Research

Odonata of Maharashtra, India with Notes on Species Distribution

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ABSTRACT. Odonata are freshwater insects spread world-wide. Tropical areas are high Odonata diversity areas. However, there has not been accumulation of extensive baseline data on spatial distribution of these insects from such places. Maharashtra, the third largest state of India, harbors a variety of land-use and occupies six biogeographic provinces. We carried out Odonata surveys in Maharashtra during 2006–2014. Compilation of all these studies along with other authenticated records resulted in a checklist of 134 species of Odonata belonging to 70 genera representing 11 families. The highest numbers of species were recorded from the Libellulidae (48 species) and Gomphidae (22 species) families. A previous study had reported 99 species of Odonata from the Maharashtra state considering records from early 1900's to 2012. Our observations across the state add 33 species to this list. Maharashtra forms a unique source of Odonata diversity and our observations support the importance of this region in providing valuable habitats for Odonata. Here, we discuss several of the new records, how global surveys might help fill the local gap in species distributions, how secondary data deposited through crowd-sourcing can help and what it offers to conservation.

Key Words: checklist, conservation, crowd-sourcing, diversity, distributional gaps

Insects belonging to the Odonata order have been studied from the perspective of ecological indicators, and many studies show that certain species exhibit high association with particular habitats (Smith et al. 2007, Gómez-Anaya and Novelo-Gutiérrez 2010). Presence or absence of certain groups of species can be looked as a proxy for habitat variables or to assess quality of freshwater habitats (Subramanian and Sivaramkrishnan 2005, Subramanian et al. 2008). These insectivorous insects have been looked also as bio-control agents against mosquitoes (Andrew et al. 2008).The order Odonata includes dragonflies and damselflies, separated into two suborders, namely Anisoptera (dragonfly) with 12 families and Zygoptera (damselfly) with 24 families. Anisozygoptera, a previously recognized third suborder, has been merged with Anisoptera in recent revision of the taxonomy of Odonata (Bybee et al. 2008, Dumont et al. 2010). About 6,000 species of Odonata and subspecies belonging to 652 genera have been documented world-wide (Schorr and Paulson 2014). India harbors 474 species and 50 subspecies belonging to 142 genera spread across 18 families (Subramanian 2014). The taxonomy of Indian Odonata is well worked out and descriptions are available for almost all the reported species (Fraser 1933a, 1934, 1936; Davies and Tobin 1984, 1985; Prasad and Varshney 1995; Subramanian 2014).

After Fraser's seminal work (Fraser 1933a, 1934, 1936) on Odonata of India, there was a gap of almost 50 yr in studies on Odonata across the country. After establishing the Zoological Survey of India in 1916, trained taxonomists started collecting data and publishing lists of Odonata of localities or regions. In spite of this effort, Odonata were largely neglected due to the lack of awareness and difficulty in field identification. Introduction of field-guides (such as Emiliyamma et al. 2005, Subramanian 2005, Andrew et al. 2008, Nair 2011, Kiran and Raju 2013) has recently accelerated process of data collection on Odonata. Advent of open access public forums and websites (such as Asia-Dragonfly 2014, DragonflyIndia 2014, IBP 2014) has further increased data deposition in public domain and authentication of records. As species records often vary on spatiotemporal scale, creating checklists and updating them become crucial to understand species distribution dynamics and possible threats to them. Maharashtra State lies in central-west India. It is one of the Odonata species rich states, given the variety of habitats it supports, owing to its unique geographical position. Researchers from the Zoological Survey of India and other academic institutes have often surveyed various parts of Maharashtra. Their studies have been mostly localized to a small area. Most of the endemic Odonata of Western Ghats of India are habitat sensitive, restricted to a narrow ecological space (Subramanian 2007; Subramanian et al. 2011; Koparde et al. 2014, 2015).Therefore, updating species presence data is continuously needed to devise specific conservation strategies. Only locality based information by Fraser (1924, 1933a, 1934, 1936) was available for Maharashtra until the first checklist of the state, including 46 species was published by Prasad (1996). This list was further updated by Kulkarni et al. (2012) increasing the total count of species to 99, including subspecies. Although Kulkarni et al. (2012) took into consideration a larger collection sampled across most of the state; they failed to incorporate recent field studies and authenticated data in public domain. Moreover, most of their studies were scattered throughout the state with very few studies in Western Ghats, which is a hotspot for endemic Odonata (Subramanian 2007). This article updates the current checklist of the state based on recent field studies, published literature and authentic data mined through social media; and discusses Odonata distribution and geographical gaps in Odonata surveys in Maharashtra.

Materials and Methods

Study Area

Maharashtra (15° 35′–22° 02′ N and 72° 36′–80° 54′ E) is the third largest State of India with an area of 307,690 km^2, constituting 9.36% of the India area. The State is bound by Arabian Sea on the west, Gujarat State on the northwest, Madhya Pradesh State on the north, Chhattisgarh State in the northeast, Andhra Pradesh State in the east, and Karnataka and Goa States in the south. The coastline of the State is ∼720 km long. The Western Ghats run parallel to the sea coast. The State covers six biogeographic provinces:(1) West coast, (2) Western Ghats-Malabar plains, (3) Western Ghats-mountains, (4) Deccan Peninsula-central highlands, (5) Deccan Peninsula-central plateau, and

(6) Deccan Peninsula-Deccan south (Rodgers et al. 2002). Maharashtra is divided into 35 administrative districts.

The region is flat undulating terrain, devoid of any major hill ranges. Large numbers of wetlands, such as ponds, lakes, and perennial streams, dot this landscape. The State has three well-defined seasons: monsoon (June to September), winter (October to January), and summer (February to June). The mean maximum temperature is 36.8°C, and the mean minimum temperature is 15.8°C (Hijmans et al. 2005a). Rainfall varies according to the topography of the region. Champion and Seth (1968) mention six forest types in Maharashtra: (1) tropical semi-evergreen, (2) tropical moist-deciduous, (3) tropical dry-deciduous, (4) tropical thorn, (5) subtropical broadleaf hill, and (6) littoral and swamp forests. Extensive tracts of evergreen and semi-evergreen forests, even though fragmented, are still present in the Western Ghats of Maharashtra. North-east Maharashtra supports few large moist-deciduous and dry-deciduous forest patches. A number of protected areas (PAs), reserved forests (RFs), wildlife sanctuaries (WLSs), and national parks (NPs) are spread across the state. Table 1 provides localities from which data were collected (Fig. 1).

