Short communication

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OCCURRENCE OF LEPIDOPTERAN POLLINATORS AND PESTS ON DIFFERENT CROPS AT GAZIPUR IN BANGLADESH

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ABSTRACT

The Lepidopteran butterflies and moths are biotic components of the environment and important indicator taxa of land management practices. The abundance of butterflies and moths in Bangladesh has declined in the recent two decades due to rapid transformation of agricultural and forest lands for urbanization. By this time awareness among the researchers has developed for conservation of biodiversity, and they are showing much interest in survey and identification of Lepidopteran insect. The occurrence of Lepidoptera pollinator and pest species associated with cucumber, okra, tomato, mustard and mango crops were investigated at Gazipur in Bangladesh from July 2018 to June 2019. Results showed that a total of 22 species of Lepidoptera were found on the studied crops. Of the Lepidopteran insects, thirteen species under four families were pollinator while nine species under six families were pest. The family Papilionidae encountered the top rank among the families. The rank abundance of the pest and pollinator species fluctuated and the pest species harbored with top and equal abundance on both tomato and mango. The abundance of the pollinator species encountered the top rank on tomato.

Keywords: Abundance, butterflies, moths, cucumber, okra, tomato, mustard, mango

Gazipur is located in the middle (25°25′ N and 89°5′ E) of Bangladesh and the area entertains with a pleasantly warm and sunny winter from December to January, dry season from February to May, long rainy season from June to September due to the summer monsoon, and short autumn from October to November. Annual average temperature, relative humidity and rainfall are 25.8°C, 67% and 2036 mm respectively (Amin *et al.* 2018). Gazipur has abundant forest area dominated by Sal, *Shorea robusta* Gaertn, trees.

Gazipur has unique physiographic characteristics having diversity in agricultural crops and variations in the soil properties and hydrological conditions. The physiographic characters support a diverse set of ecosystems that have enriched the diversity of flora and fauna (Mittermeier *et al.* 1998, Jaman *et al.* 2014). Rice, jute, mustard, vegetable, jackfruit, mango, pineapple and many other agricultural crops are grown in this area. The cultivated crops, fruit and forest plants of this area created a habitat of Lepidoptera insects. Different species of Lepidopteran insect acts as pollinator of the flowering plants and increase the yield and quality of the crops, while some species are severe pests and their infestations significantly affect crop production.

The abundance of the Lepidopteran pollinator and pest species was investigated in cucumber, okra, tomato, mustard and mango agroecosystems at Bangabandhu Sheikh Mujibur Rahman Agricultural University, Gazipur, during July 2018 to June 2019. The adult Lepidopteran insects were captured using a sweep net. Sweeping was done weekly in between 09:00 to 11:00 h of the day, and each sample consisted of 30 sweeps. The captured insects were kept in specimen jars and brought to the Entomology Laboratory for identification and categorization. Insects were identified by observing their morphological characteristics, compared with museum specimens and photographs. The collected insects were categorized as pollinator and pest on the basis of their behavior and feeding. Whittaker abundance-rank curve (Whittaker 1972) was used to compare the abundances of the Lepidopteran species.

In this study a total of 203 flying Lepidopteran insects were captured from cucumber, okra. mustard, tomato

and mango plants. The insects were sorted out into 22 species under 9 families (Table 1 and Table 2). Among the collected insects,13 species were found as pollinator and the abundance of the pollinator species belonged to four families namely Pieridae, Lycaenidae, Papilionidae and Nymphalidae (Table 1). The occurrence of the Lepidopteran pest species belonged to six families namely Crambidae, Noctuidae, Gelechiidae, Saturniidae, Pyralidae and Nymphalidae (Table 2).

The rank abundance curve of the recorded species associated with the crops sharply declined and highest of abundance was found on tomato (37%) followed by mango (33%), okra (18.5%), cucumber (7.4%), while the lowest as 3.7% was found on mustard (Figure 1). The abundance curve of the Lepidopteran families showed that the family Papilionidae attained the top rank with 27.3%, the families Pieridae, Nymphalidae and Noctuidae exerted middle rank with 18.2% and the lowest rank was found on Crambidae, Pyralidae, Saturniidae and Lycanidae (Figure 2).

The shape of the rank abundance curve of the pest and predator species was different (Figure 3). The pest species showed the top and equal abundance (44.4%) on both tomato and mango followed by okra (11.1). The rank abundance of pest on cucumber and mustard was found nil. The pollinator species showed the top rank of abundance on tomato (33.3%) followed by mango (27.8%), okra (22.2%), cucumber (11.1%). The lowest abundance (5.6%) was found on mustard (Figure 3).

