Journal of Entomology and Zoology Studies

Available online at www.entomoljournal.com

J E Z S Journal of Entomology and Zoology Studies

E-ISSN: 2320-7078
P-ISSN: 2349-6800
JEZS 2017; 5(1): 697-700

Received: 04-11-2016
Accepted: 05-12-2016

Waykar Bhalchandra
Department of Zoology,
Dr. Babasaheb Ambedkar Marathwada University,
Aurangabad-431004 (M.S.) India

Baviskar RK
Department of Zoology,
Govt. Pansemal College, Dist – Badwani (M.P.) India

Correspondence
Waykar Bhalchandra
Department of Zoology,
Dr. Babasaheb Ambedkar Marathwada University,
Aurangabad-431004 (M.S.) India

Diversity of pollinator bees from Paithan taluka of Aurangabad district (M.S.) India

Waykar Bhalchandra and Baviskar RK

Abstract
The survey on diversity of pollinator bee was conducted from different locations of Paithan taluka. Total twenty two (22) bee species belonging to eleven (11) genera were identified as pollinators. Out of these, four (4) bee species were honeybees from Genus *Apis* and eighteen (18) species were solitary bees. Eighteen (18) species of solitary bees were dominant pollinators, during mid monsoon to winter season and was followed by bumblebees, wild bees and honey bees. In summer season honeybee species *Apis florea* F., *Apis dorsata* F., *Apis mellifera* L. and *Apis cerana indica* F. were the most dominant pollinators and only few species of solitary bees were observed. Amongst the honey bee species *Apis florea* F. was the most dominant bee species, which is widely distributed and is followed by *Apis dorsata* F., an introduced species *Apis mellifera* L. and *Apis cerana indica* F.

Keywords: Diversity of bees, honeybee species, pollinators, solitary bees

1. Introduction
Pollinators have a key part in the survival of integrity of terrestrial ecosystem through their major role in plant reproduction, thereby providing services and goods to the society [1]. Pollination has two important consequences, it maintains biodiversity of flowering plants and maintains ecosystem functioning. Many empirical studies have found positive correlations between pollinator diversity and plant functioning [2, 3].

Pollination by insects and other animals is significant in most terrestrial habitats. Fruit, vegetable or seed production from 87 of the 115 leading global food crops depends upon animal pollination [4]. It involves 67% of species of flowering plants and a relatively high diversity of insect taxa [5]. On the other hand, 35% of crop production worldwide and 70% of major global crop species rely on animal pollination [6, 7]. The value of insect pollination for worldwide agricultural production is estimated at 153 billion, which represents 9.5% of the value of the world agricultural production used for human food [8]. Recently Lautenbach et al., [9] estimated values of bee pollination at €265bn in global food supply.

According to recent estimate about 1200 species of vertebrate pollinators [10] and 80,000 species of insect pollinators are present worldwide [11]. Amongst 80,000 species of insect pollinators, 17,533 species of bees are identified as pollinators worldwide, out of these 633 species in 60 genera and six families were reported from India [12].

Among the insect pollinators honeybees are the most important pollinators of angiosperms because of their vegetarian diet, flower visiting habits, floral fidelity, presence of thousands of work force, large number of hairs on body that readily pick up pollen grains and the fact that they exclusively visit many flowers of the same species during a single trip and also their availability throughout the year makes honey bees the most efficient and reliable pollinator [13, 14].

Honeybees pollinate 16% of the total of 0.25 million of flowering plant species in the world and nearly 40000 species of agricultural plants [15]. Worldwide, 90 per cent food supply is contributed by 82 commodities assigned to plant species and bees are pollinators of 63 (i.e.70%) of these plant species and are the most important known pollinators of 39 (48%) of these plant species. One-third of human diet is derived directly or indirectly from bee pollination in developed countries. Of the hundred or so animal-pollinated crops which make up most of the world's food supply, at least 80% are pollinated by honeybees and wild bees [8, 16]. Over the past two decades many investigators recorded the declining in population of bee species and the colony numbers (colony collapse disorder) due to the environmental problems like climate change, drought, fire, deforestation, fragmentation of natural and agriculture

foraging habitats, pesticides, parasitic mite, bee diseases and the spread of invasive species [17]. These difficulties cause direct threat to production of crops, thus leading to a food crisis and negative effect on human life and natural ecosystem [18, 19]. In order to formulate effective conservation strategies there is an urgent need to generate information regarding the diversity of bee species [20].

There is complete lack of information on bee pollinator diversity at Paithan taluka of Aurangabad district. Therefore, the present investigation was carried out to study the diversity of *Apis* and non- *Apis* bee pollinators.

