



E-ISSN: 2320-7078

P-ISSN: 2349-6800

JEZS 2018; 6(4): 455-459

© 2018 JEZS

Received: 16-05-2018

Accepted: 17-06-2018

**Patel Hiral**

Department of Agricultural  
Entomology, N.M. College of  
Agriculture, Navsari  
Agricultural University, Navsari,  
Gujarat, India

**Abhishek Shukla**

Department of Agricultural  
Entomology, N.M. College of  
Agriculture, Navsari  
Agricultural University, Navsari,  
Gujarat, India

**Surani Pratik**

Department of Agricultural  
Entomology, N.M. College of  
Agriculture, Navsari  
Agricultural University, Navsari,  
Gujarat, India

## Biodiversity of praying mantids (Insecta: Mantodea) in Gujarat, India

**Patel Hiral, Abhishek Shukla and Surani Pratik**

### Abstract

The present study was conducted during August 2016 to July 2017 with the objective to explore the fauna of mantids from different agri-horticultural crops, ornamentals, weeds, wild vegetation and leaf litter at Navsari, South Gujarat, India. Overall 374 specimens of mantids were collected from different agro-ecosystems. From these specimens, 21 known species belonging to 15 genera and 5 families were identified. Out of all 21 species proportion of *Mantis religiosa* (Burmeister, 1838) was found the most abundant in the study area *i.e.* 67.91 followed by *Hierodula viridis* (Burmeister, 1838) (6.95) and *Humbertiella ceylonica* (Saussure, 1869) (5.34%), which were also recorded as very common species. Among different agro-ecosystems, grassland ecosystem ranked first position with 21 species (100%). The paddy ecosystem constituted 14 species (66.67%), followed by mango ecosystem which constituted 10 species (47.61%), while in banana and pond ecosystem 7 species (33.33%) were presented. The variation in species of mantids might be due to diverse kind of habitat, vegetation, food availability and agricultural practices. Maximum numbers of species were recorded during September and October months during the survey period. The value of Shannon index of diversity for mantids at Navsari Agricultural University campus was 1.49, evenness was 0.49 while species richness is 21.

**Keywords:** Praying mantids, biodiversity, south Gujarat

### 1. Introduction

Mantids (Insecta: Mantodea), usually known as Praying Mantis, hold significant place in the ecosystem as predators, mainly feed on grasshoppers, moths, butterflies, flies, beetles and they are well adapted in camouflage and mimicry<sup>[1]</sup>. Mantids have attained their common popular name from the way they raise their two fore legs in a posture of prayer. They are often found waiting still for hours together for their prey with their heads rotating 180°<sup>[2]</sup>. They are diurnal and are attracted to lights at night<sup>[3]</sup>. They are weak flies and are generally seen sitting on herbs, shrubs and trees<sup>[4]</sup>. There are around 2300 species of mantids under 434 genera all over the world<sup>[5]</sup>. From India 162 species of mantids under 68 genera belonging to six families were reported<sup>[6]</sup>. Research on mantids in India was further propelled by several researchers in India<sup>[7-12]</sup>. So far 4 species and 4 genera of mantids have been recorded from all over Gujarat<sup>[6]</sup>. We are representing here mantids diversity of NAU campus. Considering the importance of this group in biological control, the present study was carried out to understand the diversity of these important mantids under the South Gujarat agro-climatic conditions.

### 2. Materials and Methods

#### Study site

A study on biodiversity of mantids were carried out at Department of Agricultural Entomology, N. M. College of Agriculture, Navsari Agricultural University, Navsari (Gujarat) during August 2016 to July 2017. Navsari is situated at coastal region of western India. Geographically, it is situated at 20°57' N latitude and 72°54' E longitude with an altitude of 11.98 meters above the mean sea level.

#### Collection, Preservation and Identification of mantids

Adult, free flying mantids was collected from the different ecosystems *i.e.* grassland ecosystem followed by paddy, mango, banana and pond by using standard insect collecting swap net attached to a ring with a handle of 1.00 m length, 0.3m hoop ring diameter. The soft nylon net with 1.00 m depth sewed on the hoof ring. All the collected specimens were preserved in 70 per cent ethyl alcohol with proper labeling, indicating locality, date and name

#### Correspondence

**Patel Hiral**

Department of Agricultural  
Entomology, N.M. College of  
Agriculture, Navsari  
Agricultural University, Navsari,  
Gujarat, India

of collector. Mostly, spot observation were followed by collection and photography from the different areas for their identification. For identification mantid specimens were killed in killing jar and spread and pinned properly. The initial identification, of the praying mantids was done with the help of the keys of state fauna services of Zoological Survey of India, Kolkata. The final confirmation had been be done with the help of expert by sending specimens and personal visit.

