Some benefical Predatory insect Species in Hinthada University Campus

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Abstract

The present study investigated the predatory insects species in Hinthada University Campus. A total of eight species belonging to seven genera under three families were recorded during the study period from June 2018 - June 2020. The highest species number were recorded from Family Libellulidae, five species , followed by two species of Family Coccinellidae and one species from Family Chrysopidae.There were five species of odonata that were recorded from family Libellulidae. Their larvae and adults stages feed on aphids, mosquitoes, and small insects. Larval stages were aquatic. There were two species of ladybird bettles that were recorded from Family Coccinellidae and their larva and adult stages feed on aphids, eggs of lepidoteran, adult and larvae of whiteflies, soft body insects and caterpillars. In Family Chrysopidae, green lace wings adult and larva feed on aphids, larvae of Spodoptera, leaf rollers, leaf miners and mealy bugs. Odonate species may probably be effective in controlling the pests of harmful insects as biological control agent. Ladybird beetles and green lace wings feed on harmful insect pests of agriculture, horticulture and forestry. The larvae and adults of all these species were used in biological pest control.

Key words: Libellulidae, Coccinellidae, Chrysopidae.control agent, harmful insect

INTRODUCTION

The insects are the largest group of animals, comprising about 70% of known species. Over 800,000 species have been described and one author estimates that this may be less than a fifth of existing species (Fonseka, 2000).

Insects are the dominant group of animals on the earth. They far surpass all other terrestrial animals in numbers and occur practically everywhere. Many insects are extremely valuable to man and human society. However, a few insects are harmful and cause enormous losses to agricultural crops, stored products, and the health of man and animal (Borror *et al.*, 1976).

In every year, insects cause enormous damage to food plant all over the world. This is mainly the result of agriculture that extends more and more tending to large areas of monocultures. The growing of only a few crops in a certain area, and the continual importance of the quality of crops to meet market demands are some of the factors which are responsible for the increase of insects attacks and consequently the reduction of yields (Wyniger, 1962).

Insects become pests when they conflict with human welfare, aesthetic or profit (Hill, 1983). Insects noticeably damage directly or indirectly to man himself or to his livestock, growing crops, stored product or other possessions. Such damage may be of regular or of occasional occurrence and may vary from total loss to a very small fraction (Bainbrigge and Fletcher, 1914).

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Most type of plants are attacked and injured by insects. The injury is caused by insects feeding or oviposition on the plant or serving as agents in the transmission of plant diseases. This injury may form a reduction in crop yields to the complete destruction of the plant (Borror *et al.,* 1976).

Many insects cause damage by eating or sucking the juice of field crops, vegetables and garden plants or by bringing about disease in them. These are field and garden pests or crop pests. Most of the time, natural enemies and other factors keep the population of pests in sufficiently low levels causing no damage on plants (Ghosh, 1940).

A number of caterpillars is pest on garden mums including cabbage looper, cluster caterpillar, cotton bollworm and leaf roller. Caterpillars can feed on almost all of the above ground portions of the plant. Adults generally migrate to garden mums when they are placed outdoors (Kessler,1998)

Nine orders under class Insecta are namely, Coleoptera, Diptera, Lepidoptera, Hymenoptera, Hemiptera, Orthoptera, Odonata, Isoptera and Siphonaptera.The Odonata are relatively large and often beautifully colored insects that spend a large part of their time on the wing. The immature stages are aquatic, and adults are usually found near water. All stages are predaceous and feed on various insects and other organisms, and from man's point of view, are generally very beneficial, the adults are harmless to man; that is, they do not bite or sting (Borror, 1954).

Dammerman (1929) reported that some ladybird beetles, Coccinellidae were the most familiar and the beneficial beetle. Both adults and larvae were nearly all insectivorous, feeding on a variety of other small soft- bodied insects, such as aphid , scales and mites.

Imms (1976) stated that predators mainly adult and larvae coccinellid were important in decreasing the numbers of aphid in the population. Many countries were now applying the method of biological control because of the problem of insecticides resistance and pollution.

Cauquil (1988) stated that, the larvae of ladybird beetles, syrphid flies and lacewings fed on aphids, whitefly, mites and the eggs of various insects.

The larvae of lacewing are predatory and feed on aphids and members of this genus have been used in biological pest control.

