



Short Communication

Diversity and Morphometric of Oothecae of Mantids in District Mirpurkhas, Sindh

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ABSTRACT

Mantids is a fascinating and predatory small group of bulky insects and has been superbly engineered for speed and power. Object of this work is to see the stability and morphometrics of oothecae of mantids occurring in agricultural areas of Mirpurkhas. Due to the little exploration to this bio-control agent is the reason to conduct research in District Mirpurkhas, Sindh (May to Oct 2018). Total 319 specimens were collected and arranged into 06 genera and 08 species along with morphometrics of 40 oothecae which were sorted and a few healthy were allowed for hatching at the advanced research laboratory of Arachnology and Entomology. The collected samples were kept at an Average temperature and humidity between 28.2 ± 0.47 to 38.78 ± 0.47 °c, 57.6 ± 0.55 to 72.6%, respectively.

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Authors' Contribution

JAK and TJU conceived and designed the experiments. FM, SM and AS collected the data and did experiments. FS helped in writing the paper.

Key words

Mantids, Oothecae, Species Richness, Morphometrics

Mantids are predatory insects consume many types of animals like arthropods, insects, birds, reptiles, etc. It is a small group includes 436 genera and 2370 species of which, 38 species in 23 genera and 5 families exist in Pakistan. Mostly occurs in warmer parts of the world (Beier, 1968; Chaturvedi and Hegde, 2000; Chaturvedi *et al.*, 2005; Mohammad *et al.*, 2011). Due to their predatory lifestyle, they have evolved powerful raptorial forelegs with two ventral rows of sturdy spines on femur. These structures help them in seizing, holding and capturing prey which is some time bigger and power full (Bertsch *et al.*, 2019). Mantids need plants for niche hence their association is more effective regarding to predatory nature in the ecosystem (Ursani *et al.*, 2017). Their life span is short less than a year and are oviparous, lay eggs in oothecae. Ootheca (egg beg) is light brown, larger and varies in color and size (Bowie and Bowie, 2003; Lim *et al.*, 2019; Ursani *et al.*, 2017). The female constructs them by moving her abdomen side to side to lay down a continuous ribbon. The strong outer case is formed at the same time by producing foam which sets hard. The number of eggs in each oothecae is variable, having 258 to 330 and 50 to 60 eggs which found on different parts of trees and shrubs. Their two characters make them unique in insect's world; first, forelegs which armed with sharp spines like jack knife are flexible like arms of man; second is highly movable head. Despite several parameters of research

done on praying mantids occurring in the world, the rearing, richness and morphometric study of oothecae is still fully or partially unresolved. This study will be an attempt to illuminate the knowledge about the species richness and morphometric study of oothecae of mantids in District Mirpurkhas, Sindh including their identification, keys and distribution. The present exploration will hopefully lay a valuable basis for further research of the biology of praying mantids which will be without doubt made available a dense basis for studies leading to rather more hopeful field, the biological control of insect pests of agriculture of Pakistan. This study will lead to a better understanding of these fascinating insects that can be used against the pest as bio-control agents for the first time in Mirpurkhas, Sindh. The work allover reported on mantids is fair but diverge by several researchers like (Bethoux and Wieland, 2009; Bohn *et al.*, 2010; Devi *et al.*, 2011; Ehrmann, 2011; Khokhar *et al.*, 2016; Metz *et al.*, 1985; Mukherjee *et al.*, 2005; Nalepa and Lenz, 2000; Prete *et al.*, 2012; Prete and McLean, 1996; Ramsay, 1990; Rivera, 2010), but the present work is distinguished and first time reported.

Materials and methods

During the present study (May to October, 2018) 319 specimens and 49 oothecae were collected from bushes, grasses, open grounds, crops, on the bark of the trees and the field where there is no tillage by hand picking, insect net and light trap methods. Oothecae of species were reared and processed according to (Ursani *et al.*, 2017). The oothecae were kept at an Average temperature and

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humidity between 28.2 ± 0.47 to $38.78 \pm 0.47^\circ\text{C}$, 57.6 ± 0.55 to 72.6% and were held in reserve in fish aquarium like glass houses and top of reserve enclosed with fine mesh nylon cloths. These houses were refined bushy and muddy as compared with the natural habitats of praying mantids. Soon after hatching in the same way nymphs were transferred in other glass houses with 2 feet height and width and 4 feet length. For maintaining glass house temperature during day and night a bulb was fixed, in winters bulb was brought closer to glass houses while during hot temperature it was maintained on distant or switched off.

