Communication

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Rapid multi-taxa assessment around Dhamapur Lake (Sindhudurg, Maharashtra, India) using citizen science reveals significant odonate records

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Abstract: In the present work, we discuss the results of a four-day long rapid survey around Dhamapur Lake and surrounding freshwater habitats in the Sindhudurg District of Maharashtra through public participation. In total, 61 odonates, 51 butterflies, 17 species of amphibians and reptiles, 90 birds, and four mammals are documented. Our observations taken over a brief time reflect the importance of citizen science in documenting local biodiversity. We report involvement of citizen scientists in recovering significant odonate records for the state.

Keywords: Biodiversity, conservation, freshwater ecosystem, northern Western Ghats, Odonata, wetland.

Abbreviations: IUCN – International Union for Conservation of Nature, WPA – Wild Life (Protection) Act, 1972.
INTRODUCTION

The indeterminate exploitation of the natural resources by humans has caused considerable alterations in the ecosystem functioning and biodiversity loss through urbanization, habitat destruction, habitat modification, and degradation of vital freshwater resources (Gleick et al. 2001; McKinney 2002; Diaz et al. 2006; Dudgeon et al. 2006). Despite the current body of knowledge of environmental degradation, several regions remain less explored in terms of data on biodiversity. The lack of knowledge on biodiversity hampers the decision making at policy level and hence considered as one of the global priorities when forming conservation frameworks (Meyer et al. 2015; Sorte & Somville 2020). In recent years, citizen science has proved to be a beneficial tool in collecting biodiversity data through people’s participation (Theobald et al. 2015; Chandler et al. 2017; Mckinley et al. 2017). It is used for research, to understand distribution and possible threats to multiple taxa like insects, amphibians, birds, and mammals (Kolby 2015; Forrester et al. 2017; Zapponi et al. 2017; Sorte & Somville 2020). In India, the practice of citizen science has proved as a useful tool for biodiversity documentation at finer spatial scale (Badrinath 2015; Seshadri & Gururaja 2015; SoIB 2020). The lack of knowledge on biodiversity hampers the decision making at policy level and hence considered as one of the global priorities when forming conservation frameworks (Meyer et al. 2015; Sorte & Somville 2020). In recent years, citizen science has proved to be a beneficial tool in collecting biodiversity data through people’s participation (Theobald et al. 2015; Chandler et al. 2017; Mckinley et al. 2017). It is used for research, to understand distribution and possible threats to multiple taxa like insects, amphibians, birds, and mammals (Kolby 2015; Forrester et al. 2017; Zapponi et al. 2017; Sorte & Somville 2020). In India, the practice of citizen science has proved as a useful tool for biodiversity documentation at finer spatial scale (Badrinath 2015; Seshadri & Gururaja 2015; SoIB 2020).

Data collection

The 6th DragonflySouthAsia meet was conducted during 10–13 October 2019 wherein a total of 25 people participated from India and Sri Lanka. A few members of Syamantak, a local community working towards conservation of wetlands in the Sindhudurg area (http://syamantak.cfsites.org/), also took part. On all the four days, we opportunistically surveyed the sites for rapid assessment of selective invertebrates and vertebrates. Rapid multi-taxa assessments are used to yield quick yet reliable results. These are cost-effective, useful to make inventories of the local biodiversity, and the information obtained in terms of species richness can be used potentially to represent the community structure (Oliver & Beattie 1993, 1996). We used citizen science model for data collection and to document the maximum number of species (Chandler et al. 2017). The process involves participation in the survey by volunteers with little or no expertise on the taxa whose observations were verified by the experts later on.

METHODS

Study area

Sindhudurg District, situated at the southernmost tip of Maharashtra, is one of the biodiversity rich areas of the state and includes parts of northern Western Ghats, locally known as Sahyadri Hill ranges. Dhamapur Lake (16.033°N & 73.593°E; 22m) is located in the Malvan Tehsil of Sindhudurg District (Figure 1, Image 1). The climate of Malvan Tehsil remains hot and humid throughout the year having an annual average temperature 27.1°C and average annual precipitation of 2,865mm (Malvan summary 2020).

The lake is a 400 years old human-made lake with an area of 22 hectares. It provides water to Malvan City (TERI 2013). The surrounding villages Dhamapur and Walvali depend on its water for domestic use and irrigation purposes. The forest around the lake is moist deciduous and categorised as reserve forest. Streams having varying canopy cover, flow along one side of the lake (Image 3), while the other side is surrounded by marshes and paddy fields (Image 2).

Survey sites

We surveyed various freshwater habitats like lakes, ponds, wells, and streams around Dhamapur Village as our focal taxon was odonates. We also surveyed the natural vegetation, paddy-fields and forest patches around these habitats. Details of the study sites are given in Table 1 (Images 2–6).

Rapid multi-taxa assessment around Dhamapur Lake

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The participants were split into four different groups, each containing six to seven members, to cover different habitats surrounding the lake (Image 2 & 3). They were trained in using iNaturalist app (https://www.
Table 1. Study sites of Dhamapur lake area.

| Survey sites | Survey locality | GPS coordinates and elevation | Habitat |
|--------------|-----------------|------------------------------|---------|
| S1           | Dhamapur Lake (Image 1 & 2) | 16.0335°N & 73.5939°E, 22m | Surrounded by moist deciduous forest and streams on one side and marshlands, paddy fields on other |
| S2           | Stream along Dhamapur Lake (Image 3) | 16.0325°N & 73.5952°E, 18m | Stream of varied canopy cover, fed by the lake flowing alongside through moist-deciduous and semi-evergreen vegetation; intermittent rocky areas forming temporary puddles; presence of algae on the rock surface |
| S3           | Thakurwadi Lake (Image 4) | 16.0112°N & 73.6474°E, 14m | Marshland with aquatic vegetation |
| S4           | Kasartaka Stream (Image 5 & 6) | 16.0448°N & 73.5746°E, 65m | A stream with varying water depth from open shallow areas to areas with 0.6–0.9 m water depth and closed canopy; intermittent grass patches and herbs along the banks |
| S5           | Ponds and wells | 16.0288°N & 73.5918°E, 17m | Temporary and permanent water sources in nearby residential areas |
Rapid multi-taxon assessment around Dhamapur Lake

Mujumdar et al.
RESULTS

In total, we documented 61 odonates (Table 2), 51 butterflies (Table 3), 17 species of amphibians and reptiles (Table 4 & 5), 90 birds (Table 6), and four mammals (Table 7) during the tenure. We encountered the newly described Ceriagrion chromotherax Joshi & Sawant, 2019 in both Dhamapur and Thakurwadi lakes (Image 17). As per the status provided by Wild Life (Protection) Act, 1972 (hereafter, WPA), Doleschallia bisaltide (Cramer, [1777]) and Hypolimnas misippus (Linnaeus, 1764) are included in schedule I, while Cynitia lepidea (Butler, 1868) and Parthenos sylvia (Cramer, 1775) are under schedule II among butterflies. In the case of birds, the majority of the species, i.e., 80 out of 90 species belong to schedule IV. Three species are categorised as Near Threatened, namely, Anhinga melanogaster Pennant, 1769, Anthracoceros coronatus (Boddart, 1783), and Brachypodius pirocephalus (Jerdon, 1839), while Buceros bicornis Linnaeus, 1758 is Vulnerable. A. coronatus and B. bicornis are included under schedule I whereas A. melanogaster and B. pirocephalus are under schedule IV of WPA.

