION

The Drepanidae are often referred to as Hooktips, since the forewing apex of many species is hooked. It is chiefly a tropical and sub-tropical family of moths with about 800 species worldwide. Of these, about 107 species occur in the Indian sub-region (Jairajpuri 1991), mostly in Northeast India.

The family is placed in the superfamily Geometroidea and its closest relatives are the families Cyclididae, Thyatiridae and Epiplemlidae. Two subfamilies are represented in India, Drepaninae and Oretinae. Only the former subfamily is dealt with in the present paper. It is distinguished from Oretinae by the presence of a functional proboscis in both sexes and a frenulum in males.

Little is known about the early stages of Indian Drepanidae. The present material is based on records and observations concerning adults. The known larval hostplants of the Drepanidae in India belong to Myrtaceae (*Eugenia* L.), Rosaceae (*Rubus* L.), Palmae (*Phoenix* L.), Fagaceae (*Quercus* L.) and Zingiberaceae (*Amomum subulatum* Roxb.). None of the members of this family are known to be chemically protected, and therefore they depend largely on camouflage to avoid observation. Some have gone so far as to shed nearly all of the scales on their wings, leaving them practically transparent. Settled with outspread wings against any background, they are very difficult to distinguish unless one has observed them settling.

In the systematic section, unless otherwise mentioned, the known distribution of the species has been excerpted from Hampson (1892). The new records noted in this paper are with reference to this information.

### LOCATION

The administrative division of Kumaon occupies a section of the Himalayan range west of Nepal. Together with the neighbouring division of Garhwal, it constitutes the headwaters of the Ganga river system. Osmaston (1927) divided the ranges of Kumaon into five climatic zones: the first is the submontane tract below the southern foothills, called the Bhabar. The second, which receives the heaviest rainfall in the area (up to 300 cm annually), extends from where the submontane tract meets the hills to the crest of the outermost range of hills. The third zone, which receives up to 200 cm of rainfall annually, is the largest zone, extending from the crest of the outermost hills to the crest of the outermost

mountains of the main range. The fourth zone, which receives a maximum of 100 cm of rainfall annually, is the main Himalayan range, while the fifth is the trans-Himalayan area north of the main range, which receives the least precipitation annually, up to 30 cm. In the present study, Drepanid species have been recorded only in the second zone of Kumaon where the Bhimtal valley and Maheshkhan are situated. Two species have been recorded at Joshimath and Khiron. The latter two locations are in Garhwal and, were Osmaston's (1927) divisions to be extended to Garhwal, they would be in the fourth zone, i.e. the main range.

Bhimtal town lies 22 km by road southeast of the district headquarters of Nainital, while Maheshkhan lies roughly 19 km east of Nainital. The main study site in Jones Estate, 2 km from Bhimtal town, is at an elevation of 1500 m while Maheshkhan is 2100 m above msl. Joshimath (1750 m) is a large town in Chamoli district of Garhwal, while Khiron is a village and valley south of the town of Badrinath in the same district.

#### DURATION

The present ongoing study has been undertaken more or less continuously for two decades and sporadically for a few years before that. Hence, observations regarding relative scarcity, annual generations, etc. are based on a long term perspective. The observations were more or less restricted to the Bhimtal valley and its vicinity, and projections concerning the distribution of species within Kumaon are necessarily based on indirect data, as discussed further on.

#### ATTRACTANTS

All the specimens examined except *Macrauzata fenestraria* Moore were attracted either to mercury vapour lamps of 125 or 160 W, or to tungsten filament lamps of 60 or 100 W. In some moth families, it has been observed that females are less frequently attracted to artificial light, sometimes not at all. In the present study, both sexes of all species were attracted to light except *M. fenestraria* which was recorded under exceptional circumstances, and *Teldenia vestigiata* Butler, *Drepana innotata* Hampson and *Tridrepana sadana* Moore, of which only females have been recorded so far. As has been discussed in the systematic section, this is probably due to the absence of males from the area within the ambit of the light, rather than the unattractiveness of such light for them.

In the case of *M. fenestraria*, the specimens were found dead in a pool where they had evidently come to drink water. None of the other species were recorded at water, but this does not mean that they do not visit water to quench their thirst.

