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Notes on the External Morphology and Phallic complex of two species of the genus *Sphingonotus* Fieber (Oedipodinae: Acrididae: Orthoptera) from , Sindh, Pakistan.

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Abstract: The genus *Sphingonotus* and its species were divided and described by Mistchenko in (1936).Two species of genus Sphingonotus were taken namely *Sphingonotus akbari* Wagan & Baloch (2001); *Sphingonotus hussaini* Baloch & Wagan,(2000) to study the Phallic complex characters and external features. These species are closely related to *S. eurasius eurasius* Mishchenko (1936) in having the general body form and the inner side of hind femur is with black pre apical spots but can easily be separated from the same in having pronotum with well developed lateral carinae in metazona and the lateral is 2.5 times longer than prozona and by the other characters as noted in description. The specimens were collected from various agricultural fields with help of insect net than preserved and killed by standard entomological methods. At the present, we have studied especially the internal characters of genitalia Epiphallus bridge shaped, these characters are used as tool in classification system in all insect orders.

1. INTRODUCTION

The Oedipodinae or band-winged grasshoppers were first recognized as a family by Walker, (1870), with Oedipoda as the type genus. The grasshopper which belongs with sub family Oedipodinae usually is related with open, sunny areas. In way of life pattern nearly all *Sphingonotus* are known as geophiles. A good deal of taxonomic work on Oedipodinae of Pakistan had been conducted by earlier workers (Bie-Bienkoand Mischenko 1951), Although, in the beginning of this century genitalia characteristics have been widely used to understand in systematic in most insect orders, Especially after (Dirsh, 1956); Who Proposed classification in Acridoidea based on the Phallic complex; As well as. (Vickery and Kevan 1983 and Otte 1984), pointed out that the phallic complex in the two different families show variation in almost every respect; as well as subfamily Oedipodinae distinguish rather than other tribes of grasshoppers species. Although, Riffat & Wagan 2009 & 2010 , Riffat *et al.*, 2013 & 2015, and Soomro *et al*., 2015 has carried significant work on the Hemiacridinae Pyrgomorphidae and Oxyinae respectively from Sindh. But yet no data regarding Oedipodinae was available on this from Pakistan that's was a main object to accomplish this research.

2. MATERIAL AND METHODS

Specimens were collected using insect nets and were properly spread and mounted in insect storage boxes, labelled with scientific names, place and date of collection and deposited in the insect collection of the Department of Zoology, University of Sindh, Jamshoro, Pakistan for further detailed study. The specimens were preserved in 70% alcohol. Dry mounts were also prepared for best understanding of certain characters like size, colour, and texture etc. For the study of male genitalia Kevan *et al*., (1969) method was adopted. In addition to study of various components of genitalia, the apical part of female bodies were cut off and boiled in a test tube containing 10% KOH solution to make the material transparent. These species has been collected near the cultivated fields of maize and sugarcane and from the beds of river Indus having the different vegetation of herbs and grasses.

3. DISCUSSION AND RESULTS

Sphingonotus akbari Wagan & Baloch **(**2001) **External characters.** Size small. Antennae slender slightly longer than head and pronotum together. Head moderately projecting above pronotum. Eyes large, prominent, their vertical diameter slightly longer than sub ocular distance. Face weakly oblique, almost vertical. Frontal ridge weakly projecting between antennae, concave below ocellus with thick raised margins, its width between antennae less than half the width of vertex between the eyes. Fastigium of vertex somewhat narrow, with low, well defined margins and without carinula transverse groove well developed. Tegmina long narrow with parallel sides and dense venation and reticulation. Hind femur more than four times longer than broad. Hind tibia shorter than femur with 10 inner and 8-9 outer spines.

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Epiphallus status: The epiphallus is attached to the ninth sternite and to the zygoma by muscular tissues. Epiphallus bridge shaped, bridge fairly straight moderately thick, anterior projections flat, rectangular protruding up ward, lateral boundaries slightly incurved, posterior projections continued, but deep and in cylindrical form having oval rounded margins. Ancorae strongly stout laterally placed, median large, conical, but sharply pointed at apex, little wide at base. Lobes of lophi although tube like in form, slightly incurved to inner side, anterior portion obtusely rounded, shallow and spherical rounded at terminal part.

Coloration: Generally grayish brown with scattered black spots on head, pronotum, tegmina, legs. Wings without, any dark fasciae viens slightly grayish in color. Inner face of hind femur grayish brown, without, any fasciations. Hind tibia grayish in color.

Sperm theca: The spermatheca sac like and elongated, pre-apical diverticulum slightly thik and with rounded acute apices at apex. Apical diverticulum rounded at base.

