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SHORT COMMUNICATION

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DIVERSITY OF BUTTERFLIES OF THE SHELTHALLI WILDLIFE SANCTUARY, SHIVAMOGGA DISTRICT, KARNATAKA, INDIA

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Abstract: A study was conducted on the diversity of butterflies by using the pollard walk method in the tropical dry deciduous habitats of Shettihalli Wildlife Sanctuary, Shivamogga District, Karnataka, from February 2010 to January 2011. A total of 151 species of butterflies belonging to 99 genera and five families was recorded. The family Nymphalidae was the most dominant with the highest number of species (52 species; 35%), followed by Lycaenidae (33 species; 22%), Hesperiidae (25 species; 17%), Pieridae (24 species; 16%), and Papilionidae (15 species; 10%). The study also revealed 24 species of butterflies which are protected under various schedules of Indian Wildlife Protection Act, 1972, and 13 species as being endemic to the Western Ghats, peninsular India and Sri Lanka.

Keywords: Diversity, endemicity, southern Western Ghats.

The Western Ghats is a prominent globally recognized biodiversity hotspot (Myers et al. 2000; Gunawardene et al. 2007), which covers about 60% of the forest area of Karnataka and one among the 36 biodiversity hotspots of the World.

There are a few reports available until date on the butterflies of the Western Ghats (e.g., Gaonkar 1996; Kunte 2000, 2008; Kehimkar 2008; Padhye et al. 2012; Kasambe 2018). Some examples of earlier documentation on butterflies from the Western Ghats protected areas include: 100 species from Silent Valley National Park (Mathew & Rahamathulla 1993), 124 species from Parambikulam Wildlife Sanctuary (Sudheendrakumar et al. 2000), 139 species from Kudremukh National Park (Radhakrishnan 2007), 74 species from Peechi-Vazhani Wildlife Sanctuary (Mathew et al. 2005), 53 species from Neyyar Wildlife Sanctuary (Mathew et al. 2007), 115 species from Gudavi Bird Sanctuary (Dayanand 2014), and 85 species from the montane forests of Eravikulam National Park (Sreekumar et al. 2018); and non-protected areas: 75 species from Siruvani Reserve Forests (Arun 2003), 282 species from the Kerala part of Nilgiri Biosphere Reserve (Mathew 2016), and 172 species from Dakshina Kannada District (Naik & Mustak 2016). The present study was conducted to examine the status, endemicity, and abundance of butterflies from Shettihalli Wildlife Sanctuary, Shivamogga, Karnataka.

MATERIAL AND METHODS

Study area

The Shettihalli Wildlife Sanctuary (SWS) located between 13.8873°N and 75.3879°E occupies an area about 395.6km² (Fig. 1). It is spread over parts of three taluks of Shivamogga District: Shivamogga, Hosanagara, and Thirthahalli. The terrain in the sanctuary is plain...
to undulating with a few pockets consisting of very steep terrains and hillocks. The temperature within the sanctuary varies from 15°C to 39°C and the average rainfall varies around 2000mm dominated by the southwest monsoon during July to September. It covers dry deciduous, moist deciduous and semi evergreen forests of the Western Ghats. The sanctuary is rich in both floral and faunal diversity.

Sampling method

Butterfly survey was carried out from February 2010 to January 2011 to record their status and abundance. The line transect method developed by the Institution of Terrestrial Ecology (Pollard 1979) was followed to monitor the diversity. Butterflies were recorded by direct visual observation along the three fixed transect routs, each of 2km long and 10m wide, passing through the different landscape elements like dry deciduous, semi evergreen and scrub forest and walked at a constant pace for approximately one to one and half an hour. The data collection carried out in a bi-weekly random survey in the whole study period. Observations were made between 07.30hr to 11.00hr, when butterflies are most active. Butterflies were identified by using various field guides (Kunte 2000; Sharma & Radhakrishna 2005; Kasambe 2018) and the nomenclature followed is as per Kasambe (2018). Butterflies observed in this study were categorized into five categories on the basis of their abundance under different score classes such as: very common (VC) 80–100%, common (C) 60–80%, occasional (O) 40–60%, rare (R) 20–40% and very rare (VR) below 20% (Aneesh et al. 2013).