The anurans, Euphylognis cyanophlyctis (Schneider, 1799), E. hexadactylus (Lesson, 1834), Hoplobatrachus tigerinus (Daudin, 1802), and Polypedates maculatus (Gray, 1830) are Least Concern according to IUCN and first three are included under schedule IV of WPA. In order Serpentes among reptiles, Fowlea piscator (Schneider, 1799) and Ptyas mucosa (Linnaeus, 1758) belong to schedule II, Oligodon taeniolatus (Jerdon, 1853) and Amphiasma stolatum (Linnaeus, 1758) belong to schedule IV of WPA and remain Not Evaluated by IUCN. No species in Order Sauria is included under WPA but categorised as Least Concern according to IUCN with exception of Calotes versicolor (Daudin, 1802) which is Not Evaluated. The mammalian species Herpestes edwardsii (É. Geoffroy Saint-Hilaire, 1818), Macaca radiata (É. Geoffroy, 1812), and Funambulus palmarum (Linnaeus, 1766) are Least Concern while Semnopithecus hypoleucos Blyth, 1841 is Vulnerable as per IUCN. The first two are part of schedule II of WPA while the latter are not included under any schedule.

Comments on significant records of odonates

Following odonates observed at Thakurwadi Lake on 12 October 2019 are significant records considering their current known geographical distributions. The lake is filled with emergent and submergent aquatic vegetation including members of family Nymphalidae (Image 4).
Table 2. Checklist of Odonata (dragonflies and damselflies) species.

| Scientific Name                                      | Common Name                  | IUCN status | Locality of observation |
|------------------------------------------------------|------------------------------|-------------|-------------------------|
| **Suborder Zygoptera**                               |                              |             |                         |
| **Family Lestidae**                                  |                              |             |                         |
| 1 Lestes praemorsus decipiens Kirby, 1893           | Sapphire-eyed Spreadwing     | LC          | TL                      |
| 2 Platysteles cf. platystylus                        | -                            | -           | TL                      |
| **Family Platystictidae**                            |                              |             |                         |
| 3 Protosticta gravelyi Laidlaw, 1915                | Pied Reedtail                | LC          | KS                      |
| **Family Calopterygidae**                            |                              |             |                         |
| 4 Vestalis gracilis (Rambur, 1842)                  | Clear-winged Forest Glory    | LC          | S                       |
| **Family Chlorocyphidae**                           |                              |             |                         |
| 5 Helicocypha bisignata (Hagen in Selys, 1853)       | Stream Ruby                  | LC          | S                       |
| 6 Libellago indica (Fraser, 1928)                    | Southern Heliodor             | LC          | S                       |
| **Family Euphaeidae**                                |                              |             |                         |
| 7 Euphaea fraseri (Laidlaw, 1920)                   | Malabar Torrent Dart         | LC          | S; KS                   |
| **Family Platycnemididae**                           |                              |             |                         |
| 8 Copera marginipes (Rambur, 1842)                  | Yellow Bush Dart             | LC          | DL                      |
| 9 Copera vittata Selys, 1863                        | Blue Bush Dart               | LC          | DL                      |
| 10 Disparoneura quadrimaculata (Rambur, 1842)       | Black-winged Bamboo Tail     | LC          | KS                      |
| 11 Prodasineura verticalis (Selys, 1860)            | Black Bambootail             | LC          | S                       |
| **Family Coenagrionidae**                            |                              |             |                         |
| 12 Aciagrion occidentale Laidlaw, 1919              | Green-striped Slender Dartlet| LC          | TL                      |
| 13 Agriocnemis piersi Laidlaw, 1919                 | White Dartlet                | LC          | S; TL                   |
| 14 Agriocnemis pygmaea (Rambur, 1842)               | Pygmy Dartlet                | LC          | M; KS                   |
| 15 Agriocnemis splendidissima Laidlaw, 1919         | Splendid Dartlet             | NE          | M; KS                   |
| 16 Ceriagrion coronae (Brauer, 1865)                | Orange-tailed Marsh Dart     | LC          | DL                      |
| 17 Ceriagrion chrophonurus Joshi and Sawant, 2019   | Sindhudurg Marsh Dart        | NE          | TL; DL                  |
| 18 Ceriagrion coronae (Fabricius, 1798)             | Coromandel Marsh Dart        | LC          | DL                      |
| 19 Ceriagrion rubrae Laidlaw, 1916                  | Orange Marsh Dart            | NE          | TL                      |
| 20 Ischnura rubillo Selys, 1876                     | Western Golden Dartlet       | LC          | M                       |
| 21 Ischnura senegalensis (Rambur, 1842)             | Senegal Golden Dartlet       | LC          | TL; DL                  |
| 22 Mortonagrion varra (Fraser, 1920)                | Brown Dartlet                | DD          | DL; S;                  |
| 23 Pseudagrion decorum (Rambur, 1842)               | Three-striped Blue Dart      | LC          | DL                      |
| 24 Pseudagrion indicum Fraser, 1924                 | Yellow-striped Blue Dart     | DD          | KS; S                   |
| 25 Pseudagrion malabaricum Fraser, 1924             | Malabar Sprite               | LC          | M; TL                   |
| 26 Pseudagrion microcephalum (Rambur, 1842)         | Blue Grass Dartlet           | LC          | M; DL                   |
| **Suborder Anisoptera**                              |                              |             |                         |
| **Family Aeshnidae**                                |                              |             |                         |
| 27 Anax guttatus (Burmeister, 1839)                 | Blue-Tailed Green Darner     | LC          | DL                      |
| 28 Anax immoculiferum Rambur, 1842                  | Blue Darner                  | LC          | KS                      |
| 29 Anax indicus Lieftrink, 1942                     | Lesser Green Emperor         | LC          | DL                      |
| 30 Gynacantha dravida Lieftrink, 1960               | Brown Darner                 | LC          | KS                      |
| 31 Gynacantha cf. khasiaca                          | -                            | -           | TL                      |
| **Family Gomphidae**                                |                              |             |                         |
| 32 Ichthogomphus rapax (Rambur, 1842)               | Common Clubtail              | LC          | DL                      |
| 33 Paragomphus lineatus (Selys, 1850)               | Common Hooktail              | LC          | KS                      |
1. **Lestes praemorsus decipiens** Kirby, 1894

A pair was observed in the marshy area of the lake. The male was identified as *Lestes praemorsus* on the basis of characters like thorax with greenish antehumeral stripes, crenulate on the outer sides; segment nine with dorso-lateral blue marking; blunt and curved cerci with whitish hairs and paraprocts blackish, short with white hairs at the tip (Image 10). The female looked similar to the male with profound thoracic antehumeral stripes. Anal appendages were whitish, short, and pointed (Image 11). The species is distributed from western India to Assam (Fraser 1933), Andaman Islands and across the northern parts of the country and consist of two subspecies *L. praemorsus sikkima* Fraser, 1929 and *L. praemorsus decipiens* Kirby, 1893 (Prasad & Varshney 1995; Dow & Sharma 2020). *L.p. sikkima* is confined to Sikkim in northeastern India and is distinguished by having a metallic posthumeral stripe (Fraser 1933). The male specimen observed at the lake lacks any metallic posthumeral markings (Image 12), thus it is concluded to be representing the widespread subspecies *L.p. decipiens*. It should, however, also be noted that the taxonomic status of the subspecies of *L. praemorsus* is insufficiently resolved (Kosterin 2019). DS found the...
species in Vimleshwar Village of the district. Considering the distribution in the mentioned references and citizen science portals (Anonymous 2020a), we note that these are the first confirmed records of the subspecies from Maharashtra.