None of the species were ever found on over-ripe fruit, sap or other sugar based attractants. However, it is not unlikely that they visit certain flowers.

#### MATERIAL EXAMINED

Drepanid species are known to be generally scarce and never found in large numbers. Several of the species discussed are known by one or two specimens from Kumaon. Such singletons are almost certainly stragglers, although not necessarily from outside Kumaon. The remaining species appear more or less regularly, especially *Albara violacea* Butler, *Tridrepana albonotata* Moore and *Callidrepana argenteola* Moore. In these cases, only a few specimens of all those attracted were taken. The specimens not taken were noted separately, but since they add nothing new to the matter under discussion, all reference to them has been omitted in this paper. Photographs have helped place additional specimens, as in the case of *Tridrepana sadana* Moore and *Drepana pallida* Moore.

### FLYING TIME

With the exception of *Albara violacea*, the present paper deals with species that have so far been recorded only during and immediately after the Southwest monsoon, i.e. from June to October. Several species of the family are on the wing in spring, from February onwards, but they have not been included here.

All the species recorded from Bhimtal in the present paper, except *A. violacea*, were on the wing when relative humidity was over 30%. Perhaps humidity is of importance in the relatively drier area west of Nepal and these species will have more broods annually in the humid eastern Himalaya and N.E. India.

### DISPERSAL AND POPULATION DYNAMICS

Although several of these moths are robustly built, are powerful fliers and have functional mouthparts, their power of dispersal appears to be rather limited. With some moth families, such as the Limacodidae, which lack functional mouthparts, their limited power of dispersal is understandable. Factors constraining the Drepanidae, however, are still obscure. Examples of this are *Teldenia vestigiata*, *Drepana innotata* and *Tridrepana sadana*, but especially *Macrauzata fenestraria*, which has not ventured across the relatively short distance between Maheshkhan and Bhimtal, at least during the last three decades. The former three, too, do not appear to be notable travelers, with what seem to be odd stragglers reaching the study site in Bhimtal.

As has been noted earlier, these moths are never common. Population outbreaks have never been noted, although population levels increased during the years of heavy rainfall between 1979 and 1983 and subsequently plummeted in the wake of repeated forest fires in the post-1984 period, which was followed by severe drought years during the late eighties.

### ZOOGEOGRAPHY

At the generic level, the known Drepanid fauna of Kumaon includes *Macrocilix* Butler, *Macrauzata* Butler, *Auzata* Walker, *Derocha* Walker, *Bapta* Stephens,

*Oreta* Walker and *Albara* Walker. The present paper adds *Teldenia* Moore, *Leucodrepana* Hampson, *Callidrepana* Felder, *Drepana* Schrank, *Tridrepana* Swinhoe and *Spica* Swinhoe. The new records of *Leucodrepana* and *Drepana* are not remarkable, since one or more species of *Leucodrepana* were expected to be found along the Himalaya above 2500 m, and species of *Drepana* had been recorded both east and west of Kumaon, so one species or other was certain to be found.

The new records of *Teldenia*, *Callidrepana* and *Tridrepana* are not unusual, since they are widespread in the Indo-Malayan area. Given the Indo-Malayan affinities of most of the Lepidopteran fauna of Kumaon, their absence was more remarkable than their presence. The interesting record is that of *Spica* from the main range. A number of other moth and butterfly species are restricted to the main range, even though conditions exist that would probably support their populations in the outer ranges (Smetacek, P., unpublished data). The factors restricting the distribution of such species to the main range will certainly prove to be interesting when they are discovered.

It is not certain that *Spica* does not occur in the outer ranges. However, if it did, its habit of being attracted to light and sitting there the whole day, even in towns, would have drawn attention to it. It has been recorded at 3800 m in Nepal (Ebert 1966), so it might be a high elevation species, therefore restricted to the main range. The presence of this species in Joshimath at 1750 m elevation might repay further study in understanding its ecology better.