Table .I, Showing the measurements of different body parts of *Sphingonotus akbari*

BodyParameters	Male (n = 16)		Female (n = 12)	
	(Mean ± Sd)	(Range)	(Mean ±Sd)	(Range)
Length of Body	15.3 ±3.89	14-16.2	19.66±2.93	18-21
Length of Antennae	6.5±1.87	6-7	6.98 ± 0.68	6.8-7
Length of Pronotum	2.15 ±2.70	2-3.1	3.42 ± 0.86	3-3.5
Length of Tegmina	15.96± 1.79	15.2-16.2	18.96 ± 1.26	18.8-19.5
Maximum width of Tegmina	3.17 ± 0.89	3-3.2	3.99 ± 0.64	3.5-4.2
Length of hind Femur	7.18 ± 1.99	7-8.1	10.25 ± 3.18	10-11.5
Maximum width of hind Femur	2.03 ± 1.09	2-2.1	2.91 ± 1.05	2.5-3
Length of hind tibia	8.01 ± 0.83	7.8-8.4	10.4 ± 1.76	9.8-11

Collection sites; Sindh: Hyderabad: 16.viii. (2002) 7 Male, 6 Female (Wagan and Barkat).Hussainabad river Indus kotri 23.viii.(2002) 5 Male, 4 Female. (Barkat) Punjab: Islamabad: 1 Male holotype, 2 Females allotype and Paratype, Simly Dam,18.x.97 (Wagan and legari). Chakwal: 2.vii.2004 6 Male, 5 Female (Wagan, Barkat and Sabir).

Species relation remarks: This species is very closely related to *S.lavandulus* Popov,1980, in having general body form and the inner side of hind femur is without any fascia but can easily be separated from the same in having the metazona of pronotum about the length of prozona and the lophal lobe of the lophus is larger than broad and the ancorae is sharply incurved and by the other characters as noted in the keys and description. Earlier Wagan and Baloch 2001 give the morphological and epiphallic features , whereas at present study I have viewed whole Phallic complex and extended more internal anatomical characters, Besides this I have noted the anterior and basal shape position of Spermatheca .I have recorded slightly difference in body Parameters.

This species have been collected near the cultivated fields of maize and sugar cane and from the beds of river Indus having the vegetation of herbs and grasses. Presently I have collected sufficient numbers from the bank of river Indus so we confirm the presence of this species and its distribution has been extended to Sindh province.

Sphingonotus hussaini Baloch and Wagan (2000)

Diagnostic characters: Size medium. Antennae 25 segmented, longer than head and pronotum together. Head strongly projecting above pronotum. Face vertical, frontal ridge generally broad, weakly concave, wide between antennae, constricted below ocellus, obsolete near clypeus, margins thick, its width between antennae about half of the width of vertex between eyes. Fastigium of vertex strongly sloping, vertex with two shallow pits on the sides of the median carinula margins distincts, median carinula distinct. Tegmina almost reaching to the apex of hind tibia; intercalary vien near to the discoidal vien and approaching it still more towards the apex. Hind femur with a slightly wavy upper carina, Which is lowered in the apical quarter. Hind tibia with 9 outer and 10 inner spines.

Coloration: Generally brownish grey in color. Tegmina brown in the basal quarter. wings colorless to slightly grayish with a wide black regular bent fascia, which is narrowed posteriorly, not reaching posterior margins and inner margins by a long distance.

Sperm theca: The sperm theca with pre–apical diverticulum fairly large, straight upwardly finger like actutly rounded at apex. Apical diverticulum sac like elongated, smoothly rounded at base.

Table 2, Showing the measurements of different body part of *Sphingonotus hussaini*

Body Parameters	Female (n = 1)
Length of Body	17.0
Length of Antennae	8.0
Length of Pronotum	3.0
Length of Tegmina	15.0
Maximum width of Tegmina	4.0
Length of hind Femur	8.2
Maximum width of hind Femur	3.0
Length of hind tibia	9.0

Collection sites: Punjab: Khushab: 1 Female, 8 km from salt range towards Chakwal in rocky area 26.vi.97 (Wagan and leg).

Species relation remarks: This species is closely related to *S. eurasius eurasius* Mishchenko (1936) in having the general body form and the inner side of hind femur is with black pre apical spots but can easily be separated from the same in having pronotum with well developed lateral carinae in metazona and the lateral is 2.5 times longer than prozona and by the other characters as noted description. This species was described by Wagan & Baloch on the basis of single holotype female (2000).My studies based on the female holotype shows that its sperm theca having elongated large pre apical diverticulum differs from the other species of *Sphingonotus* studied. Prominent feature and shape of the sperm theca shows the vary character from other species of Sphingonotus . Certain characters are remarkably considered for systematic view of orthopteroid insects.

