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Predatory Behavior of Praying Mantids (Mantidae:Mantodea) from Sindh, Pakistan

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ABSTRACT

Diverse activities (predators, scavengers, etc) for acquiring food is called feeding behavior. The aforesaid food or the prey is obtain diversely by different predators with the help of special capabilities (like lion, leopard, hyena, etc) but in praying mantids it is much unique. Praying mantids (Mantodea) is a class of generally large and egregious predatory insects with versatile, unique and special capabilities. They feed upon a diverse form of animals, ranging from mosquitoes to grasshoppers, reptiles and tiny vertebrates. Observing the feeding behaviour of praying mantids under natural conditions is difficult due to their speed, camouflage, low lying in vegetation etc. That's why this study was under taken to see feeding behavior of three diverse occurring species in Laboratory conditions. The feeding behaviour of preying mantids commonly comprises upon three stages; the search of prey, locating the prey and continuous visual focus, slow movement towards the prey of or waiting for prey to come closer and finally stream fast attack on the prey with their pair of raptorial legs. All this known from their oothecae (egg case) rearing in aerated cadges to hatching. From first nymphal instar to adult; the feeding behaviour of Tenodera attenuata, Sphrodomantis transcausica and Mantis religiosa was documented.

INTRODUCTION

The agricultural areas of Pakistan which have right average ecological condition often suitable and encouraging for insect fauna. In which most insects are pest causes far-reaching damage to agriculture. Farmers use pesticides in order to save their crops. These practices proved risky for numerous fauna, flora and men. Other hand nature has alternate of these pesticides, predator like birds, reptiles, arthropods and a few insects. Birds and reptiles has many disadvantages for predation due to size, weight, colour and number but predator insects are the best for above troubles like Praying mantids PM. PM fit in order Dictyoptera and suborder Mantodea which consists of 2300-2500 species, 446-450 genera and 14 families as stated by (Beier, 1968, Vickery & Kevan, 1983, Ken Preston-Mafham, 1990, Otte & Spearman, 2005, Ehrmann, 1985, (Soomro *et al.*, 2002, 2012, Khokhar & N.M. Soomro, 2009, N.M. Soomro *et al.*, 2012, Soomro *et al.*, 2013). They are diurnal, solitary and found in warmer areas of the world (Ehrmann, 2001, Hessler *et al.*, 2008). They were used as biological control agents, but not giving satisfactory results in biological control, yet a few species of PM in China were lucratively applied as bio-control agents in cotton (Wang & Jin, 1995). Toil on this insect is scarce in Pakistan. Only little research on taxonomy reported except Biology of *Tenodera attenuatta* from Sindh (Tahira *et al.*, 2018). In addition the reported literature throughout the world is focused on mating and cannibalism behaviour as (Maxwell, 1999, Roeder, 1935, Kynaston & Mill, 1994, Lawrence, 1992, Liske, & Davis, 1987). but this research work is purely on feeding behaviour of three species of Mantodea and it is reported for the first time.

METERIALS AND METHODS

Specimen and their oothecae gathered in 2019-2020 (in May-October from 13 different sites of district Matiari (Table1,2 & Picture,1,2) by hand picking. Overall 434 specimens and 117 oothecae were collected. Only selected species and their oothecae were allowed for rearing and hatching for observing Feeding Ethology in Glass cages having 3-5 feet length, 2-3 feet width and 1.5 feet height) were refined as bushy and muddy as their natural habitats (Picture 3-5). The controlled live observations were carried out in the lab and green house facilitated by

Institute of Biotechnology and Genetic Engineering IBGE. The morphometric of body, tegmina, pronotum, legs (all 3 pairs) and antennae each stage was documented. Pictures were taken by digital Samsung 12.5 mixa pixel camera.

