

MODIFICATIONS TO THE KNOWN EXPANSE OF INDIAN BUTTERFLIES

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Introduction

The only measurement used in the study of Lepidoptera is the wingspan. Although it is a rather simple concept, there are various interpretations of the term. The intention is to obtain an idea of the expanse of the creature. In a few cases, identification becomes easier if one has an idea of the size. However, there is no universal definition of the term, wingspan. Some older authors measured a straight line between the forewing apices of pinned specimens. This, of course, was controversial, since the same butterfly could have different wingspans, depending on the position of its forewings in relation to each other. A more reliable method was followed by Evans (1932). In this, the butterfly is measured from the centre of the thorax to the tip of the forewing apex and the result doubled. Evans (1932) provided wingspans of all butterfly species then known from the Indian subcontinent and the book is still the standard work on the subject.

Piet van der Poel (*pers. comm.*) noted that in his measurement of Colin Smith's butterfly collection at the Natural History Museum, Pokhara, Nepal, the measure between the forewing apices gives a value between 75% and 98% of the measure used by Evans (1932). Some subsequent authors did not follow Evans' (1932) method and interpreted the wingspan to mean the direct distance between the forewing apices of set specimens (Kunte, 2000); others defined it in the following terms,

“a straight distance between the two apices of the forewing of a preserved specimen that has the dorsum of the forewings at right angles to the body.” (Kehimkar, 2008) again others suggested that the wingspan was obtained by measuring a forewing from the base to the apex and doubling the result (Sondhi et al., 2013). Unfortunately, all these authors proceeded to use Evans' (1932) figures in their species descriptions, thereby creating confusion, since Evans' (1932) figures were obtained by a different measure.

Some recent authors interpreted the wingspan to mean the direct distance between the forewing apices (Kunte, 2000); others defined it more precisely in the following terms, “a straight distance between the two apices of the forewing of a preserved specimen that has the dorsum of the forewings at right angles to the body.” (Kehimkar, 2008) or else as the sum resulting from doubling the forewing length (Sondhi, Kunte, *et al.*, 2013) while using Evans' (1932) figures. This, naturally, was misleading. If one considers that the centre of the thorax as the apex of an inverted triangle, the distance from the centre of the thorax to the apices of the forewings as the sides of the triangle and the distance between the apices as the base of the triangle, the above authors all define the wingspan as the base of the triangle, while presenting measurements for the two sides.

Material and Methods

Specimens in the private collection of the authors at Jones Estate, Bhimtal, Uttarakhand, India were measured. Two species, *Troides aeacus* and *Delias pasithoe*, were measured in the Wankhar Butterfly Museum, Shillong, Meghalaya. Unfortunately, the specimens examined in the Wankhar Museum do not have data labels, so all that can be assumed is that they were collected somewhere in India. Nevertheless, they add information to the known expanse of the species, regardless of where they were collected. The collection at Jones Estate was started in 1947 by Fred Smetacek Sr. and most of the specimens collected before 1980 can be attributed to him. It comprises not only a reference collection of specimens of Indian moths and butterflies, but dwarf specimens, aberrations and cripples. Specimens were measured and compared with measurements for the species in Evans (1932). If larger or smaller, these specimens are figured here and the new record for the wingspan of the species is given in Table 1.

Discussion

It is not clear which collections were examined by Evans (1932) in order to arrive at the figure presented for each species. We may assume that he examined material in his own collection, as well as those in the Natural History Museum, London. Beyond this, it would be merely speculation, for although Evans is known to have visited various collectors in different parts of India and Europe, whether he measured their specimens or not is not known. The largest Indian butterfly, on the basis of Evans' measurements, is an unknown individual of the Southern Birdwing (*Troides minos* (Cramer, [1779])) which scaled 190 mm. In the present paper, we have a specimen of the Golden Birdwing (*Troides aeacus*) measuring 194 mm, which is therefore the largest butterfly in India and the mantle for the largest species therefore passes from *Troides minos* to *Troides aeacus*. The largest individual of the

