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Biodiversity and Systematics Status of Band-Winged Grasshoppers, Oedipodinae Walker, 1871 (Orthoptera: Acrididae) from Thar Desert, Pakistan

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RS presented the concept. SS and RS wrote the manuscript. ML did field surveys and designed methodology. SK and AAS analysed the data.

Key words
Biodiversity, Taxonomy, Oedipodinae, Thar Desert, Band-winged grasshoppers

ABSTRACT

In this study 09 localities of Thar Desert of Sindh have been surveyed and 1383 specimens of band-winged grasshoppers were collected. These samples were sorted out into 07 genera and 11 species. Morphological and morphometry account of each species with illustration ecology and global distribution was given. Taxonomic keys have been generated at generic and species level.

INTRODUCTION

Members of subfamily Oedipodinae are cosmopolitan in nature and commonly known as band-winged grasshoppers often brightly colored; they often flash their wings during flight. Body medium to large in size, rather sturdy. Head shorter than pronotum. Antennae filiform. Frons vertical. Head subglobular to short subconical. Pronotum saddle shaped or crest shaped and tectiform. Tegminal medial area with intercalary vein usually serrated. Tegmina and wing fully developed (Usmani, 2008; Hochkirch and Husemann, 2008; Bughio *et al*., 2013). These grasshoppers are of considerable economic importance, and generally occur in wide range of habitat, ranging from agricultural loam, deserted, semi deserted and hilly areas having the vegetation of grasses, herbs and shrubs (Bughio *et al*., 2013) and about 900 species, some of them are known as most notorious pests in the world (Copr, 1982). Systematics study of the subfamily Oedipodinae from Egypt excluding genus *Sphingnotus* carried out and reported subfamily as the major pest of many valuable crops throughout world especially in agriculturally developing countries like Egypt (Asmaa *et al*., 2008). Pakistan also has it rich numbers due to their diversity of habitats such as agricultural crops, hilly areas and desert like plain. Swarm of *Locusta migratoria* causes huge losses throughout the world (Vickery and Kevan, 1983). Species of genera *Gastrimargus* and *Oedaleus* are considered as major pest of agriculture (Samways and Lockwood, 1998). Grasshopper species belonging to family Oedipodinae are of extensive economic importance and continuously cause damage to pastures and different crops in rain-fed and irrigated areas. Oedipodinae is distributed throughout the world with approximately 185 genera (Tamkeen *et al*., 2015). Dey *et al*. (2022) reported 13 species/subspecies of genus *Thalpomena* Saussure from the Atlas Mountain.

Hochkirch and Husemann (2008) reported one new species (*Spingonotus fuerteventurae*) of tribe Sphingonotini (Orthoptera: Acrididae: Oedipodinae) from Fuerteventura. They also revised tribe Sphingonotini of Canarian along with the molecular phylogeny based on

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Abbreviations
EBCRL, Entomology and Bio-Control Research Lab; LF, Length of femur; LH, Length of head; LP, Length of pronotum; LT, Length of tegmen; LT, Length of tibia; LW, Length of wing; SEM, Sindh Entomological Museum; TBL, Total body length

the mitochondrial DNA sequences (ND5). Usmani (2008) described new species i-e *Aiolopus* obariensis (♂) along with the 3 other species (A. thalassinus, A. strepens and A. simulatrix) from Libya. This holotype species has club-shaped and short left antennae which were collected from Wadi Haya region at an altitude of 470m on alfalfa host plant from Fezzan province. Shah *et al*. (2008) described external morphological characteristics of three species viz., *Acrotylus longipes longipes, A. insubricus* and *A. humbertianus* of subfamily Oedipodinae. Beside this, it was noticed that these species were very closely related to each other and difficult to classify so complete structure and comparative morphological characteristics of various body parts along with some new descriptive morphological characteristics has been fully described in order to make accurate identification (Shah *et al*., 2008). The growing list of described species and sub species includes their possible economic importance as well as lack of any comparative taxonomic study and need for accurate identification to certain knowledge of relationship within subfamily Oedipodinae. Keeping in view above, it was essential to identify species of Oedipodinae accurately so that diagnosis of an economic problem can be properly made form Thar Desert, Sindh, Pakistan.

MATERIALS AND METHODS

Various localities of Thar Desert have been surveyed and specimens of subfamily Oedipodinae have been collected (Table I). The grasshoppers were collected with the help of traditional hand net from agricultural crops, hilly areas, deserted and semi deserted plains having the vegetation of grasses, herbs and shrubs (Riffat and Wagan, 2015). In order to sort out into species the collected material was brought to Entomological and Bio-Control Research Lab (EBCRL) at Department of Zoology, University of Sindh, Jamshoro, Pakistan. Standard entomological killing bottles were used to kill live specimens by using potassium cyanide. In order to avoid the color may change specimens were not left longer in bottle than 5-8 minutes by adopting technique of Vickery and Kevan (1983) and Riffat and Wagan (2015). Before specimens dried, pinning of samples was performed. The head of specimen was directed slightly downwards on the wood made stretching board and insect pin was inserted on slightly to the right of the median carina in posterior of pronotum. Setting of left wings was with the long axis of the body at right angle to the pin. To minimize the possibility of breaking and to occupy the small area posterior legs were bent beneath the body. The abdomen was dropped below wings. Fully dried specimens were preserved in insect cabinets with labels providing collection date, habitat, locality, and collector's name. Naphthalene balls (C10H8) were placed in boxes to prevent the attack of ants and other insects. Specimens were identified through the bibliographies given by Riffat and Wagan (2015), and Orthoptera Species File (OSF) (Cigliano *et al*., 2020) was also consulted. Photographs of the various species were prepared. Line drawings were made with a camera lucida fitted on a microscope (Ernst Leitz Wetzlar Germany 545187) and these were improved with the help of the software's Adobe illustrator CC-2015 and Adobe Photoshop CS. Measurements of various body parts were calculated in millimeters (mm) using the microscope (Oculas), 10×10 graph, compass, divider, and ruler. The material has been deposited in Sindh Entomological Museum (SEM), Department of Zoology, University of Sindh, Jamshoro. Pakistan.

Table I. Distribution of Oedipodinae species in different localities of Thar Desert Sindh with particular number.

Species	Diplo	Islamkot	Nagarparkar	Sanghar	Umerkot	Mithi	Chachro	Rohri	Nara
Hilethera aeolopoides	32	22	18	07	12	27	15	21	29
Aiolopus thalassinus thalassinus	37	16	21	09	07	23	11	24	23
Aiolopus thalassinus tumulus	21	09	09	05	11	09	09	23	11
Acrotylus humbertianus	24	-	22	18	07	-	25	14	26
Acrotylus longipes subfasciatus	15	21	29	09	23	11	08	-	25
Acrotylus longipes longipes	18		37	16	-	09	23	11	16
Trilophidia annulata	09	23	11	21	29	09	01	04	27
Sphingonotus rubescens rubescens	19	06	-	14	28	21	29	09	23
Sphingonotus savignyi	11	21	29	24	32	31	21	24	12
Locusta migratoria	06	-	-	09	04	02	-	01	-
Oedaleus senegalensis	02	-	-	-	-	02	-	01	-

Subfamily: Oedipodinae
Tribe: Epacromiini
Genus *Hilethera* Uvarov, 1923 1
***Hilethera aeolopoides* (Uvarov, 1922)**

Material examined

Pakistan, Sindh. 11♂, 21♀; Riffat, Mohan, Samiullah; 21 Aug. 2019; Diplo 24.5686°N, 69.4803°E, 9♂, 13♀; Riffat, Mohan; 23 Aug. 2019; Islamkot 24.6992°N, 70.1705°E, 5♂, 13♀; Samiullah, Riffat, Mohan; 25 Aug. 2019; Nagarparkar 24.3516°N, 70.7657°E, 2♂, 5♀; Riffat, Mohan, Samiullah; 27 Sep. 2019; Sanghar 26.0537°N, 68.9554°E, 4♂, 8♀; Riffat, Mohan, Samiullah; 6 Sep. 2019; Umerkot 25.3434°N, 69.7240°E, 8♂, 19♀; Riffat, Samiullah; 11 Sept. 2019; Mithi 24.7412°N, 69.8103°E, 6♀, 9♀; Samiullah, Riffat, Mohan; 9 Sep. 2019; Chachro 25.1068°N, 70.2642°E, 8♂, 13♀; Riffat, Samiullah, Mohan; 21 Sept. 2019; Rohri 27.6732°N, 68.8984°E, 5♂, 24♀; Mohan, Riffat, Samiullah; 23 Sep. 2019; Nara 26.8799°N, 69.0457°E.