2. *Platylestes cf. platystylus*
   A single female individual sighted at the lake seems to be closer to *Platylestes platystylus* (Rambur, 1842) based on the pterostigma (quadrate as opposed to elongate in *Lestes* spp.) and thoracic markings (presence of black spots on each side) (Image 13). We did not collect the specimen hence species level identification was not confirmed. We treat our record as *Platylestes cf. platystylus*. The species *P. platystylus* has distribution in West Bengal in India (Fraser 1933; Prasad & Varshney 1995; Sharma 2010). It is also reported from Tripura and Kerala on citizen science portals (Anonymous 2020b; https://www.inaturalist.org/observations?place_id=6681&taxon_id=109709). Rison & Chandran (2020) recorded the species from few localities in Kerala recently. During present study, the female was seen curling abdomen on an emergent aquatic plant, indicating probable attempt at egg-laying.

3. *Pseudagrion malabaricum* Fraser, 1924
   *Pseudagrion malabaricum* was first reported from Maharashtra State by Tiple et al. (2013) in the Vidarbha region. Subsequently, this species has also been reported from Devgad Taluka and Chaukul Village in Sindhudurg District (Anonymous 2020c). During the present survey, several adults were observed among the reeds and grassy aquatic vegetation near the lake edge (Image 14). The species was identified based on the cerci being shorter than abdomen segment 10 and not bifid at apex (Image 15). The only other *Pseudagrion* species recorded in the habitat, *P. microcephalum*, has bifid cerci clearly longer than the segment 10 while the morphologically similar species *P. australasiae* has cerci bifid at apex as seen in profile (Fraser 1933).

4. *Gynacantha cf. khasiaca*
   A single male individual was observed in the vegetation surrounding the lake. The specimen was recognised separate from the other *Gynacantha* spp. recorded during the study and showed similar characters to those of *Gynacantha khasiaca* MacLachlan, 1896 i.e. paraproct longer than half of the length of cerci (Image 18) and two lateral brownish stripes on the greenish thorax (Image 19). *G. khasiaca* is distributed in West Bengal, Assam and Khasi hills in Meghalaya in India (Fraser 1936). Few studies further add the southernmost distribution of the species to West Bengal (Mitra 2002; Payra et al. 2017). We confirm the observed specimen as *Gynacantha cf. khasiaca* owing to confirmation of the mentioned limited characters as we did not collect the specimen. It is an interesting opportunistic record from the western India considering its affinity to *G. khasiaca* with the known distribution range in northeastern parts of the country (Mitra et al. 2010). It requires detailed study of the specimen further to confirm its identity.

5. *Indothemis limbata sita* Campion, 1923
   *Indothemis limbata* was described as *Trithemis limbata* Selys, 1891 based on specimens from Myanmar and Malay Peninsula. A different form of the species was described as *I. limbata sita* from Sri Lanka, based on the wing venation and markings (Campion 1923). Later studies considered *I. limbata limbata* to be restricted to Myanmar and southeastern Asia and *I. limbata sita* to be restricted to the western India and Sri Lanka barring one record from Odisha (Fraser 1936; Prasad & Varshney 1995). Babu et al. (2009) reported *I. limbata limbata* as a new record for the state mentioning the distribution as Odisha, West Bengal, parts of northeastern India, and Karnataka. State checklists of odonates mention the species with the same reference (Director 2012; Tiple & Koparde 2015). The authors considered *I. limbata sita* in the checklist of India (Subramanian & Babu 2017), but there is no mention of the species in the Western Ghats atlas (Subramanian et al. 2018). Opportunistic observations indicate the presence of the species from Assam (Anonymous 2020d) and Uttara Kannada, Karnataka (https://www.facebook.com/photo/?fbid=707419235973335&set=gm.740960425953503). These studies show that there has been a discrepancy on the identity and distribution of both the subspecies. The new record of *I. limbata limbata* from Maharashtra needs to be confirmed by re-examining the specimens and comparing with the holotypes since all the other records of the subspecies are from Odisha and northeastern parts India and the paper didn’t include any illustration or image of the specimens studied.

Present records from the lake show the presence of at least one adult (Image 20) and one sub-adult male (abdomen with yellowish markings) (Image 21). We confirm the record as *Indothemis limbata sita* based on characters of the adult male such as hyaline wing apices and 10-1/2 antenodal nervures in the forewing (apices bordered as blackish-brown and 11-1/2 - 12-1/2 antenodal nervures in *I. limbata limbata*). At species level *I. limbata* is distinguished from the congeneric species *I. carnatica* (Fabricius, 1798) by black body with black anal appendages and base of hindwing with extensive brown marking as opposite to violaceous body.
Table 3. Checklist of butterflies.

| Scientific name | Common name | IUCN status | WPA schedule |
|-----------------|-------------|-------------|--------------|
| **Family Papilionidae** | | | |
| 1 | Graphium agamemnon (Linnaeus, 1758) | Tailed Jay | NE - |
| 2 | Graphium teredon (C. & R. Felder, 1865) | Southern Bluebottle | NE - |
| 3 | Papilio demoleus Linnaeus, 1758 | Lime Butterfly | NE - |
| 4 | Papilio polymnestor Cramer, [1775] | Blue Mormon | NE - |
| 5 | Papilio polytes Linnaeus, 1758 | Common Mormon | NE - |
| **Family Hesperidae** | | | |
| 6 | Aeromachus pygmaeus (Fabricius, 1775) | Pygmy Scrub Hopper | NE - |
| 7 | Ampitta dioscorides (Fabricius, 1793) | Bush Hopper | NE - |
| 8 | Iambrix salacia (Moore, [1866]) | Chestnut Bob | NE - |
| 9 | Orios golosae (Moore, [1881]) | Ceylon Dartlet | NE - |
| 10 | Parnara guttatus (Bremer & Grey, [1852]) | Straight Swift | NE - |
| 11 | Pelopsides sp. Walker, 1870 | - | NE - |
| 12 | Spialia galba (Fabricius, 1793) | Indian Skipper | NE - |
| 13 | Tagiades litigiosa Moeschler, 1878 | Water Snow Flat | NE - |
| 14 | Taractrocera ceramas (Hewitson, 1868) | Tamil Grass Dart | NE - |
| 15 | Udaspes fulis (Cramer, [1775]) | Grass Demon | NE - |
| **Family Pieridae** | | | |
| 16 | Catopsilia pomona (Fabricius, 1775) | Common Emigrant | NE - |
| 17 | Delias eucharis (Drury, 1773) | Common Jezebel | NE - |
| 18 | Eurema hecabe (Linnaeus, 1758) | Common Grass Yellow | NE - |
| 19 | Leptosia nina (Fabricius, 1793) | Psyche | NE - |
| 20 | Pareronia ceylanica (C. & R. Felder, 1865) | Dark Wanderer | NE - |
| 21 | Pareronia valeria (Cramer, [1776]) | Common Wanderer | NE - |
| **Family Riodinidae** | | | |
| 22 | Abisara bifasciata Moore, 1877 | Two-spot Plum Judy | NE - |
| **Family Lycaenidae** | | | |
| 23 | Acytolepis puspa (Horsfield, [1828]) | Common Hedge Blue | NE - |
| 24 | Coleta decidia (Hewitson, 1876) | Angled Pierrot | NE - |
| 25 | Chilades pandava (Horsfield, [1829]) | Plains Cupid | NE - |
| 26 | Jamides celeno (Cramer, [1775]) | Common Cerulean | NE - |
| 27 | Luxura atymnus (Stoll, 1780) | Yamfly | NE - |
| 28 | Rathinda amor (Fabricius, 1775) | Monkey Puzzle | NE - |
| **Family Nymphalidae** | | | |
| 29 | Cirrochroa thais (Fabricius, 1878) | Tamil Yeoman | NE - |
| 30 | Cupha erymantha (Drury, [1773]) | Rustic | NE - |
| 31 | Cymita lepideae (Butler, 1868) | Grey Count | NE II |
| 32 | Danaus chrysippus (Linnaeus, 1758) | Plain Tiger | LC - |
| 33 | Danaus genutia (Cramer, [1779]) | Common Tiger | NE - |
| 34 | Daleschilia biaatalide (Cramer, [1777]) | Autumn Leaf | NE I |
| 35 | Elymnias hypermnestra (Linnaeus, 1763) | Common Palmfly | NE - |
| 36 | Euploea core (Cramer, [1780]) | Common Crow | LC - |
| 37 | Euthalia aconera (Cramer, [1777]) | Common Baron | NE - |
| 38 | Hypolimnas bolina (Linnaeus, 1758) | Great Eggfly | NE - |
| 39 | Hypolimnas misippus (Linnaeus, 1764) | Danaid Eggfly | NE I |
| 40 | Junonia almana (Linnaeus, 1758) | Peacock Pansy | LC - |
| 41 | Junonia atthis (Linnaeus, 1763) | Grey Pansy | NE - |
| 42 | Junonia iphita (Cramer, [1779]) | Chocolate Pansy | NE - |
| 43 | Junonia lemonias (Linnaeus, 1758) | Lemon Pansy | NE - |
Table 4 Checklist of amphibians.

