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Diurnal variation in the activities of three common Odonate species at their natural habitat

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Abstract

Odonata is a common insect order of India which acts as a bioindicator of the wetland ecosystem. Both Dragon and Damselfly exhibit diurnal variation of their activity which is related to environmental thermal intensity. The flier Dragon fly species *Aethriamanta brevipennis* (Family: Libellulidae), *Diplacodes nebulosa* (Family: Libellulidae) and percher Damselfly species *Ceriagrion coromandelianum* (Family: Coenagrionidae) exhibited differential activity patterns adjacent to a wetland. Flying activities were more pronounced at morning and territoriality was more observed at afternoon especially by *D. nebulosa*. The percher species *C. coromandelianum* spent more time in resting.

Keywords: *Aethriamanta brevipennis*, *Ceriagrion coromandelianum*, *Diplacodes nebulosa*, Odonata.

Introduction

Odonata is a common order of carnivorous insect which is distributed globally in tropical and temperate areas. The actual number is estimated to 7000 which are mainly present near the wetlands (Kalkman et al., 2008). The larvae are essentially aquatic and both larvae and adults are predatory in nature. They are used as bioindicator of environmental health (Bulankova, 1997) especially of aquatic environment (Kalkman et al., 2008). In India the diversity of the Odonates is well marked having 500 species (Andrew et al., 2008), and they are easily observed around the stagnant (Roush and Amon, 2003) and flowing water bodies (Hofmann and Mason, 2005) like mountain streams, rivers and ponds. The most common

family of Dragon fly in Eastern India is Libellulidae (Mitra, 1992) and a number of Damselflies of several families (Andrew et al., 2008).

The Odonates cannot walk or crawl at all. They only take rest on the shoot of aquatic macrophyte and fly or hover during dynamicity. Based on the behaviour the Odonates are classified into two groups – perchers and fliers (De Marco, 1998) and the classification is based on the thermoregulation (De Marco and Resende, 2002). Therefore their activity pattern is related with the intensity of sun light. This study was exclusively focused on three very common Odonate species of West Bengal (Dawn, 2014) viz. the Dragon flies *Aethriamanta brevipennis* (Family: Libellulidae), *Diplacodes*

nebulosa (Family: Libellulidae) and Damsel fly *Ceriatagrion coromandelianum* (Family: Coenagrionidae) found at a confined wetland of Dumdum. The behaviours like resting, flying and aggression were studied to depict on their diurnal variation. As monsoon time is not the breeding season of the Odonates (Andrew et al., 2008), therefore, mating behaviour was not considered in this study.

Materials and method

The present study was done for consecutive five days covering three species mentioned earlier. The entire work was done between two halves i.e., 8:30am – 11:30am and 2pm – 5pm. The study was done in simultaneously in two groups – one at the bank of Motijheel (a wetland) and another at the play ground of Dumdum Motijheel College. Hovering of the Dragon flies was observed at late afternoon at the college ground and their number was documented following the grand census method (Barlow-Irick, 2002). Other behaviours were observed at the wetland (Giugliano et al., 2012). The observed species along with their respective behaviour were photo documented entirely with mobile phone camera (Samsung Galaxy J-5primeTM and Samsung Galaxy J-1TM). All data were pooled together time wise and date wise for compilation using MS-Office TM Word and Excel software.

All results were statistically analysed through Student's 't' test at 95% confidence limit as per standard procedure. The data were collected three times independently.

Results

Resting activity of in all species except *C. coromandelianum* reduced number in afternoon hours and the reduction was significant in *D. nebulosa* ($P < 0.05$). *C. coromandelianum* showed slight increase in number of resting individual in afternoon than morning hours (Fig. 1).

During afternoon hours flying activities were significantly reduced in *A. brevipennis* ($P < 0.001$) and *D. nebulosa* ($P < 0.001$), in case of *C. coromandelianum* the reduction was non-significant (Fig. 2). Flying activity including hovering was also related with relative abundance of the species (Fig. 2).