Description

Antennae filiform with 20-segment, slightly thickened towards apex, shorter than head and pronotum together. Head is raised above the level of pronotum, shorter than pronotum, fastigial foveolae triangular and visible from above. Pronotum rugose, anterior margin produced, posterior margin obtuse angulate having black spots along margin, median carina intersected by posterior sulcus only. Tegmina possess 3-dark band. Hind femur brown in color, paler at base with a paler ring near the knee, latter with a dark patch on the inner side. Wings transparent but at apical tips light dark spots present and tibia with 16-black spines. Body buff colored and spotted with brown. Tegmina with three dark bands. Wings are transparent but apical region contain light dark spots. Hind femur brown, paler at base with a paler ring near the knee, latter with a dark patch on the inner side (Fig. 1).

Male: LH 2.52 ± 0.29 (mm), LP 3.29 ± 0.19 (mm), LT 18.8 ± 2.77 (mm), LW 17.6 ± 2.40 (mm), LF 11.0 ± 1.0 (mm), LT 9.8 ± 0.83 (mm), TBL 20.0 ± 2.34 (mm). Female: LH 2.73 ± 0.38 (mm), LP 3.71 ± 0.31 (mm), LT 21.6 ± 0.54 (mm), LW 20.6 ± 0.54 (mm), LF 14.4 ± 0.54 (mm), LT 12.0 ± 1.00 (mm), TBL 22.6 ± 1.34 (mm), (Fig. 2).

Ecology

This species is graminivorous and cosmopolitan found in many grasses but prefer to feed on the Alfalfa-Losan (*Medicago sativa*) in various districts of Thar especially Umerkot while, sometimes also collected from Smart weed- kheer wal (*Euphorbia hirta*) and barley (*Hordeum vulgare*). However, it is predominantly present in wild vegetation.

Distribution

Asia-Temperate, Srilanka, Arabian Peninsula, Oman: Muscat and Pakistan (Moeed, 1966; Ahmed, 1980; Yousuf, 1996; Baloch, 2000).

Note

This species is closely related to *H. hierichonie* in having general shape and inter-lunar area of tegmina more than twice broad as discoidal area but can easily be separated from the same in having large antennae reaching up to hind margin of pronotum. Earlier, Uvarov (1925), Ahmed (1980), Yousuf (1996) and Baloch (2000) recorded this from Dadu, Hyderabad and Khairpur districts of Sindh province. Recently, Riffat *et al.* (2013) collected its fair number from fodder crops of Thar Desert, while, Soomro *et al.* (2014) also confirmed its presence from Nara Desert, Khairpur, Sindh. Moeed (1966) misidentified this species as Lorina oedipodiodes and recorded from Dadu and Hyderabad. During this survey, we have collected its fair number from barley fields, roadsides surrounded by vegetation of grasses.

Genus *Aiolopus* Fieber, 1853 2.
1. *Aiolopus thalassinus thalassinus* (Fabricius, 1781)
(Figs. 1a and 2a)

Material examined

Pakistan, Sindh. 9♂, 28♀; Riffat, Mohan, Samiullah; 21 Aug. 2019; Diplo 24.5686°N, 69.4803°E, 5♂, 11♀; Riffat, Mohan; 23 Aug. 2019; Islamkot 24.6992°N, 70.1705°E, 4♂, 17♀; Samiullah, Riffat, Mohan; 25 Aug. 2019; Nagarparkar 24.3516°N, 70.7657°E, 2♂, 7♀; Riffat, Mohan, Samiullah; 27 Sep. 2019; Sanghar 26.0537°N, 68.9554°E, 1♂, 6♀; Riffat, Mohan, Samiullah; 6 Sep. 2019; Umerkot 25.3434°N, 69.7240°E, 5♂, 18♀; Riffat, Samiullah; 11 Sept. 2019; Mithi 24.7412°N, 69.8103°E, 2♀, 9♀; Samiullah, Riffat, Mohan; 9 Sep. 2019; Chachro 25.1068°N, 70.2642°E, 3♂, 21♀; Riffat, Samiullah, Mohan; 21 Sept. 2019; Rohri 27.6732°N, 68.8984°E, 7♂, 16♀; Mohan, Riffat, Samiullah; 23 Sep. 2019; Nara 26.8799°N, 69.0457°E.

Description

Antennae filiform with 21-23 antennal segments. Body usually medium in size. Head subconical smaller than pronotum slightly saddle shaped, narrowed in prozona and lateral carina absent. Fastigium of vertex elongate angular, concave with developed lateral carinulae, frons oblique, frontal rigde flat. Fastigial foveolae trapezoidal. Pronotum

slightly saddle shaped, constricted in prozona, median carina weak, medial area of tegmen with intercalary vein well developed and finely serrated. Mesosternal interspace almost square. Tegmina and wings developed. Wings hyaline, slightly opaque at apex. Hind femur slender long, dorsal carina not serrated; dorsal genicular lobes rounded. Hind tibia thin with inner pair of spines longer than external one, external apical spines absent, 10-11 black tipped spines on either side. Claws shorter. Arolium of small size half length of claw. Body color paler brown, greenish brown or dusty brown. Antennae brownish. Head reddish brown, fastigium green, brown or pink reddish. Tegmina slightly transparent, brownish with irregular blackish speckles. Wing colorless and hyaline. Hind femur paler brown, ventral carinae with green band, inner side having 2-3 dark bands. Hind tibia straw color (Fig. 1).

Male: LH 2.73 ± 0.51 (mm), LP 3.29 ± 0.31 (mm), LT 18.8 ± 1.30(mm), LW 17.4 ± 1.51 (mm), LF 12.0 ± 1.87(mm), LT 10.4 ± 1.51 (mm), TBL 19.6 ± 1.14 (mm). Female: LH 2.45 ± 0.24 (mm), LP 4.1 ± 0.23 (mm), LT 19.0 ± 3.60 (mm), LW 17.6 ± 3.20 (mm), LF 13.0 ± 1.0 (mm), LT 11.2 ± 0.83 (mm), TBL 20.0 ± 3.60 (mm) (Fig. 2).

Affected host plants

Graminivorous in nature. Although, this species collected from different cultivated fields but frequently observed in maize (*Zea mays*), lady finger (*Abelmoschus esculentus*), alfalfa-losan (*Medicago sativa*), barley (*Hordeum vulgare*), pearl millet (*Pennisetum glaucum*), jowar (*Sorghum vulgare*), water melon (*Citrullus vulgaris*), lawn grasses/ chabar gaah (*Cynodon dactylon*) crops.

Distribution

Australia, France, India, Japan, Pakistan, Southwest Africa, Srilanka. Europe, Middle Europe, Switzerland, Locarno and Maggia Delta (Hollis, 1968; Ahmed, 1980; Riffat *et al*., 2013).

Note

This species is closely related to *A. meruensis* having antennae shorter than head and pronotum, but can distinguished by fastigal foveolae which was narrower. Moeed (1966) and Hollis (1968) collected this subspecies from crops as a serious pest. Ahmed (1980) recorded it from various districts of Pakistan during monsoon season. Riffat *et al*. (2013) reported this from fodder crops of Thar Desert. The specimens in our hand having short and conical arolium which is slightly differ from other reported species. At present, specimens were captured from mixed and scattered vegetation of grasses along with lady finger field.

2. *Aiolopus thalassinus tumulus* (Fabricus, 1798) (Figs. 1a and 2a)

Material examined

Pakistan, Sindh. 8♂, 13♀; Riffat, Mohan, Samiullah; 21 Aug. 2019; Diplo 24.5686°N, 69.4803°E, 1♂, 8♀; Riffat, Mohan; 23 Aug. 2019; Islamkot 24.6992°N, 70.1705°E, 2♂, 7♀; Samiullah, Riffat, Mohan; 25 Aug. 2019; Nagarparkar 24.3516°N, 70.7657°E, 5♀; Riffat, Mohan, Samiullah; 27 Sep. 2019; Sanghar 26.0537°N, 68.9554°E, 2♂, 9♀; Riffat, Mohan, Samiullah; 6 Sep. 2019; Umerkot 25.3434°N, 69.7240°E, 9♀; Riffat, Samiullah; 11 Sept. 2019; Mithi 24.7412°N, 69.8103°E, 4♀, 6♀; Samiullah, Riffat, Mohan; 9 Sep. 2019; Chachro 25.1068°N, 70.2642°E, 7♂, 16♀; Riffat, Samiullah, Mohan; 21 Sept. 2019; Rohri 27.6732°N, 68.8984°E, 1♂, 10♀; Mohan, Riffat, Samiullah; 23 Sep. 2019; Nara 26.8799°N, 69.0457°E.