RESULTS

Specimens were progression according to model entomological methods and Egg case or oothecae measured in mm (Table 3) and were held in reserve in fish aquarium like glass houses (3 feet in length, width and height 1.5 feet) on top of enclosed with fine mesh nylon cloths. These houses were refined bushy and muddy as compared with the natural habitats of praying mantids (Picture.3,4). Average temperature and humidity was adjusted for all species and for their oothecae 28.2 ± 0.47 to 38.78 ± 0.47 ^{0}c, 57.6 ± 0.55 to 72.6 %. Subsequent to a period praying mantids nymphs appeared from egg case or oothecae, each species has different hatching duration (Table.4). The behaviour of the hatchling or Nymphs: they seem to be hungry or starved after hatching, and looked tired when experienced first time from the ootheca where cannibalistic behaviour noted. It was recorded highest in *Sphodromantis transcaucasica* nymphs then other two species (Picture5,6,15). After hatching nymphs were shifted in other glasses cages for three purposes 1. To avoid them from cannibalism, 2. To provide space, 3. And to easy for feeding. Further morphometric of new born to adult at each molt, time period and feeding behaviour recognized as in (Table.5). Nymphs to adults of objective species properly feed upon different insect which were collected by insect net. After each molt the feeding behaviour of all members become aggressive and consumption of prey also increase. They feed upon a diverse form of animals, ranging from mosquitoes to grasshoppers, reptiles and tiny vertebrates. Observing the feeding behaviour of praying mantids under natural conditions is difficult due to their speed, camouflage, low lying in vegetation etc. That's why this study was under taken to see feeding behavior of three diverse occurring species in Laboratory conditions. The feeding behaviour of preying mantids commonly comprises upon three stages; the search of prey, locating the prey and continuous visual focus, slow movement towards the prey of or waiting for prey to come closer and finally stream fast attack on the prey with their pair of raptorial legs. All this known from their oothecae (egg case) rearing in aerated cadges to hatching (Pic 3,15, 16). Once the any victim moves near the reach of raptorial legs and they exhibit the swift, jerk movements which is in part of a second. When a mantid feels hunger after 3-4 hours of 1st meal it again starts slow locomotion for the search of other meal (Picture 7,8, 16).

Table 1

Collection of mantids from thirteen (13) sites of District Matiari

Name of Species	OS	OV	SE	KH	NM	SP	BS	MA	ST	SA	ZA	PI	HA	#sp
Mantis religiosa (Linnaeus 1758)	+	+	+	+	-	+	+	+	+	+	-	-	+	125
Sphrodromantis transcaucasica (Stoll 1937)	+	+	+	+	+	+	+	+	+	+	+	-	-	149
Tenodera attenuata (Olivier, 1792)	+	+	+	-	-	-	+	-	-	-	+	-	+	160
Total specimen of praying mantids collected														434

Table 2

Collection of oothecae of mantids from thirteen (13) sites of District Matiari

Species	OS	OV	SE	KH	NM	SP	BS	MA	ST	SA	ZA	PI	HA	#sp
Mantis religiosa (Linnaeus 1758)	+	-	-	-	-	-	+	+	-	-	-	-	+	20
Sphrodromantis transcaucasica (Stoll 1937)	+	+	-	-	-	-	-	+	+	-	+	-	-	36
Tenodera attenuata (Olivier, 1792)	+	+	+	-	-	-	+	-	-	-	+	-	+	61
Total oothecae of mantids collected														117

Note: (+) sign indicates the presence of species while (-) sign indicates absence of the species.
OS= Oderolal Station, OV= Oderola Village, SE= Sekhat, KH= Khyber, NM= Nobat Mari, SP= Sultan Pur, BS= Bhitshah, MA= Matiari, ST= Sheer M. Thora, SA= Saeedabad, ZA= Zairpir, PI= Pingharo, HA= Hala

Table 3

Morphometric (Range/Average) of selected (05) oothecae of each species and no. of eggs.

Oothecae of Species	Length	width	Vertical height	No. of compartment/Eggs
Species 1*	19	13	16	350
Species 2*	17	11	13	290
Species 2*	18	12	14	243

*** *Mantis religiosa , Sphrodromantis transcaucasica* and *Tenodera attenuata*

Table 4

Morphometric (Range/ Average) of selected (05) oothecae of each species and hatching birth rate.