RESULTS AND DISCUSSION

The study revealed the presence of 151 species of butterflies, belonging to five families. The checklists of all the species observed with their status are given in Table 1. Family-wise distribution of butterflies species showed that, Nymphalidae was the most dominant with 52 species (35% of total species), followed by Lycaenidae with 33 species (22%), Hesperiidae with 25 species (17%), Pieridae with 24 species (16%), and Papilionidae with 15 species (10%). On the basis of the frequency of occurrence of each butterfly species’ abundance, we calculated that 68 (46%) species were common followed by 35 (23%) rare, 30 (20%) very common, 13 (9%) occasional, and 3 (2%) very rare species (Fig. 2).

Thirteen taxa listed in SWS were found to be endemic species of which six species are endemic to the Western Ghats, viz.: *Pachliopta pandiyana*, *Papilio dravidarum*, *Troides minos*, *Kallima horsfieldi*, *Idea malabarica*, and *Caltoris canaraica* (Kunte 2008); five species, viz.: *Discophora lepida*, *Cirrochroa thais*, *Mycalesis patina*, *Cethosia mahratta*, and *Pareronia ceylanica* endemic to the Western Ghats and Sri Lanka (Kasambe 2018); and two species, viz.: *Prioneris sita* and *Papilio polynemestor* endemic to peninsular India and Sri Lanka (Kunte 2008; Kasambe 2018).
### Table 1. Checklist of butterflies along with their conservation status in Shettihalli Wildlife Sanctuary, Shivamogga, Karnataka.