**Biodiversity analysis**

For making biodiversity analysis, the data regarding collected specimens of mantids were arranged according to the source. The biodiversity count was made by using Shannon diversity index <sup>[13]</sup> to estimate species richness, evenness and species diversity. The per cent proportion of different mantid species were determined and percentage of each species was calculated. This analysis were made to determine the most abundant and prevalent mantid species in the surveyed area during course of study.

**3. Results and Discussion**

An investigation was undertaken to know the biodiversity of

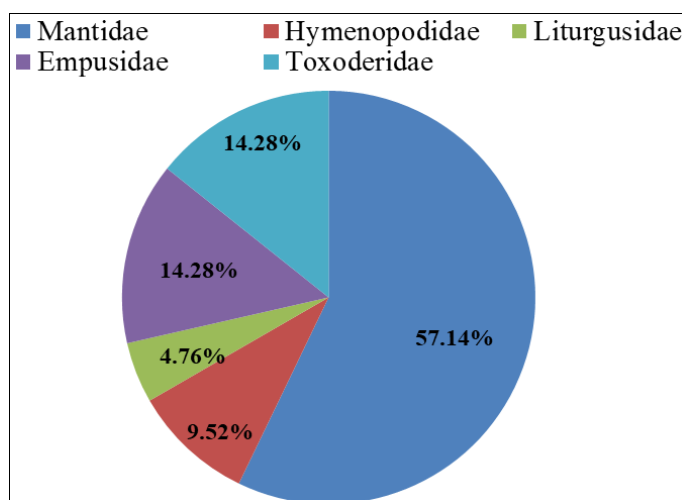
mantids at Navsari Agricultural University campus and the findings are presented as under:

**Biodiversity of mantids**

During the present study, total 21 species of mantids were recorded from different locations, which belong to five families. Among them 57.14 per cent species belongs to family Mantidae, 14.28 per cent from Empusidae, 14.28 per cent species belongs to family Toxoderidae, 9.52 per cent species represents Hymenopodidae, and remaining 4.76 per cent species from family Liturgusidae (Table 1 and Figure 1). Dwari and Mondal <sup>[14]</sup> in a study also reported a total 10 species of mantids belonging to 9 genera under 3 families viz. Mantidae, Hymenopodidae and Liturgusidae. The Mantidae was the most dominant family. Under the present study Mantidae was the most dominant family comprises of 8 genera and 12 species with 57.14 per cent species distribution. This may be more or less in accordance with the earlier work. Chaturvedi and Hegde <sup>[15]</sup> who also reported mantidae as most common family in various parts of Bandhavgarh and Sanjay Gandhi National Park, Mumbai.

**Table 1:** Species distribution of mantids in different families:

	Family	Genera	No. of species	% Species
Order Mantodea	Mantidae	8	12	57.14
	Hymenopodidae	2	2	9.52
	Liturgusidae	1	1	4.76
	Empusidae	2	3	14.28
	Toxoderidae	2	3	14.28
Total	5	15	21	100



**Fig 1:** Distribution of Mantodea in different families

Looking to the habitat wise distribution of mantids, grassland ecosystem ranked first position with 21 species (100%). The paddy ecosystem constituted 14 species (66.67%), followed by mango ecosystem constituted 10 species (47.61%), banana and pond ecosystem presented 7 species (33.33%) (Table 2,

Fig 2). The variation in species of mantids might be due to diverse kind of habitat, vegetation, food availability and agricultural practices. Chaturvedi and Hedge <sup>[15]</sup> also collected maximum number of mantid species from grassland found in Sanjay Gandhi National Park, Mumbai.