Results

For the present survey 03 families, Empusidae, Eremiaphilidae and Mantidae were collected from ten agricultural sites, The Mantidae is the largest occurring family and Empusidae is least occurring family, and 06 genera and 06 species recorded (Table I and II). Maximum number of specimens was collected of family mantidae. *Mantis religiosa religiosa* (Linnaeus 1758) species was

found from almost all the visited localities of District Mirpurkhas. Other collected species were *Tenodera attenuata* (Stoll 1937), *Sphoodromantis trancaucasica* (Stoll, 1937), *Empusa unicornis* (Linnaeus, 1763), *Microthespis dmitrievi* (werner 1708), *Humbetiella indica* (Saussure, 1869). Together with specimens 40 Ootheca were also collected and after the assortment and identification the eggs were of three species i-e *Mantis religiosa religiosa* (Linnaeus 1758), *Tenodera attenuata* (Stoll 1937) and *Humbetiella indica* (Saussure, 1869).

Table I. Diversity of Mantodea in district Mirpurkhas.

S. No	Name of families	No. of specimen	No. of genera	No. of species
1.	Empusidae	64	01	01
2.	Eremiaphilidae	91	01	01
3.	Mantidae	164	04	04
Total	03	319	06	06

Table II. Mantids and Ootheca collected from 10 sites of district Mirpurkhas.

Name of species	MK	GQM	DL	KAS	BM	SA	KGM	JT	ST	HBT	# of species
Mantids											
<i>Mantis religiosa religiosa</i> (Linnaeus 1758)	+	+	+	+	-	+	+	+	+	+	74
<i>Sphoodromantis trancaucasica</i> (Stoll, 1937)	+	+	+	+	+	+	+	+	+	+	69
<i>Tenodera attenuata</i> (Stoll 1937)	+	+	+	+	+	+	+	+	+	+	105
<i>Empusa unicornis</i> (Linnaeus, 1763)	+	+	+	-	-	-	+	-	-	-	05
<i>Microthespis dmitrievi</i> (werner 1708)	-	-	-	+	-	-	-	+	-	-	07
<i>Humbetiella indica</i> (Saussure, 1869)	+	+	+	-	-	-	+	+	-	+	79
Total											319
Oothecae											
<i>Mantis religiosa</i> (Linnaeus 1758)	+	-	-	-	-	-	+	+	-	-	09
<i>Tenodera attenuata</i> (Stoll 1937)	+	+	-	-	-	-	-	+	+	-	19
<i>Humbetiella indica</i> (Saussure, 1869)	+	+	+	-	-	-	+	-	-	-	12
Total											40

Note: (+) sign indicates the presence of species while (-) sign indicates absence of the species. MK, Mataro Khaskheli; GQM, Ghulam Qadir Mari; DL, Dolat Laghari; KS, Khadim Ali Shah; BM, Bair Mori; SA, Shuja Abad; KG, Kot Ghulam Mohammad; JT, Jhudo Taluka; ST, Sindhri Taluka; HT, Hussain Bux Mari Taluka.

Table III. Oothecae hatching status.

Ootheca studies	Date of hatching	No. of hatching	No. of compartments/eggs	Hatching birth rate %
1 st	17 Oct, 2017	209	355	59.714
2 nd	22 Oct, 2017	255	347	74.344
3 rd	27 Oct, 2017	220	312	70.512

The oothecae of species were reared in Zoology laboratory of DNMMGDC Village Sadiq Memon, Tando Allahyar near MirpurKhas and were processed according to (Ursani et al., 2017) and standard entomological methods to take measurement of Oothecae. Specimen's progression was according to model entomological methods and Egg case or oothecae measured in mm (Table III) and were held in reserve in fish aquarium like glass houses and top of reserve enclosed with fine mesh nylon cloths. These houses were refined bushy and muddy as compared with the natural habitats of praying mantids (Fig. 1). Average temperature and humidity was adjusted between 28.2 ± 0.47 to 38.78 ± 0.47 °C, 57.6 ± 0.55 to 72.6% . 40 number of oothecae was collected out of which 3 species oothecae were sorted out (i.e. *Tenodera attenuata*, *Mantis religiosa*, *Humbertiella indica*). Some of the oothecae were remain unknown due to denatured state of Oothecae or their already hatching. Three healthy Oothecae of *Tenodera attenuata* species selected to see hatching status of eggs (Table IV).



Fig. 1. Praying mantids (A) and their ootheca (B) collected from Mirpurkhas C and D show oothecae of 3 species of praying mantids fixed in glass Houses in lab.

Table IV. Morphometric (mm) of selected (03) oothecae of *Tenodera attenuata*.

