

# The Study of Butterflies

## 5. Congregations, Courtship and Migration

*Peter Smetacek*

Peter Smetacek works on the taxonomy and zoogeography of Indian Lepidoptera. He is also interested in exploring the potential of Lepidoptera as bio-indicators of ecological functions and groundwater.

Part 1. The Naming of Indian Butterflies, *Resonance*, Vol.5, No.6, pp.8-14, 2000.

Part 2. Flight, Fuels and Senses, *Resonance*, Vol.5, No.8, pp.4-12, 2000.

Part 3. Intra-specific Variation, *Resonance*, Vol.6, No.5, pp.8-15, 2001.

Part 4. Defences and Defensive Behaviour, *Resonance*, Vol.7, No.5, pp.8-15, 2002.

Keywords

Courtship, pheromones, migration, swarming.

**In this part, we examine some causes of congregations, look at courtship and wonder at migration.**

A butterfly is the final stage of a life cycle consisting of an egg, larva, pupa and adult. In this adult stage, a butterfly has four main tasks: locating a mate and mating, laying eggs on suitable substrate, feeding and, of course, surviving long enough to achieve the first three. Since we are presently not in a position to attribute consciousness and personality to individual butterflies, we must presume that these tasks are performed according to genetically encoded behaviour patterns that vary from group to group, or from species to species and, sometimes, among individuals within a species.

In general, not much is known about the behaviour of Indian butterflies. It is not that they have not been observed – the point is, observing something and understanding it are two different things. For example, it was known for over a century that males of certain crow and tiger butterflies congregate in swarms on certain plants, settling on exposed roots, bruised stems or leaves. The reason did not emerge until, during the second half of the last century, it was understood that the males, upon emergence from their pupae, lack certain chemicals essential to the process of courting females. The swarms consist of males in search of pyrrolizidine alkaloids that are used to trigger attractants called pheromones used when the butterflies go a-wooing. Without these chemicals, females would ignore the males.

While on the subject of congregations, some Indian butterflies like the Crimson Rose (*Pachliopta hector*), some tigers (*Tirumala* and *Danaus*) and Crows (*Euploea*) sometimes roost in communes that may consist of thousands of individuals. Such roosts are

usually on one or a few closely grouped trees or bushes, while neighbouring vegetation is often entirely without roosting butterflies. So far as is understood, this phenomenon usually occurs during population outbreaks; at normal densities these species are content to roost alone. Such roosts are habitual among some South American butterflies.

At other times, butterflies gather in selected valleys or ravines, at puddles or on sandbanks and, lastly, on food sources such as overripe fruit or certain flowers. It is not known why certain ravines or valleys will, in certain years and only for a week or so, be filled with butterflies to the extent that they will bump into one another incessantly, due to lack of space in which to manoeuvre, while surrounding areas 200 m away will have no more than their usual complement of butterflies at the time. The unusual thing is that such congregations may consist of over 20 species representing many groups of species except the Swallow-tails, who are too restless to stay in one place for long, although they too pass through the ravine regularly. Such ravines usually have a water source and are rather shady, but other shady ravines with water in the area will be found to be almost empty while one plays host to the swirling swarm. The reason for such congregations is not understood yet.

A second site of congregations is mudpuddles and sandbanks

#### Box 1.

Sometimes, several individuals of a species gather together around a flowering bush or a favourite hilltop. Some species are more alert than others, being correspondingly more difficult to approach. If one or more individuals of such a species are taken by a collector, the others will melt away, to return only after the collector has left. This happens even if the individuals taken were collected while the others were soaring out of sight behind a tree or lower down the hillside.

With less alert species such as whites, the crowd will only move away if the intruder creates considerable disturbance, shaking the vegetation or waving the net about.

In the case of the Common Bluebottle *Graphium sarpedon*, a collector noted "I found it difficult to catch on the wing as it was very wary and seemed to know how far away (from the net) it was safe and when I moved behind a tree it would come round the tree to investigate."



