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DISTRIBUTION OF GENUS *AIOLOPUS* (OEDIPODINAE: ACRIDIDAE: ORTHOPTERA) FROM DISTRICT DADU, SINDH

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ABSTRACT

The present study was conducted on distribution and incidence of *A. thalassinus thalassinus* important pest of agriculture in District Dadu. At present a total of 5362 specimens including various nymphal instars and adults were collected from different localities of District Dadu, during the year 2015-2016. Very surprising amount of insect was collected and sorted out into different nymphal stages. This site has been investigated for the first time. Present study recommends that if frequent survey would be done in this area more material will be collected.

1. INTRODUCTION

District Dadu is located on the Western bank of River Indus. Mountains of Kheerthar range is located in west of Dadu and in East river Indus and district Naushro and Nawab Shah located. Its nighbouring Districts are Larkana in North and Jamshoro in South. District Dadu has vast fertile agricultural land and various valuable crops are cultivated, such as Wheat, Paddy crop, Maize, Millet, Sugarcane, so many varieties of fruits and vegetables. The following study has been carried out on the distribution and incidence of *Aiolopus* species from District Dadu [1, 2, 3, 4]. The expansion in cultivated areas has resulted increased incidence of insects, of which grasshoppers have been found feeding on a wide variety of vegetation. Among the grasshoppers the species of genus *Aiolopus* is important pest of agriculture [5, 6, 7, 8]. The genus *Aiolopus* have been not studied in detail from Dadu expect a few references such as Hollis [9], Ahmed [10], Solangi [11], Wagan and Solangi [12, 13] and Wagan [14]. Therefore this study was designed.

2. MATERIAL AND METHODS

Collection of samples:
The species incidence was determined by taking about 100 sweeps (8.89 × 50.8 cm) from the various localities of District Dadu includes village Hafiz Meer Mohammad Kalhoro, village Makhdom Bilawal, village Bachal Bouk, village Syed Naban Shah, village sita, village Ghulam Hussain Gadhi and village Loung Khan Lund from agricultural fields of millet, barseem, rice, wheat, vegetables and grasses. Collection was made twice a month in the year 2015-2016.

Preservation of samples:
The collected material was immediately preserved by conventional methods and deposited in the Department of Zoology, University of Sindh Jamshoro and in Laboratory of Zoology Department of Govt (U B) Degree College Dadu.

Classification:
The system of classification followed by Uvarov [15]. They were counted, sorted kept in the laboratory for the killing and preservation of hoppers procedure described by Vickery and Keven [16] was adapted species were identified following the taxonomic key of Hollis [9].

Morphometry:
The body parts of the insects were measured with vernier caliper except first instar, first instar and

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antennae were measured by micrometer and for determining of number of antennal segments binocular microscope was operated. To get a look of population density of hoppers on their aliveness ratio various cages of same size were taken and hoppers were kept in these cages and they were served balanced food, i.e. millet, alfalfa and rice etc on each day observation were taken and dead hoppers were distanced from the cages and molted hoppers also counted.

3. RESULTS

Three species of genus *Aiolopus* have been collected from various localities of District Dadu Sindh. Total of 5362 (Adults and nymphs) specimens of Genus *Aiolopus*. Total 3702 (69%) (Adults and nymphs) specimens of species *A. thalassinus thalassinus*, 1132 (21%) of species *A. thalassinu tamulus* and 528 (10%) of species *A. thalassinus simulatrix* showing in Table 1.

Table 1- Field distribution and incidence of species *Aiolopus* in Various Localities of District Dadu in 2015- 2016 (Average of sweep 100)

Species	Localities								
	Village Sita	Village Makhdoom Bilawal	Village Syed Naban Shah	Village Hafiz Meer Kalhoro	Village Ghulam Hussain Gadhi	Village M.Bachal Bouk	Village Loung Khan Lund	Total	%
Aiolopus thalassinus thalassinus	802	602	570	714	509	492	555	3702	69%
A. thalssinus tamulus	291	161	91	121	210	171	87	1132	21%
A. simulatrix simularix	93	70	85	100	42	58	80	528	10%