Common Grass Yellow (*Eurema hecabe*) is also mentioned in the following table. It was recorded in Uttarakhand. The remaining species mentioned in the present paper have new records for the least known size. This size is of interest, since it tells us how small a species can be before metamorphosis is aborted and the larva starves to death. Usually, the smallest sized individuals are in the spring brood, presumably because the larvae did not find enough food during the winter months. However, this has not been experimentally proved. What is known is that when larvae are bred, the resulting adult specimens are often smaller than wild ones. Species like *Papilio bianor* and *P. protenor* are known to have spring broods that are much smaller in size than the summer or post-Monsoon broods. In other cases, such as *Graphium sarpedon* and *G. cloanthus*, a few individuals in the spring brood can be quite small, whereas summer individuals are usually large. In yet other cases, such as *Cyrestis thyodamas* Boisduval, 1846, *Stibochiona nicea* (Gray, 1846), *Sephia dichroa* (Kollar, [1844]), dwarf specimens have never been recorded. A specimen of the Common Yellow Swallowtail (*Papilio machaon* Linnaeus, 1758) is also included in figure 2. It is probably the smallest specimen of the species known, but due to an unfortunate accident, the forewing apices were torn off and the specimen cannot be measured. It is depicted for record's sake.

Acknowledgements

We are grateful to Rosalyna Moore Wankhar for permission to measure and mention specimens of *Triodes aeacus* and *Delias pasithoe* in the collection of Wankhar Memorial Butterfly Museum, Shilong.

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Table 1. Showing the New Record for the Wingspan of the Species

SN	Species	Collection data	Wingspan (mm)	Forewing length (mm)	Evans' (1932) figures (mm)
1	<i>Troides aeacus</i> (C. & R. Felder, 1860) Golden Birdwing female	Didihat, Uttarakhand, 1900 m 21.v.2012	194	90	150-170
	<i>Troides aeacus</i> (C. & R. Felder, 1860) Golden Birdwing male	Wankhar Butterfly Museum, Shillong, Meghalaya. No data label.	106	49	150-170
2	<i>Byasa polyeuctes</i> (Doubleday, 1842) Common Windmill	Near Gagar, 2100m, Uttarakhand, 2.v.2014	98	46	110-140
3	<i>Byasa dasarada</i> (Moore, 1858) Great Windmill	Near Gagar, 2100m, Uttarakhand 29.v.1994	96	45	100-140
4	<i>Papilio bianor</i> Cramer, [1777] Common Peacock	Jones Estate, Bhimtal, 1500m Uttarakhand 10.iii.1971	78	37	90-130
5	<i>Papilio protenor</i> Cramer, [1775] Spangle	Jones Estate, Bhimtal, 1500m Uttarakhand 17.iii.1974	86	40	100-140
6	<i>Papilio polytes</i> Linnaeus, 1758 Common Mormon	Jones Estate, Bhimtal, 1500m Uttarakhand 26.i.1970	52	25	90-100
7	<i>Papilio clytia</i> Linnaeus, 1758 Common Mime	Jones Estate, Bhimtal, 1500m Uttarakhand 13.vi.1966	78	37	90-130
8	<i>Graphium sarpedon</i> (Linnaeus, 1758) Common Bluebottle	Jones Estate, Bhimtal, 1500m Uttarakhand 20.iii.1982	68	32	80-90
9	<i>Graphium cloanthus</i> (Westwood, 1841) Glassy Bluebottle	Jones Estate, Bhimtal, 1500m Uttarakhand 14.iii.1994	64	30	85-95
10	<i>Catopsilia pomona</i> (Fabricius, 1775) Common Emigrant	Jones Estate, Bhimtal, 1500m Uttarakhand 5.v.1960	46	21	55-80