Description

Antennae filiform with 21-23 segments. Body small to medium in size. Head sub-conical, shorter than pronotum. Fastigium of vertex without median carinula. Pronotum sub-saddle shaped, constricted in middle median carina well developed and lateral carina absent. Frontal ridge gradually tapered towards fastigium of vertex. Foveolae longer. Tegmina and wings fully developed with obtuse rounded apices. Hind femur of medium size. Hind tibia slender with 10-11 black tipped spines. In the hind tibia basal third part has a straw-colored band while, in the median part usually bluish and apical part reddish. Arolium small. Body color paler green, dusty or greenish. Tegmina transparent having brown and white irregular scattered dots. Wings transparent and hyaline. Hind femur along ventral carina on outer margin with black spots. Hind tibia reddish or paler with one or two small black bands (Fig. 1).

Male: LH 2.38 ± 0.29(mm), LP 3.71 ± 0.31 (mm), LT 20 ± 0.79 (mm), LW 19.1 ± 0.41 (mm), LF 11.4 ± 0.41(mm), LT 9.5 ± 0.5 (mm), TBL 20.1 ± 0.82(mm). Female: LH 3.08 ± 0.45 (mm), LP 4.27 ± 0.29 (mm), LT 23.6 ± 0.89 (mm), LW 22 ± 1 (mm), LF 13.2 ± 0.57 (mm), LT 11.8 ± 0.57 (mm), TBL 24.6 ± 0.41 (mm) (Fig. 2).

Affected host plants

This sub-species is graminivorous in nature. During the field survey it was noticed that this species is predominantly found in extensive grasslands and smaller patches and also found in irrigated land in crops. Abundant cultivation and salt marshes. *Cynodon dactylon* is a preferred food on which it can develop completely yet even when this is present it tries to damage other plants including cotton (*Gossypium arboretum*), barley (*Hordeum*

vulgare) and jowar (*Sorghum vulgare*).

Distribution

Africa, Europe, Asia, Australia, France, Madagascar, Turkey, Italy, India, Japan, Srilanka, Southwest Africa and Pakistan (Perwin *et al*., 1983; Riffat *et al*., 2013; Hollis, 1968).

Note

This subspecies is very closely related to *A. thalassinus thalassinus* and can be distinguished by the frontal ridges narrow, pronotum less produced behind as a round apex. This subspecies is not widely distributed as *A. thalassinus thalassinus*, but it was recorded from all districts of Thar Desert. Earlier, this subspecies was recorded form Dadu, Hyderabad and Tharparkar while this subspecies reported from Punjab by (Moeed, 1966; Hollis, 1968; Ahmed, 1980), Perwin *et al*. (1983) reported it from Karachi while, Riffat *et al*. (2013) confirms its presence in Thar Desert. Presently, it was captured from cultivated fields of sugarcane, maize, barley, vegetables and grasses in meadows along the road sides was found.

Genus *Acrotylus* Fieber, 1853

1. *Acrotylus humbertianus* Saussure, 1884

Material examined

Pakistan, Sindh. 5♂, 19♀; Riffat, Mohan, Samiullah; 21 Aug. 2019; Diplo 24.5686°N, 69.4803°E, 7♂, 15♀; Samiullah, Riffat, Mohan; 25 Aug. 2019; Nagarparkar 24.3516°N, 70.7657°E, 1♂, 17♀; Riffat, Mohan, Samiullah; 27 Sep. 2019; Sanghar 26.0537°N, 68.9554°E, 7♀; Riffat, Mohan, Samiullah; 6 Sep. 2019; Umerkot 25.3434°N, 69.7240°E, 4♀, 21♀; Samiullah, Riffat, Mohan; 9 Sep. 2019; Chachro 25.1068°N, 70.2642°E, 2♂, 12♀; Riffat, Samiullah, Mohan; 21 Sept. 2019; Rohri 27.6732°N, 68.8984°E, 3♂, 23♀; Mohan, Riffat, Samiullah; 23 Sep. 2019; Nara 26.8799°N, 69.0457°E.

Description

Antennae filiform having 24-antennal segment. Body small to medium in size, yellowish brown in color, whitish beneath and hairy throughout. Fastigium of vertex without median carina. Pronotum short, wide and saddle shaped, its posterior margin rounded. Dorsum of pronotum crossed by posterior transverse sulcus only, as long as or shorter than its width, strongly tuberculate, median carina well developed, lateral carina irregular and tuberculate. Sometime absent in metazona, metazona longer than prozona, posterior margin of pronotum rounded. Mesosternal interspace wide, about twice wider than its greatest length. Tegmina and wings fully developed. Wing yellowish in color but at the base with an incomplete dark transverse band. Mesosternal interspace much wider than long. Hind tibia pale and slender in shape, with 10-inner and 8-outer black tipped spines. Body fulvulous grey, ventral surface grayish yellow, antennae from base shows white spots with brownish dark in color. Small black speckles noticed in fastigium of vertex. Membranes of tegmina semi-transparent, brown opaque at base. Wings hyaline, light yellowish at base, dark band in the centre of wing. Hind femur yellowish (Fig. 1).

Male: LH 2.23 ± 0.22(mm), LP 2.58 ± 0.25 (mm), LT 18.2 ± 0.83 (mm), LW 18.1 ± 1.88 (mm), LF 11.1 ± 1.02 (mm), LT 10.0 ± 1.0(mm), TBL 17.9 ± 1.63 (mm). Female: LH 2.30 ± 0.71 (mm), LP 2.60 ± 0.2 (mm), LT 21.7 ± 0.90 (mm), LW 20.8 ± 1.03 (mm), LF 12.7 ± 0.67 (mm), LT 11.2 ± 0.75 (mm), TBL 20.4 ± 1.47 (mm) (Fig. 2).

Affected host plants

Mostly the specimens feed on grasses (*Cynodon dactylon*) but sometimes also noticed in other fields such as *Zea mays* (maize), *Abelmoschus esculentus* (lady finger), *Sorghum bicolor* (jowar) and *Hordeum vulgare* (barley).

Distribution

India, Nepal, Sri-lanka, Afghanistan and Pakistan (Wagan, 1990; Mahmood *et al*., 2004; Hirdesh and Usmani, 2014).

Note

Humbertianus is closely related to *A. patruelis* having long tegmina and arolium, wing coloration yellowish at the base and having an incomplete dark band which is unique character of this species. Earlier, Ahmed (1980) confirmed the presence of this species from various provinces of Pakistan. Moeed (1966), Wagan (1990), Wagan and Solangi (1990) also reported this species from different parts of Sindh while, Baloch (2000) recorded from Punjab and Mahmood *et al*. (2004) from Azad Jammu and Kashmir. Riffat *et al*. (2013) confirmed the existence of this species from various districts of Thar Desert. Hirdesh and Usmani (2014) reported it from Rajasthan (India) with large collection from different localities *viz*. Jaisalmer, Barmer and Sirohi. During this survey we have also obtained fair number of specimens from barley, vegetables, rocky and green field were present.

2. *Acrotylus longipes subfasciatus* Bey-Bienko, 1948

Material examined

Pakistan, Sindh. 1♂, 14♀; Riffat, Mohan, Samiullah; 21 Aug. 2019; Diplo 24.5686°N, 69.4803°E, 3♂, 18♀; Riffat, Mohan; 23 Aug. 2019; Islamkot 24.6992°N,

70.1705°E, 7♂, 22♀; Samiullah, Riffat, Mohan; 25 Aug. 2019; Nagarparkar 24.3516°N, 70.7657°E, 1♂, 8♀; Riffat, Mohan, Samiullah; 27 Sep. 2019; Sanghar 26.0537°N, 68.9554°E, 2♂, 21♀; Riffat, Mohan, Samiullah; 6 Sep. 2019; Umerkot 25.3434°N, 69.7240°E, 3♂, 8♀; Riffat, Samiullah; 11 Sept. 2019; Mithi 24.7412°N, 69.8103°E, 4♀, 4♀; Samiullah, Riffat, Mohan; 9 Sep. 2019; Chachro 25.1068°N, 70.2642°E, 5♂, 20♀; Mohan, Riffat, Samiullah; 23 Sep. 2019; Nara 26.8799°N, 69.0457°E.

Description

Antennae filiform with 21-24 segmented, longer than head and pronotum together, dark brownish with white spots at base. Color of body is paler brown in color. Head conical shorter than pronotum. Fastigium of vertex triangular with raised lateral carinulae. Fastigial foveolae distinct, irregular, frons vertical. Hind femur has inner light brown incomplete band along the ventro-external carina, but shining pale above the ventro-external carina, dorsal edge with 2-brown spots. Hind tibia pale. Ovipositor short, robust, valves curved, dorsal valves hook like, ventral valve with external lateral projection. Body paler brown in color, antennae dark brownish having white spots at base, pronotum with white brownish speckles. Tegmina semitransparent, light brown at basal half, light brown spot at margin. Wings hyaline with yellowish base, dark band short lunar type. Hind femur with inner light brown and hind tibia pale in color (Fig. 1).

