



Redescription of *Hierodula coarctata* Saussure (Mantodea: Mantidae) from Maharashtra, India

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The Mantodea are an important group of predators on which considerable taxonomic work has been done. Several species have been reported from India and among these many need detailed revision and redescription. One is *Hierodula coarctata*, first described by Saussure (1869) from Bengal. The species was described briefly on the basis of a female (Habite: "Les Indes Orientales; le Bengale"). Original description was short but subsequently a more detailed description was given (Saussure 1871) along with two illustrations (frontal view of the head and dorsal aspects of head-pronotum). The colouration of spines, structure of male genitalia, male- female variation etc. were not mentioned however. It was later placed under the genus *Parhierodula* (*Parhierodula*) by Giglio-Tos (1927) on the basis of crenulation on the anterior margin of the forewing. Mukherjee et al. (1995) also treated it under *Parhierodula* (*Parhierodula*), however, since the frontal sclerite structure, pronotum and other structures resemble species under the genus *Hierodula*, it was transferred to this genus by Ehrmann (2002).

The species is known so far from Mumbai (Nadkerny 1965; Nadkerny 1974), Oriental India and Australia (Giglio-Tos 1927), Madras, North Salem and Chichawatni in Punjab, Pakistan (Roonwal & Bhasin 1951), Sri Sailam, Andhra Pradesh (Rao et al. 2005), Bengal (Saussure 1869) and from Maharashtra (present study).

Materials and Methods: Specimens were collected during morning and evening hours by aerial net and hand picking from bushy plantations in Nasik, Pune and Ahmednagar during 2002-2004. These were set-pinned and dried. Male genitalia were dissected from some fresh specimens collected from Pune. Genitalia were dissected, treated with hot KOH, washed, dehydrated through grades of alcohol and mounted in DPX on slide. Dissection of male genitalia, etc. and photography was carried out under binocular stereozoom microscope (Leica SMZ 6 attached with Canon Powershot S 50). Taxonomic literature followed includes work of Saussure (1869), Roonwal et al. (1951), Nadkerny (1965), Nadkarny (1974), Giglio-Tos (1927), Mukherjee et al. (1995), Ehrmann (2002), and Rao et al. (2005).

Twenty specimens of *H. coarctata* obtained from different localities in Maharashtra were studied. Only 12 (2 females and 10 males) of those have been dry preserved and stored in the cabinets at Zoology Department, Modern College, Pune 5. Rest were dissected and discarded or have been stored in alcohol. Specimens were collected by different people but all were determined by the authors. The details of specimens are given below (as: date, locality, collector and Modern College Zoology Museum-MCZM number in parenthesis)

1 male, 01.x.02, Pune, HVG (MCZM-40); 1 male, x.2002, Pune, Nilesh (MCZM-41); 2 males, 2002, Pune, students' collection (MCZM-42-43); 1 female, vii.2002, Pune, students' collection (MCZM-44); 1 male, vii.2003, Ahmednagar, Paturkar (MCZM-45); 1 male, 01.x.03, Pune, HVG (MCZM-46); 1 female, 04.ix.03, Khadkee-Pune, HVG (MCZM-47); 1 male, 10.ix.03, Mahalung-Pune, A. Sen (MCZM-48); 1 male, vii.04, Vishrantwadi-Pune, L.Singh (MCZM-49); 1 male, 22.viii.04, Pune, HVG (MCZM-50); 1 male, 2004, Nasik, unknown (MCZM-51).

Results: In the present study, male and female specimens of a mantid *Hierodula coarctata* were collected from different localities and studied taxonomically. The details for this study are provided below. Measurement details for seven males and two females are given in Table 1.

Diagnostic Characters

Both Sexes: General body colouration: Green with a tinge of yellow (Image 1 live male). Head: triangular with prominent round eyes. Antennae: with scanty bristles (3-5 per segment). Ocelli: prominent. Mandibles: strong,

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Table 1. Measurements (in mm) for some specimens of *H. coarctata*.

