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Taxonomic note on two species of genus *Junonia* (Nymphalidae: Lepidoptera)

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Abstract

The species of the genus *Junonia* (Hubner, 1816) belonging to the family Nymphalidae (Order: Lepidoptera). They are median sized and multicolored butterflies, distributed throughout the world, wherever the flowering plants are available except Antarctic region. They have eyespots of different size and color in their hind wings, which help in the identification. The butterflies of the genus *Junonia* Hubner were collected from different regions of Hyderabad, Sindh, Pakistan during January 2015 to April 2015. The identification was done with the help of available Literature. Two species namely *Junonia almana* (Linnaeus, 1758) and *Junonia hirta* (Fabricius, 1798) were identified first time from Hyderabad, Sindh, Pakistan. These two species were identified on the basis of morphological features and internal genitalia. Key to the identified species of the genus *Junonia* Hubner has also given.

Keywords: Taxonomic Note, *Junonia almana* L., *Junonia hirta* F., Hyderabad, Sindh, Pakistan

1. Introduction

The species of the genus *Junonia* Hubner belong to the family Nymphalidae and order Lepidoptera. They are commonly known as Pansies and have reduced fore legs in both sexes and covered with hair that's why they are also called as "Brush-footed" butterflies, they do not use fore legs for walk, only middle and hind legs use for walk. The butterflies of this genus are medium sized, multicolored and have prominent maculae in the discoidal cell of the fore wings and ocelli (eye spots) in the hind wings which are used in the identification of the species [1]. Various species of *Junonia* Hubner have different colors of eye spots such as blue pink or orange and have different arrangement, size and shape [2]. The species of the genus *Junonia* Hubner are worldwide distributed and fly for a long distance and carry pollen grains along with their legs from flower to flower which help in the cross pollination [3]. About 33 species of genus *Junonia* Hubner have been documented from over all the world except Antarctic region, out of these 6 species namely *Junonia almana* L., *Junonia atlites* L., *Junonia hirta* F., *Junonia iphita* C., *Junonia lemonias* L. and *Junonia orithya* L. have been recorded from Pakistan [4]. Change in the temperature, deforestation, climate change, increase of CO₂ and indiscriminate use of pesticides direct effect on the butterflies, because the butterflies are delicate and very sensitive to changes of the environmental condition [5]. Therefore, the aim of present study to know the status of the species of the genus *Junonia* from Hyderabad, Sindh.

2. Materials and Methods

The butterflies of the genus *Junonia* Hubner were collected from different crops, vegetables, fruits and different parks of Hyderabad during January 2015 to April 2015. The collected butterflies put into plastic jar and brought to Entomology laboratory. The collected specimens were killed by keeping them into refrigerator, instead of using chloroform, because chloroform effect on the colour of specimens. The butterflies stretched on the stretching board and kept in that position for overnight, then transferred to insect box and naphthalene ball were kept into the box to protect them from the predator and fungus. For the identification of specimens, we have used the binocular microscope with the help of identification key of Hampson [6] and wing venation of Miller [7]. For the internal identification of the male and female genitalia, first of all the abdomen of the specimen removed from its body then boiled it into 10% of potassium hydroxide (KOH). After that, with the help of fine forceps the abdomen of the specimen dissected from the lateral side under the dissecting microscope, the internal parts of the male and female genitalia technically removed from the abdomen, then genitalia of both sexes washed with the tap water and preserved into the vial of glycerin and pinned with the

specimen [8]. Genital terminology of male and female was used given by Klots [9] and Winter [10].

3. Results and Discussion

3.1. Key to the two species of genus *Junonia*

- Upper side of the fore wing rich orange-yellow, uncus sclerotised somewhat sickle-shaped..... *Junonia almana* L.
 Upper side of the fore wing yellow, uncus sclerotised, somewhat inverted V-shaped..... *Junonia hirta* F.