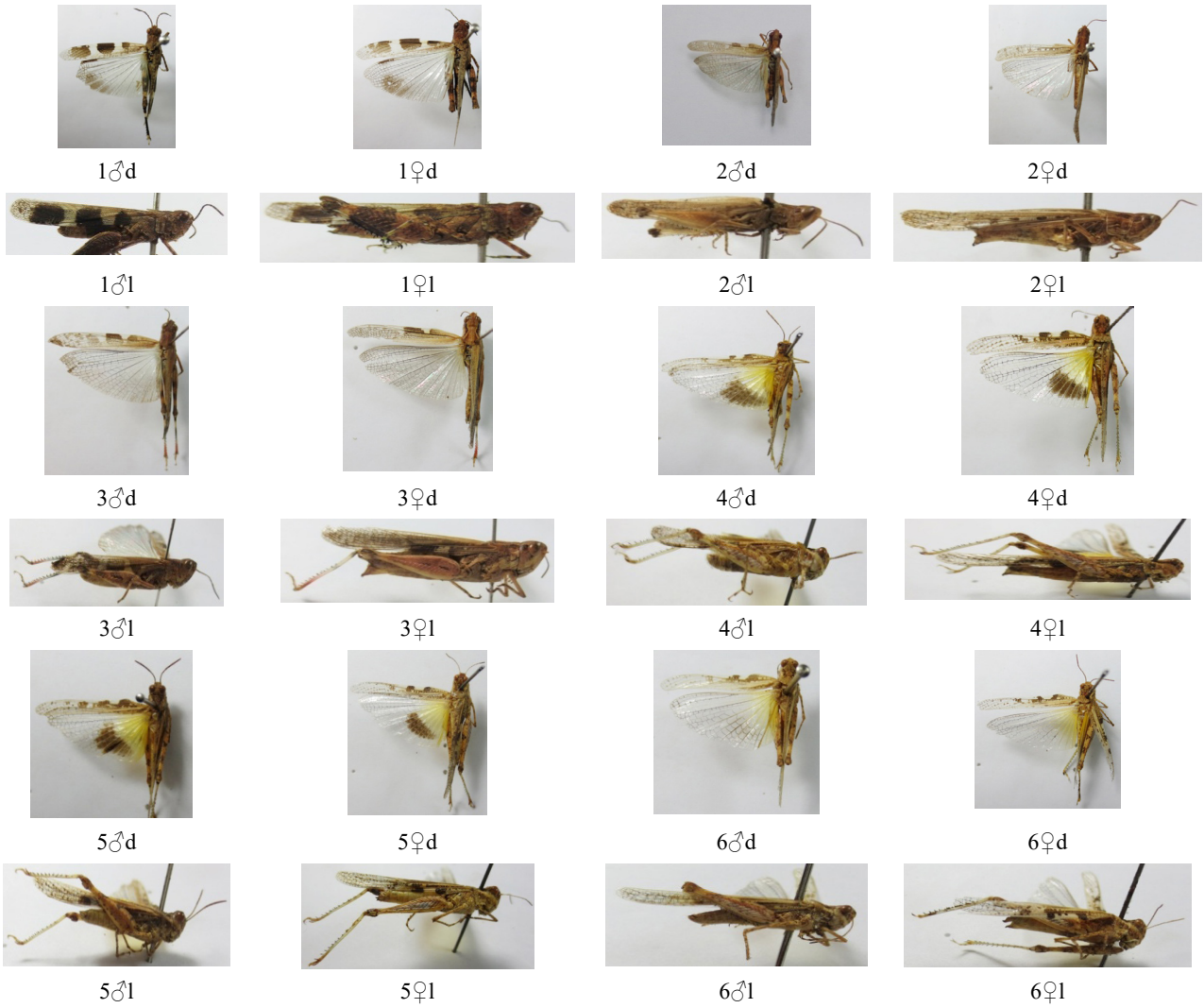

Fig. 1. 1, *Hilethera aeolopoides*; 2, *Aiolopus thalassinus thalassinus*; 3, *Aiolopus thalassinus tumulus*; 4, *Acrotylus humbertianus*; 5, *Acrotylus longipes subfasciatus*; 6, *Acrotylus longipes longipes*. Note: ♂d=Male dorsal; ♀d=Female dorsal; ♂l=Male lateral; ♀l= Female lateral.

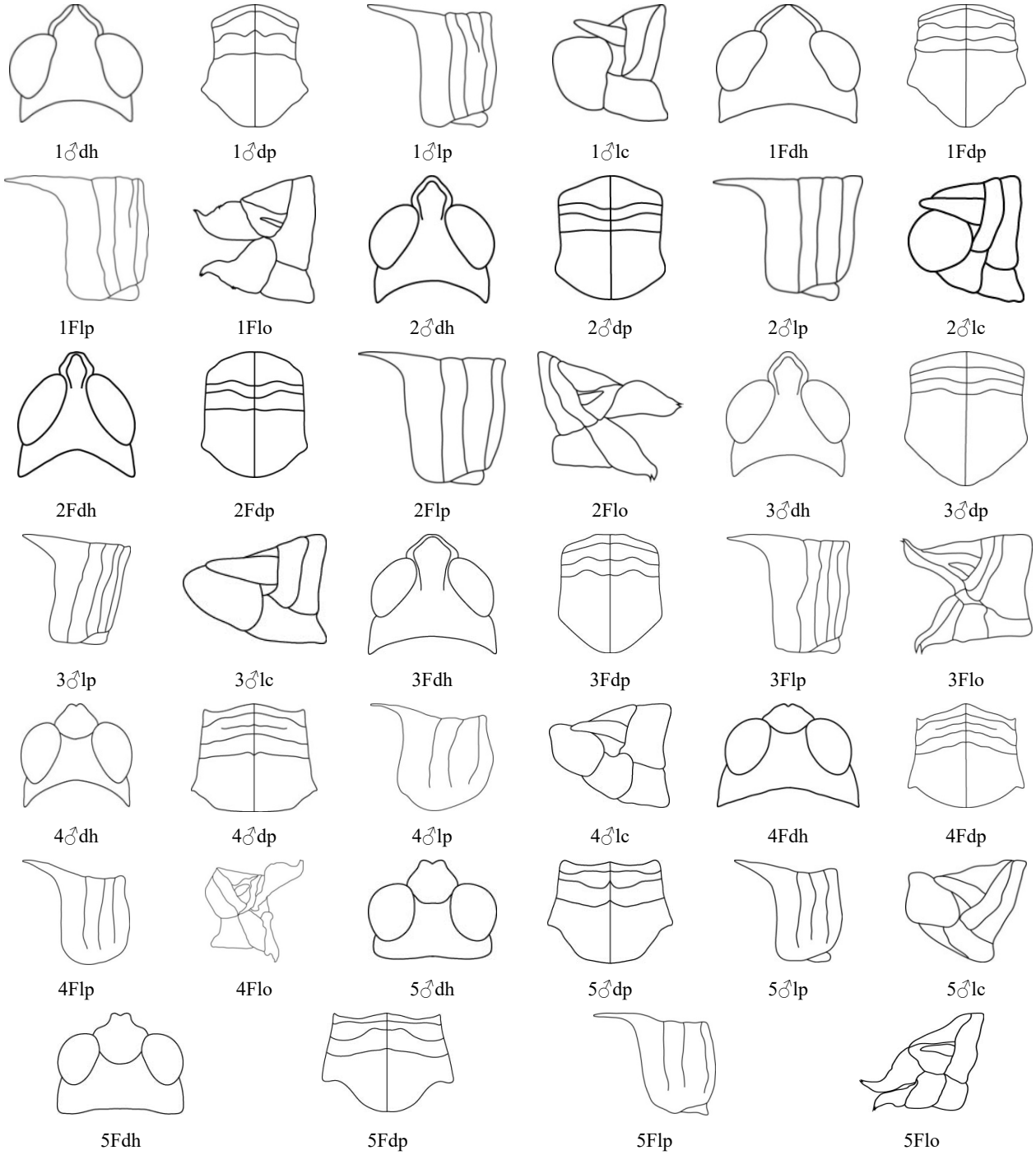

Fig. 2. 1, *Hilethera aeolopoides*; 2, *Aiolopus thalassinus thalassinus*; 3, *Aiolopus thalassinus tumulus*; 4, *Acrotylus humbertianus*; 5, *Acrotylus longipes subfasciatus*. Note: Mdh=♂ dorsal head, Mdp=♂ dorsal pronotum, Mlp=♂ lateral pronotum, Mlc=♂ lateral cerci, Fdh=♀ dorsal head, Fdp=♀ dorsal pronotum, Flp=♀ lateral pronotum, Flo=♀ lateral Ovipositor.

Male: LH 2.19 ± 0.32(mm), LP 2.45 ± 0.24 (mm), LT 19.6 ± 1.91 (mm), LW 18.6 ± 1.81 (mm), LF 11.8 ± 0.83(mm), LT 10.3 ± 0.67 (mm), TBL 18.4 ± 2.53 (mm).

