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Report on nine new species of mantids (Insecta: Mantodea) and their insect pest predatory potential from agroecosystems of Kolhapur region

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Abstract
Mantids (Mantodea: Insecta) are very potential biocontrol agents of several agricultural insect pests. Therefore, present work was aimed to study morphological, biodiversity, predatory potential and abundance of mantids during the years 2011-13 from Kolhapur district, India. A total of nine species of mantids belonging to the genera *Creobroter, Humbertiella, Eremoplana, Deiphobe, Hierodula* and *Schizocephala* have been reported feeding on moths, caterpillars, grasshoppers, jassids, scales, mealy bugs, white flies, aphids and termites on various economically important crop plants.

Keywords: Abundance, Agroecosystems, Biocontrol potential, Diversity, Mantids, Pests.

1. Introduction
Mantids (Insecta: Mantodea) are associated with agro and forest ecosystems [9, 10]. They are carnivorus showing peculiar habits of pre-capture, camouflage and reproduction and well known biological pest control agents. They are found in warm moist tropical rainforest, particularly after monsoon and generally prefer altitude of about 3500 to 4000 ft. As mantids are mostly weak fliers they are found on herbs, shrubs and trees.
Mantids were previously considered to belong to order Dictyoptera but, Burmeister [3] considered them under order Mantodea for their distinctive features. Giglo-Tos [4] provided family status of mantids and divided into thirty two sub-families. However, most workers accepted Beier's [1] classification which is also followed in the present text. According to his classification Blattopteriodea is super order and Mantoidea is the order of mantids. A total of 160 species of mantids under 67 genera have been reported from India [9]. Mukherjee & Hazra [10] added 23 species to this order from India. There are 6 families of mantids known from India out of which 3 families occur in Maharashtra [11]. Review of literature indicates that very little information is available on state wise mantid fauna of India [8, 9, 10]. In past Beier[1] , Bolivar[2], Burmeister [3], Giglo-Tos [4], Kirby [5] , Lefebvre [6] , Linnaeus [7] , Mukherjee and Hazra [8, 9, 10] , West wood[15] ,Wood-Mason [16] and Patil & Sathe[11] worked on mantids. Since pesticides lead to pollution, health hazards, killing of beneficial insects, pest resistance, pest resurgence, secondary pest out break etc. The present work was aimed towards exposing new fauna of mantids and their utilization in integrated pest control.

2. Materials and Methods
Biodiversity of praying mantids was studied by visiting agricultural fields of various tahsils of Kolhapur district at 15 days interval during 2011-2013. Kolhapur is situated between 15º to 17 ºC North latitude and 73º to 74º East longitude acquiring 1,46,575 hectares land and uneven rainfall from 700 mm to 6000 mm and altitude of 546 m from sea level. The survey was conducted by one man one hour search method and praying mantids were collected during morning hours. The survey was terminated after harvesting of crops in the region. In the description of species the terminology adopted is same as that of Beier's [1] Spot observations were made on predatory behaviour of mantids and the pest insects found on various crop

plants. The insects and crop plants have been identified by consulting appropriate literature noted in references [1-16].

3. Results and Discussion

A total of nine species of mantids belonging to the genera *Creobroter, Deiphobe, Eremoplana, Hierodula, Humbertiella* and *Schizocephala* are reported from agro and forest ecosystems of Kolhapur region.

3.1. *Creobroter kolhapurensis* sp. nov. Male:

68 mm long, green; forewing 46 mm long and 12 mm wide, whitish green with single spot; antenna brownish, 25 mm long.

Flagellar formula:

SL/W = 1.92, PL/W = 1.3, 1L/W = 0.55, 2 L/W = 0.75, 75L/W = 4.

Preys: *Aphis craccivora* Koch, grasshoppers, small moths & butterflies.

Prey plants: *Nicotiana tabacum* L., *Morus alba* L., *Arachis hypogaea* L., *Oryza sativa* L.

Remarks:

This species runs close to *Creobroter laevicollis* (Saussure) [10] with the following characters:

1. Eye spot on fore wing appears little proximately placed.
2. Coxa with 5 short spines.
3. Fore wings well developed.
4. Pronotum denticulate.

However, it differs from above species in:

1. Annal membrane not black.
2. Hind wing not pink at base.
3. No smoky patches in the centre of wing.
4. Abdomen yellowish.
5. Femoral internal spines 21 mm long and short brown spines black at tip.
6. Flagellar formula: SL/W = 1.92, PL/W = 1.3, 1L/W = 0.55, 2 L/W = 0.75, 75L/W = 4.