## SYSTEMATIC SECTION

### ***Macrauzata*** Butler

1889. Illust. Typ. Spec. Lep. Het. in the Brit. Mus. Vii: 43.

### ***Macrauzata fenestraria*** Moore

1867. Proc. zool. Soc. Lond. : 639.

**Material Examined:** 4 exs.: 4.vi.1998 Maheshkhan 2100 m x4 (2 males, 2 females).

**Forewing Length:** 22 – 26 mm.

**Expanse:** 60 – 66 mm (Hampson 1892): 46 – 54 mm (*mih*i).

**Distribution:** Kangra (Himachal Pradesh), Sikkim; Japan.

**Remarks:** Hampson (1892) described only the female, for which the above measurements were given. Of the material examined, the males are smaller with a forewing length of 22 – 23 mm, while both females have a forewing length of 26 mm. All the specimens examined are considerably smaller than those examined by Hampson.

The specimens were found dead, floating in a small pool formed by a forest stream, along with a large number of other Lepidoptera, especially butterflies. It is likely that the water in the stream was poisoned by insecticides and other chemicals from the apple orchards near its source, for several butterflies that came to drink water while I was there died and ended up floating on the water.

All four specimens retrieved from the water are in reasonably good condition, with the wings intact and the pattern readily discernible. The latter matches Hampson's (1892) description and depiction.

This seems to be a very local moth, for though it appears to be established at 2100 m elevation in Maheshkhan forest, it has never been recorded from the Bhimtal valley, which is 600 m lower but adjoins Maheshkhan valley and is only a few air-kilometers away. It is robustly built, with a functional proboscis, so the distance should be easily within its potential dispersal range.

Watson & Whalley (1983) depict a Japanese species of the genus as *Macrauzata maxima* Inoue, so *fenestraria* probably does not occur there, although Hampson included Japan.

***Teldenia*** Moore

1882. Lep. Ceyl. ii:119.

***Teldenia vestigiata*** Butler

1880. Ann. Mag. Nat. Hist. (5)vi:222.

**Material Examined:** 14 exs.: Males: 9.viii.2001, 15.viii.2001, 17.viii.2001, 18.viii.2001, 20.viii.2001; Females: 29.vii.2001; 8.viii.2001; 12.viii.2001, 16.viii.2001, 17.viii.2001 x2, 20.viii.2001, 30.viii.1997, 5.ix.1997.

**Forewing Length:** 10 – 12 mm.

**Expanse:** 25 mm (Hampson 1892); 22 – 26 mm (*mih*i).

**Distribution:** Sikkim, Nagas, Sri Lanka.

**Remarks:** The present record extends the known distribution of the genus and species westward to Kumaon. Only one brood has been noted, but there would probably be a second brood earlier in the year. It is a small, inconspicuous moth, easily overlooked since it is not common and never appears in numbers. It is commoner in some years than in others, e.g. in 2001 it was commoner than in the preceding years.

The specimens examined match Hampson's (1892) description and depiction. In the matter of size, some are a little smaller and others a little larger than the specimens examined by Hampson, which were males. Therefore, it appears that there is little difference in size between the sexes.

The species is on the wing during periods of high atmospheric humidity, generally over 35 % indoors and over 40% outdoors. It has been bred on *Eugenia firma* (Myrtaceae) in Sri Lanka according to Sevastopulo (1940). This tree does not occur in Kumaon, but three other species of *Eugenia* do (Osmaston 1927), all within a 15 km radius of the main study area. If this moth feeds only on species of *Eugenia* in Kumaon, the present records are probably from the upper limit of its altitudinal range, since the larval host plant does not occur above this altitude.

***Leucodrepana*** Hampson

1892. Faun. Brit. Ind. Moths 1: 333; fig. 231 (male).

***Leucodrepana idaeoides*** Hampson

1892. Faun. Brit. Ind. Moths 1: 333; fig. 231 (male).

**Material Examined:** 1 ex.: 21.vii.1992 Khiron, Garhwal 3600 m.

**Forewing Length:** 14 mm.

**Expanse:** 33 mm (Hampson 1892); 30 mm (*mihi*).

**Distribution:** Sikkim 3048 m.

**Remarks:** The single specimen examined was attracted to a campfire on a meadow just above the tree line. The present record extends the known distribution of the genus and species westward to Garhwal from the previously known localities in Sikkim and the Khasi Hills. The species will almost certainly be found in similar localities in Kumaon, although it has not been recorded so far. The present record also extends the altitudinal range by about 550 m, from the previous record by Hampson of 3048 m to 3600 m.