3.2. Junonia almana (Linnaeus, 1758) (Figure A1 and B1)

3.2.1. Colouration

Head light orange, paler beneath, eyes light yellow, antennae dark brown, maxillary palpi yellowish-white; thorax black with orange hair and scales, legs paler, fore wings dark orange-yellow with black transverse black lines in costal margin, ocellus with white centrally and outer border black, costa, apex, termen and tornus dusky black, hind wings dusky orange yellow, ocellus brownish orange, costa, apex, termen, tornus and dorsum dusky black; abdomen black.

3.2.2. Head

Head round in shaped, broad and convex frons, large eyes, antennae large reached at the length of the wings, proximally spoon shaped, second segment of maxillary palpi large, proboscis large and coiled.

3.2.3. Thorax

Thorax broad covered with hair, legs with spines and covered with white and black scales.

3.2.4. Fore wings (Figure C1)

Fore wings are larger than hind wings, costa arched shaped, apical part rounded, concave shaped termen, rounded tornus, slightly arched dorsum, opened discoidal cell; veins, Subcosta (Sc) arised from discoidal cell, reached at the half of the length of the costa, Radius (R1) originated from the base of the wings and forked into Radius (R2) and followed by Radius (R3) Radius (R4) and Radius (R5), Radius (R2) anastomosing with Radius (R3) and reached at the end at the apex of wing, Radius (R4) and Radius (R5) reached at the termen, Median (M1) arised from the angle of discoidal cell, Median (M2) arised from the lower side of the angle of discoidal cell, Median (M3) anastomosing with Median Cubitus (Cu1) and arised from the below side of the discoidal angle, Cubitus (Cu2) is parallel with Cubitus (Cu1), Anal vein (A2) arised from the base of the wing followed by separated from the discoidal cell up to the tornus.

3.2.5. Hind wings (Figure D1)

Hind wings are leaf shaped, its costa arched from the base and apex rounded, pointed tornus and curved dorsum, opened discal cell; veins, Subcosta and Radius ($Sc+R$) originated from the base of the wings followed by separated from Radius (R1), Humeral (h) move towards the costal margin and arised from the $Sc+R$ and Rs, Rs reached at the termen, Median (M1) arised from upper angle of the discoidal cell, Median (M2) arised from the lower of the discoidal cell, Median (M3) anastomosing with cubital (Cu1) arised from lower side of the discoidal cell, Cubital (C1) and (Cu2) arised from discoidal cell for unequal distance reached at the termen, Anal vein (A1) originated from the base of the cell reached at the dorsum,

Anal (A2) and Anal (A3) originated from the base of the wing separately with each other than meet at the half of the dorsum length.

3.2.6. Male genitalia (Figure E1 and F1)

Male genitalia symmetrical, sclerotised uncus laterally sickle shaped, dorsal side tapered at the apex, tegumen anterior side broad, posterior side narrow, short vinculum, V-shaped saccus, lateral side without saccular process, angular juxta; valvae anterior side broad, posterior side narrow have thecal appendages, Aedeagus sclerotised (Fig. G1), dorsal side straight, ventral side curved, conjunctival membrane is present.

3.2.6. Comparative Notes

Junonia almana (L) stands isolated among other species of the genus in having upper side ground colour rich orange – yellow and fore wing with a pale dusky and a much darker short transverse bar with lateral jet – black marginal lines across the cell.

3.3.7. Distribution

J. almana L. has been documented from different localities of Pakistan [11]. Philipe from Lahore [12], Malik from Peshawar [13], Hassan from Islamabad [14] Inayatullah from lower Swat [15], Khan from Azad Kashmir and Muzaffarabad [16], Naz from Murree, Rawalpindi and Mansehra [17]. Presently this species recorded for the first time from Hyderabad, Sindh, Pakistan.