Ootheca studies	Date of hatching	No. of hatching	No. of compartment/ eggs/ ootheca	Hatching birth rate %
Species 1*	October, 2020	274	350	78.28
Species 2*	October, 2020	230	290	79.31
Species 2*	November, 2020	185	243	76.13

Table 5

Morphometric (/ Average /Range) of 05 nymphs of each species after each molt and feeding rate.

Nymph stage	*Feeding status noted/ stage
1st instar	Fruit flies, houseflies, aphids, jasids, mosquitoes, drosophila etc
2nd instar	Crickets, beetles, butterflies, flies etc. Prefer small prey
3rd instar	Grasshoppers nymphs, moths, butterflies stick insects crickets etc

4th instar	Crickets, grass hoppers etc, Ignore small prey
5th instar	Butter flies, moths, all small animals which come close to them.

* with the increase of size their choice of prey; size of prey; number of the prey increase and dramatically their ignorance to small and tiny insects or prey was decrease

Table 6

Morphometric (Range) of 05 adults male & female of three species.

BPA	*T. attenuata*		*S. transcaucasica*		*M. religiosa*	
	Male	Female	Male	Female	Male	Female
TBL	79.00- 80.50	79.00- 80.50	49.00- 50.50	46.00.46.50	43.00.46.00	48.00.49.00
LP	31.50- 30.50	31.50- 30.50	16.50- 17.00	17.50-18.00	13.00-14.00	14.00-14.50
WP	04.00- 04.00	04.00- 04.00	05.00- 05.50	05.00- 05.50	04.00- 04.50	05.00- 05.50
LT	52.00-51.00	52.00-51.00	36.00-36.50	40.00- 41.50	30.00- 33.50	33.50- 34.50
LC	14.00-14.00	14.00-14.00	11.00-11.50	12.00-13.00	10.00-10.50	11.00-11.50
LFF	18.00- 18.00	18.00- 18.00	13.00- 14.00	16.00-16.50	10.50-11.00	10.50-11.50
LFT	08.00- 08.50	08.00- 08.50	07.00- 07.50	07.50-08.00	05.50-06.00	06.00-07.00

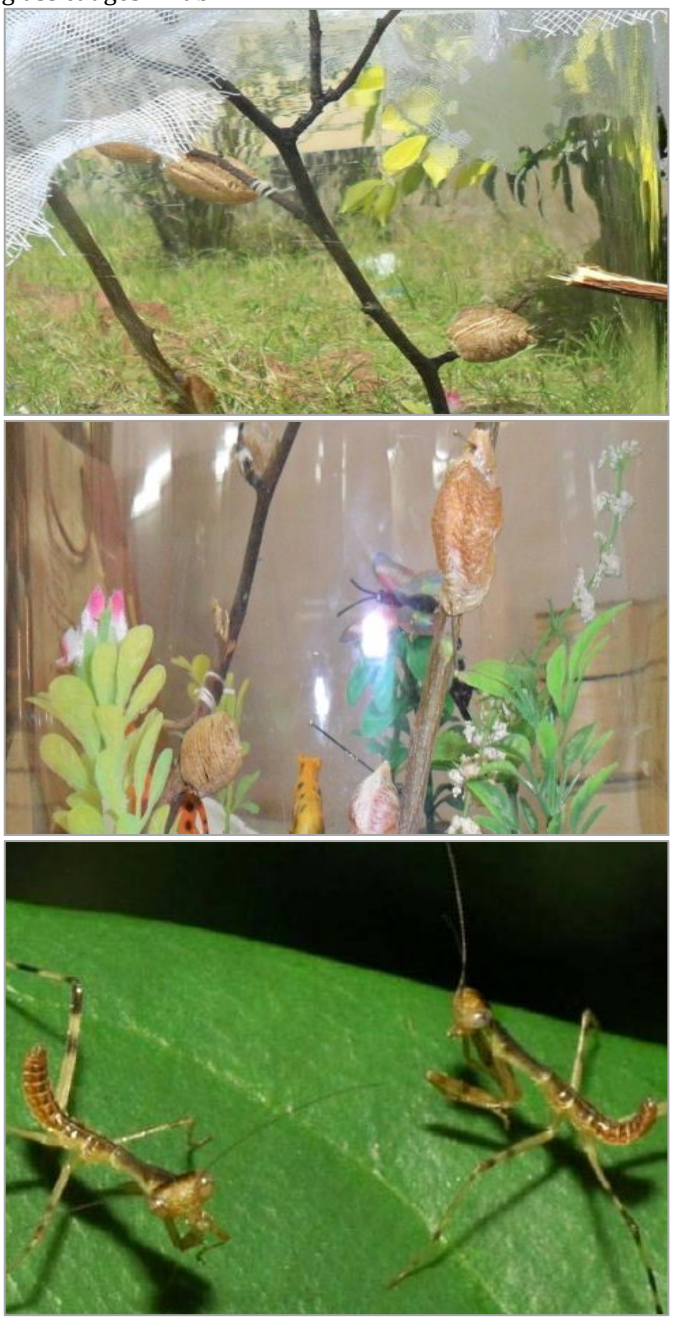
BPA, body parameter.TBL, total body length. LP, length of pronotum. WP, width of pronotum. LT, length of tegmina. LC, length of coxa. LFF, length of fore femur. LFT, length of fore tibia.