Data Collection

Dragonflies and damselflies were collected, photographed, identified using standard taxonomic literature (Fraser 1933a, 1934, 1936; Mitra 2006) and field-guides (Subramanian 2005, Andrew et al. 2008, Nair 2011), and released during the surveys from 2006 to 2014. Secondary data were obtained from published literature (Laidlaw 1917, 1919; Fraser 1919, 1921, 1924, 1926, 1931, 1933a,b, 1934, 1936; Prasad 1996; Kulkarni et al. 2002; Kulkarni and Prasad 2002; Talmale and Kulkarni 2003, 2006; Kulkarni et al. 2004; Kulkarni and Prasad 2005; Kulkarni and Talmale 2005, 2008, 2009; Kulkarni et al. 2006a,b; Tiple et al. 2008; Babu et al. 2009; Babu and Nandy 2010; Sathe and Bhusnar 2010; Koparde et al. 2011; Aland et al. 2012; Manwar et al. 2012; Kulkarni et al. 2012; Tiple 2012a,b; Wankhede et al. 2012; Andrew 2013; Babu et al. 2013; Kulkarni and Subramanian 2013; Tijare and Patil 2012; Talmale and Tiple 2013; Tiple et al. 2013; Koparde et al. 2014, 2015; P. K., unpublished data) and authenticated records in public domain (DragonflyIndia 2014, IBP 2014). All scientific names follow Subramanian (2014). All the records up till Prasad (1996) were considered as old literature and records mentioned in literature after Prasad (1996) were considered as recent. Geographical coordinates of locations of published studies were extracted from literature (Table 1). In case of lack of data, geo-coordinates were assigned approximately near the study area. Surveyed localities were plotted on a map of Maharashtra (Fig. 1) and India land-use layer (Hijmans et al. 2005b). Land-use attributes of each locality were extracted using DIVA-GIS v7.5. Shapefiles of India, districts in India and wetland areas in India were accessed from DIVA spatial data portal (Hijmans et al. 2005b) and that of biogeographic provinces of India was obtained from India Biodiversity Portal (Rodgers et al. 2002, IBP 2014).

Results

The compilation of field studies and data from literature resulted in 134 species of Odonata, including 87 species of Anisoptera and 47 species of Zygoptera from Maharashtra. They belong to 70 genera representing 11 families (Table 2). Libellulidae was represented by the highest number of species (48), followed by Coenagrioniidae (27) and Gomphidae (22). Both Euphaeidae and Cordulidae were represented by a single species. Twenty-two species were Data Deficient, and 11 were not listed in International Union of Conservation for Nature (IUCN) red-list of threatened species. Two species *viz. Indothemis carnatica* and *Heliogomphus promelas* were listed as Near Threatened. Around 50% of Data Deficient species in the list belong to Gomphidae (11 species), followed by Macromiidae and Platycnemididae (three species each). Twenty five species of Anisoptera and 10 species of Zygoptera were added to the State checklist. The new Anisoptera species belong mainly to Gomphidae (nine species), Libelluliidae (eight species), and Aeshnidae (four species). The 10 new species of Zygoptera, belong to Coenagrionidae (four species), Platycnemididae (four species), Euphaeidae (one species), and Lestidae (one species). In addition, 16 species have been recently recorded in single studies. Thirteen of them belong to Gomphidae (9) and Macromiidae (4). During the field-studies, two species recorded were not known from the State: *Anaciaeschna jaspidea* and *Anax imperator.*

Discussion

Maharashtra supports high faunal diversity owing to its geographic position and the biogeographic zones it covers. Given the variety of macro- and micro-habitat types, it was expected that the State supports high number of Odonata species. From recent surveys and data mining, we have added 35 species to the previous list by Kulkarni et al. (2012) that included 99 species. Kulkarni et al. (2012) had counted some of the subspecies, such as *Libellago lineate lineate* and *Libellago lineata indica* or *Aciagrion hisopa hisopa* and *Aciagrion hisopa krishna* as different species in their species checklist. However, we confined our identification till species level. Recording subspecies on field is highly difficult. Hence, including subspecies in the checklist may introduce error. This difference of 35 species between previous (Kulkarni et al. 2012) and current checklist is mainly due to incomplete on-field sampling by previous researchers, which was scattered throughout the State. They undersampled various biogeographic provinces in Maharashtra. Moreover, difficulty in collection, unapproachable terrain in certain areas such as Western Ghats (mountains) or Central highlands, and limitations due to resources and expertise might have resulted in such a gap. Also Kulkarni et al. (2012) failed to incorporate records other than those published by the Zoological Survey of India. However, this work along with Prasad (1996) has been instrumental in providing the first exhaustive checklist of Odonata of Maharashtra State. Our sampling in addition to sampling done by previous researchers almost spanned the State. The sampling was not systematic and spread across seasons, because concentrated mainly in postmonsoon season when Odonata activity is at peak (Kulkarni and Subramanian 2013). The data collection was a collective effort, and sampling was highly limited due to resources and expertise. Therefore, although the current checklist significantly updates the previous ones by Prasad (1996) and Kulkarni et al. (2012), it may not be interpreted as a complete checklist of Odonata of Maharashtra.

Certain biogeographical areas such as the West coast or the Malabar plains of Western Ghats have been underrepresented in this and previous studies. The Deccan south region was not sampled at all. The Deccan peninsula-central plateau which represents the largest area of Maharashtra was fairly well-represented in all the studies, except central Maharashtra, dominated by scrub-forest and dry-deciduous forest, for which there is a serious lack of data. Similarly, the Western Ghats (mountains) have not been sampled exhaustively during the study period, despite the fact that they are also areas of high endemism (Myers et al. 2000; Subramanian 2007; Subramanian et al. 2011). This region which is rich in evergreen and semi-evergreen forest patches, even though fragmented, has been highly underrepresented in samples. Out of 74 localities from where data were compiled, only four localities represent evergreen forest areas (Table 1). The northern part of Western Ghats of Maharashtra has been also undersampled. This undersampling might be the root-cause of lack of data on species numbers and distributions (Koparde et al. 2014). It seems that most of the data on Odonata diversity from Maharashtra comes either from West Maharashtra or East and North-east Maharashtra (Fig. 1). From Central-north and North-east Maharashtra, Satpuda mountain ranges have been undersampled, even if biogeographically important areas (Hora 1949, 1953; Auden 1949; Daniels 2001; Karanth 2003). Species distribution data from these areas should be important in answering questions related to the biogeography of Indian peninsula and/or the Indian