The specimen examined is slightly smaller than Hampson's type material. Whether this is within acceptable limits or is characteristic of the western population will only be clarified by examining more specimens. The flight is weak and erratic. It settles with the wings held flat against the substrate in the manner adopted by most Drepanidae.

***Drepana*** Schrank

1802. Fauna Boica II: 155.

***Drepana pallida*** Moore

1879. Desc. New Lep. Ins. Coll. Atkinson. Het. : 84.

**Material Examined:** 6 exs.: 13.vii.1977; 12.vii.1990; 16.x.1993 (females); 7.ix.1974; 9.ix.1997; 25.ix.1995 (males).

**Forewing Length:** 20 – 26 mm.

**Expanse:** 44 mm (males), 60 mm (females) (Hampson 1892); 42 – 56 mm (*mihi*).

**Distribution:** Sikkim.

**Remarks:** A new record for Kumaon. This and the next species extend the known range of the genus to Kumaon. It is bivoltine, with one brood on the wing in July and the second in September and October. It is a well established, if not very common insect in the Bhimtal valley. It ascends to at least 1730 m, for I have noted it in the nearby town of Bhowali.

Females are generally larger than the males and have less brown suffusion on the wings. In fact, the light brown groundcolour noted by Hampson (1892) varies considerably, with some specimens almost whitish and others suffused with brown. In other respects, the specimens match Hampson's description. The flight is rapid and direct.

In the matter of size, one male examined was smaller than the material examined by Hampson, while the females were not as large as Hampson's material. The latter seems to be a consistent trend, for some other females, examined in photographs, do not appear to be larger than 56 mm.

***Drepana innotata*** Hampson

1892. Faun. Brit. Ind. Moths I: 335.

**Material Examined:** 1 ex.: 26.viii.1997 (female).

**Forewing Length:** 20 mm.

**Expanse:** 36 mm (female) (Hampson 1892); 44 mm (*mihi*).

**Distribution:** Kulu (Himachal Pradesh).

**Remarks:** The single female is the only specimen of this species seen so far in Bhimtal. It extends the known distribution eastwards to Kumaon. It is rather larger than the type material examined by Hampson. He stated that the wings are hyaline with a few scattered white scales, and absolutely without markings. However, the specimen examined has two very faint black postmedial spots on veins Cu1b and M3 of the forewing.

It is likely that this moth will be more frequently met in suitable localities, such as broadleaf evergreen forests at slightly higher elevation than the main study site, e.g. above 1800 m. Such forests are home to other semi-hyaline Drepanids such as members of the genus *Deroca* Walker. The specimen examined was certainly a straggler in the process of dispersing the species. It seems that, like *Macrauzata fenestraria*, these moths do not generally travel far from favoured localities. However, the present record indicates that it is capable of greater dispersal than *M. fenestraria*.

***Albara*** Walker

1866. Cat. Lep. Het. Brit. Mus., London xxxv: 1566.

***Albara violacea*** Butler

1889. Illust. Typ. Spec. Lep. Het. In the Brit. Mus. Vii: 42, pl. 124, fig. 7.

**Material Examined:** 7 exs.: 12.iii.1991; 1.iv.1991. 6.iv.2002; 13.vi.1983; 16.vii.2001, 20.ix.2000; 2.xi.2000.

**Forewing Length:** 17 – 19 mm.

**Expanse:** 38 mm (Hampson 1892); 36 – 40 mm (*mihi*).

**Distribution:** Dharamsala (Himachal Pradesh).

**Remarks:** A new record for Kumaon which extends the known distribution of the species eastwards. It is rare in the Bhimtal valley. There appear to be three annual broods, one in spring, the second in summer and the third in autumn.

The specimens examined add some information to the known expanse of the species with the specimens examined by Hampson forming a mean. In other respects, they do not differ from the description.

The appearance of this species in Kumaon is not unexpected, unlike *Spica luteola*. The other member of the genus found in Kumaon, *A. lilacina* Moore, is much commoner with an extended flying period. It is likely that other members of the genus will be recorded from biotypes not covered in the present study.