2. Materials and Methods

2.1 Study area

Geographically, Paithan taluka of Aurangabad district is located at 19^0 29' N and 75^0 26' E. The average altitude of this area is 458 meter above sea level.

The soils on the table land are derived from highly shallow black substrate. The average annual rainfall ranges between 65–85cm and is mostly received between June to September. In monsoon temperature ranges between 28 ^{0}C-35 ^{0}C. In winter months i.e. from October to January it ranges between 8 ^{0}C-32.9 ^{0}C and in summer months i.e. from February to May ranges between 32 ^{0}C-44.6 ^{0}C.

2.2 Collection and preservation of bees

Field data was collected through regular frequent visits to the study sites, during October 2012 – September 2013. Each study visit served as pseudo replicates for the site and all observations were done between 0700-1800 hours in winter and monsoon season and 0700–1830 hours in summer season on every visit at study sites.

Whenever bee species was observed on flowers it was caught by sweep insect net. Insect visitors were collected on a sunny day between 07:00 and 18:00 throughout the entire flowering period. Bees collected by aerial netting method were killed with the help of killing bottle. The dead insect was immediately transformed into absolute alcohol. Time and date of collection were documented for each specimen. In the lab, specimens were pinned, mounted and oven–dried for 24 hours at 40 °C. All specimens were kept in special insect boxes supplied with foam plates for pinning and naphthalene balls to enable long storage without pest damage. Specimens of bees were kept in the Laboratory for identification.

2.3 Identification of specimens

Initial identification to the genus level was conducted in the laboratory of the Zoology department. Identifications were further approved and identified to species level by experts. Dr. Rajeev Gupta Prof. and Head Dept. of Zoology, Jay Narayan Vyas University, Jodhpur.

3. Results and discussion

Survey on diversity of bee pollinators was carried out at different locations of Paithan taluka of Aurangabad district, during the period October 2012–September 2013 and obtained data were summarized in table 1.

In present study total twenty two [22] bee species from eleven [11] genera were identified as pollinators, found on different crops at different locations of Paithan taluka. Out of twenty two [22] species of bees four bee species were honeybees from family Apidae and Genus *Apis* and remaining eighteen [18] species were solitary bees.

The most rich genus were *Megachile*, having five [5] species viz., *Megachile lanata* (Fabricius, 1775), *Megachile bicolor* (Fabricius, 1781), *Megachile coelioxysides* (Bingham, 1899), *Megachile relativa* (Cresson, 1878) and *Megachile* spp.

Genus *Nomia* includes four [4] species viz, *Nomia elliotii* (Smith, 1875), *Nomia westwoodi* (Gribodo, 1894), *Nomia curvipes* (Fabricius, 1793) and *Nomia mannei* (Cockerell, 1910).

Genus *Apis* includes four [4] species viz., *Apis florea* (Fabricius, 1787), *Apis cerana indica* (Fabricius, 1793), *Apis dorsata* (Fabricius, 1793) and *Apis mellifera* (Linnaeus, 1758).

Genus *Xylocopa* includes two [2] species viz, *Xylocopa violacea* (Linnaeus, 1758), *Xylocopa fenestrata* (Fabricius, 1798).

And genus *Pseudapis, Haliactus, Scolia, Andrena, Nomada, Euglossa* and *Amegilla* included one [1] species each viz, *Pseudapis oxybeloides* (Smith, 1875), *Halictus rubicundus* (Christ, 1791), *Scolia* spp, *Andrena venata* (LaBerge and Ribble, 1975), *Nomada luteoloides* (Robertson, 1895), *Euglossa dilemma* (Bembe and Eltz, 2011) and *Amegilla cingulata* (Fabricius, 1775) respectively.

In present study it was found that eighteen [18] species of solitary bees were the dominant pollinators, during mid monsoon to winter season and was followed by bumblebees, wild bees and honey bees. In summer season honeybee species *Apis florea* F., *Apis dorsata* F., *Apis cerana indica* F. and *Apis mellifera* L. were the most dominant pollinators, and only few species of solitary bees were observed on flowering plants, this might be due to colonial habit of honey bees and their ability to store their food in the hives so they can survive in the draught conditions when only few plants were blooming. Amongst the honey bee species *Apis florea* F. was the most dominant bee species, wildly distributed and are followed by *Apis dorsata* F., an introduced species *Apis mellifera* L. and *Apis cerana indica* F.

