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SHORT COMMUNICATION

Catalogue of selected insect groups of Lalwan Community Reserve and Ranjit Sagar Conservation Reserve, Punjab, India

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Abstract: We present the first documentation of the insect fauna of Lalwan Community Reserve and Ranjit Sagar Conservation Reserve, Punjab. The survey was conducted in the months of May and June 2019. Selected insect groups were focused on for the rapid documentation of the entomofauna. Overall, we recorded 91 species of insects belonging to the orders Lepidoptera, Coleoptera, and Odonata. A total of 68 species including 46 species of order Lepidoptera, nine species of Odonata, and 13 species of Coleoptera were reported from Lalwan Community Reserve. Thirty-seven species consisting of 23 species of Odonata and 14 species of Lepidoptera were recorded from Ranjit Sagar Conservation Reserve, Punjab.

Keywords: Coleoptera, diversity, entomofauna, Lepidoptera, Odonata.

A healthy ecosystem reveals the diversity and community structure of the insect groups in itself (Fagundes et al. 2011). Biodiversity surveys provide fundamental information needed for conservation planning, protected area justification and design, and development of management plans (Spector & Forsyth 1998). India is on the list as one of the major biodiversity rich countries of the world, due to the presence of a wide range of habitats from alpine to tropical ecosystems and freshwater to marine, desert, and island ecosystems (Ghosh 1996). According to studies conducted by Ghosh in the years 1990, 1994, and 1996, 2% of the total global space resides in India and in terms of biodiversity it inhabits about 7% of faunal biodiversity globally. Among all the fauna on Earth class Insecta is the most flourishing, these appeared 3 billion years ago and spread all over the world due to their ability to survive in any habitat and extreme conditions; hence considered as indicators of changes happening in nature (Harrington & Stork 1995; Gullan & Cranston 1996). Insects are the most diverse animal group present on earth and show an extreme level of adaptability probably in all kinds of habitats (Harrington & Stork 1995; Landres et al. 1988).

Insects are the largest group among animals regarding their global presence (10,53,578 species); India is also rich in insect diversity with 65,047 species (Chandra et al. 2018), occupying several ecological niches, being considered very important in the dynamics of natural ecosystems (Borror et al. 1992; Kim 1993; Gullan & Cranston 1996; Thomazini & Thomazini 2000). Coleoptera (beetles) are the largest order of insects, with about 400,000 species worldwide, representing 30% of animals and about 40% of all insects (Lawrence & Britton 1991; Lawrence & Newton 1995; Costa 2000). About 180,000 species of Lepidoptera have been described in the world which comprise of moths and butterflies. A total of 1,439 species of butterflies have been described from India so far. They play an

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important role in pollinating flowering plants. Odonata comprises carnivorous insects, dragonflies (Anisoptera) and the damselflies (Zygoptera). Odonates comprise 6,233 species in 685 genera globally, India has 486 species, about 50 subspecies in 151 genera and 18 families (Subramanian & Babu 2017). Dragonflies and damselflies are very good indicators of freshwater.

Sharma & Joshi (2009) documented the butterflies in district Hoshiarpur from Dholbaha Dam. Bhardwaj et al. (2017) documented the biodiversity of Siswan Reserve, Punjab in which 169 species of insects were reported. Singh et al. (2018) reported the coleopteran fauna of the Siswan Reserve, Punjab. The present study reveals the Lepidoptera, Coleoptera, & Odonata fauna of the Lalwan Community Reserve and Lepidoptera & Odonata fauna of Ranjit Sagar Conservation Reserve, Punjab for the first time.

Study Area

Lalwan Community Reserve (LCR) is situated in Tehsil Garshakar in district Hoshiarpur, Punjab. Ranjit Sagar Conservation Reserve (RSCR) is known for the Ranjit Sagar Dam, also known as the Thein Dam, constructed by the Government of Punjab on the Ravi River (Figure 1). RSCR is situated on the border of two states of India, Jammu & Kashmir and Punjab. Insect assessment was carried out only in the Punjab portion of the RSCR.