Table 1. Details of the study localities

Locality	Longitude	Latitude	ALT (m)	AMT (°C)	PPT (mm)	LST
Biogeographic zone—Coasts						
Biogeographic province—West Coast						
Devgad, Sindhudurg	73.3748	16.3727	14	27.2	2,529	4
Biogeographic zone—Western Ghats						
Biogeographic province—Western Ghats Malabar Plains						
Parpoli stream 1, Sindhurug	73.95786	15.95033	121	27	3,520	4
Verle, Sindhudurg	73.93003	15.98918	123	27	3,628	2
Biogeographic province—Western Ghats Mountains						
Tamhini stream 1, Pune	73.4877	18.4762	723	24	3,026	2
Tamhini stream 2, Pune	73.4288	18.4442	780	23	3,371	2
Tamhini stream 3, Pune	73.4116	18.4416	408	25	3,745	2
Tamhini stream 4, Pune	73.414	18.4606	379	25	3,825	2
Paddyfield 1, Pune	73.4289	18.444	780	23	3,371	2
North Koyna WLS	73.7902	17.6813	1027	22.2	2,493	1
North Chandoli NP	73.7186	17.2401	831	23.2	2,736	2
Pophali-Sonapatra, Ratnagiri	73.655	17.4251	810	23.2	2,877	1
South Chandoli NP	73.8043	17.1217	926	22.7	2,529	4
South Koyna WLS	73.7796	17.492	781	23.5	2,384	1
Amba RF, Kolhapur	73.7735	16.9851	462	25.2	2,888	2
Hiranyekeshi river, Sindhudurg	74.02269	15.95667	825	23.4	3,491	1
Parpoli stream 2, Sindhudurg	73.97319	15.94603	195	26.6	3,452	2
Biogeographic zone—Deccan Peninsula						
Biogeographic province—Deccan Peninsula—Central Highlands						
Prakasha dam, Nandurbar	74.3524	21.5098	115	27.4	274	4
Toranmal RF, Nandurbar	74.4675	21.8155	688	24.2	833	2
Melghat tiger reserve, Amravati	77.1974	21.446	495	25.9	1,301	2
Biogeographic province—Deccan Peninsula—Central Plateau						
Amravati agrculture, Amravati	77.7833	20.9333	333	27.3	804	5
Amravati University dam, Amravati	77.8016	20.9376	370	27.1	839	4
Anand Sagar lake, Buldhana	76.6934	20.7752	283	27.4	660	4
Arunavati dam, Digras, Yavatmal	77.7544	20.098	330	27.5	945	4
Bhandara city, Bhandara	79.6646	21.1699	259	27	1,240	4
Bhigwan, Pune	74.7639	18.2995	507	26	517	3
Bor dam, Wardha	78.7049	20.9717	363	27	1,036	4
Bor WLS, Wardha	78.6787	20.9778	360	26.8	1,036	3
Borgaon Manju lake, Akola	77.1381	20.6947	306	27.4	774	4
College of military engineering, Pune	73.8363	18.5864	573	25	766	5
Eklahare, Nashik	73.8971	19.9737	552	24.9	668	4
Empress garden, Pune	73.8923	18.5121	567	25	702	5
Gadchiroli Dam, Gadchiroli	79.9936	20.1684	211	27.2	1,483	4
Ghanewadi talav, Jalna	75.8578	19.9104	524	26.4	709	4
Ghorpad dam, Nagpur	78.7615	21.2728	384	26	1,011	3
Ghorzari dam, Pavani, Bhandara	79.6296	20.5494	260	27	1,398	2
Gondakhairi lake, Nagpur	78.9385	21.158	339	26	1,055	4
Gorewada NP, Nagpur	79.0385	21.1931	335	26.8	1,071	5
Gosekhurd dam, Pawani, Bhandara	79.6059	20.8828	228	27.3	1,330	3
Hazrat lake, Nandurbar	74.2334	21.3581	220	26.8	679	4
Itiadoh dam, Brahmapuri, Chandapur	80.1717	20.8104	343	26.6	1,494	2
Kanhan river, Nagpur	79.2271	21.2264	280	27	1,104	3
Katraj hills, Pune	73.8712	18.4433	693	24	920	4
Kawadi, Pune	74.0014	18.5074	541	25.3	580	4
Khadakwasla dam, Pune	73.7584	18.4283	605	25	1,128	4
Khindsi dam, Ramtek, Nagpur	79.3702	21.3979	308	26.8	1,134	4
Koradi lake, Nagpur	79.0906	21.2565	293	27	1,045	5
Linga lake, Nagpur	79.0956	21.2576	293	27	1,045	5
Lonar lake, Buldhana	76.5083	19.9768	482	26.6	803	4
Lower Wardha dam, Amravati	78.255	20.875	281	27.5	963	2
Malkhed RF, Amravati	77.7702	20.8955	368	27.2	834	2
Marunji, Pimpri-Chinchwad, Pune	73.7144	18.625	604	24.6	1,264	3
Mehrun lake, Jalgaon	75.5655	20.981	244	27.1	788	4
Mutha River, Pune	73.837	18.5057	560	25	768	5
Nagpur city, Nagpur	79.0768	21.1494	319	26	1,090	5
Navegaon Bandh dam, Gondia	80.133	20.923	290	26.9	1,495	2
Pashan lake, Pune	73.7825	18.5317	595	24.8	997	5
Pench tiger reserve, Nagpur	79.2279	21.7017	491	25	1,057	2
Pimpalgaon lake, Ahmadnagar	74.7629	19.2103	690	25.1	559	4
Potara river-Nagri-Warora	78.8666	20.425	212	27.6	1,162	3
Purna river Andura Karanja	77.393	20.5873	342	27.3	838	4
Sarangkheda dam, Sinnar, Nandurbar	73.9582	19.8466	684	24.3	726	4
Sinhgad valley, Pune	73.7759	18.3766	735	24	1,308	2
Songirpada lake, Nadurbar	74.1879	21.3226	236	26.8	721	4
Tadoba-Andhari tiger reserve, Chandrapur	79.4009	20.1999	232	27	1,342	2
Taljai hill, Pune	73.8407	18.4746	640	24.6	885	4
Umari dam, Gadchiroli	79.9368	20.0144	197	27.3	1,448	4
Urse, Pune	73.6175	18.7132	872	23	2,200	4

(*continued*)

Table 1. Continued

Locality	Longitude	Latitude	ALT (m)	AMT (°C)	PPT (mm)	LST
Vainganga Bhandara Bridge, Bhandara	79.6669	21.1478	254	27.1	1,265	4
Veer Sawarkar Udyan, Pimpri-Chinchwad, Pune	73.791	18.6274	568	24.9	952	5
Velhe, Pune	73.7076	18.3673	697	24.1	1,596	4
Vetal hill, Pune	73.81655	18.5284	606	24.8	892	5
Wadali lake, Amravati	77.7943	20.9252	369	27.1	836	4
Wardha river, Wardha	78.1442	20.979	287	27.4	932	4
Zilpi lake, Nagpur	78.86812	21.06376	336	26.8	1,058	4

ALT—Altitude; AMT—Annual mean temperature; PPT—Annual precipitation; LST—Landscape type; 1—Evergreen broadleaved tree cover; 2—Closed Deciduous boradleaved tree cover; 3—Deciduous shrub cover closed-open; 4—Cultivated and managed areas; 5—Artificial surfaces and associated areas