The Lepidopteran insects quickly respond to climatic and environmental changes (Warren *et al.* 2001). Habitat and environmental change interrupt the reproduction, growth and development of insects and impose some detrimental effects on their population. Larsen (2004) documented 236 species of butterfly in Bangladesh but the present investigation showed only 22 species of Lepidoptera associated with five crop plants at Gazipur. Conversion of agricultural land to urbanization are the main factors of driving species towards extinction (Schipper *et al.* 2008, Böhm *et al.* 2013). Rapid urbanization at Gazipur may inflicts the abundance of Lepidoptera insects.

Most of the phytophagous insects render on specific host and they showed season-specific abundance (Awmackand Leather 2002, Bernays and Chapman 2007). Monoculture dominant agriculture affects the existence and abundance

Table 1. Occurrence of the Lepidopteran pollinators associated with different crops at Gazipur in Bangladesh

Agro-ecosystem	Pollinator		
	Name	Species	Family
Cucumber	Sulphur butterfly	*Colias eurytheme*	Pieridae
	Pea blue bufferfly	*Lampides boeticus*	Lycanidae
Okra	Swallow tail butter fly	*Papilio troilus*	Papilionidae
	Giant swallow tail butter fly	*Papilio cresphontes*	Papilionidae
	Lemon butter fly	*Papilio demoleus*	Papilionidae
	Sulphur butter fly	*Phoebis sennae*	Pieridae
Mustard	Cabbage butterfly	*P. brassicae*	Pieridae
Tomato	Lemon butterfly	*Papilio demoleus*	Papilionidae
	Swallow tail butterfly	*Papilio cresphontes* *P. troilus* *P. machaon*	Papilionidae
	Four footed butterfly	*Phystis simois*	Nymphalidae
	Sulphur butterfly	*Phoebis sennae*	
Mango	Lemon butterfly	*Papilio demoleus*	Papilionidae
	Four footed butter	*Junonia coenia* *J. evarete*	Nymphalidae
	Monarch butterfly	*Danus plexippus*	Nymphalidae
	Plain tiger	*D. chrysippus*	Nymphalidae

Table 2. Occurrence of the Lepidopteran pests on different crops at Gazipur in Bangladesh

Agro-ecosystem	Pollinator		
	Name	Species	Family
Cucumber	-	-	-
Okra	Okra shoot and fruit borer	*Earias vittella*	Crambidae
Mustard	-	-	-
Tomato	Fruit borer	*Helicoverpa armigera*	Noctuidae
	Common cutworm	*Agrotis ipsilon*	Noctuidae
	Army worm	*Spodoptera litura*	Noctuidae
	Stem borer	*Phthorimaea operculella*	Gelechiidae
Mango	Mango defoliator	*Cricula trifenestrata*	Saturniidae
	Bark eating caterpillar	*Indarbella quadrinotata*	Noctuidae
	Leaf webber	*Orthagaex vinacea*	Pyralidae
	Leaf eating caterpillar	*Euthalia garuda*	Nymphalidae

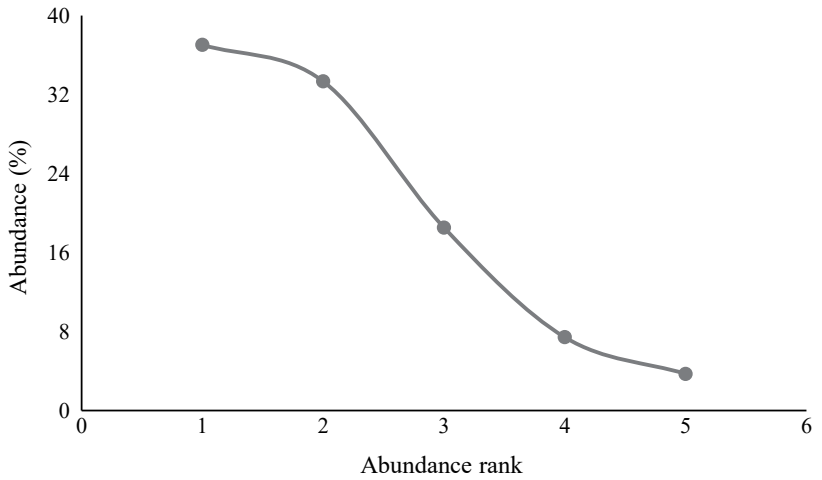


Figure 1. Rank abundance curve of the Lepidopteran species associated with different crops at Gazipur in Bangladesh

