

ENVIS Madhya Pradesh Newsletter

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Dear Readers,

The butterflies, like other animals of lower order, are very sensitive to the environmental degradation and act as a weather cock for the impending environment and ecological calamities. They differ from moths in absence of clubbed antennae. They visit flowering plants to drink nectar, to lay their eggs and to hide away from bad weather or predators. The nectar feeder butterflies have longer proboscis and visit those flowers which are directed upwards. For many butterflies, drinking at wet soil patches is an important feeding activity. The female butterflies replenish their sodium reserve through the sperms received from males, whereas the males make up this loss of sodium by drinking contaminated water (mud pudding). The colour of wing is due to scattering optical effects and not due to pigments only. Thus brightness of colour depends on sun rays falling on their wings.

ENVIS- MP



Butterfly Diversity of Tiger Reserves of Madhya Pradesh

The butterflies and flowering plants are co-evolved during early Cretaceous period (150 million years ago) as seen from the fossils of Mandla district of Madhya Pradesh. Since then they are associated with wild flowering plants and serve as indicator of forest health. The living species diversity of butterflies recorded recently consists of 117 species from the Pachamarhi Biosphere (Belsare 1999, Sen, 1999, Wadatkar 2007), 75 from the Pench Tiger Reserve (Sen & Dungriyal, 2000, Wadatkar 2007) and 31 from the Bandhavgarh Tiger Reserve (Anonymus 2006).

They are grouped as ; **1) Swallowtails** (Common Rose ,*Pachliopta aristolochiae*, Crimson Rose, *Pachliopta hector*, Common Mime , *Papilio clytia*, Lime Butterfly, *Papilio demoleus*, Common Mormon ,*Papilio polytes*), **2) Whites & Yellows** (Common Jezebel, *Delias*



eucharis, Yellow Orange Tip, *Ixias pyrene*, Lemon Emigrant , *Catopsilia crocale* , Common Grass Yellow, *Eurema hecabe*, Small Grass Yellow, *Eurema brigitta*, *rubella* **3) Blues** (Zebra Blue , *Leptotes plinius*, Pale Grass Blue , *Pseudoziziria maha*, Gram Blue , *Euchrysops Cnejus*, Common Silverline , *Spindasis vulcanus*, Plum Judy , *Abisara echerius*), **4) Milkweed butterflies** (Plain Tiger , *Danaus chrysippus*, Common Tiger, *Danaus genutia*, Glassy Tiger, *Parantica aglea*, Indian Common Crow , *Euploea core*) ; **5) Browns** (Common Evening Brown ,*Melanites leda*, is meme Dark Evening Brown, *Melanitis phedima*) ; **6.) Nymph Lids** (Angled Castor ,*Ariadne ariadne*, Common Castor , *Ariadne merione* , Common Leopard , *Phalanta phalantha*, Lemon Pansy , *Junonia lemonia*, Yellow Pansy , *Junonia hiertas*, Peacock Pansy , *Junonia almanac*, Chocolate Pansy, *Precis iphita*, Blue Pansy ,*Junonia orithya*, Grey Pansy, *Junonia atlites*, Danaid Eggfly, *Hylpolimnas missipus*, Orange Oakleaf , *Kallima inachus*, Common Sailor ,*Neptis hylas*, varmona, Baronet, *Euthalia nais* *Synphaedra nais*, Tawny Coster ,*Acraea violaed* and **7) Skippers** (Indian Grass Demon , *Edaspes folcus*).

The diversity of butterfly species and their abundance are observed in the Tiger Reserves of Madhya Pradesh. Most of the butterflies inhabit



grasslands, riverine ecosystem and dry deciduous forests of these reserves. In Satpuda Tiger Reserve the butterflies of Hesperiiidae family avoid bogged areas and marshy lands for living. Only one species, *Plum Judy* inhabits dense and dry deciduous forest of this Reserve. The adult butterflies in various areas of Satpuda Reserve prefer *Tridax procumbens* flowers. The second most preferred flowering plant is *Calosia argenta* (34%). The plant, *Lantana camera* is preferred by 28% butterflies. The members of family Lycaenidae visit the flowers of

Lantana, Ber, Palas trees. The species like Mottled Emigrant, Lime Butterfly, Plain Tiger, Common Indian Crew, Golden Angle prefer more than nine host plants for food sources. Common Evening Brown, Common Tree Brown and Common threeing, sp prefer moist places under tree shades. Chestnut Bob and Common Tree Brown species are found around moist places near Arjun (*Terminalia arjuna*) trees. The abundance of some species like Common Bluebottle, Baron, Common Baron and Staff sergeant indicate dense forest area. All these species are not found in denuded forests outside the Reserves.



The butterflies of Madhya Pradesh have more broods per year (multivoltinism).