*Figure 1. A small congregation of Browns (Satyrinae) on a streambed. Thirteen individuals of four species have gathered. Such gatherings can consist of hundreds of individuals.*

(*Figure 1*) rich in certain minerals required by male butterflies for the formation of spermatophores (see Part 2 of this series). Such groups consist of several hundred individuals at most. Bird droppings and mammalian urine also attract certain species, presumably due to the presence of minerals such as sodium.

A third cause of congregations is food, whether flower nectar, overripe fruit, a rotting carcass or a cowpat. Each source attracts number of particular types of butterflies. In the case of flowers and other sources or sugars like fruit and tree-sap, both sexes are attracted indiscriminately but in the case of cowpats and rotting carcasses, it is more often the males that are attracted. Butterflies are rather specific in their requirements: species that prefer flowers will very rarely, if ever, be found on overripe fruit. The mudpuddlers also avoid tree sap and overripe fruit while the majority of flower visitors avoid cowpats, carcasses as well as mudpuddles. Even among flowers, there are less than a handful that are universally popular. Usually, each flower has a certain group of butterflies among whom it is popular. Such groups sometimes consist of closely related species of one or more genera; in other cases, species from different families will congregate on a particular flower species. In all such congregations, no particular inter-butterfly communication, apart from the usual push-and-shove, has been observed either between members of a single species or of different species.

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The only known inter-butterfly communication is during the process of courtship, which is so elaborate in some species that it leaves a niggling doubt whether these creatures are really as uncommunicative the rest of the time as we believe. Each group has its own ritual, which usually begins when the sexes spot each other. Recognition of mates of the same species is based on sight and smell, involving the colour and pattern on the wings, and chemicals called pheromones, respectively.

It should be noted that the words 'sight' and 'smell' are used for want of more specific terms. Butterflies cannot 'see' things the way we do, since they do not have such sophisticated eyes. What they do have are compound eyes, each containing from 2,600–18,200 facets in different species. It is believed that they 'see' a fuzzy picture of the world since the lenses are fixed and cannot change shape or position to bring objects into sharp focus. Similarly, regarding 'smell', we know that flowers release perfume to attract insects while insects release pheromones to attract mates. We know in the case of certain moths, that a drop or two of the pheromone released by a female can attract males from over ten kilometres away downwind. The antennae appear to be the sensory organs involved, but it is not certain whether the molecules of the perfumes or pheromones are perceived by the insect's brain as a 'smell' comparable with our sense of the same name or in some other manner outside our experience. When we consider how butterflies manoeuvre through dense vegetation at relatively high speed, it is difficult to believe that their senses are poorly developed. There is no doubt that the antennae house more than just the sense of 'smell', for a butterfly deprived of one antenna will go blundering about, bumping into objects and flying lopsided in a manner that causes one to realise how perfect the in-flight manoeuvring is at other times.

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To return to the process of courtship, each group has its own ritual. Males of some species stake out a patch, often along a well used path or a clearing in a forest. They patrol the patch day after day, challenging any other butterfly or, indeed, any creature that comes near the patch that even vaguely resembles the species. Even small birds are chased by some species of butterflies, although the birds practically ignore such 'attacks'. Often, the butterfly flies rapidly towards an intruder but if it is of a different species, it returns to its perch without further ado. Sometimes, there is an intentional mid-air collision, with a resounding thwack that can be heard several metres away. Such jousts usually result in the intruder fleeing, with the defender in hot pursuit. It soon returns to its beat, which it first checks to



**Box 2**

It sometimes happens that individuals of different species mate. While it has not been observed in nature so far, in extensive breeding experiments carried out on Swallowtails *Papilio*, one instance of a spontaneous pairing between two different species was observed in a greenhouse. Hybrids can be obtained by hand pairing of different species, but so far no such butterfly hybrid has proved capable of producing fertile offspring.