Methods

Lepidoptera, Odonata, & Coleoptera orders were focused in LCR, however only Lepidoptera and Odonata were focused in RSCR. The insect sampling survey was done through the water streams of forests of LCR and on the bank of the RSCR Lake. A total of 17 points were selected at 1,000-m intervals for sampling in the LCR whereas 10 points were selected at the RSCR. Sampling was done both at day (09.00–18:00 h) and night (20:00–22:00 h). Sweep netting was performed for insects under order Lepidoptera, Hymenoptera, & Odonata. Light trapping method was applied during the evening and night sampling to collect insects like Lepidoptera and Coleoptera. Hand picking method was applied for insects under order Coleoptera. Insects were photographed and a few were also collected for their proper key identification. Odonates were identified using published literature (Andrew et al. 2008; Subramaniam 2009; Nair 2011) and web sources. Butterflies were identified with published literature (Uniyal 2004; Talbot 1939, 1947; Singh 2011) and web sources. Moths using (Hampson 1892–1896; Zolotuhin & Pinratana 2005; Pinratana & Cerny 2009; Nieukerken et al. 2011). Beetles were identified with the published literature (Andrewes 1929; Sewak 2009; Chandra & Gupta 2013; Chandra 2018).

Results and Discussion

A total of 91 species (Table 1) belonging to 19 families were reported (Figure 2) including 68 species from LCR and 37 species from RSCR, which were reported for the first time from the regions. LCR holds the diversity of 46 species of order Lepidoptera, nine species of Odonata, and 13 species of Coleoptera. RSCR holds the diversity of 23 species of Odonata and 14 species of Lepidoptera (Figure 3). Photographs of all the species reported from these two regions are presented in Images 1–4.

Biodiversity conservation issues mostly focus on the ecological impact of management practices and their aim is to provide a practical background for sustainable biodiversity management. Such a study was done in the

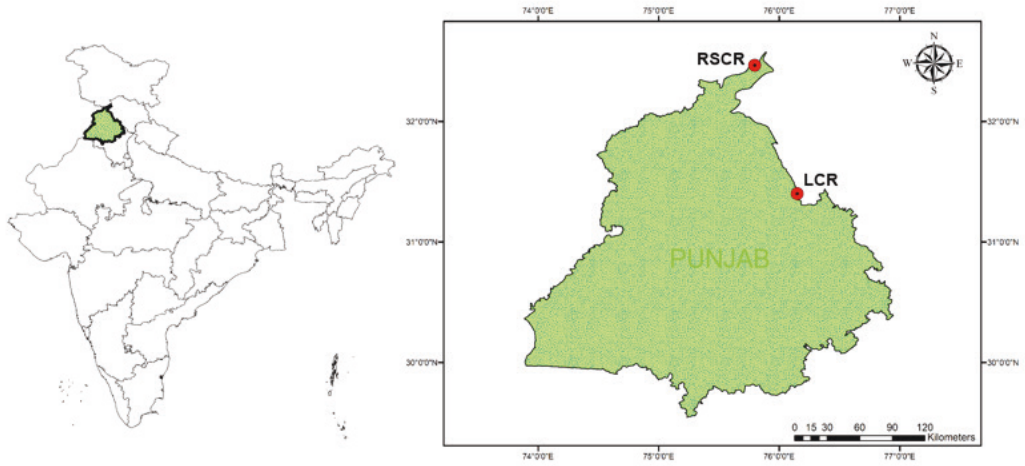

Figure 1. Map represents the two study areas in Punjab State.

Table 1. Catalogue of species recorded from Lalwan Community Reserve and Ranjit Sagar Conservation Reserve.