More chasing instances was noted at the afternoon hours though it was only significant in *D. nebulosa* ($P < 0.001$). Maximum frequency of chasing was also seen in the same species (Fig. 3).

Discussion and conclusion

It had been noted earlier that the ethological classification of the Odonata is based on the overt characters like thermoregulation (De Marco, 1998). The fliers remain mostly on wings even when they are non reproducing and non foraging and the perchers spend most of the time on a perch from where they fly a short for feeding or mating and come to the perch thereafter (Corbet and May, 2008). It had been reported earlier that the Dragon flies are strong fliers than the Damsel flies (Subramanian, 2009). From this study it was observed that the Damsel fly *C. coromandelianum* exhibited minimum flying activity whereas the two Dragon fly species *A. brevipennis* and *D. nebulosa* showed more flying occurrences.

In case of the flier Odonates the flying activity is dependent upon the thermal intensity (De Marco, 1998). In this study there is a significant reduction in the number of the flying individuals of the Dragon flies *A. brevipennis* and *D. nebulosa* during the afternoon hours when the intensity of the sun light was low as well as the observation site was under shaded condition. Though the percher Damsel fly species *C. coromandelianum* engaged mostly in resting on perches of aquatic macrophytes and their numbers were almost similar in morning and afternoon (slightly increased in afternoon). Territoriality was more pronounced among the male Odonates (Jhonson, 1964) and among the

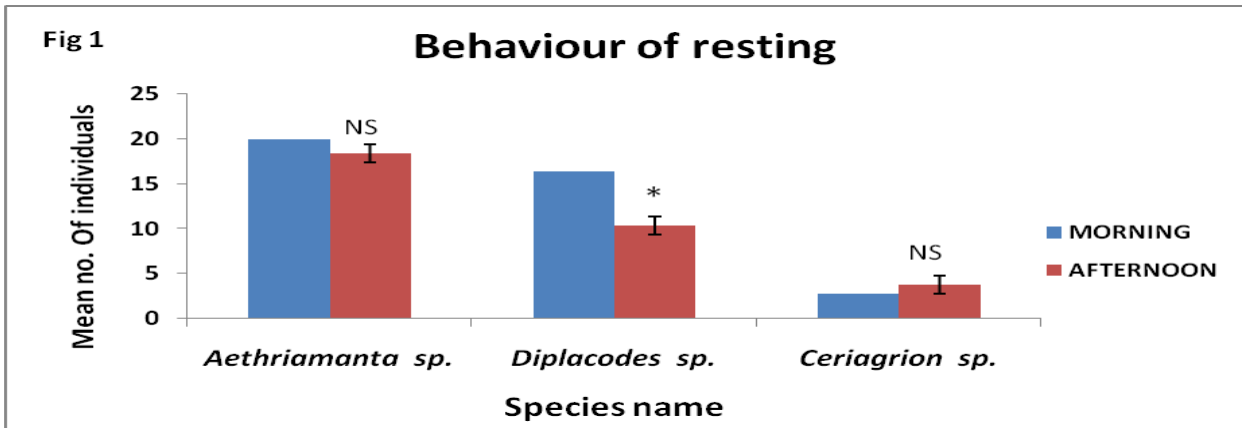


Fig. 1. Resting (perching) individuals of three Odonate species. *D. nebulosa* showed reduction at $p < 0.05$ at afternoon.