In nearly every case of hand pairing of different species, the offspring bore traces of both the parents on its wings. Therefore, if inter-specific mating occurred in nature on a regular basis, specimens of such pairings would no doubt exist in collections. A few possible hybrids between different Arabian *Colotis* species have been recorded, but the better known exception that proves the rule is from the lowlands of Sikkim, where two well known Swallowtails, the Great Mormon *Papilio memnon* and the South Indian Blue Mormon *Papilio polymnestor* occur together. Forms intermediate between the two species have been obtained, suggesting that the two species occasionally mate in nature. It is not known whether such possible hybrids were fertile or not.

There is an interesting case of the pairing of two species of giant silkmoths (Saturniidae). The species concerned are *Anthraea perneyi* of China and *Anthraea roylei* of the Himalaya. They produced a hybrid which bore characters of both parents and produced fertile offspring. A controversy immediately arose during the 1970's, since one group raised the hybrid to the status of a species, calling it *Anthraea proylei*. This was opposed by taxonomists, who refused to treat *proylei* as anything more than a hybrid. They maintained that despite the fact that *proylei* bred true, i.e. *proylei* parents produced *proylei* offspring, not *perneyi* or *roylei* offspring, it was nevertheless a hybrid, an artificial creation that would not necessarily be stable in nature. Today, *proylei* is not considered a species. The name is still used to refer to the hybrid in tasar silk producing circles, where the moth is extensively used.

**Figure 2. Mating Orange Staff Sergeants: the female has her wings open. In the event of being disturbed, she will fly while the male hangs prone.**



confirm that no other butterfly has, in the meantime occupied it. The patrolling then continues, up and down the beat, with the butterfly often settling on a perch which commands the beat. The perch is rarely an individual choice. During the last century, a writer noted for a rather pugnacious species, the Orange Staff Sergeant (*Figure 2*), 'a male caught on a leaf there was an hour later replaced by another male on the same leaf'. I have noted the same thing in a number of other species; where, if a fresh male manages to drive off a worn male, it sits on the same perches as the previous individual. Year after year, the same species take up the same beats, making it possible to find them easily once one knows the area.

However, there is more to the whole thing than merely



**Figure 3.** *The female Brimstone butterfly, settled on the leaf with outspread wings, raises her abdomen out of reach of the hovering male to signal her unwillingness to mate.*

*All photo credits: Peter Smetacek*

the defence of a beat. There comes a time in the life of a butterfly when the long awaited female appears. The defender approaches her with the usual exuberance but, instead of knocking her about and chasing her, he circles her and, in the language of the air force, forces her down to land, occasionally jostling her in mid-air if she attempts to flee. If she is determined to flee, he has no qualms about knocking her from above, forcing her lower and lower until she is forced to settle.

Once the female has settled, willingly or unwillingly, courtship begins in earnest. Many species of male butterflies have greasy looking patches of specialised scales on their wings (see Part 2 of this series). It is believed that these scales are used mainly to exude a scent which stimulates the female sexually. The female's sensory organs appear to be located in her antennae, for the males of some species attempt to rub their patches of specialised scales on the antennae of the female. If the female's reaction is positive, the male lines up the tip of his abdomen with hers and mating commences, a process that may last for an hour or so. In this period, if the couple is disturbed, it is usually the female that flies off, carrying the unmoving male with her, still attached to the tip of her abdomen. Sometimes, it is the male that carries the female. It is worth noting in passing that butterflies are capable of flying with double their weight, although not very fast or far.

If the female's response is negative, she has several options for brushing off the male's advances. If she is on a bush or tree, she



may simply drop down from the perch where she was forced to land by the attending male. In doing so, she does not open her wings or attempt to glide, but merely drops like an inanimate object. Else, she may open her wings and raise her abdomen so that the tip is quite out of reach of the male (*Figure 3*). Lastly, she may simply fly off, to be forced down again and again until the male's persistence wears off and he returns to his beat.