	Family	Genus	Species	Author & year of description	Common name	Location
	Lepidoptera					
1	Hesperiidae	*Pelopidas*	*sinensis*	Mabille, 1877	Chinese Branded Swift	LCR, RSCR
2		*Sarangesa*	*dasahara dasahara*	Moore,1866	Indian Common Small Flat	LCR
3		*Tarucus*	*nara*	Kollar, 1848	the striped Pierrot	RSCR
4	Lycaenidae	*Albulina*	sp.			LCR
5		*Anthene*	*emolus emolus*	Godart, 1824	Bengal Common Ciliate Blue	LCR
6		*Castalius*	*rosimon*	Fabricius, 1775	the common Pierrot	LCR
7		*Celatoxia*	*albidisca*	Moore, 1884	White disc Hedge blue	LCR
8		*Curetis*	*acuta*	Moore, 1877	Acute Sunbeam	LCR
9		*Tajuria*	*cippus*	Fabricius, 1798	Indian Peacock Royal	LCR
10	Nymphalidae	*Acraea*	*violae*	Fabricius, 1775	Tawny Coster	RSCR
11		*Ariadne*	*merione*	Cramer, 1777	Common Castor	LCR, RSCR
12		*Cyrestis*	*thyodamas*	Boisduval, 1836	Map Butterfly	LCR
13		*Danaus*	*chrysippus*	Linnaeus, 1758	Plain Tiger	LCR
14		*Euploea*	*mulciber*	Cramer, 1777	the striped blue crow	RSCR
15		*Euploea*	*core*	Cramer, 1780	Common Crow	LCR, RSCR
16		*Hypolimnas*	*bolina*	Drury, 1773	the great eggfly, common eggfly	LCR, RSCR
17		*Junonia*	*lemonias*	Linnaeus, 1758	lemon pansy	LCR, RSCR
18		*Junonia*	*almana*	Linnaeus, 1758	Peacock Pansy	LCR
19		*Junonia*	*hierta hierta*	Fabricius, 1798	Oriental Yellow Pansy	LCR
20		*Junonia*	*iphita*	Cramer, 1779	Chocolate Pansy	LCR, RSCR
21		*Junonia*	*orithya ocyale*	Hübner, 1819	Dark Blue Pansy	LCR
22		*Lethe*	*europa*	Fabricius, 1775	Bamboo Treebrown	LCR
23		*Neptis*	*hylas*	Linnaeus, 1758	Common Sailer	LCR
24		*Parantica*	*aglea*	Stoll, 1782	the glassy tiger	RSCR
25		*Phalanta*	*phalantha*	Drury, 1773	Common Leopard	LCR, RSCR
26		*Tirumala*	*septentrionis*	Butler, 1874	Dark Blue Tiger	LCR, RSCR
27	Papilionidae	*Graphium*	*cloanthus cloanthus*	Westwood, 1841	Himalayan glassy bluebottle	LCR
28		*Papilio*	*polytes*	Linnaeus, 1758	Indian Common Mormon	LCR, RSCR
29	Pieridae	*Belenois*	*aurota aurota*	Fabricius, 1793	Indian Pioneer	LCR
30		*Catopsilia*	*pomona*	Fabricius, 1775	Lemon Emigrant	LCR, RSCR
31		*Eurema*	*brigitta*	Stoll, 1780	Small Grass Yellow	LCR
32		*Ixias*	*marianne*	Cramer, 1779	White Orange-tip	LCR
33		*Pieris*	*canidia*	Sparrman, 1768	Asian Cabbage White	LCR
34	Crambidae	*Agrotera*	*scissalis*	Walker, 1865		LCR
35		*Cnaphalocrocis*	*medinalis*	Guenée, 1854		LCR
36		*Conogethes*	*punctiferalis*	Guenée, 1854		LCR
37		*Diaphania*	*indica*	Saunders, 1851		LCR
38		*Omiodes*	sp.			LCR
39		*Orphanostigma*	*abruptalis*	Walker, 1859		LCR
40	Erebidae	*Barsine*	*orientalis*	Černý Pinratana, 2009		LCR
41		*Arctornis*	sp.			LCR
42		*Spilosoma*	*lutea*	Hufnagel, 1766		LCR
43		*Lymantria*	sp.			LCR

