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Record of Sweet Bees, Genus *Nomia* Latreille, 1804 (Halictidae: Apoidea) from Pothwar tract, Pakistan

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Abstract

Four species of genus *Nomia* Latreille, 1804 namely, *Nomia (Nomia) crassipes* (Fabricius, 1798), *Nomia (Nomia) curvipes* (Fabricius, 1793), *Nomia (Hoplonomia) elliotii* (Smith, 1875) and *Nomia (Hoplonomia) westwoodii* Gribodo, 1894 have been reported for the first time from the Pothwar region of Pakistan. These species have been described with the help of micro- photographs, floral host range and their distribution range.

Keywords: *Nomia*, Apoidea, Halictidae, Sweet bees

1. Introduction

The Subfamily Nomiinae (Halictidae: Hymenoptera) comprises of 500 species with worldwide distribution except in South America [20]. These are almost cosmopolitan and primarily well distributed in arid and sub-arid regions of the world. Subfamily Nomiinae includes sub-social or solitary bees that build their nests in the ground on exposed warm places. Out of 11 genera of Nomiinae, only 4 genera (65 species) are distributed in Palaearctic region [1]. According to [15], Oriental fauna consists of 136 species. The most striking features of these bees are 3 submarginal cells in their forewings, 1st and 3rd cells sub-equal in length while 2nd shorter. Antennae arise near the mid-length of eyes. Episternal groove present up to scrobe but sometime weak depression below scrobal groove. Legs of male Nomiinae are greatly modified which facilitate them during mating with female [19].

Among the genera of Nomiinae, the genus *Nomia* is distributed from Africa to South East Asia. It has been also reported from Pakistan, India and Afghanistan [16]. Typical characters specify this genus viz., size 9-13 mm, conspicuous colored (white, yellow, blue and green) tergal bands, impunctate and hairless colored marginal zones, hind wing clear without dark area, malar space nearly absent, metanotum sometime with lamelliform projections [14]. The pattern of nest building varies within different species ranging from vertical burrowing to hanging type nests [9]. In some nests, the cells are bordered with wax like shiny material. There are 1-20 females and 23-191 cells in a single nest of *Nomia* bees [18].

Non-Apis bees including ground nesting species are most efficient pollinators of various crops [5]. *Nomia melanderi* Cockerell has mainly generalist foraging habit but it is most preferred (specialist) pollinator for Alfalfa crop in North America [6]. It has been the only managed ground-nesting bee for more than fifty years in the US with largest aggregation of their ground nests per unit area [8]. Solitary bees of genus *Lipotriches* (Halictidae: Hymenoptera) are well known pollinator of 21 species of Graminae family [10]. Similarly species of *Apis* and *Nomia* are also efficient pollinators of native grasses of Kenya [3]. Probabilities of pod and seed set in alfalfa crop in single flower visit for pollination efficacy found female alkali bees and alfalfa leaf cutting bees responsible for 78% flower visits. They were superior to honeybee, *Apis mellifera* for higher flower tripping frequencies for pollen and nectar collection [6].

Bee fauna of Pothwar, Punjab is still unexplored and requires lot of taxonomic work. In this regard, in continuation to our studies on bees [21-23] we made an effort during 2013-14 to explore these beneficial crop pollinators.

2. Materials and Methods

To explore the bee fauna of Pothwar tract of Punjab, Pakistan, a survey for the collection of bees was carried out during 2013-14. The various bee species were collected from different localities and host plants including ornamental flowers, crops, weeds and houses with the help

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of aerial net. The collected specimens were killed in a killing bottle (containing potassium cyanide) and tagged after pinning by using common pins. After tagging the identification procedure was carried out under Kruss microscope. The specimens were identified up to species level by using identification keys of [2, 14-16]. Micrometry and measuring scale were used for the measurements of different parts (body length, forewing length and width) of bees. The Labomed CZM6 microscope (10x / 22 W.F) was used for the illustration of identified species and then preserved in wooden boxes (containing naphthalene balls and Coopex® powder to prevent ants damage) for future studies. All the research was carried out in the laboratory of Biosystematics, Department of Entomology, PMAS-Arid Agriculture University Rawalpindi, Pakistan.

3. Results and Discussion

3.1 Genus *Nomia* Latreille, 1804

Nomia (Nomia) crassipes (Fabricius, 1798)

Nomia (Nomia) curvipes (Fabricius, 1793)

Nomia (Hoplonomia) elliotii (Smith, 1875)

Nomia (Hoplonomia) westwoodi (Gribodo, 1894)

Diagnostic characters

The yellow, white, green and blue integumental bands, body length ranges from 9-13mm, metanotum of some species with lamelliform projections, males of subgenus *Nomia* with one or

two preapical teeth underside of hind femur, antennae filiform, labial palpi 4 segmented, maxillary palpi 6 segmented, forewings with 3 sub-marginal cells, radial cells rounded at apex. The species of this genus build their nests in hard soils, banks, flat ground, houses and store pollens for their young ones.

