



Research Article

AGGREGATION OF GRASSHOPPERS (ORTHOPTERA) FROM THAR DESERT, SINDH

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ABSTRACT

At the present survey from May 2016 to October 2017 a total of 856 specimens were collected from Thar Desert, Sindh. Collected samples were classified into 2 Families i.e. Acrididae and Pyrgomorphidae, 6 Subfamilies and 13 species i.e. *Hilethera aeolopoides* (Uvarov, 1922), *Aiolopus thalassinus thalassinus* (Fabricius, 1781), *Heteracris littoralis* (Rambur, 1838), *Acrida exaltata* (Walker, 1859), *Atractomorpha acutipennis blanchardi* Bolívar, 1905, *Pyrgomorpha* (*Pyrgomorpha*) *bispinosa deserti* Bey-Bienko & Mishchenko, 1951, *Acrotylus humbertianus* Saussure, 1884, *A. longipes subfasciatus* Bei-Bienko, 1948, *A. longipes longipes* (Charpentier, 1845), *Ochrilidia geniculata* (Bolivar, 1913), *Truxalis eximia eximia* Eichwald, 1830, *Locusta migratoria* (Linnaeus, 1758) and *Oxya hyla hyla* Serville, 1831. Further, taxonomic keys, photographs, illustrations and affected host plants were highlighted to know the actual pest status of existing species. In addition to this, Biodiversity Index, Simpsons Index of Biodiversity and Species richness also calculated for each species.

Keywords: Acrididae, Aggregation, Orthoptera, Pyrgomorphidae, Thar Desert.

INTRODUCTION

Desert is defined as lands where evaporation exceeds rainfall. They may found at any latitude wherever rain fall is below 25 cm per year and not evenly distributed. Deserts occupy about 17% of land surface of the earth. There are two types of deserts, distinguished on the basis of temperature namely the hot desert and the cold desert. Sahara is the hot and largest desert lies across North Africa to Arabian Peninsula while Gobi desert of Mongolia is the coldest. Besides this, the deserts are also found in Australia, Central Asia, India and Pakistan. In Pakistan 3 deserts are more famous Thar, Cholistan and Thull. As for The desert is concerned it is considered as the seventh largest desert on planet Earth and third in continent Asia (Lal *et al.*, 2015). Thar Desert has resulted from geo- tectonic and climatic changes in the past, more than 100 years ago (Ahmed, 1969; Wadia, 1960). The grasshopper fauna of Thar Desert has attracted less attention of early Entomologists except for a few references (Ahmed, 1980; Moeed, 1966, 1976; Sultana Riffat & Wagan, 2009, 2010, 2012; Riffat & Wagan, 2015; Sultana & Wagan, 2008, 2010; Sultana *et al.*, 2013). Hence, present attempt has been made to bring the knowledge of grasshopper fauna of Thar Desert up to date.

MATERIALS AND METHODS

Collection of samples

Survey was carried out during May 2016 to October 2017 from different localities of Thar Desert, Sindh. Specimens were collected from different habitats i.e. grasses, vegetation, rocky area, sandy area, roadsides etc, with the help of insect hand net and hand picking methods.

Killing and preservation of grasshoppers

After collection, samples were brought to Entomological And Biocontrol Research Laboratory (EBCRL-Laboratory) Department of Zoology, University of Sindh, Jamshoro then killed and preserved (Vickery & Kevan, 1983) and Standarized Entomological Method (Sultana Riffat & Wagan, 2012; S Riffat & Wagan, 2015).

Identification of Samples

By the help of keys and description available in literature and on the website (www.orthoptera.org) Orthoptera species file online identification of samples was carried out under Stereoscopic Dissecting Binocular Microscope.

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Statistical analysis

Data obtained from experimental groups would be subject to one-way analysis of variance (ANOVA by Origin Pro 8.0 Software) and illustrations were made by using Adobe Illustrator CC 2015.