Female: LH 2.52 ± 0.29 (mm), LP 2.94 ± 0.19 (mm), LT 21.2 ± 0.83 (mm), LW 20.8 ± 0.57 (mm), LF 13.3 ± 0.67 (mm), LT 12.5 ± 0.5 (mm), TBL 21.8 ± 0.57 (mm) (Fig. 2).

Affected host plants

This subspecies mostly found in the maize (*Zea mays*), lady finger (*Abelmoschus esculentus*), snow brush (*Aerva javanica*), broom bush (*Leptadenia pyrotechnica*), milk hedge (*Euphorbia neriifolia*) and grasses (*Cynodon dactylon*) but few specimens were also noticed in bitter apple (*Citrullus colocynthis*) and phog plant (*Calligonum polygonoides*). Primarily, it damages pasture and since the distributional area is subject to droughts, this effect may be greatly aggravated by the grasshoppers.

Distribution

Asia temperate, Western Asia, Iran, India and Pakistan (Riffat *et al*., 2013; Soomro *et al*., 2014).

Note

This subspecies is related to *A. longipes longipes* having middle leg very large and slender inner spur of hind tibia also long and wings yellowish in coloration. But it can be separated from other species of genera by short lunar shaded dark band present from the dorsum of the wing. Earlier, Ahmed (1980) recorded this subspecies in Tharparkar and from rocky areas of Dadu district. Riffat *et al*. (2013) also confirmed its existence in Thar Desert. Soomro *et al*. (2014) collected this from Nara. During the present survey its fair numbers were collected from open grounds, rocky areas, roadsides, scattered vegetation and cultivated fields.

3. *Acrotylus longipes longipes* (Charpentier, 1845)

Material examined

Pakistan, Sindh, 6♂, 12♀; Riffat, Mohan, Samiullah; 21 Aug. 2019; Diplo 24.5686°N, 69.4803°E, ♂, 31♀; Samiullah, Riffat, Mohan; 25 Aug. 2019; Nagarparkar 24.3516°N, 70.7657°E, 1♂, 15♀; Riffat, Mohan, Samiullah; 27 Sep. 2019; Sanghar 26.0537°N, 68.9554°E, 9♀; Riffat, Samiullah; 11 Sept. 2019; Mithi 24.7412°N, 69.8103°E, 3♀, 20♀; Samiullah, Riffat, Mohan; 9 Sep. 2019; Chachro 25.1068°N, 70.2642°E, 2♂, 9♀; Riffat, Samiullah, Mohan; 21 Sept. 2019; Rohri 27.6732°N, 68.8984°E, 2♂, 14♀; Mohan, Riffat, Samiullah; 23 Sep. 2019; Nara 26.8799°N, 69.0457°E.

Description

Antennae filiform with 23-24 segmented, longer than head and pronotum. Head thicker and slightly shorter than the pronotum. Fastigium of vertex angular, concave with lateral carinulae. Frons vertical. Fastigial foveolae present almost triangular in shape. Pronotum more or less smooth on disc, short, tuberculate, constricted in prozona, median carina visible, distinct and lateral carinae irregular tuberculate. Dorsal side of prozona having no inverse triangular elevation but a very small whitish convex spot on each side located at very anterior margin of transverse groove. Metazona with longitudinal ridges just indicated. Mesosternal space about three times wider than its greatest length. Tegmina and wings well developed. Body small to medium and hairy rugose. Body usually paler brown and dirty brown in color. Antennae dark brownish and base of antennae with white spots. Pronotum with brownish speckles. Head brown with lower part whitish. Fastigium of vertex show distinct brown lateral carinulae. Pronotum with two brown lateral bands contiguous with those of head ended posteriorly with two small white tubercles against posterior sulcus. Wings transparent with some dark veins. Hind femur having paler yellowish, external upper margin with two triangular brown spots and upper carina spotted brown. Hind tibia brownish or sometimes bluish (Fig. 1).

Male: LH 2.18 ± 0.33 (mm), LP 2.56 ± 0.20 (mm), LT 19.5 ± 0.57 (mm), LW 18.5 ± 0.57 (mm), LF 12.0 ± 0.40(mm), LT 11 .0± 0.40 (mm), TBL 18.5 ± 2.08 (mm). Female: LH 2.33 ± 0.20 (mm), LP 2.66 ± 0.17 (mm), LT 23.0 ± 1.0 (mm), LW 21.5 ± 0.5 (mm), LF 14.0 ± 0.5 (mm), LT 13.0 ± 0.5 (mm), TBL 22.0 ± 1.0 (mm) (Fig. 4).

Affected host plants

Mostly the specimens were collected from grasses (*Cynodon dactylon*), herbs and shrubs and different fields present in Thar.

Distribution

Europe, Southeastern Europe, Greece, Epidaurus, India and Pakistan (Bughio *et al*., 2013; Shah *et al*., 2008; Wagan and Riffat, 2013).

Note

This subspecies is very closely related to *A. insubricus insubricus* in having tegmina dirty light brown along with slight spot-on margin while, wing light yellow. Wings without dark band which is a unique character and distinguish this from its close ally. Shah *et al*. (2008) reported this subspecies from grassland, dry vegetation, rangelands, graveyards and rocky areas, Bughio *et al*. (2013) and Wagan and Riffat (2013) reported this from Sindh. During this survey mostly specimens were collected from deserted and semi-deserted areas.

Genus *Trilophidia* Stål, 1873
Trilophidia annulata (Thunberg, 1815)

Material examined

Pakistan, Sindh. 9♀; Riffat, Mohan, Samiullah; 21 Aug. 2019; Diplo 24.5686°N, 69.4803°E, 2♂, 21♀; Riffat,

Mohan; 23 Aug. 2019; Islamkot 24.6992°N, 70.1705°E, 6♂, 7♀; Samiullah, Riffat, Mohan; 25 Aug. 2019; Nagarparkar 24.3516°N, 70.7657°E, 4♂, 17♀; Riffat, Mohan, Samiullah; 27 Sep. 2019; Sanghar 26.0537°N, 68.9554°E, 7♂, 22♀; Riffat, Mohan, Samiullah; 6 Sep. 2019; Umerkot 25.3434°N, 69.7240°E, 1♂, 8♀; Riffat, Samiullah; 11 Sept. 2019; Mithi 24.7412°N, 69.8103°E, 1♀; Samiullah, Riffat, Mohan; 9 Sep. 2019; Chachro 25.1068°N, 70.2642°E, 1♂, 3♀; Riffat, Samiullah, Mohan; 21 Sept. 2019; Rohri 27.6732°N, 68.8984°E, 8♂, 19♀; Mohan, Riffat, Samiullah; 23 Sep. 2019; Nara 26.8799°N, 69.0457°E.

Description

Body small to medium. Head subconical Antennae slightly thickened, pale at base, filiform with 22-24 antennal segment having black yellow bands, slightly thickened in apical part, equal or slightly longer than head and pronotum together. Eyes prominent, rounded and somewhat bulging. Fastigium of vertex elongate, trapezoid, without median carinulae, fastigial foveolae visible from above. Frontal ridge sulcate. Pronotum rugose, indistinctly tuberculate, angulated behind, with row of black spots on the posterior margin. Dorsal side crossed by two transverse sulci; median carina strongly raised from two high tooth-like (Denticles) structures in prozona. Mesosternal interspace about twice wider than its length, metasternal interspace open. Hind femur robust. Hind tibia carmine red. Arolium small in size, tegmina and wing fully developed. Tegmina with membrane semi transparent, opaque at base, narrow, longer than the tip of the abdomen, rounded at apex with dark brown spots. Wings hyaline, slightly colored at base and cloudy along apical margin, females without fascia if present very diffuse.supra anal plate in male angular and elongate, cerci conical, narrow with obtuse apex. Subgenital plate conical and short. Ovipositor short and robust having curved valve, small external lateral projections at the lower valve. Body with dark brown in color. Antennae with yellow banbs. Pronotum spotted with a row of black spots at posterior margin. Tegmina grey in color with two brown bands. Wings hyaline, yellow at the base and brown or black beyond. Hind femur having yellow band just above the basal lobe. Hind tibia brown having a pale band at the base and slightly pale band beyond the middle. Spines from the base show pale color (Fig. 3).

