Research Article

LADYBEETLES OF NEPAL (COLEOPTERA: COCCINELLIDAE) FROM THE CROP FIELDS AT NEPAL AGRICULTURAL RESEARCH COUNCIL, KHUMALTAR, LALITPUR

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ABSTRACT

The diversity of ladybeetles fauna of Nepal Agricultural Research Council (NARC), Khumaltar, Lalitpur is studied in this paper. In this study, 7 species from 4 subfamilies (Chilocorinae, Sticholotidinae, Scymninae and Coccidulinae), 6 tribes (Chilocorini, Epilachnini, Sticholotidini, Scymnini, Noviini and Coccinelini) and 6 genera (*Chilocorus*, *Henospilachna*, *Jauravia*, *Pharoscymnus*, *Rodolia* and *Scymnus*) were collected and identified. The identified species were *Chilocorus nigritus* (Fabricius, 1798), *Henosepilachna kathmanduensis* (Miyatake, 1985), *Henosepilachna vigintioctopunctata* (Fabricius, 1775), *Jauravia quadrinotata* (Kapur, 1946), *Pharoscymnus flexibilis* (Mulsant, 1853), *Rodolia pumila* (Weise, 1892) *and Scymnus posticalis* (Sicard, 1913).

INTRODUCTION

Coccinellidae is the largest family under the superfamily Coccinelloidea. They are commonly known as ladybugs, ladybirds, lady beetles or ladybird beetles. Their habitat range includes those as diverse as cities, fields, gardens, sea coasts and mountains (Majerus and Kearns, 1989; Hodek and Honek, 1996). It has about 6000 species under 360 genera world-wide (Escalona *et al.*, 2017). Many Coccinellids are predators and major biological control agents of hemipteran pests such as aphids, mealy bugs and scale insects, as well as thrips and mites (Moreton, 1969; Hawkeswood, 1987; Majerus, 1994). Some Coccinellids also prey upon early instars of Lepidoptera and Coleoptera (Hodek, 1964), some also feed on fungi (Bagal and Trehan, 1945). From the Indian subcontinent, 36 species of aphidophagous coccinellids have been reported (Agarwala and Ghosh, 1988). Usually, the brightly coloured species are aphidophagous, while the darker coloured and smaller species feed on insects like scale insects, mealy bugs, whiteflies or spider mites (Ipetri, 1999). The colour and its pattern differ greatly often even within the same species with local adaptation, in which the frequency of melanic forms varies greatly between populations (Michie *et al.*, 2010). Prey location by ladybeetle adults is dependent on a number of factors, such as the honeydew produced by aphids acting as an arrestant stimulus (Carter and Dixon, 1984), or micro-climate and their searching ability affected by plant density (Honek, 1982).

Nepal Agricultural Research Council, Khumaltar, Lalitpur is at an altitude of about 1320masl. The vegetation is of deciduous type. Common fruits found are citrus, mulberry, guava, papaya, pear, peach etc. Cruciferous vegetables like cabbage, radish, cauliflower, broccoli, mustard, rapeseed etc. cucurbits like cucumber, pumpkin, bitter gourd, bottle gourd, ash gourd etc. and other vegetables like pea, beans, potatoes etc. were found to be grown. Similarly, grasses like rye, oats, dhunche and cereal crops like rice, maize, wheat, barley are grown. The climate is hot and wet during monsoon and cold and dry during winter. The area of NARC, Khumaltar, Lalitpur expands up to 47.2 hectors including 22.40 hectors of National Animal Science Research Institute.

In Nepal overall, Hope (1831) took the first effort to record the Coccinellidae in which he described 19 new species. Subsequently, Mulsant (1850) added three and Crotch (1874) added one species later to the list of Hope. Dohrn (1882) later described one more species from Nepal. Kapur (1955) reported 26 species from Nepal of which 5 were new to science and 15 were new to Nepal. Kapur (1963) also

enlisted 51 species from Darjeeling, Sikkim and Tibet. Similarly, Miyatake (1985) listed 46 spp. from Nepal Himalayan expedition in 1968. Canepari and Milanese (1997) listed 114 species along with 26 new species from Himalaya of Nepal. Poorani (2002; 2004) listed several species from Nepal in her annotated checklist. Joshi and Manadhar (2001) listed 31 species from Nepal. Likewise, Thapa (2000) also listed 31 species. This is the first initiative to record the ladybeetles fauna from NARC, Khumaltar, Lalitpur. All the species reported in this research have been previously reported from several parts of Nepal.