3.3. *Junonia hirta* (Fabricius, 1798)

(Yellow Pansy) (Figure A2 and B2)

3.3.1. Colouration

Head dark brownish black, eyes dark brown, antennae pale, maxillary palpi white, proboscis black; thorax dark brownish black, fore wings bright yellow, apex half of the wing jet black with white streak, dorsum jet black, hind wings bright yellow, half of the terminal margin black, dorsum brown, anteriorly brilliant blue spot in interspaces 2 and 5; abdomen dark brownish black.

3.3.2. Head

Head round head, convex and broad from the frons side, large eyes, and antennae large reached the half of the length of the wings, last portion of the antennae spoon shaped, maxillary anterior side porect, second segment large then the other, large proboscis and coiled.

3.3.3. Fore wings (Figure C2)

Fore wings, costa with broad triangular projection downward at the discal cell, apex broad, termen sinuated, angular tornus, concave shaped termen, rounded tornus, slightly arched dorsum opened discoidal cell; Subcosta (Sc) arised from base of the wing, reached at the half of the length of the costa; Radius (R1) originated from the base of the wings and forked into Radius (R2) and followed by Radius (R3) Radius (R4) and Radius (R5), Radius (R2) anastomosing with Radius (R3) and reached at the end at the apex of wing, Radius (R4) and Radius (R5) reached at the termen; Median (M1) arised from the angle of discoidal cell, Median (M2) arised from the lower side of the angle of discoidal cell, Median (M3) anastomosing with Median Cubitus (Cu1) and arised from the below side of the discoidal angle, Cubitus (Cu2) is parallel with Cubitus (Cu1), Anal vein (A2) arised from the base of the wing followed by separated from the discoidal cell up to the tornus.

3.3.4. Hind wings (Figure D2)

Hind wings are leaf shaped, its costa arched from the base and apex rounded, pointed tornus and curved dorsum, opened discal cell; veins, Subcosta and Radius (Sc+R) originated from the base of the wings followed by separated from Radius (R1), Humeral (h) move near the costal margin and arised from the Sc+R and Rs, Rs reached at the termen, Median (M1) arised from upper angle of the discoidal cell, Median (M2) arised from the lower of the discoidal cell, Median (M3) anastomosing with cubital (Cu1) arised from lower side of the discoidal cell, Cubital (C1) and (Cu2) arised from discoidal cell for unequal distance reached at the termen, Anal vein (A1) originated from the base of the cell reached at the dorsum, Anal (A2) and Anal (A3) originated from the base of the wing separately with each other than meet at the half of the dorsum length.

3.3.5. Male genitalia (Figure E2 and F2)

Tegumen elongated with narrow apex and broad at its upper end, uncus sclerotised not curved without any appendage, parameres produce into acute apex with thorn-like structure at latero-posterior margin, saccus broad triangular in shape without any saccular process, aedeagus (Figure G2) tubular with lateral margin sinuated, thecal appendage absent dorsal membranous Conjunctival appendage

3.3.6. Female genitalia (Figure H2)

Papillae anales proximal round and pilose, posterior apophysis not developed, anterior apophysis well developed, long spine like, ductus bursae very short and tube shaped, corpus bursae balloon shaped and sub genital plate is very short.

3.3.7. Comparative Notes

Junonia hirta is most closely related to *Junonia orithya* in having upper side ground colour, but differ in having blue colour of the hind wing.

3.3.8. Distribution

J. hirta (Fabricius, 1798) has been documented from different localities of the Pakistan. Lahore Philine from Lahore [18], Evans from Baluchistan [19] Malik from Karachi [20], Inayatullah from lower Swat [21], Naz from Murree, Rawalpindi and Mansehra [22]. Presently, this species is recorded for the first time from Hyderabad, Sindh, Pakistan.