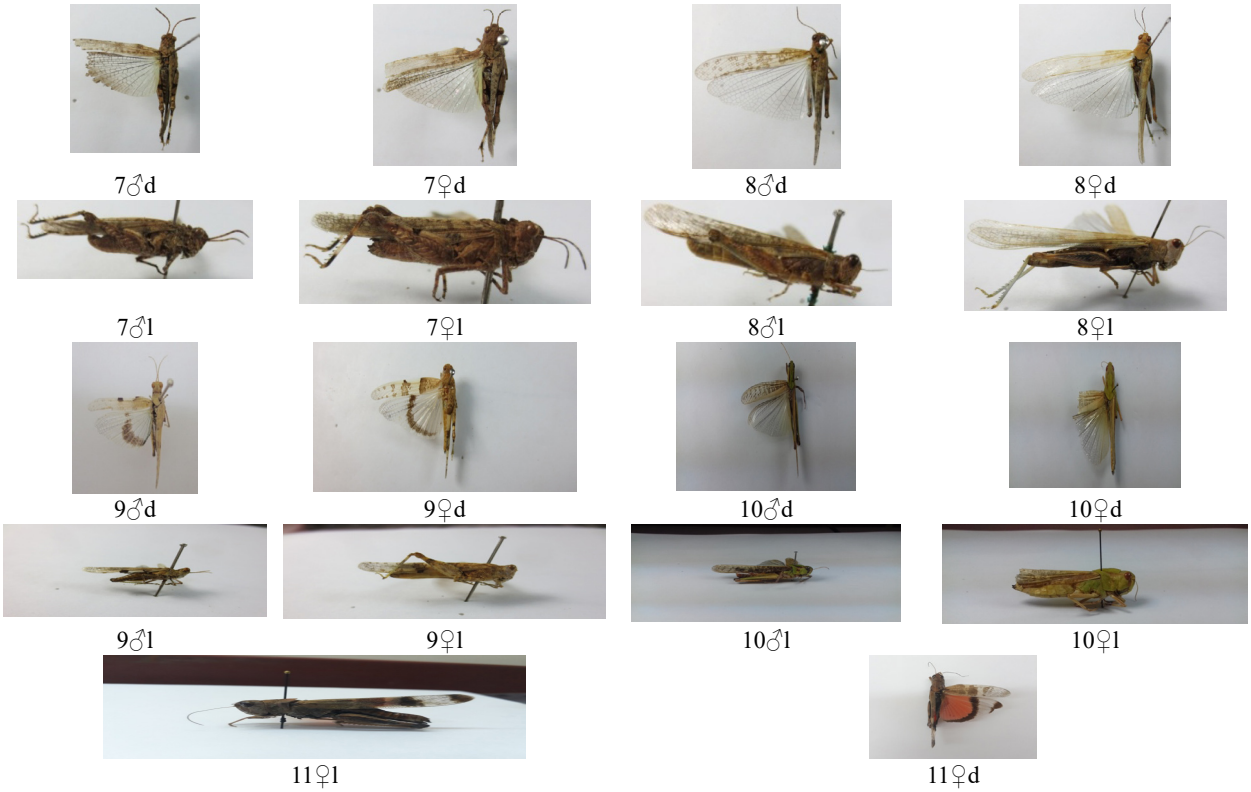

Fig. 3. 7, *Trilophidia annulate*; 8, *Sphingonotus (Sphingonotus) rubescens rubescens*; 9, *Sphingonotus (Sphingonotus) savignyi*; 10, *Locusta migratoria*; 11, *Oedaleus senegalensis*. Note: ♂d=Male dorsal; ♀d=Female dorsal; ♂l=Male lateral; ♀l= Female lateral.

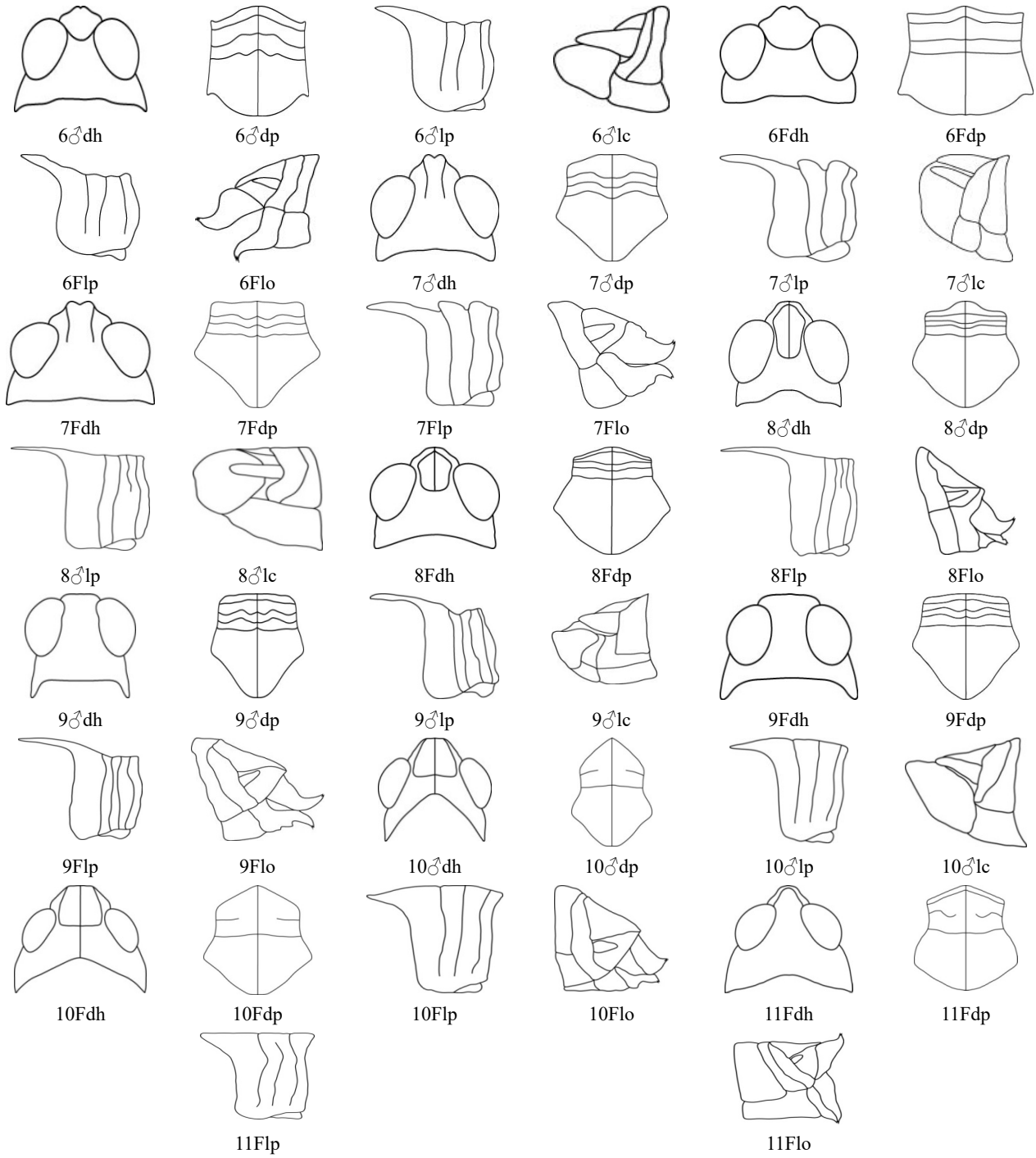

Fig. 4. 6, *Acrotylus longipes longipes*; 7, *Trilophidia annulate;* 8, *Sphingonotus (Sphingonotus) rubescens rubescens*; 9, *Sphingonotus (Sphingonotus) savignyi*; 10, *Locusta migratoria*; 11, *Oedaleus senegalensis*. Note: Mdh=♂ dorsal head, Mdp=♂ dorsal pronotum, Mlp=♂ lateral pronotum, Mlc=♂ lateral cerci, Fdh=♀ dorsal head, Fdp=♀ dorsal pronotum, Flp=♀ lateral pronotum, Flo=♀ lateral Ovipositor.

Male: LH 1.96 ± 0.19(mm), LP 3.04 ± 0.15 (mm), LT 17.0 ± 0.70 (mm), LW 15.6 ± 0.65 (mm), LF 9.7 ± 0.44 (mm), LT 8.3 ± 0.27 (mm), TBL 14.9 ± 0.65 (mm). Female: LH 2.37 ± 0.09 (mm), LP 3.77 ± 0.09 (mm), LT

19.8 ± 0.44 (mm), LW 18.3 ± 0.44 (mm), LF 11.2 ± 0.27 (mm), LT 9.5 ± 0.35 (mm), TBL 19.1 ± 0.74 (mm) (Fig. 4).

Affected host plants

It is found in open fields where grasses *Cynodon dactylon*, jowar (*Sorghum vulgare*), pearl millet (*Pennisetum glaucum*), lady finger (*Abelmoschus esculentus*), barley (*Hordeum vulgare*) and maize (*Zea mays*) were present.

Distribution

Afghanistan, Bangladesh, China, India, Japan, Korea, Malaysia, Mongolia, Nepal, North Borneo, Pakistan, Singapore, Srilanka, Taiwan and Thailand (Nayeem and Usmani, 2012; Kumar and Usmani, 2014; Rafi *et al*., 2014).

