

the abundance of Zygoptera in Yercaud and the reverse may be true for the abundance of Anisoptera in other hilly regions. Odonata of Family Libellulidae (Anisoptera) are common in plains and their diversity decreases with increase in altitude because fast flowing streams and rivers are not suitable for Libellulidae naiads, which require sluggish and weedy ponds (Samways, 1989). But Libellulidae was dominant at higher altitudes in the present study. Eurytopic (wide habitat tolerance) nature of Libellulidae (Stewart and Samways 1998;

Clausnitzer 2003; Opperl 2005a,b) might be responsible for their abundance when compared to other families, namely Coenagrionidae, Lestidae and Platycnemididae recorded in the present study.

Higher species richness and diversity of Odonata in Yercaud could be attributed to the vast area, variety of biotopes (temporary water bodies, river, stream, cascade) and high shade cover. This is in agreement with the findings of Samways (1989) in South Africa and Opperl (2005a) in Papua New Guinea.

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17. STATUS AND DISTRIBUTION OF *APPIAS LALAGE* BUTTERFLY (LEPIDOPTERA: PIERIDAE) IN THE WESTERN GHATS, SOUTH-WESTERN INDIA

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Much confusion surrounds the occurrence of *Appias lalage* Doubleday, 1842 (Lepidoptera: Pieridae: Pierinae), also known as the Spot Puffin butterfly, in the Western Ghats. The Western Ghats is a mountain chain that runs along the western coast of southern India, and it is one of the globally

recognized biodiversity hotspots. Its evergreen forest flora and fauna are isolated from the nearest Himalayan and north-east Indian forests by over 1,500 km of dry, mixed deciduous forests on the Deccan Plateau. Hence, the Western Ghats is a key feature of peninsular India from biogeographic,

biodiversity and conservation perspectives (Gadgil 1996). In this note we present our observations on *A. lalage* to clarify its status and distribution within this mountain range.

The type specimen of *A. lalage* was taken from Khasi Hills in north-eastern India, which were previously included in Assam, but now belong to the state of Meghalaya, bordering Bangladesh. The currently well-known distribution of the nominate subspecies is throughout the Himalayas (Himachal Pradesh and Uttarakhand to Nepal, Sikkim, northern West Bengal, Bhutan and Arunachal Pradesh), the Khasi, Garo, Jaintia, Cachar and Lushai Hills of the Patkai Range (covering the entire north-eastern India) and the mountainous region of Myanmar (Evans 1932; Talbot 1939; Wynter-Blyth 1957; Smith 1989; Haribal 1992; Larsen 2004). Throughout its range it occurs between 550 m and 2,500 m above msl, but is partial to higher elevations; inhabits evergreen forests, and it may be seasonally common (Evans 1932; Parsons and Cantlie 1948; Wynter-Blyth 1957; Smith 1989; Haribal 1992; Larsen 2004). Two other subspecies have been listed under *A. lalage*: (a) *A. lalage lageloides* Crowley, 1900 occurs in Hainan, China (Io 2000), and (b) *A. lalage lagela* Moore, 1878 occurs in southern Myanmar, Thailand and Peninsular Malaysia (Evans 1932; Talbot 1939; Pinratana 1983; Corbet *et al.* 1992); although *lagela* is now widely recognized as a subspecies of *A. pandione* Geyer, 1832 rather than of *A. lalage* (Pinratana 1983; Corbet *et al.* 1992).

The occurrence of *A. lalage* in the Western Ghats, however, has been confirmed only recently. Early references on Indian butterflies do not mention the southern Indian range of the species, probably because the British collectors apparently did not collect it from the Western Ghats (Evans 1910; Antram 1924; Evans 1932; Talbot 1939; Wynter-Blyth 1957). Some of the specimens collected by these collectors were initially identified as *A. lalage*, but they turned out to be misidentified *Appias indra shiva* Swinhoe, 1885, the Sahyadri Plain Puffin (Harish Gaonkar, pers. comm.). Perhaps due to this, claims of occurrence of this species in the Western Ghats were largely discredited, and there was no explanation for a single specimen deposited in the collection of the Madras Government Museum, Chennai. This male specimen, collected from Kalakad Forest (now Kalakad-Mundanthurai Tiger Reserve and neighbouring forest tracts in south-western Tamil Nadu; henceforth KMTR), was a wet season form (Satyamurti 1966). Although Satyamurti recognized that this was the first record of the species from southern India, he did not report any other details of this specimen or of the species in this area.

