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Impact of urbanisation on the Plant Pollinator relationship

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ABSTRACT: Climate change and urbanization have been shown to change plant phenology and the associated insect species. This study was designed to study the flowering phenological patterns and associated insect species in two habitat- forest area of nambor wild life sanctuary, Assam and Urban areas. Phenological changes associated with urbanization and global climate change has been observed worldwide for flowering time and pollinator community. This research shows a general decrease of pollinators in urban areas, although some species respond positively. The objective was to find out the pollinator diversity in urban areas and forest area. We hypothesized that availability of flowering plants, timing, length of flowering is influenced by habitat and there is a direct relationship between availability of flowering plants and associated insect species diversity.

Keywords: Urbanisation, Pollination. Flower phenology, Insect diversity

I. INTRODUCTION

Pollination is one of the most important types of interaction between plants and animals in ecosystems because it is a key process in the sexual reproduction of most angiosperms and can affect directly the plant reproduction success.Later blooming of plants over time and within urban areas compared to rural areas have been reported in Western Europe (Fitter and Fitter [2002]; Hepper [2003]; Mimet *et al*. [2009]; Roetzer *et al.* [2000]), China (Lu *et al.*[2006]), and North America (Primack *et al*. [2004]; Schwartz and Reiter [2000]; Zhao and Schwartz [2003]). Pollution (Honour et al. [2009]), have also been investigated for their effect on flowering phenology (Neil and Wu [2006]). Abundance and richness of bees have also been studied extensively across the world (Cane *et al*. [2006]; Eremeeva and Sushchev [2005]; Matteson *et al.* [2008]; McFrederick and LeBuhn [2006]; McIntyre and Hostetler [2001]; Pauw [2007]; Tommasi *et al.* [2004]) to understand the effects of global climate change and urbanization on pollinators. This study shows a general decrease of Pollinators like Butterflies, Ants, Dipterans, Wasps, Thrips etc along with bees in Urban areas due to harmful impact of urbanisation on both plant and insect community along with their habitat. The objectives of this study were to-

1. To investigate the plant community along with its flowering time in the two sites, Site 1 is Nambor Wildlife Sanctuary, Assam and Site 2 is Urban area of Golaghat district.
2. To find out the visiting arthropods associated with the flowering plants and their abundance.
3. To compare the data's of both the habitats to find out the result.

II. STUDY AREA

Study area was Golaghat distict of Assam. Study was conducted in two sites. Site 1 is Nambor wildlife sanctuary of assam which is located in Golaghat and Karbi Anglong districts of Assam sharing its boundary with Nambor Doigrung wild life Sanctuary and Garampani Wild Life Sanctuary(famous for hot water spring). Site 2 is Urban areas of Golaghat town where impact of urbanisation and pollution is there.

III. METHODS

Diversity of flowering plants and time of flowering: The plant survey was done in each month of the year to find out the data. The survey was carried out from January 2014 to January 2015in the two sites, Site 1 and Site 2 separately.

Diversity and abundance of flower visitors: The pollinating insect survey was done in each month of the year to find out the data for various analyses. The survey was carried out from January 2014 to January 2015 using the methods of Pollard et al. (1975).Insects observed in the line transects were either caught with aerial net or photographed for identification. The insects were identified in the field condition.

Relative species abundance: It is calculated by dividing the number of species from one group by the total number of species from all groups.

IV. RESULT

Plant and flower visiting insect abundance and diversity in site 1.

Total 9 species of plants belonging to 7 families and 9 species of insects belonging to 5 families were reported from the site 1 which is Natural habitat of Nambor Wildlife Sanctuary without human disturbance. Total 6 species of plants belonging to 4 families and 6 species of insects belonging to 4 families were reported from the site 2 which is urban area of golaghat town with human disturbance.

Table 1: Species of plants and associated insects present in the Site 1 along with flowering time.