**Table 2:** Species richness of Mantids from five major agro-ecosystems of NAU campus

S. No.	Habitats	Number of observed species	Per cent distribution
1	Paddy ecosystem	14	66.67
2	Mango ecosystem	10	47.61
3	Pond ecosystem	7	33.33
4	Grassland ecosystem	21	100
5	Banana ecosystem	7	33.33
Total		21	100

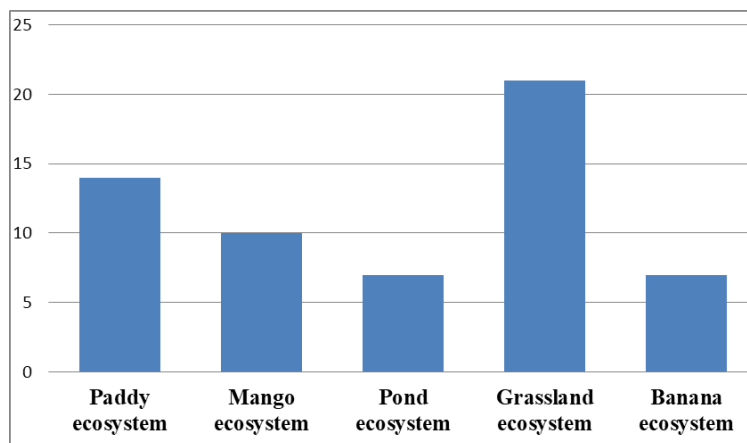


Fig 2: Species of mantids in different ecosystem

The results showed that *Mantis religiosa* (67.91) was found the most abundant in the study area followed by *Hierodula viridis* (6.95) and *Humbertiella ceylonica* (5.34%) which were also recorded as very common species. Whereas, *Archimantis latistyla* (2.40%), *Hierodula venosa* (2.13%), *Aethalochroa ashmoliana* (1.87%), *Statilia maculata* (1.60%) were evidenced as common in occurrence. Similarly, 15 species viz. *Schizocephala bicornis* (1.60%), *Hierodula membranacea* (1.60%), *Tenodora sinensis* (1.06%), *Hierodula keralensis* (1.06%), *Creobroter apicalis* (0.80%), *Hierodula coarctata* (0.80%), *Empusa guttula* (0.80%),

*Hierodula grandis* (0.80%), *Aethalochroa insignis* (0.80%), *Toxoderopsis spinigera* (0.80%), *Ameles fasciipennis* (0.53%), *Gongylus gongylodes* (0.53%), *Gongylus trachelophyllus* (0.26%) were found as rarely occurred mantids under the present study area. Sureshan<sup>[9]</sup> from Orissa while studying the diversity of mantids, found *M. religiosa* as a most dominant species among overall collected species. Further, Vyjayandi<sup>[12]</sup> also reported *M. religiosa*, *H. viridis* and *H. keralensis* as the most dominant species in Kerala, thus more or less in accordance with the present findings.

Table 3: Population and abundance of mantids in South Gujarat.

S. No.	Mantid Species	Population (No)	Abundance (%)
1.	<i>Ameles fasciipennis</i> (Kaltenbach, 1963)	2	0.53
2.	<i>Humbertiella ceylonica</i> (Saussure, 1869)	20	5.34
3.	<i>Gongylus gongylodes</i> (Linnaeus, 1758)	2	0.53
4.	<i>Tenodora sinensis</i> (Nurseryman, 1962)	4	1.06
5.	<i>Mantis religiosa</i> (Burmeister, 1838)	252	67.91
6.	<i>Hierodula viridis</i> (Burmeister, 1838)	26	6.95
7.	<i>Creobroter apicalis</i> (Westwood, 1889)	3	0.80
8.	<i>Hierodula keralensis</i> (Vyjayandi, 1995)	4	1.06
9.	<i>Aethalochroa ashmoliana</i> (Westwood, 1841)	7	1.87
10.	<i>Statilia maculata</i> (Zheng, 1987)	6	1.60
11.	<i>Hierodula coarctata</i> (Saussure, 1869)	3	0.80
12.	<i>Empusa guttula</i> (Thunberg, 1815)	3	0.80
13.	<i>Gongylus trachelophyllus</i> (Burmeister, 1838)	2	0.53
14.	<i>Archimantis latistyla</i> (Serville, 1838)	9	2.40
15.	<i>Hierodula grandis</i> (Saussure, 1869)	3	0.80
16.	<i>Tropido guttatipennis</i> (Stal, 1877)	2	0.53
17.	<i>Hierodula membranacea</i> (Burmeister, 1838)	6	1.60
18.	<i>Schizocephala bicornis</i> (Linnaeus, 1758)	6	1.60
19.	<i>Aethalochroa insignis</i> (Wood-Mason, 1878)	3	0.80
20.	<i>Hierodula venosa</i> (Olivier, 1792)	8	2.13
21.	<i>Toxoderopsis spinigera</i> (Wood-Mason, 1889)	3	0.80
Total		374	100