Similar studies have also been carried out by some investigators. According to Kumar and Lenin, [21] Apoidea were predominant visitors of sesame. Ashoke et al., [22] recorded 6 bee species foraging on *Jatropha curcas* in India. Jasra and Rafi, [23] reported *Apis mellifera* and *Apis cerana* as the main pollinating insect species in different parts of the country. Abrol et al., [24] studied the diversity of bees with special emphasis on non *Apis* pollinators in Jammu division of India and recorded 30 bee species. Kannagi et al., [25] studied the hymenopteran diversity in a deciduous forest from South India and reported 36 species of bees.

Table 1: Diversity of bee species from Paithan taluka of Aurangabad district, during the year 2012-2013.

Sr. No.	Scientific name	Sub-Family	Order
1	*Megachile lanata* (Fabricius, 1775)	Megachilidae	Hymenoptera
2	*Megachile bicolor* (Fabricius, 1781)	Megachilidae	Hymenoptera
3	*Megachile coelioxysides* (Bingham, 1899)	Megachilidae	Hymenoptera
4	*Megachile relativa* (Cresson, 1878)	Megachilidae	Hymenoptera
5	*Megachile* spp.	Megachilidae	Hymenoptera
6	*Nomia elliotii* (Smith, 1875)	Halictidae	Hymenoptera
7	*Nomia westwoodi* (Gribodo, 1894)	Halictidae	Hymenoptera

8	*Nomia curvipes* (Fabricius, 1793)	Halictidae	Hymenoptera
9	*Nomia mannei* (Cockerell, 1910).	Halictidae	Hymenoptera
10	*Apis florea* (Fabricius, 1787)	Apinae	Hymenoptera
11	*Apis cerana indica* (Fabricius, 1793)	Apinae	Hymenoptera
12	*Apis dorsata* (Fabricius, 1793)	Apinae	Hymenoptera
13	*Apis mellifera* (Linnaeus, 1758).	Apinae	Hymenoptera
14	*Xylocopa violacea* (Linnaeus, 1758),	Xylocopinae	Hymenoptera
15	*Xylocopa fenestrata* (Fabricius, 1798).	Xylocopinae	Hymenoptera
16	*Pseudapis oxybeloides* (Smith, 1875)	Halictidae	Hymenoptera
17	*Halictus rubicundus* (Christ, 1791),	Halictidae	Hymenoptera
18	*Scolia* spp.	Scolidae	Hymenoptera
19	*Andrena venata (LaBerge and Riblle,1975)*	Andrenidae	Hymenoptera
20	*Nomada luteoloides* (Robertson, 1895),	Nomadinae	Hymenoptera
21	*Euglossa dilemma* (Bembe & Eltz, 2011)	Apidae	Hymenoptera
22	*Amegilla cingulata* (Fabricius, 1775)	Apidae	Hymenoptera

4. Conclusion

During October 2012 to September -2013 twenty two [22] bee species were observed from different locations of Paithan taluka of Aurangabad district. These twenty two species belonging to eleven genera, out of which four bee species were honey bee species from family *Apidae* and genus *Apis*. While remaining eighteen [18] bee species were solitary There were five species belonging to Megachile, four species belonging to genus *Nomia*, four species belonging to genus *Apis*, two species belonging to genus *Xylocopa* and one each species belonging to genus *Pseudapis, Haliactus, Scolia, Andrena, Euglossa, Nomada* and *Amegilla*.

During monsoon and winter season solitary bee species were dominant, while in summer season honey bee species genus *Apis* were dominant pollinators. Among the honey bee species, *Apis florea* was more common and widely distributed. Occurrence of honey bee species in summer may be because of their colonial habit and ability to store food in the comb.

5. Acknowledgements

The authors are appreciably acknowledged the financial assistance from DBT, ministry of Science and Technology. Authors are also thankful to Prof. Rajeev Gupta, Head Dept. of Zoology, Jay Narayan Vyas University, Jodhpur for extending the help for identification of bee species.

