

Butterflies of Keoladeo National Park, Bharatpur (Rajasthan)

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The Indian State of Rajasthan (erstwhile 'Rajputana,' now with 32 Districts), with Jaipur as capital, covers an area of 342, 239 sq. km in north-western India, adjacent to Pakistan in the west, the Indian States of Punjab and Haryana in the north, Madhya Pradesh in the east and Gujarat in the south. It encompasses the following four biogeographical sub-sub-areas :

the THAR DESERT (all of Marwar, from Ganganagar to Jalore, Jaisalmer to Sikar);

the MEWAR-MALWA PLATEAU (all of Mewar from Sirohi to Alwar, and Ajmer to Kota);

the PUNJAB DOAB (northern tip of Alwar); and

the RANN OF CUTCH (southern extremity of Jalore).

The Aravalli Hills divide Rajasthan into its two major geographical regions: the desert Marwar in the west and the more vegetated Mewar in the east. The northern portions of this range near Jaipur and Ajmer have dominantly *Anogeissus pendula* Edgew. (Combretaceae) forests (*Dhokra*, local name), which have a decidedly limited distribution in north-west India, but the southern section of the Aravalli Hills near Udaipur also has *A. latifolia* Wallich (*Dhaura*, *dhawa* in local vernacular), especially on the western and southern slopes of the hills. The dry, western part of Rajasthan contains around 800 plant species as its flora (Rolla & Kanodia, 1952, 1964; Shetty & Pandey, 1977), while the eastern, more humid portion contains about 1,400 plant species (Majumder, 1977). Pramanick & Hariharan (1952) wrote on the climate of Rajasthan, Krishnan (1952) on its geology, and Mani (1974) on its biogeography. There are some 21 Wildlife Sanctuaries and National Parks (Protected Areas) designated in this State (Sankhala, 1964) as given in Table 1.

Two quotations that describe Rajasthan geography and its butterfly fauna are here reproduced :

"The Aravalli is the oldest range of India, traversing 800 km in NE-SW direction. Uplifted and folded during the Pre-Cambrian, it was reduced almost to the sea-level due to erosion, but a second uplift in the late Mesozoic elevated the

area to 1,200m near Udaipur and to about 300m at its either end near Delhi and Ahmedabad (Pichamuthu & Radhakrishna, 1968). The central range is made up of gneisses, schistose rocks and quartzite of the Aravalli system. To the SW. of the main Aravalli Range rises Mt Abu, its peak at Guru Shikhar (1,722m) is the highest point between the Himalayas and the Nilgiris." [from Legris & Meher-Homji, 1977, *Trop. Ecol.*, 18: 10-24].

"Dominated by the Thar Desert in the west, the Aravalli Hills (Guru Shikhar, 1772m [sic] is the highest peak near Mt Abu) cross the State in the south and east. The butterfly fauna of the State is predominantly Oriental with a few Afrotropical elements, and has not been completely documented. Rajasthan has a forest cover of about 13,280 sq. km, which is about 4% of the total [State] area. About 70 species of butterflies are recorded so far from this State. The forested areas undoubtedly contain many more species." [from Harish Gaonkar's 1996 manuscript, "*The Butterflies of the Indian region*," Vol. 1].

The Keoladeo National Park is a world famous wildlife reserve, especially for waterbirds and details on it can be found in Ali (1953, 1985), Donahue (1962), Gee (1962), Sankhala (1964), Scott (1966), and Breeden & Breeden (1982). After initial works on butterflies of Bharatpur by Palot & Soniya (2000, 2001), Trigunayat et al. (2008) presented a more or less complete list of butterflies of this protected area. However, the names used by these authors are either obsolete or incorrect and this list of mine below gives corrected and updated ones, even trinomials. The list (Table 2) is placed in alphabetical order for genera and species listed under each family, but these latter are in currently understood phylogenetic order, from basal to derived. Parentheses around author names for subsequent generic combinations are omitted in my list below, since these apply to most of the old names for a group that has been researched since the dawn of Entomology, from Linnaeus and Fabricius in the late 18th century, almost 300 years ago.

Table 1. National Parks and Wildlife Sanctuaries in Rajasthan.