Further, the monthly activities of mantids were presented in the Table 4 showed that most of the collection were made during October, 2016 (80 mantids) and was followed by September 2016 (59 mantids). However, the lowest collection of mantids were made during May 2017. Where only 9 mantids were collected. Thus, activities of mantids were highest during the month of October, which were reflected in term of number of specimens collected, while lowest activity of mantids were noticed in May with lowest collection. The

present findings on mantids activities were closely supported by Dwari and Mondal<sup>[14]</sup> from various collection sites of Howrah district of west Bengal. They collected maximum number of mantids from September to November and least mantid were collected from April to July, therefore closely support the present findings. This may be due to the availability of more numbers of prays during the months of September and November as compared to the hotter months.

**Table 4:** Month Wise Mantids Collection

S. No.	Month	Year	No of mantids
1.	August	2016	20
2.	September	2016	59
3.	October	2016	80
4.	November	2016	45
5.	December	2016	39
6.	January	2017	31
7.	February	2017	34
8.	March	2017	14
9.	April	2017	18
10.	May	2017	09
11.	June	2017	13
12.	July	2017	12

### Biodiversity indices

Biodiversity is the number and variety of species and other taxa in any locality, ecosystem, region, or the biosphere. A diversity index is a quantitative measure that reflects how many different types (such as species) there are in a dataset, and simultaneously takes into account how evenly the basic entities (such as individual) are distributed among those types. The value of a diversity index increases both when the number of type increases and when evenness increases. For a given number of types, the value of a diversity index is maximized when all types are equally dominant. The value of Shannon index of diversity for mantids at Navsari Agriculture University campus has been 1.4944 (Table 5).

$$\text{Species Diversity Index (H')} = -\sum_{i=1}^k p_i \ln p_i$$

$$= 1.4944$$

Where, pi is the proportion of characters belonging to the i<sup>th</sup> type of latter in string of interest (Table 5).

Evenness is measure of the relative abundance of the different species making up the richness of an area. The evenness of mantids at Navsari Agricultural University campus has been 0.4901.

Species richness is a measure of the number of different kinds of species present in particular area. One would presume that more species equals more diversity. Mantids species richness of Navsari Agricultural University campus has been 21. The present findings were closely supported by Helmkampf <sup>[16]</sup> from Malaysia, who also reported the higher biodiversity of mantids on the farmland site due to large abundances of potential prey species that profit from anthropogenic disturbances, such as orthopterans and moths.

**Table 5:** Biodiversity indices of mantids

S. No.	Mantid Species	Population (No)	Pi	ln (pi)	(pi) × ln(pi)
1.	<i>Ameles fasciipennis</i>	2	0.005	-5.23110862	-0.027973843
2.	<i>Humbertiella ceylonica</i>	20	0.053	-2.92852352	-0.156605536
3.	<i>Gongylus gongylodes</i>	2	0.005	-5.23110862	-0.027973843
4.	<i>Tenodora sinensis</i>	4	0.011	-4.53796144	-0.048534347
5.	<i>Mantis religiosa</i>	252	0.674	-0.39482671	-0.26603297
6.	<i>Hierodula viridis</i>	26	0.070	-2.66615926	-0.18534797
7.	<i>Creobroter apicalis</i>	3	0.008	-4.82564351	-0.03870837
8.	<i>Hierodula keralensis</i>	4	0.011	-4.53796144	-0.048534347
9.	<i>Aethalochroa ashmoliana</i>	7	0.019	-3.97834565	-0.074461015
10.	<i>Statilia Maculata</i>	6	0.016	-4.13249633	-0.066296733
11.	<i>Hierodula coarctata</i>	3	0.008	-4.82564351	-0.03870837
12.	<i>Empusa guttula</i>	3	0.008	-4.82564351	-0.03870837
13.	<i>Gongylus trachelophyllus</i>	2	0.005	-5.23110862	-0.027973843
14.	<i>Archimantis latistyla</i>	9	0.024	-3.72703122	-0.089687917
15.	<i>Hierodula grandis</i>	3	0.008	-4.82564351	-0.03870837
16.	<i>Tropido guttatipennis</i>	2	0.005	-5.23110862	-0.027973843
17.	<i>Hierodula membranacea</i>	6	0.016	-4.13249633	-0.066296733
18.	<i>Schizocephala bicornis</i>	6	0.016	-4.13249633	-0.066296733
19.	<i>Aethalochroa insignis</i>	3	0.008	-4.82564351	-0.03870837
20.	<i>Hierodula venosa</i>	8	0.021	-3.84481426	-0.082242016
21.	<i>Toxoderopsis spinigera</i>	3	0.008	-4.82564351	-0.03870837
Total		374	1	-88.891408	-1.49448191