4. Conclusion

The scholars have been worked on the species of the genus *Junonia* Hubner from the different localities of Pakistan, but from Hyderabad very little work has done on the genus *Junonia* Hubner. They described these species on the basis of morphological characters, body colour and wing venation. They have ignored the internal male and female genitalia. Studies of this nature is not sufficient in compare to large number of the butterfly fauna, so it is very difficult to distinguished species of the same genus on the morphological characters. Presently, two species of the genus *Junonia* Hubner namely *J. almana* (Linnaeus, 1758) and *J. hirta* (Fabricius, 1798) have been documented for the first time from Hyderabad, Sindh, Pakistan. These species are described on the morphological characters and internal male and female genitalia. The main characters have explained as shape and structures of male genitalia as uncus, tegumen, vinculum, vulvae and aedeagus and structure of female as papillae, apophysis, ductus bursae and corpus bursae.

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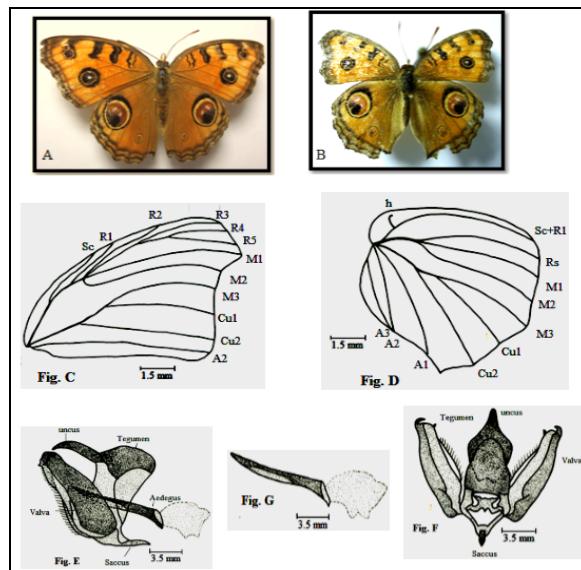


Fig 1: *Junonia almana* L. A. Male; B. Female; C. Fore wing; D. Hind wing; E. Male genitalia (Lateral side); F. Male genitalia (dorsal side); G, Aedeagus.

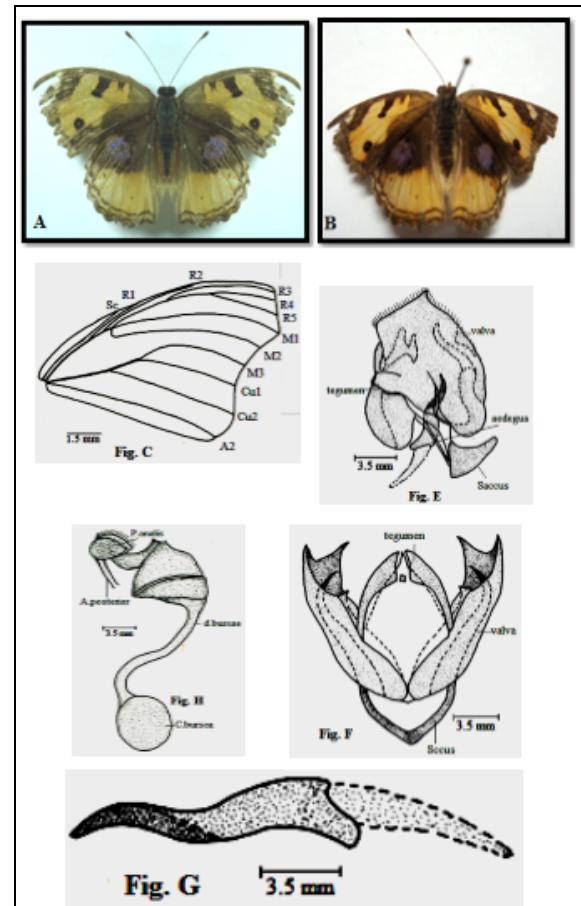


Fig 2: *Junonia hirta* F. A. Male; B. Female; C. Fore wing; D. Hind wing; E. Male genitalia (Lateral side); F. Male genitalia (dorsal side); G, Aedeagus; H. Female genitalia.

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