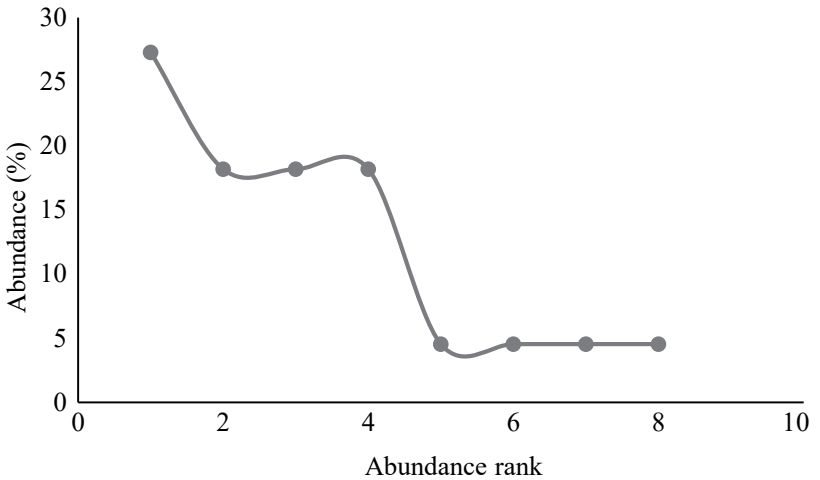


Figure 2. Rank abundance curve of the encountered Lepidopteran families associated with different crops at Gazipur in Bangladesh

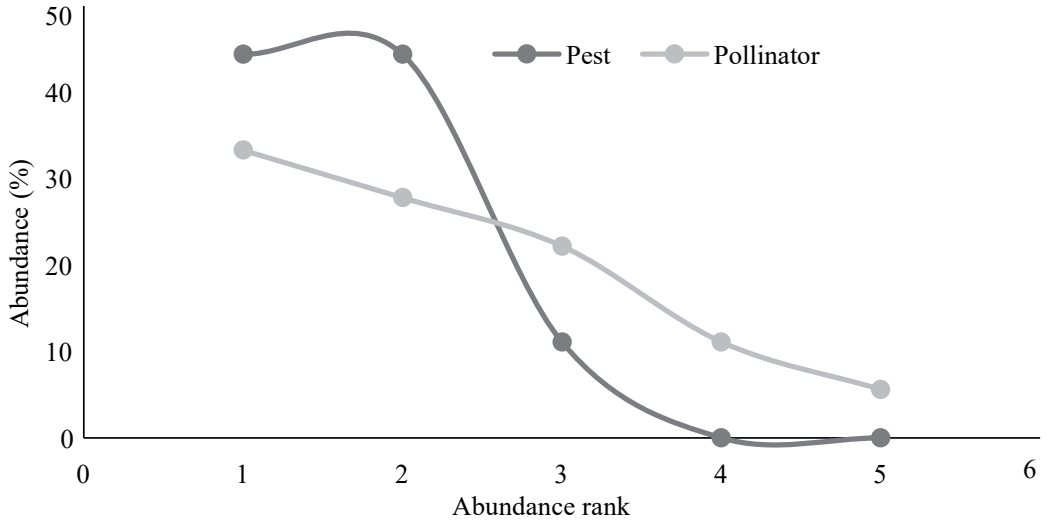


Figure 3. Comparison of the abundance of Lepidopteran pests and pollinators associated with different crop at Gazipur in Bangladesh

of insect species. On the contrary, cultivation of rice, brinjal and cucurbitaceous vegetable round the year are the prime determinants of pesticide use. Farmers use a wide range of pesticides and 77% of the total farmers use pesticides at least once in a crop season. About 43000 Mt pesticides are using per year in Bangladesh. Indiscriminate use of the pesticides kills non-target insects and decreases Lepidopteran populations.

The Lepidopteran insects play significant role in pollination of crop plants, however many of them are destructive, because their larvae are phytophagous (Bashar 2013). Floral combinations and adequate plant species make favorable environment for reproduction and development of such insects. The aesthetic value of butterflies makes them popular among amateur naturalists and collectors as well. So, they are important creature and well-studied group throughout the world. Study on the compilation of species lists and identification of habitat preferences, and abundances should be taken into consideration for effective conservation of biodiversity.

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