### 5. Acknowledgement

The authors are thankful to Dr. H. V. Ghate, Professor of Zoology, Modern College, Pune for identification of Mantids, also thankful to Professor and Head, Department of Entomology, N. M. College of Agriculture, Navsari, The Principal N. M. College of Agriculture, Navsari as well as

Director of Research and Dean P.G. Studies, Navsari Agriculture University for providing all the necessary facilities during the course of study.

### 6. References

1. Sureshan PM, Sambath S. Mantid (Insecta: Mantodea)

- fauna of old Bihar (Bihar and Jharkhand) with some new records for the state. Records of the Zoological Survey of India. 2009; 109(3):11-26.
2. Sureshan PM. A Preliminary Study on the Mantid Fauna (Insecta: Mantodea) of Orissa, India. Rec. zool. Surv. India. 2009; 305:1-56.
  3. Dutta W, Sur D. Praying Mantis: A threatened group of insect from Purulia, West Bengal. Biodiversity Conservation: Fundamentals and Applications, 2012, 262-263.
  4. Sathe TV, Vaishali PJ. Report on nine new species of mantids (Insecta: Mantodea) and their insect pest predatory potential from agroecosystems of Kolhapur region, Journal of Entomology and Zoology Studies. 2014; 2(5):304-307.
  5. Ehrmann R. Mantodea: Gottesanbeterinnen der Welt. Naturund Tier-Verlag Gomb H (NTV), Munster, Germany, 2002, 519.
  6. Mukherjee TK, Hazra AK, Ghosh AK. The mantid fauna of India (Insecta: Mantodea). Oriental Insects. 1995; 29:185-358.
  7. Ghate HV, Ranade SP. Biodiversity of mantids (Insecta: Mantodea) in Pune (Western Ghats) with notes on other regions of Maharashtra, J Bombay Nat. Hist. Soc. 2002; 99(2):348-352.
  8. Rao TK, Ghate HV, Sudhakar M, Maqsood JSM, Krishna SR. Updated checklist of praying mantid species (Insecta: Mantodea) from Nagarjunasagar Srisailem Tiger Reserve, Andhra Pradesh. Zoos' Print Journal. 2005; 20(6):1905-1907.
  9. Sureshan PM, Jafer P, Radhakrishnan C. New additions to the mantid fauna (Insecta: Mantodea) of Andaman & Nicobar Islands, India. Zoos' Print Journal. 2004; 19(7):1544.
  10. Sureshan PM, Ghate HV, Radhakrishnan C. Insecta: Mantodea. Fauna of Tadoba Andhari tiger Reserve. Zoo1. Surv. India. Conservation Area Series. 2006; 25:227-232.
  11. Vyjayandi MC, Narendran TC, Mukherjee TK. A new species of praying mantis (Insecta: Mantodea) from Kerala, India. Oriental Insects. 2006; 40:285-290.
  12. Vyjayandi MC. Mantid fauna of Kerala, India. Rec. zool. Surv. India. Occ. 2007; 267:1-169.
  13. Shannon CE. A mathematical theory of communication. Bell System Tech. J. 1948; 27:379-423.
  14. Dwari S, Mondal AK. Diversity of mantids (Insecta: Mantodea) of Howrah district, West Bengal, India. Journal of Entomology and Zoology Studies. 2018; 6(2):1038-1042.
  15. Chaturvedi N, Hedge V. Mantid fauna of Sanjay Gandhi National Park, Mumbai, with some new records for Maharashtra State. J Bombay Nat. Hist. Soc. 2000; 97:295-297.
  16. Helmkampf ME, Schwarz CJ, Beck J. A first look at the biodiversity of praying mantids, 2007.