Oothe- cae	Length	Width	Vertical height	No. of compartments/ eggs/ oothecae
1 st	19	13	16	350
2 nd	15	11	13	347
3 rd	09	08	10	312

Discussion

During survey it was observed that mantid biodiversity and species richness is somewhat stable at natural habitats where no tillage, no pesticides spray were used and also where there is no bi-annual cultivation. While in cultivated areas species richness decreases. The species *Tenodera attenuata* was reared in the laboratory as is the foremost occurring species throughout Sindh province and grow huge and feed many insect pests in comparison of other species of praying mantids. Reared *Tenodera* species recorded longevity period in female is $165 \pm$ days (around 6 months) and in male longevity observed is $134 \pm$ days (around 4 months). So, females have elongated longevity than males. During rearing it has been observed that the females of *Tenodera attenuata* species are more pitiless and eager prey feeders, spend more time in hunting and eating anything but adults males lazy and rarely hunting. However, the cannibalistic behavior was not recorded as both partners live freely, attack and feed on other insects rather to eat themselves. Mating takes 2 h to complete and after few days female deposited its eggs within a foamy light brown Oothecae. Females after mating laid 1-3 times oothecae but 1st Ootheca were healthy then 2nd and 3rd.

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Statement of conflict of interest

The authors have declared no conflict of interest.

References

- Beier, M., 1968. *Mantodea (Fangheuschrecken)* (Vol. 12). Walter de Gruyter.
- Bertsch, D.J., Martin, J.P., Svenson, G.J. and Ritzmann, R.E., 2019. *J. exp. Biol.*, **222**.
- Bethoux, O. and Wieland, F., 2009. *Zool. J. Linn. Soc.*, **156**: 79-113. <https://doi.org/10.1111/j.1096-3642.2008.00485.x>
- Bohn, H., Picker, M., Klass, K.D. and Colville, J., 2010. *Arthrop. Syst. Phylog.*, **68**: 53-69.
- Bowie, M.K. and Bowie, M.H., 2003. *N. Z. Ent.*, **26**: 3-5. <https://doi.org/10.1080/00779962.2003.9722103>
- Chaturvedi, N. and Hegde, V., 2000. *J. Bombay natl. Hist. Soc.*, **97**: 295-296.
- Chaturvedi, N., Mukherjee, T.K. and Giri, V., 2005. *J. Bombay natl. Hist. Soc.*, **102**: 242.
- Devi, M.B., Joymati, L., Kananbala, A., Binarani, A. and Manoj, K., 2011. *Ann. Pl. Prot. Sci.*, **19**: 457-

- 458.
- Ehrmann, R., 1992. *Entomol. Z.*, **102**: 153-162.
- Ehrmann, R., 2011. *Articulata*, **26**: 1-42. <https://doi.org/10.1111/j.1467-9604.2010.01476.x>
- Khokhar, J.A., Soomro, N.M., Ursani, T.J., Malik, S., Narejo, N.T. and Dhiloo, K.H., 2016. *Eur. Acad. Res.*, **3**: 12116-12123.
- Lim, J.R., Kwon, S.J., So, S.Y. and Cheon, H.K., 2019. *J. Sericult. entomol. Sci.*, **55**: 1-5.
- Metz, J.A.J. and Van Batenburg, F.H.D., 1985. *J. math. Biol.*, **22**: 209-238. <https://doi.org/10.1007/BF00275716>
- Mohammad, S.K., Alla, S.M.G., El-Hamouly, H., Ehrmann, R. and El-Den Nasser, M.G., 2011. *Zootaxa*, **3044**: 1-27. <https://doi.org/10.11646/zootaxa.3044.1.1>
- Mukherjee, T.K., Das, B.C. and Hazra, A.K., 2005. *Rec. Zool. Surv. India*, **104**: 143-149.
- Nalepa, C.A. and Lenz, M., 2000. *Proc. R. Soc. Lond. Ser. B Biol. Sci.*, **267**: 1809-1813. <https://doi.org/10.1098/rspb.2000.1214>
- Prete, F.R. and McLean, T., 1996. *Brain Behav. Evol.*, **47**: 42-54. <https://doi.org/10.1159/000113228>
- Prete, F.R., Theis, R., Komito, J.L., Dominguez, J., Dominguez, S., Svenson, G. and Wieland, F., 2012. *J. Insect Physiol.*, **58**: 648-659. <https://doi.org/10.1016/j.jinsphys.2012.01.018>
- Ramsay, G.W., 1990. *Mantodea (Insecta), with a review of aspects of functional morphology and biology*. Fauna of New Zealand, pp. 19.
- Rivera, J., 2010. *Zootaxa*, **2638**: 44-64. <https://doi.org/10.11646/zootaxa.2638.1.3>
- Ursani, T.J., Khokhar, J.A., Dhiloo, K.H., Malik, S., Yaseen, M., Chandio, J.I., Soomro, A.R., Raza, U. and Chandio, W.A., 2017. *J. Ent. Zool. Stud.*, **5**: 2620-2624.

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