Name	District	Habitat
1. Desert National Park	Jaisalmer	Desert thorn forest
2. Mount Abu Sanctuary	Sirohi	<i>Acacia, Butea</i> , dry grass, wetland
3. Phulwari Sanctuary	Udaipur	Dry deciduous sal
4. Kumbhalgarh Sanctuary	Udaipur	<i>Boswellia, Aegle</i>
5. Jaisamand Sanctuary	Udaipur	<i>Anogeissus pendula</i> , wetland
6. Sita Mata Sanctuary	Banswara	Dry teak, bamboo brake
7. Tal Chappar Sanctuary	Sikar	Dry mixed deciduous, thorn
8. Nahargarh Sancturay	Jaipur	Dry mixed deciduous
9. Jamva-Ramgarh Sanctuary	Jaipur	Dry mixed deciduous
10. Sariska National Park	Alwar	Dry deciduous, <i>Anogeissus</i> , thorn
11. Todgarh Raoli Sanctuary	Bharatpur	<i>Boswellia</i>
12. Keoladeo National Park	Bharatpur	<i>Acacia, Butea</i> , dry grass, wetland
13. Van Vihar Sanctuary	Bharatpur	Dry deciduous, grassland, <i>A. pendula</i>
14. Ranthambore National Park	Sawai Madhopur	Dry mixed deciduous, <i>Anogeissus</i> ,
15. Kaila Devi Sanctuary	Sawai Madhopur	<i>Boswellia</i>
16. Jawahar Sagar Sanctuary	Kota	Dry mixed deciduous, thorn, wetland
17. Ramgarh Sanctuary	Kota	Dry deciduous
18. Gharial Sancturay	Kota	Riverine
19. Darah Sanctuary	Kota	<i>Anogeissus</i>
20. Shergarh Sanctuary	Kota	Dry mixed deciduous
21. Bhensrodgarh Sanctuary	Chittorgarh	Scrub, dry deciduous

It may be noted that in this arid tropical habitat, the Pieridae (23 spp.) are most diverse, followed by the largest butterfly family, the Nymphalidae (20 spp.; several subfamilies are recognized but are not mentioned here). Delhi, which is just 180km north of Bharatpur, has its butterfly fauna well researched. It is possible that other species of the Lycaenidae (14 spp. listed here; but 22 recorded from Delhi) and, especially, Hesperidae (7 spp.; 11 spp. in Delhi) occur around Bharatpur and await capture and identification, especially if nearby forested hills (with other food plant species of butterfly larvae) are also surveyed and sampled (*cf* MacPherson, 1927). The butterflies of Delhi have been studied in great detail, from Jandu (1942, 1943) to Donahue (1967, 1968), Ashton (1973), Larsen (1988, 2006) and Smetacek (1997, 2000, 2009), and these works are a good comparative documentation to a study of the Bharatpur District butterfly fauna, which could do with more detailed and focused surveys and sampling to reveal its actual butterfly diversity. Some 20 or more species than what are given in the list below are known from the Delhi area.

Recently, in late February 2015, I spent two days in this National Park and saw several of these recorded butterfly species there (no others) while sampling Diptera, these

latter mainly for my focused research on Syrphidae (hover or flower-flies). Butterflies were not especially searched for in this short period of time, during my participation by invitation to a *National Seminar on Bird Biodiversity of Rajasthan: Opportunities and Challenges*, at Keoladeo N.P., organized by Dr Ashok Verma of the Society for Research in Ecology and Environment (SREE) on 27- and 28 February 2015.

Works on butterflies of Rajasthan that I have been able to find are given above and in the References at the end of this note. Of other insect diversity recorded in Rajasthan, recently Kailash Chandra (2011: 199) gave a table indicating the number of species of the following insect Orders: Collembola (6), Protura (0), Diplura (0), Archaeognatha (0), Zygentoma (2), Ephemeroptera (0), Odonata (48), Dermaptera (3), Plecoptera (0), Embioptera (0), Orthoptera (87), Phasmida (0), Mantodea (9), Blattaria (4), Isoptera (61), Psocoptera (0), Phthiraptera (39), Thysanoptera (20), Hemiptera (59), Coleoptera (239), Neuroptera (5), Mecoptera (0), Siphonaptera (0), Strepsiptera (0), Diptera (135), Lepidoptera (216), Trichoptera (0), and Hymenoptera (116), for a total of 1,049 insect species so far known from Rajasthan. However, these numbers need further checking, and corroboration or correc-

Table 2. List of the Butterflies of Keoladeo National Park, Bharatpur, Rajasthan.