***Callidrepana*** Felder & Felder

1867. Reise Frig. Novara. Lep. Pl. 83, fig. 11. Erkl. p. 2.

***Callidrepana argenteola*** Moore

1859. in Horsfield & Moore, Cat Lep. Ins. Mus. Hon. East. Ind. Co. Lond. II: 369.

**Material Examined:** 13 exs.: 27.viii.1997; 31.viii.1978; 5.ix.1997; 6.ix.1995 x2; 7.ix.1983; 10.ix.1997 x2; 13.ix.1977; 25.ix.1999; 1.x.1992; 9.x.1998; 10.x.1998.

**Forewing Length:** 15 – 22 mm.

**Expanse:** 35 – 45 mm (males); 50 mm (females) (Hampson 1892); 34 – 46 mm (*mihi*).

**Distribution:** Sikkim; Burma; Sri Lanka; Java (Hampson 1892); India to Taiwan, Malaya, Java, Sumatra, Borneo, Sulawesi (Barlow 1982).

**Remarks:** The present records extend the known distribution of the genus and species to Kumaon. There appears to be a single extended annual generation, which is on the wing from the end of August to mid-October. The lack of a spring generation may indicate the greater importance of high atmospheric humidity levels, rather than temperature or day-length, in governing emergence patterns.

It is among the commoner Drepanids in the Bhimtal valley. This appears to be the altitudinal limit of the species, since I have not seen it at higher elevation.

The specimens examined agree with Hampson's (1892) description in all respects except in the size of the females, which are not as large as the specimens examined by Hampson.

***Tridrepana* Swinhoe**

1895. Trans. Ent. Soc. Lond.: 3.

***Tridrepana albonotata* Moore**

1879. Desc. New Lep Ins. Coll. Atkinson. Het.: 83.

**Material Examined:** 9 exs.: 15.vii.1990; 25.viii.1993; 31.viii.1999; 10.ix.1977; 10.ix.1999; 11.ix.1977; 11.ix.1998; 25.ix.1999; 14.x.1995.

**Forewing Length:** 14 – 20 mm.

**Expanse:** 34 – 38 mm (Hampson 1892); 30 – 42 mm (*mihi*).

**Distribution:** Sikkim; Nilgiris (Tamil Nadu) (Hampson 1892); Oriental Tropics (Barlow 1982).

**Remarks:** A new record for Kumaon. This and the next species extend the known distribution of the genus to Kumaon. Although not a common insect, it is remarkably regular in the appearance of the brood, as can be seen from the records above that are more than twenty years apart. It seems that there is one extended brood, on the wing from the end of August to mid-October, with a smaller brood in July. It is also possible that the July record is of an individual that emerged unusually early.

The specimens examined match the description given by Hampson (1892) as well as the male illustrated in Barlow (1982). However, the males are smaller and the females larger than the material examined by Hampson.

The species is well established in the Bhimtal valley, which is probably near the upper altitudinal limit. It might be commoner at lower elevation. Like several other Drepanids, it is on the wing during the wettest period of the year, which suggests that atmospheric humidity plays a major role in governing the emergence patterns of the species.

***Tridrepana sadana* Moore**

1865. Proc. zool. Soc. Lond.: 817.

**Material Examined:** 3 exs.: 19.iv.2001 (female); 20.ix.2000 (male); 11.x.1998 (female).

**Forewing Length:** 20 – 24 mm.

**Expanse:** 40 mm (male) (Hampson 1892); 42 mm (male), 48 – 52 mm (females) (*mihi*).

**Distribution:** Sikkim.

**Remarks:** The specimens examined are placed tentatively under this species. It is a new record for Kumaon, from where this genus was hitherto not reported.

At least two other specimens of this species, identified from photographs, have been recorded in the Bhimtal valley previously.

The specimens examined are rather similar to the figure of *Tridrepana fulvata* Snellen in Barlow (1982), except for the size of the discal patch and the submarginal spots below the forewing apex, which are black in the specimen examined but brown in the figure. *T. fulvata* is from outside Indian faunal limits.