Adults are crepuscular or nocturnal. They feed on pollen, nectar and honeydew supplemented with mites, aphids and other small arthropods, and some namely *Chrysoperia* were mainly predatory.

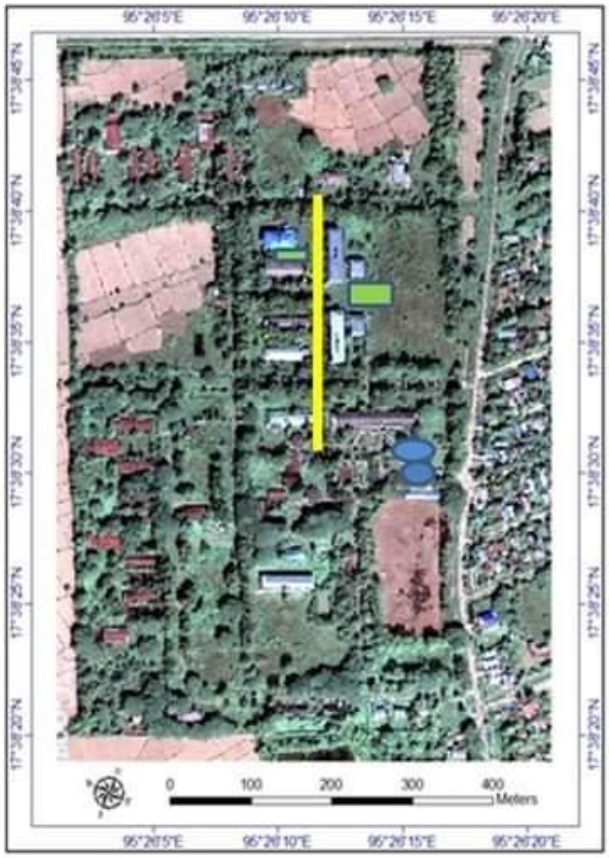
While depending on species and environmental conditions, some green lacewings will eat only about 150 prey items in their entire life, in other case 100 aphids will be eaten in a single week. Thus in several countries, millions of such voracious chysopidae are reared for sale as biological control agents of insect and mite pests in agriculture and gardens (Wikipedia,2020).

The present study was carried out to investigate the beneficial predatory insects in Hinthada University Campus.

MATERIAL AND METHODS

Study area

The investigation of the beneficial predatory insects was conducted in Hinthada University Campus, Hinthada Township, Ayeyawady Region, that extends from Latitude 17˚38 17° 38' 37" N and Longitude 92° 26' 39" E. Total area is 0.37km sq and situated at the northern part of the Hinthada Township (Fig.1)



(Source: Department of Geography, Hinthada University)

Plate1. Map of study site

Study period

The study period lasted from June 2018 to June 2020.

Specimen collection

The specimens were collected mainly during day time because most of the insects are diurnal in nature. But some species were collected at night under Light. The ordinary insect net with a long handle was used in collection of specimen. It was collected from the various plants and bushes.

Preserving the specimens

The coloration of fresh specimens were noted and recorded immediately. Some insects were preserved with 70% alcohol and some insects were placed in the letter-sized envelopes with the wing held in a vertical position. Then the dead specimens were pinned and kept on the soft plastic plate.

Identification of collected specimens

The specimens were identified according to Fraser (1933-1936), Roger (1978) and Orr (2005).

RESULTS

A total of eight species of predatory insects belonging to three families under three orders were recorded in the study sites of Hinthada University Campus. Among them, Libellulidae family was recorded to the highest species number (five species), followed by

(two species) in Coccinellidae and one species from family Chrysopidae. Identification was followed after Fraser (1933-1936), Roger (1978) and Orr (2005).

. (Table 1).

Systematic position and description of recorded insects.

Phylum -Arthropoda
Class - Insecta
Order - Odonata
Family - Libellulidae
Genus - *Orthetrum*
Species - *O. sabina* Drury, 1770

Species - *O. glaucaum* (Brauer, 1865)

Genus - *Neurothemis*
Species - *N. fulvia* Drury, 1773

Genus - *Tholymis*

Species - *T. tillarga* Fabricius, 1798

Genus - *Rhyothemis*
Species - *R . Phyllis* Sulzer, 1776
Order - Coleptera
Family - Coccinellidae
Genus - *Cheilomenes*
Species - *C . sexmaculata* (Fabricius, 1781)

Genus - *Coccinella*

Species - *C . transversalis* Fabricius, 1775

Genus - *Chrysoperia*
Species - *C . carnea* (Stephens, 1836)

Orthetrum Sabina Drury, 1770

Total length of adult *O. sabina* was 30 mm long. In the head region, labium, labrum and front are yellow, eyes are green mottled with black. The color of the thorax region has greenish yellow with black stripes. The abdomen is greenish yellow marked with black and distinctly swollen at the base. Female is very similar to the male. Wings are transparent and pterostigma black with middle ochreous.