All this elaborate process is eliminated in some species. The Grass Yellows (*Eurema* spp). for example, are common butterflies, very similar to the Nilgiri Grass Yellow illustrated in Part 1 of this series. They tend to swarm in some localities and are gregarious in their early stages, which means that the caterpillars and pupae 'hang out together' on or near their larval host plants. Having hung together in the pupal stage, they also emerge together, within a few hours or days of each other. In South India, it was discovered that the males, instead of chivalrously waiting for the females to reach a stage where their consent became a matter of uncertainty, simply went and mated with them as soon as they emerged from their pupae, before their wings had dried out and, in some cases, before they had even expanded!

### Migration

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every spring in the Himalaya. It, too, travels in a north westerly direction but so far, it is not known what causes these flights or where they end. In the Palni Hills of South India, the same butterfly migrates in a north easterly direction in spring. In southern India, butterfly migrations have been documented in the Palni Hills. Twenty two species are known to migrate, travelling southwards in October and November during the rainy season. In February and March, Albatrosses *Appias* and Emigrants *Catopsilia* travel northwards and the same two genera migrate again during May and June, but in no particular direction. There are scattered reports of migrations from other parts of India, mainly Assam, the Western Ghats and Rajasthan, but these are not regular, either with regard to species or timing.

Dispersal of the species is speculated to be a major purpose of migration. Most butterflies known to migrate are widespread, that is, they are found over vast tracts of land, although they might not breed in all the areas where they are found. They generally exhibit very little geographical variation. A good example is the Painted Lady, which is found in Asia, Europe, parts of Africa and most of North America. Throughout this range, there are no geographical races: a butterfly obtained in India is practically indistinguishable from a North American specimen. Similarly, the Peablu, which occurs from Europe to Japan, throughout Africa and from South Asia to Australia has no described geographical races.

However, not all widespread butterflies are migrants. Species such as the Copper *Lycaena phlaeas*, which is known from Europe, Africa, throughout temperate Asia to North America is not known to migrate and has numerous described geographical races.

The most obvious cause of migrations is a rapid expansion of the population of one or more species in an area, which leads to a reduced food supply and a subsequent exodus in search of food. Most of the migrations of the Painted Lady can be traced to this cause. Such migrations are usually sporadic, owing their origin

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to abnormal circumstances. In other cases, such as the Peablu or Albatrosses, the lack of food does not seem to be the prime cause. Perhaps it is merely a genetic programme that enables the species to colonise vast areas. Whatever the reason, the Peablu is certainly a common butterfly over the range it inhabits.

In the Himalaya, a seasonal migration has been noted. Cabbage Whites (*Pieris*), that are almost exclusively hill insects, descend to the adjoining plains during the winter, to raise a brood which returns to the hills the following spring. Such migrants have been recorded as far away as Delhi, but it is not known whether the succeeding generation of the Delhi records would be in a position to return to the hills or whether they would perish in the heat of the plains during summer.

Butterflies are capable of travelling great distances. In the course of migrations, they regularly traverse continents. However, these journeys are undertaken over a period of days or weeks. A more remarkable achievement is the irregular appearance of North American butterflies on European shores, which involves a trans-Atlantic crossing. The Monarch and the Buck-eye (*Vanessa virginiensis*) have both established populations on the Canary Islands off the European coast, while the Monarch has also established itself in Australia. It is one of the mysteries of the butterfly world how the Coppers, that are found in Europe, temperate Asia and North America, reached New Zealand in the dim past, having speciated there in the meantime. Or how the two endemic butterfly species of Hawaii reached there from Asia, where their congeners live.

That such long flights in insects are possible was proved recently when a part of a swarm of locusts that started off from the west coast of Africa reached the coast of South America, after a seventeen hour non-stop flight over the southern Atlantic Ocean!

*Address for Correspondence*  
Peter Smetacek  
Jones Estate  
P.O. Bhimtal, Nainital  
Uttaranchal 263 136, India.