RESULTS AND DISCUSSION

A total of 856 specimens were collected from sandy, cultivated, vegetation, rocky, grassy, roadsides and open areas of Thar Desert and sorted out into 2 Families i.e. Acrididae and Pyrgomorphidae, 6 Subfamilies i.e. Oedipodinae, Eyprepocnemidinae, Acridinae, Pyrgomorphinae, Gomphocerinae and Oxyinae, 10 tribes i.e. Epacromiini, Eyprepocnemidini, Acridini, Atractomorphi, Pyrgomorphini, Acrotylini, Ochridini, Truxalini, Locustini and Oxyini, 11 Genera i.e. *Hilethera*, *Aiolopus*, *Heteracris*, *Acrida*, *Atractomorpha*, *Pyrgomorpha*, *Acrotylus*, *Ochridia*, *Truxalis*, *Locusta* and *Oxya*. 11 species *H. aeolopoides* (Uvarov, 1922),

A. thalassinus thalassinus (Fabricius, 1781), *H. littoralis* (Rambur et al., 2005), *A. exaltata* (Walker, 1859), *A. humbertianus*, *A. longipes subfasciatus* (Bei-Bienko, 1948), *A. longipes longipes*, *O. geniculata* (Bolivar, 1913), *T. eximia eximia* (Eichwald, 1830), *L. migratoria* (Wheeler, 1969), *O. hyla hyla* Serville, 1831 belong to Acrididae, while rest 2 species *A. acutipenis blanchardi* (Bolivar, 1905) and *P. (Pyrgomorpha) bispinosa deserti* (Bey-Bienko & Mishchenko, 1951) related with Pyrgomorphidae. Moreover, maximum number of specimens were belong to *P. bispinosa deserti* with 51.16% followed by 16.12% of *A. humbertianus*, while minimum number of specimens related to *O. hyla hyla* with 0.23%, followed by 0.46% of *L. migratoria* (Table 1). In addition to this, useful affected host plants (Table 2) along with the Biodiversity Index, Simpsons Index of Biodiversity and Species richness was also measured (Table 3). Moreover, taxonomic keys, distribution of sampling (Figure 1), photographs (Figure 2) and illustration (Figure 3) also highlighted.