Orthetrum glaucaum (Brauer, 1865)

Total length of adults was 40 mm. Coloration of the head region of young has a pale olivaceous brown and that of adults is changing to glassy black. Eyes are dark green in colour. Thorax region has dark dull blue black with fine blue black hairs. Abdomen is bulged at segments one to three and then very slim to end. Segments one to eight are pruinosed pale blue and the remaining segments are black. Wings are transparent and spot is dark reddish brownish in colour.

Neurothemis fulvia Drury, 1773

Total length of adults was 27 mm. The head was reddish brown. Eyes are dark reddish brown. The thorax is reddish brown without marking. Abdomen is relatively short, slightly dilated at base and tapered gradually to anal end with dark reddish brown. Wing spot is dark reddish brown.

Tholymis tillarga Fabricius, 1798

Total length of adults was 44 mm. Head large and labrum, labium and face are olivaceous yellow. Eyes are brown and capped with reddish. In thorax region, golden yellow with bright red colour. Abdomen bright rust red in colour especially on dorsum. Wings are hyaline, broad fan-shaped and golden brown patch with milky white bordered on the hind wings, pterostigma is small and reddish brown between dark veins.

Rhyothemis Phyllis Sulzer, 1776

Total length of adults was 23 mm. The head is small and dark metallic green colour. Above eyes are dark reddish-brown. Thorax is narrow and small with dark metallic green but not colourful as the wings. Abdomen relatively short, markedly compressed and black. Wings was palely tinted throughout with yellow and all apices with blackish brown. A black nodal spot is limited to the node and this spot is reduced in hind wing, at the loose of which are distinctive brown and yellow bars. Pterostigma is blackish brown.

Cheilomenes sexmaculata (Fabricius, 1781)

Adult beetle *C. sexmaculata* was 4 – 5.50 mm long. Body is hemispherical in shape and orange color. Head bears a pair of eyes and a pair of short club – shaped antennae. Thorax bears three pairs of legs and two pairs of wings. T – like black marking is found with a black transverse wave band and six black spots on the elytra. Covers include two zigzag lines and a near black spot in each elytra. Abdomen strongly convex dorsally, nearly flat ventrally. Male is and female are similar in appearance. Male is slightly smaller than female.

Coccinella transversalis Fabricius, 1775

Adult beetle *C. transversalis* was 4.50 – 7.00 mm long. Body is hemispherical in shape. Head bears a pair of eyes and a pair of short club – shaped antennae. Thorax is composed of three pairs of black segmented legs and two pairs of wings, bright orange red in colour with black marking and transverse band at apical third not reaching lateral margin and three smaller apical spots, one sutrual and two lateral on the elytra. Male is slightly smaller than female.

Chrysoperia carnea (Stephens, 1836)

Adult green lacewings were 12 – 20 mm long a pale green colour with long, threadlike antennae and glassy golden compound eyes. They have large membranous pale green wings which fold tent – wise above their abdomens.

In the present study, a total of eight predatory species were recorded. Among them, family Libellulidae were the highest species number and their adult stages feed on aphids, mosquitoes, and small insects. Larval stages were aquatic. Family Coccinellidae have two species of ladybird bettles, and their larva and adult stages feed on aphids, eggs of lepidoteran, adult and larvae of whiteflies, soft body insects and caterpillars.

In Family Chrysopidae, green lace wings adult and larva feed on aphids, larvae of *Spodoptera*, leaf rollers, leaf miners and mealy bugs.

