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Diversity of Praying Mantis in Gardenland Ecosystems of Coimbatore

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ABSTRACT: Study on mantid diversity in gardenland crop ecosystems of Coimbatore district, Tamil Nadu revealed the occurrence of 16 species belonging to 13 genera under 7 families. Among the families, Gonypetidae was represented by four species; Eremiaphilidae, Hymenopodidae and Mantidae represented by three species each and Amophoscelidae, Toxoderidae and Empusidae by one species each. *Euantissa pulchra* was abundant and observed in many crop ecosystems of gardenland followed by *Humbertiella similis*, *Humbertiella nigrospinosa* and *Elmantis tricomaliae*. Coconut ecosystem harboured maximum number of individuals as well as mantid species followed by forage crops. *Elmantis tricomaliae* was recorded in maximum numbers of locations followed by *Humbertiella nigrospinosa*. Higher and lower species richness and diversity was observed in Periyanayakkanpalayam and Anaimalai blocks respectively.

Keywords: Praying mantis, species richness, diversity, gardenland ecosystem, Coimbatore

INTRODUCTION

Praying mantis are attractive, cryptic and solitary insects occur in tropical and subtropical climatic conditions (Schultz, 2018). Both nymphs and adult are ambush predators in terrestrial ecosystem and play a vital role in natural control of insect pests (Svenson and Whiting 2004). Mantids snatch the prey using its raptorial forelegs, adults devour larger insects like grasshoppers, beetles, crickets while nymphs predate on aphids, leafhoppers, caterpillars and other soft bodied insects (Loxton and Nicholl 1979). They also serve as bio-indicators of environmental loss (Battiston *et al*., 2020). Globally over 2300 species of mantids under 436 genera and 15 families were reported (Schwarz and Roy 2019). In India, the number of mantid species reported are 184 under 73 genera and 11 families which includes 44 species belonging to 36 genera and 9 families from Tamil Nadu (Ghate *et al.,* 2019). Reports in Tamil Nadu includes those of Chandra and Sharma (2009); Vyjayandi *et al.* (2010); Srikumar *et al.* (2018); Meeran *et al.* (2021).

Considering their importance as predators in cultivated ecosystem, the present work was conducted to inventorize the diversity of mantids in gardenland crop ecosystems of Coimbatore.

MATERIALS AND METHODS

Exploratory surveys were made from November 2021 to April 2022 to study the diversity of praying mantis in garden land ecosystem of Coimbatore district (Table 1). Sampling of mantids was done by visual inspection (Brannoch *et al.,* 2017). The morphological characters were observed using Leica S8APO stereo microscope; photographed with Leica M205C microscope and Nikon D3100 DSLR camera. Species identification was done by following the keys of Mukherjee *et al.* (1995); Vyjayandi (2007).

Relative abundance of sampled data was computed by the following Yu and Yoo (2015). Biodiversity indices *viz*., Margalef species richness index (α) (Margalef, 1958), Simpson's diversity index (D) (Simpson, 1949), Peilou's evenness index (J') (Pielou, 1966) and Berger-Parker Dominance index (May, 1975) were computed using online freeware biodiversity calculator to reveal the species richness, diversity, evenness and dominance of mantid species in different blocks of Coimbatore district.

Table 1: Details of the mantid sampling locations in Coimbatore district of Tamil Nadu.

Sr. No.	Block (Coimbatore)	Geo-coordinates		Crops
		Latitude	Longitude	
1.	Anaimalai	10.490614 N	76.979828 E	Coconut
2.		10.361599 N	76.979230 E	Tea
3.		10.402855 N	76.992796 E	Tea
4.		10.324878 N	76.946846 E	Coffee
5.		10.328324 N	76.946685 E	Pepper
6.	Annur	11.2446786 N	77.1023887 E	Arecanut
7.		11.229766 N	77.13077 E	Coconut
8.		11.232652 N	77.119994 E	Forage crop
9.	Karamadai	11.32098 N	76.941161 E	Almond, teak
10.	Kinathukadavu	10.823337 N	76.930204 E	Coconut
11.		10.806872 N	76.947853 E	Cotton
12.		10.804640 N	76.912770 E	Banana
13.		10.837120 N	76.978900 E	Pulses
14.		10.817399 N	76.987496 E	Cocoa
15.	Madukkarai	10.867786 N	76.942508 E	Fodder
16.		10.869791 N	76.947046 E	Coconut
17.	Periyanayakkanpalayam	11.179812 N	76.923359 E	Mango
18.		11.112709 N	76.954698 E	Tamarind
19.		11.13824 N	77.003726 E	Coconut
20.		11.007524 N	76.916938 E	Sugarcane
21.		11.009187 N	76.928482 E	Papaya
22.		10.994427 N	76.915104 E	Paddy
23.		11.014973 N	76.931587 E	Ornamental plants
24.		11.0068197 N	76.9290862 E	Medicinal plant
25.		11.0079551 N	76.9396390 E	Cotton
26.		11.0189349 N	76.9312299 E	Pulses
27.		11.0194842 N	76.9294208 E	Cotton
28.		11.0194842 N	76.9294208 E	Sorghum
29.	Perur	10.972094 N	76.900265 E	Moringa
30.		10.974177 N	76.909930 E	Coconut
31.	Pollachi	10.665757 N	76.882058 E	Amla
32.		10.656776 N,	76.886689 E	Mango
33.	Thondamuthur	10.9962727 N	76.799642 E	Jasmine
34.		11.000638 N	76.855003 E	Curryleaf
35.		11.006751 N	76.806535 E	Jackfruit, Citrus
36.		10.993140 N	76.851375 E	Maize