6. References

1. Potts SG, Woodcock BA, Roberts SPM, Tscheulin T, Pilgrim ES, Brown VK et al. Enhancing pollinator biodiversity in intensive grasslands. J Appl. Ecol. 2009; 46:369-379.
2. Perfectti F, Gómez José M, Bosch J. The functional consequences of diversity in plant–pollinator interactions. Oikos. 2009; 118(9):1430-1440.
3. Partap U. The pollination role of honeybees. In Hepburn, HR; Radloff, S (eds), Honeybees of Asia. 2011, 227-255.
4. Klein AM, Vaissière BE, Cane JH, Steffan-Dewenter I, Cunningham SA, Kremen C et al. Importance of pollinators in changing landscapes for world crops. Proc. R. Soc. B Biol. Sci. http://dx.doi:10.1098/rspb.2006.3721. 2007.
5. Forup ML, Henson KSE, Craze PG, Memmott J. The restoration of ecological interactions: plant–pollinator networks on ancient and restored heathlands. Journal of Applied Ecology. 2008; 45:742-752.
6. Kremen C, Williams NM, Aizen MA, Gemmill-Herren B, LeBuhn G, Minckley R. et al. Pollination and other ecosystem services produced by mobile organisms: a conceptual framework for the effects of land-use change. Ecology Letters. 2007; 10:299-314.
7. Steffan-Dewenter I, Westphal C. The interplay of pollinator diversity, pollination services and landscape change. Journal of Applied Ecology. 2008; 45:737-741.
8. Gallai N, Salles J, Settele J, Vaissière BE. Economic valuation of the vulnerability of world agriculture confronted with pollinator decline. Ecological Economics. 2009; 68:810-821.
9. Lautenbach S, Seppelt R, Liebscher J, Dormann CF. Spatial and Temporal Trends of Global Pollination Benefit. PLoS ONE. 2012; 7:e35954.
10. Allen-Wardell G, Bernhardt P, Bitner R, Burquez A, Buchmann S, Cane J et al. The potential consequences of pollinator declines on the conservation of biodiversity and stability of food crop yields. Conservation Biology. 2008; 12(1):8-17.
11. Kumar D, Naidu B. A contribution towards the insect fauna of Vadodara, Gujarat (India). The Order Hemiptera, Halteres. 2010; 1(2):58-63.
12. Gupta IJ. Insecta: Lepidoptera: Nymphalidae. Fauna of Sikkim. State Fauna (Published by the Director, Zool. Surv. India, Kolkata). 2003; 9(4):27-91.
13. Nabhan GP, Buchmann SL. Services provided by Pollinators in Nature"s services: societal dependence on natural ecosystems edited by Daily, G. C. Island Press, 1997.
14. Waykar B, Baviskar RK, Nikam TB. Diversity of nectariferous and polleniferous bee flora at Anjaneri and Dugarwadi hills of Western Ghats of Nasik district (M.S.) India. Journal of Entomology and Zoology Studies. 2014; 2(4):244-249.
15. Crane E, Walker P. Pollination directory for World Crops. International Bee Research Association, London, 1984.
16. Waykar Bhalchandra, Baviskar RK. Diversity of bee foraging flora and floral calendar of Paithan taluka of Aurangabad district (Maharashtra), India. Journal of Applied Horticulture. 2015; 17(2):155-159.
17. Hapwood J, Black SF, Vaughan M, Lee-Madea E. Beyond the Birds and the Bees: Effects of Neonicotinoid Insecticides on Agriculturally Important Beneficial Invertebrates. Report by the Xerces Society. At: http://www.xerces.org/wpcontent/uploads/2013/09/XercesSociety_CBCneonics, 2013.
18. Torchio PF. Diversification of pollination strategies for U.S. crops. Environmental Entomology. 1990; 19 (6):1649-1656.
19. Phadke RP. Beekeeping as an industry and its role in

forestry, agriculture and horticulture, Proceedings of workshop on Role of apiculture in increasing crop yields in horticulture, 2008.
20. Baviskar RK. Potential and prospectus of beekeeping in Paithan taluka of Aurangabad district. Ph.D. thesis, Dr. Babasaheb Ambedkar Marathwada University, Aurangabad, 2015.
21. Kumar R, Lenin JK. Insect pollinators and effects of cross pollination on yield attributes of sesame (*Sesamum indicum* L.). Indian Bee J. 2000; 62(1-2):75-80.
22. Ashoke B, Kalyani D, Subodh KD. Floral biology, floral resource constraints and pollination limitation in *Jatropha curcas* L. Pak. J Biol. Sci. 2005; 8(3):456-460.
23. Jasra AW, Rafi MA. Pollination Management of Apricot as a Livelihood Source in Northern Areas. Pakistan Journal of Agricultural Engineering and Veterinary Sciences. 2008; 24(1):34-40.
24. Abrol DP, Shankar UMA, Chatterjee D, Ramamurthy VV. Exploratory studies on diversity of bees with special emphasis on non-*Apis* pollinators in some natural and agricultural plants of Jammu division, India. Current science. 2013; 103(7).
25. Kannagi Anita, Sivakumar V, Santhi V, Jemima FB. Hymenopteran diversity in a deciduous forest from South India. International Journal of Biodiversity and Conservation. 2013; 5(10):666-670.