Asian Journal of Biological and Life Sciences | Original Research

Role of Heteropoda venotoria in Household pest Control : A comparative study

Mansur Ahmed*, Jinnath Anam and P.K. Saikia

Animal Ecology and Wildlife Biology Lab, Department of Zoology, Gauhati University.

E-mail : mansurahmd@gmail.com Contact No : +91-9864905647

Submitted : 30.09.2013 Accepted : 06.11.2013 Published : 30.04.2014

Abstract

Spiders are one of the most abundant predatory groups in the terrestrial ecosystems. They feed on insects, some other arthropods and play important role in pest control. They have unique habitat and they live in almost all the environments. Spiders serve as buffers that limit the initial exponential growth of prey populations. The giant crab spider *Heteropoda venotoria* is an important predator of cockroaches. The spider is often found associated with human habitations. This spider is highly valued in tropical countries because they capture and feed on cockroaches and other insect pests. The aim of the present study was to investigate the prey preference of Heteropoda and to compare the predatory efficiency of Heteropoda with other five spider species to determine the role of Heteropoda to control household insect pests. Spiders were collected from agricultural and residential areas of Tezpur revenue circle of Sonitpur District. Five different spider species Heteropoda, Plexippus, Pardosa, Argiope, Neoscona, Crossopriza were collected in separate container to the laboratory. The predatory behavior of all the spiders were recorded whether they capture, kill or ignore the pest . Heteropoda were also observed in their natural habitat during night hours to record their natural prey items. The present study showed that Heteropoda preyed on a wide range of insect pests as well as other spider species. Among the preys Cockroach was found the most preferred prey and Crossopriza was found the second preferred host of Heteropoda. Among the five spider species Heteropoda was found the most effective predator of insect pests.

Key words : Heteropoda, Household pest, Painfull bite, Egg sac

INTRODUCTION

Spiders are considered as important predator of insect pests and serve as a buffer to limit the initial exponential growth of prey population [1-5]. Spiders can lower insect densities, as well as stabilize populations by virtue of their top-down effects, microhabitat use, prey selection, polyphagy and obligate predatory feeding strategies [4]. Several workers reported the predatory potency of spiders [4-7]. Many specialists considered spiders as dangerous animal [8], however, only few species are really dangerous for humans [9]. Unlike other arthropods, the spider species rarely transmit communicable diseases and play a critical role in the ecosystem by controlling the vector arthropods that frequently transmitted human diseases, such as mosquitoes and flies [10]**.** The species *Heteropoda venotoria* (Huntsman spider) is not a danger spider, but a locally painful bite may be delivered to any human being who have carelessly handles a huntsman spider [10]. *Heteropoda venotoria*, commonly known as common huntsman spider or giant crab spider. Male is generally 20-25 mm length and female is 25-30 mm length in size. It is most common spider inside houses and occasionally on tree trunks in gardens. Gravid females carry the white disc- shaped egg sac under the body with the help of palps. *Heteropoda venotoria* is very common spider in houses of Assam. This spider is highly valued in tropical countries because they capture and feed on cockroaches and other household insect pests [11-13]. The aim of the present study was to investigate the prey preference of Heteropoda and to compare the predatory efficiency of Heteropoda with other five spider species to determine the role of Heteropoda in control of insect pests.

MATERIALS AND METHOD

Spiders were collected from agricultural and residential areas of Tezpur revenue circle of Sonitpur District of Assam, India. To study the prey spectrum a total of five adult *Heteropoda venotoria* were collected and kept in captivity. The spiders were kept in separate plastic container (18cm hight and 8cm diameter). The spiders were starved for 24 hours before experiment. The female Heteropoda carrying egg sacs were not considered for the experiment, as they do not show preference for any prey. Insect pest and other arthropods preys including other spider species were collected from residential and agricultural fields of Sonitpur district and were kept in separate containers.