| Scientific name                  | Common name                  | IUCN Status | WPA Schedule |
|----------------------------------|------------------------------|-------------|--------------|
| Family Dicroglossidae             |                              |             |              |
| 1 Euphlyctis cyanophlyctis (Schneider, 1799) | Skittering Frog               | LC          | IV           |
| 2 Euphlyctis hexadactylus (Lesson, 1834) | Indian Green Frog            | LC          | IV           |
| 3 Hoplodactylus tigrinus (Daudin, 1802) | Indian Bull Frog             | LC          | IV           |
| 4 Sphaerotheca sp. Günther, 1859 | Burrowing Frog               | -           | -            |
| Family Ranidae                    |                              |             |              |
| 5 Hydrophylax bahuwistara Padhye, Jadhav, Modak, Nameer & Dahanukar, 2015 | Fungoid Frog                 | NE          | -            |
| Family Ranixalidae                |                              |             |              |
| 6 Indirana sp.                    | -                            | -           | -            |
| Family Rhacophoridae              |                              |             |              |
| 7 Polypedates maculatus (Gray, 1830) | Common Indian Tree Frog      | LC          | -            |

NE—Not Evaluated | LC—Least Concern

Table 5. Checklist of reptiles.

| Scientific name                  | Common name                  | IUCN Status | WPA Schedule |
|----------------------------------|------------------------------|-------------|--------------|
| Order Sauria                     |                              |             |              |
| Family Agamidae                  |                              |             |              |
| 1 Calotes versicolor (Daudin, 1802) | Garden Calotes              | NE          | -            |
| 2 Monilesaurus rouxi Duméril & Bibron, 1837 | Forest Calotes            | LC          | -            |
| Family Gekkonidae                |                              |             |              |
| 3 Hemidactylus sp.               | -                            | LC          | -            |
| 4 Hemidactylus frenatus Duméril & Bibron, 1836 | Asian House Gecko       | LC          | -            |
| 5 Hemidactylus prashadi Smith, 1935 | Bombay Leaf-toed Gecko    | LC          | -            |
| Family Scincidae                 |                              |             |              |
| 6 Eustropis allapallensis (Schmidt, 1926) | Allapalli Grass Skink     | LC          | -            |
| Order Serpentes                  |                              |             |              |
| Family Colubridae                |                              |             |              |
| 7 Fowlea piscator (Schneider, 1799) | Checkered Keelback          | NE          | II           |
| 8 Oligodon taeniolatus (Jerdon, 1853) | Indian Streaked Kukri Snake | NE          | IV           |
| 9 Ptyas mucosa (Linnaeus, 1758) | Indian Rat Snake          | NE          | II           |
| Family Natricidae                |                              |             |              |
| 10 Amphiesma stolatum (Linnaeus, 1758) | Buff-striped Keelback     | NE          | IV           |

NE—Not Evaluated | LC—Least Concern
Table 6. Checklist of birds.