MATERIALS AND METHODS

The surveys were carried out during June 2018- January 2019, in the pastures of National Animal Science Research Institute and crop fields at Nepal Agricultural Research Council (Khumaltar, Lalitpur, 27°65'N, 85°32'E, 1320 masl). The sightings were recorded capturing photos in Sony Cyber-Shot DSC-HX90V 18.2MP camera. The GPS details of location and date were recorded on the photos itself. The sweep nets and hand collection were used and specimens were collected in Borosilicate glass veils (6.3 x 2.3 cm dia) and killed with cotton plugs soaked in ethyl acetate. The collected specimens were taken to the Insect Museum Laboratory of Entomology Division (NARC, Khumaltar, Lalitpur). Larvae collected were reared till adults emerged. The adults were dissected under Olympus stereo-microscope Model SZ2-ILST. The stereo-microscope was connected to Dell Inspiron 3537 laptop installed with ScopeImage 9.0 (H1C) software and connected with COSLAB MODEL: MDCE-5C Digital USB Microscope Camera to capture images under the view.

After the dissection, their genitalia were preserved in the microscope slides using Fevicol® glue that became transparent when dried. Detached head, abdomen and rest of the body were also pasted to the slide. The slides were preserved in a slide box with labels on them. Other adults were mounted in cards using adhesive- Fevicol®, pinned and labeled with data on locality and collection date, identified and preserved in a sealed box with naphthalene balls. Thus, the main basis for identification was the observation of male genitalia.

RESULTS AND DISCUSSION

A total of 7 species of Coccinellidae belonging to 6 genera from 6 tribes and 4 subfamilies were recorded.

1. *Chilocorus nigritus* (Fabricius, 1798)

Coccinella nigrita Fabricius,1798, *Chilocorus nigritus* Mulsant, 1850, *Chilocorus nigrita* Bielawski, 1957

Material (s) examined: Khumaltar, Lalitpur, 04.x.2018 m.

Description: Size 3.7mm in length and 3.1mm in width. Head brownish. Pronotum, scutellum and elytra bright black. Proximal angles of pronotum have testaceous patch.Glabrous body almost circular with dorsum strongly convex and dome shape. Venter all brownish. Elytral epipleuron black. Pronotal epipleuron brownish.

Distribution: India, Pakistan, Sri Lanka, Bangladesh, Myanmar, China, Indonesia, Thailand, South Africa, Seychelles, Pacific, Brazil (Poorani 2012), Nepal (Joshi &Manandhar 2001).

Found on: A single male specimen was found on mulberry tree.

2. *Henosepilachna kathmanduensis* (Miyatake, 1985)

Material (s) examined: Khumaltar, Lalitpur, 13.viii.2018 m; Khumaltar, Lalitpur,10.x.2018 m

Description: Size from 5-6.1mm length and 3-4.5mm width. Males smaller than females. Oval dome shaped brownish pubescent body. Head brownish. 5 black spots on pronotum, 1 arrow shaped in the middle and 2 on each sides at posterior parts. 6 black spots on each elytron in 1-1-2-1-1 fashion. The first '1' spot near suture at basal half and the other '1' spot near the suture of apical half. Venter brown with metasternum and median of first 4 or 5 abdominal sternites fuscous. A small central portion of elytral epipleuron black.

Distribution: Nepal (Poorani, 2012).

Found on: It was found feeding on small weeds.

3. *Henosepilachna vigintioctopunctata* (Fabricius, 1775)

Coccinella 28-punctata Fabricius, 1775, *Coccinella chrysomelina* Fabricius, 1775, *Coccinella sparsa* Herbst, 1786, *Henosepilachna vigintioctopunctata* Jadwiszczak &Wegrzynowicz, 2003

Material (s) examined: Khumaltar, Lalitpur, 2018.x.01 m; Khumaltar, Lalitpur, 2018.x.08 f.

Description: Size from 5.8-6.4mm length and 3.9-5mm width. Convex hemispherical pubescent brownish body. 3-4-1-3-2-1 fashion black spots on pubescent elytra. 7 spots on pronotum in 2-5 fashion. The front "2" larger. Brown head and black eyes. Brown elytral epipleuron with some large oval black patches. Fuscous metasternum with center brown.

Distribution: India, Sri Lanka, Pakistan, Nepal, Bhutan, Burma, Thailand, Vietnam, Philippines, Indonesia, Japan,

China, New Guinea, Fiji, Solomon Islands, Australia (Poorani, 2012).

Found on: They were found on various vegetables and weeds.