Their eggs consist of a hard-ridged outer layer of shell, called the *chorion*. This is lined with a thin coating of wax which prevents the egg



from drying out before the larva has had time to fully develop and is fixed to a leaf with special glue, which hardens rapidly. As it hardens it contracts, deforming the shape of the egg. The glue is easily seen surrounding the base of every egg forming a meniscus. This glue is so hard that the silk pad, to which the setae are glued, cannot be separated. Eggs are usually laid on plants. Each species of butterfly has its own host plant range and while some species of butterfly are restricted to just one species of plant, others use a range of

plant species, often including members of a common family.

Butterfly larvae, or caterpillars, consume plant leaves and spend practically all of their time in search of food. Caterpillars mature through a series of stages called instars. Host plants often have toxic substances in them and caterpillars are able to sequester these substances and retain them into the adult stage. This helps making them unpalatable to birds and other predators. Such unpalatability is advertised using bright red, orange, black or white warning colours. The toxic chemicals in plants are often evolved specifically to prevent them from being eaten by insects. Insects in turn develop countermeasures or make use of these toxins for their own survival.

This "arms race" has led to the co-evolution of insects and their host plants.

The larva transforms into a pupa (or chrysalis) by anchoring itself to a substrate and moulting for the last time. The chrysalis is usually incapable of movement, although some species can rapidly move the abdominal segments or produce sounds to scare potential predators. The adult, sexually mature, stage of the insect is known as the imago.



The Common Mormon of Madhya Pradesh has female morphs which imitate the unpalatable red-bodied swallowtails, the Common Rose and the Crimson Rose. Many of these butterflies have distinctive seasonal forms. This phenomenon is termed *seasonal polyphenism* and the seasonal forms of the butterflies are called the dry-season and wet-season forms.

They feed primarily on nectar from flowers. Some also derive nourishment from pollen tree sap, rotting fruit, dung, decaying flesh, and dissolved minerals in wet sand or dirt. They are important as pollinators for some species of plants although in general they do not carry as much pollen load as the honey bees. They are, however, capable of moving pollen over greater distances. As adults, butterflies consume only liquids which are sucked by means of their proboscis. They feed on nectar from flowers and also sip water from damp patches. This they do for water, for energy from sugars in nectar and for sodium and other minerals which are vital for their reproduction. Besides damp patches, some butterflies also visit dung, rotting fruit or carcasses to obtain minerals and nutrients. In many species, this mud-puddling behaviour is restricted to the males. Butterflies sense the air for scents, wind and nectar using their antennae.

The antennae come in various shapes and colours. They are richly covered with sensillae. A butterfly's sense of taste is coordinated by chemoreceptors on the tarsi, which work only on contact, and are used to determine whether an egg-laying insect's offspring will be able to feed on a leaf before eggs are laid on it.



Chemical defenses are widespread and are mostly based on chemicals of plant origin. In many cases the plants themselves evolved these toxic substances as protection against herbivores. Butterflies have evolved mechanisms to sequester these plant toxins and use them for their own defense. These defense mechanisms are effective only if they are also well advertised and this has led to the evolution of bright colours in unpalatable butterflies. This signal may be mimicked by other butterflies. These mimetic forms are usually restricted to the females.



Importance and usefulness of butterflies



They serve as indicator of air quality, act as a weathercock for the impending environment and ecological calamities. They are vital geographic and ecological indicators and are often used in population dynamic in devising pest control strategies and in studying

evolution of plants by co-evolution of insects. The discovery of Rhesus factor in human blood is due to the study of polymorphic swallow tails.

Recent work on wing of butterfly

Recent report shows the presence of internal laminar and internal crystal-like nano-structures of the concave multilayer in windows of wings of Indian butterfly species, *Lime Butterfly* which is common in Madhya Pradesh forests. The nano-structure of wing produces coherent scattering optical effects forming a low pass filters for protecting the butterflies from UV radiations. The Fourier Transform images indicate that the reflectance is high in the visible wavelength range, but low in ultraviolet range. If cotton fibers are manufactured in textile industries with the same arrangement, we will be protected from low frequency wavelengths like infra-red and UV radiations from sunlight. Further, if we prepare chips of similar pattern with nano-particles of carbon, we can store solar energy to transform into electricity, by allowing energy to pass slowly through them. If we succeed in this venture, we can do



away with costly photovoltaic cells of silicon material and produce cells of cheap material. This would bring revolution in trapping solar energy for electricity!

Butterflies as weather clock

Butterflies are seen in more numbers during morning hours shown in the evening hours. On cloudy and windy days, fewer butterfly species and individuals are seen than on sunny days. Some species like Common Red Eye Malabar spotted Flat, Monkey Puzzle and Common Owl which were recorded and enlisted in Bison Lodge Of Pachamarhi, during 20th century, are no more seen now due to increase in temperature and loss of humid atmosphere. They act as bioindicators of weather changes e.g. their congregation in more numbers indicate the onset of monsoon rains.

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