

Insect faunal diversity of Salt Lake City – an urbanized area adjacent to Kolkata, India

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Abstract

Salt Lake City or Bidhannagar, a part of East Kolkata Wetland, is an advanced township adjacent to Kolkata. A total of 266 insect species of 206 genera under 74 families belonging to the eleven order are reported in this communication. Of them, Lepidoptera shared maximum species (73 species), followed by Odonata (46 species), Diptera (44 species), Coleoptera (42 species), Hemiptera (25 species), Hymenoptera (17 species), Orthoptera (10 species) and Blattaria (06 species). The orders Ephemeroptera, Dermaptera and Mantodea shared single species respectively. Present work is the baseline data of insect faunal diversity of Salt Lake City, an urbanized area in the vicinity of Kolkata, West Bengal.

INTRODUCTION

Throughout the World, urbanization is a symbol of development and novelty of city life though this process somehow affects biodiversity in various ways as it produces anthropogenic activities in the area. Urbanization is the replacement of nature by culture (Rolston, 1994). The Salt Lake City is now a dreamland to many people though it was once a swampy, marshy stretch of land on the eastern fringe of Calcutta (now Kolkata). This salty, marshy land of eastern Calcutta became transferred into a well-planned satellite township with rapid urbanization, which may lead some negative impact on the local flora and fauna.

Probably, the work of Seymour-Sewell (1934) was the first scientific information on the faunal resources of the Salt Lake City when the land was swampy, marshy stretch with salt water. After modification of this marshy land into township, some interesting birds were documented from this

area by Saha *et al.* (1971). Some notable works on the insect fauna of salt lake were made by Biswas *et al.* (2012), Ghosh & Chattopadhyay (2013), Roy *et al.* (2014 a & b), Das *et al.* (2014), Ghosh & Bhunia (2016). Dawn (2014) and Mukhopadhyay & Ghosh (2014) have made some contribution on the odonate fauna of Kolkata and surroundings.

Apart from these literatures, Mukherjee (1993), Biswas *et al.* (1994), Chatterjee & Biswas (1995), Saha *et al.* (1995), Dutta *et al.* (1997), Joseph & Parui (1997), Gupta (1997), Ghosh & Chaudhury (1997 a & b), Mandal & Ghosh (1997) and Jonathan & Gupta (1998) also contributed chapters where some insect faunal diversity were recorded from Salt Lake City in the State fauna series of West Bengal published by Zoological Survey of India, Kolkata. At present, the physiography of the Salt Lake is completely changed due to rapid urbanization and other developmental works.

Therefore, this communication will definitely help to know which groups of insects are still present in this present scenario of Salt Lake City. This communication is the compilation of earlier reported insect species and the present study (2011-2015) and report a total of 266 species of insects belonging to eleven different orders and 74 families. The present paper may provide the baseline data of the insects from this area which definitely will help in future to study the impact of rapid urbanization in this developing city by the insect diversity and population.

MATERIALS AND METHODS

Surveys were conducted in the different wards of the Salt Lake City, Banabitan (Central park), different parks, different markets, college campuses, Wetlands & Fisheries, roadside plants and bushes etc. during the period of July, 2011 to June, 2015 between 06:00 to 18:00 hours of the day. The insects were usually collected by sweeping the insect net and hand picking at the day time except the butterflies. Methodology was followed after the hand book on collection, preservation and Identification published by Zoological Survey of India, Kolkata (Jonathan & Kulkarni, 1986). The collected materials were identified by experts of Zoological Survey of India.

Study area: Salt Lake City (22.58° N, 088.42° E) is a well-planned satellite township lying in the eastern part of Kolkata in the district of North 24 parganas in the Indian state of West Bengal. The area is also known as Bidhannagar, which is named after Dr. Bidhan Chandra Roy, Chief Minister of West Bengal (1948-1962) who actually planned to establish the township to mitigate the problem of overpopulation in Calcutta (now Kolkata) after the partition of Bengal. The land area has almost doubled now with the inclusion of Duttabad, Sukantanagar, Nayapatti and Mahishbathan along with the 25 wards of Bidhannagar Municipality.

RESULTS AND DISCUSSION

Altogether, 266 species pertaining to 206 genera under 74 families belonging to 11 orders of insects were recorded from this satellite township, Bidhannagar (Salt Lake City). Of them, order Lepidoptera shared maximum species among all orders, represented by 73 species (table no. 2) followed by Odonata with 46 species (table no. 4), Diptera with 44 species (table no. 1), Coleoptera with 42 species (table no. 3), Hemiptera with 25 species (table no. 6), Hymenoptera with 17 species

(table no. 5), Orthoptera with 10 species (table no. 7), Blattaria with 06 species (table no. 8) and Ephemeroptera, Dermaptera, Mantodea each shares only a single species (table no. 9).

Among these 266 species, 164 species were previously reported and the rest 102 species are presently recorded in this study (Present records are marked with*). Among the 74 families of insects reported from this zone, order Hemiptera represented maximum families (16 families, 22.97%), followed by the order Diptera (15 families, 20.27%), Coleoptera (13 families, 17.57%), Lepidoptera (11 families, 14.86%) and Orthoptera (05 families, 6.76%). Order Odonata and Hymenoptera both shared 04 families (5.41%) while the order Blattaria shared only 03 families (4.05%). The lowest number of families represented by Ephemeroptera, Dermaptera and Mantodea, all of which shared a single family as well (figure no. 1).

Considering the insect diversity of Salt Lake City in generic level, Lepidoptera has shared maximum genera (27.18%), that is followed by both the order Diptera and Odonata (16.5%). Coleoptera shared 15.09% of the genera which is followed by Hemiptera (10.68%), Hymenoptera (5.83%), Orthoptera (4.37%), Blattaria (2.37%) and the remaining lesser found orders like Ephemeroptera, Dermaptera, Mandodea shared only 0.49% of each (figure no. 2).

Similar to that of generic diversity, Lepidoptera is more diversified in terms of species diversity with comparison to other insect orders and shared 27.18% of the total insect diversity from this area followed by Odonata (17.29%), Diptera (16.54%), Coleoptera (15.79%), Hemiptera (9.40%), Hymenoptera (6.39%), Orthoptera (3.76%), Blattaria (2.26%) and Ephemeroptera, Dermaptera and Mantodea, each of which shared only 0.38% (figure no. 3).

In terms of the number of species (family-wise) reported from this satellite township, the maximum number of species is shared by family Libellulidae (Odonata) with 29 species which is followed by Nymphalidae (Lepidoptera) with 19 species, Lycaenidae (Lepidoptera) with 16 species, Scarabaeidae (Coleoptera) with 14 Species, Coenagrionidae (Odonata) with 13 species and Pieridae (Lepidoptera) with 11 species. The remaining families shared between 01-09 species (figure no. 4).

