GENUS COCCINELLA (COCCINELLIDAE: COLEOPTERA) FROM GILGIT-BALTISTAN WITH TWO NEW RECORDS FROM PAKISTAN

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ABSTRACT

The genus Coccinella from Gilgit-Baltistan was revised and four species were confirmed. Coccinella iranica and C. redemita are reported here as new records for Pakistan. Diagnostic characters of each species are given along with colour markings of elytra and detail structure of genitalia. Remarks pertaining to taxonomic discussion, history, taxonomy status and regional record of distribution are given for each species.

Keywords: Coccinella, Coccinellid beetles, ladybird beetles, Coccinellinae, Coccinellidae, New records, Gilgit-Baltistan, Pakistan

INTRODUCTION

It is interesting that Linnaeus – the great naturalist’s first zoological contribution to the nomenclature was on Coccinella. He described this genus in 1758 with its 36 European representatives. Laterille put this genus under newly established Coccinellidae. Later on, European taxonomists did intensive work on this group of insects, notably Mulsant (1846, 1850 and 1866); Redtenbacher (1843); LeConte (1852); Crotch (1874); Weise (1885a,b; 1892 and 1900) and Ganglbauer (1899). The members of genus Coccinella Linnaeus, 1758 are aphidophagous and principally distributed in the Holarctic region with only a few species in the Oriental and/or Australian regions (Kovar, 1997). Species of the genus Coccinella are reported in several catalogues published at the beginning of 20th century and Jacobson (1915) added 30 Palaeartic species as newly records of the distribution data. Dobrzanskiy (1926) was the first taxonomist to give the basis of the modern classification of the genus Coccinella, by precisely defining essential characters of the genus, using colour pattern and structure of genitalia to separate the genera Oenopia (Mulsant, 1850) former Synharmonia (Ganglbauer, 1899) and Coccinula (Dobrzanskiy), 1925.

Initial documentation of predatory coccinellids of Pakistan was done by Irshad (2001, 2003) and Irshad and Khan (2005). The details regarding predatory coccinellids species from Pakistan and current knowledge on the predatory coccinellid beetles of Gilgit-Baltistan are mainly based on Rafi et al. (2005). In this compilation only two species of genus Coccinella have been listed from this area. The exact number of species of genus Coccinella is still incompletely documented in Pakistan. The number of spots on the elytra of the common coccinellids cannot be used alone for their identification. This character was used for years as a basis for many species group, but the majority of these names are not valid now. Later on, the structure of male genitalia was used as a taxonomic character for identification. Dobrzanskiy (1926 and 1927), Timberlake (1943), Kapur (1957; 1958) and Chapin (1965) provided specific taxa that can be represented the natural group of the species.

MATERIALS AND METHODS

The Study area

The Gilgit-Baltistan province of Pakistan (formerly the Northern Areas of Pakistan) is spread over an area of 72498 km$^2$ and administratively divided into seven districts: namely Astorre, Diamer, Gilgit, Ghanche, Ghizer, Hunza Nahagar and Skardu. The area lies between 72° and 77° east longitude and 34.5° and 37° north latitude. This area is surrounded by China, India, Afghanistan and it is separated from Tajikistan by narrow Wakhan strip.

Collection

For collection of the coccinellid species, surveys were conducted from 2005 to 2011 in all the seven districts of Gilgit-Baltistan and mostly in the months of May through August as majority of the areas are accessible during these months only. The specimens were collected by sweeping, hand picking, beating the bushes and shaking the trees. Field data of each specimen was recorded.

Description

The species were described following the literature of Kapur (1958), Kuznetsov (1997) and Katakura et al. (2001). The collected specimens were identified up to species level following the terminology and taxonomic keys of Canepari and Milanese (1997), Inayatullah et al. (2005), Rafi et al. (2005) and Kuznetsov (1997).

Genitalia Examination

For genitalia extraction, the method of Majerus and Kearns (1989) was followed with some modification. The specimens were softened by putting into hot water for 1 to 2 minutes. With the help of two entomological needles, abdomen was detached from the body and boiled in 10% potassium hydroxide solution for half an hour to dissolve excess tissue and partially clear opaque structures. The abdomen was cleaned up a little bit in hot water and transferred to pure glacial acetic acid for five minutes. To dehydrate it, abdomen was first deeped in 80% ethanol and then in absolute alcohol for 5 minutes, respectively. Finally abdomen was moved to clove oil. The processed abdomen was put in a cavity slide with a drop of glycerine and genitalia operated with the help of two entomological needles under stereoscope. Male genitalia were mounted on a plastic strip adhesive with hydrosoluble glue and the female genitalia on a strip of transparent plastic with Euparal. The specimens identification were re-confirmed for this study by Italian expert Dr. Claudio Canepari.