Picture 1, 2

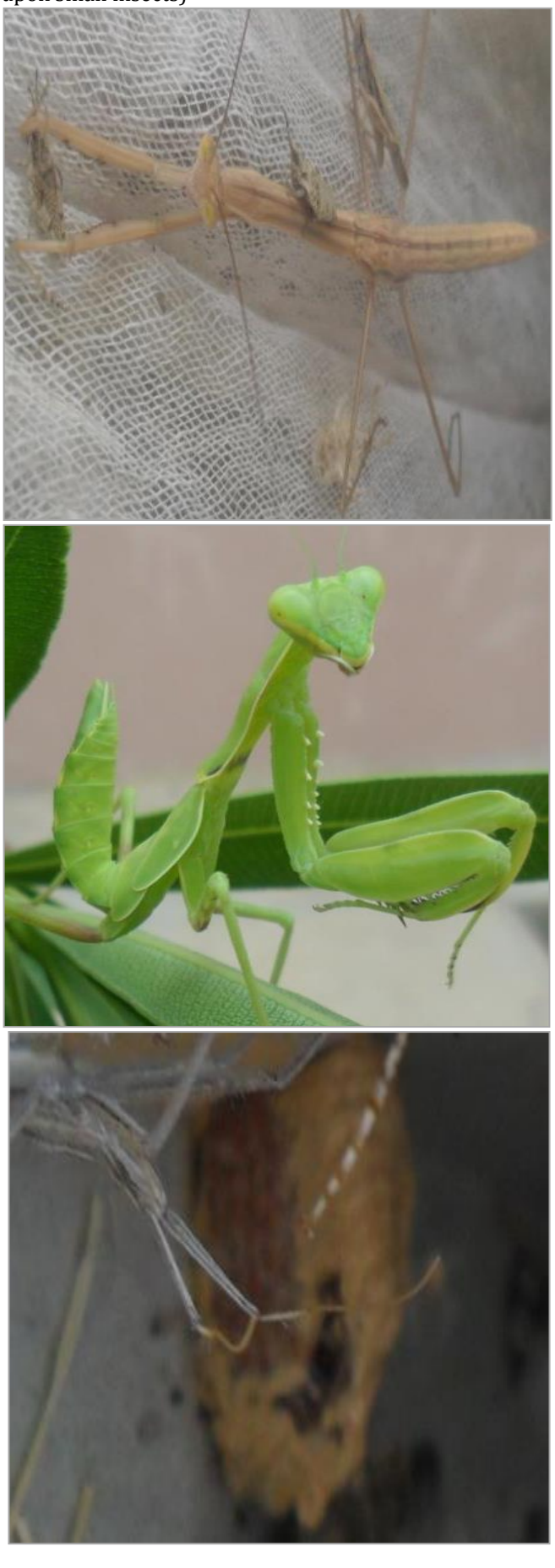
Showing collected sample of adult praying mantids and their oothecae

