

Danainae congregation in the Konkan region of Maharashtra, India

Migration of American monarch butterflies *Danaus plexippus* (Nymphalidae: Danainae) is a 'spectacular phenomenon' known and studied for over 150 years¹. However, overwintering of these migrating butterflies remained unnoticed till 1975, when sites in Mexico holding densely clustered butterflies in millions were discovered. Initially, roosting sites in the Gulf States of USA were confused for wintering sites. While wintering sites typically support butterflies in extended diapause for almost the entire winter season, roosting sites are usually one-night stopovers where migrating butterflies stop or nectar². Roost site selection is a relatively plastic behaviour³. Here we report a butterfly congregation from the Konkan region of Maharashtra, which in many ways resembles a wintering event. But there is no conclusive evidence whether this is a result of recurrent migration. However, in this context, we present a synthesis of butterfly migration and congregation reports from India.

In India, migration of butterflies is being reported since the late 19th century. Several notes have been published on migrating butterflies (Table 1), but meticulous long-term studies are being carried out only recently (K. Kunte, pers. commun.). Pioneering observations on butterfly migration in India were made by Aitken^{4,5} and Pratl⁶ in the western

coastal region. Aitken postulated a coastal, cyclic north-south migration to escape heavy monsoon of southern coastal region over two generations.

Williams⁷, in the late 1930s, compiled extensive information on butterfly migration available for India. Despite plotting directional and seasonal migratory movements of several butterfly species, he was clearly unable to synthesize an entire migration cycle of any species. The first such hypothesis was presented by Kunte⁸, wherein the danaines of the eastern coastal plains migrate to the hills of the western coast around October–November and return to the plains in April–May. He also conjectured that migrating South Indian danaines were actually butterflies of evergreen and semi-evergreen forests of the hills, but were forced to migrate to the eastern coastal plains to avoid the heavy Southwest monsoon.

We observed such a congregation of Danainae butterflies near Gothos village, Kudal taluka, Sindhudurg district, Maharashtra (16°2'28"N, 73°49'57"E, 100 m amsl, 30 km radial distance to coast). This site is nestled in the lower hill ranges of the Western Ghats. The hill is curved, forming a closed area opening to the west. The valley is divided into several small rainfed paddy fields that remain fallow till the next monsoon. The hillside immediately above the fields is

covered with moderately disturbed forest of moist deciduous nature. Above this, the Forest Department has planted teak. Thereafter, the hill rises steeply and is clothed with typical semi-evergreen forest. On the other side of the hill, there is a small dam in Nileli village.

We visited this site on 25 December 2012, 10 February 2013, 16 February 2013 and 25 March 2013. On the first and second visits, tens of thousands of butterflies were seen. But in late February, the number had declined to a few thousand individuals. On the last visit, no butterflies could be seen. There were Striped Tigers, *Danaus genutia* (Cramer), Common Crows, *Euploea core* (Cramer) and Blue Tigers, *Tirumala limniace* (Cramer) in the descending order of abundance. They were perched on the bushes in hordes of hundreds. When disturbed, they rose from their perches to fly for some time and again settled back. There were others that were perched on tree trunks, lower branches and dead twigs hanging from trees. Three fields in the valley were densely populated with Tumba, *Leucas aspera*, which was flowering and hundreds of butterflies left their roosts to hover over these plants for nectar. A few mating pairs of *D. genutia* and *E. core* were seen.