In 1990s there were three important reports of the species from the Western Ghats. First, in 1995 a single male of a wet season form was reported mud-puddling at the Gudampara Estate, Idukki district, Kerala, at 1,200 m above msl (Nalini and Lomov 1996). Shortly afterwards, two entire

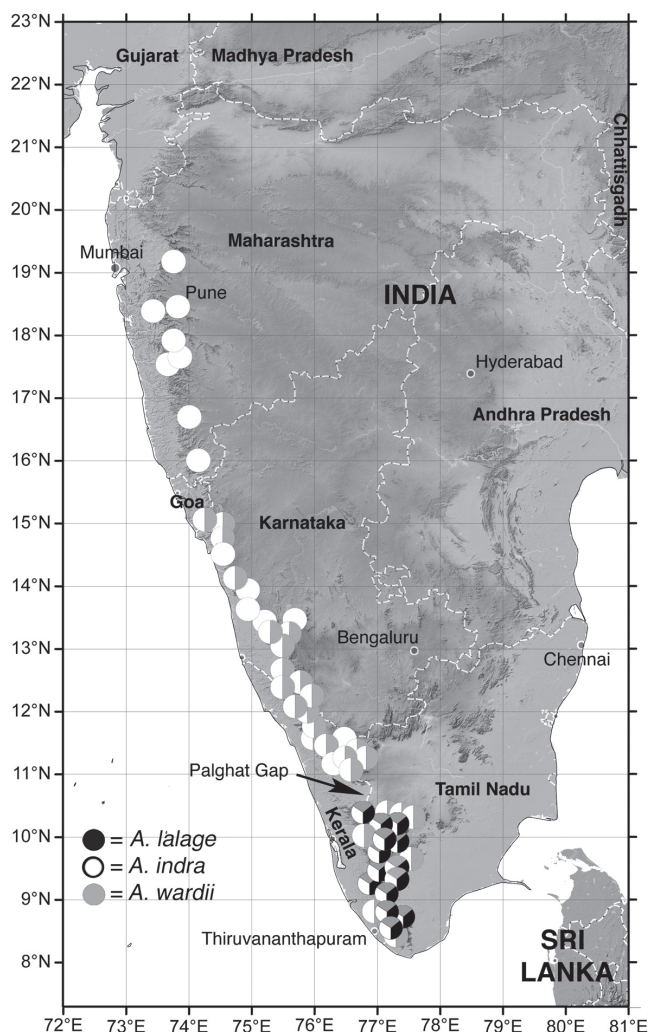


Fig. 1: Distribution of *Appias lalage lalage*, *A. indra shiva* and *A. wardii* in the Western Ghats

Each circle represents a spot record for the species, which are colour-coded as shown in the map. Half-split white-grey circles represent localities where *A. indra shiva* and *A. wardii* have been recorded together. Three-way split white-grey-black circles indicate that all three species co-occur at the localities surveyed. Data from Kunte (unpublished manuscript)

populations of the species were simultaneously reported from southern Western Ghats, one from KMTR, and the other from Eravikulam National Park, Kerala (Devy 1998; Kunhikrishnan 1998). These confirmed for the first time that the *A. lalage* specimens reported by Satyamurti, Nalini and Lomov were not stray and of unknown origin, but part of thriving populations within the southern Western Ghats. In his paper Kunhikrishnan attempted to describe in detail the status of this species in the Western Ghats. We extend that effort here with much more extensive observations that we have accumulated over the past 10 years.

In subsequent years since Soubadra Devy and Kunhikrishnan's reports, we have seen *A. lalage* in almost all

the major mountains in the states of Tamil Nadu and Kerala in the Western Ghats south of the Palghat Gap (Fig. 1). Particularly, we have seen large numbers at higher elevations in Eravikulam National Park, Grass Hills (the Anamalais), Periyar Tiger Reserve, Chemmunji Hills and Athirumala Hills in the Peppara Wildlife Sanctuary (WLS) in the Kerala part of the Ashambu Hills, KMTR, Schendurney WLS, Ponnudi Hills, Venkulamedu Hills and Agasthya Koodam Peak (border between Neyyar WLS and KMTR). All our sightings are from 600 m to 2,600 m above msl. We have, however, failed to locate *A. lalage* north of the Palghat Gap in spite of years of observations in these parts. This is interesting since the Palghat Gap is a biogeographic barrier that isolates many endemic butterflies on its northern and southern sides (Gaonkar 1996; Kunte 2008). It is up to a 40 km wide low-lying area that forms a major break among the tall mountains of the southern Western Ghats. The Nilgiri Mountains just north of the Palghat Gap have historically been extensively studied for their butterfly fauna and earlier workers in that region had never sighted *A. lalage* (see Larsen 1987-1988 and references therein). Mathew and Rahmathulla, however, reported *A.p. lagela* from Silent Valley National Park in Kerala, which is north of the Palghat Gap (Mathew and Rahmathulla 1993). This record is doubtful because *A.p. lagela* occurs in southern Myanmar, Thailand and Malaysia (see above), and is unlikely to occur in southern India. Dr. George Mathew of Kerala Forest Research Institute at Peechi, first author of the 1994 report, informed us that the record was probably based on just one or two specimens collected, which could not be located when we contacted him, and felt that more material was needed to verify the previous record. Our suspicion is that this would turn out to be *A. indra shiva*, although we do not rule out the possibility that it was a stray *A. lalage* that might have been blown across the Palghat Gap by strong winds. At present, from our failure to find the species north of the Palghat Gap and in absence of any other proof, we conclude that in the Western Ghats *A. lalage* is confined to the hills south of the Palghat Gap. We have observed it on both eastern and western slopes of the Western Ghats.