| Scientific Name | Common Name | IUCN Status | WPA Schedule |
|-----------------|-------------|-------------|--------------|
| **Family Accipitridae** |  |  |  |
| 1 | Haliastur indus (Boddaert, 1783) | Brahminy Kite | LC | I |
| 2 | Hieraaetus pennatus (J.F. Gmelin, 1788) | Booted Eagle | LC | I |
| 3 | Nisaetus cirrhatus (J.F. Gmelin, 1788) | Changeable Hawk Eagle | LC | I |
| 4 | Pernis ptilorhynchus (Temminck, 1821) | Oriental Honey Buzzard | LC | I |
| 5 | Spilornis cheela (Latham, 1790) | Crested Serpent Eagle | LC | I |
| **Family Aegithinidae** |  |  |  |
| 6 | Aegithina tiphia (Linnaeus, 1758) | Common Iora | LC | IV |
| **Family Alcedinidae** |  |  |  |
| 7 | Alcedo atthis (Linnaeus, 1758) | Common Kingfisher | LC | IV |
| 8 | Ceryle rudis (Linnaeus, 1758) | Pied Kingfisher | LC | IV |
| 9 | Ceyx erithaca (Linnaeus, 1758) | Oriental Dwarf-kingfisher | LC | IV |
| 10 | Halcyon smyrnensis (Linnaeus, 1758) | White-breasted Kingfisher | LC | IV |
| 11 | Pelargopsis capensis (Linnaeus, 1766) | Stork-billed Kingfisher | LC | IV |
| **Family Anatidae** |  |  |  |
| 12 | Dendrocygna javanica (Horsfield, 1821) | Lesser Whistling-duck | LC | IV |
| **Family Aeshingidae** |  |  |  |
| 13 | Anhinga melanogaster Pennant, 1769 | Oriental Darter | NT | IV |
| **Family Ardeidae** |  |  |  |
| 14 | Ardea alba Linnaeus, 1758 | Great Egret | LC | IV |
| 15 | Ardea cinerea Linnaeus, 1758 | Grey Heron | LC | IV |
| 16 | Ardea intermedia Wagler, 1829 | Intermediate Egret | LC | IV |
| 17 | Ardeola grayii (Sykes, 1832) | Indian Pond-heron | LC | IV |
| 18 | Bubulcus ibis (Linnaeus, 1758) | Cattle Egret | LC | IV |
| **Family Bucerotidae** |  |  |  |
| 19 | Anthracoceros coronatus (Boddaert, 1783) | Malabar Pied Hornbill | NT | I |
| 20 | Buceros bicornis Linnaeus, 1758 | Great Hornbill | VU | I |
| 21 | Ocyeros griseus (Latham, 1790) | Malabar Grey Hornbill | LC | - |
| **Family Campephagidae** |  |  |  |
| 22 | Pterorhynchus cinnamomeus (Linnaeus, 1766) | Small Minivet | LC | IV |
| 23 | Pterorhynchus flammeus (J.R. Forster, 1781) | Scarlet Minivet | LC | IV |
| **Family Caprimulgidae** |  |  |  |
| 24 | Caprimulgus atripennis Jerdon, 1845 | Jerdon’s Nightjar | LC | IV |
| **Family Charadriidae** |  |  |  |
| 25 | Vanellus indicus (Boddaert, 1783) | Red-wattled Lapwing | LC | IV |
| **Family Chloropseidae** |  |  |  |
| 26 | Chloropsis aurifrons (Temminck, 1829) | Golden-fronted Leafbird | LC | IV |
| **Family Cisticolidae** |  |  |  |
| 27 | Orthotomus sutorius (Pennant, 1769) | Common Tailorbird | LC | IV |
| 28 | Prinia hodgsoni Blyth, 1844 | Grey-breasted Prinia | LC | IV |
| 29 | Prinia inornata Sykes, 1832 | Plain Prinia | LC | IV |
| 30 | Prinia socialis Sykes, 1832 | Ashy Prinia | LC | IV |
| **Family Columbidae** |  |  |  |
| 31 | Chalcophaps indica (Linnaeus, 1758) | Asian Emerald Dove | LC | IV |
| No. | Scientific Name | Common Name         | Status | Category |
|-----|----------------|---------------------|--------|----------|
| 32  | Columba livia  | Rock Pigeon         | LC     | IV       |
| 33  | Spilopelia chinensis | Spotted Dove   | LC     | IV       |
| 34  | Treron affinis  | Grey-fronted Green-pigeon | LC | IV       |
| 35  | Corvus macrorhynchos | Large-billed Crow | LC     | IV       |
| 36  | Corvus splendens  | House Crow         | LC     | IV       |
| 37  | Cacomantis passerinus | Grey-bellied Cuckoo | LC | IV       |
| 38  | Centropus sinensis  | Greater Coucal     | LC     | IV       |
| 39  | Eudynamys scolopaceus | Asian Koel         | LC     | IV       |
| 40  | Dicaeum erythrorhynchos | Pale-billed Flowerpecker | LC | IV       |
| 41  | Dicrurus aeneus  | Bronzed Drongo      | LC     | IV       |
| 42  | Dicrurus leucophaeus  | Ashy Drongo        | LC     | IV       |
| 43  | Lanchura malacca  | Tricolored Munia    | LC     | IV       |
| 44  | Lanchura punctulata  | Scaly-breasted Munia | LC | IV       |
| 45  | Lanchura striata  | White-rumped Munia  | LC     | IV       |
| 46  | Cecropis daurica  | Red-rumped Swallow  | LC     | IV       |
| 47  | Hirundo smithii  | Wire-tailed Swallow | LC     | IV       |
| 48  | Ptyonoprogne concolor  | Dusky Crag Martin  | LC     | IV       |
| 49  | Metopidius indicus  | Bronze-winged Jacana | LC | IV       |
| 50  | Alcippe pocipechala  | Brown Cheeked Fulvetta | LC | IV       |
| 51  | Psilopogon haemacephalus (Statius Muller, 1776) | Coppersmith Barbet | LC | IV       |
| 52  | Psilopogon viridis (Boddaert, 1783) | White-cheeked Barbet | LC | IV       |
| 53  | Psilopogon zeylanicus (J.F. Gmelin, 1788) | Brown-headed Barbet | LC | IV       |
| 54  | Merops leschenaultii  | Chestnut-headed Bee-eater | LC | IV       |
| 55  | Merops orientalis  | Green Bee-eater     | LC     | IV       |
| 56  | Merops philippinus  | Blue-tailed Bee-eater | LC | IV       |
| 57  | Hypothymis azurea  | Black-naped Monarch | LC     | IV       |
| 58  | Motacilla cinerea  | Grey Wagtail        | LC     | IV       |
| 59  | Motacilla maderaspatensis  | White-browed Wagtail | LC | IV       |
| 60  | Copsychus saularis (Linnaeus, 1758) | Oriental Magpie-robin | LC | IV       |
| 61  | Cyornis tickelliae  | Tickell’s Blue-flycatcher | LC | IV       |
| 62  | Eumyias thalassinus (Swainson, 1838) | Verditer Flycatcher | LC | IV       |
| 63  | Kittacincla malabarica (Scopoli, 1786) | White-rumped Shama | LC | IV       |
| 64  | Saxicola torquatus (Linnaeus, 1766) | Common Stonechat | LC | IV       |
| Family | Scientific Name | Common Name | Status | Category |
|--------|-----------------|-------------|--------|----------|
| Nectariniidae | Aethopyga vigorsii (Sykes, 1832) | Vigor’s Sunbird | LC | IV |
| Nectariniidae | Cinnyris lotenius (Linnaeus, 1766) | Loten’s Sunbird | LC | IV |
| Nectariniidae | Leptocoma minima (Sykes, 1832) | Crimson-backed Sunbird | LC | IV |
| Nectariniidae | Leptocoma zeylonica (Linnaeus, 1766) | Purple-rumped Sunbird | LC | IV |
| Oriolidae | Oriolus xanthornus (Linnaeus, 1758) | Black-hooded Oriole | LC | IV |
| Paridae | Machlolophus xanthogenys (Vigors, 1831) | Black-lored Tit | LC | IV |
| Paridae | Gymnornis xanthocollis (E. Burton, 1838) | Chestnut-shouldered Bush-sparrow | LC | IV |
| Pycnonotidae | Puff-throated Babbler | LC | IV |
| Paridae | Microcarbo niger (Vieillot, 1817) | Little Cormorant | LC | IV |
| Phasianidae | Pavo cristatus (Linnaeus, 1758) | Indian Peafowl | LC | IV |
| Phylloscopidae | Phylloscopus trochiloides (Sundevall, 1837) | Greenish Warbler | LC | IV |
| Picidae | Dinopium benghalense (Linnaeus, 1758) | Lesser Golden-backed Woodpecker | LC | IV |
| Picidae | Micropterus brachyurus (Vieillot, 1818) | Rufous Woodpecker | LC | IV |
| Ploceidae | Ploceus philippinus (Linnaeus, 1766) | Baya Weaver | LC | IV |
| Pycnonotidae | Brachypodius picocephalus (Jerdon, 1839) | Grey-headed Bulbul | NT | IV |
| Pycnonotidae | Pycnonotus cafer (Linnaeus, 1766) | Red-vented Bulbul | LC | IV |
| Pycnonotidae | Pycnonotus jocosus (Linnaeus, 1758) | Red-whiskered Bulbul | LC | IV |
| Scolopacidae | Actitis hypoleucos (Linnaeus, 1758) | Common Sandpiper | LC | IV |
| Strigidae | Otus sp. | Scops Owl | LC | IV |
| Strigidae | Strix leptogrammica (Temminck, 1832) | Brown Wood-owl | LC | IV |
| Strigidae | Acridotheres fuscus (Wagler, 1827) | Jungle Myna | LC | IV |
| Timaliidae | Dumetia hyperrhyncha (Franklin, 1831) | Tawny-bellied Babbler | LC | IV |
| Timaliidae | Pomatorhinus horsfeldi (Sykes, 1832) | Indian Scimitar-babbler | LC | IV |

LC—Least Concern | NT—Near Threatened | VU—Vulnerable
Table 7. Checklist of mammals.

| Scientific name                                      | Common name                  | IUCN Status | WPA Schedule |
|------------------------------------------------------|------------------------------|-------------|--------------|
| Order Carnivora: Family Herpestidae                  |                              |             |              |
| 1 Herpestes edwardsii (É. Geoffroy Saint-Hilaire, 1818) | Indian Grey Mongoose         | LC          | II           |
| Order Primates: Family Cercopithecidae                |                              |             |              |
| 2 Macaca radiata (E. Geoffroy, 1812)                  | Bonnet Macaque               | LC          | II           |
| 3 Semnopithecus hypoleucos Blyth, 1841                | Black-footed Gray Langur     | VU          | -            |
| Order Rodentia: Family Sciuridae                      |                              |             |              |
| 4 Funambulus palmarum (Linnaeus, 1766)                | Three-striped Palm Squirrel  | LC          | -            |

Abbreviations: LC—Least Concern | VU—Vulnerable

with white anal appendages and small amber yellow colour at hindwing base in the latter. *I. carnatica* was not recorded during the present study but is reported from peninsular India (Dow 2019). DS has observed it in Sindhudurg District (Anonymous 2020e). Image 20 has been used for comparison in the novel description of *Bradinopyga konkanensis* from western coastal parts of the state (Joshi & Sawant 2020). We highlight this as the first confirmed record of the subspecies from the western Maharashtra.