The Salt Lake City faces some serious urbanization challenges of the modern era. The modern urbanization of this satellite township had

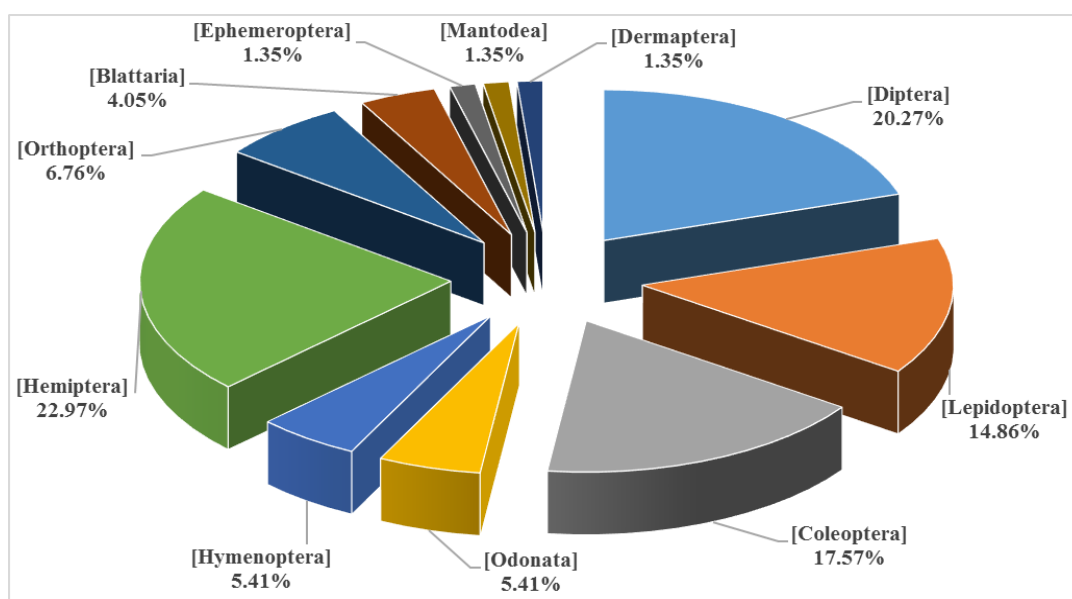


Figure – 1: Order wise Diversity of families (%)

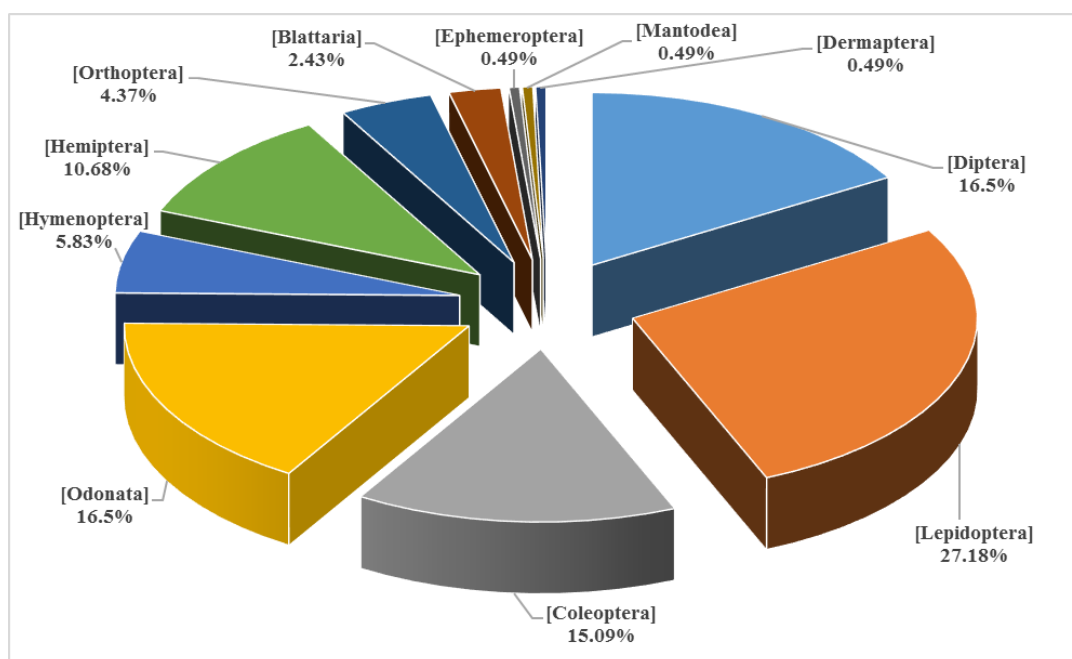


Figure – 2: Order wise Diversity of genera (%)

begun since 1958 and is still continuing. Replacement of natural habitats by human-dominated areas results biodiversity loss. This is the first consolidated report on the insect faunal diversity of Salt Lake City, Kolkata. As a whole, the diversity of insects of this area is mostly dominated by aquatic, flower visiting and filth inhabiting fauna.

Lepidoptera are widely accepted as ecological indicator of ecosystem health throughout the World (Rosenberg *et al.*, 1986; New *et al.*, 1995; Nimbalkar and Shinde, 2015). Among the 11 orders of insect reported from this area, lepidopterans (Butterflies and moths) are found as predominant group which clearly indicates the area with good vegetative cover.

