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EVOLUTIONARY ADAPTATIONS IN MORPHOLOGY AND ECOLOGY OF *THOLYMIS TILLARGA* (FABRICIUS) AND *BRADINOPYGA GEMINATA* (RAMBUR) (INSECTA : ODONATA)

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INTRODUCTION

Morphological and ecological features which have selection value and ensure the survival of the species are known as evolutionary adaptations. Lack (1965) defined evolutionary ecology, concerning those features of a species or population that are evolutionary adaptations (i.e., have survival value) and are not merely the consequences of population dynamics. Similarly evolutionary morphology are those features which are evolutionary adaptations. Evolutionary adaptations, it is presumed, arise usually in Hutchinson's (1957) "fundamental niche"

Primitive insects, like dragonflies, like other animals have undergone several changes since their evolution. As a result Corbet (1962) observed " certain tropical Anisoptera with coloured wings are thought to derive protection from birds on account of their resemblance to large Hymenoptera in flights" It may be considered coevolution. Moreover, odonates have got the highest development of compound eyes; the head is movable and is set on the neck or prothorax. The head can be twisted sideways 180°, backward 70°, forward and downward 40° The width of hind wings, especially in Anisoptera, help them in capturing preys while on wings. Dragonflies can fly backward, move vertically upward, like a helicopter or stop in turn in the midst of the rapid progression, as if they have been rammed into. This could be made possible due to adjustment of the centre of gravity between bases of wings and leaves a sharp contrast with all other living insects. These features, too, have selection value (Mitra, 1999, 2002 & 2003).

In the present paper morphological and ecological features of *Tholymis tillers* (Fabricius) and *Bradinopyga geminata* (Rambur) and their importance in the survival of the species have been discussed.

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MATERIAL AND METHODS

Observations were made both in field and in laboratory. Field observations were carried out in Dum Dum Park, on the eastern fringe of Calcutta and where the author lived (since 1967) and in Jodhpur, Rajasthan, during the period from February to April, 1980, for laboratory observations three examples of each species *viz.*, *Tholymis tillarga* and *Bradinopyga geminata* and five examples of *Brachythemis contaminata* (Fabricius) were collected. For experimental work a black board measuring 30 × 30 cms was used.

OBSERVATIONS

Morphological features having selection value : Tholymis tillarga (Fabricius) : The imago of *Tholymis tillarga* (Fabricius) can be identified in the field with the help of the broad fan-shaped smoky, golden-brown fascia extending from node to base of hind-wing, very deep in colour at node and somewhat longitudinally striated, paling towards the base and posterior border of hind-wing : the fascia bordered distally by a broad oval opalescent white spot about four cells deep. During flight over water and viewed from above the opalescent spots on the hind wings are lit by the reflection of the sky and glow with extraordinary intensity, as dusk falls on the tanks. This features help the species to resemble large hymenopterous insects and derive protection from predators.

Bradinopyga geminata (Rambur) : In the field an adult can be identified with the help of its cryptic colour. Prothorax and thorax cinereous or dirty pale yellow, marbled and peppered with black in a very irregular manner (best described as granite in colour). The perostigma further adds to their cryptic colouration. This, in the environment, especially during rest on the old tree trunk, shaded granite, plastered old walls make them practically indistinguishable from surroundings. This features help them to derive protection from the predators.

Experimental observations : Five examples of *Brachythemis contaminata* (Fabricius) were fixed on a white wall in a well illuminated room in the right. By the side of these specimens one example of *Tholymis tillarga* (Fabricius) was also fixed. The House gecko (*Hemidactylus brookil*) moving on the wall attacked the specimens of *Brachythemis contaminata* but not the *Tholymis tillagra*, since the opalescent white spot was glowing. Two examples of *Tholymis tillarga* were fixed on the black board and then the board was fixed on the wall. The room was illuminated. The opalescent white spot was distinct, and the gecko, moving about did not devour the dragonflies. But when the light was made dim, the spot was not very distinctly glowing and the gecko then attacked the dragonflies.

One specimen of *Bradinopyga geminata* was fixed on the dirty portion of the wall and the light of the room was made dim, the gecko could not see the specimen. The last two specimens of *Bradinopyga geminata* were fixed on the black board and the board was fixed on the white wall in

a well illuminated room. The gecko moving on the wall, walked over the board but did not attack the odonata specimen probably due to marger of the body colour of the odonata specimen with the black background.

Ecological features having selection value : Both *Tholymis tillarga* and *Bradinopyga geminata* are crepuscular in habit and show maximum activities from late afternoon of dusk to the early evening. They also come out in the very early morning to prey on smaller insects. At that time when the insects are on the wings neither opalescent white spot on the wing of *Tholymis tillarga* glow nor the body colour of *Bradinopyga geminata* merges with the habitats of their prey, *i.e.*, the leaves of bushes and trees. But as soon the sun rays reach the ground dragonflies take shelter under cover or in the shade. *Tholymis tillarga* goes in the bushes and hang under leaves. In this way they go out of the predators' sight. Thus the species get protection both from heat and the predators as well. *Bradinopyga geminata* rests on the shaded three trunk, plastered walls or granite walls. The cryptic body colour harmonizes with the environment to such an extent that the specimens become indistinguishable from the environment. In Jodhpur, Rajasthan, the author has noticed that a good number of *Bradinopyga geminata* specimens rest throughout the day on an old plastered wall and used to come out in the early dusk or early evening in search of food.

DISCUSSION

From the above it is thought that in the early morning the body colour of dragonflies do not merges with the environment, *i.e.*, the habitat of their prey. It can, therefore, be conjectured that the lack of merger of body colours with the environment give opportunities to the predators of dragonflies, *i.e.*, birds who are also out of their roots for foods. Hence the death rate of these dragonflies in the morning is higher than the midmorning. According to Mitra (1974) the opalescent white spot on the hind wings *Tholymis tillarga* help the species to mimic hymenopterous insects and they derive protection from the predators. Fraser (1936) considered that the cryptic colour of the body of *Bradinopyga geminata* help the species to derive protection from birds. The habit of taking rest either on the shaded three trunk, plastered walls or granite walls of *Bradinopyga geminata* to avoid heat also help them to derive protection from the predators. Similarly to avoid the heat *Tholymis tillarga* takes shelter under leaves in the nearby bushes, which, too, help them to get protection from predators (Mitra, 1994).

It is, therefore, conjectured that the aforesaid features increase the survival value of these species and hence can be considered as the evolutionary adaptations.

ABSTRACT

Morphological and ecological features which are evolutionary adaptations of *Tholymis tillarga* (Fabricius) and *Bradinopyga geminota* (Rambur) have been discussed.

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