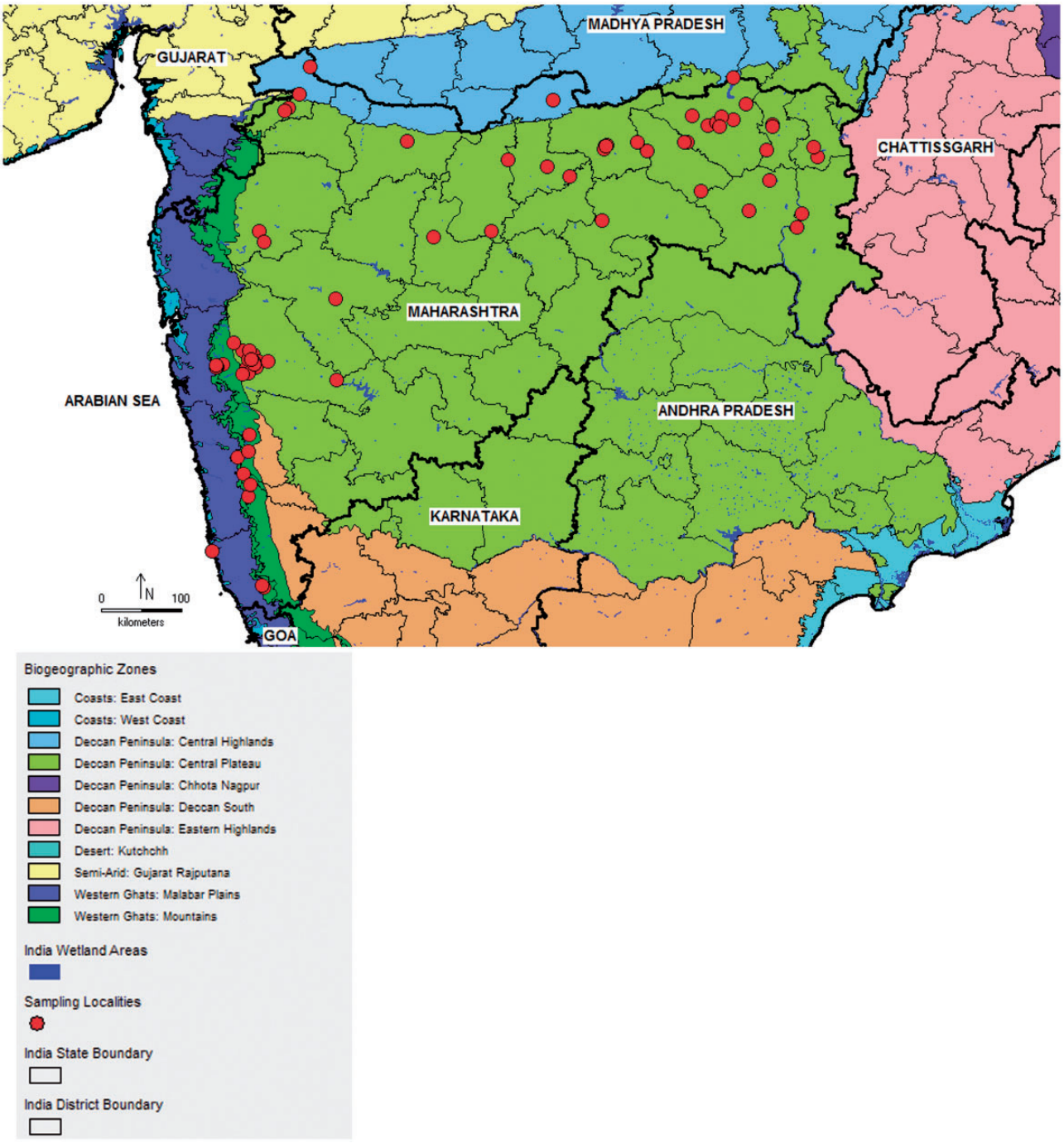

Fig. 1. Map of the surveyed localities (Hijmans et al. 2005b).

Table 2. Checklist of Odonata of Maharashtra state.