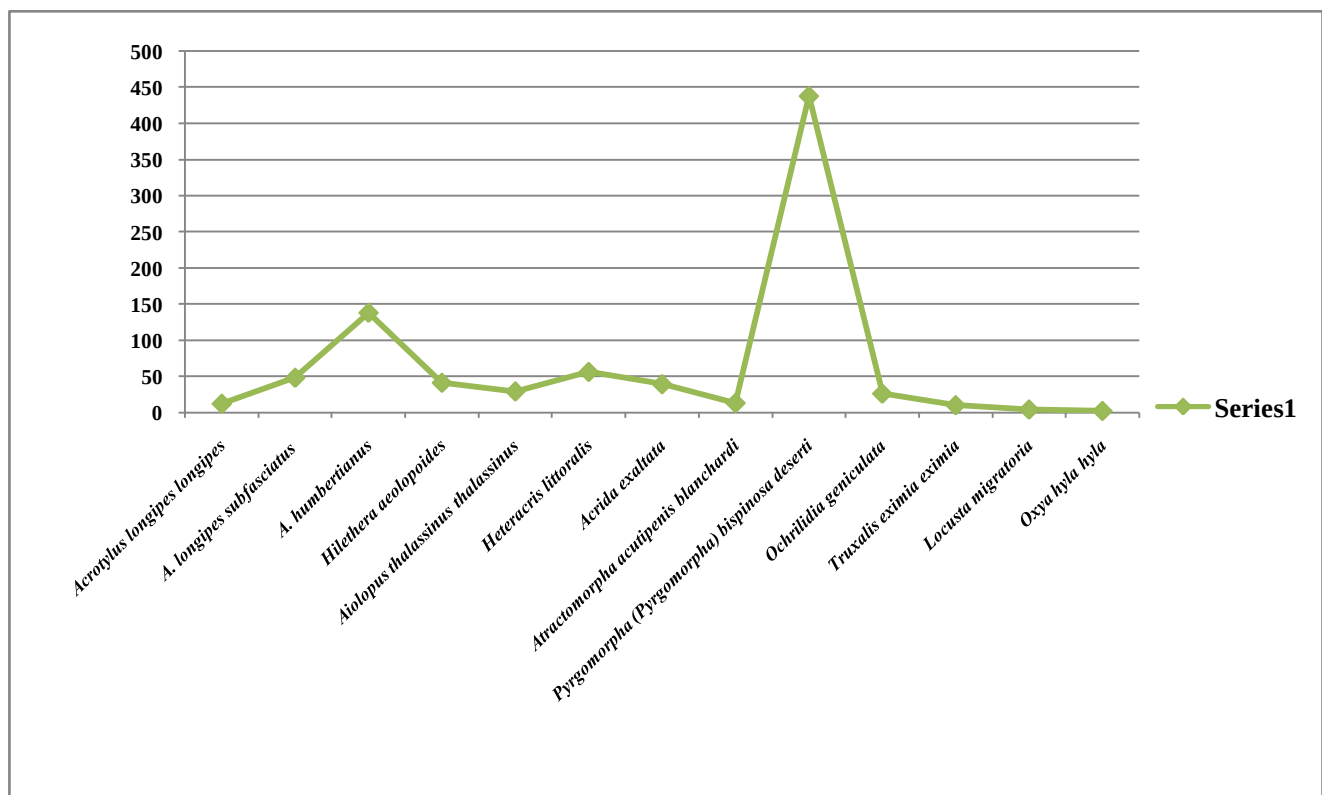


Figure 1. Number of specimens collected from various localities of Thar Desert, Sindh.

Male (Dorsal view)



(a)



(c)



(e)



(g)



(i)



(k)



(m)

Female (Lateral view)



(b)



(d)



(f)



(h)



(j)



(l)



(n)

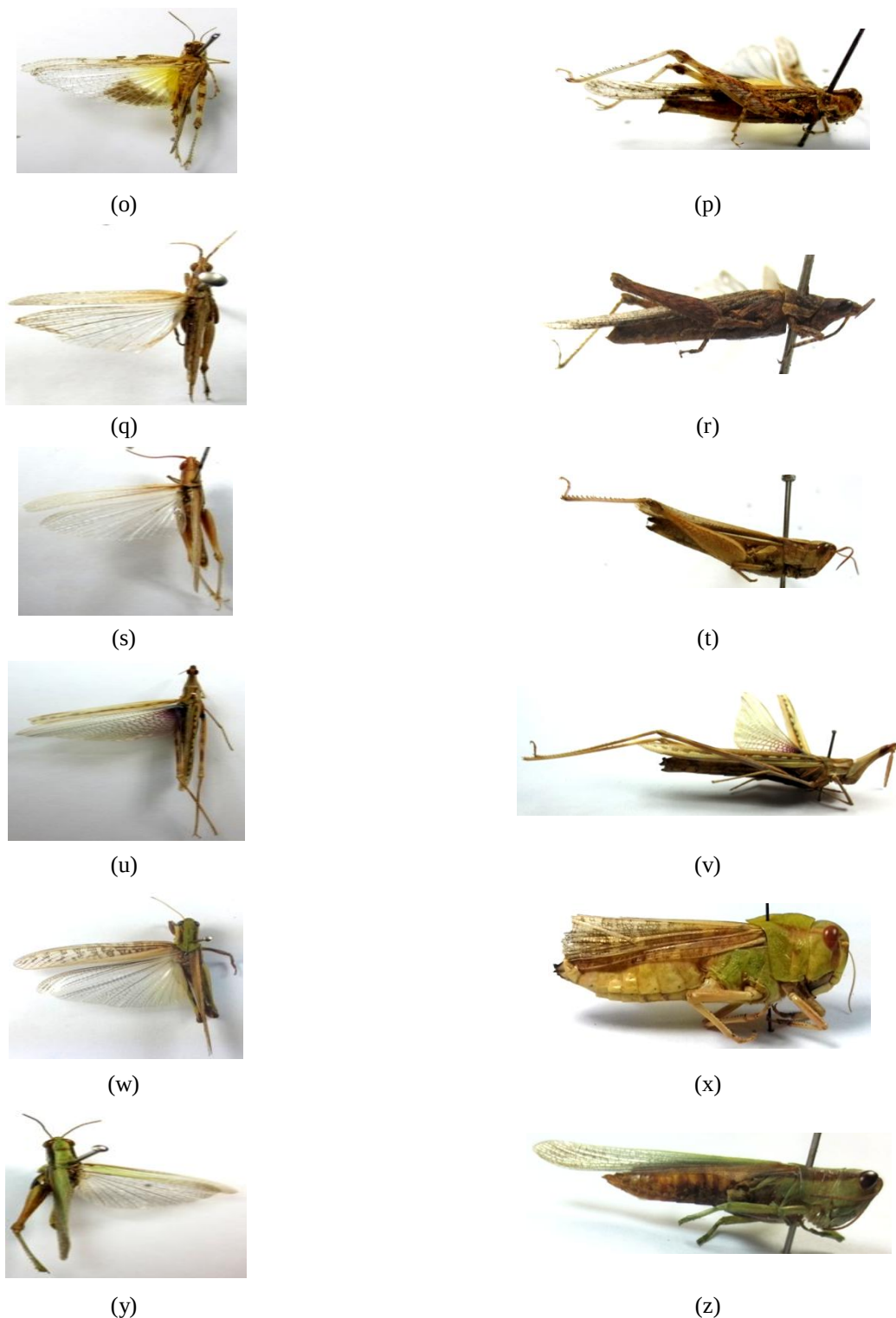
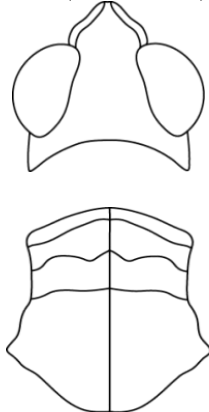