Note

Earlier, Moeed (1966) reported this species from Dadu, Hyderabad and Tharparkar districts of Sindh. Nayeem and Usmani (2012) collected this species from paddy and ploughed wheat fields in Jharkhand (India). Kumar and Usmani (2014) collected this species from Rajasthan (India) on Bajra and grasses. Rafi *et al*. (2014) collected this species from Central and Eastern Uttar Pradesh, India. Riffat *et al*. (2013) collected this from Tharparkar, Sanghar and Badin districts. During present survey large numbers of specimens were collected from grasses, near road sides, barley field and also near phog plant.

1. Genus *Sphingonotus*
Sphingonotus (Sphingonotus) rubescens rubescens (Walker, 1870)

Material examined

Pakistan, Sindh. 5♂, 14♀; Riffat, Mohan, Samiullah; 21 Aug. 2019; Diplo 24.5686°N, 69.4803°E, 2♂, 4♀; Riffat, Mohan; 23 Aug. 2019; Islamkot 24.6992°N, 70.1705°E, 5♂, 9♀; Riffat, Mohan, Samiullah; 27 Sep. 2019; Sanghar 26.0537°N, 68.9554°E, 3♂, 25♀; Riffat, Mohan, Samiullah; 6 Sep. 2019; Umerkot 25.3434°N, 69.7240°E, 4♂, 17♀; Riffat, Samiullah; 11 Sept. 2019; Mithi 24.7412°N, 69.8103°E, 11♀, 18♀; Samiullah, Riffat, Mohan; 9 Sep. 2019; Chachro 25.1068°N, 70.2642°E, 1♂, 8♀; Riffat, Samiullah, Mohan; 21 Sept. 2019; Rohri 27.6732°N, 68.8984°E, 2♂, 22♀; Mohan, Riffat, Samiullah; 23 Sep. 2019; Nara 26.8799°N, 69.0457°E.

Description

Antennae filiform with 28-antennal segments, longer than head and pronotum together. Body small to medium in size. Fastigium of vertex has median and lateral carinae. Frontal ridge slightly concaves with lateral carinae. Two sulci present at dorsal side of pronotum, median carina linear, lateral carina absent. Metazona longer than prozona, posterior margin of pronotum obtuse angular. Prozona smaller than metazona. Mesosternal interspace wider than long. Tegmina light brown with irregular brown spots towards proximal portion. Wings slightly bluish towards base and without transverse band. Abdomen shorter than tegmina and wing. Hind femur slender and dark on the inner side. Size of arolium is small. Body grayish or dusty with brownish markings. Head whitish,antennae dark and light brown. Hind femur outer lower area with whitish and inner lower area bluish in coloration. Hind femur light brownish with dark subapical band from inner lower area. Hind tibia bluish to whitish with brown spines. Tegmina transparent with a dark basal fascia.Wings hyaline with blackish vannal veins. Inner side of femur having brown black with two light fascia. Tibia bright blue, dirty whitish with faint blue shade and black inside (Fig. 3).

Male: LH 2.44 ± 0.12 (mm), LP 3.67 ± 0.17 (mm), LT 24.3 ± 0.67 (mm), LW 22.8 ± 0.57 (mm), LF 10.8 ± 0.44(mm), LT 9.4 ± 0.41 (mm), TBL 21.9 ± 0.74 (mm). Female: LH 2.93 ± 0.14 (mm), LP 4.61 ± 0.31 (mm), LT 30.7 ± 1.89 (mm), LW 29.2 ± 1.89 (mm), LF 14.0 ± 1.27 (mm), LT 12.1 ± 1.14 (mm), TBL 28.5 ± 2.31 (mm) (Fig. 4).

Affected host plants

This subspecies commonly found in grasses i-e (*Medicago sativa*), Bajra (*Hordeum vulgare*) sometimes also occurred in Jowar (*Sorghum vulgare*), Lawn grasses/ Chabar Gaah (*Cynodon dactylon*) and in Water melon (*Citrullus vulgaris*).

Distribution

Africa, Egypt, India, Iran, Italy, North Africa, Pakistan, Spain, Wadi Genneh (Sinai) and Turkey (Moeed, 1966; Riffat *et al*., 2013).

Note

This subspecies was active flyer during day so most of the specimens were collected in early morning. Moeed (1966) reported this from Dadu and Hyderabad districts. Wagan (1990) collected this from rocky areas of Thatta and Dadu districts. Riffat *et al*. (2013) confirmed its occurrence from various districts of Sindh. Sampling was done from rocky areas of localities of Diplo, Islamkot, Sanghar, Umerkot, Mithi, Chachro, Rohri and Nara in Thar Desert. Large number of specimens of this were collected from jowar field while, few specimens were also found in grasses along with roadsides.

2. *Sphingonotus (Sphingonotus) savignyi* Saussure, 1884

Material examined

Pakistan, Sindh. 1♂, 10♀; Riffat, Mohan, Samiullah; 21 Aug. 2019; Diplo 24.5686°N, 69.4803°E, 2♂, 19♀; Riffat, Mohan; 23 Aug. 2019; Islamkot 24.6992°N, 70.1705°E, 7♂, 22♀; Samiullah, Riffat, Mohan; 25 Aug. 2019; Nagarparkar 24.3516°N, 70.7657°E, 7♂, 17♀; Riffat, Mohan, Samiullah; 27 Sep. 2019; Sanghar 26.0537°N, 68.9554°E, 6♂, 26♀; Riffat, Mohan, Samiullah; 6 Sep. 2019; Umerkot 25.3434°N, 69.7240°E, 12♂, 19♀; Riffat, Samiullah; 11 Sept. 2019; Mithi 24.7412°N, 69.8103°E, 1♀, 20♀; Samiullah, Riffat, Mohan; 9 Sep. 2019; Chachro 25.1068°N, 70.2642°E, 9♂, 15♀; Riffat, Samiullah, Mohan; 21 Sept. 2019; Rohri 27.6732°N, 68.8984°E, 1♂, 11♀; Mohan, Riffat, Samiullah; 23 Sep. 2019; Nara 26.8799°N, 69.0457°E.

Description

Antennae filiform with 26-28 antennal segment, longer than head and pronotum together. Body is small to medium in size. Fastigium of vertex with lateral and median carinulae. Frontal ridge flat. Color of the body paler brown with whitish coloration. Dorsal side of pronotum have three transverse sulci, lateral carinae absent, median carinae linear. Prozona smaller than metazona. Pronotum posterior margin obtuse angular. Mesosternal interspace wider than long. Tegmina long and narrow with two brown bands at basal half. Wings with a transverse band extending from costa to anal angle. Hind femur cylindrical and arolium of small size. Wings are colorless at base. Hind femur yellow on the inner side. Hind tibia pale with bluish tings, black at base. Body reddish grey with whitish and dark spots. Head whitish, antennae brown with light rings. Tegmina in apical third transparent. Wings colorless, transparent with a dark narrow curved fascia, apex with a dark spot. Inner side of femur pale buff with a blackish fascia. Hind tibia yellowish, inner side of bases black (Fig. 3).

Male: LH 2.20 ± 0.20 (mm), LP 3.42 ± 0.46 (mm), LT 22.0 ± 1.27 (mm), LW 20.5 ± 1.27 (mm), LF 10.5 ± 0.16 (mm), LT 9.2 ± 0.57 (mm), TBL 21.4 ± 1.81 (mm). Female: LH 2.65 ± 0.33 (mm), LP 4.37 ± 0.56 (mm), LT 26.7 ± 2.77 (mm), LW 24.8 ± 2.28 (mm), LF 12.3 ± 0.83 (mm), LT 10.7 ± 0.75 (mm), TBL 25.6 ± 2.07 (mm) (Fig. 4).

Affected host plants

This species is very rare in occurrence it's mostly found in grasses (*Medicago sativa*), bajra (*Hordeum vulgare*), booro (*Saccharum bengalense*), kano-sar reed plant (*Saccharum arundinacea*) but also damage the jowar (*Sorghum vulgare*), lawn grasses/ chabar gaah (*Cynodon dactylon*) and water melon (*Citrullus vulgaris*).

Distribution

Egypt, India, Iran, Italy, Kenya, North Africa, Pakistan, Somalia Sudan and Turkey (Rafi *et al*., 2014; Wagan, 1990; Wagan and Riffat, 2013).

Note

Riffat *et al*. (2013) collected this species from Umerkot, Sanghar and Badin districts of Thar Desert. While, Wagan (1990) collected only female from district Larkana. Rafi *et al*. (2014) collected this species from Central and Eastern Uttar Pardesh (India) in long grasses or in bushes. Beside this, Wagan and Riffat (2013) also confirmed its presence from various districts of Pakistan. They suggest that this species considered as an important pest of agriculture just like other species of genus Locusta and can produce swarm. Presently, we agreed on this account. This species found in both agricultural and nonagricultural fields.