4. *Jauravia quadrinotata* (Kapur, 1946)

Material (s) examined: Khumaltar, Lalitpur, 2018.x.05 m; Khumaltar, Lalitpur, 2018.x.05 f

Description: Size about 2.4mm in length and 1.9mm in breadth. Small circular convex pubescent brownish body. Elytra has 4 sub rounded black spots, 2 on base and 2 on sub apical part. Eyes black. Metasternum and first 3 or 4 abdominal sternites fuscous. Outer lateral part of tibia and inner lateral part of tarsi (especially first) has rows of hairs.

Distribution: India, Bhutan, Nepal (Poorani, 2012); Taiwan, China (Yunnan) (Kovar, 2007).

Found on: They were found on the plants of *Duranta erecta*.

5. *Pharoscymnus flexibilis* (Mulsant, 1853)

Scymnus (Diomus) flexibilis Mulsant, 1853, *Scymnus flexibilis* Crotch, 1874, *Pharus flexibilis* Weise, 1900, *Pharoscymnus flexibilis* Korschefsky, 1931**.**

Material (s) examined: Khumaltar, Lalitpur, 2018.ix.25 m; Khumaltar, Lalitpur, 2018.x.10 m

Description: A small brownish convex bodied beetle about 1.6-1.8mm in length and 1-1.2mm in width. Elytra has setae. One indistinct brownish spot on basal part of elytron (humeral spot), same type of spot on basal anterior suture. A prominent black spot in median line on the disc of elytron and one brown indistinct spot in subapical part of each elytron. Venter brownish with sternum and first abdominal segment fuscous.

Distribution: India, Pakistan (Poorani, 2012); Afghanistan, Iran (Kovar, 2007).

Found on: It was abundantly found on Prunus plants and some on Pumelo.

6. *Rodolia pumila* (*Weise, 1892)

Material (s) examined: Khumaltar, Lalitpur, 2018.x.04 m; Khumaltar, Lalitpur, 2018.x.08 m.

Description: About 3-4mm in length and 2.1-2.8mm in width. Oblong convex glabrous orange colored body. Head orange. Clypeus pubescent. Eyes posterior pubescent. Posterior margin of head black. Pronotum sparsely pubescent. Scutellum glabrous. Margins and distal parts of elytra more pubescent and central parts have very small hairs. Very small punctations. Sternums black. Forefemurs, foretibiae, and foretarsi orange. Claws browner. Apices of the remaining femurs orange. Remaining tibiae and tarsi orange. Claws more brown. Sixth abdominal sternite fuscous brown, 7, 8 and 9 are orange. Venter pubescent. Elytral epipleuron orange. No tibial spurs.

Distribution: India, Sri Lanka (Poorani, 2012).

Found on: It was found on Pumelo plants.

*Rodolia of Asia needs a proper revision.

7. *Scymnus posticalis* (Sicard, 1913)

Scymnus (Pullus) posticalis Korschefsky, 1931, *Scymnus hilaris* Weise, 1879, *Pullus hilaris* Ohta, 1929, *Pullus hilaris ab. awanus* Ohta, 1929, *Scymnus (Pullus) hilaris* Sasaji, 1971, *Scymnus (Scymnus) ishidai* Araki, 1963, *Scymnus (Nephus) inops* Smirnoff, 1973

Material (s) examined: Khumaltar, Lalitpur, 2018.ix.27 f, Khumaltar, Lalitpur, 2018.x.11 m.

Description: About 2.1-2.4mm in length and 1.1-1.6mm in width. Short convex dome shaped pubescent body. Head orange. Margins of pronotum orange. Eyes black. Apices of elytra testaceous. Pronotal epipleuron testaceous. Sternum black. Legs testaceous. Medians of 4th and 5th abdominal sternites fuscous.

Distribution: India, Nepal, Japan, Myanmar (Poorani, 2012); Bhutan, China (Fujian, Gguandong, Guizhou, Guangxi, Henan, Hubei, Sichuan, Shaanxi, Yunnan), South Korea, Taiwan (Kovar, 2007)

Found on: It was found on Justicia plants.

CONCLUSION

Seven different species of Coccinellidae belonging to 4 different subfamilies, 6 different tribes and 6 different genera were collected and identified in this study. They were *Chilocorus nigritus* (Fabricius, 1798)*, Henosepilachna kathmanduensis* (Miyatake, 1985)*, Henosepilachna vigintioctopunctata* (Fabricius 1775)*, Jauravia quadrinotata* (Kapur, 1946)*, Pharoscymnus flexibilis* (Mulsant, 1853)*, Rodolia pumila* (Weise, 1892) *and Scymnus posticalis* (Sicard, 1913)*.* All of these species have been studied from Nepal in earlier literatures and no species new to science or new to Nepal have been reported in this study.