**DISCUSSION**

Inventorying and monitoring biodiversity at a regional scale is essential as it provides vital information on the occurrence and distribution of local diversity, and their associations with local habitat. A study by Kunte et al. (1999) recommended biodiversity surveys at a local level encompassing taxa from diverse groups and not just flagship vertebrate species like birds and mammals. It further states that building a network of long-term biodiversity monitoring projects with an understanding of landscape elements (e.g., vegetation types, microhabitats requirements of particular taxa) in ecologically sensitive areas such as the Western Ghats is important.

The current study dwells on two important aspects discussed as following -

**a) Role of citizen science in biodiversity documentation**

The very key aspect of citizen science is public engagement in data collection through which they can connect with nature and make a positive contribution towards the environment. It acts as a bridge between researchers and the local community, including the stakeholders. The participants actively participated in the current survey and documented different taxa of the study area with increased interest towards local biodiversity. Their effort resulted in the multi-taxa checklist of Dhamapur Lake and surroundings and also added two subspecies to the state Odonata checklist. They also uploaded their observations on the online database of iNaturalist that served the purpose of data sharing on a broader platform.

**b) Conservation implications of Dhamapur Lake and surroundings**

Among the odonates, presence of the species *Platylestes cf. platystylus* and *Gynacantha cf. khasiaca*, possible new records to the state (Tiple & Koparde 2015; Koparde et al. 2020), highlights the potential of the lakes for more systematic Odonata surveys in the future. Habitats around Dhamapur Lake support a rich and diverse fauna. The scheduled butterflies like *D. bisaltide*, *P. sylvia*, and *C. lepidea* and the key-stone bird species such as *A. coronatus* and *B. bicornis* are indicator species inhabiting dense moist forests. We observed a colour aberrant individual of *Psilopogon viridis* (Boddaert, 1783) during the survey (Image 46). We based the species identification, in the absence of prominent cheek and head coloration, on size and iris skin colour (black as in *P. viridis*). We speculate that the bird was either a leucistic or ino individual given features such as normal eye pigmentation, iris skin and beak colour (Grouw 2006; Koparde et al. 2014). Habitats around Dhamapur Lake are also known to harbour a large variety of animals including *Lutrogale perspicillata* (L. Geoffroy Saint-Hilaire, 1826) - Smooth Coated Otter, a Vulnerable species according to IUCN. The biodiversity action plan prepared for Sindhudurg and Malvan districts mentions the lake as a large wetland and as a unique feature of Malvan Tehsil, further mentioning that the lake has the potential to be developed as a Ramsar site, however,
biodiversity has to be studied (TERI 2013).

Biodiversity studies have been focused at certain locations in Sindhudurg District. Places like Amboli, a hill station in Sawantwadi Tehsil, attracts many nature enthusiasts and tourists every year. Explorations by the researchers have resulted in a number of scientific publications (Bhakare & Ogale 2018; Satose et al. 2018; Rao et al. 2019) and new species (Vogel & Rooijen 2011; Sayyed et al. 2018; Chaitanya et al. 2019) from this area. There are hardly any long-term monitoring studies in this area facing high tourism pressure.

Current work done over a period of just four days revealed some interesting faunal records, especially for odonates, birds, and mammals that tried to fill the knowledge gap on the biodiversity information of the district. The findings, though primary, form the base for future monitoring and conservation of the Dhamapur Lake area. We recommend systematic biodiversity surveys in this underexplored but potentially biodiversity rich area for conservation of local freshwater ecosystems such as the streams originating from the lake, and important rivers such as Karli River. Data collected on the local biodiversity can be used to target local students for awareness programmes and to promote sustainable tourism activities without disturbing the integrity of the lake and nearby forest, in order to avail the resources in the long run.

REFERENCES

Aengals, R., V.M.S. Kumar, M.J. Palot & S.R. Ganesh (2018). A Checklist of Reptiles of India. 35pp. Version 3.0. Online publication is available at www.zsi.gov.in/ (Last update: May 2018). https://www.zsi.gov.in/WriteReadData/userfiles/file/Checklist/Reptile%20Checklist%20(May%202018).pdf

Andrew, R., P. Koparde & K.A. Subramanian (2015). The 8th Indian Symposium of Odonatology and Tropical Biodiversity. Agrion 19(2): 32–35. https://worlddragonfly.org/wp-content/uploads/docs/agrion/Agrion_19-2_July2015_hq.pdf

Anonymous (2020a). Lestes praemorsus Hagen in Selys, 1862 – Scalloped Spreadwing. In Joshi, S., P. Dawn, P. Roy & K. Kunte (eds.). Odonata of India, v. 1.48. Indian Foundation for Butterflies. URL: http://www.indianodonata.org/sp/190/Lestes-praemorsus. accessed 30 May 2020.

Anonymous (2020b). Platyplestes platystylus Rambour, 1842. In Joshi, S., P. Dawn, P. Roy & K. Kunte (eds.). Odonata of India, v. 1.48. Indian Foundation for Butterflies. URL: http://www.indianodonata.org/sp/217/Platyplestes-platystylus. accessed 29 May 2020.

Anonymous (2020c). Pseudagrion malabaricum Fraser, 1924 – Malabar Sprite. In Joshi, S., P. Dawn, P. Roy & K. Kunte (eds.). Odonata of India, v. 1.48. Indian Foundation for Butterflies. URL: http://www.indianodonata.org/sp/394/Pseudagrion-malabaricum. accessed 31 May 2020.

Anonymous (2020d). Indothemis limbata Selys, 1891 – Restless Demon. In Joshi, S., P. Dawn, P. Roy & K. Kunte (eds.). Odonata of India, v. 1.48. Indian Foundation for Butterflies. URL: http://www.indianodonata.org/sp/592/Indothemis-limbata. accessed 29 May 2020.

Anonymous (2020e). Indothemis carnatica Fabricius, 1798 – Light-tipped Demon. In Joshi, S., P. Dawn, P. Roy & K. Kunte (eds.). Odonata of India, v. 1.48. Indian Foundation for Butterflies. URL: http://www.indianodonata.org/sp/591/Indothemis-carnatica. accessed 29 May 2020.

Babu, R., C. Sinha & M. Prasad. (2009). New records of Odonata (Anisoptera) from Maharashtra. Records of the Zoological Survey of India 108: 113–117. http://faunaofindia.nic.in/PDFVolumes/records/108/04/0113-0117.pdf

Badrinath, R. (2015). Bridging Gaps between Scientists and Citizens: Uncovering the World of Frogs and Toads in Honey Valley, Coorg, Karnataka, India. FrogLog 23(4): 41–43. https://www.amphibians.org/wp-content/uploads/2018/12/FrogLog116_high.pdf

Bhakare, M. & H. Ogale (2018). A Guide to Butterflies of Western Ghats (India). Includes Butterflies of Kerala, Tamil Nadu, Karnataka, Goa, Maharashtra and Gujarat State. Authors and publishers, Satara & Sindhudurg, x+496pp.