Laboratory procedures

A total of 25 Heteropoda were used for five rounds of experiments. Body length for large, medium and small sized Heteropoda (measured from anterior end of cephalothorax to posterior end of abdomen and carapace breadth) was 20-25 mm, 15-19 mm, 10-14 mm and breadth was 10-12 mm, 7-9 mm, 4-6 mm respectively. All tests were carried out during day time. For experiment Cockroach (Periplanata sp), adult mosquitoes (Culex), House fly (Musca), Grass hopper, Aphid and spider species *Crossopriza lyoni*, *Neoscona nautica*, *Argiope pulchella*, *Theridion sp*, *Pholcus sp* and Ants were offered as prey species.

To test the prey preference

In the laboratory to test the prey preferences five separate clean transparent glass container (25cm height and 12cm diameter) were used. The top of the containers were covered with fine mesh cloth and a filter paper was hanged from top to facilitate the escape bahaviour of the prey species. During the test, an adult Heteropoda was put in the test container. The preys were introduced in the test container 10 minutes before a test spider (Heteropoda) introduced and no prey was observed attacking one another, else the test was aborted. Once the test spider was in the test container observation was continued. When it captured a prey, the experiment was stopped and preyed specimen was recorded.

To compare the predatory efficiency of Heteropoda with

other spiders

Five different spider species *Heteropoda venotoria, Plexippus paykulli, Pardosa pseudoannulata, Argiope pulchella, Neoscona nautica and Crossopriza lyoni* were collected in separate container of size 25cm height and 12cm diameter. To all test containers7 insect pests were introduced. The predatory behavior of all the spiders were recorded for 12 hours whether they capture, kill or ignore the pest.

To study the predatory behavior of Heteropoda in natural habitat

Heteropoda were observed in their natural habitat during night hours from 8 pm to 10 pm for 20 days once in a week to record their natural prey items.

RESULTS

In the present study the role of *Heteropoda venotoria* on insect pest control were studied in natural habitat as well as in laboratory conditions (30±5˚C, 75%±5% RH and photoperiod of 12:12(LD)). *Heteropoda venotoria* were mainly related with human habitations like in houses, kitchens, sheds. The predatory role of *Heteropoda venotoria* was observed by searching the spider during night hours from 8pm to 10pm and found that out of 18 encountered 11 eating Cockroaches, 3 eating Pholcidae and 3 house flies and 1 Dragon fly(table1). In the laboratory study

Table 1. List of prey of Heteropoda found in natural habitat

Prey species	No of observation	Microhabitat(Place of observation)
Cockroach	11	Wall, under table, back side of almirah
Pholcus	3	Wall
House fly	3	Wall
Dragon fly	1	wall

Table 2. List of insect pests and spiders consumed by Heteropoda in laboratory test

Prey species	Body size(mm)	Body size of Heteropoda
Cockroach	10-25mm	10-25mm
Grass hopper	11-16mm	15-25mm
House fly	4-6mm	10-15mm
Mosquito	3-6mm	10-15mm
Aphid	1-3mm	10-15mm
Dragon fly	17-25mm	20-25mm
Neoscona	6-10mm	15-25mm
Crossopriza	3-6mm	10-25mm
Theridion	3-6mm	10-25mm
Plexippus	5-9mm	15-25mm
Pholcus	3-7mm	10-25mm

insect pests and other spider species were offered one by one and found that Heteropoda forage on almost all types of pests and other spider species except ants. List of insect pests and spiders consumed by Heteropoda in laboratory are shown on table-2. It is also found that only small sized Heteropoda(10-15mm) consumed mosquitoes, Aphids and House flies, medium and large sized Heteropoda generally ignored such type of small preys. To study the prey preference of Heteropoda five insect pests Cockroach, Grass hopper, House fly, Mosquito, Aphid and five spider species Plexippus, Pardosa, Crossopriza, Neoscona and Argiope were togather introduced in the test container at a time