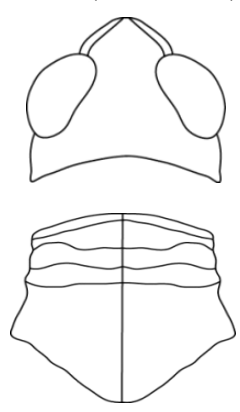
Figure 2. (a-♂, b-♀) *H. aeolopoides* (c-♂, d-♀) *A. thalassinus thalassinus* (e-♂, f-♀) *H. littoralis* (g-♂, h-♀) *A. exaltata* (i-♂, j-♀) *A. acutipennis blanchardi* (k-♂, l-♀) *A. longipes longipes* (m-♂, n-♀) *A. longipes subfasciatus* (o-♂, p-♀) *A. humbertianus* (q-♂, r-♀) *P. (Pyrgomorpha) bispinosa deserti* (s-♂, t-♀) *Ochrilidia geniculata* (u,v- ♀) *T. eximia eximia* (w-♂, x-♀) *L. migratoria* (y-♂, z-♀) *O. hyla hyla*.

H. aeolopoides

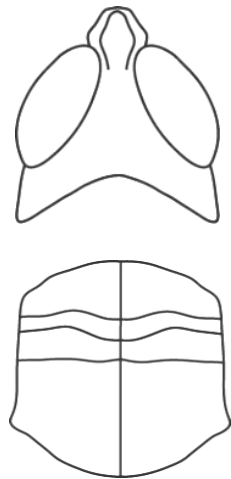
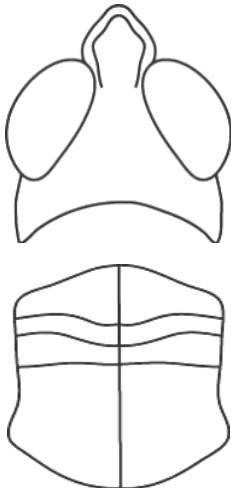
Male (Dorsal view)



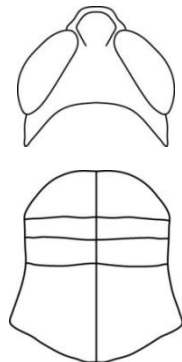
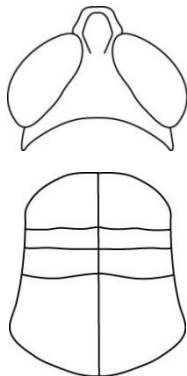
Female (Lateral view)