RESULTS AND DISCUSSION

A total of 227 mantids were collected during the exploratory survey conducted for a period of six months from 10 blocks of Coimbatore district. Morphological characterization revealed the occurrence of 16 species of mantids belonging to 13 genera under 7 families. Among the families, Gonypetidae was dominant and represented by four species followed by Eremiaphilidae, Hymenopodidae, Mantidae (three species each), Amophoscelidae, Toxoderidae and Empusidae (One species each). Among the species, *Euantis sapulchra* Fabricius (Family: Hymenopodidae) (21.1 %) was abundant followed by *Humbertiella similis* Giglio-Tos (19.8 %), *Humbertiella nigrospinosa* Sjostedt (17.6 %) and *Elmantis tricomaliae* Saussure (13.2 %) (Family: Gonypetidae). Above results are in accordance with the findings of Hiral *et al.* (2018); Dwari & Amal (2018); Patel *et al.* (2018). They reported the dominance of Mantidae and Hymenopodidae in terrestrial ecosystems. Srikumar *et al.* (2018) reported occurrence of eight species of mantis from the tea plantations of Tamil Nadu. However, in the present study no mantid species was observed in the tea plantations of Anaimalai block of Coimbatore district. This may be because of the use of pesticides or alterations in the climatic conditions (Battiston and Fontana 2010).

The mantid species, *Euantissa pulchra* was noticed in crops like paddy, sorghum, pulses, cotton, sugarcane, coconut, banana, citrus, curry leaf and ornamental plants. Whereas, some species were observed only in specific crop ecosystems like *Cheddikulama straminea* in ornamental plants; *Didymocorypha lanceolata*, *Schizocephala bicornis* and *Parathespis humbertiana* in forage crops; *Humbertiella indica* in mango and *Gongylus gongylodes* in medicinal plants. According to Soomro *et al*. (2013), *Humbertiella indica* resemble bark and prefers to colonize trees. Similarly, *Schizocephala bicornis* mimics like stick and prefers grassland ecosystem (Mukherjee *et al.,* 1995). From the above observations it is evident that a particular species inhabits specific microhabitat because of its camouflage ability to protect itself from their enemies.

Among the garden land crops surveyed, maximum number of species was recorded in coconut (6 species) followed by forage crops (4), sorghum (3), cotton (3), sugarcane (3), mango (3), banana (3), ornamental plants (3) and teak (3). In crops like maize, cocoa, arecanut, papaya, jack, amla, curry leaf, jasmine and medicinal plants occurrence of only one species was observed. Abundance of mantids was higher in coconut ecosystem (57 Nos.) followed by mango, cotton (21 each), ornamentals (17) and teak (16) which reveals that majority of praying mantis prefer unaltered ecosystems *viz.,* trees, ornamental plants and organic field conditions.

Elmantis tricomaliae was observed in nine out of 10 locations surveyed followed by *Humbertiella nigrospinosa*, *Humbertiella similis* (8 locations) and *Euantissa pulchra* (5). Maximum number of mantid

species was recorded in Perianayakkanpalayam (PPM) (13 species) (Margalef Index (MI) = 2.77) followed by Thondamuthur (TDM) (7 species) (MI = 1.91), Annur (ANR) (MI = 1.2) and Kinathukadavu (KKD) (MI = 1.2) (5 species in each location). In Anaimalai (ANA), only two species of mantids were recorded. Simpson's diversity index varies from 0 to 1. Increase in the value of index indicates decrease in diversity and *vice-versa* of species. Simpson's index indicated higher mantid diversity in PPM (0.154) and TDM (0.13) and lower in ANA (0.43). According to Berger-Parker index of dominance, *Humbertiella similis* was dominant in ANA, KRA, MDU, POL; *Humbertiella nigrospinosa* dominant in ANR, KKD; *Euantissa pulchra* in PPM, TDM and *Elmantis tricomaliae* in PRU. Peilou's evenness index showed higher species evenness in Anamalai (0.99) and lower in Madukkaraiblock (0.82).