The specimens examined differ from Hampson's description of *T. sadana* in the following respects:

On the forewing *recto*, there is a brown-ringed white spot in the cell. A similar spot is situated at the lower angle of the cell, at the top of the large red-brown patch. There are traces of a postmedial line. On the hindwing *recto*, there is a brown-ringed white spot at the upper end of the cell and a similar, but smaller spot at the lower end of the cell.

The *verso* surface is unmarked, except for an obscure speck at the end of the cell and three prominent submarginal brown specks below the apex, which are repeated on the *recto* surface. The cilia below the apex of the forewing are brown.

The reason that the specimens examined have been placed tentatively under this species despite the abovementioned differences is that if this is an undescribed species or a species unknown to me, it will be possible to place it correctly on the basis of the points mentioned above.

There appear to be two annual generations, one in spring and the second in autumn. It is certainly a very rare moth in the Bhimtal valley.

***Spica*** Swinhoe

1889. Proc. zool. Soc. Lond.: 424.

***Spica luteola*** Swinhoe

1889. Proc. zoo. Soc. Lond.:414, pl. 44, fig. 10.

**Material Examined:** 4 exs.: 29.viii.1993, Joshimath, Garhwal 1750 m x3; 2.ix.1993 Joshimath, Garhwal 1750 m.

**Forewing Length:** 16 – 18 mm.

**Expanse:** 34 mm (Hampson 1892); 34 – 38 mm (*mihi*).

**Distribution:** Sikkim (Hampson 1892); Nepal (Ebert 1966).

**Remarks:** The present records extend the known distribution of the genus and species to Garhwal. Since it is known from both east and west of Kumaon, it will

almost certainly be found in Kumaon. It is only known from the main Himalayan range and since little work has been carried out in this range in Kumaon, the fact that it has not been recorded is not remarkable.

It is attracted to tungsten filament lamps and all the specimens were collected at different locations in Joshimath town in the morning, below lamps that had been left on all night. The flight is rather weak and fluttering, unlike the Noctuids, which it superficially resembles. It seems to be the only Indian Drepanid besides *Cilix glaucata* Scopoli that rests with its forewings over its hindwings, both draped laterally over the abdomen, in the position usually adopted by Arctiids and Noctuids.

It was not recorded from other localities in Garhwal around Joshimath, where studies were carried out earlier in August. The brood is probably not on the wing until the end of August, as in the case of *Callidrepana argenteola*. However, in Nepal, Ebert (1966) found it about the village of Khumjung (3800 m) in the main Himalayan range in July. Possibly, Joshimath is near the lower limit of its altitudinal range.

## DISCUSSION

Hampson (1892) recorded 14 species of 9 genera from the Himalaya west of Nepal, of which one species was treated as a Geometrid by him. No species were specifically recorded from Kumaon at the time. Subsequently, members of all nine genera, except *Cilix* Leach, have been recorded from Kumaon. *Cilix* will probably be found at higher elevation, i.e. above 1600 m or in the main Himalayan range eventually. It has not been recorded mainly because no one has really looked for it.

The present paper adds five genera, i.e. *Teldenia*, *Leucodrepana*, *Callidrepana*, *Tridrepana* and *Spica*, and nine species to the known Drepanid fauna of Kumaon and Garhwal. The new records in the present paper constitute c. 35% of the Drepanid fauna of this area, in terms of species as well as genera. There are several unidentified species in my collection, so the figure for species, if not for genera, will increase.

The difficulty with surveying the Drepanids is that, firstly, in this area, they are on the wing for a rather limited period, the exact timing varying with the altitude, local weather conditions and probably several other factors not understood at present. Secondly, they are local insects, not given to much traveling, unlike large moths such as the majority of Hawkmoths. Therefore, the observer has to be in the right place at just the right time. Thirdly, they are generally scarce insects. Although it is possible that some species are common in favourable habitats, they are never attracted in large numbers to artificial light, the only known attractant at present. It is not remarkable for this family that some species, like *Drepana innotata*, have been recorded only once in over twenty years at the main study site, although it will probably be found to be well established in a biotype not far from Bhimtal in due course. *M. fenestraria* has not even appeared so far at the main study site, although it is evidently well established a few air-kilometers away in Maheshkhan.