No.	Scientific name	OS	Reported by/distribution	D	W	T
Suborder: Anisoptera						
Family: Aeshnidae (10)						
1	*Anaciaeschna jaspidea* (Burmeister, 1839)	VR	Jalgaon*	1		LC
2	*Anax guttatus* (Burmeister, 1839)	VC	Throughout Maharashtra*	1	1	LC
3	*Anax immaculifrons* (Rambur, 1842)	C	Throughout Maharashtra*	1	1	LC
4	*Anax imperator* (Leach, 1815)	NK	Nashik*	1		LC
5	*Anax indicus* (Lieftinck, 1942)	R	Zessin and Günther (2009)	1		LC
6	*Anax parthenope* (Selys, 1839)	R	Fraser (1936), Tiple et al. (2008), Tiple (2012a)	1	1	LC
7	*Gynacantha bayadera* (Selys, 1891)	C	Throughout Maharashtra*	1	1	LC
8	*Gynacantha dravida* (Lieftinck, 1960)	FC	Throughout Maharashtra*	1	1	LC
9	*Gynacantha rotundata* (Navas, 1930)	VR	Navas (1930)		1	DD
10	*Hemianax ephippiger* (Burmeister, 1839)	FC	Throughout Maharashtra*	1	1	LC
Family: Gomphidae (22)						
11	*Anormogomphus heteropterus* (Selys, 1854)	R	Babu et al. (2009), Tiple et al. (2013)	1		LC
12	*Burmagomphus pyramidalis* (Laidlaw, 1922)	R	Fraser (1934), Prasad (1996)		1	NA
13	*Asiagomphus nilgiricus* (Laidlaw, 1922)	UN	Sathe and Bhusnar (2010), Aland et al. (2012)		1	DD
14	*Burmagomphus laidlawi* (Fraser, 1924)	UN	Sathe and Bhusnar (2010), Aland et al. (2012)		1	DD
15	*Davidioides martini* (Fraser, 1924)	UN	Sathe and Bhusnar (2010), Aland et al. (2012)		1	DD
16	*Cyclogomphus vesiculosus* (Selys, 1873)	R	Fraser (1934), Prasad and Varshney (1995), Prasad (1996)	1		NA
17	*Cyclogomphus ypsilon* (Selys, 1854)	R	Laidlaw (1922), Fraser (1934), Prasad (1996), Satara (DragonflyIndia 2014)	1	1	NA
18	*Cyclogomphus wilkinsi* (Fraser, 1926)	R	Fraser (1934), Prasad (1996), Nagpur*	1		DD
19	*Cyclogomphus heterostylus* (Selys, 1854)	R	Fraser (1919, 1924, 1926, 1931, 1934, 1943), Laidlaw (1922), Prasad (1996), Tiple et al. (2013)	1	1	DD
20	*Gomphidia t-nigrum* (Selys, 1854)	R	Laidlaw (1922), Fraser (1934), Prasad (1996), Babu and Nandy (2010), Nagpur*	1	1	LC
21	*Gomphidia kodaguensis* (Fraser, 1923)	VR	Koparde et al. (2015)		1	DD
22	*Heliogomphus promelas* (Selys, 1873)	R	Thane and Sindhudurg (DragonflyIndia 2014), Koparde et al. (2014)		1	NT
23	*Ictinogomphus distinctus* (Ram, 1985)	R	Tiple (2012a), Tiple et al. (2013)	1		DD
24	*Ictinogomphus angulosus* (Selys, 1854)	R	Tiple et al. (2014)	1		LC
25	*Ictinogomphus rapax* (Rambur, 1842)	VC	Throughout Maharashtra*	1	1	LC
26	*Macrogomphus annulatus* (Selys, 1854)	FC	Laidlaw (1922), Fraser (1934), Prasad (1996), Tiple et al. (2008, 2013), Babu and Nandy 2010, Tiple (2012a), Kulkarni and Subramanian (2013)	1	1	DD
27	*Macrogomphus wynaadicus* (Fraser, 1924)	UN	Sathe and Bhusnar (2010), Aland et al. (2012)		1	NA
28	*Microgomphus torquatus* (Selys, 1854)	R	Laidlaw (1922), Fraser (1934), Prasad (1996), Kulkarni and Prasad (2002), Nagpur*, Chandrapur*, Pune*; Kulkarni and Subramanian (2013), Raigad (DragonflyIndia 2014)	1	1	DD
29	*Microgomphus verticalis* (Selys, 1873)	UN	Fraser (1934), Prasad (1996)		1	DD
30	*Onychogomphus grammicus* (Rambur, 1842)	UN	Fraser (1934), Babu et al. (2009), Babu and Nandy (2010)	1		DD
31	*Onychogomphus nilgiriensis* (Fraser, 1922)	VR	Koparde et al. (2014)		1	LC
32	*Paragomphus lineatus* (Selys, 1850)	C	Throughout Maharashtra*	1	1	LC
Family: Libellulidae (48)						
33	*Acisoma panorpoides* (Rambur, 1842)	C	Throughout Maharashtra*	1	1	LC
34	*Aethriamanta brevipennis* (Rambur, 1842)	VR	Tiple et al. (2008), Manwar et al. (2012), Nagpur*	1		LC
35	*Brachydiplax sobrina* (Rambur, 1842)	FC	Prasad and Ghosh (1988), Prasad (1996), Tiple et al. (2008), Tiple (2012a), Andrew (2013)	1	1	LC
36	*Brachythemis contaminata* (Fabricius, 1793)	VC	Throughout Maharashtra*	1	1	LC
37	*Bradinopyga geminata* (Rambur, 1842)	VC	Throughout Maharashtra*	1	1	LC
38	*Cratilla lineata* (Brauer, 1878)	FC	Fraser (1936), Prasad (1996), Kulkarni and Talmale (2008), Tiple et al. (2008), Koparde et al. (2014, 2015), Raigad*, Ratnagiri* and Sindhudurg*	1	1	LC
39	*Crocothemis servilia* (Drury, 1770)	VC	Throughout Maharashtra*	1	1	LC
40	*Diplacodes lefebvrii* (Rambur, 1842)	R	Prasad (1996), Tiple et al. (2008, 2013), Tiple (2012a), Pune*	1	1	LC
41	*Diplacodes nebulosa* (Fabricius, 1793)	R	Fraser (1936), Kulkarni et al. (2006a), Tiple et al. (2008), Tiple (2012a), Andrew (2013)	1		LC
42	*Diplacodes trivialis* (Rambur, 1842)	VC	Throughout Maharashtra*	1	1	LC
43	*Indothemis limbata* (Selys, 1891)	UN	Babu et al. (2009)		1	LC
44	*Indothemis carnatica* (Fabricius, 1798)	R	Tiple et al. (2008), Tiple (2012a), Mumbai (DragonflyIndia 2014), Koparde et al. (2014, 2015), Kolhapur* and Pune*	1	1	NT
45	*Lathrecista asiatica* (Fabricius, 1798)	C	Throughout Maharashtra*	1	1	LC
46	*Neurothemis fulvia* (Drury, 1773)	C	Throughout Maharashtra*	1	1	LC
47	*Neurothemis intermedia* (Rambur, 1842)	VC	Throughout Maharashtra*	1	1	LC

(*continued*)