The site under report matches the typology of 'low-altitude, forested sites

Table 1. Review of butterfly migration records in India

Report	Place	Migrating butterfly species	Direction	Time of year
Aitken ^{4,5}	Konkan coast, Maharashtra	<i>Euploea core</i> with few <i>Danaus aglea</i> and <i>D. limniace</i>	Northward and Southward	Early June and late July
Pratl ⁶	Western coastal region	<i>E. core</i>	South	Mid October
Chaturvedi and Satheesan ²³	Khandala, Maharashtra	<i>E. core</i> some other Danaids	Southward	Early October
Chaturvedi ²⁴	Mumbai, Maharashtra	<i>E. core</i>	Northwest	Early and later parts of July
Dudgeon ²⁵	Kangra valley, Himachal Pradesh	<i>Catopsilia crocale</i> with few <i>C. pyranthe</i> and <i>Belenois mesentina</i>	Eastward and Westward	August and April
Wesche-Dart ²⁶	Kumaon, Uttarakhand	<i>Catopsilia pomona</i>	—	—
Lowe ²⁷	Kumaon, Uttarakhand	<i>C. crocale</i>	West	July
Parsons ²⁸	Assam	<i>Appias albina darada</i>	East and South	May
Jamdar ²⁹	Kashmir	<i>Pieris brassicae</i>	Northward	End of May
Nurse ³⁰	Deesa, Gujarat	<i>C. pyranthe</i>	Northwest	August
French ¹⁸	Kolar, Karnataka	<i>E. core</i> and <i>D. melissa</i>	West	Eight days in July
Andrewes ³¹	Nilgiris, Tamil Nadu	<i>Euploea</i> spp.	Westward	October
Briscoe ¹⁹	Nilgiris, Tamil Nadu	<i>D. limniace</i> , <i>C. pyranthe</i>	South and west	October
Reuben ³²	Vellore, Tamil Nadu	<i>D. limniace</i> and <i>E. core</i>	Southwest	Early August
Reuben ³³	Mumbai, Maharashtra	<i>E. core</i>	Northward and Southward	June and July

along the ... coast' taken by the western population of *D. plexippus*⁹. Forest habitat provides shade, moisture and protection from the wind. Hamilton *et al.*¹⁰ observed that *D. plexippus* in wintering sites in California used different tree species for roosting during different parts of winter. In Mexican wintering sites butterflies roosting on tree trunks had distinct thermal advantages over those roosting on branches¹¹ the effect being larger for larger trees. The wintering site reported here has a diversity of tree species. Butterflies roosted on the trunks, branches, dead twigs and even shrubs. There appeared no obvious preference either for any particular tree species or tree trunks. Similarly, the presence and use of patches of *L. aspera* seemed to be only incidental and not a determining factor behind this congregation. *L. aspera* is an important source of nectar for several butterflies¹².

At a landscape scale, like forest, presence of open water was highly correlated with wintering sites of *D. plexippus*³. But, Smetacek¹³ witnessed dense congregations of butterflies of several species in some valleys, while others having similar conditions of shade and water were empty. Wintering sites are often like small point locations varying from 0.5 to 5 ha within a very large area of seemingly similar vegetation underlining the importance of micro-climatic conditions. This must also be true as the butterflies ought to spend a longer time in a very small area¹. The congregation reported here was spread over an area not more than 0.5 ha, but including the paddy fields used by them the total area could be approximately 2 ha.

Some observers have documented small-scale butterfly congregations chiefly for food and pheromone precursors¹⁴⁻¹⁶. However, Larsen¹⁷ recorded a congregation of thousands of *E. core* in Corbett National Park during dry season. French¹⁸ reported that migrating butterflies took refuge in sheltered places weighing down the branches of bushes. Briscoe¹⁹ too noticed roosting clusters on trees. But apart from the observations by Kunte⁸ in the southern Western Ghats, there is no published historic report of a huge congregation containing tens of

thousands of individuals. Our observations match those of him and those from Taiwan²⁰. Local people informed us that such a congregation was recurrent. However, it has not occurred so far in the subsequent winter. Alternatively, this could be a contraction in distribution in response to adverse seasonal conditions²¹.

Brower⁹ had concluded that progressive deforestation of wintering sites had made the monarch butterfly migration an endangered phenomenon. These sites are also prone to stochastic catastrophic events like bad weather²². It is important, therefore, that conclusive evidence for occurrence of overwintering phenomenon should be gathered and such sites studied in detail while they are protected against potential threats.

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