Campion, H. (1923). A new form of Indothemis limbata from Ceylon (Odonata). Annals Magazine Natural History Series 9(11): 28–31.

Chaitanya, R., I. Agarwal, A. Lajmi & A. Khadkekar (2019). A novel member of the Hemidactyulus brookii complex (Squamata: Gekkonidae) from the Western Ghats of Maharashtra, India. Zootaxa 4646(2): 236–250. https://doi.org/10.11646/zootaxa.4646.2.2

Chandler, M., L. See, K. Copas, A.M.Z. Bonde, B.C. López, F. Danielsen, J.K. Legind, S. Masinde, A.J. Miller-Rushing, G. Newman, A. Rosemartin & E. Turak (2017). Contribution of citizen science towards international biodiversity monitoring. Biological Conservation 213: 280–294. https://doi.org/10.1016/j.biocon.2016.09.004

Daniel, J.C. (2002). The Book of Indian Reptiles and Amphibians. Bombay Natural History Society, Bombay, 141pp.

Dow, P. & A.B. Roy (2017). DrangonflyIndia Meet, 2016. Agrion 21(1): 28–32. https://worlddragonfly.org/wp-content/uploads/docs/agrion/Agrion_21-1_Jan2017_hq.pdf

Dias, S., J. Fargione, F.S. Chapin III & D. Tilman (2006). Biodiversity loss threatens human well-being. PLoS Biology 4(8): e277. https://doi.org/10.1371/journal.pbio.0040277

Dinesh, K.P., C. Radhakrishnan, B.H.C.K. Murthy, P. Deepak & N.U. Kulkarni (2019). A checklist of amphibians of India with IUCN conservation status. 17pp. Version 2.0. Online publication is available at www.zsi.gov.in (Updated till January 2019). https://www.zsi.gov.in/WriteReadData/userfiles/file/Checklist/Amphibia_Checklist2019.pdf

Dow, R.A. (2019). Indothemis carnatica. The IUCN Red List of Threatened Species 2019: e.T163674A123027708. Downloaded on 03 September 2020. https://doi.org/10.2305/IUCN.UK.2019-2.RLTS.T163674A123027708.en

Dow, R.A. & G. Sharma (2020). Lestes praemorsus. The IUCN Red List of Threatened Species 2020: e.T167485A138285039. Downloaded on 05 June 2020. https://doi.org/10.2305/IUCN.UK.2020-1.RLTS.T167485A138285039.en

Dudgeon, D., A.H. Arthington, M.O. Gessner, Z.I. Kawabata, D.J. Knowler, C. Lévêque, R.I. Naiman, A.H. Prieur-Richard, D. Soto, M.L. Stiassny & C.A. Sullivan (2006). Freshwater biodiversity: importance, threats, status and conservation challenges. Biological Reviews 81(2): 163–182. https://doi.org/10.1017/S1464793100006950

Director (2012). Fauna of Maharashtra, State Fauna Series 20(Part-2): 1–673. Zoological Survey of India, Kolkata. http://faunaofindia.nic.in/PDFVolumes/vols/sfs/067/index.pdf

Forrester, T.D., M. Baker, R. Costello, R., Kays, A.W. Parsons & W.J. McShea (2017). Creating advocates for mammal conservation through citizen science. Biological Conservation 208: 98–105. https://doi.org/10.1016/j.biocon.2016.06.025

Fraser, F.C. (1933). The fauna of British India including Ceylon and Burma. Odonata. Vol. I. Taylor and Francis, London, 436pp.

Fraser, F.C. (1934). The fauna of British India including Ceylon and Burma. Odonata. Vol. II. Taylor and Francis, London, 442pp.

Fraser, F.C. (1936). The fauna of British India including Ceylon and...
Rapid multi-taxa assessment around Dhamapur Lake

Mujumdar et al.

SoIB (2020). State of India’s Birds, 2020: Range, trends and conservation status. The SoIB Partnership, 50pp. https://www.stateofindiasbirds.in/wp-content/uploads/2020/02/SoIB_Web-version_Final.pdf

Sorte, F.A.L. & M. Somveille (2020). Survey completeness of a global citizen-science database of bird occurrence. Ecography 43: 34–43. https://doi.org/10.1111/ecog.04632

Subramanian, K.A. (2009). Dragonflies of India: A field guide. Vigyan Prasar, Department of Science and Technology, Govt. of India, 168pp. http://www.vigyanprasar.gov.in/digilib/

Subramanian, K.A. & R. Babu (2017). Checklist of Odonata (Insecta) of India. Version 3.0. 54pp. Online publication is available at www.zsi.gov.in (Updated till September 2017). https://www.zsi.gov.in/WriteReadData/userfiles/file/Checklist/Odonata%20V3.pdf

Subramanian, K.A., K.G. Emiliyamma, R. Babu, C. Radhakrishnan & S.S. Talmale (2018). Atlas of Odonata (Insecta) of the Western Ghats. Published by the Director, ZSI, Kolkata, 417pp.

TERI (2013). Participatory Rural Appraisal Study in Devgad and Malvan Blocks, Sindhudurg District. The Energy and Resources Institute, New Delhi, 126pp. https://www.researchgate.net/publication/270276288_Biodiversity_Action_Plan_for_Sindhudurg_Maharashtra_India

Theobald, E.J., A.K. Ettinger, H.K. Burgess, L.B. DeBey, N.R. Schmidt, H.E. Froehlich, C. Wagner, J. TERI (2013). Participatory Rural Appraisal Study in Devgad and Malvan Blocks, Sindhudurg District. The Energy and Resources Institute, New Delhi, 126pp. https://www.researchgate.net/publication/270276288_Biodiversity_Action_Plan_for_Sindhudurg_Maharashtra_India

Tiple, A.D., & P. Koparde (2015). Odonata of Maharashtra, India with Notes on Species Distribution. Journal of Insect Science 15(1): 1 - 10. https://doi.org/10.1093/jisesa/iev028

Uetz, P., P. Freed & J. Hošek (eds.) (2019). The Reptile Database. accessed 15 March 2020. http://reptile-database.org/

Varshney, R.K. & P. Smetacek (eds.) (2015). A Synoptic Catalogue of the Butterflies of India. Butterfly Research Centre, Bhimtal and Indinov Publishing, New Delhi, ix+261pp., 8pl.

Vogel, G. & J. van Rooijen (2011). A new species of Dendrelaphis (Serpentes: Colubridae) from the Western Ghats—India. Taprobanaica 3(2): 77–85. https://doi.org/10.4038/taprov.v3i2.3963

Whitaker, R. & A. Captain (2004). Snakes of India – The Field Guide. Draco Books, Chengelpet, Tamil Nadu, India, 500pp.