3.1.1 *Nomia (Nomia) crassipes* (Fabricius, 1798)

Nomia, Latr. Hist. Nat. Ins. xiii, p. 369 (1805).

Eucera crassipes, Fabricius 1798: 278. Lectotype MMM: MCZ Copenhagen.

Nomia curvipes, Smith 1875: 42, Pl.1 fig. 8.

Nomia megasomioides, Strand 1913: 31, MMM. Types: 2MMM, Taiwan, Anping, VII. ; Hirashima, 1956: 32 [*Nomia (Nomia) megasomioides*].

Diagnostic Characters

Head and abdomen are lightly but closely while thorax is coarsely and densely punctured. Clypeus slightly convex, antennae with testaceous brown color except scape (1st segment) which is pale yellow (Fig. 1; B), tergal bands of abdomen yellowish green, apical portion of forewings more or less smoky (Fig. 1; D), hind femur greatly swollen with a curve distally, basal half of hind femora dark while distal half yellowish in color, hind tibiae with apical teeth (Fig. 1; C), metanotum without projections.

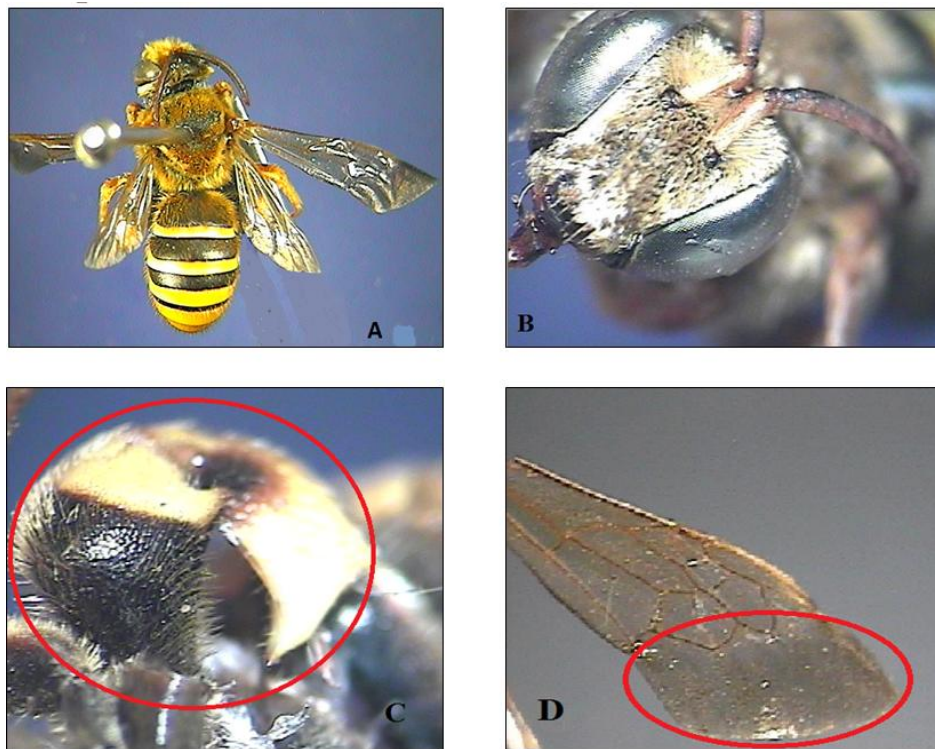


Fig 1 (A-D): External morphology of *Nomia (Nomia) crassipes* (male), A. Dorsal view; B, Clypeus; C, Hind tibia with apical tooth; D, Wings smoky apically

Material Examined

Chakwal, 18.08.2013, 2♂.

Measurements

Abdomen as wide as thorax. Body length 13mm, forewing length 9mm and width 3mm (male).

Distribution

The species is reported from China, Thailand, India, Pakistan, Madagascar, and Africa from Gambia to Sudan south to

Angola, Transvaal, and Mozambique [14].

Comments

The species was collected from variety of hosts like Wild Safflower (*Carthamus oxycanthus*), Common bean (*Phaseolus vulgaris*), Milk thistle (*Silybum marianum*) etc. during August, 2013. Collected specimens were compared with the published data of [2, 14, 15]. This species is reported for the first time from Punjab Province of Pakistan.