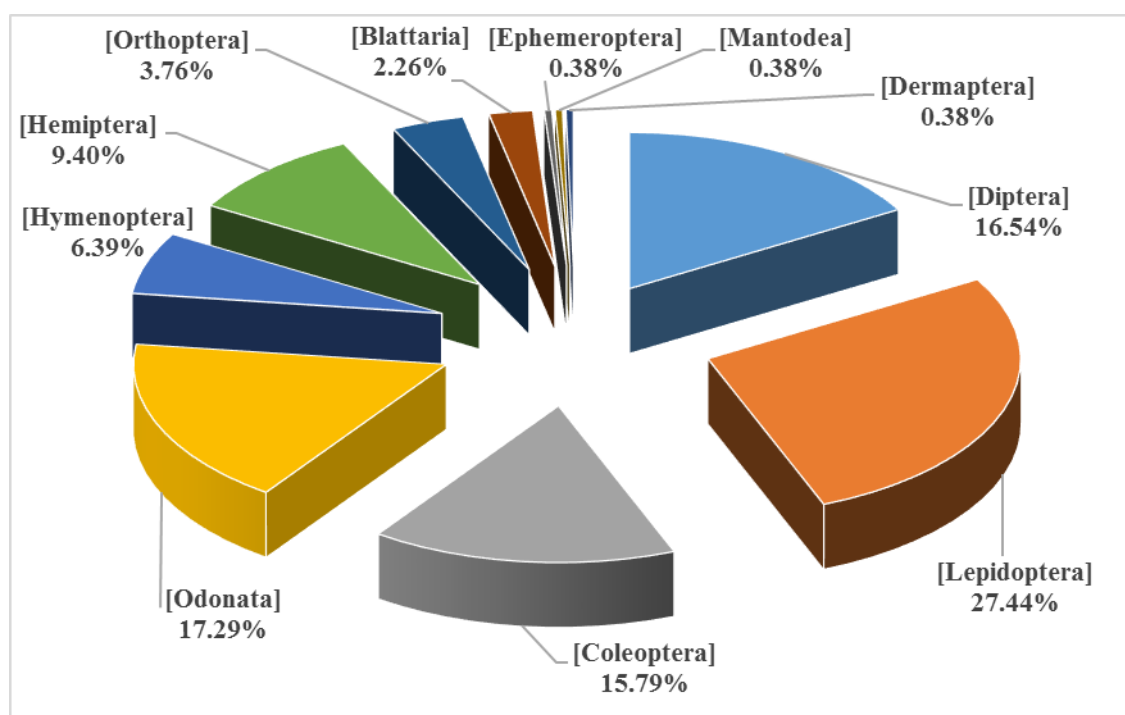


Figure – 3: Order wise Diversity of species (%)

Probably, more managed gardens and parks of Salt Lake City provides host plants to the lepidopteran insects other than wild flora and trees. The presence of less number of beetles and bugs like phytophagous insects of this area also support that lack of wild flora.

Water bodies serve as good breeding grounds for aquatic and semi-aquatic insects including Odonata (Dawn, 2014). The present findings also support the observation of some previous workers Dawn (2014) and Mukhopadhyay and Ghosh (2014). Therefore, odonates are second dominant insect group in this area. Apart from these odonates, presence of aquatic bugs (Hemiptera: Belostomatidae, Gerridae, Notonectidae, Mesoveliidae) and aquatic beetles (Coleoptera: Dyticidae, Hydrophilidae, Noteridae) in Salt Lake area indicates presence of many water bodies (both natural and human made).

The members of Diptera are the third abundant group in this township. Family Syrphidae, Dolichopodidae indicates the presence of several flowering plants where as other families like Calliphoridae, Muscidae, Sarcophagidae, Sepsidae, Culicidae indicates the presence of filthy area, garbage, fish markets, which clearly marks the high human interference of this area.

Insects play a crucial role as key indicators which enable the monitoring of urbanization impact on biodiversity (Clarke *et al.*, 2008) as well as helps in pollination, nutrient cycling, decomposition, soil aeration etc. (Thompson and McLachlan, 2007). Therefore, this communication will definitely help to monitor the loss of biodiversity in future due to urbanization of this area.

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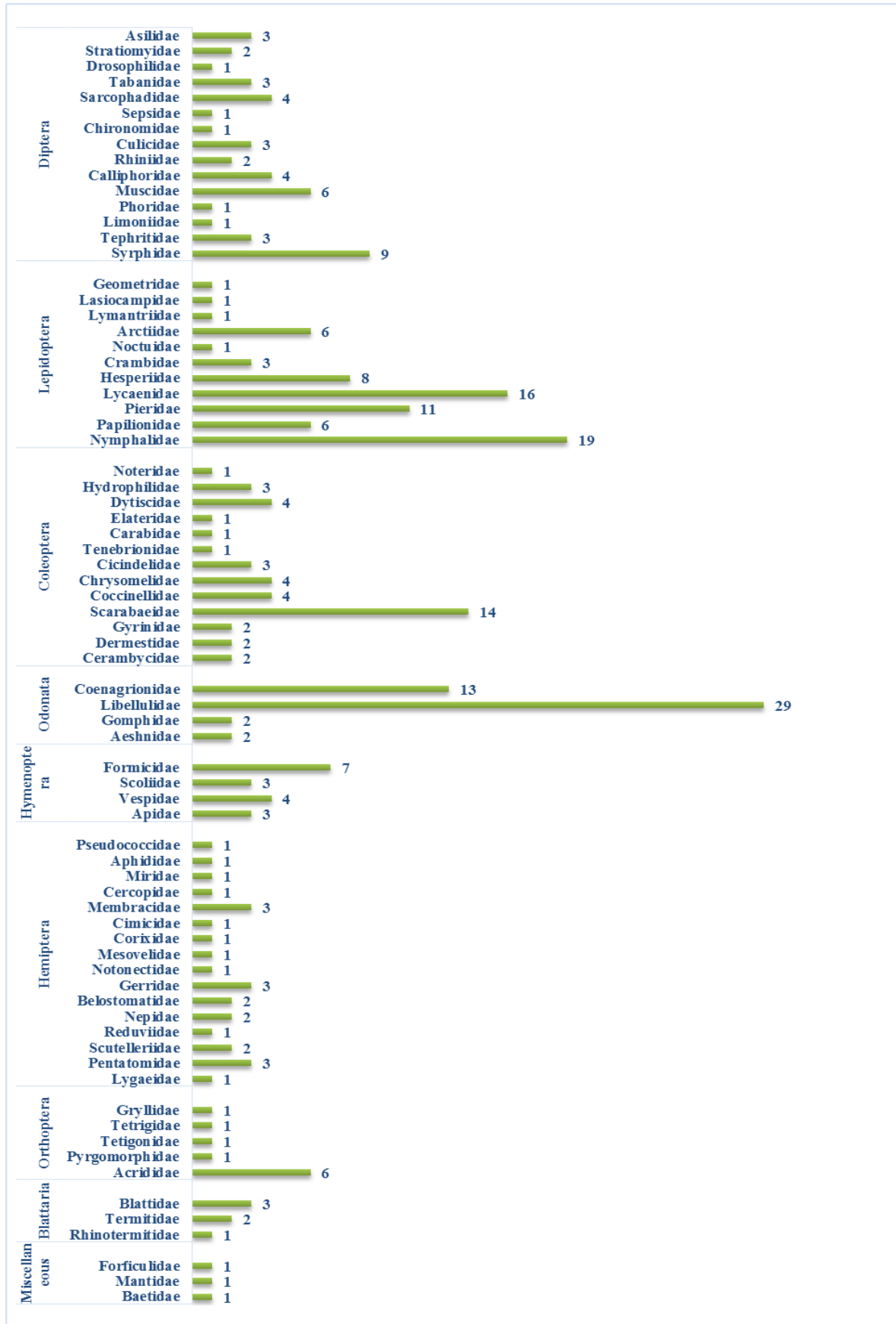