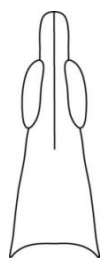
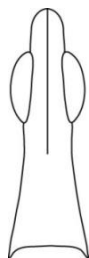
A. thalassinus thalassinus

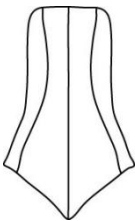


H. littoralis

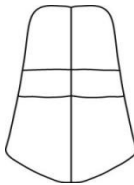
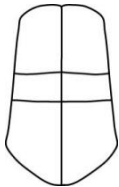
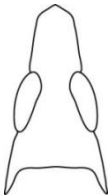
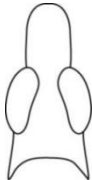
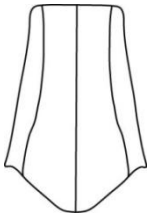


A. exaltata

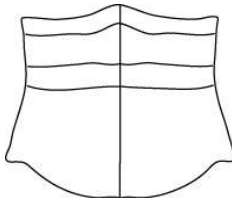
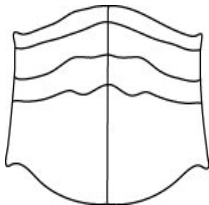
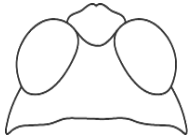




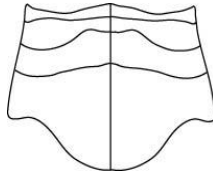
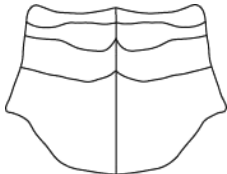
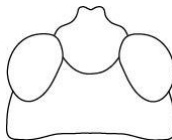
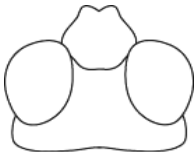
A. acutipennis blanchardi



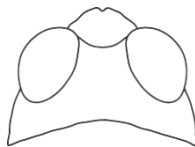
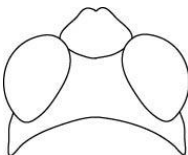
A. longipes longipes