Specimens Studied	Total length	Pronotum	Forecoxa	Forefemur	Foretibia
Nasik, 1 Male	49	13.5	10	13	7
Nasik, 1 Male	48	13	9.5	12.5	7
Pune (Mahalung), 1 Male	45.3	14	10.5	13.5	8
Pune, 3 Males	44-44.5	13-13.5	9.5-10	12.5-13	6.8-7
Ahmednagar, 1 Male	44	13.5	10.5	14	7
Pune, 2 Females	52-55	16.5-16.7	13-13.3	15.5-16	8.5-8.7

**Image 1. *Hierodula coarctata* male**

terminal half dark black; labial palpi externally green but black internally. Frontal sclerite: wider than high with two vertical, blunt carinae that create one median and two lateral feeble grooves that are usually greenish (Images 2a & 2b). Pronotum: supra-coxal dilation prominent, dorsally pale yellow; prozona with tubercles at edges. Prosternum near base with a deep reddish or magenta patch; similar patch on mesosternum encloses a pair of central, jet-black nipple like tubercles (Image 4). Forelegs: dark or pale green; pre-apical lobes of forecoxa convergent, internal surface pale green, with few bristles; posterior edge with feebly marked two rows of bristles; anterior edge with few spinules in between bigger spines; pre-marginal spines strong, the proximal one largest and totally jet black in some cases; rest spines usually white, the second proximal spine is about 1/3rd of the first black one (Images 5a & 5b). Forefemur with four external and four discoidal spines each; discoidal spines arranged in a row, entirely blackish on inner face; internal spines 15 (7 long and 8 small); all entirely blackish or brownish with black tips; external spines black at tips; claw groove towards base (Image 6). Anterior tibia with 9-10 external and 14-15 internal spines,

**Images 2a - Frontal sclerite with carinae; 2b - Frontal sclerite with green grooves;**

all pale yellow with black tips; entire tarsi dorsally bright green, internally often black at distal ends. Meso- and metathoracic legs: The Meso- and metathoracic femora marked by three reddish to red-brown bands which may be complete around like a ring or incomplete, very faint reddish or even obsolete in some specimens; trochanters deep or pale brown. Wings: both wings extend beyond the tip of the abdomen; in forewing, the costal area and part of discoidal area adjoining the stigma is opaque bright



Images 3a - Pronotum (male); 3b - Pronotum (Female)



Image 4. Bands and nipple like tubercles on sterna



Images 5a - Proximal black coxal spine and sterna with green border; 5b- variation in coxal spines; wider green border on sterna

green, rest of the areas transparent; stigma pale lemon yellow or cream coloured, bordered by reddish-brown or magenta patches on either ends (Image 7); venation green; hind wing entirely transparent, costal area pale green; veins greenish. Abdominal segments: dorsally pale yellow, ventrally with bright green transverse bands along posterior margin, bands are wider on penultimate and on boat shaped sub-genital plate (Images 5a & 5b). These green bands are thin and pale dorsally.

Male: Average length (from vertex to the tip of the abdomen) for male was found to be 45mm. Body colour pale green. Disc of frontal sclerite pale green. Lateral edges of pronotum pale yellow of which the edges of prozona was magenta in some dried males (Image 8, dried male). Bases of the pro- and mesosterna with broad pale red transverse bands. These bands contain paired light brown or white blotches with tubercles on the mesosternum. Supra-coxal dilation of pronotum less wide (width 6.0mm) as compared to that of the female; edges of prozona with few fine tubercles in males; carina on metazona is indistinct (Images 3a & 3b). Pre-apical lobes of forecoxa without transverse green band. Forefemur pale green externally. Number of the pre-marginal tubercular spines on forecoxae varied from three to four, these spines are gradually shorter distally. Meso- and metathoracic legs may be pale green or pale



Image 6. Inner view of entire fore leg

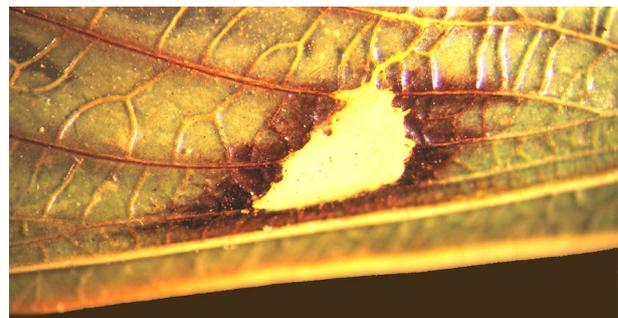


Image 7. Stigma bordered by reddish-brown



Image 8. Dried male and female

yellow; with or without pale brown bands. Larger inner spines on forefemur black on inner face or pale brown with blackish apices; discoidal spines pale brown on inner side. Meso- and metathoracic trochanters light brown. Forewings: pale green to dark green; anterior margin of forewing smooth, stigma creamy or whitish, with dark reddish patches on either side; subcosta bright yellow, rest veins pale greenish. Costal area of forewing pale to dark green. Abdominal segments: less broad, width 7.8-8.1 mm; sterna pale greenish with a thin band of green at the distal end. Male genitalia: found identical in all specimens (Images 9a & 9b, male genitalia) and hence all are conspecific.