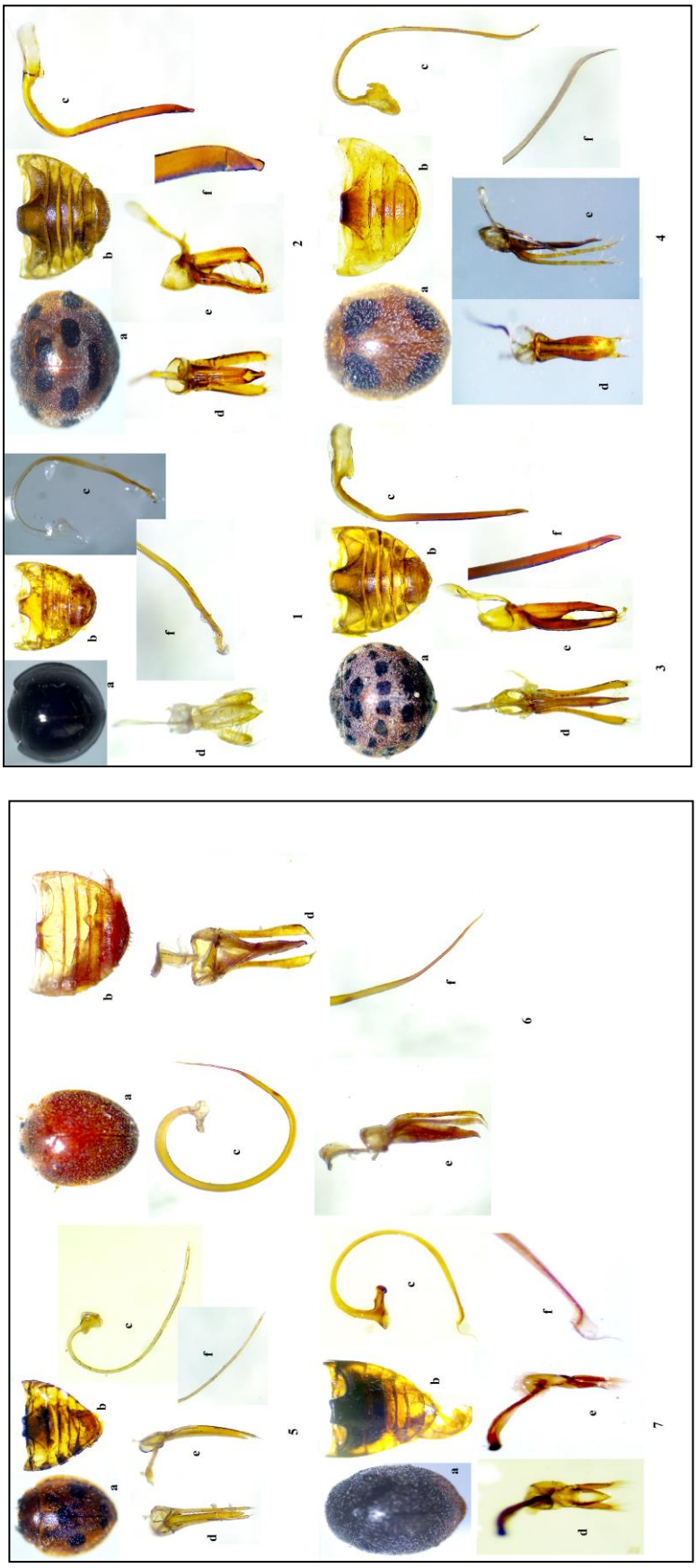

Fig. 1. Habitus and Male Genitalia of Each Studied Species:
1. *Chilocorusnigritus* (Fabricius, 1798) **2.** *Henosepilachna kathmanduensis* (Miyatake, 1985) **3.** *Henosepilachna vigintioctopunctata* (Fabricius, 1775) **4.** *Jauravia quadrinotata* (Kapur, 1946) **5.** *Pharoscymnus flexibilis* (Mulsant, 1853) **6.** *Rodolia pumila* (Weise, 1892) **7.** *Scymnus posticalis* (Sicard, 1913)

a. Habitus b. Male Abdomen* c. Sipho d. Tegmen, Ventral View e. Tegmen, Lateral View f. Sipho Tip

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