| Common name                  | Scientific name                  | Status | WPA 1927 |
|------------------------------|----------------------------------|--------|----------|
| **Family: Papilionidae**      |                                  |        |          |
| 1 Crimson Rose               | *Pachliopta hector* Linnaeus, 1758 | VC     | Sch. I   |
| 2 Common Rose                | *Pachliopta aristolochiae* Fabricius, 1775 | R      |          |
| 3 Malabar Rose*              | *Pachliopta pandiyana* Moore, 1881 | R      |          |
| 4 Common Jay                 | *Graphium doson* C. & R. Felder, 1864 | C      |          |
| 5 Tailed Jay                 | *Graphium agamemnon* Linnaeus, 1758 | C      |          |
| 6 Spot Swordtail             | *Graphium nomius* Esper, 1799    | C      |          |
| 7 Southern Bluebottle        | *Graphium teredon* C. & R. Felder, 1865 | R      |          |
| 8 Common Mime                | *Papilio clytia* Linnaeus, 1758  | VC     | Sch. I   |
| 9 Lime Butterfly             | *Papilio demoleus* Linnaeus, 1758 | C      |          |
| 10 Common Mormon             | *Papilio polytes* Linnaeus, 1758 | VC     |          |
| 11 Blue Mormon***            | *Papilio polymezostar* Cramer, 1775 | VC     |          |
| 12 Common Banded Peacock     | *Papilio crino* Fabricius, 1792  | R      |          |
| 13 Red Helen                 | *Papilio helenus* Linnaeus, 1758 | O      |          |
| 14 Malabar Raven*            | *Papilio dravidarum* Wood-Mason, 1880 | C      |          |
| 15 Southern Birdwing*        | *Troides minos* Cramer, 1779     | C      |          |
| **Family: Lycaenidae**        |                                  |        |          |
| 16 Common Silverline         | *Spindasis vulcanus* Fabricius, 1775 | C      |          |
| 17 Common Pierrot            | *Castalius rosimon* Fabricius, 1775 | VC     | Sch. I   |
| 18 Banded Blue Pierrot       | *Discolampa ethion* Westwood, 1851 | VC     |          |
| 19 Dark Pierrot              | *Tarucus ananda de Niceville, 1883 | C      | Sch. IV  |
| 20 Striped Pierrot           | *Tarucus nara* Kollar, 1848     | R      |          |
| 21 Red Pierrot               | *Talicada nyseus* Guerin-Meneville, 1843 | C      |          |
| 22 Common Cerulean           | *Jamides celena* Cramer, 1775   | C      |          |
| 23 Dark Cerulean             | *Jamides bachus* Stoll, 1782    | VR     |          |
| 24 Lime Blue                 | *Chilades iarius* Stoll, 1780   | C      |          |
| 25 Gram Blue                 | *Euchrysops cneus* Fabricius, 1798 | C      | Sch. II  |
| 26 Zebra Blue                | *Leptotes plinius* Fabricius, 1793 | C      |          |
| 27 Pea Blue                  | *Lampides boeticus* Linnaeus, 1767 | C      | Sch. II  |
| 28 Tiny Grass Blue           | *Zizula hylox* Fabricius, 1775  | R      |          |
| 29 Dark Grass Blue           | *Zizeeria karsandra* Moore, 1865 | R      |          |
| 30 Common Hedge Blue         | *Acytalepis puspa* Horsfield, 1828 | C      | Sch. I   |
| 31 Lesser Grass Blue         | *Zizina atis* Fabricius, 1787   | VC     |          |
| 32 Plain Hedge Blue          | *Cealstrina lavendaronis* Moore, 1877 | C      |          |
| 33 Large Oakblue             | *Arhopala amontes* Hewitson, 1862 | R      |          |
| 34 Indian Oakblue            | *Arhopala atrax* Hewitson, 1862 | R      |          |
| 35 Common Ciliate Blue       | *Anthene emolus* Godart, 1824   | C      |          |
| 36 Pointed Ciliate Blue      | *Anthene lycaenina* C. Felder, 1868 | C      | Sch. II  |
| 37 Indian Red Flash          | *Rapala iarius* Fabricius, 1787 | C      |          |
| 38 Indigo Flash              | *Rapala varuna* Horsfield, 1829 | C      | Sch. II  |
| 39 Slate Flash               | *Rapala monea* Hewitson, 1863   | C      |          |
| 40 Yamfly                    | *Lexura atymnus* Stoll, 1780    | C      |          |
| 41 Plum Judy                 | *Abisara echerius* Stoll, 1790  | VC     |          |
| 42 Monkey Puzzle             | *Rathinda amor* Fabricius, 1775 | C      |          |
| Common name         | Scientific name                  | Status | WPA 1927 |
|---------------------|----------------------------------|--------|----------|
| 43 Plains Cupid     | Chilades pandava Horsfield, 1829 | VC     |          |
| 44 Grass Jewel      | Freyeria trophylus Freyer, 1845  | C      |          |
| 45 Forget-Me-Not    | Catochrysops strabo Fabricius, 1793 | C     |          |
| 46 Common Apefly    | Spalgis epius Westwood, 1852     | C      |          |