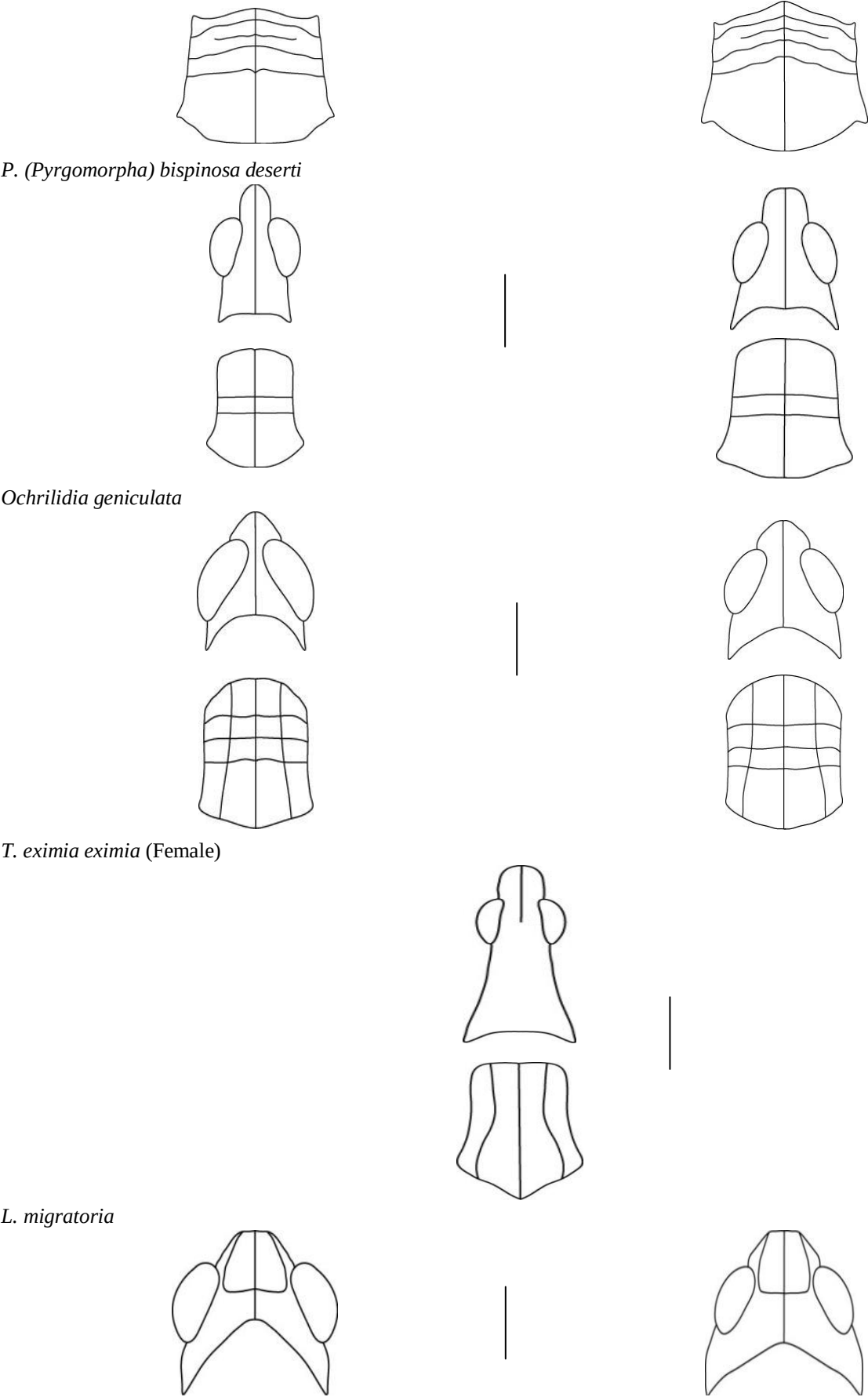


A. longipes subfasciatus



Acrotylus humbertianus





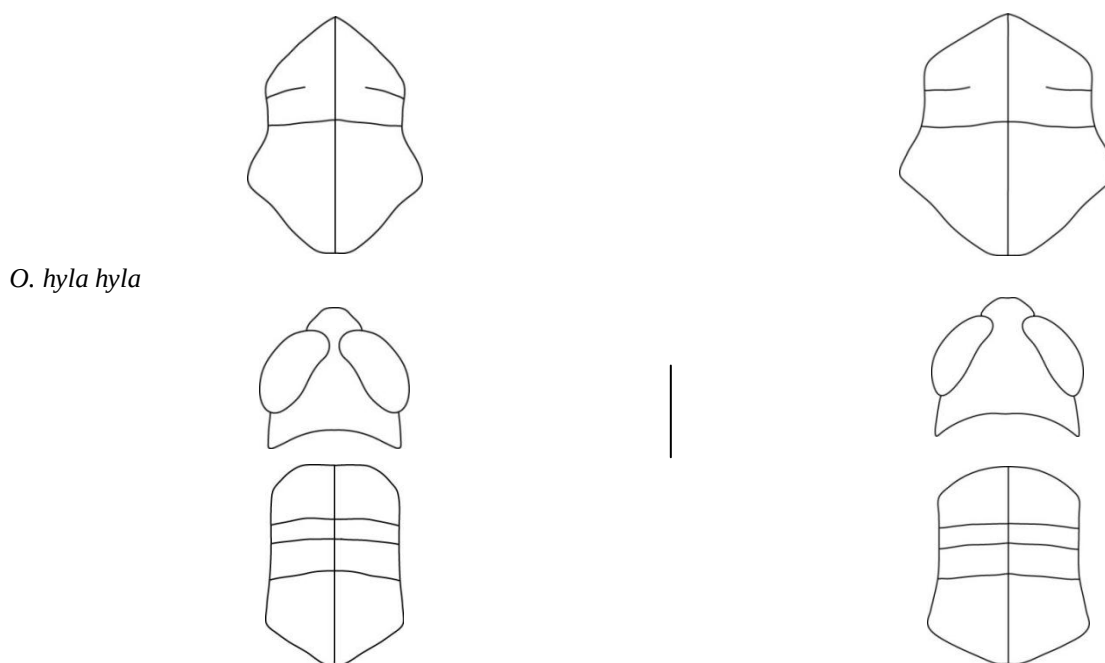


Figure 3. Illustrations of different species of Acrididae and Pyrgomorphidae (Barline = 4 mm).