Figure – 4: Number of species (family-wise) in Salt Lake City

Table – 1: List of Diptera reported from Salt Lake City

Sr. No.	Name of the species	Family	Reference/ Present Record
01	<i>Sphaerophoria indiana</i> Bigot, 1884*	Syrphidae	Present record
02	<i>Mesembrius bengalensis</i> (Wiedemann, 1819)	Syrphidae	Ghosh & Chattopadhyay, 2013
03	<i>Mesembrius quadrivittatus</i> (Wiedemann, 1819)	Syrphidae	Dutta <i>et al.</i> , 1997
04	<i>Lathyrrophthalmus arvorum</i> (Fabricius, 1787)	Syrphidae	Roy <i>et al.</i> 2014a
05	<i>Lathyrrophthalmus polychromatus</i> (Brunetti, 1923) *	Syrphidae	Present record
06	<i>Episyrphus balteatus</i> (De Geer, 1776)	Syrphidae	Roy <i>et al.</i> 2014a
07	<i>Eristalis tenax</i> (Linnaeus, 1758)	Syrphidae	Roy <i>et al.</i> 2014a
08	<i>Serratoparagus serratus</i> (Fabricius, 1805)	Syrphidae	Dutta <i>et al.</i> , 1997
09	<i>Syritta indica</i> (Wiedemann, 1824)	Syrphidae	Roy <i>et al.</i> 2014a
10	<i>Bactrocera (Bactrocera) dorsalis</i> (Hendel, 1912) *	Tephritidae	Present record
11	<i>Bactrocera (Zeugodacus) cucurbitae</i> (Coquillett, 1899)	Tephritidae	Roy <i>et al.</i> 2014a
12	<i>Campiglossa cribellata</i> (Bezzi, 1913)	Tephritidae	Roy <i>et al.</i> 2014a
13	<i>Limonia (Limnobia) irrorata</i> (Wiedemann, 1828) *	Limoniidae	Present record
14	<i>Megaselia (Megaselia) scalaris</i> (Loew, 1866) *	Phoridae	Present record
15	<i>Atherigona (Atherigona) simplex</i> (Thomson, 1869) *	Muscidae	Present record
16	<i>Musca domestica</i> Linnaeus, 1758	Muscidae	Roy <i>et al.</i> 2014a
17	<i>Musca ventrosa</i> Wiedemann, 1830	Muscidae	Roy <i>et al.</i> 2014a
18	<i>Neomyia lauta</i> (Wiedemann, 1830)	Muscidae	Roy <i>et al.</i> 2014a
19	<i>Neomyia timorensis</i> (Robineau-Desvoidy, 1830)	Muscidae	Ghosh & Chattopadhyay, 2013
20	<i>Neomyia indica</i> (Robineau-Desvoidy, 1830)	Muscidae	Roy <i>et al.</i> 2014a
21	<i>Chrysomya megacephala</i> (Fabricius, 1794)	Calliphoridae	Roy <i>et al.</i> 2014a
22	<i>Hemipyrellia ligurriens</i> (Wiedemann, 1830)	Calliphoridae	Roy <i>et al.</i> 2014a
23	<i>Lucilia porphyrina</i> (Walker, 1856)	Calliphoridae	Roy <i>et al.</i> 2014a
24	<i>Bengalia torosa</i> (Wiedemann, 1819)	Calliphoridae	
25	<i>Stomorhina discolor</i> (Fabricius, 1794)	Rhiniidae	Roy <i>et al.</i> 2014a
26	<i>Isomyia viridaurea</i> (Wiedemann, 1819)	Rhiniidae	Roy <i>et al.</i> 2014a
27	<i>Anopheles (Cellia) stephensi</i> Liston, 1901*	Culicidae	Present record
28	<i>Anopheles (Cellia) culicifacies</i> Giles, 1901*	Culicidae	Present record
29	<i>Culex (Culex) quinquefasciatus</i> Say, 1823*	Culicidae	Present record
30	<i>Clinotanypus vomerus</i> (Chaudhuri & Debnath) *	Chironomidae	Present record
31	<i>Sepsis indica</i> Wiedemann, 1824*	Sepsidae	Present record
32	<i>Sarcophaga ruficornis</i> (Fabricius 1794) *	Sarcophagidae	Present record
33	<i>Parasarcophaga albiceps</i> (Meigen)	Sarcophagidae	Roy <i>et al.</i> 2014a
34	<i>Parasarcophaga (Liosarcophaga) dux</i> (Thomson)	Sarcophagidae	Roy <i>et al.</i> 2014a
35	<i>Iranihindia futilis</i> (Senior-White, 1924)	Sarcophagidae	Roy <i>et al.</i> 2014a
36	<i>Chrysops dispar</i> (Fabricius, 1798) *	Tabanidae	Present record
37	<i>Tabanus (Tabanus) striatus</i> Fabricius, 1787 *	Tabanidae	Present record
38	<i>Tabanus (Tabanus) rubidus</i> Wiedemann, 1821	Tabanidae	Ghosh & Chattopadhyay, 2013
39	<i>Drosophila melanogaster</i> (Meigen 1830) *	Drosophilidae	Present record
40	<i>Hermetia illucens</i> (Linnaeus, 1758)	Stratiomyidae	Roy <i>et al.</i> 2014a
41	<i>Microchrysa flaviventris</i> (Wiedemann, 1824)	Stratiomyidae	Roy <i>et al.</i> 2014a
42	<i>Philodicus femoralis</i> Ricardo, 1921 *	Asilidae	Present record
43	<i>Philodicus ceylanicus</i> Schiner, 1868	Asilidae	Joseph and Parui, 1997
44	<i>Astochia guptai</i> Joseph & Parui, 1981a	Asilidae	Joseph and Parui, 1997