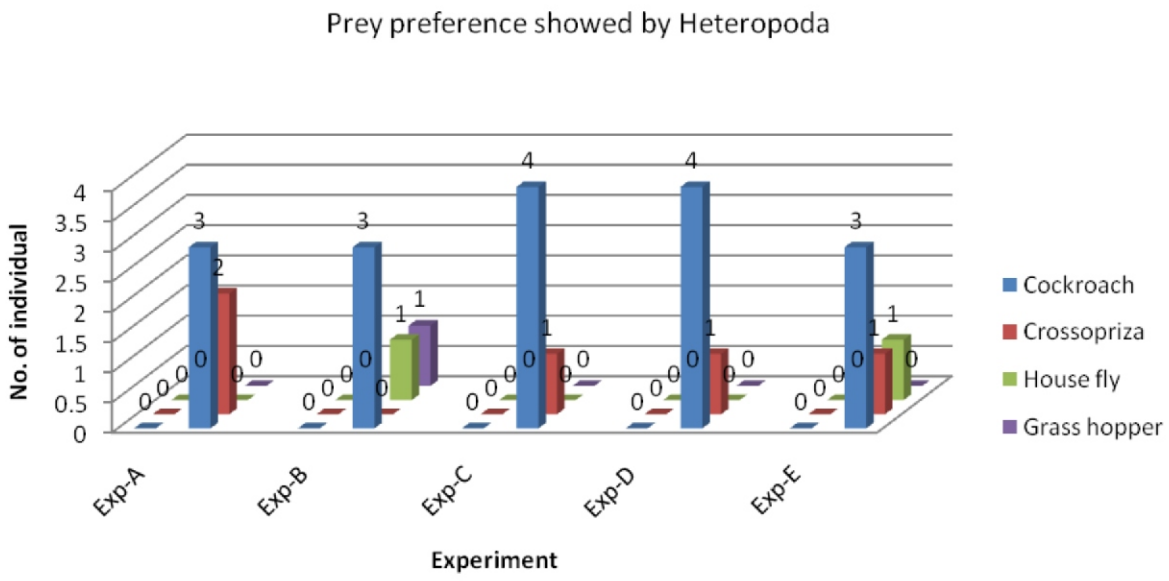

Fig. 1. Figure showing prey preference by Heteropoda venotoria

Table 3. List of Preys consumed by different predators in the laboratory test: Yes=√; No=×

Prey species	prayed in the laboratory test By					
	Heteropoda venotoria	Plexippus paykuli	Pardosa pseudoannulata	Argiope sp	Neoscona sp	Crossopriza sp
Cockroach	v	×	×	×	×	×
House fly	v	v	v	×	×	×
Mosquito	v	v	v	×	×	×
Aphid	v	v	v	×	×	×
Grasshopper	v	×	×	×	×	×
Lady bird beetle	v	×	×	×	×	×
Ant	×	×	×	×	×	×

and then Heteropoda was introduced. It was found that in the laboratory other spider species did not showed predatory behaviour within the first half hour of introduction of the species. When Heteropoda was introduced in the test container, within half an hour it started to show predatory behaviour. Among the prey the first preference of Heteropoda was recorded. To know the prey preference five test containers were used at a time and the experiment was replicated five times. The experiment showed that Cockroach was the most preferred (68%) preys of Heteropoda followed by Crosasopriza(20%)(Fig1). The predatory efficiency of Heteropoda was compared with *Plexippus paykuli, Pardosa pseudoannulata*, Argiope, Neoscona and Crossopriza. The study revealed that *Heteropoda venotoria* showed maximum predation on almost all types of insect pests followed by *Plexippus paykuli* and *Pardosa pseudoannulata* which predated on Mosquitoes and house flies and orb weaver spiders Argiope, Neoscona, and Crossopriza did not showed any predatory behavior in the laboratory test (Table3).Therefore, we can conclude that *Heteropoda venotoria* had most tendency to Cockroaches followed by Crossopriza.

DISCUSSION

The present study revealed that Hetreopoda preys on almost all types of prey. Bhattacharya reported the spider had been known to eat scorpions and bats, although it is questionable whether it normally attacks such prey [13-14]. Study revealed that Heteropoda mostly prefers Cockroaches as prey. Similar result was also reported by various workers.[11-13].It is the first time report that Heteropoda also prefers Crossopriza as a prey. The present study found that hunting spider *Heteropoda venotoria* is a good controlling agent of household pests than web weavers. Similar result was also reported by Young and Edwards[15]. In South Africa Steyn [16] recorded due to spiders settled in houses a reduction of fly populations by 99% within 2½months and at the same time, a pronounced decrease of gastrointestinal infections of men in that region, because the vectors of disease were destroyed. Many specialists considered spiders as dangerous animal [8], however, only few species are really dangerous for humans [9]. Unlike other arthropods, the spider species rarely transmit communicable diseases and play a critical role in the ecosystem by controlling the vector arthropods that frequently transmitted human diseases, such as mosquitoes and flies [10]. The species *Heteropoda venotoria* (Huntsman spider) is not a danger spider, but a locally painful bite may be delivered to any human being who have carelessly handles a huntsman spider [10].

