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Taxonomic identification of certain species of *Popillia* (Coleoptera: Scarabaeidae: Rutelinae)

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ABSTRACT: *Popillia* species belonging to Scarabaeidae of Coleoptera are pests of several horticultural crops and hence are economically important. The present study was focused on 10 species of the genus *Popillia* Dejean, 1821 that are predominant across the country. The diagnostic characters of these species along with illustrations are furnished in this paper to facilitate easy identification of the species.

Keywords: Diagnostic keys, India, *Popillia*, scarab beetle, white grub

INTRODUCTION

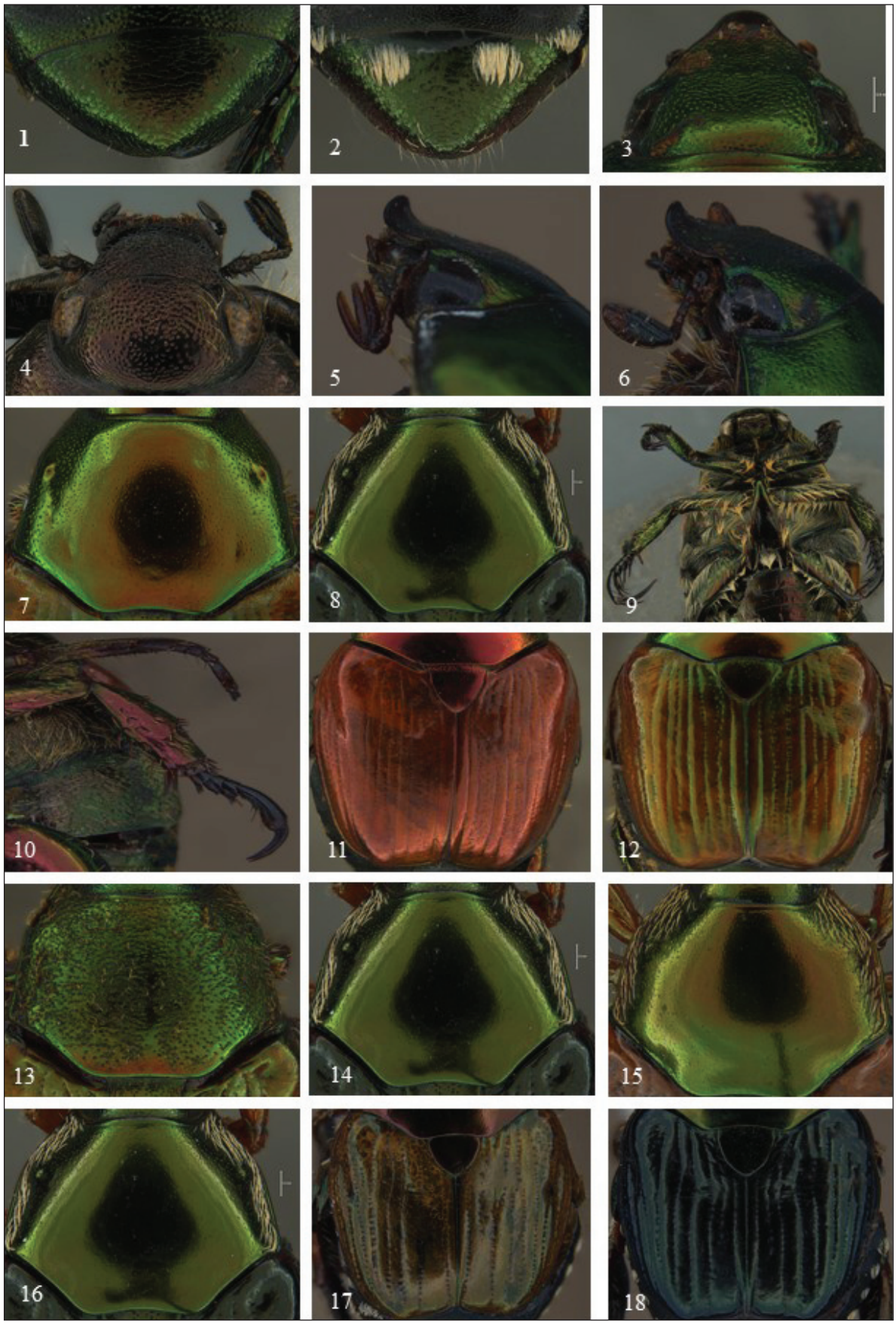
Popillia Dejean, 1821 (Coleoptera: Scarabaeidae) is a small genus within the subfamily Rutelinae and tribe Anomalini. The genus is represented by 322 species and 27 subspecies globally (Schoolmeesters, 2021). Arrow (1917) has given an account of 42 species occurring in the Indian sub-continent in his Fauna Volume of British India (part-2). The beetles of this genus are important pests of agricultural and horticultural crops and are often found in great numbers in aggregation. The adult beetles cause damage to various plant parts and the damage on leaves often results in complete skeletonization of the foliage. The adult beetles of *Popillia* also feed on fruits of horticultural crops *viz*. apple, peach, pear, plum (Sreedevi et al., 2019) and result in heavy fruit drop thus incurring economic losses. Apart from adult beetles, the subterranean larvae of *Popillia* species feed on roots of various horticultural plants and grasses in different ecosystems. Certain species feed extensively on roots of grasses thus becoming detrimental to golf courses, parks and lawns. Significant contributions to the knowledge on diagnostic keys of these beetles were chiefly of Arrow (1917), Chatterjee and Biswas (1995, 2000a, 2000b, 2003), Chatterjee (2004, 2010), Sarkar (2016), Geetha and Agarwal (2018), Telnov and Zorn (2019) Further, a concise knowledge on diagnostic keys of species of this genus is still wanting.