Table 2: Occurrence of mantis species in gardenland ecosystem of Coimbatore District and their relative abundance.

Sr. No.	Species	ANA	ANR	KRA	KKD	MDU	PPM	PRU	POL	TDM	RA (%)
Amophoscelidae											
1.	*Amorphoscelis annulicornis*	×	✓	×	×	×	×	✓	×	✓	2.39
Eremiaphilidae											
2.	*Cheddikulama straminea*	×	×	×	×	×	✓	×	×	×	0.48
3.	*Didymocorypha lanceolata*	×	×	×	×	✓	✓	×	×	×	0.96
4.	*Schizocephala bicornis*	×	×	×	×	×	✓	×	×	×	3.52
Toxoderidae											
5.	*Parathespis humbertiana*	×	×	×	×	✓	×	×	×	×	0.44
Gonypetidae											
6.	*Elmantis tricomaliae*	✓	✓	✓	✓	×	✓	✓	✓	✓	13.40
7.	*Humbertiella indica*	×	×	×	×	×	×	×	✓	×	2.21
8.	*Humbertiella nigrospinosa*	×	✓	✓	✓	✓	✓	✓	✓	✓	17.62
9.	*Humbertiella similis*	✓	✓	✓	✓	✓	✓	×	✓	✓	19.82
Empusidae											
10.	*Gongylus gongylodes*	×	×	×	×	×	✓	×	×	×	1.44
Hymenopodidae											
11.	*Creobroterapicalis*	×	×	×	✓	×	✓	×	×	×	2.39
12.	*Euantissa pulchra*	×	✓	×	✓	×	✓	×	×	✓	20.57
13.	*Hestiasula brunneriana*	×	×	×	×	×	✓	×	×	✓	4.31
Mantidae											
14.	*Hierodula doveri*	×	×	×	×	×	✓	×	×	✓	4.85
15.	*Hierodula membranacea*	×	×	×	×	×	✓	✓	×	×	1.32
16.	*Statilia maculata*	×	×	×	×	×	✓	×	×	×	1.32

Note:(✓) mark indicates presence of species; (×) mark indicates absence of species

Abbreviations used

ANA	Anaimalai	MDU	Madukkarai	TDM	Thondamuthur
ANR	Annur	PPM	Periyanayakkanpalayam	RA	Relative abundance
KRA	Karamadai	PRU	Perur		
KKD	Kinathukadavu	POL	Pollachi		

Table 3: Diversity of mantids in garden land ecosystem.

Mantid species	Crops
Family: Amophoscelidae	
Amorphoscelis annulicornis	Coconut, arecanut, citrus, jack,
Family: Eremiaphilidae	
Cheddikulama straminea	Ornamental plants
Didymocorypha lanceolata	Forage crops
Schizocephala bicornis	Forage crops
Family: Toxoderidae	
Parathespis humbertiana	Forage crops
Family: Gonypetidae	
Elmantis tricomaliae	Paddy, coconut, mango, tamarind, teak
Hubertiella indica	Mango
Humbertiella nigrospinosa	Coconut, mango, moringa, teak
Humbertiella similis	Coconut, cocoa, amla, moringa, teak
Family: Empusidae	
Gongylus gongylodes	Medicinal plants
Family: Hymenopodidae	
Creobroter apicalis	Pulses, cotton, banana
Euantissa pulchra	Paddy, sorghum, pulses, cotton, sugarcane, coconut, banana, citrus, curryleaf, ornamental plants
Hestiasula brunneriana	Forage crops, coconut, tamarind, jasmine, ornamental plants
Family: Mantidae	
Hierodula doveri	Sorghum, cotton, sugarcane, ornamental plants
Hierodula membranacea	Sorghum, banana
Statilia maculate	Maize, sugarcane, papaya

Table 4: Species richness and diversity of mantids in different blocks of Coimbatore district.

Sr. No.	Place of collection	Margelef's Index of Species Richness (α)	Simpson's Diversity Index (D)
1.	Anaimalai	0.5139	0.4286
2.	Annur	1.214	0.2222
3.	Karamadai	0.7578	0.3846
4.	Kinathukadavu	1.228	0.2585
5.	Madukkarai	1.365	0.3056
6.	Periyanayakkanpalayam	2.771	0.154
7.	Perur	1.108	0.3048
8	Pollachi	0.8049	0.3788
9.	Thondamuthur	1.914	0.1304

Table 5: Dominance of mantid fauna recorded in different blocks of Coimbatore district.