Picture 3-5

The oothecae of 3 species of praying mantids fixed in glass cadges in lab

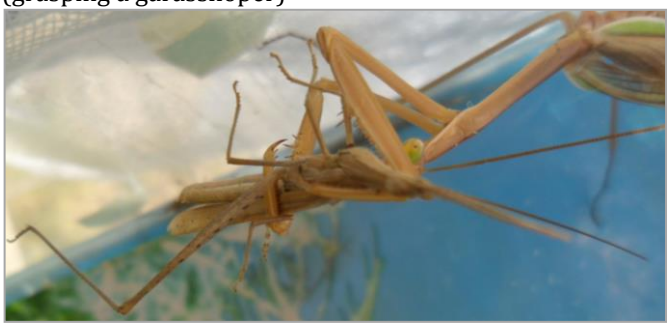


Picture 6-8
The nymphs of 3 species of praying mantids (feeding upon small insects)



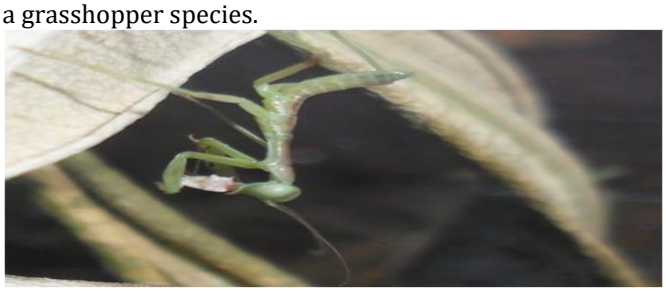
Picture 9-11
Feeding behaviours of *Tenodera attenuata* species from nymph to adult

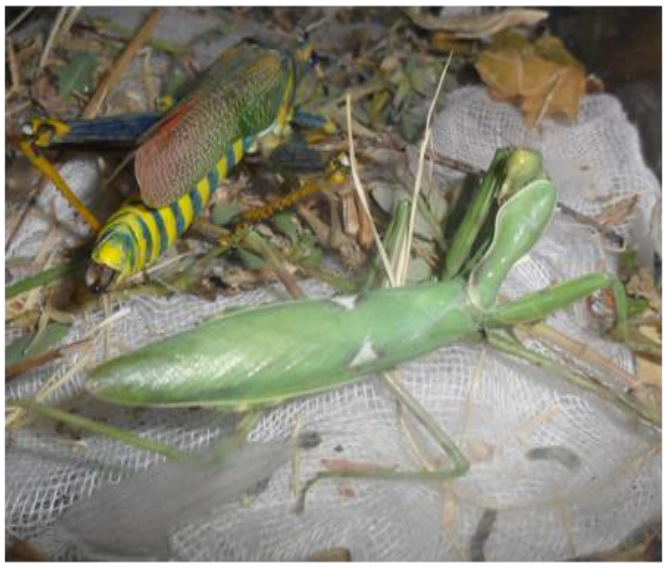
Picture 12
Feeding behaviour of *Tenodera attenuata* (Male) (grasping a garasshoper)



Picture 14
Feeding behaviour of *Tenodera attenuata* (Female) (Eating a grasshoper)

Picture 15,16
Feeding behaviour of *Sphrodromantis transcaucasica* (nymph) (Eating a small insects) and in adult stage eating a grasshopper species.





CONCLUSION

In general all above three species of praying mantises are ambush predators specifically when they are reached at adult stage and this has been often observed in females, while some are stalking which pursue the prey, this specially observed in new hatching up to their lost molt when their wings are developed. Their best hunting tools are use of camouflage and patience to stalk or lie in wait for prey before capturing it with lightning-fast, spined (saw like) forelegs. They are visually oriented hunters that strike in milliseconds, grabbing their victims and consuming them with powerful mandibles. In general Predatory plannings for to capture prey are under, Surprise attack predation; Stalking; Mimicry; Active pausing the prey.

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