Female: Average length for female was found to be 55mm. Body colour dark green; disc of frontal sclerite green. Bases of the pro- and mesosterna with broad red or magenta coloured transverse bands. These bands

contain paired dark brown blotches with tubercles on the mesosternum. Supra-coxal dilation broader (width 7.5mm); prozona with a shallow dorso-median, longitudinal sulcus; tubercles at edges of prozona stronger than those of the male; edges of metazona also partly granular; metazona with a mid-dorsal, blunt carina that ends posteriorly in two flat rounded elevations. Pre-apical lobes of forecoxa with a transverse green band in one case. Forefemur dark greenish with dark patches on its inner side. Pre-marginal tubercular spines on forecoxae varied from 4-6 in numbers; the proximal one or two are uniquely very big, dark black or red-brown (Images 5a & 5b) and rarely bifid at its apex. Dorsally meso- and metathoracic legs pale green or light magenta in one case; with or without distinct pale reddish bands. Larger inner spines on forefemur entirely black or blackish; discoidal spines entirely blackish on inner face. Meso- and metathoracic trochanters dark reddish-brown. Forewings: dark green in all females with smooth anterior margins; stigma pale lemon, with dark reddish or magenta patches at proximal as well as distal ends; subcosta bright yellow, rest of the veins dark greenish; costal area of forewing dark green with magenta coloured streaks. Abdominal segments: broader than in the case of male with width 9.0-10.0 mm; sterna yellowish or pale green with a broad dark greenish bands at the distal end of some of the sterna or the entire width and breadth of the sterna dark green (Images 5a & 5b); often a mid-ventral proximal, half moon shaped black blotch on sterna may also be seen.

Discussion

The taxonomic studies of Mantodea are often based on body colouration, coxal spines, inner spines of forefemur and colour of stigma in forewings along with other characters. During this study, male and female specimens of *Hierodula coarctata* exhibited several distinct colour patterns and modifications of spines on forecoxae. Critical examination of these specimens confirmed their polymorphic status. Moreover, the study of male genitalia confirmed them to be conspecific.

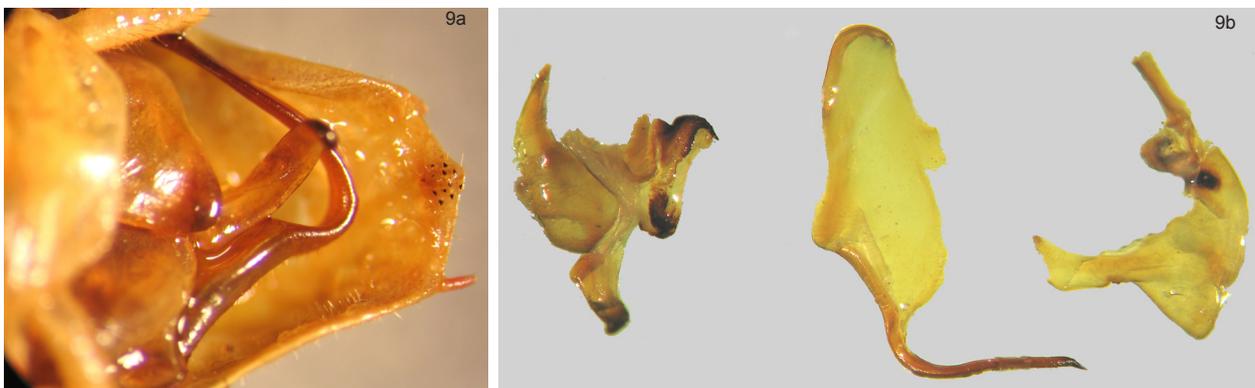


Image 9a - Male genitalia in situ, dorsal view; 9b - Dissected male genitalia, dorsal view.

The study indicates that all specimens showed pale or light green to dark green colouration of the body. This variation seems to be adaptive to the colour of vegetation. Comparatively, the females were more brightly coloured as well as larger in size than males. The stigma, inner spines of forefemur, coxal spines and sterna showed variable colouration. These were notable taxonomic characters. The presence of variable coxal spines (by shape and colour) was very distinct and quite striking. The proximal spine(s) on forecoxae appear to be big, tubercular, jet black and even the apex was bifid in rare instances. Examples with white spines on coxae showed no enlargement of spines. In one case only left coxa showed enlarged black tubercle but tubercles on right coxa were normal. The presumed type of *Hierodula coarctata* is much discoloured but in some other specimens the blackish coxal tubercles can be seen (Roger Roy, Paris Museum of Natural History, pers. comm.). This study again confirms the view that members of a species may show gradual changes in colouration as well as in few other structures which can be important taxonomically but these may not be sufficient to declare a new species.

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