Table 1. Total number of specimens along with the percentage (%) collected from Thar Desert during May 2016 to October 2017

S. No.	Name of species	No. of specimens	Percentage (%)
01.	<i>Acrotylus longipes longipes</i>	12	1.40%
02.	<i>A. longipes subfasciatus</i>	48	5.60%
03.	<i>A. humbertianus</i>	138	16.12%
04.	<i>Hilethera aeolopoides</i>	41	4.78%
05.	<i>Aiolopus thalassinus thalassinus</i>	29	3.38%
06.	<i>Heteracris littoralis</i>	56	6.54%
07.	<i>Acrida exaltata</i>	39	4.55%
08.	<i>Atractomorpha acutipenis blanchardi</i>	13	1.51%
09.	<i>Pyrgomorpha (Pyrgomorpha) bispinosa deserti</i>	438	51.16%
10.	<i>Ochrilidia geniculata</i>	26	3.03%
11.	<i>Truxalis eximia eximia</i>	10	1.16%
12.	<i>Locusta migratoria</i>	4	0.46%
13.	<i>Oxya hyla hyla</i>	2	0.23%

Table 2. Affected host plants noticed during field survey

S. No.	Name of species	Affected host plants
01.	<i>H. aeolopoides</i>	<i>Medicago sativa</i> , <i>Euphorbia hirta</i> and <i>Hordeum vulgare</i>
02.	<i>A. thalassinus thalassinus</i>	<i>Hordeum vulgare</i> , <i>Pennisetum glaucum</i> , <i>Sorghum vulgare</i> and <i>Citrullus vulgaris</i>
03.	<i>H. littoralis</i>	<i>Acacia jacquemontii</i> , <i>A. leucophloea</i> , <i>Azadirachta indica</i> , <i>Prosopis cineraria</i> and <i>Tecomella undulate</i>
04.	<i>A. exaltata</i>	<i>Calotropis procera</i> , <i>Ziziphus nummularia</i> and <i>Euphorbia neriifolia</i>
05.	<i>A. acutipenis blanchardi</i>	<i>Euphorbia neriifolia</i> , <i>Hordeum vulgare</i> and <i>Abelmoschus esculentus</i>
06.	<i>A. longipes longipes</i>	<i>Cynodon dactylon</i> and <i>Abelmoschus esculentus</i>
07.	<i>A. longipes subfasciatus</i>	<i>Aerva javanica</i> , <i>Leptadenia pyrotechnica</i> and <i>Euphorbia neriifolia</i>
08.	<i>Acrotylus humbertianus</i>	<i>Zea mays</i> , <i>Abelmoschus esculentus</i> , <i>Sorghum bicolor</i> and <i>Hordeum vulgare</i>

09.	<i>P. (Pyrgomorpha) bispinosa deserti</i>	<i>Sorghum vulgare</i> and <i>Ziziphus nummularia</i>
10.	<i>Ochrilidia geniculata</i>	<i>Pennisetum glaucum</i> , <i>Sorghum vulgare</i> and <i>Abelmoschus esculentus</i>
11.	<i>T. eximia eximia</i>	<i>Salvadora oleoides</i> and <i>Hordeum vulgare</i>
12.	<i>L. migratoria</i>	<i>Hordeum vulgare</i> , <i>Zea mays</i> , <i>Medicago sativa</i> and <i>Sorghum vulgare</i>
13.	<i>O. hyla hyla</i>	<i>Salvadora oleoides</i> , <i>Tamarix aphylla</i> , <i>Prosopis cineraria</i> and <i>Capparis deciduas</i>

Table 3. Distribution of specimens, Biodiversity Index, Simpsons Index of Biodiversity and Species richness