In keeping with the trend observed in the SpHINGIDAE (Smetacek 1994) and butterflies (Smetacek 1995, 2001; unpublished data) in Kumaon, most of the new records are Indo-Malayan species or genera. The range of only two species is extended eastwards. These are *Albara violacea* and *Drepana innotata*. While the former appears to be a well established resident, the latter is a straggler but presumably not from very far away. It is impossible to say whether the remaining new records are recent colonists or have been established for centuries, since there is no reference material to fall back upon. Therefore, the present material must serve as base-line data for future studies.

It is noteworthy that except for *Drepana innotata* and *Tridrepana sadana*, none of the species display any variation from the material described by Hampson or, in the case of *Tridrepana albonotata*, from the Malayan specimen illustrated in Barlow (1982). There seems to be very little geographical variation among the species treated in this paper. Nor has any seasonal variation been noted among them.

The only difference between Hampson's specimens and the present ones appears to be in the matter of size, but even in this, there are no consistent trends and most of the differences may be attributed to the greater number of specimens examined in the present study.

The flying time of Drepanids appears to be remarkably regular in this area, with hardly any stragglers. This is not often the case in other moth families. Minor upsets in the weather are often enough to cause the unseasonal appearance of Noctuids, Geometrids and members of several other families. Even the unusually early Southwest monsoon in 1999 and 2000 in this area did not affect Drepanid emergence patterns at all. During drought years and in the wake of major forest fires, populations tend to drop, sometimes steeply, but the same can be said for all other moth families.

Although two species in two genera, i.e. *Leucodrepana idaeoides* and *Spica luteola* have not been recorded from Kumaon so far, the fact that they have been recorded from both east (Nepal and Sikkim) and west (Garhwal) of here implies that they will almost certainly be found in similar habitats in Kumaon.

#### ACKNOWLEDGEMENTS

A Times Fellowship 1991 enabled me to visit Joshimath and Khiron in 1992. I am grateful to the Times of India Group for this; to Kumar Ghorpade for literature and to the editor for valuable suggestions.

#### REFERENCES

- Barlow, H.S. (1982): An introduction to the moths of S.E. Asia. Malayan Nature Society, Kuala Lumpur. Pp. 305, pl. 51.
- Ebert, G. (1966): Beitrage zur Kenntnis der Entomologischen sammelgebiete der Nepal-Expedition 1962. *Ergebn. Forsch. Unternehmen Nepal Him. Leifg.* 3: 121 – 136.

Hampson, G.F. (1892): The Fauna of British India including Ceylon and Burma. Moths, Vol. 1. Taylor & Francis, London. Pp. xxiii + 527.

Jairajpuri, M.S. (Ed.) (1991): Animal Resources of India. Protozoa to Mammalia. Zoological Survey of India, Calcutta. Pp. xxvii + 694.

Osmaston, A.E. (1927): A Forest Flora for Kumaon. Government Press, Allahabad. Pp. xxxiv + 604.

Sevastopulo, D.G. (1940): On the food-plants of Indian Bombyces (Heterocera). *J. Bombay nat. Hist. Soc.* 41: 817 – 827.

Smetacek, P. (1994): An annotated list of the Hawkmoths of Kumaon, N. India: a probable case of faunal drift. *Rec. Zool. Sur. Ind. Occ. Paper 156*: 1 – 55.

Smetacek, P. (1995): A new altitudinal and range record for the Copper Flash butterfly (*Rapala pheretimus* Hewitson) (Lycaenidae). *J. Bombay nat. Hist. Soc.* 92: 127 – 128.

Smetacek, P. (2001): Resolution of the controversial western limit of the range of *Delias acalis* God. (Lepidoptera: Pieridae). *J. Bombay nat. Hist. Soc.* 98: 298 – 300.

Watson, A. & P.E.S. Whalley (1983): The Dictionary of Butterflies and Moths in colour. Peerage Books, London. Pp. xiv + 296.

---

February 2002.

PETER SMETACEK  
*Jones Estate, Bhimtal,*

*Nainital,*

*Uttaranchal 263 136, India.*

**(2002) Journal, Bombay Natural History Society 99(3): 446 – 454.**

---