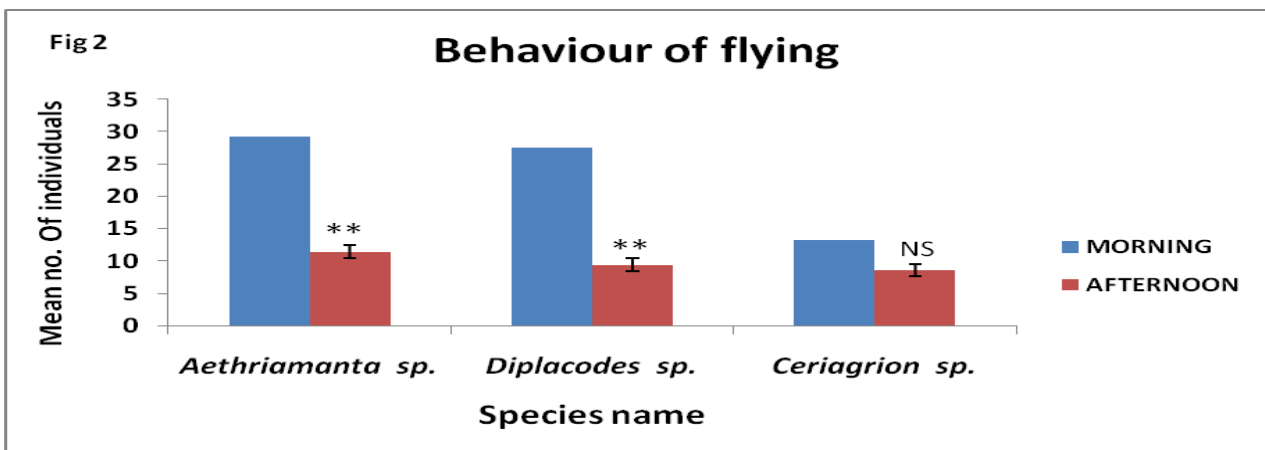


Fig. 2. Flying individuals in morning and afternoon hours. Activity reduced in *A. brevipennis* ($p < 0.001$) and *D. nebulosa* ($p < 0.001$) at afternoon to that of the morning.

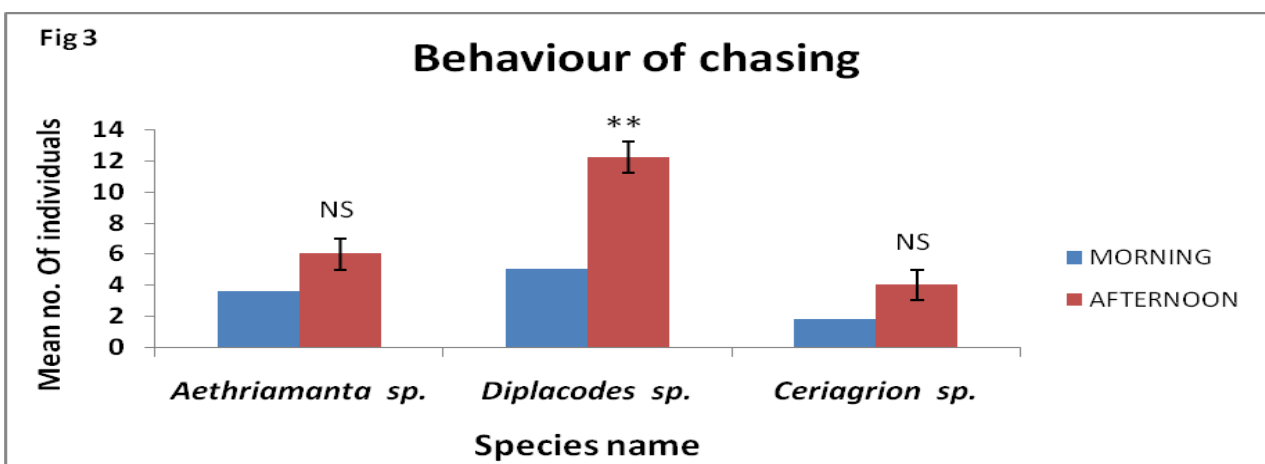


Fig. 3. Mean number of individuals engaged in chasing. *D. nebulosa* showed significant increase ($p < 0.001$) at afternoon.

percher species the frequency of territoriality was low (Marden and Waage, 1990). Though reported earlier about the temperature independence during territoriality (Fried and May, 1983) this study exhibited more territoriality in the afternoon hours irrespective of the species and maximum chasing activity was exhibited by *D. nebulosa*. This manifestation was just opposite to the flying activity of the same species. Maximum territoriality was reported during the breeding season (Corbet, 1980). As the study was not conducted in breeding season therefore the territoriality was simply due to feeding competition as both homo specific and hetero specific chasings were observed.

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Conflict of interest

None to declare.

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