Table – 2: List of Lepidoptera reported from Salt Lake City

Sl. No.	Name of the species	Family	Reference/ Present Record
01	<i>Euploea core</i> (Cramer, 1780)	Nymphalidae	Biswas <i>et. al.</i> , 2014
02	<i>Euploea klugii</i> Moore, 1857 *	Nymphalidae	Present record
03	<i>Danaus chrysippus</i> (Linnaeus 1758)	Nymphalidae	Biswas <i>et. al.</i> , 2014
04	<i>Melanitis leda</i> (Linnaeus, 1758)	Nymphalidae	Biswas <i>et. al.</i> , 2014
05	<i>Melanitis phedima</i> (Cramer, 1782) *	Nymphalidae	Present record
06	<i>Elymnias hypermnestra</i> (Linnaeus, 1763)	Nymphalidae	Biswas <i>et. al.</i> , 2014
07	<i>Mycalesis perseus</i> (Fabricius, 1775)	Nymphalidae	Biswas <i>et. al.</i> , 2014
08	<i>Ypthima asterope</i> (Klug, 1832)	Nymphalidae	Biswas <i>et. al.</i> , 2014
09	<i>Ypthima huebneri</i> Kirby, 1871	Nymphalidae	Biswas <i>et. al.</i> , 2014
10	<i>Acraea violae</i> (Fabricius, 1775)	Nymphalidae	Biswas <i>et. al.</i> , 2014
11	<i>Limenitis procris</i> Cramer, 1779	Nymphalidae	Biswas <i>et. al.</i> , 2014
12	<i>Ariadne ariadne</i> (Linnaeus, 1763)	Nymphalidae	Biswas <i>et. al.</i> , 2014
13	<i>Ariadne merione</i> (Cramer, 1779)	Nymphalidae	Biswas <i>et. al.</i> , 2014
14	<i>Junonia almana</i> (Linnaeus, 1758)	Nymphalidae	Biswas <i>et. al.</i> , 2014
15	<i>Junonia atlites</i> (Linnaeus, 1763)	Nymphalidae	Biswas <i>et. al.</i> , 2014, Gupta, 1997
16	<i>Hypolimnas bolina</i> (Linnaeus, 1758)	Nymphalidae	Biswas <i>et. al.</i> , 2014
17	<i>Hypolimnas misippus</i> (Linnaeus, 1764)	Nymphalidae	Gupta, 1997
18	<i>Tirumala limniace</i> (Cramer, 1775)	Nymphalidae	Biswas <i>et. al.</i> , 2014, Gupta, 1997
19	<i>Neptis jumbah</i> (Moore 1857) *	Nymphalidae	Present record
20	<i>Pachliopta aristolochiae</i> Fabricius, 1775 *	Papilionidae	Present record
21	<i>Papilio clytia</i> (Linnaeus, 1758) *	Papilionidae	Present record
22	<i>Papillio demoleus</i> Linnaeus, 1758 *	Papilionidae	Present record
23	<i>Papillio polytes</i> Linnaeus, 1758	Papilionidae	Biswas <i>et. al.</i> , 2014
24	<i>Graphium doson</i> (Felder, 1864)	Papilionidae	Biswas <i>et. al.</i> , 2014
25	<i>Graphium agamemnon</i> (Linnaeus, 1758)	Papilionidae	Biswas <i>et. al.</i> , 2014
26	<i>Ixias pyrene</i> Linnaeus, 1764 *	Pieridae	Present record
27	<i>Ixias marianne</i> (Cramer, 1779)	Pieridae	Ghosh and Chaudhury, 1997a
28	<i>Cepora nerissa</i> Fabricius, 1775 *	Pieridae	Present record
29	<i>Catopsilia pomona</i> (Fabricius, 1775)	Pieridae	Biswas <i>et. al.</i> , 2014
30	<i>Catopsilia pyranthe</i> (Linnaeus, 1758)	Pieridae	Biswas <i>et. al.</i> , 2014
31	<i>Delias eucharis</i> (Drury, 1773)	Pieridae	Biswas <i>et. al.</i> , 2014
32	<i>Eurema blanda</i> (Boisduval, 1836)	Pieridae	Biswas <i>et. al.</i> , 2014
33	<i>Eurema hecabe</i> (Linnaeus, 1758)	Pieridae	Biswas <i>et. al.</i> , 2014
34	<i>Leptosia nina</i> (Fabricius, 1793)	Pieridae	Biswas <i>et. al.</i> , 2014
35	<i>Appias albina</i> (Boisduval)	Pieridae	Biswas <i>et. al.</i> , 2014
36	<i>Appias libythea</i> (Fabricius, 1775)	Pieridae	Biswas <i>et. al.</i> , 2014
37	<i>Tarucus nara</i> (Kollar 1848)	Lycaenidae	Biswas <i>et. al.</i> , 2014
38	<i>Tarucus plinius</i> Fabricius, 1793 *	Lycaenidae	Present record
39	<i>Spindasis vulcanus</i> Fabricius, 1775 *	Lycaenidae	Present record
40	<i>Pseudozizeeria maha</i> (Kollar, 1848)	Lycaenidae	Biswas <i>et. al.</i> , 2014
41	<i>Zizeeria karsandra</i> (Moore, 1865) *	Lycaenidae	Present record
42	<i>Zizina otis</i> (Fabricius, 1787) *	Lycaenidae	Present record
43	<i>Lampides boeticus</i> (Linnaeus, 1767) *	Lycaenidae	Present record
44	<i>Spalgis epeus</i> (Westwood) *	Lycaenidae	Present record
45	<i>Rapala manea</i> Hewitson, 1863	Lycaenidae	Biswas <i>et. al.</i> , 2014
46	<i>Castalius rosimon</i> (Fabricius, 1775)	Lycaenidae	Biswas <i>et. al.</i> , 2014
47	<i>Zizula hylax</i> Fabricius, 1775	Lycaenidae	Biswas <i>et. al.</i> , 2014
48	<i>Talicauda nyseus</i> Guerin-Meneville, 1847	Lycaenidae	Biswas <i>et. al.</i> , 2014
49	<i>Neopithecops zalmora</i> Butler, 1870	Lycaenidae	Biswas <i>et. al.</i> , 2014
50	<i>Euchrysops cnejus</i> (Fabricius, 1798)	Lycaenidae	Biswas <i>et. al.</i> , 2014