3.1.2 *Nomia (Nomia) curvipes* (Fabricius, 1793)

Andrena curvipes: Fabricius, 1793

Megilla curvipes: Fabricius, 1804

Nomia curvipes: Latreille, 1804

Nomia curvipes: Lepeletier de Saint Fargeau, 1825

Nomia indica Lepeletier Saint Fargeau, 1841 292 "India". "Mr. Serville Museum" (not tested, synonymy based description). Syn. November

Diagnostic characters

It is similar in appearance with *Nomia crassipes* except tibial modification. Tergum with yellow transverse bands (Fig. 2; A), apical margin of forewings less smoky, hind wings clear, basal half of hind femora dark brown while apical half pale yellow, hind tibiae of male are broadened toward inner side forming an acute angle (Fig. 2; C), Thorax with dense punctuations as compared to head and abdomen (Fig. 2; D).

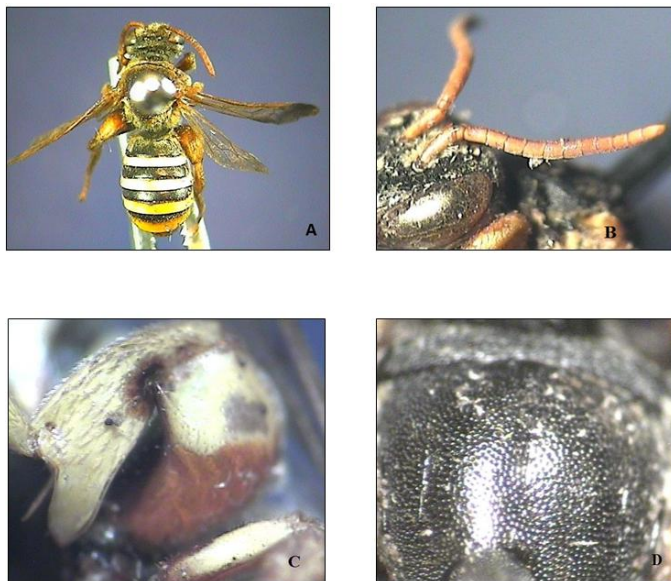


Fig 2 (A-D): External morphology of *Nomia (Nomia) curvipes* (Male), A. Dorsal view; B, Male antenna (13 segmented); C, Hind tibia forming an acute angle; D, Thorax with dense punctuations.

Material Examined

Chakwal, 18.08.2013, 3♂ and 1♀.

Measurements

Body length 11mm, forewing length 7mm and width 2.5mm (male).

Distribution

India, Pakistan, Bengal and upper Burma [2].

Comments

The specimens were compared with the published data of [2, 14, 15], found to be similar. This species was collected from hosts like Wild Safflower (*Carthamus oxycanthus*), Common bean (*Phaseolus vulgaris*), Groundnut (*Arachis hypogaea*) etc. This species is reported for the first time from Punjab Province of Pakistan.

3.1.3 *Nomia (Hoplonomia) elliotii* (Smith, 1875)

Nomia elliotii, Smith, Trans. Ent. Soc. 1875, p. 44, ♀ ♂; Dall. Torr. Cat. x, p.166.

Hoplonomia elliotii (Smith, 1875)

Nomia simplicipes Friese, 1897

Diagnostic Characters

Fine punctuations on head and thorax, clypeus flat (Fig. 3; B), scutellum coarsely punctured and characterized by a notch or bituberculate posteriorly, metanotum with two lamelliform projections in the middle (Fig. 3; C), basal four abdominal segments with greenish yellow bands apically and transverse impressed lines medially, the hind femora of male swollen (Fig. 3; D), the tibiae with blunt testaceous process.

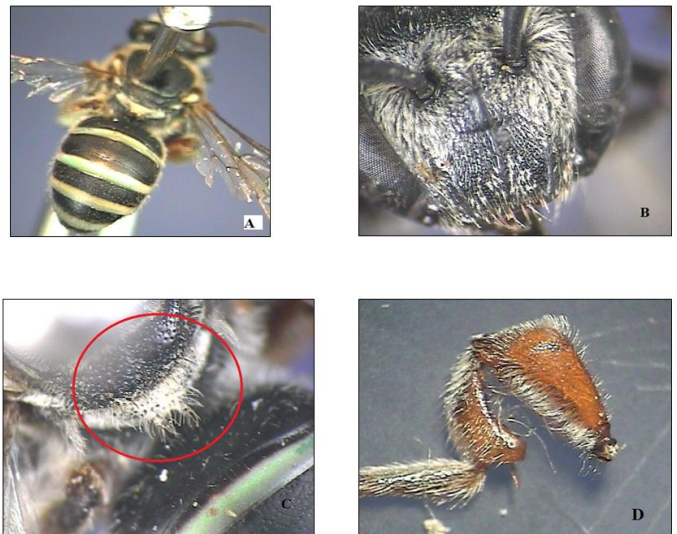


Fig 3 (A-D): External morphology of *Nomia (Hoplonomia) elliotii*, A, Dorsal view of Female; B, Clypeus flat; C, Scutellum bituberculate and metanotum with two lamelliform projections; D, Hind femur of male swollen.