3.2. *Creobroter maharashtri* sp.nov. Female:

Body 65 mm long, light green; fore wing 53 mm long and 10 mm wide, with eye like spot in the middle; antenna 20 mm long, brownish, simple.

Flagellar Formula:

SL/W = 2.90, PL/W = 2.1, 1L/W = 1.93, 2L/W = 1.40, 75 L/W = 3.

Preys:

Rhophalosiphum maidis Fitch., *Helicoverpa armigera* Hubn., *Peregrinus maidis* Aslma, *Spodoptera* spp., Mosquitoes *Culex* sp., *Aedes* sp.

Prey plants:

Sorghum vulgare, M. alba.

Remarks:

This species runs close to *Creobroter lavevicollis* (Sauss.) with the following characters:

1. Body color light green, body length 66mm.
2. Fore wing with eye like spot in the middle of fore wing.
3. Vertex with spines.
4. Prothorax green, pronotum short.

However, it differs from above species in:

1. Pronotum bicarniate, denticulate.
2. Coxa strong denticulate with four spines.
3. Femur yellowish green, 22 brown spines with blackish tip.
4. Tibia with 20 greenish spines and dark brown at tip.
5. Flagellar formula: SL/W = 1.92, PL/W = 1.3, 1L/W = 0.55, 2 L/W = 0.75, 75L/W = 4.

3.3. *Creobroter Marathi* sp.nov. Female:

Body 63 mm long, yellowish brown; forewing 44 mm long and 9 mm wide with eye like spot; antenna 18 mm long and brown.

Flagellar Formula:

SL/W = 3.35, PL/W = 3.1, 1L/W = 3.8, 2L/W = 1.71, 75L/W = 5.8.

Preys:

Mosquitoes (*Culex* sp., *Aedes* sp.), scale insects, mealy bugs, aphids, grass hoppers, jassids, white flies, termites.

Prey plants:

Custard apple (*Annona squamosa*), *M. alba, O. sativa.*

Remarks:

This species runs close to *Creobroter laevicollis* (Sauss.) with the following characters:

1. Eye spot on fore wing appears a little proximately placed.
2. Body length 62mm, body colour yellowish brown.
3. Coxa with 6 spines.
4. Pronotoum denticulate.

However, it differs from above species in

1. Body colour yellowish brown.
2. Hind wing not pink at base.
3. Femur with 21 long spines with brown tip.
4. Tibia with spines 13 pairs, short dark brown.
5. 1st, 2nd and 3rd segment of tarsi with blackish spot.
6. Thorax with large black spot.
7. Flagellar formula: SL/W = 1.92, PL/W = 1.3, 1L/W = 0.55, 2 L/W = 0.75, 75L/W = 4.

3.4. *Deiphobe kolhapurensis* sp.nov. Female:

Body dark blackish, 82 mm long; forewing 38 mm long and 6 mm wide, brown, with blackish spots; antenna blackish brown, normal, 13 mm long.

Flagellar Formula:

SL/W = 1.2, PL/W = 1.68, 1L/W = 2, 2L/W = 0.68, 50 L/W = 1.21.

Preys:

Grasshoppers, caterpillars, psyllids, aphids and white flies.

Prey plants:

Guava, *Psidium guajava* L., Mango *Mangifera indica* L., Subabul *Leucaena leucocephala*

Remarks:

This species runs close to *Deiphobe incisa* with the following characters:

1) Body length 81mm.
2) Abdominal length 57mm.

3) Fore wing length 38mm.

However, it differs from above species in:
1) Eyes blackish, pointed, horn like.
2) Fore wings with blackish spots.
3) Prothorax bicarniate, denticulate, elongated with small spines.
4) Fore leg, coxa denticulate with small brown spines; trochanter somewhat denticulate; femur with 10 brown spines and one long brown spine, tibia with 6 brown spines with black tip, tibia shows blackish edges at inner side.
5) Anal cerci flat, brownish.
6) Flagellar Formula: SL/W = 1.92, PL/W = 1.3, 1L/W = 0.55, 2 L/W = 0.75, 75L/W = 4.

3.5. *Eremoplana elongata* sp. nov. Female:
80 mm long excluding ovipositor, brown, long; forewing 47 mm long and 7mm broad; antenna 20 mm long, brownish, normal.

Flagellar Formula:
SL/W = 1.6, PL/W = 1.71, 1L/W = 2, 2L/W = 0.7, 50 L/W = 1.28.