MATERIALS AND METHODS

The study was carried out in 2020-21 and the beetles were collected through light traps during April - June months. Additonally the specimens that are avialble in the Insect Museum of ICAR-National Bureau of Agriucltural Insect Resources (NBAIR) were used for the study. The collected and museum speicmens were cleaned, relaxed and studied for the diagnostic characters. The images of the distinguishning characters were taken using Leica M205 A automontage microscope and the species were identified using available keys (Arrow, 1917) and with help of Dr. Carsten Zorn (by sending the images).

The present work was aimed at developing diagnostic keys for the identification of ten predominant species of the genus *Popillia* (Coleoptera: Scarabaeidae) occurring in India. The species studied were *Popillia nasuta* Newman, 1838, *Popillia cyanea* Hope, 1831, *Popillia complanata* Newman, 1838, *Popillia cupricollis* Hope, 1831, *Popillia schizonycha* Arrow, 1913, *Popillia macclellandi* Hope, 1845, *Popillia pilicollis* Kraatz, 1892**,** *Popillia nr. nasuta, Popillia* sp.1 and *Popillia* sp. 2.

The external morphological characters *viz.,* shape of the front margin of clypeus, punctation of clypeus, punctation on vertex and frons, punctations on pronotum, presence or absence of hairs and a circular spot like depression on pronotum, shape of scutellum, punctations on scutellum, number of striations on each elytron, presence or absence of fovea on each elytron, presence or absence of lateral flange on elytra, punctations on pygidium, type of setae on pygidium, shape and punctations of mesosternal process, shape of fore tibia dentation and clefts on claws of legs, structure of phallobase and parameres of male genitalia of the ten species were studied and based on these characters, diagnostic keys were developed for studied species of *Popillia* (Coleoptera: Scarabaeidae).



Figs. 1 - 18. Diagnostic characters of different *Popillia* spp.

RESULTS

Keys to the species of genus *Popillia* (adopted from Arrow, 1917)

1. Pygidium without hairy spots at base (Fig. 1) ……...……2

   -Pygidium with hairy spots at base (Fig. 2) …….....……4

2. Clypeus pronounced into snout (Fig. 3) ……..……3

   `-Clypeus normal, not like above, rounded or semi-circular (Fig. 4) ….. ***Popillia cyanea*** **Hope, 1831**

3. Clypeus pronounced into a snout, apically smooth, rounded and strongly reflexed (Fig. 5) .....……***Popillia nasuta*** **Newman, 1838**

   -Clypeus pronounced into a snout, apically smooth, rounded and slightly reflexed (Fig. 6) …….....…….....***Popillia nr. nasuta***

4. Pronotum without hairs, elytra without fovea (Fig. 7) ……..5

   -Pronotum with hairs, elytra with a fovea behind the shoulders (Fig. 8) ……7

5. Longer claw clefted only in fore leg (Fig. 9) .....…….***Popillia cupricollis*** **Hope, 1831**

   -Longer claw clefted in both fore and mid leg (Fig. 10) ..……6

6. An abrupt and conspicuous lateral flange behind the shoulder of each elytron absent (Fig. 11) ...…….. ***Popillia macclellandi*** **Hope, 1845**

   -An abrupt and conspicuous lateral flange behind the shoulder of each elytron present (Fig. 12) ……..……***Popillia*** **sp. 1**

7. Hair confined to sides of the pronotum (Fig. 14) . .....…….8

   -Hair not confined to sides of the pronotum, clothed with short erect light brown setae except narrow longitudinal median carina (Fig. 13) ……...…….***Popillia pilicollis*** **Kraatz, 1831**

8. A circular spot like depression on middle region of either side of pronotum absent (Fig. 15), elytron with transverse fovea just below scutellum .....***Popillia complanata*** **Newman, 1838**

   -A circular spot like depression on middle region of either side of pronotum visible (Fig. 16), elytron with transverse fovea just below scutellum …….....……9

9. Each elytron with a transverse shallow fovea just below scutellum (Fig. 17)…….....…….. ***Popillia*** **sp.2**

   -Each elytron with a deep fovea just below scutellum (Fig. ...……***Popillia schizonycha*** **Arrow, 1917**

CONCLUSION

The *Popillia* species are economically important and hence the identification or diagnostic keys are essential. The illustrated diagnostic identification keys furnished in this paper is an attempt and presentation to facilitate easy identification of species.

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