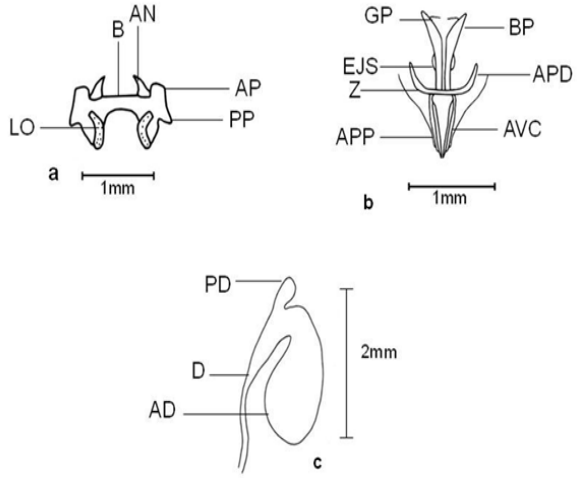


Fig i: *Sphingonotus akbari* , genitalia.
a) Epiphallus. b) Endophallus and Cingulum dorsal view . c) Sperm theca .

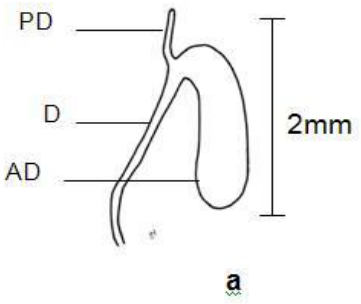


Fig ii:*Sphingonotus hussaini*
a) Sperm theca .

REFERENCES:

Baloch, N. (2000). survey and taxonomy of grasshoppers belonging to family Acrididae (Orthoptera) of the Punjab. Ph. D. Thesis, University of Sindh.

Bei-Beinko G. Y., and L. L Mishchenko (1951). Locust and Grasshoppers of U.S.S. R and adjacent countries. 1 and 2 Monson, Jerusalem. 691Pp.

Dirsh, V. M. (1956). The phallic complex in Acridoidea (Orthoptera) in relation to taxonomy. Trans. R. Entomol. Soc. Lond. 108 : 223–356.

Mistchenko, L. L. (1936). .Revision of Palaearctic species of the genus *Sphingonotus* Fieber (Orth. Acrid). *Eos*. 12(3-4) : 65-282.

Otte, D. (1984). The North American Grasshoppers Volme II. Acrididae, Oedipodinae. Cambridge, Massachusetts, Harvard University Press.

Popov. G. B. (1980), Acridoidea of Eastern Arabia. *J.Oman stud. spec. Rep* 2;13-148.

Riffat, **S**., and M. S. Wagan, (2009). Studies on morphology and ecology of grasshopper *Hieroglyphus oryzivorus* Carl, 1916 (Acrididae: Orthoperta) *Pak. J. Zool.* 41(4): 329-334

Riffat, S., and M. S. Wagan, (2010). Systematic status and ecology of *Hieroglyphus perpolita* (Uvarov, 1932) (Acrididae: Orthoperta) of Pakistan. Pak. J. Zool. 42(6):667-672.

Riffat, S., S. W. Yawar, and M. S. Wagan, (2013). Orthopterian biodiversity of desert (Thar) Sindh Pakistan. *Pak. J. Zool* 45(2): 299-304.

Riffat, S., M. S. Wagan and F. H. Solangi, (2015)**.** ome observation on *Pyrgomorpha inaequalipennis* Bolivar, (Pyrgomorphidae: Orthoptera). *Sindh Univ. Res. Jour. (Sci. Ser.)* 47(1):119-120.

Soomro, N., S. Riffat. M. S. Wagan, A. R. Abbasi B. K. Solangi. (2015). Occurrence of *Oxya* Species (Oxyinae: Acrididae: Orthoptera) from Sindh. *Sindh Univ. Res. Jour. (Sci. Ser.) Vol.47 (2): 251-25.*

Vickery, V. R. and D. K. Mc.Kevan (1983). A monograph of the Orthopteroid Insects of the Canada and adjacent regions. Lyman.Ent. Mus. Res. Lab. Memior No13. Vol. I and 2, 2: 681-1462.

Walker, F. (1870). Catalogue of specimens of *Dermaptera saltatoria* in the collection of the British Museum . London, 3: i- iv+425-604, 4: iiv+605-809.ES.

Wagan, M. S. (2001) A New species of Sphingonotus Fieber(Oedipodinae:Acrididae:Orthoptera) from Pak. *Sindh* Univ. *Res. Jour. (Sci. Ser.). Vol 33(2):41-44.*