Table 2. Continued

No.	Scientific name	OS	Reported by/distribution	D	W	T
48	*Neurothemis tullia* (Drury, 1773)	C	Throughout Maharashtra*	1	1	LC
49	*Onychothemis testacea* (Laidlaw, 1902)	R	Fraser (1936), Koparde et al. (2015), Sindhudurg*		1	LC
50	*Orthetrum* anceps (Schneider, 1845)	UN	Prasad (1996)		1	NA
51	*Orthetrum sabina* (Drury, 1773)	VC	Throughout Maharashtra*	1	1	LC
52	*Orthetrum japonicum* (Uhlar, 1858)	VR	Babu et al. (2009)	1		LC
53	*Orthetrum chrysis* (Selys, 1891)	FC	Throughout Maharashtra*	1	1	LC
54	*Orthetrum glaucum* (Brauer, 1865)	VC	Throughout Maharashtra*	1	1	LC
55	*Orthetrum luzonicum* (Brauer, 1868)	VC	Throughout Maharashtra*	1	1	LC
56	*Orthetrum pruinosum* (Burmeister, 1839)	VC	Throughout Maharashtra*	1	1	LC
57	*Orthetrum testaceaum* (Burmeister, 1839)	UN	Babu et al. (2009)		1	NA
58	*Orthetrum taeniolatum* (Schneider, 1845)	VC	Throughout Maharashtra*	1	1	LC
59	*Orthetrum triangulare* (Selys, 1878)	R	Aland et al. (2012), Koparde et al. (2015)		1	LC
60	*Palpopleura sexmaculata* (Fabricius, 1787)	C	Throughout Maharashtra*	1	1	LC
61	*Pantala flavescens* (Fabricius, 1798)	VC	Throughout Maharashtra*	1	1	LC
62	*Potamarcha congener* (Rambur, 1842)	VC	Throughout Maharashtra*	1	1	LC
63	*Rhodothemis rufa* (Rambur, 1842)	R	Fraser (1936), Tiple et al. (2008), Tiple (2012a), Andrew (2013), Koparde et al. (2015), Nagpur*	1	1	LC
64	*Rhyothemis variegata* (Linnaeus, 1763)	VC	Throughout Maharashtra*	1	1	LC
65	*Sympetrum fonscolombei* (Selys, 1840)	UN	Kulkarni and Subramanian (2013)		1	LC
66	*Sympetrum hypomelas* (Selys, 1884)	UN	Kulkarni et al. (2012)		1	LC
67	*Hydrobasileus croceus* (Brauer, 1867)	UN	Fraser (1936), Prasad (1996), Raigad (DragonflyIndia 2014)	1		LC
68	*Tetrathemis platyptera* (Selys, 1878)	R	Fraser (1936), Prasad (1996), Tiple et al. (2008), Tiple (2012a), Ratnagiri* and Sindhudurg*	1	1	LC
69	*Tholymis tillarga* (Fabricius, 1798)	C	Throughout Maharashtra*	1	1	LC
70	*Tramea virginia* (Rambur, 1842)	FC	Kulkarni et al. (2004), Tiple et al. (2008)	1	1	LC
71	*Tramea basilaris* (Palisot de Beauvois, 1807)	C	Throughout Maharashtra*	1	1	LC
72	*Tramea limbata* (Desjardins, 1832)	C	Throughout Maharashtra*	1	1	LC
73	*Trithemis aurora* (Burmeister, 1839)	VC	Throughout Maharashtra*	1	1	LC
74	*Trithemis festiva* (Rambur, 1842)	VC	Throughout Maharashtra*	1	1	LC
75	*Trithemis kirbyi* (Selys, 1891)	FC	Throughout Maharashtra*	1	1	LC
76	*Trithemis pallidinervis* (Kirby, 1889)	VC	Throughout Maharashtra*	1	1	LC
77	*Urothemis signata* (Rambur, 1842)	FC	Throughout Maharashtra*	1	1	LC
78	*Zygonyx iris* (Kirby, 1869)	R	Sindhudurg (DragonflyIndia 2014); Koparde et al. (2014, 2015); Ratnagiri*		1	LC
79	*Zyxomma petiolatum* (Rambur, 1842)	R	Throughout Maharashtra*	1	1	LC
80	*Hylaeothemis indica* (Fraser, 1946)	VR	Koparde et al. (2014), Nagpur*	1	1	DD
Family: Macromiidae (06)						
81	*Epopthalmia frontalis* (Selys, 1871)	R	Fraser (1936), Prasad (1996), Tiple et al. (2008), Tiple et al. (2013)	1	1	NA
82	*Epophthalmia vittata* (Burmeister, 1839)	C	Throughout Maharashtra*	1	1	LC
83	*Macromia flavicincta* (Selys, 1874)	VR	Fraser (1936), Prasad (1996), Tiple et al. (2008, 2013)	1	1	DD
84	*Macromia flavovittata* (Fraser, 1935)	UN	Sathe and Bhusnar (2010), Aland et al. (2012)		1	DD
85	*Macromia cingulata* (Rambur, 1842)	C	Fraser (1936), Sathe and Bhusnar (2010), Aland et al. (2012), Satara (DragonflyIndia 2014), Nagpur*	1	1	LC
86	*Macromia indica* (Fraser, 1924)	VR	Sathe and Bhusnar (2010), Aland et al. (2012), Mumbai (DragonflyIndia 2014)		1	DD
Family: Corduliidae (01)						
87	*Hemicordulia asiatica* (Selys, 1878)	R	Fraser (1936), Prasad and Varshney (1995), Prasad (1996), Sathe and Bhusnar (2010), Nagpur*	1		LC
Suborder: Zygoptera						
Family: Chlorocyphidae (02)						
88	*Libellago lineata* (Burmeister, 1839)	C	Throughout Maharashtra*	1	1	LC
89	*Heliocypha bisignata* (Hagen in Selys, 1853)	C	Fraser (1925, 1934), Lahiri and Sinha (1991), Prasad (1996), Babu and Nandy (2010), Kulkarni and Subramanian (2013), Koparde et al. (2014), Koparde et al., unpublished data, Kolhapur*, Pune*, Ratnagiri* and Sindhudurg*	1	1	LC
Family: Coenagrionidae (27)						
90	*Aciagrion pallidum* (Selys, 1891)	FC	Fraser (1933a,b), Prasad (1996), Tiple et al. (2008), Manwar et al. (2012), Tiple et al. (2013), Koparde et al. (2014, 2015), Pune (DragonflyIndia 2014), Ratnagiri*	1	1	LC
91	*Aciagrion hisopa* (Selys, 1876)	R	Fraser (1933a,b), Prasad (1996), Tiple (2012b), Koparde et al. (2014, 2015), Sindhudurg* and Satara*	1	1	LC
92	*Aciagrion occidentale* (Laidlaw, 1919)	R	Prasad (1996), Kulkarni and Prasad (2002), Tiple (2012a), Tiple et al. (2013), Koparde et al. (2014, 2015)	1	1	LC
93	*Agriocnemis lacteola* (Selys, 1877)	R	Tiple (2012a), Tiple et al. (2013), Kulkarni et al. (2012)	1		LC
94	*Agriocnemis pieris* (Laidlaw, 1919)	FC	Fraser (1933a,b), Prasad (1996), Nagpur* and Sindhudurg*	1	1	LC

(*continued*)