Material Examined

Islamabad, 17.02.2013, 1♂ and 1♀; Chakwal, 25.12.2013, 1♀ and 1♂.

Measurements

Body length 9mm, forewing length 6mm and width 3mm (male).

Distribution

The sub genus *Hoplonomia* occurs in Japan, China, India, Southeast Asia, the Philippines, Indonesia, New Guinea, the Bismarcks, the Solomon Islands, Australia south to southern Queensland, and Madagascar. It is not known from Africa [14].

Comments

The species is collected from Chakwal and Islamabad districts and compared with the published data of [2, 14, 15]. It is reported first time from Punjab province of Pakistan. Its host ranges from weeds, ornamental flowers to soil for nesting.

3.1.4 *Nomia (Hoplonomia) westwoodii* Gribodo, 1894

Nomia westwoodii, Gribodo, Bull. Soc. Ent. Ital. 1894, p. 128; Dall. Torr. Cat. x, p. 170.

Nomia simillima, Smith, Trans. Ent. Soc. 1875, p. 44, ♂, pl. ii, fig. 4 {nec Smith, Jour. Linn. Soc. 1863, p. 46}.

Diagnostic characters

It has close resemblance to *N. elliotii* like bifid projections on metanotum (Fig.4; C) but vary in color pattern and size. Hind tibiae and femora not much swollen, without apical sharp truncate tibial process (Fig.4; B), legs and abdominal sternites pale rufo-testaceous (Fig.4; D).

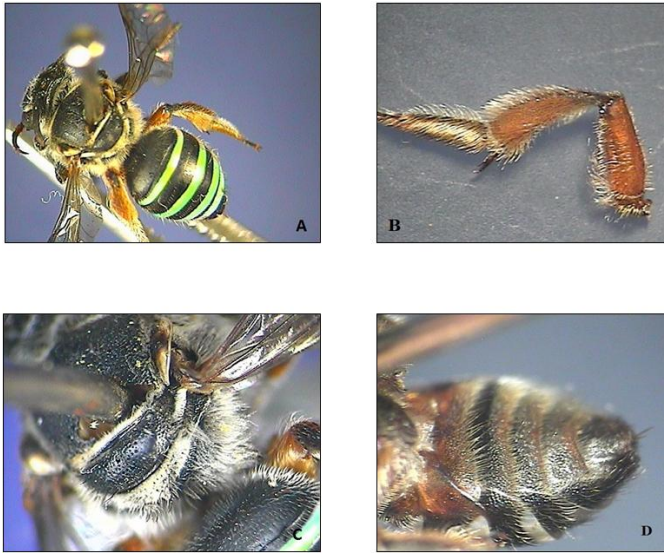


Fig 4 (A-D): External morphology of *Nomia (Hoplonomia) westwoodii*, A, Dorsal view (Female); B, Hind tibia lees swollen and without apical process; C, Metanotum with two lamelliform projections; D, Abdominal sternites pale rufo-testaceous

Material Examined

Islamabad, 17.02.2013, 2♀; Chakwal, 25.12.2013, 1♀ and 1♂.

Measurements

Body length 9mm, forewing length 6mm and width 3mm (female).

Body length 10mm, forewing length 7mm and width 4mm (male).

Distribution

India and Bengal ^[15].

Comments

This species was compared with the published data of ^[2, 14, 15] and found to be similar. It is reported first time from Punjab province of Pakistan. Its hosts are weeds and ornamental flowers.

General Comments

Wild bee fauna comprise more than 85% ground nesting bees not managed to pollinate crops ^[7]. Their multiplication requires suitable nesting sites preparation prior to crop, land without vegetation and some salt and avoidance of insecticide application ^[11, 12, 17]. Some predaceous problems also need to be identified and managed for their thriving population to get their benefit of flower visitation and crop pollination ^[4, 13]. Probabilities of pod and seed set in alfalfa crop in single flower visit for pollination efficacy found female alkali bees and alfalfa leaf cutting bees responsible for 78% flower visits. They were superior to honeybee, *Apis mellifera* for higher flower tripping frequencies for pollen and nectar collection ^[6]. Sweet Bees, Genus *Nomia* reported during our studies will be helpful for the uplift of yield of various crops in Pothwar tract in future.

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