| 47 Common Lineblue  | Prosotas nora Felder, 1860       | VC     |          |
| 48 Indian Sunbeam   | Curetis thetis Drury, 1773       | R      |          |
|                     | Family: Nymphalidae              |        |          |
| 49 Club Beak        | Libythea myrrha Godart, 1819     | R      |          |
| 50 Common Castor    | Ariadne merione Cramer, 1777     | C      |          |
| 51 Angled Castor    | Ariadne ariadne Linnaeus, 1763   | R      |          |
| 52 Tawny Coster     | Acraea violae Fabricius, 1793    | VC     |          |
| 53 Blue Tiger       | Tirumala limniace Cramer, 1775   | VC     |          |
| 54 Dark Blue Tiger  | Tirumala septentrionis Butler, 1874 | C     |          |
| 55 Plain Tiger      | Danaus chrysippus Linnaeus, 1758 | R      |          |
| 56 Striped Tiger    | Danaus genuta Cramer, 1779       | C      |          |
| 57 Glassy Tiger     | Parantica agleia Stoll, 1782     | R      |          |
| 58 Grey Count       | Cynita lepidea Butler, 1868      | R      | Sch. II  |
| 59 Common Crow      | Euploea core Cramer, 1780        | VC     | Sch. IV  |
| 60 Danaid Eggfly    | Hylomma missippus Linnaeus, 1764 | C      | Sch. I   |
| 61 Great Eggfly     | Hylomma bolina Linnaeus, 1758    | C      |          |
| 62 Southern Blue Oakleaf* | Kalima horsfeldii Kollar, 1844     | O      |          |
| 63 Autumn Leaf      | Doleschallia bisaltide Cramer, 1777 | R      | Sch. I   |
| 64 Lemon Pansy      | Junonia lemonias Linnaeus, 1758  | VC     |          |
| 65 Peacock Pansy    | Junonia almana Linnaeus, 1758    | C      |          |
| 66 Yellow Pansy     | Junonia hirta Fabricius, 1798    | C      |          |
| 67 Chocolate Pansy  | Junonia iphita Cramer, 1779      | C      |          |
| 68 Gray Pansy       | Junonia atilis Linnaeus, 1763    | R      |          |
| 69 Blue Pansy       | Junonia orithya Linnaeus, 1758   | VC     |          |
| 70 Rustic           | Cupha erymanthis Drury, 1773     | C      |          |
| 71 Baronet          | Symphaedra nais Forster, 1771    | R      |          |
| 72 Nigger           | Orsatriaeno medus Fabricius, 1775 | C      |          |
| 73 Commander        | Moduza procis Cramer, 1777       | R      |          |
| 74 Common Sailer    | Neptis hylas Linnaeus, 1758      | VC     |          |
| 75 Common Leopard   | Pholanta pholantha Drury, 1773   | VC     |          |
| 76 Common Five-ring | Ypthima baldus Fabricius, 1775   | C      |          |
| 77 Common Three-ring| Ypthima astrope Klug, 1832       | C      |          |
| 78 Common Four-ring | Ypthima huebneri Kirby, 1871     | VC     |          |
| 79 Common Baron     | Euthalia aconthea Cramer, 1777   | C      |          |
| 80 Common Lascar    | Pantoporia hardonia Stoll, 1790  | R      |          |
| 81 Common Nawab     | Polyura athamas Drury, 1773      | R      |          |
| 82 Cruiser          | Vindula erota Fabricius, 1793    | O      |          |
| 83 Clipper          | Parthenos sylvia Cramer, 1775    | VC     | Sch. II  |
| 84 Southern Duffer**| Discophora lepida Moore, 1857    | O      | Sch. II  |
| 85 Tamil Yeoman**   | Cirrochroa thais Fabricius, 1787 | R      |          |
| 86 Indian Red Admiral| Vanessa indica Herbst, 1794      | R      |          |
| Common name               | Scientific name                   | Status | WPA 1927 |
|--------------------------|-----------------------------------|--------|----------|
| Painted Lady             | Vanessa cardui Linnaeus, 1758      | O      |          |
| Blue Admiral             | Kaniska canace Linnaeus, 1763     | O      |          |
| Common Evening Brown     | Melanitis leda Linnaeus, 1758     | VC     |          |
| Dark Evening Brown       | Melanitis phedima Cramer, 1780    | C      |          |
| Common Bushbrown         | Mycalesis perseus Fabricius, 1775 | C      |          |
| Glad-eye Boshbrown**     | Mycalesis patnia Moore, 1857      | R      |          |
| Dark-branded Bushbrown   | Mycalesis mineus Linnaeus, 1758   | C      | Sch. II  |
| Tamil Treebrown          | Lethe drypetis Hewitson, 1863     | O      |          |
| Bamboo Treebrown         | Lethe eurota Fabricius, 1775      | O      | Sch. I   |
| Tailed Palmfly           | Elymnias caudata Butler, 1871     | C      |          |
| Common Palmfly           | Elymnias hypermnestra Linnaeus, 1763 | C    |          |
| Common Map               | Cyrestis thyodamas Boisduval, 1846 | VR  |          |
| Tamil Lacewing**         | Cethosia maharatta Moore, 1872    | O      |          |
| Malabar Tree Nymph*      | Idea malabarica Moore, 1877       | VR     |          |