- Family HesperIIDae**
1. *Badamia exclamationis* Fabricius - Brown Awl
 2. *Caltoris kumara* Moore - Blank Swift
 3. *Hasora (vitta) indica* Evans - Plain Branded Awl
 4. *Parnara bada* Moore - Straight Swift
 5. *Suastus gremius* Fabricius - Indian Palm Bob
 6. *Taractrocera (maevius) sagara* Moore - Local Grass Dart
 7. *Udaspes folus* Cramer - Grass Demon
- Family PapilionIDae**
1. *Pachliopta aristolochiae* Fabricius - Whitespotted Rose
 2. *Pachliopta hector* Linnaeus - Crimson Rose
 3. *Papilio demoleus* Linnaeus - Lime Swallowtail
 4. *Papilio (polytes) romulus* Cramer - Black Mormon
- Family PierIDae**
1. *Aporia (agathon) phryxe* Boisduval - Great Blackvein [Not "*agathon agathon*"! (Trigunayat et al., 2008, et seq.)]
 2. *Appias (albina) swinhoei* Moore - Southern Albatross [Not "*albina darada*"!]
 3. *Belenois aurota* Fabricius - Pioneer [Not "*Anapheis aurota aurota*"!]
 4. *Catopsilia pomona* Fabricius - Lemon Emigrant [and form *crocale* Cramer]
 5. *Catopsilia pyranthe* Linnaeus - Mottled Emigrant
 6. *Cepora (nerissa) evagete* Cramer - Field Gull [Not "*nerissa nerissa*"!]
 7. *Colias (croceus) edusina* Butler - Dark Clouded Yellow [Not "*fieldii menetries*"!]
 8. *Colotis (amata) calais* Cramer - Small Salmon Arab [Not "*amata*"!]
 9. *Colotis danae* Fabricius - Southern Crimson Tip
 10. *Colotis (danae) dulcis* Butler - Northern Crimson Tip [Not "*danae dulas*"!]
 11. *Colotis etrida* Boisduval - Small Orange Tip [Not "*etridas*"!]
 12. *Colotis fausta* Oliver - Large Salmon Arab [Not "*Madais fausta*"!]
 13. *Colotis vestalis* Butler - White Arab
 14. *Delias eucharis* Drury - Indian Jezebel
 15. *Eurema hecabe* Linnaeus - Two-Spot Grass Yellow [Not "*Terias hecabe contubernalis*"!]
 16. *Eurema laeta* Boisduval - Spotless Grass Yellow [Not "*Terias laeta sikkima*"!]
 17. *Eurema (andersoni) ormistoni* Watkins - One-Spot Grass Yellow [Not "*Terias andersoni andersoni*"!]
 18. *Eurema (brigitta) rubella* Wallace - Red-Line Grass Yellow
19. *Ixias (pyrene) satadra* Moore - Yellow Orange Tip [Not "*pyrene familiaris*"!]
 20. *Leptosia nina* Fabricius - Psyche
 21. *Pareronia (valeria) hippia* Fabricius - Indian Wanderer
 22. *Pierius brassicae* Linnaeus - Large Cabbage White [Not "*nepalensis*"; *nipalensis* Gray is a synonym]
 23. *Pieris (canidia) indica* Evans - Indian Cabbage White
- Family LycaenIDae**
1. *Azanus ubaldus* Cramer - Bright Babul Blue
 2. *Chilades lajus* Stoll - Lime Blue [Not "*laius*"!]
 3. *Chilades pandava* Horsfield - Plains Cupid [Not "*pandava*"!]
 4. *Euchrysops cnejus* Fabricius - Gram Blue
 5. *Freyeria (trochylus) putli* Kollar - Grass Jewel [Not "*trochylus*"!]
 6. *Jamides celeno* Cramer - Indian Cerulean
 7. *Lampides boeticus* Linnaeus - Pea Blue
 8. *Leptotes plinius* Fabricius - Zebra Blue [Not "*Syntarucus plinius*"!]
 9. *Pseudozizeeria maha* Kollar - Pale Grass Blue
 10. *Spindasis vulcanus* Fabricius - Indian Silverline
 11. *Tarucus venosus* Moore - Himalayan Pierrot [Not "*T. v. dharata*"; *dharta* Bethune Baker is a NE. Indian species!]
 12. *Zizeeria karsandra* Moore - Dark Grass Blue
 13. *Zizina (otis) indica* Murray - Lesser Grass Blue [Not "*Zizina otis*"!]
 14. *Zizula hylax* Fabricius - Tiny Grass Blue ["*Zizula gaika*" Tremen is a synonym!]
- Family NymphalIDae**
1. *Acraea violae* Fabricius - Tawny Coster
 2. *Argynnis hyperbius* Johanssen - Indian Fritillary [Not "*Argyreus*"!]
 3. *Ariadne (merione) tapestrina* Moore - Rounded Hill Castor [Not "*Ariadne merione assama*"!]
 4. *Danaus chrysippus* Linnaeus - Plain Tiger [and variety *dorippus* Cramer]
 5. *Danaus genutia* Cramer - Striped Tiger
 6. *Euploea core* Cramer - Indian Black Crow
 7. *Hypolimnas bolina* Linnaeus - Great Eggfly
 8. *Hypolimnas misippus* Linnaeus - Danaid Eggfly
 9. *Junonia almana* Linnaeus - Peacock Pansy [Not "*Precis*"!]
 10. *Junonia hierta* Fabricius - Yellow Pansy [Not "*Precis hierta magna*"!]
 11. *Junonia lemonias* Linnaeus - Lemon Pansy [Not "*Precis*"!]
 12. *Junonia (iphita) pluvialis* Frühstorfer - Chocolate Pansy [Not "*Precis iphita*"!]
 13. *Junonia (orithya) swinhoei* Butler - Blue Pansy [Not "*Precis orithya ocyale*"!]