51	<i>Chilades pandava</i> (Horsfield, 1829)	Lycaenidae	Biswas <i>et. al.</i> , 2014
52	<i>Chilades lajus</i> (Stoll, 1780)	Lycaenidae	Biswas <i>et. al.</i> , 2014
53	<i>Borbo cinnara</i> (Wallace, 1866) *	Hesperiidae	Present record
54	<i>Parnara guttatus</i> Bremer & Grey, 1853 *	Hesperiidae	Present record
55	<i>Pelopidas mathias</i> (Fabricius, 1798)	Hesperiidae	Ghosh and Chaudhury, 1997b
56	<i>Pelopidas agna</i> (Moore, 1865) *	Hesperiidae	Present record
57	<i>Spialia galba</i> (Fabricius, 1793)	Hesperiidae	Biswas <i>et. al.</i> , 2014
58	<i>Oriens goloides</i> (Moore, 1881)	Hesperiidae	Biswas <i>et. al.</i> , 2014
59	<i>Suastus gremius</i> (Fabricius, 1798)	Hesperiidae	Biswas <i>et. al.</i> , 2014
60	<i>Matapa aria</i> (Moore, 1865)	Hesperiidae	Biswas <i>et. al.</i> , 2014
61	<i>Spoladea recurvalis</i> (Fabricius, 1775) *	Crambidae	Present record
62	<i>Scirpophaga incertulas</i> (Walker, 1863) *	Crambidae	Present record
63	<i>Cnaphalocrocis medinalis</i> (Guenée, 1854) *	Crambidae	Present record
64	<i>Asota caricae</i> (Fabricius, 1775) *	Noctuidae	Present record
65	<i>Amata cyssea</i> (Stoll, 1782) *	Arctiidae	Present record
66	<i>Argina argus</i> Kollar, 1844	Arctiidae	Biswas <i>et. al.</i> , 2014
67	<i>Utetheisa pulchella</i> (Linnaeus, 1758)	Arctiidae	Mandal and Ghosh, 1997
68	<i>Spilaretia obliqua</i> (Walker, 1855)	Arctiidae	Mandal and Ghosh, 1997
69	<i>Syntomis diaphana</i> Kollar, 1844	Arctiidae	Mandal and Ghosh, 1997
70	<i>Syntomis passalis</i> (Fabricius, 1781)	Arctiidae	Mandal and Ghosh, 1997
71	<i>Euproctis sp.</i> *	Lymantriidae	Present record
72	<i>Trabala vishnou</i> (Lefèbvre, 1827)	Lasiocampidae	Biswas <i>et. al.</i> , 2014
73	<i>Scopula pulchellata</i> (Fabricius, 1794)	Geometridae	Mandal and Ghosh, 1997

Table – 3: List of Coleoptera reported from Salt Lake City

Sl. No.	Name of the species	Family	Reference/ Present Record
01	<i>Batocera rufomaculata</i> (DeGeer,1775)	Cerambycidae	Roy <i>et. al.</i> 2014b
02	<i>Stromatium barbatum</i> (Fabricius,1775)	Cerambycidae	Roy <i>et. al.</i> 2014b
03	<i>Anthrenus sp.</i> *	Dermestidae	Present record
04	<i>Attagenus alfieri</i> Fabricius 1787 *	Dermestidae	Present record
05	<i>Orectochilus productus</i> Régimbart, 1884 *	Gyrinidae	Present record
06	<i>Dineutus indicus</i> Aubé, 1838	Gyrinidae	Roy <i>et. al.</i> 2014b
07	<i>Catharsius molossus</i> (Linnaeus, 1758)	Scarabaeidae	Ghosh and Bhunia ,2016
08	<i>Oryctes rhinoceros</i> (Linnaeus, 1758)	Scarabaeidae	Roy <i>et. al.</i> 2014b, Ghosh and Bhunia ,2016
09	<i>Anomala bengalensis</i> (Blanchard, 1851)	Scarabaeidae	Roy <i>et. al.</i> 2014b and Ghosh and Bhunia ,2016
10	<i>Anomala biharensis</i> Arrow, 1917	Scarabaeidae	Ghosh and Bhunia ,2016
11	<i>Anomala bilobata</i> Arrow, 1912	Scarabaeidae	Ghosh and Bhunia ,2016
12	<i>Anomala polita</i> (Blanchard, 1851)	Scarabaeidae	Ghosh and Bhunia ,2016
13	<i>Adoretus lacustris</i> Arrow 1917	Scarabaeidae	Ghosh and Bhunia ,2016; Chatterjee and Biswas, 1995
14	<i>Adoretus lasiopygus</i> Burmeister, 1855	Scarabaeidae	Ghosh and Bhunia ,2016
15	<i>Adoretus versutus</i> Harold, 1869	Scarabaeidae	Ghosh and Bhunia ,2016
16	<i>Adoretus flavus</i> Arrow 1917	Scarabaeidae	Ghosh and Bhunia ,2016; Chatterjee and Biswas, 1995
17	<i>Onthophagus dama</i> (Fabricius, 1798)	Scarabaeidae	Roy <i>et. al.</i> 2014b and Ghosh and Bhunia ,2016
18	<i>Onitis philemon</i> Fabricius, 1801	Scarabaeidae	Ghosh and Bhunia ,2016
19	<i>Xylotrupes gideon</i> (Linnaeus, 1767)	Scarabaeidae	Ghosh and Bhunia ,2016
20	<i>Heteronychus lioderes</i> Redtenbacher, 1867	Scarabaeidae	Roy <i>et. al.</i> 2014b and Ghosh and Bhunia ,2016
21	<i>Coccinella septempunctata</i> (Linnaeus, 1758)	Coccinellidae	Roy <i>et. al.</i> 2014b

22	<i>Coccinella transversalis</i> Fabricius, 1781	Coccinellidae	Roy <i>et. al.</i> 2014b
23	<i>Coelophora unicolor</i> Fabricius, 1792	Coccinellidae	Roy <i>et. al.</i> 2014b
24	<i>Epilachna indica</i> (Mulsant)	Coccinellidae	Roy <i>et. al.</i> 2014b
25	<i>Aulacophora almora</i> Maulik, 1936 *	Chrysomelidae	Present record
26	<i>Aulocophora foveicollis</i> Lucas, 1849 *	Chrysomelidae	Present record
27	<i>Menochilus sexmaculatus</i> (Fabricius)	Chrysomelidae	Roy <i>et. al.</i> 2014b
28	<i>Monolepta signata</i> (Olivier,1808)	Chrysomelidae	Roy <i>et. al.</i> 2014b
29	<i>Neocollyris bonelli</i> (Guerin, 1834) *	Cicindelidae	Present record
30	<i>Neocollyris crassicornis</i> (Dejean, 1825)	Cicindelidae	Saha <i>et. al.</i> , 1995
31	<i>Cicindela aurovittata</i> Brulle, 1838 *	Cicindelidae	Present record
32	<i>Tribolium castaneum</i> (Herbst 1797) *	Tenibrionidae	Present record
33	<i>Amblystomus sp.</i> *	Carabidae	Present record
34	<i>Agrypnus sp.</i> *	Elateridae	Present record
35	<i>Cybister limbatus</i> (Fabricius, 1775)	Dytiscidae	Roy <i>et. al.</i> 2014b
36	<i>Cybister tripunctatus lateralis</i> (Fabricius, 1798)	Dytiscidae	Roy <i>et. al.</i> 2014b
37	<i>Cybister javanus</i> Aube,1838	Dytiscidae	Roy <i>et. al.</i> 2014b
38	<i>Laccophilus flexuosus</i> Aube,1838	Dytiscidae	Roy <i>et. al.</i> 2014b
39	<i>Stemolophus rufipes</i> (Fabricius)	Hydrophilidae	Roy <i>et. al.</i> 2014b
40	<i>Berosus indicus</i> Motschulsky, 1861	Hydrophilidae	Roy <i>et. al.</i> 2014b
41	<i>Helochares anchoralis</i> Sharp, 1890	Hydrophilidae	Roy <i>et. al.</i> 2014b
42	<i>Canthydrus laetabilis</i> (Walker,1858)	Noteridae	Roy <i>et. al.</i> 2014b