Preys:
Grasshoppers, mealy bugs, aphids, scale insects, leaf roller caterpillar.

Prey plants:
Grasses, *A. squmosa*, Bamboo *Dendrocalamus strictus*, Rose *Rosa* sp., China rose *Hibiscus rosa-sinensis.*

Remarks:
This species runs close to *Eremoplana microptera* Wlk. with the following characters:
1) Body colour brown and body length 80mm.
2) Prothorax elongated brown with small spines.
3) Length of abdomen 56mm and forewings 47mm.

However, it differs from above species in:
1) Fore leg femur with 7 sharp spines and many unequal small spines, tibia with 10 black spines.
2) Fore wing with wavy margin at anterior side.
3) Middle and hind legs with flux on femur and tibia.
4) Anal cerci flat.
5) Flagellar formula: SL/W = 1.92, PL/W = 1.3, 1L/W = 0.55, 2 L/W = 0.75, 75L/W = 4.

3.6. *Hierodula orientalis* sp.nov. Female:
85 mm long, pale green; fore wing 55 mm long and 14 mm wide, without spot; antenna 20 mm long, brown.

Flagellar Formula:
SL/W = 3.25, PL/W = 3, 1L/W = 3, 2L/W = 1.66, 59 L/W = 5.5.

Preys:
Grass hoppers, cockroaches, termites, caterpillars *H. armigera, Erias fabia* and Mosquitoes.

Prey plants:
Gossypium hirsutum L., *A. sqamosa, M. alba.*

Remarks:
This species runs close to *Hierodula bipapilla* (Serville-Audinet) with the following characters:
1) Anterior coxa with whitish patches at base.
2) Internal spines of femur black.
3) Pronotum short, little narrowed posteriorly.
4) Fore wings longer than abdomen.
5) Dilation of pronotum does not extend upto base.

However, it differs from the above species in:
1) Metazona of prosternum without blackish bands.
2) Body length 85mm.
3) Anterior femur with small brown spines.
4) Internal tip of tarsi not black.
5) Antenna thin and yellowish brown.
6) Tibial spurs brownish.
7) Flagellar formula: SL/W = 1.92, PL/W = 1.3, 1L/W = 0.55, 2 L/W = 0.75, 75L/W = 4.

3.7. *Hierodula shivajiensis* sp.nov. Male:
Body 60 mm long, yellowish; fore wing 40 mm long and 6 mm wide, without spot; antenna 17 mm long, yellowish.

Flagellar Formula:
SL/W = 2.98, PL/W = 2.40, 1L/W = 2.42, 2L/W = 1.53, 59L/W = 5.1.

Preys:
Jassids, mealy bugs, white flies, aphids, caterpillars of *S. litura, H. armigera, Mythimna separata* Walker and termites.

Prey plants:
M. alba, S. vulgare, Cajanus cajan Mill.

Remarks:
This species runs to *Hierodula bipapilla* (Serville-Audinet) with the following characters:
1) Body length 60mm, flat bodied.
2) Eyes large brown.
3) Pronotum short, little narrowed posteriorly.
4) Coxa with few spinules among them.
5) Fore hind wings longer than abdomen.

However, it differs from above species in:
1) Body colour brown.
2) Frontal scelerite not bicarinate.
3) Metazona of prosternum not with two less distinct blackish bands.
4) Femur with five black spines and 14 yellowish spines with black tip and only one long spine.
5) Tibia with 11 small yellowish spines and one black spine.
6) Flagellar Formula: SL/W = 1.92, PL/W = 1.3, 1L/W = 0.55, 2 L/W = 0.75, 75L/W = 4.

3.8. *Humbertiella mulberae* sp.nov. Male:
Body brownish, small, 43 mm long; fore wing 31 mm long and 4 mm wide, brown; antenna 12 mm long, brown, normal.

Flagellar Formula:
SL/W = 1.26, PL/W = 1.50, 1L/W = 1.98, 2L/W = 0.59, 50L/W = 1.18.

Preys:
White fly, jassids, soft scales, mealy bugs, Spodopteran spp. *Sylepta derogata*, butterflies, termites.

Prey plants:
M. alba (local variety), Caster *Ricinus communis* L.
Remarks:
This species runs close to *Humbertiella indica* (Sauss.) with the following characters:
1) Body flat, 43mm long.
2) Fore wings length 31mm.
3) Thorax 13mm long, blackish-brown.