11	<i>Eurema hecabe</i> (Linnaeus, 1758) Common Grass Yellow	Jones Estate, Bhimtal, 1500m Uttarakhand 8.ix.2017	54	25	40-50
12	<i>Colias erate</i> (Esper, 1805) Pale Clouded Yellow	Ranikhet, Uttarakhand, 1500m 16-31.iii.2015	42	19	45-55
13	<i>Colias nilagiriensis</i> C. & R. Felder, 1859 Nilgiri Clouded Yellow	Kodaikanal, Tamil Nadu, 2100m 21.iii.1992	40	19	45-50
14	<i>Pieris canidia</i> (Linnaeus, 1768) Indian Cabbage White	Jones Estate, Bhimtal, 1500m Uttarakhand 8.iv.2016	42	20	45-60
15	<i>Pontia daplidice</i> (Linnaeus, 1758) Bath White	Jones Estate, Bhimtal, 1500m Uttarakhand 10.vi.1990	42	20	45-50
16	<i>Ixias pyrene</i> (Linnaeus, 1764) Yellow Orange Tip	North eastern India, no data label.	44	21	50-70
17	<i>Appias lyncida</i> (Cramer, [1777])	North eastern India, no data label.	52	25	55-70
18	<i>Delias eucharis</i> (Drury, 1773) Common Jezabel	Jones Estate, Bhimtal, 1500m Uttarakhand 27.iii.1981	58	28	70-80
19	<i>Delias belladonna</i> (Fabricius, 1793) Hill Jezabel	Jones Estate, Bhimtal, 1500m Uttarakhand 2.iv.1982	66	32	70-85
20	<i>Delias pasithoe</i> (Linnaeus, 1767) Redbase Jezabel	Wankhar Butterfly Museum, Shillong, Meghalaya. No data label.	46	21	70-85
21	<i>Pareronia hippia</i> (Fabricius, 1787) Common Wanderer	Jones Estate, Bhimtal, 1500m Uttarakhand 20.xi.2014	56	26	65-80
22	<i>Danaus chrysippus</i> (Linnaeus, 1758) Plain Tiger	Jones Estate, Bhimtal, 1500m Uttarakhand 20.v.2010	54	25	70-80
23	<i>Parantica melaneus</i> (Cramer, [1775]) Chocolate Tiger	North Eastern India, no data label.	72	35	85-95
24	<i>Athyma opalina</i> (Kollar, [1844]) Himalayan Sergeant	Jones Estate, Bhimtal, 1500m Uttarakhand 21.iii.1994	46	21	60-70
25	<i>Neopithecops zalmora</i> (Butler, [1870]) Quaker	Rudrapur, Uttarakhand, 400m, 1.iii.1994	18	8	20-30



Fig.1: *Triodes aeacus*



Fig.2: *Byasa polyeuctes*



Fig.3: *Byasa dasarada*



Fig.4: *Papilio bianor*



Fig.5: *Papilio protenor*



Fig.6: *Papilio polytes*



Fig.7: *Papilio clytia*



Fig.8: *Graphium sarpedon*



Fig.9: *Grahium cloanthus*



Fig.10: *Papilio machaon*



Fig.11: *Catopsilia pomona*



Fig.12: *Eurema hecabe*



Fig.13: *Colias erate*



Fig.14: *Pieris canidia*



Fig.15: *Colias nilagirensis*



Fig.16: *Appias lycida*



Fig.17: *Ixias pyrene*

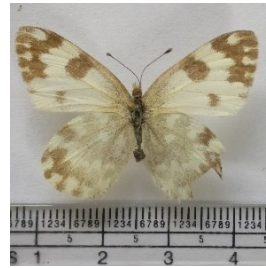


Fig.18: *Pontia daplidice*



Fig.19: *Delias eucaris*



Fig.20: *Danaus chrysippus*



Fig.21: *Neopithecops zalmora*



Fig.22: *Pareronia hippia*



Fig.23: *Athyma opalina*



Fig.24: *Parantica melaneus*