Table – 4: List of Odonata reported from Salt Lake City

Sl. No.	Name of the Species	Family	Reference/ Present Record
01	<i>Anax guttatus</i> (Burmeister, 1839)	Aeshnidae	Dawn, 2014
02	<i>Gynacantha dravida</i> Lieftinck, 1960	Aeshnidae	Dawn, 2014
03	<i>Ictinogomphus rapax</i> (Rambur, 1842)	Gomphidae	Dawn, 2014
04	<i>Paragomphus lineatus</i> (Selys, 1850)	Gomphidae	Dawn, 2014
05	<i>Sympetrum obstrum</i> *	Libellulidae	Present record
06	<i>Acisoma panorpoides</i> Rambur, 1842	Libellulidae	Dawn, 2014
07	<i>Aethriamanta brevipennis</i> (Rambur, 1842)	Libellulidae	Dawn, 2014
08	<i>Brachythemis contaminata</i> (Fabricius, 1793)	Libellulidae	Mukhopadhyay & Ghosh, 2014
09	<i>Pantala flavescens</i> (Fabricius) *	Libellulidae	Present record
10	<i>Macrodiplax cora</i> (Brauer, 1867) *	Libellulidae	Dawn, 2014
11	<i>Crocothemis servilia</i> (Drury, 1770)	Libellulidae	Mukhopadhyay & Ghosh, 2014
12	<i>Orthetrum sabina</i> (Drury, 1770)	Libellulidae	Mukhopadhyay & Ghosh, 2014
13	<i>Orthetrum prunosum</i> (Newman)	Libellulidae	Mukhopadhyay & Ghosh, 2014
14	<i>Bradinopyga geminata</i> (Rambur, 1842)	Libellulidae	Mukhopadhyay & Ghosh, 2014
15	<i>Rhyothemis variegata</i> (Linnaeus, 1763)	Libellulidae	Mukhopadhyay & Ghosh, 2014
16	<i>Neurothemis tullia</i> (Drury, 1773)	Libellulidae	Mukhopadhyay & Ghosh, 2014
17	<i>Neurothemis fulvia</i> (Drury, 1773)	Libellulidae	Mukhopadhyay & Ghosh, 2014
18	<i>Brachydiplax chalybea</i> Brauer, 1868	Libellulidae	Mukhopadhyay & Ghosh, 2014
19	<i>Brachydiplax sobrina</i> (Rambur, 1842)	Libellulidae	Dawn, 2014
20	<i>Brachydiplax farinosa</i> Kruger, 1902 *	Libellulidae	Present record
21	<i>Diplacodes trivialis</i> (Rambur, 1842)	Libellulidae	Mukhopadhyay & Ghosh, 2014
22	<i>Diplacodes nebulosa</i> (Fabricius, 1793)	Libellulidae	Dawn, 2014
23	<i>Lathrecista asiatica</i> (Fabricius, 1798) *	Libellulidae	Present record
24	<i>Palpopleura sexmaculata</i> (Fabricius, 1787)	Libellulidae	Dawn, 2014
25	<i>Pantala flavescens</i> (Fabricius, 1798)	Libellulidae	Dawn, 2014
26	<i>Potamarcha congener</i> (Rambur, 1842)	Libellulidae	Dawn, 2014
27	<i>Rhodothemis rufa</i> (Rambur, 1842)	Libellulidae	Dawn, 2014
28	<i>Tholymis tillarga</i> (Fabricius, 1798)	Libellulidae	Dawn, 2014
29	<i>Tramea basilaris</i> (Palisot de Beauvois, 1805)	Libellulidae	Dawn, 2014

30	<i>Tramea limbata</i> (Desjardins, 1832)	Libellulidae	Dawn, 2014
31	<i>Trithemis pallidinervis</i> (Kirby, 1889)	Libellulidae	Dawn, 2014
32	<i>Urothemis signata</i> (Rambur, 1842)	Libellulidae	Dawn, 2014
33	<i>Zyxomma petiolatum</i> Rambur, 1842	Libellulidae	Dawn, 2014
34	<i>Pseudagrion microcephalum</i> (Rambur, 1842)	Coenagrionidae	Dawn, 2014
35	<i>Pseudagrion decorum</i> (Rambur, 1842)	Coenagrionidae	Dawn, 2014
36	<i>Pseudagrion rubiceps</i> (Selys, 1876)	Coenagrionidae	Dawn, 2014
37	<i>Ceriagrion coromandelianum</i> (Fabricius, 1798)	Coenagrionidae	Dawn, 2014
38	<i>Ceriagrion cerinorubellum</i> (Brauer, 1865)	Coenagrionidae	Dawn, 2014
39	<i>Ceriagrion olivaceum</i> Laidlaw, 1914 *	Coenagrionidae	Present record
40	<i>Agriocnemis pygmaea</i> (Rambur, 1842)*	Coenagrionidae	Present record
41	<i>Agriocnemis lacteola</i> Selys, 1877	Coenagrionidae	Dawn, 2014
42	<i>Enallagma parvum</i> Selys, 1876	Coenagrionidae	Dawn, 2014
43	<i>Ischnura aurora</i> (Brauer, 1865)	Coenagrionidae	Dawn, 2014
44	<i>Ischnura senegalensis</i> (Rambur, 1842)	Coenagrionidae	Dawn, 2014
45	<i>Onychargia atrocyana</i> (Selys, 1865)	Coenagrionidae	Dawn, 2014
46	<i>Agriocnemis femina</i> (Brauer, 1868) *	Coenagrionidae	Present record