Photography

In order to examine the adult speciemens and fine details of genitalia, Olympus SZX-16 stereoscope was used. Adult specimens and their genitalia were photographed with attached digital DP2-BSW (CCTV) camera with microscope.

Deposition

The identified specimens were deposited in National Insect Museum (NIM), National Agricultural Research Centre, Islamabad, Pakistan.

RESULTS AND DISCUSSION

Genus: Coccinella Linnaeus, 1758

Type species: *Coccinella septempunctata* Linnaeus, 1758, by subsequent designation (Latreille, 1810)

1. **Coccinella iranica** Dobzhanskiy, 1926

(Plate 1)


**Material Examined:** 1 ♀, Pak., GB, Hunza, Duikar, 20. iv. 2005 (Amir) (NIM)

**Description:** Body large, oval, slightly convex, body colour brownish-yellow. Head black, slightly exposed from dorsal view. Eyes large, surrounded by clypeus and pronotum. Pronotum large, only touch at middle with elytra, mostly black with brownish stripe along anterior margins. Scutellum rudimentary. Elytra brownishyellow with eight irregular black spots, four on each elytron, one is common on anterior margin along sutural line, the spots along middle portion developed into an L-shaped patch, other two spots on anal margins are oval and sub-equal.

**Genitalia:** Phalobase: Trab and basal piece typical like other *Coccinella* species. Median lobe very broad for most of its length, abruptly narrowed at subdistal portion. Apex much narrow, round at tip. Paramers long, slightly shorter than median lobe, cylindrical, slightly curved before apex, tip rounded and without hairs. Siphonalcapsule large, outer arm thick and elongated, inner arm very short and hooked. Siphonal tube abruptly curved at base, siphonal tip unique as shown in Plate 1.b.

**Remarks:** This species was first described by Dobrzhansky in 1926 from northern Iran. Later on, in 1931, he placed it under *C. difficilis* species group. Fursch (1984) separated *C. hodaki* as a new species from the collection of *C. iranica* on the basis of median lobe outline. Kovar (1997) reported it from Turkey as a new record. During the present study, only one female specimen was collected from Duikar, Hunza which was confirmed as *C. iranica* by C. Canepari, Italy. *C. iranica* is a new record for Pakistan.

Plate 1

*a. Adult*
b. Female genitalia

**Distribution**: Iran, Turkey.

2. *Coccinella redemita* (Weise, 1895)

(Plate 2)


**Material Examined**: 1 ♂ Pak., GB, Diamer, Goharabad, 5. vi. 2007 (Falak Naz) (NIM).

**Diagnosis**: Body medium, slightly oval, posteriorly pointed, general colour black, finely pubescent. Head yellow, except posterior border black touch eyes, mouth parts brown; clypeus with eight stigmata arranged in two groups vertically, each with four stigmatae. Eyes large, vertical, finely faceted and black. Pronotum transverse, lateral margins extended, anterior margin yellow, posterior margin black, with four black lateral projections. Elytra shiny black, each with eight pale patches, the patch along anterior margin is large, extending from posterial margin to anterai margin. Epipleura developed.

**Genitalia**: Phalobase: Trab short, gradually broadening towards apex, deeply excavated and apex notched. Basal piece broader than long, somewhat square-shaped. Parameres thick, cylindrical, slightly depressed at middle distally rounded, tip provided with sparsely hairs in medium size. Median lobe thick and broad, distalpart diminishing in thickness presenting cone shape, apical end round. Siphonal capsule unique, elongated, directed towards tube. Tube thick for most of its length, slightly curved at base then almost straight, apical part tapering on one side.

**Remarks**: *C. redemita* is new record for the study area, Pakistan as well as Sub-continent. In the present study, only one male specimen was collected from Goharabad, Diamer.

**Distribution**: Iran

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Plate 2

*Coccinella septempunctata*

a. Adult
3. *Coccinella septempunctata* Linnaeus, 1758

(Plate 3)


**Material Examined:** 2 ♂ 3 ♀ Pak. GB, Hunza, Gulmit, 12. vi. 2008 (M. Ashfaque) (NIM); 1 ♂ 1 ♀ Pak. GB, Hunza, Nagar, 12. vi. 2008 (M. Ashfaque) (NIM); 1 ♂ Pak. GB, Skardu, Kachora lake, 16. vi. 2008 (A. Shehzad) (NIM); 2 ♂ Pak. GB, Gilgit, Pari bangla, 15. vi. 2008 (Ashraf) (NIM); 2 ♂ 3 ♀ Pak. Sindh, Jacobabad, 22. iii. 2008 (Ishaque) (NIM); 2 ♂ 3 ♀ Pak. Sindh, Sukkar, 24. iii. 2008 (Ishaque) (NIM); 1 ♂ 2 ♀ Pak. AJK, Mangla, 22. vi. 2008 (Ishaque/Zia) (NIM); 3 ♂ 2 ♀ Pak. Punjab, Murree, 31. v. 2007 (Rahim Khan) (NIM); 3 ♂ Pak. Punjab, Chiniot, 10. iii. 2008 (A. Shehzad) (NIM).