Table 1. Species composition of predatory insect in Hinthada University Campus

No	Order	Family	Scientific name	Common name
1	Odonata	Libellulidae	*Orthetrum sabina*	Green skimmer
2			*O. glaucaum*	Asian skimmer
3			*Neurothemis fulvia*	Fulvous forest skimmer
4			*Tholymis tillarga*	Foggy - winged twister
5			*Rhyothemis phyllis*	Yellowstripe flutter
6	Coleoptera	Coccinellidae	*Cheilomenes sexmaculata*	Six spotted ladybird beetle
7			*Coccinella transversalis*	Transverse lady beetle
8	Neuroptera	Chrysopidae	*Chrysoperia carnea*	Green lace wing

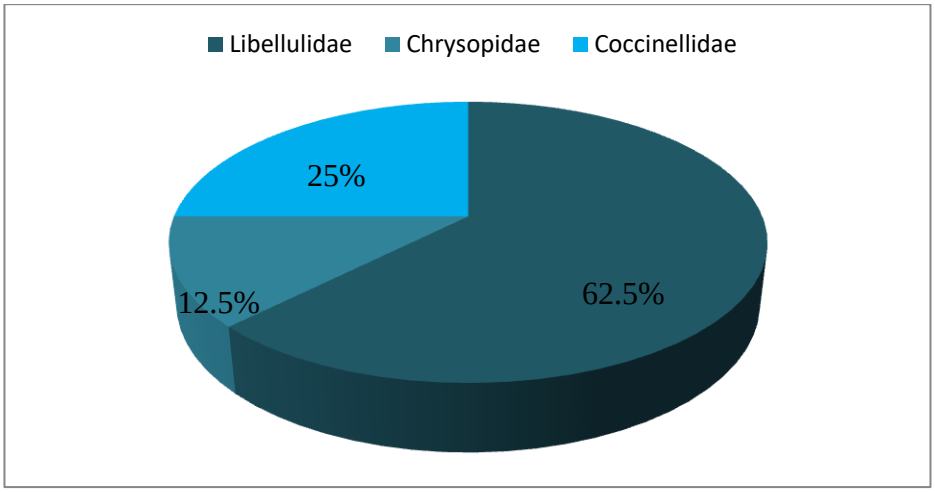


Fig 1. Percentage of species composition of predatory insect

Table 2. Recorded species of predatory insects feeding on their prey

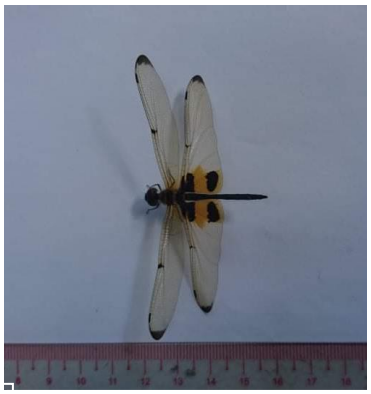
No	Predator species	Feeding stage	Prey species
1	*Orthetrum sabina*	Adult and larvae	Aphids, mosquito, small insects
2	*O. glaucaum*	"	"
3	*Neurothemis fulvia*	"	"
4	*Tholymis tillarga*	"	"
5	*Rhyo themis Phyllis*	"	"
6	*Cheilomenes sexmaculata*	"	Aphid, eggs of lepidopteran, adult and larvae of whiteflies, soft body insects and caterpillars
7	*Coccinella transversalis*	"	"
8	*Chrysoperia carnea*	"	Aphids larvae of *Spodoptera* and leaf roller, leaf miner and mealybugs

A. Orthetrum sabina

B. Orthetrum glaucaum

C.Neurothemis fulvia

D . *Tholymis tillarga*



E. *Rhyothemis phyllis*

F. *Cheilomenes sexmaculata*

G. *Coccinella transversalis*

H. *Chrysoperia carnea*

Plate 2. Recorded predatory insect species in Hinthada University Campus

DISCUSSION

In the present study, a total of eight predatory insect species belonging to three families under three orders were recorded. In the family Libellulidae, five odonate species of *Orthetrum sabina*, *O. glaucaum*, *Neurothemis fulvia*, *Tholymis tillarga* and *Rhyothemis phyllis* were recorded. In the family Coccinellidae, two species of ladybird beetles *Cheilomenes sexmaculata* and *Coccinella transversalis* were recorded. In the family Chrysopidae, one species of *Chrysoperia, carnea* was recorded.

In the present study, 62.5% of odonata were recorded from the family Libellulidae, 25% of ladybird beetles were recorded from the family Coccinellidae and 12.5% of green lace wing were recorded from the family Chrysopidae. Among them, the highest species number belonging to the family Libellulidae were the odonata species .