Tribe Locustini
Genus *Locusta* Linnaeus, 1758
Locusta migratoria (Linnaeus, 1758)

Material examined

Pakistan, Sindh. 6♂; Riffat, Mohan, Samiullah; 21 Aug. 2019; Diplo 24.5686°N, 69.4803°E, 8♂, 1♀; Riffat, Mohan, Samiullah; 27 Sep. 2019; Sanghar 26.0537°N, 68.9554°E, 4♂; Riffat, Mohan, Samiullah; 6 Sep. 2019; Umerkot 25.3434°N, 69.7240°E, 2♂; Riffat, Samiullah; 11 Sept. 2019; Mithi 24.7412°N, 69.8103°E, 1♂; Riffat, Samiullah, Mohan; 21 Sept. 2019; Rohri 27.6732°N, 68.8984°E.

Description

Antennae filiform with 23 antennal segments. Body size is large. Median and lateral carina clear in fastigium of vertex. Fontal ridge flat. Pronotum granulose, strongly tectiform, median carina well marked, intersected by posterior sulcus only. Lateral carina absent, prozona smaller than metazona. Posterior margin of pronotum obtuse- angular. Prosternal process absent, mesosternal interspace as long as wide. Tegmina and wing well marked. Hind femur slightly broad at base, narrowing towards knee, paler green in color with two dark bands on the ventral aspect. Hind tibia light reddish in color. Arolium is small in size. The slight yellow tinting of wing and black anal veins considered to be the major morphological character of this species. Body is paler brown to dark brown in color. Head with yellow lateral and median oblique bands.

Tegmina semi-transparent, irregular dark brown or light brown spots with paler brown color. Wings hyaline, light paler at base. Femur paler brown with two dark bands at inner side and dark bands on outer side. Tibia with light reddish color (Fig. 3).

Male: LH 3.44 ± 0.10 (mm), LP 7.35 ± 0.35 (mm), LT 36.0 ± 2.00 (mm), LW 34.0 ± 2.00 (mm), LF 20 .0± 1.00 (mm), LT 18.33 ± 0.76 (mm), TBL 35.33 ± 1.52 (mm). Female: LH 4.9 (mm), LP 10.5 (mm), LT 42 (mm), LW 40 (mm), LF 24 (mm), LT 22 (mm), TBL 43 (mm) (Fig. 4).

Affected host plants

Graminivorous in nature capable of damaging grain crops i.e., barley (*Hordeum vulgare*), maize (*Zea mays*) also attacks on the grasses (*Medicago sativa*), jowar (*Sorghum vulgare*).

Distribution

Australia, China, Europe, India, Iran, Korea, Mongolia, Pakistan, Siberia and South Africa (Rafi *et al*., 2014; Riffat *et al*., 2013).

Note

Riffat *et al*. (2013) collected this species from Umerkot, Sanghar and Badin districts while, Wagan (1990) collected only female from district Larkana. Rafi *et al*. (2014) collected this species from Central and Eastern Uttar Pardesh (India) in long grasses or in bushes. Beside this, Wagan and Riffat (2013) also confirm its presence from Pakistan and declared this as severe pest of many crops. This species has been collected from both agricultural and non-agricultural fields. Surprisingly, single female and few males were found.

Genus *Oedaleus* Fieber, 1853
Oedaleus senegalensis (Krauss, 1877)

Material examined

Pakistan, Sindh. 2♀; Riffat, Mohan, Samiullah; 21 Aug. 2019; Diplo 24.5686°N, 69.4803°E, 2♀; Riffat, Samiullah; 11 Sept. 2019; Mithi 24.7412°N, 69.8103°E, 1♀; Riffat, Samiullah, Mohan; 21 Sept. 2019; Rohri 27.6732°N, 68.8984°E.

Description

Antennae filiform with 20-21 antennal segments. Body small to medium in size. Head subglobular. Fastigium of vertex elongate and lacks median carinula. Fastigial foveolae short and triangular. Frontal ridge flat or sulcate. Frons rounded and straight. Pronotum tectiform and constructed, crossed by posterior transverse sulcus, median carina obtuse. Lateral carinae absent. Metazona slightly longer than prozona. Mesosternal interspace wider than long. Tegmina and wing fully developed. Wings hyaline towards base. Hind femur with three indistinct oblique transverse dark band on outer upper marginal and medial areas extending onto inner surface. Hind tibia slender having dark basal ring, 12 outer and 13 inner black tipped spines. Cerci short, conical, obtuse rounded apices in male. Female has conical, short and compressed cerci with angular apex. Ovipositor robust, short, valves curved and stout. Arolium small in size. Hind wing fascia complete or narrow interrupted at first anal vein. Body yellowish with brownish in color. Head yellowish with brown punctuations and one yellow longitudinal band behind each eye. Pronotum having yellowish X-shaped pattern contiguous with 2 yellowish band. Tegmina with scattered tetragonal spots and two brown bands at base. Wings transparent. Hind femur uniform in coloration having yellow color from innerside, hind tibia light reddish on inner aspect and yellowish on outer aspect having distinct apical yellow band (Fig. 3).

Female: LH 3.73 ± 0.72 (mm), LP 5.01 ± 0.53 (mm), LT 21.66 ± 2.08 (mm), LW 19.83 ± 1.89 (mm), LF 15.83 ± 2.75 (mm), LT 14.83 ± 2.36 (mm), TBL 24.0 ± 2.64 (mm) (Fig. 4).

Affected host plants

This species has been collected from fodder crops as well as in the field of maize (*Zea mays*), grasses (*Cynodon dactylon*), bajra (*Pennisetum glaucum*), jowar (*Sorghum vulgare*) and barley (*Hordeum vulgare*).

Distribution

Afghanistan, Egypt, India, Iran, Kenya, North Africa, Oman, Pakistan, Senegal and Turkey (Prabakar, 2015; Chandra *et al*., 2007; Garai, 2010).

Note

Riffat *et al*. (2013) reported this species from District Jamshoro, Sindh, Pakistan, while (Rafi *et al*. 2014) from central and eastern Uttar Pradesh, India. Garai (2010) collected this species from Iran. Prabakar (2015) reported from Tamil Nadu, India. Chandra *et al*. (2007) from Madhya Pradesh and Chhattisgarh, India. Kumar and Usmani (2014) collected from Punjab (India). Morphological this species resembles with *O. nigrofasciatus* but can be separated by rounded sub-acute pronotum in *O. senegalensis* but in *O. nigrofasciatus* it is oval in shape. During current survey only female was captured in bajra field.

Key to the species of Oedipodinae of Sindh

- Pronotum rugose anterior margin produced, posterior

margin obtuse angulate having black spots 2

- Pronotum slightly saddle shaped, constricted in prozona median carina weak. 3
- Tegmina possess 3-dark bands, wings are transparent but apical region contains light dark spots. . . . . *Hilethera aeolopoides*
- Tegmina transparent having brown and white irregular scattered dots. wings transparent and hyaline. 4
- Tegmina slightly transparent, brownish with irregular blackish speckles. Wing colorless and hyaline. . . . . *Aiolopus thalassinus thalassinus*
- Tegmina and wings fully developed wing yellowish in color but the base with an incomplete dark transverse band. 5
- Frontal ridge gradually tapered towards fastigium of vertex. Foveolae longer ……. *A. thalassinus tumulus*
- Fastigium of vertex triangular with raised lateral carinulae. Fastigial foveolae distinct, irregular, frons vertical. 6
- Frontal ridge narrow at the base. Fastigum of vertex concave with visible lateral carinulae. . . . . *Acrotylus humbertianus*
- Frontal wide. Fastigium of vertex concave with lateral curinulae . . . . . *A. longipes longipes*
- Ovipositor short, robust, valves curved, dorsal valves hook like, ventral valve with external lateral projection . . . . . *A. longipes subfasciatus*
- Ovipositor short, robust with curved valve, small external lateral projection at the lower valve……7
- Pronotum rogues indistinctly tuberculate, angulated behind, with row of black spots on the posterior margin. . . . . .*Trilophidia annulata*
- Pronotum obtuse angular prozona smaller than metazoan . . . . . *Sphingonotus (Sphingonotus) rubescens rubescens*
- Frontal ridge flat. Fastigium of vertex with lateral out median carinulae. 9
- Frontal ridge sulcate. Fastigium of vertex elongate out lacks median carinula…..…. *Oedaleus senegalensis*
- Pronotum posterior margin obtuse angular. Mesosternal interspace wider than long . . . . . *S. (Sphingonotus) savignyi*
- Pronotum having yellowish X-shaped pattern contiguous with 2 yellowish band…. *O. senegalensis*

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Statement of conflict of interest

The authors have declared no conflict of interest.

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