CONCLUSION

The present study had clearly shown the role of *Heteropoda* in household pest control. Since the spider do not make web and also preys on those web building spiders like crossopriza, which removes from houses by cleaning. As the spider generally do not bite and also not poisonous, so the spider *Heteropoda venotoria* can be used as pet to control the house hold pest. Further studies required to confirm whether *Heteropoda* transmits any communicable disease or not.

REFERENCES

1. Snyder WE and Wise DH. Predator interference and the establishment of generalist predator populations for biocontrol. *Biological Control. 1999:*15:283.292.

2. Nyffeler M. Ecological impact of spider predation: a critical assessment of Bristowe's and Turnbull's estimates. *Bull. Br. Arachnol. Soc.2000:11(9):*367-373

3. Sigsgaard L. Early season natural biological control of insect pests in rice by spiders and some factors in the management of the cropping system that may affect this control Proc European Colloquium of Arachnology European arachnology.2000: 57-64.

4. Maloney D, Drummond F A and Alford R. spider predation in Agro ecosystems :can spiders effectively control pest populations? Technical Bulletin 190 Maine Agricultural and forest Experiment Station.2003.

5. Jayakumar S and Sankari A. Spider population and their predatory efficiency in different rice establishment techniques in Aduthurai, Tamil Nadu. Journal of Biopesticides. 2010: 3 (special 1): 020-027.

6. Nyffeler M. Prey selection of spiders in the field. *J. Arachnol,1999:* 27:317-324.

7. Sebastian PA, Mathew M J, Beevi S P, Joseph J and Biju

C R. The spider fauna of the irrigated rice ecosystem in Central Kerala, India, across different elevational ranges. The Journal of Arachnology.2005: 33: 247-255.

8. Isbister GK ,White J, Currie BJ, Bsh SP, Vetter RS, Warrel D A. Spider bites: addressing mythology and poor evidence. American Journal of Tropical medicine and Hygiene.2005: 72:361-367

9. Vetter RS, Isbeter GK. Medical Aspects of Spider Bites. Annual Review of Entomologia.2008: 53:409-29.

10. Diaz J H. The Global Epidemiology, Syndromic classification, Management and prevention of spider Bites. American Journal of tropical Medicine and Hygiene.2004: 71(2): 239-250

11. Shukla S and Lele A. First report of the giant crab spider, Heteropoda venotoria (Linnaeus), (Sparassidae: Araneae) from Konkan region, Maharashtra, India. Bugs'R' All, Newsletter of the Invertebrate Conservation & Information Network of South Asia & CBSG, South Asia.2008: 16: 01-03.

12. Edwards GB. The giant crab spider, *Heteropoda venatoria*. Florida Department of Agriculture and Consumer Services, Division of PLANT Industry, Entomology Circular.1979: 205: 1-2

13. Ross J, Richman DB, Mansour F, Trambarulo A, Whitcomb W H. The Life cycle of Heteropoda venotoria(Linnaeus) (Araneae: Heteropodidae). Psyche.1982: 89: 297-30.

14. Bhattacharya AC. Food and habits of the house-spider *(Heteropoda venatoria (*Linn.). J. Bombay Nat. Hist. Soc.1942: 42(4):821-5.

15. Young, O.P., and G.B. Edwards. 1990. Spiders in United States fieldcrops and their potential effect on crop pests. *J. Arachnol.* 18:1.27.

16. Steyn J. Use of social spiders against gastrointestinal infections spread by house flies. South African Medical I.1959: 33: 730-711.

17. Ahmed M., Anam J.,Saikia MK., Saikia PK. Spider species *Heteropoda venotoria* Linnaeus 1767 (Family: Sparassidae): A commonly used traditional medicine of char chapari people of Assam, India. Indian Journal of Arachnology.2013: 2(1): 1-15.