	Family	Genus	Species	Author & year of description	Common name	Location
44	Geometridae	*Scopula*	sp.			LCR
45		*Scopula*	sp. 1			LCR
46		*Nemoria*	sp.			LCR
47		*Hypomecis*	sp.			LCR
48		*Idaea*	sp.			LCR
49	Drepanidae	*Tridrepana*	*albonotata*	Moore, 1879		LCR
50	Limacodidae	*Thosea*	sp.			LCR
	Odonata					
51	Chlorocyphidae	*Libellago*	*lineata*	Burmeister, 1839	River heliodor	RSCR
52	Coenagrionidae	*Agriocnemis*	*lacteola*	Selys, 1877	Milky Dartlet	RSCR
53		*Amphiallagma*	*parvum*	Selys, 1876	Little Blue or Azure Dartlet	RSCR
54		*Ceriagrion*	*cerinorubellum*	Brauer, 1865	Orange-tailed Marsh	RSCR
55		*Ceriagrion*	*coromandelianum*	Fabricius, 1798	Coromandel Marsh Dart and Yellow Waxtail	RSCR
56		*Ceriagrion*	*olivaceum*	Laidlaw, 1914	Rusty Marsh Dart	RSCR
57		*Copera*	*marginipes*	Rambur, 1842	Yellow Bush Dart	RSCR
58		*Paracercion*	*calamorum*	Ris, 1916	Dusky Lilysquatter	RSCR
59		*Pseudagrion*	*microcephalum*	Rambur, 1842	The Blue Riverdamsel	RSCR
60	Gomphidae	*Ictinogomphus*	*rapax*	Rambur, 1842	Common Clubtail	LCR
61	Libellulidae	*Acisoma*	*panorpoides*	Rambur, 1842	Asian Pintail, Trumpet Tail	RSCR
62		*Orthetrum*	*glaucum*	Brauer, 1865	Blue Marsh Hawk	RSCR
63		*Brachydiplax*	*farinosa*	Krüger, 1902	Black-tailed Dasher	LCR
64		*Brachythemis*	*contaminata*	Fabricius, 1793	Ditch Jewel	LCR, RSCR
65		*Brachythemis*	sp.			LCR
66		*Bradinopyga*	*geminata*	Rambur, 1842	Granite Ghost	RSCR
67		*Crocothemis*	*servilia*	Drury, 1770	scarlet Skimmer or Ruddy Marsh Skimmer	RSCR
68		*Hydrobasileus*	*croceus*	Brauer, 1867	Amber-winged Marsh Glider	RSCR
69		*Indothemis*	*carnatica*	Fabricius, 1798	Black Marsh Skimmer	LCR, RSCR
70		*Neurothemis*	*fulvia*	Drury, 1773	Fulvous Forest Skimmer	LCR, RSCR
71		*Neurothemis*	*tullia*	Drury, 1773	Pied Paddy Skimmer	RSCR
72		*Orthetrum*	*luzonicum*	Brauer, 1868	Marsh Skimmer	LCR
73		*Orthetrum*	*pruinosum*	Burmeister, 1839	Crimson-tailed Marsh Hawk	RSCR
74		*Orthetrum*	*sabina*	Drury, 1770	Slender Skimmer or Green Marsh Hawk	LCR, RSCR
75		*Orthetrum*	*triangulare*	Selys, 1878	Black-tailed Dasher	RSCR
76		*Rhodothemis*	*rufa*	Rambur, 1842	Rufous Marsh Glider	LCR
77		*Rhyothemis*	*variegata*	Linnaeus, 1763	Common Picture Wing or Variegated fFutterer	RSCR
78		*Trithemis*	*aurora*	Burmeister, 1839	Crimson Marsh Glider	RSCR
	Coleoptera					
79	Meloidae	*Hycleus*	*pustulata*	Thunberg, 1791		LCR
80	Coccinellidae	*Harmonia*	*dimidiata*	Fabricius, 1781		LCR
81	Carabidae	*Pheropsophus*	*verticalis*	Dejean, 1825		LCR
82		*Pheropsophus*	sp.			LCR
83	Histeridae	*Carcinops*	*pumilio*	Dejean, 1825		LCR

	Family	Genus	Species	Author & year of description	Common name	Location
84	Scarabidae	*Copris*	sp.			LCR
85		*Onitis*	sp.			LCR
86		*Onitis*	*singhalensis*	Lansberge, 1875		LCR
87		*Onitis*	*niger*	Wiedemann, 1819		LCR
88		*Onitis*	*castaneous*	Redt, 1848		LCR
89		*Onthophagus*	sp.			LCR
90		*Oniticellus*	*cinctus*	Fabricius, 1775		LCR
91		*Onthophagus*	*bonasus*	Fabricius, 1775		LCR

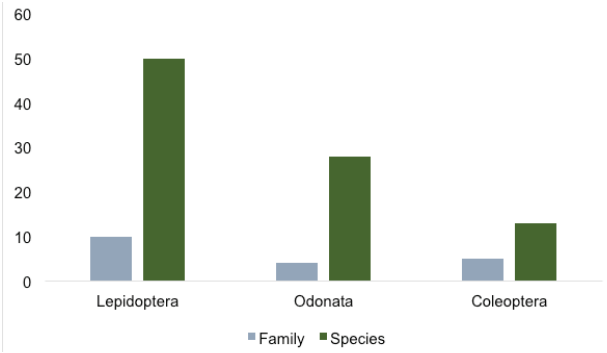

Figure 2. Overall number of insect families and species reported from the regions.

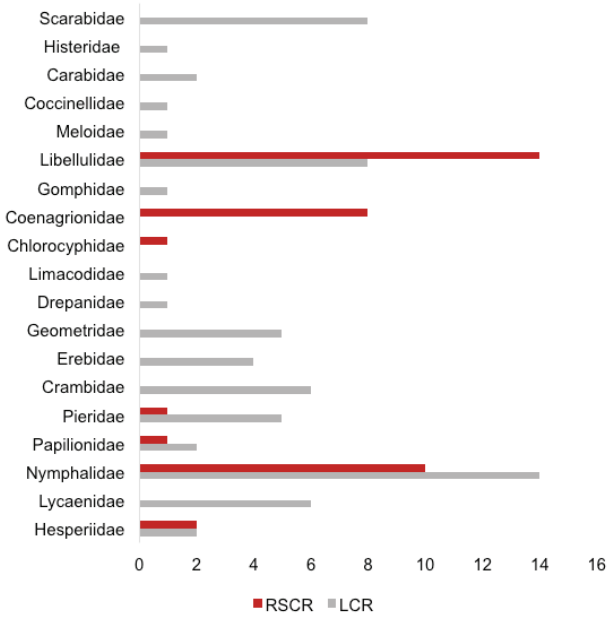

Figure 3. Number of species of each family reported from LCR and RSCR.