Borror, 1954 stated that the odonata were relatively large and often beautifully colored insects. The immature stages were aquatic and the adults were usually found near water. The adults were harmless to man. Their prey was chiefly small flying insects such as midges, mosquitoes. Odonata nymphs were aquatic insects and feed on various sorts of small aquatic organisms. The larger nymphs will attack small tadpoles or fish.

Subramanian, 2005 stated that the odonata were beneficial to man. Both larval and adult stages play a significant role in the wetland ecosystem. Adult odonates feed on mosquitoes, blackflies and other blood sucking flies and act as an important biological agent of these harmful insects.

Anonymous, 2013 described that the odonates have also been used in traditional medicine in Japan and China. In some parts of the world, they were used as food source, eaten either as adults or larvae in Indonesia, for example, they are caught on poles made sticky with birdlime, then fried in oil as delicacy.

In the present study, all of odonata species *Orthetrum sabina, Orthetrum glaucaum, Neurothemis fuliia, Tholymis tillarga* and *Rhyothemis phyllis* feed on aphids, mosquitoes and small insects. Their findings were agreed with the present finding.

Imms, 1976 stated that the predators play an important role in limiting the distribution and abundance of the aphids. Predators mainly adult and larvae coccinellid were important in decreasing the numbers of aphid in the population.

Roger, 1978 stated that the lady beetles, *Cheilomenes sexmaculata* and *Coccinella transversalis* were predaceous, commonly feeding on aphids, scale insects, mealy bug and mites.

Foster and Flood, 1995 described that predatory insects that feed on aphids include ladybeetles adult and larvae, lacewing larvae and hover larvae. Despite the large number of natural enemies that attack aphids, population generally grow more rapidly than population of their natural enemies.

Davidson and Lyon, 1997 stated that lady beetles were a large group, widely distributed active in both larval and adult stages, with a considerable range of prey which includes some of our most destructive pests, notably the mites, thrips, aphids, scales insects and mealy bugs.

Shepard et al., 1999 described that lady beetles were abundant members of a community of predatory insects that are common to vegetable and soybean fields in Southeast Asia. Ladybeetles feed on aphids, eggs of Lepidopteran and other small soft – bodied insects.

In the present study two species of ladybeetles *Cheilomenes sexmaculata* and *Coccinella transversalis* feed on aphids, eggs of lepidopteran, adult and larva of whiteflies, soft body insects and caterpillars. Their finding were agreed with the present finding.

Smith, 2009 described that the cotton aphid *A. gossypii* was attacked by a range of natural enemies. The most important are ladybird beetles, houseflies, lacewings and parasitic wasps. They usually keep aphids under control.

Shelton 2020 stated that several species of aphids, spider mites, thrips, whiteflies, eggs of leafhoppers, moths and leaf miners, small caterpillars and beetle larvae are pests. They are considered an important predator of long- tailed mealy bugs in greenhouse. These lacewing

larvae are considered generalist beneficials but are best known as aphid predators. The larvae are sometimes called aphid lions, and have been reported to eat between 100 and 600 aphids each.

Wikipedia Foundation website, 2020 stated that green lace wings feed not only on aphids but also on many other types of insects and even prey on larger creatures, such as caterpillars. They can consume large numbers of prey and completely destroy aphid colonies.

In the present study, green lacewing *Chrysoperia carnea* feed on aphids, larvae of *Spodoptera litura*, leaf roller, leaf miner and mealy bugs. Their finding were agreed with the present finding.

CONCLUTION

The present study provides the information about the predatory insect species. They feed on harmful insect pests of agriculture, horticulture and forestry. Their larvae and adults were used in biological pest control. Many species of odonata inhabiting in agro ecosystems species may probably be effective in controlling the pests of harmful insects as biological control agent and also be used as food and medicine. Adult and larvae of Coccinellidae were important in decreasing the numbers of aphid in the population. In several countries, millions of Chrysopidae were reared for sale as biological control agents of insect and mite pest in agriculture and gardens. Most of the time, all these predatory insect species keep the population of pests in sufficiently low levels causing no damage on plants. Successful pest control anywhere is not easy. Most of the time, we have to use insecticide and they are harmful to human being, their domesticated animals and also their environment. Many countries were now applying the method of biological control because of the problem of insecticide resistance and pollution.

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