Zapponi, L., A. Cini, M. Bardiani, S. Hardersen, M. Maura, E. Maurizi, L.R. De Zan, P. Audisio, M.A. Bologna, G.M. Carpaneto, P.F. Roversi, G.S. Peverieri, F. Mason & A. Campanaro (2017). Citizen science data as an efficient tool for mapping protected saproxylic beetles. Biological Conservation 208: 139–145. https://doi.org/10.1016/j.biocon.2016.04.035

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Author contribution: NM collected data in the field on butterflies, odonates and herps, contributed images, prepared checklists and wrote the manuscript. DS collected data on butterflies and odonates in the field, helped in their identification and manuscript editing, and contributed images. AS collected data in the field on butterflies, odonates, herps and birds, contributed images, helped in manuscript editing. PR collected data in the field on butterflies, odonates and birds, prepared checklists, helped in manuscript editing. PK conceptualized the idea and organized the field data collection drive, collected data in the field on odonates and birds, and reviewed manuscript draft.
Image 10. *Lestes praemorsus decipiens* (male)

Image 11. *Lestes praemorsus decipiens* (female)

Image 12. Lateral view of male *Lestes praemorsus decipiens*

Image 13. *Platylestes cf. platystylus* (Female)

Image 14. *Pseudagrion malabaricum* (Male)

Image 15. Anal appendages of male *Pseudagrion malabaricum* (Lateral view)
Image 16. Protosticta gravelyi

Image 17. Ceriagrion chromothorax

Image 18. Gynacantha cf. khasiaca (male)

Image 19. Lateral view of male Gynacantha cf. khasiaca

Image 20. Adult male of Indothemis limbata sita

Image 21. Subadult male of Indothemis limbata sita
Rapid multi-taxa assessment around Dhamapur Lake

Mujumdar et al.

Image 22. Zyxomma petiolatum

Image 23. Tetrathemis platyptera

Image 24. Paragomphus lineatus

Image 25. Aeromachus pygmaeus

Image 26. Taractrocera ceramans

Image 27. Udaspes folus

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Image 28. Orsotriaena medus

Image 29. Parantica aglea

Image 30. Larva of Cynitia lepidea

Image 31. Abisara bifasciata

Image 32. Loxura atymnus

Image 33. Euphyctis cyanophlyctis
Rapid multi-taxon assessment around Dhamapur Lake

Mujumdar et al.

Image 34. *Euphlyctis hexadactylus*

Image 35. *Hydrophylax bahuvistara*

Image 36. *Polypedates maculatus*

Image 37. *Calotes versicolor*

Image 38. *Monilesaurus rouxii*

Image 39. *Hemidactylus prashadi*
Rapid multi-taxa assessment around Dhamapur Lake

Mujumdar et al.

Image 45. *Alcippe poioicephala*

Image 46. *Psilopogon viridis*

Image 47. *Aethopyga vigorsii*

Image 48. *Herpestes edwardsii*

Image 49. *Semnopithecus hypoleucos*
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Review

A history of primatology in India (In memory of Professor Sheo Dan Singh)
– Mewa Singh, Mridula Singh, Honnavalli N. Kumara, Dilip Chetry & Santanu Mahato, Pp. 16715–16735

Communications

University campuses can contribute to wildlife conservation in urbanizing regions: a case study from Nigeria
– Ilyasu Simon, Jennifer Che & Lynne R. Baker, Pp. 16736–16741

Killer Whale Orcinus Orca (Linnaeus, 1758) (Mammalia: Cetartiodactyla: Delphinidae) predation on Sperm Whales Physeter macrocephalus Linnaeus, 1758 (Mammalia: Cetartiodactyla: Physeteridae) in the Gulf of Mannar, Sri Lanka
– Ranil P. Nanayakkara, Andrew Sutton, Philip Hoare & Thomas A. Jefferson, Pp. 16742–16751

The Critically Endangered White-rumped Vulture Gyps bengalensis in Sigur Plateau, Western Ghats, India: Population, breeding ecology, and threats
– Arockianathan Samson & Balasundaram Ramakrishan, Pp. 16752–16763

Avifauna of Saurashtra University Campus, Rajkot, Gujarat, India
– Varsha Trivedi & Sanjay Vaghela, Pp. 16764–16774

Five new species of trap-door spiders (Araneae: Mygalomorphae: Idiopidae) from India
– Manju Siliwal, Rajshekhar Hippargi, Archana Yadav & Dolly Kumar, Pp. 16775–16794

Rapid multi-taxa assessment around Dhamapur Lake (Sindhudurg, Maharashtra, India) using citizen science reveals significant odonate records
– Neha Mjumdar, Dattatrasad Sawant, Amila Sumanapala, Parag Rangnekar & Pankaj Koparde, Pp. 16795–16818

Leaf nutrients of two L. species contrast among in situ and ex situ Cycas
– Shailendra Raut, Nishikant Gupta, Mark Everard & Indu Shekhar Singh, Pp. 16819–16830

A checklist of butterfly fauna of Bankura Town, West Bengal, India
– Ananya Nayak, Pp. 16868–16878

A diversity of spiders (Arachnida: Araneae) from a cashew ecosystem in Kerala, India
– Mamparambath Subramanian Smitha & Ambalaparambil V. Sudhikumar, Pp. 16879–16884

Clinical and pathological findings in a Dwarf Red Brocket Mazama rufina (Mammalia: Cetartiodactyla: Cervidae) attacked by dogs
– Eduardo Alfonso Diaz, Gustavo Donoso, Carolina Sáenz, Ivette Dueñas & Francisco Cabrera, Pp. 16885–16890

Indigenous uses and traditional practices of endemic and threatened Chilgoza Pine Pinus gerardiana Wall. ex D.Don by tribal communities in Kinnair District, Himachal Pradesh, northwestern Himalaya
– Swaran Lata, P.S. Negi, S.S. Samant, M.K. Seth & Varsha, Pp. 16891–16899

Notes

Range extension and first confirmed record of the Flightless Anomalure Zenkerella insignis (Matschie, 1898) (Mammalia: Rodentia: Anomaluridae) in Nigeria
– Dolapo Oluwafemi Adejumoh, Taiye Adeniyi Adeyanju & Temidayo Esther Adeyanju, Pp. 16900–16903

Power lines as a threat to a canopy predator: electrocuted Harpy Eagle in southwestern Brazilian Amazon
– Almério Câmara Gusmão, Danilo Degra, Odair Diogo da Silva, Lucas Simão de Souza, Angélica Vilas Boas da Frota, Carlos Augusto Tuyama, Maria Cristina Tuyama, Thatiane Martins da Costa, Ana Paula Dalbem, Adrian A. Barnett, Francisca Helena Aguiar-Silva & Manoel dos Santos Filho, Pp. 16904–16908

First record of the Assam Leaf Turtle Cyclemys gemeli (Fritz et al. 2008) (Reptilia: Testudinidae: Geoemydidae) from the Darjeeling-Sikkim Himalaya, India
– Aditya Pradhan, Niran Chettri & Saibal Sengupta, Pp. 16909–16911

Breeding biology of Malabar Tree Toad Pedostibes tuberculosus (Anura: Bufonidae) from Castle Rock, Karnataka, India
– Deepak Deshpande & Nikhil Gaitonde, Pp. 16912–16915

First record of Ourapteryx dierli Inoue, 1994 (Lepidoptera: Geometridae: Ennominae) from India
– Sanjay Sondhi, Prakash Pradhan, Debal Ray, Anirban Roy & Krishnendu Acharya, Pp. 16916–16919

Notes on a communal roosting of two oakblues (Lepidoptera: Lycaenidae: Ennominae) from India
– Aditya Pradhan, Niran Chettri & Saibal Sengupta, Pp. 16920–16923

First report of mango leaf gall midge Proconstrinia robusta Li, Bu & Zhang (Diptera: Cecidomyiidae) from India
– Duraikannu Vasanthakumar, Senthilkumar Palanisamy & Radheshyam Murlidhar Sharma, Pp. 16924–16926