Siswan Reserve, Punjab which incorporated 169 species of insects to the insect fauna of Punjab (Bhardwaj et al. 2017; Singh et al. 2018) and the present study, conducted in LCR and RSCR has made a significant contribution towards increasing knowledge of insect species distributions in this area. These areas have extremely high entomofauna diversity with a total of 91 species of insects. Furthermore, the study unfolds new distribution records for all species found in this area.

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Images 1–24. 1—*Pelopidas sinensis* | 2—*Sarangesa dasahara dasahara* | 3—*Tarucus nara* | 4—*Albulina* sp. | 5—*Anthene emolus emolus* | 6—*Castalius rosimon* | 7—*Celatoxia albidisca* | 8—*Curetis acuta* | 9—*Curetis acuta* | 10—*Acraea violae* | 11—*Ariadne merione* | 12—*Cyrestis thyodamas* | 13—*Danaus chrysippus* | 14—*Euploea mulciber* | 15—*Euploea core* | 16—*Hypolimnas bolina* | 17—*Junonia lemonias* | 18—*Junonia almana* | 19—*Junonia hierta hierta* | 20—*Junonia iphita* | 21—*Junonia orithya ocyale* | 22—*Lethe europa* | 23—*Neptis hylas* | 24—*Parantica aglea.* © Amar Paul Singh.

Images 25–48. 25—*Phalanta phalantha* | 26—*Tirumala septentrionis* | 27—*Graphium cloanthus cloanthus* | 28—*Papilio polytes* | 29—*Belenois aurota aurota* | 30—*Catopsilia pomona* | 31—*Eurema brigitta* | 32—*Ixias marianne* | 33—*Pieris canidia* | 34—*Agrotera scissalis* | 35—*Cnaphalocrocis medinalis* | 36—*Conogethes punctiferalis* | 37—*Diaphania indica* | 38—*Omiodes* sp. | 39—*Orphanostigma abruptalis* | 40—*Barsine orientalis* | 41—*Arctornis* sp. | 42—*Spilosoma lutea* | 43—*Lymantria* sp. | 44—*Scopula* sp. | 45—*Scopula* sp. | 46—*Nemoria* sp. | 47—*Hypomecis* sp. | 48—*Idaea* sp. © Amar Paul Singh.

Images 49–72. 49—*Tridrepana albonotata* | 50—*Thosea* sp. | 51—*Libellago lineata* | 52—*Agriocnemis lacteola* | 53—*Amphiallagma parvum* | 54—*Ceriagrion cerinorubellum* | 55—*Ceriagrion coromandelianum* | 56—*Ceriagrion olivaceum* | 57—*Copera marginipes* | 58—*Paracercion calamorum* | 59—*Pseudagrion microcephalum* | 60—*Ictinogomphus rapax* | 61—*Acisoma panorpoides* | 62—*Orthetrum glaucum* | 63—*Brachydiplax farinosa* | 64—*Brachythemis contaminata* | 65—*Brachythemis* sp. | 66—*Bradinopyga geminate* | 67—*Crocothemis servilia* | 68—*Hydrobasileus croceus* | 69—*Indothemis carnatica* | 70—*Neurothemis fulvia* | 71—*Neurothemis tullia* | 72—*Orthetrum luzonicum.* © Amar Paul Singh.

Images 73–91. 73—*Orthetrum pruinosum* | 74—*Orthetrum sabina* | 75—*Orthetrum triangulare* | 76—*Rhodothemis rufa* | 77—*Rhyothemis variegate* | 78—*Trithemis aurora* | 79—*Hycleus pustulata* | 80—*Harmonia dimidiate* | 81—*Pheropsophus verticalis* | 82—*Pheropsophus* sp. | 83—*Carcinops pumilio* | 84—*Copris* sp. | 85—*Onitis* sp. | 86—*Onitis singhalensis* | 87—*Onitis niger* | 88—*Onitis castaneous* | 89—*Onthophagus* sp. | 90—*Oniticellus cinctus* | 91—*Onthophagus bonasus.* © Amar Paul Singh.

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