Table 2. Continued

No.	Scientific name	OS	Reported by/distribution	D	W	T
95	*Agriocnemis splendidissima* (Laidlaw, 1919)	FC	Fraser (1933a,b), Prasad (1996), Koparde et al. (2014, 2015), Nagpur*, Pune*, Satara* and Ratnagiri*	1	1	NA
96	*Agriocnemis femina* (Brauer, 1868)	R	Prasad (1996), Tiple et al. (2008, 2013), Tiple (2012a), Andrew (2013)	1		LC
97	*Agriocnemis pygmaea* (Rambur, 1842)	VC	Throughout Maharashtra*	1	1	LC
98	*Cercion dyeri* (Fraser, 1920)	R	Fraser (1933a,b), Kulkarni and Subramanian (2013), Pune*		1	NA
99	*Paracercion calamorum* (Ris, 1916)	R	Fraser (1933a,b), Tiple et al. (2013), Kulkarni and Subramanian (2013)	1	1	LC
100	*Paracercion malayanum* (Selys, 1876)	R	Fraser (1933a,b), Prasad and Varshney (1995), Prasad (1996), Tiple et al. (2013)	1		NA
101	*Ceriagrion cerinorubellum* (Brauer, 1865)	R	Fraser (1933a,b), Prasad (1996), Tiple et al. (2013)	1		LC
102	*Ceriagrion coromandelianum* (Fabricius, 1798)	VC	Throughout Maharashtra*	1	1	LC
103	*Ceriagrion olivaceum* (Laidlaw, 1914)	FC	Kulkarni and Subramanian (2013), Koparde et al. (2014, 2015), Raigad*, Sindhudurg*, Pune* and Ratnagiri*	1	1	LC
104	*Ceriagrion rubiae* (Laidlaw, 1916)	FC	Fraser (1933a,b), Sindhudurg*		1	NA
105	*Enallagma parvum* (Selys, 1876)	R	Prasad (1996), Kulkarni and Prasad (2005), Tiple et al. (2008, 2013)	1		LC
106	*Ischnura aurora* (Brauer, 1865)	VC	Throughout Maharashtra*	1	1	LC
107	*Ischnura senegalensis* (Rambur, 1842)	VC	Throughout Maharashtra*	1	1	LC
108	*Mortonagrion varralli* (Fraser, 1920)	VR	Fraser (1933a,b), Tiple et al. (2008), Manwar et al. (2012); Sindhudurg*	1	1	DD
109	*Pseudagrion spencei* (Fraser, 1922)	FC	Tiple (2012a), Tiple et al. (2013)	1		LC
110	*Pseudagrion decorum* (Rambur, 1842)	VC	Throughout Maharashtra*	1	1	LC
111	*Pseudagrion indicum* (Fraser, 1924)	R	Kulkarni and Subramanian (2013), Koparde et al. (2014, 2015)		1	DD
112	*Pseudagrion hypermelas* (Selys, 1876)	R	Fraser (1933a,b), Prasad (1996), Tiple et al. (2013); Solapur (DragonflyIndia 2014); Pune* and Nagpur*	1	1	LC
113	*Pseudagrion microcephalum* (Rambur, 1842)	C	Fraser (1933a,b), Kulkarni et al. (2002), Kulkarni and Prasad (2005), Manwar et al. (2012), Tiple (2012a,b), Kulkarni and Subramanian (2013), Tiple et al. (2013), Raigad (DragonflyIndia 2014), Koparde et al. (2014, 2015), Nagpur*, Satara* and Sangli*	1	1	LC
114	*Pseudagrion malabaricum* (Fraser, 1924)	R	Tiple et al. (2013)	1		LC
115	*Pseudagrion rubriceps* (Selys, 1876b)	VC	Throughout Maharashtra*	1	1	LC
116	*Ischnura nursei* (Morton, 1907)	FC	Kulkarni et al. (2004), Tiple et al. (2008, 2013), Manwar et al. (2012), Tiple (2012a), Tijare and Patil (2012), Andrew (2013), Kulkarni and Subramanian (2013), Nagpur* and Pune*	1	1	LC
Family: Euphaeidae (01)						
117	*Euphaea fraseri* (Laidlaw, 1920)	VR	Babu et al. (2013), Koparde et al. (2014, 2015)		1	LC
Family: Lestidae (04)						
118	*Lestes elatus* Hagen in (Selys, 1862)	FC	Prasad (1996), Tiple et al. (2008), Tiple (2012a), Kulkarni and Subramanian (2013), Koparde et al. (2011), Koparde et al. (2014, 2015), Pune* and Satara*	1	1	LC
119	*Lestes umbrinus* (Selys, 1891)	VC	Talmale and Kulkarni (2003), Tiple et al. (2008), Mumbai (DragonflyIndia 2014), Tiple (2012a), Tijare and Patil (2012), Andrew (2013), Koparde et al. (2014, 2015), Nashik*, Pune* and Ratnagiri*	1	1	DD
120	*Lestes thoracicus* (Laidlaw, 1920)	R	Talmale and Tiple (2013)	1		LC
121	*Lestes viridulus* (Rambur, 1842)	VC	Prasad (1996), Tiple (2012a), Kulkarni et al. (2004), Kulkarni and Prasad (2005), Kulkarni et al. (2006a,b), Tijare and Patil (2012), Tiple et al. (2013), Thane (DragonflyIndia 2014), Pune* and Raigad*	1	1	LC
Family: Platycnemididae (10)						
122	*Copera ciliata* (Selys, 1963)	VR	Kulkarni et al. (2004), Tiple (2012a), Tiple (2012b)	1		LC
123	*Copera marginipes* (Rambur, 1842)	VC	Throughout Maharashtra*	1	1	LC
124	*Copera vittata* (Selys, 1863)	C	Prasad (1996), Kulkarni et al. (2004, 2006a,b), Tiple (2012a), Tiple et al. (2013), Koparde et al. (2014, 2015)	1	1	LC
125	*Caconeura ramburi* (Fraser, 1922)	VR	Tiple (2012a), Babu et al. (2013), Tiple et al. (2013), Koparde et al. (2014, 2015)	1	1	DD
126	*Disparoneura quadrimaculata* (Rambur, 1842)	VC	Throughout Maharashtra*	1	1	LC
127	*Prodasineura verticalis* (Selys, 1860)	FC	Fraser (1921), Tiple (2012a), Tiple et al. (2013), Koparde et al. (2014, 2015), Kolhapur*, Pune* and Ratnagiri*	1	1	LC
128	*Elattoneura nigerrima* (Laidlaw, 1917)	R	Laidlaw (1917), Fraser (1924, 1933b, 1934), Prasad (1996), Koparde et al. (2015), Nagpur*, Pune, Rathnagiri, Satara and Sangli (Koparde et al., unpublished data)	1	1	DD
129	*Elattoneura tetrica* (Laidlaw, 1917)	VR	Sindhudurg (Koparde et al., unpublished data)		1	LC
130	*Protosticta hearseyi* (Fraser, 1922)	VR	Koparde et al. (2014, 2015)		1	DD
131	*Protosticta gravelyi* (Laidlaw, 1915)	R	Fraser (1933a,b), Prasad and Varshney (1995), Prasad (1996), Mumbai (DragonflyIndia 2014)		1	LC
Family: Calopterygidae (03)						
132	*Neurobasis chinensis* (Linnaeus, 1758)	R	Fraser (1934), Prasad (1996); Sindhudurg (DragonflyIndia 2014)	1	1	LC
133	*Vestalis apicalis* (Selys, 1873)	C	Kulkarni et al. (2006b), Kulkarni and Subramanian (2013), Raigad and Sindhudurg (DragonflyIndia 2014), Koparde et al. (2014, 2015), Kolhapur*, Pune* and Satara*	1	1	LC
134	*Vestalis gracilis* (Rambur, 1842)	VC	Kulkarni et al. (2006b), Kulkarni and Subramanian (2013), Koparde et al. (2014, 2015), Kolhapur*, Raigad*, Pune*, Ratnagiri*, Satara* and Sangli*	1	1	LC

OS: Occurrence status; D: Deccan Peninsula; W: Western Maharashtra (includes Western Ghats and West Coast); T: Threat status as assigned from IUCN, 2010 (NA: Not available; LC: Least concern; DD: Data deficient; VU: Vulnerable; NT: Near threatened.). Numbers in brackets are thenumbers of species in agiven family; 1: presence; *: data from present field studies.

Table 3. Species records thatare doubtful in terms of either taxonomic identity or spatial distribution

Scientific name	Reported by	Reported from	TS
Gomphus nigricornis/Asiagomphus nilgiricus (Laidlaw, 1922)	Aland et al. (2012)	Amba RF, Kolhapur	DD
Macromia ellisoni (Fraser, 1924)	Aland et al. (2012)	Amba RF, Kolhapur	LC
Macromia ida (Fraser, 1924)	Aland et al. (2012)	Amba RF, Kolhapur	LC
Macromia irata (Fraser, 1924)	Aland et al. (2012)	Amba RF, Kolhapur	LC
Lamelligomphus malabaricus/Onychogomphus malabarensis (Fraser, 1924)	Sathe and Bhusnar (2010)	Kolhapur	NA
Lamelligomphus nilgiricus/Onychogomphus nilgiriensis (Fraser, 1922)	Sathe and Bhusnar (2010)	Kolhapur	NA
Megalogomphus superbus (Fraser, 1931)	Sathe and Bhusnar (2010)	Kolhapur	DD
Merogomphus longistigma (Fraser, 1922)	Sathe and Bhusnar (2010)	Kolhapur	DD
Onychogomphus striatus (Fraser, 1924)	Sathe and Bhusnar (2010)	Kolhapur	DD
Microgomphus longistigma	Sathe and Bhusnar (2010)	Kolhapur	NA
Chlorogomphus xanthoptera (Fraser, 1919)	Sathe and Bhusnar (2010)	Kolhapur	VU
Chlorogomphus campioni (Fraser, 1924)	Sathe and Bhusnar (2010)	Kolhapur	LC
Epithemis mariae (Laidlaw, 1915)	Sathe and Bhusnar (2010)	Kolhapur	LC
Idionyx optata (Selys, 1878)	Sathe and Bhusnar (2010)	Kolhapur	NT
Orthetrum caledonicum	Wankhede et al. (2012)	Pune	NA

TS: Threat status as assigned from IUCN (2010). NA: Not available; LC: Least concern; DD: Data deficient; VU: Vulnerable; NT: Near threatened

subcontinent. Such studies have been carried out using Odonata as model systems (Dijkstra 2007, Shah et al. 2012), underscoring the importance of spatial data from these regions.