S.No.	Species	No: of specimens	Biodiversity Index	S.I.D
01.	<i>Acrotylus longipes longipes</i>	12	0.00019	0.9998
02.	<i>A. longipes subfasciatus</i>	48	0.0031	0.9969
03.	<i>A. humbertianus</i>	138	0.0259	0.9741
04.	<i>Hilethera aeolopoides</i>	41	0.0022	0.9978
05.	<i>Aiolopus thalassinus thalassinus</i>	29	0.0011	0.9989
06.	<i>Heteracris littoralis</i>	56	0.0042	0.9958
07.	<i>Acrida exaltata</i>	39	0.0020	0.998
08.	<i>Atractomorpha acutipenis blanchardi</i>	13	0.00023	0.9997
09.	<i>Pyrgomorpha (Pyrgomorpha) bispinosa deserti</i>	438	0.2618	0.7382
10.	<i>Ochrilidia geniculata</i>	26	0.00092	0.999
11.	<i>Truxalis eximia eximia</i>	10	0.00013	0.9998
12.	<i>Locusta migratoria</i>	4	0.000021	0.99997
13.	<i>Oxya hyla hyla</i>	2	0.0000054	0.9999
	Total	856		
	Species richness		0.4443	

Key to the species/ subspecies of family Acrididae and Pyrgomorphidae

1. Wings are transparent but at apical tips light dark spots present and tibia with 16-black spines..... 2
- . Wings hyaline, slightly opaque at apex..... *A. thalassinus thalassinus*
2. Tegmina with 3 well marked bands, hind tibia having small white and large black bands..... *H. aeolopoides*
- . Tegmina with many spots, hind femur with two black bands on the inner side..... *H. littoralis*
3. Antennae ensiform with 18-segmented..... 4
- . Antennae filiform with 15-16 segmented..... *A. acutipenis blanchardi*
4. Wings are slightly larger than tegmina and transparent..... 5
- . Wings yellow or orange at the base, hyaline, without dark bands..... *A. longipes longipes*
5. Dorsal side of pronotum crossed by transverse sulci, median and lateral carina developed..... *A. exaltata*
- . Dorsum of pronotum narrow from anterior, wide and pointed from posterior..... *P. (Pyrgomorpha) bispinosa deserti*
6. Wing hyaline, yellowish at base, dark band short lunar type..... *A. longipes subfasciatus*
- . Wing yellowish in color but at the base with an incomplete dark transverse band... *Acrotylus humbertianus*
7. Fastigium of vertex narrower from anterior side, frontal ridge shallowly sulcate, wings in female purplish blue from dorsal side..... *T. eximia eximia*
- . Fastigium of vertex triangular with obtuse apex, lower edge of fastigial foveolae visible from above..... *Ochrilidia geniculata*
8. Pronotum granulate, strongly tectiform, median carina well marked, intersected by posterior sulcus only..... *L. migratoria*
- . Pronotum flattened and very narrowing forward rounded posteriorly. Dorsal side of pronotum crossed by three transverse sulci..... *O. hyla hyla*

Very few Entomologists were worked on grasshopper's fauna of Thar Desert. Chen *et al.*, (2013) described 29 species of grasshoppers from different districts of Thar Desert. While, (Wagan, 1990) reported

incidence of *Acrotylus* species at Khairpur Nathan Shah, Mehar and Larkana district from Sindh. Earlier, (Khalid *et al.*, 2004) reported 7 species of grasshoppers belonging to Oedipodinae, Calliptaminae and Acridinae. However,

(Kumar & Usmani, 2014) reported 37 species of locusts and grasshoppers representing 25 genera, 11 subfamilies belonging to family Acrididae from different localities of Rajasthan, India. Nayeem & Usmani, (2012) described 41 species belonging to 28 genera of 10 subfamilies and 3 families from Jharkhand, India.

CONCLUSION

It could be concluded that majority of specimens belong to Acrididae followed by Pyrgomorphidae was collected from Thar Desert, Sindh during May 2016 to October 2017. Present study fills some gaps in the existing knowledge of fauna of Orthopterans of Sindh. Moreover, present survey not only helpful for accurate identification of grasshopper's species by using taxonomic keys, illustrations and photographs also confirm the accurate pest status of the species so that diagnosis of economic problems could be made properly.

ACKNOWLEDGEMENT

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