Sr. No.	Dominant insect	Location	Berger-Parker Index of Dominance
1.	*Humbertiella similis* Giglio-Tos	Anaimalai	0.5714
2.		Karamadai	0.571
3.		Madukkarai	0.556
4.		Pollachi	0.5
5.	*Humbertiella nigrospinosa* Sjostedt	Annur	0.3333
6.		Kinathukadavu	0.423
7.	*Euantissa pulchra* Fabricius	Periyanayakkanpalayam	0.342
8.		Thondamuthur	0.217
9.	*Elmantis tricomaliae* Saussure	Perur	0.467

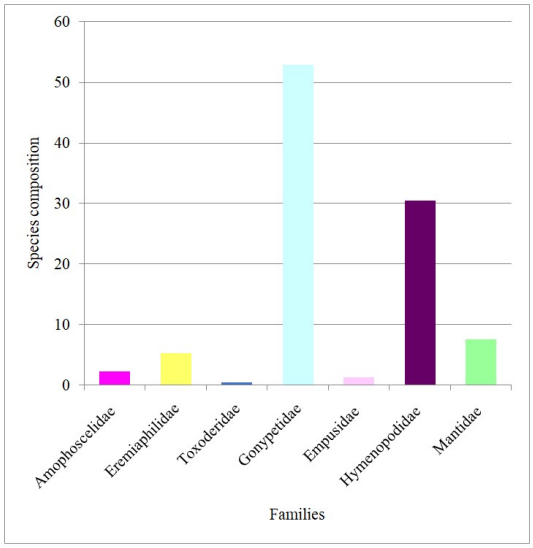

Fig. 1. Species composition of mantid families.

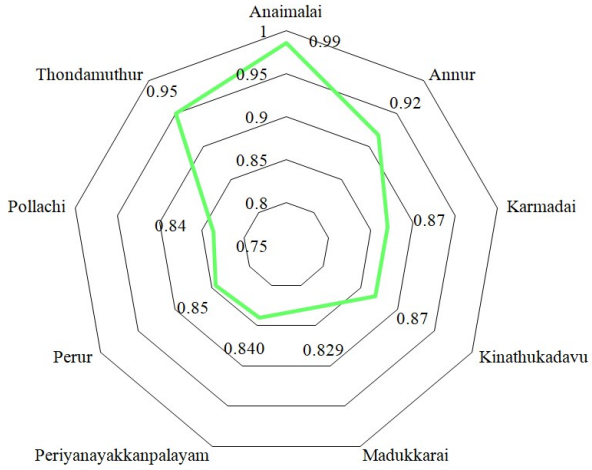

Fig. 2. Mantid species evenness in different locations of Coimbatore district.

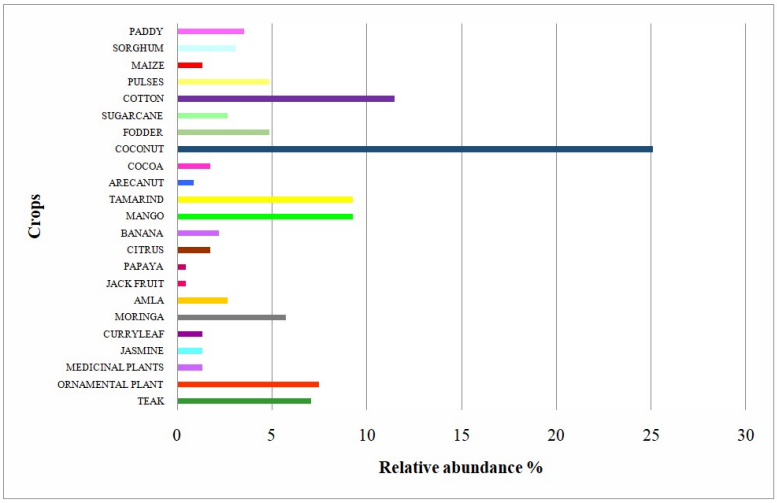

Fig. 3. Abundance of mantid fauna in different gardenland crops.

CONCLUSION

This study has provided fundamental information on the diversity of mantid fauna in the gardenland crop ecosystem of Coimbatore district, Tamil Nadu. A total of sixteen species of mantids were recorded in the study. *Euantissa pulchra*, *Humbertiella similis*, *Humbertiella nigrospinosa* and *Elmantis tricomaliae* were abundant. Mantid species richness and diversity were higher in Periyanayakkanpalayam block yielding more than thirty percent of the total specimen count. Six months study revealed the occurrence of 16 mantid species, intensive study could exhibit the presence of more number of species, even occurrence of new species. Further, this is the first report on the mantid diversity from Coimbatore district of Tamil Nadu.

FUTURE SCOPE

It is evident that with only six months of survey, focusing on understudied areas can result in new records, new species, and additional knowledge improvements to biodiversity understanding. Furthermore, this research is important for conserving as well as assessing the influence of habitat change on Mantodea diversity.

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Conflict of interest. None.

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