Sathe and Bhusnar (2010) have listed many species, especially Gomphidae family members, which are not included in the previous literature by Fraser (1933, 1934, 1936), Prasad (1996) and Kulkarni et al. (2012) (Table 3). Recent studies by Tiple (2012a,b), Tiple et al. (2013), Kulkarni and Subramanian (2013), Koparde et al. (2014, 2015) from Maharashtra or even those from Western Ghats of Goa (Rangnekar et al. 2010, Subramanian et al. 2013, Rangnekar and Naik 2014), which is a neighbouring State, failed to record these species. Sathe and Bhusnar (2010) have listed *Microgomphus longistigma* (Table 3) which is most probably *Merogomphus longistigma.* Similarly, *Orthetrum caledonicum* recorded by Wankhede et al. (2012) in Pune district is not a valid species. Recent studies by Kulkarni and Subramanian (2013) and Koparde (P. K., unpublished data) in the same district did not record this species. The species list of Amba RF, that lies in Western Ghats of Maharashtra, by Aland et al. (2012) also includes four species which have not been recorded by earlier researchers or during recent studies (Table 3). This might be because these areas were not surveyed earlier. However, authors in these articles do not mention anything specific about these species, i.e., new records to Maharashtra State, unusual sightings or taxonomic uncertainties. Koparde et al. (2014, 2015) had done a short-survey in areas around Kolhapur and Amba RF, however, they did not record species mentioned by Sathe and Bhusnar (2010) and Aland et al. (2012). Koparde et al. (2014, 2015) studies were short-termed, specifically in postmonsoon season, which might be a reason that they could not detect many Gomphidae. However, this study was more extensive than other studies in the same region. We failed to retrieve these species even from public data. Although it is difficult to assess their authenticity, while compiling the state checklist we have retained the species which have been recorded by Sathe and Bhusnar (2010) and Aland et al. (2012), considering that they had been probably undersampled by other researchers.

Most of our additions belong to the family Gomphidae. This family is also represented by the highest number of Data Deficient species as well as species for which information is not available in the IUCN red-list of threatened species (Table 1). The members of this family are fast-moving insects and may have crepuscular habits. These insects are difficult to observe or collect. Many Gomphidae are already rare. Therefore, there are high chances of not detecting them during surveys. *Microgomphus verticalis* and *Cyclogomphus vesiculosus* are the only two species of Gomphidae that have not been recorded recently; whereas 10 species have been recorded only recently (Table 2). This explains the huge gap in knowledge on the distribution of Gomphidae. Although the spatial distribution may vary in time, addition of only 10 species over almost 17 yr indicates slow rate of data acquisition on Gomphidae. Lack of recent records and systematic information on population occurrences has been discussed as a major fallout in assigning conservation status to Gomphidae by many IUCN red-list assessors (Dow 2009a,b,c; Sharma 2010; Kakkasery 2011a,b; Subramanian 2011). This trend can also be observed in Platycnemididae. Ten species of Platycnemididae are known from Maharashtra, five of which have been recorded recently. The cases of the Macromiidae and Corduliidae families are similar. These insects are highly habitat sensitive, localized, and fast moving (Subramanian 2005, Koparde et al. 2015). Despite the records of *Idionyx* species from Goa (Rangnekar et al. 2010, Subramanian et al. 2013, Rangnekar and Naik 2014), there is a complete lack of data on these species from Maharashtra except one unidentified species recorded by Koparde et al. (2015). Species from Euphaeidae and Platycnemididae (Zygoptera) are habitat sensitive and localized in small areas (Koparde et al. 2015). There is considerable lack of knowledge on the distribution and ecology of these species. This lack of data can be attributed to the lack of recent records and incomplete sampling (Koparde et al. 2014). Although the current checklist provides presence data, the absence of species from the old checklists (Prasad 1996, Kulkarni et al. 2012) can not be considered as total absence, given spatiotemporal variation and bias in data collection. These species breed in—and are closely associated with—unpolluted rivers and streams (Subramanian 2011). They have been observed to be associated with dense forests (Koparde et al. 2015). Species which are known from old literature and have not been detected recently might have even gone locally extinct due to habitat degradation and loss. The probable major causes of this extinction could be loss of habitats by expanding urbanization along with large scale climatic changes. Urban development is expected to have a deleterious impact on Odonata by reducing the area of natural habitats. The quality of residual habitats may also be adversely affected by various forms of pollutants (Subramanian et al. 2011,Tiple et al. 2013).

There are few species, such as *Protosticta graveleyi*, which are known from old literature and from records in public domain. It seems that, because sampling of Odonata has been sporadic overtime; the possibility of species gone extinct could be attributed to sampling artifact. An interesting case is *Onychothemis testacea* and *Zygonyx Iris.* Both species inhabit fast-flowing streams, water-falls and probably areas surrounded by dense forest (Subramanian 2005, Nair 2011). It is difficult to collect or even photograph these species in such areas. There is a record of *O. testacea* by Prasad (1996), after which Koparde et al. (2014, 2015) have recorded it from two different localities. Similarly, *Z. iris* has been recorded from Sindhudurg (Koparde et al., unpublished data) and Chandoli NP (Koparde et al. 2015). Another interesting finding is that of *Elattoneura nigerrima.* This species was underrecorded

after Prasad (1996) study. We retrieved many other spatial records of this species across Maharashtra from public domain. It seems that this underrecorded species is widespread, but patchily distributed in Maharashtra (Koparde et al. 2015; Koparde *et al.*, unpublished data). This probably explains artifact of sampling and usefulness of crowd-sourcing in data collection.

Advent of field-guides and public forums has driven to the next level. Continuous data sharing among researchers through social networks has led to free flow of information and site and/or species-specific studies. However, such public forums often suffer from deposition of non-authenticated records and false presence data. If checklists of regions made by experts are referred along with records in public domain, they may result into usable species data. Field data collected by experts is of primary importance to understand changing species distributions and the causes of this change. Additional systematic field-studies across Maharashtra State covering all possible microhabitats, will provide insights into species richness and threats to them. Establishing the current checklist of Odonata needs an effort to gather species presence data across an extensive landscape. This checklist is highly likely to get modified as more data flow in across the State.

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