Plant species with family	Associated insect species with family	Flowering time
Azadirachthaindica(Meliaceae)	*Apisindica (Apidae),Pieriscanidia (Pieridae)*	January-May
Helitropiumalbum(Boraginaceae)	*Cethosiacyane (Nymphalidae)*	May-June
Ziziphus jujube(Rhamnaceae)	*Apisindica (Apidae), Papiliodemoleus (Papilionidae)*	July-October
Aeglemarmelos(Rutaceae)	*Apisdorsata (Apidae), Atrophaneura hector(Papilionidae)*	May-July
Chenopodium album(Amaranthaceae)	*Cirrochroatyche (Nymphalidae)*	July-October
Ocimum sanctum(Lamiaceae)	*Apisdorsata(Apidae)*	September-December
Spilanthesoleracea(Asteraceae)	*Ant (Formicidae), Atrophaneura hector (Papilionidae)*	June-July
Leucasaspera(Lamiaceae)	*Atrophaneura hector (Papilionidae)*	November-February
Tagetespatula(Asteraceae)	*Cirrochroaaoris (Nymphalidae)*	July-October

Table 2: Species of plants and associated insects present in the Site 2 along with flowering time.

Plant species with family	Associated insect species with family	Flowering time
Azadirachthaindica (Meliaceae)	*Apisindica (Apidae)*	January-May
Helitropium album(Boraginaceae)	*Cethosiacyane (Nymphalidae)*	June
Spilanthesoleracea(Asteraceae)	*Ant(Formicidae)*	June-July
Leucasaspera(Lamiaceae)	*Atrophaneura hector(Papilionidae)*	December-February
Tagetespatula(Asteraceae)	*Cirrochroaaoris(Nymphalidae)*	September-December
Ageratum conyzoides(Asteraceae)	*Papiliodemoleus(Papilionidae)*	July-September

Table 3: Relative abundance of the insect species in site 1 and site 2.

Species of insect	Relative abundance in site 1	Relative abundance in site 2
Apis indica	0.22	0.16
Cethosia cyane	0.11	0.16
Pieris canidia	0.11	0
Papilio demoleus	0.11	0.16
Cirrochroa tyche	0.11	0.16
Apis dorsata	0.22	0
Ant	0.11	0.16
Atrophaneura hector	0.33	0.16
Cirrochroa aoris	0.11	0.16

V. DISCUSSION

From the above study Total 9 species of plants belonging to 7 families and 9 species of insects belonging to 5 families were reported from the site 1 which is Natural habitat of Nambor Wildlife Sanctuary without human disturbance. Total 6 species of plants belonging to 4 families and 6 species of insects belonging to 4 families were reported from the site 2 which is urban area of golaghat town with human disturbance. It was also reported that among all groups butterflies were found to be more.

Muthoka and Mananze, Schemske, (1976); Weiss (1995), who stated that butterflies were most potent pollinator of flowers like *Lantana and Ixora.*The relative abundance is also shown in the table 3.It was also seen that the flowering time has also been changed and for some species bloom time was 2-3 weeks later. Phenological changes (the timing of environment-influenced developmental events) associated with urbanization and global climate change have been observed worldwide for bird migration, amphibian reproduction, plant leafing and flowering, and arthropod appearance and development (Buyantuyev and Wu [2009]; Grimm *et al*. [2008]; Neil *et al.* [2010]; Neil and Wu [2006]; Walther *et al*. [2002]. Cane *et al.* [2006]; Eremeeva and Sushchev [2005]; Matteson *et al.* [2008]; McFrederick and LeBuhn [2006]; McIntyre and Hostetler [2001]; Pauw [2007]; Tommasi *et al.* [2004]) to understand the effects of global climate change and urbanization on pollinators.

The phenological and pollinator differences may affect population and community dynamics in urban ecosystems.The later blooming time of some flowers in disturbed urban sites may limit pollen availability to pollinators and thus their diversity.

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