**Family: Pieridae**

| Common name               | Scientific name                   | Status | WPA 1927 |
|--------------------------|-----------------------------------|--------|----------|
| Indian Cabbage White     | Pieris canidia Linnaeus, 1768     | C      |          |
| Common Albatross         | Appias albina Boisduval, 1836     | R      | Sch. II  |
| Pioneer                  | Anaphaes aurora Fabricius, 1793   | VC     |          |
| Common Emigrant          | Catopisilia pamona Fabricius, 1775 | C    |          |
| Mottled Emigrant         | Catopisilia pyrane Linnaeus, 1758 | C      |          |
| Common Jezebel           | Delias eucharis Drury, 1773       | C      |          |
| Painted Sawtooth***      | Prioneris sita C. & R. Felder, 1865 | R    | Sch. IV  |
| Common Grass Yellow      | Eurema hecabe Linnaeus, 1758      | VC     |          |
| Small Grass Yellow       | Eurema brigitta Stoll, 1780       | C      |          |
| One-Spot Grass Yellow    | Eurema andersoni Moore, 1886      | C      |          |
| Three-spot Grass Yellow  | Eurema blanda Boisduval, 1836     | C      |          |
| Great Orange Tip         | Hebomoia glaucippe Linnaeus, 1758 | R      |          |
| White Orange Tip         | Ixias marianne Cramer, 1779       | R      |          |
| Yellow Orange Tip        | Ixias pyrene Linnaeus, 1764       | R      |          |
| Crimson Tip              | Colotis danae Fabricius, 1775     | C      |          |
| Plain Orange Tip         | Colotis aurora Cramer, 1780       | C      |          |
| Small Orange Tip         | Colotis etrida Boisduval, 1836    | C      |          |
| Large Salmon Arab        | Colotis fausta Olivier, 1804      | R      |          |
| Small Salmon Arab        | Colotis amata Cramer, 1775        | R      |          |
| Common Wanderer          | Pareronia hippio Cramer, 1776     | C      | Sch. II  |
| Dark Wanderer**          | Pareronia ceylanica C. & R. Felder, 1865 | O    |          |
| Common Gull              | Cepora nerissa Fabricius, 1775    | C      | Sch. II  |
| Lesser Gull              | Cepora nadina Lucas, 1852         | C      | Sch. II  |
| Psycho                   | Leptosia nina Fabricius, 1793     | R      |          |