Our observations indicate that even in the Western Ghats *A. lalage* is partial to evergreen forests at higher elevations. At lower elevations (c. 600 m-1,000 m) in the Western Ghats, where it is very rare and co-occurs with *A. indra shiva* and *A. wardii* Moore, 1884 (the Lesser Albatross), the latter two usually far outnumber it. At higher

elevations (c. 1,200 m-2,200 m), however, *A. lalage* becomes much more numerous than other *Appias*. Especially above c. 1,500 m, *A. wardii* becomes scarce and *A. indra* and *A. lalage* are the only species of *Appias* that are common, where *A. lalage* outnumbers *A. indra*. It is common along evergreen forest paths and edges, on plateaus and steep slopes. Males mud-puddle frequently and several dozen may congregate on a good patch, either forming their own species group or joining congregations of other *Appias*.

There seem to be two flight periods: pre-monsoon and post-monsoon. At c. 700-900 m in KMTR we have observed very fresh specimens in fair numbers (up to a dozen individuals every day) in May and early June. However, the post-monsoon (October-November) seems to be the better season, during which dozens of individuals may be seen in a single day. At Eravikulam-Grass Hills it is plentiful in October, flying even along the main tourist road that passes through shola forests and tea plantations around Rajamalai. We have also occasionally observed individuals flying at an altitude of c. 2,600 m along the slopes of Anaimudi Peak (the Anaimudi Peak, at an elevation of 2,695 m, is the highest point in southern India and included in the Eravikulam National Park). From December the populations decline gradually, the species becoming a rare sight in summer (March-April).

We hope that this note clarifies the status of *A. lalage* in southern India. We tentatively assign the Western Ghats populations to the nominate subspecies, *A.l. lalage*. Although we have reported seasonal occurrence and some habits of the species and delineated its distribution within the Western Ghats, we do not know its early stages and other natural history. This is particularly important because host plants and early stages of *A. lalage* are unknown even from the northern populations (Robinson *et al.* 2001). We hope that this information becomes available soon.

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18. A NEW RECORD OF HOST PLANT *EMBELIA ACUTIPETALUM* OF ATLAS MOTH *ATTACUS ATLAS* LINNAEUS FROM KONKAN

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Atlas moth *Attacus atlas* Linnaeus of Family Saturniidae is commonly seen in monsoon in Konkan region. On July 25, 2008, I found five final instar caterpillars of Atlas moth *Attacus atlas* Linnaeus near a small village Kasba, Taluka Sangameshwar, District Ratnagiri. Caterpillars were 110 mm long. All caterpillars were feeding on leaves of *Embelia acutipetalum* (Family Myrsinaceae), a common plant in Konkan (Fig. 1). Local Marathi name of this plant is 'Vavding'. Many food plants of Atlas moth *Attacus atlas* Linnaeus are known, but there is no reference of this plant and is being reported here as the first record.



Fig. 1: Final instar caterpillar of *Attacus atlas* feeding on the leaves of *Embelia acutipetalum*

19. ABUNDANCE OF THREE SPECIES OF THE HORSESHOE CRAB ALONG THE COAST OF MALAYSIA

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Horseshoe crabs, popularly known as a 'living fossil', are one of the best-known living animals on Earth. They are important for the pharmaceutical, clinical and food industries, besides being good indicator organisms for monitoring the health of coastal zones. The blue blood of the horseshoe crab

has been proved to be of great value medically for the production of lectin (Saito *et al.* 1997) and tachyplesin I (Morvan *et al.* 1997).

In some Asian countries like Singapore, Malaysia, Borneo, the eggs of horseshoe crab are considered as a