**Description:** Body roundly oval, convex, nearly hemispherical, densely punctate. Body with seven spotted, three on each elytra and one right behind the middle of thorax. The size of the spots can vary considerably. Elytra marks patched, black. Head transverse, black with pair of yellow spots on frons near eyes. Head triangular with yellow hairs except on eye. Antennae 11 segmented with basal segment longer. Clypeus anteriorly truncate with small yellow antero-lateral projections. Eyes small with minute facets. Pronotum twice as broad as long, densely punctate pitted. Pronotum punctate, densely and finely, black with small b. Male genitalia

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2 ♂ 3 ♀ Pak. GB, Hunza, Gulmit, 12. vi. 2008 (M. Ashfaque) (NIM); 1 ♂ 1 ♀ Pak. GB, Hunza, Nagar, 12. vi. 2008 (M. Ashfaque) (NIM); 1 ♂ Pak. GB, Skardu, Kachora lake, 16. vi. 2008 (A. Shehzad) (NIM); 2 ♂ Pak. GB, Gilgit, Pari bangla, 15. vi. 2008 (Ashraf) (NIM); 2 ♂ 3 ♀ Pak. Sindh, Jacobabad, 22. iii. 2008 (Ishaque) (NIM); 2 ♂ 3 ♀ Pak. Sindh, Sukkar, 24. iii. 2008 (Ishaque) (NIM); 1 ♂ 2 ♀ Pak. AJK, Mangla, 22. vi. 2008 (Ishaque/Zia) (NIM); 3 ♂ 2 ♀ Pak. Punjab, Murree, 31. v. 2007 (Rahim Khan) (NIM); 3 ♂ Pak. Punjab, Chiniot, 10. iii. 2008 (A. Shehzad) (NIM).

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yellow spots at anterior angles. Scutellum small, nearly equilateral, brownish black. Elytra without hairs and finely pitted.

**Genitalia:** Phalobase: Trab short and very thick. Basal piece elongated. Median lobe much thickened, very broad at base upto 1/3rd of its length, then abruptly narrowing towards apex, deeply excavated when seen from dorsal side. Siphon: siphonal capsule bulging and thick. Parameres relatively shorter than median lobe, covered with dense long hairs on dorsal side except base. Siphonal tube long, the distal end carries sac like structure.

**Remarks:** This is a commonly occurring species and was collected from Goharabad, Golapur, Gulmit, Jaglot, Karimabad, Kitch, Nilt nagar, Rakaposhi areas of Gilgit-Baltistan.

**Distribution:** Cosmopolitan.

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**Plate 3**

*Coccinella transversoguttata*

a. Adults

b. Male genitalia
4. **Coccinella transversoguttata** Faldermann, 1835

(Plate 4)


**Material Examined:** 2 ♂, 2 ♀ Pak. GB, Skardu, 7. vi. 2003 (Ather) (NIM); 1 ♂ Pak. GB, Skardu, 12. vi. 2008 (M. Ashfaque) (NIM).

**Description:** Body broadly hemispherical, strongly convex, black, obsoletely punctate with small transverse spots. Head nearly inserted and not visible from above and with two pale spots on each side near eyes. Head, pronotum and elytra densely punctate. Pronotum and scutellum black with anterolateral spots on pronotum, orange. Thorax apical margin not white. Elytra dull orange with a subbasal common facia, a transverse medial spot near hind margin and another towards apex near anteriar margin. The spots black, size various ; their arrangements highly variable.

**Genitalia:** Phalobase: Trabshort and thick.basal piece very broad, rectangular. Median lobe longer than parameres, wide, deeply emarginated in the distal half of its length, apical part extended forming a tongue-like structure. Siphon like as that of *C. septempunctata* as illustrated in Plate 4.b.

**Remarks:** The species is highly variable in elytral marking, therefore, Leng (1920) reported that there are 11 varieities of this species in North America. Casey (1899) declared American representatives of this species as *C. quinquenotata* Kirby and Asiatic representatives as *C. transversoguttata* Falderman. Dobzhanskiy (1926) synonymized these species under *C. transversoguttata* Falderman on basis of similarity in male genitalia. He further stated that there is no difference between the two representaives except in spot 2 which is usually absent in Asiatic specimens. During present study, it was collected from Skardu.

**Distribution:** India, China, Japan, Siberia, North America
CONCLUSIONS AND RECOMMENDATIONS

It is concluded that four species of genus *Coccinella* are occurring in Gilgit-Baltistan, out of which *C. septempunctata* and *C. transversoguttata* are commonly occurring species in the area, therefore, these two species can be utilized in biological control-based IPM. Further exploration in the area may yield other species of the genus.

REFERENCES