**Family: Hesperiidae**

| Common name               | Scientific name                   | Status | WPA 1927 |
|--------------------------|-----------------------------------|--------|----------|
| Chestnut Bob             | Iambrix salala Moore, 1865        | VC     |          |
| Indian Palm Bob          | Soastus gremius Fabricius, 1798   | C      |          |
| Indian Skipper           | Spialia gaibo Fabricius, 1793     | R      |          |
| Common Grass Dart        | Taractrocera maevius Fabricius, 1793 | R    |          |
| Tamil Grass Dart         | Taractrocera ceramas Hewitson, 1868 | VC  |          |
| Common name                   | Scientific name                  | Status | WPA 1927 |
|------------------------------|----------------------------------|--------|----------|
| Common Palm Dart             | Telicota colon Fabricius, 1775   | VC     |          |
| Dark Palm Dart               | Telicota bambusae Moore, 1878    | VC     |          |
| Tamil Dartlet                | Oriens goloides Moore, 1881      | C      |          |
| White Banded Awl             | Hasora badra Hubner, 1818        | C      |          |
| Common Banded Awl            | Hasora chromus Cramer, 1780      | VC     |          |
| Common Snow Flat             | Tagiades jepetus Stoll, 1781     | C      |          |
| Water Snow Flat              | Tagiades litigosa Moeschler, 1878| VC     |          |
| Common Yellow-breasted Flat  | Gerosis bhagava Moore, 1866      | C      |          |
| Tricoloured Pied Flat        | Coladenia indrani Moore, 1866    | C      |          |
| Fulvous Pied Flat            | Pseudocoladenia dan Fabricius, 1787| C      |          |
| Common Redeye                | Matapa aria Moore, 1866          | O      |          |
| Variable Swift               | Pelopidas mathias Fabricius, 1798| VC     |          |
| Rice Swift                   | Borbo cinnara Wallace, 1866      | VC     |          |
| Kanara Swift*                | Caltox canarica Moore, 1884      | C      |          |
| Dingy Scrub Hopper           | Aeromachus dubius Elwes & Edwards, 1897| R      |          |
| Bush Hopper                  | Ampatia disocrides Fabricius 1793| C      |          |
| Common Banded Demon          | Notocrypto paralysos Wood-Mason & de Niceville, 1881 | C      |          |
| Grass Demon                  | Udaspes folus Cramer, 1775       | O      |          |
| Indian Ace                   | Halpe hindu Evans, 1937          | C      | Sch. II  |
| Southern Spotted Ace         | Thoressa astigmat Swinhoe, 1890 | VR     |          |

Endemism: *—Endemic to Western Ghats | **—Endemic to Western Ghats and Sri Lanka | ***—Endemic to Peninsular India and Sri Lanka. Legal Status: IWPA, 1972, Schedules I to IV. Status: VC—Very common | C—Common | O—Occasional | R—Rare | VR—Very Rare.

Figure 2. Species frequency of occurrence of butterflies in Shettihalli Wildlife Sanctuary, Shivamogga District.

Butterflies are sensitive to changes in the habitat and climate, which influence their distribution and abundance (Wynter-Blyth 1957). The study area hosts 24 scheduled butterfly species: seven species under Schedule I Part IV, 13 species under Schedule II, and four species under Schedule IV of the Indian Wildlife (Protection) Act 1972 (Arora 2003; Gupta & Mondal 2005) (Table 1).

The present study reports for the first time preliminary information on the butterfly species diversity of Shettihalli Wildlife Sanctuary, which can be used in monitoring ecosystem health, stability and functioning of the study area (Mandal 2016). Occurrence of the schedule and endemic species in the study area indicates that SWS is home to a rich diversity of butterflies.

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Image 1. Great Eggfly *Hypolimnas bolina* © M.N. Harisha.

Image 2. Grey Count *Cynitia lepidea* © Harish Prakash.

Image 3. Palm Judy *Abisara echerius* © Harish Prakash.

Image 4. Lime Butterfly *Papilio demoleus* © Harish Prakash.

Image 5. Lemon Pansy *Junonia lemonias* © Harish Prakash.

Image 6. Glassy Tiger *Parantica aglea* © Harish Prakash.

Image 7. Psyche *Leptosia nina* © Harish Prakash.

Image 8. Rustic *Cupha erymanthis* © Harish Prakash.

Image 9. Southern Birdwing *Troides minos* © M.N. Harisha.

Image 10. Clipper *Parthenos sylvia* © Harish Prakash.

Image 11. Common Mormon *Papilio polytes* © Harish Prakash.

Image 12. Common Leopard *Phalanta phalantha* © Harish Prakash.
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