14. *Melanitis (phedima) galkissa* Frühstorfer - Dark Evening Brown [Not "*Melanitis phedima bela*" !]
15. *Melanitis (leda) ismene* Cramer - Familiar Evening Brown
16. *Parantica (aglea) melanoides* Moore - Pale Glassy Tiger
17. *Phalanta phalantha* Drury - Large Leopard
18. *Tirumala (limniace) leopardus* Butler - Pale Blue Tiger
19. *Tirumala septentrionis* Butler - Dark Blue Tiger
20. *Vanessa cardui* Linnaeus - Painted Lady [Not "*Cynthia*" !]

TOTAL = 68 species, of 46 genera and 5 families.

tion, by specialists who will each know their taxa (Orders) better.

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(Bionotes).

Record Murrah Bull Earns Rs. 2,10,000 per day

A big crowd of gawkers has gathered around Yuvraj, a giant 1400 kg Murrah bull that on Friday was crowned champion at Meerut's All India Cattle Show by a 10-member jury, startled as much by the animal's size as by his owner's refusal to sell it for a mind-boggling Rs 7 crore.

As Yuvraj chews on unconcerned by all the adulation, Karamvir Singh, who has brought him up "like a son", says he doesn't really need the money. "I already earn close to Rs 50 lakh a year from Yuvraj," he smiles. "Everything in life is not about money."

Yuvraj generates 3.5-5ml semen daily, which is diluted up to 35ml.

0.25ml of the semen, which costs Rs 1,500, is used to inseminate a Murrah buffalo.

Based on this calculation, the owner makes Rs 2,10,000 every day on an average.

Ravinder Sangwan, senior scientist at Sardar Vallabh Bhai Patel Agriculture University, where the competition for India's top bull was held, has an explanation on why Yuvraj is a cash bull that Kurukshetra-based Karamvir Singh may not want to part with.

"Yuvraj is a perfect specimen of the Murrah breed," Sangwan says. "It generates 3.5 to 5ml of very high quality semen everyday which is diluted to increase the volume to 35ml. Now, 0.25ml, which is one dose of semen used for artificially inseminating Murrah buffaloes, costs close to Rs 1,500. So, ideally in a single day, a dairy farmer can easily earn roughly about Rs 2,10,000.