Table – 5: List of Hymenoptera reported from Salt Lake City

Sl. No.	Name of the species	Family	Reference/ Present Record
01	<i>Apis (Megapis) dorsata</i> (Fabricius) *	Apidae	Present record
02	<i>Apis florea</i> Fabricius, 1887 *	Apidae	Present record
03	<i>Apis (Apis) cerena indica</i> (Fabricius) *	Apidae	Present record
04	<i>Vespa (Vespa) basalis</i> Smith, 1852 *	Vespidae	Present record
05	<i>Vespa (Vespa) tropica</i> (Linnaeus, 1758)*	Vespidae	Present record
06	<i>Meranoplus bicolor</i> (Guérin-Méneville, 1844) *	Vespidae	Present record
07	<i>Eumenes sp.</i> *	Vespidae	Present record
08	<i>Campsomeriella (Campsomeriella) collaris collaris</i> (Fabricius, 1775)	Scoliidae	Jonathan and Gupta, 1998
09	<i>Scolia (Discolia) cruenta</i> Klug, 1805	Scoliidae	Jonathan and Gupta, 1998
10	<i>Scolia (Discolia) histrionica desidiosa</i> Bingham, 1896	Scoliidae	Jonathan and Gupta, 1998
11	<i>Camponotus compressus</i> (Fabricius, 1887) *	Formicidae	Present record
12	<i>Camponotus sericeus</i> (Fabricius, 1798)*	Formicidae	Present record
13	<i>Oecophylla smaragdina</i> (Fabricius, 1775) *	Formicidae	Present record
14	<i>Diacamma vagans</i> (Smith, 1860) *	Formicidae	Present record
15	<i>Crematogaster brunnea contemta</i> (Mayr, 1879) *	Formicidae	Present record
16	<i>Monomorium pharaonis</i> (Linnaeus 1758) *	Formicidae	Present record
17	<i>Tetraponera (I) ruforigra</i> (Jerdon, 1851)*	Formicidae	Present record

Table – 6: List of Hemiptera reported from Salt Lake City

Sl. No.	Name of the species	Family	Reference/ Present Record
01	<i>Metocus uniguttatus</i> (Thunberg) *	Lygaeidae	Present record
02	<i>Agonoscelis nubila</i> (Fabricius) *	Pentatomidae	Present record
03	<i>Erthesina fullo</i> (Thunberg) *	Pentatomidae	Present record
04	<i>Nazara viridula</i> (Linnaeus, 1758) *	Pentatomidae	Present record
05	<i>Chrysocoris stollii</i> (Wolff) *	Scutelleriidae	Present record
06	<i>Chrysocoris purpureus</i> (Westwood) *	Scutelleriidae	Present record
07	<i>Ectrychotes dispar</i> (Reuter, 1881) *	Reduviidae	Present record
08	<i>Laccotrephes griseus</i> (Guerin)	Nepidae	Das <i>et. al.</i> 2014
09	<i>Ranatra sordidula</i> (Dohrn)	Nepidae	Das <i>et. al.</i> 2014
10	<i>Lethocerus indicus</i> (Lepeletier & Serville, 1825)	Belostomatidae	Das <i>et. al.</i> 2014
11	<i>Diplonychus rusticus</i> Fabricius, 1871	Belostomatidae	Das <i>et. al.</i> 2014
12	<i>Limnogonus (L.) fossorum</i> (Fabricius, 1775)	Gerridae	Das <i>et. al.</i> 2014
13	<i>Limnogonus (L.) nitidus</i> (Mayr, 1865) *	Gerridae	Present record

14	<i>Gerris thoracicus</i> (Schummel, 1832) *	Gerridae	Present record
15	<i>Nychia marshalli</i> (Scott, 1872)	Notonectidae	Das <i>et. al.</i> 2014
16	<i>Mesovelia indica</i> Horváth, 1915	Mesoveliidae	Das <i>et. al.</i> 2014
17	<i>Micronecta merope</i>	Corixidae	Das <i>et. al.</i> 2014
18	<i>Cimex lectularius</i> (Linnaeus, 1758) *	Cimicidae	Present record
19	<i>Otinotus mimicus</i> (Distant) *	Membracidae	Present record
20	<i>Oxyrhachis lefroi</i> Distant, 1851	Membracidae	Biswas <i>et al.</i> , 1994
21	<i>Oxyrhachis rufescens</i> Walker, 1851	Membracidae	Biswas <i>et al.</i> , 1994
22	<i>Idioscopus</i> sp. *	Cercopidae	Present record
23	<i>Ragmus importunitas</i> (Distant, 1910) *	Miridae	Present record
24	<i>Aphis (Aphis) craccivora</i> (Koch, 1854) *	Aphididae	Present record
25	<i>Adelosoma phragmitidis</i> Borchsenius, 1948	Pseudococcidae	Biswas <i>et al.</i> , 1994

Table – 7: List of Orthoptera reported from Salt Lake City

Sl. No.	Name of the species	Family	Reference/ Present Record
01	<i>Oxyrhepes obtusa</i> (Stal) *	Acrididae	Present record
02	<i>Epistaureus sinetye</i> (Bolivar) *	Acrididae	Present record
03	<i>Dittopternis venusta</i> (Walker) *	Acrididae	Present record
04	<i>Leva indica</i> (Boliver) *	Acrididae	Present record
05	<i>Leva cruciate</i> (Boliva) *	Acrididae	Present record
06	<i>Gesonula punctifrons</i> (Stal, 1861) *	Acrididae	Present record
07	<i>Atractomorpha crenulata</i> (Fabricius) *	Pyrgomorphidae	Present record
08	<i>Scudderia</i> sp. *	Tetigonidae	Present record
09	<i>Tropidopola longicornis</i> (Fieber, 1853)*	Tetrigidae	Present record
10	<i>Acheta domesticus</i> (Linnaeus, 1758) *	Gryllidae	Present record

Table – 8: List of Blattaria reported from Salt Lake City

Sl. No.	Name of the species	Family	Reference/ Present Record
01	<i>Coptotermes heimi</i> (Wasmann) *	Rhinotermitidae	Present record
02	<i>Odontotermes feae</i> (Wasmann) *	Termitidae	Present record
03	<i>Odontotermes obesus</i> (Rambur) *	Termitidae	Present record
04	<i>Periplanata americana</i> (Linnaeus, 1758)*	Blattidae	Present record
05	<i>Blatta orientalis</i> Linnaeus, 1758 *	Blattidae	Present record
06	<i>Neostylopyga rhombifolia</i> (Stoll, 1813)	Blattidae	Mukherjee, 1993

Table – 9: List of Lesser found insects reported from Salt Lake City

Sl. No.	Name of the species	Family	Order	Reference/ Present Record
01	<i>Cloeon</i> sp. *	Baetidae	Ephemeroptera	Present record
02	<i>Mantis religiosa</i> Linnaeus, 1758*	Mantidae	Mantodea	Present record
03	<i>Forficula auricularia</i> Linnaeus, 1758 *	Forficulidae	Dermoptera	Present record

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