However, this species differs from above species in:
1) Fore wings brown with black dots at lateral sides.
2) Prothorax not bicarinate with black dots.
3) Body colour brown.
4) Coxa brown with 4 small brown spines.
5) Femur with 10 brown spines and one long brown spine.
6) Tibia with 12 black spines and 6 brown spines with black tips, tibia shows blackish edges at inner side, anterior tibia denticulate.
7) Flagellar formula: SL/W = 1.92, PL/W = 1.3, 1L/W = 0.55, 2 L/W = 0.75, 75L/W = 4.

3.9. *Schizocephala gramminae* sp.nov. Female:
Body large, slender, stick like, 95 mm long and 3 mm wide, dark green; wings short; antenna thick, 30 mm long, yellowish brown, combed.

Flagellar formula:
SL/W = 2.7, PL/W = 1.04, 1L/W = 2.42, 2L/W = 2.1, 75 L/W = 3.

Preys:
Soft bodied homopterous insect pests, such as jassids, aphids, scales, mealy bugs, white flies and termites.

Prey plants:
Grasses, Guava.

Remarks:
This species runs close to *Schizocephala bicornis* (Linnaeus) with the following characters:
1. Body green in colour.
2. Spines of foreleg black at tip only.
3. Femur with 6 external spines.
4. Fore wings well developed.

However, it differs from above species by having following characters:
1. Antennal base not thicker.
2. Middle and hind tibiae ventrally non spiny.
3. Ten black small spots on ventral side of thorax.
4. Flagellar formula: SL/W = 1.92, PL/W = 1.3, 1L/W = 0.55, 2 L/W = 0.75, 75L/W = 4.

Kolhapur is agriculturally advanced region of India with high rain and several water bodies leading to rich high biodiversity. Sugarcane, vegetables, pulses, cereals and horticultural crops are commonly cultivated in the area but, expected yield of the crops is not achieved so far because of damage caused by the insect pests viz. jassids, mealy bugs, white flies, lepidopterous borers, grass hoppers, termites and caterpillars and are difficult to control with insecticides due to the development of resistance. Praying mantids are also effective biocontrol agents of mosquitoes and cockroaches, and biopesticides scattered in Kolhapur region. The predatory potential reported in the text will add great relevance for mass propagation of mantids and their release in the field for control of various insect pests as a ecofriendly measure.

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5. References
1. Beier M. Blattopteroidea. Ordnung mantodea. *Bronn's KI.* Ordn. Tierreich 1964; 5(3):849-970.
2. Bolivar I. Les Orthopteres de st Joseph's College. a' Trichinopoly. Ann Soc Ent France 1897; 66:303-316.
3. Burmeister H. Handbuch der Entomologie. Berlin 1838; (2):1-120.
4. Giglio-Tos E, *Mantidae. Das Teirreich* 50 Lief. (Berlin) 1927.
5. Kirby WF. A synonymic Catalogue of Orthoptera, (London) 1904; (1).
6. Lefebvre MA. Nouveau groupe d orthopteres de la Famille des Mantides. *Ann.Soc. Ent. France* 1835; (4): 499.
7. Linnaeus C. Systema naturae per regna tria naturae, Secundum Classes. Ordines, Genera, species, cum Characteribus, Diffrentiis, Synonymis locis. Ed. Holmiae, 1758; 10(1): 1-823.
8. Mukherjee TK, Hazra AK. On a small collection of Mantidae (Dictyoptera) from Maharashtra, India, with the description of new species. *Rec. Zool. Surv. India* 1983; 80: 459-465.
9. Mukherjee TK, Hazra AK. Insecta: Mantodea *Rec. Zool. Surv. India*, 1985; 82(1-4): 33-39.
10. Mukherjee TK, Hazra AK. Insecta: Mantodea. State Fauna Series 3: Fauna of West Bengal 1993; (4): 475-510.
11. Patil VJ, Sathe TV. Insect predators and pest management. 2003; 153-180. Daya Publi. House, New Delhi.
12. Sathe TV. A text book of Forest Entomology. 2009; 1-234. Daya Publi. House, New Delhi.
13. Sathe TV, Bhusnar AR. Grasshopper diversity and Control. 2014; 1-263. Astral Int. Nat. Pvt. Ltd., New Delhi.
14. Sathe TV, Jadhav BV. Indian Pest Aphids. 2008; 1-211 Daya Publi. House, New Delhi.
15. West Wood J. Revisio Insectorum: Family Mantiderum. 1889; 52 + iii, 14 Pls. London.
16. Wood-Mason J. A catalogue of Mantodea, Indian Museum, Calcutta. 1891; (2) (Calcutta).