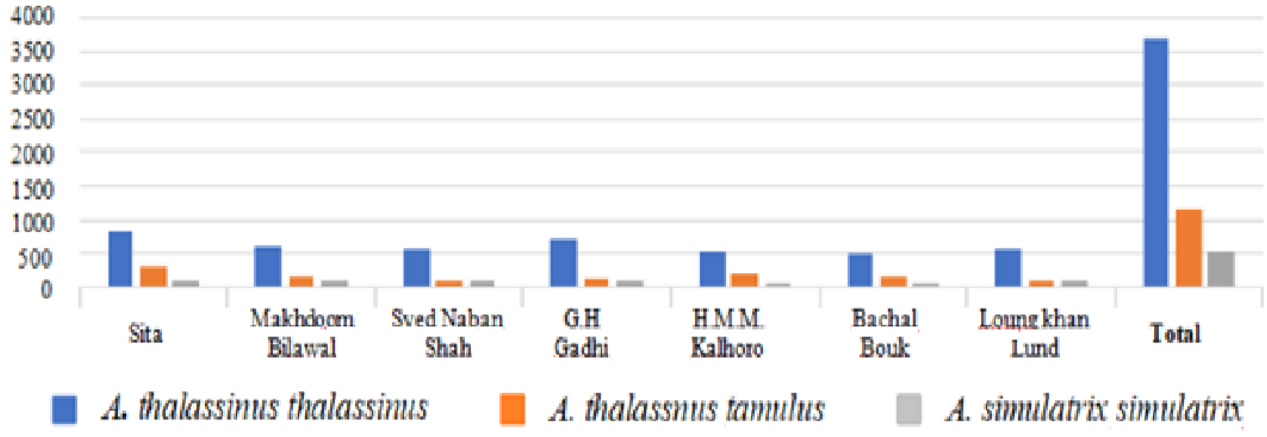

Figure 1- Field observation and incidence of genus *Aiolopus* in various localities of district Dadu in 2015 – 2016.

Taxonomic account

Key to species of genus *Aiolopus* occurring in Dadu

1.	Tegmina without district spots: hind femur more slender about five times longer than its maximum width……..……..……..……...	*thalassinus*
–.	Tegmina with distinct spots, hind fenar heavier, about four times longer than its maximum width…….……	*Simulatrix*

Key to sub species of *Aiolopus*

1.	Frontal ridge broad; produced behind and obtusely angular apex…….…….……	*thalassinus*
–.	Fronted ridge narrow; pronotum less produced behind and rounded apex…….…….……	*tamulus*

a. *A. thalassinus thalassinus* (Fabricius, 1781)

Gryllus thalassinus Fabricus, 1781. Spec. Insect 1:367 Epacromis.
Jakobons, 1905. Saran. Pryam zoh. Rose. Imp. Sop Stran: 246.
Ailopus thalassinus Uvarov, 1927, Saran, Evrop, SSR. Zap. Sibri : 102.
Tarbinskii, 1940. Saran Pyrg. Pryam. nase.Azer, SSSR: 29, 24.
Bei- Bienko and Mishchenko, 1951 Saran. Fawny, SSSR i.Sop stran: 568.
Thalassinus Hollis, 1968 Bull, Brit, Mus, nat. Hist (Ert): 22.

Diagnostic Characters
Small to medium sized. Antenna filiform 21-23 segmanted. Head Sub-conical, smaller than pronotum; fastigium of vertex angular and medium size, with lateral carinulae extended posteriorly to apices of eye and bent inwards projected over frons roundly; pronotum slightly saddle shaped; narrowed in prozona, median carina present; lateral carinae absent; dorsum crossed by two sulci, prozona longer than metazoan, posterior apex slightly produced and with obtuse angular apex. Cerci small, narrow conical, with obute apices, Sub- gential plate curved. In females Ovipostior short, robust, valves curved. Tegmina and wings fully developed Hind femur long, old dorsal carina not serrateted, dorsal genicular lobes rounded.

Distribution
Pakistan, India, South West Africa, Japan, Australia, France and Srilanka.

Table 2- Morphometric characteristics of *A. thalassinus thalassinus*.

Measurements (mm)	Males				Females			
	n	Mean	Range	S D±	n	Mean	Range	S.D ±
Body length	20	16.50	15-21	2.0	20	22.00	19-23	2.8
Pronotum	20	3.5	2.5-3.5	0.2	20	4.2	40-50	0.3
Tegmina	20	18.5	16-21	1.5	20	21.00	21-23	0.4
Hind Femur	20	8.5	8.5-9.5	0.6	20	2.5	1.75-3	0.4

Standard deviation of 0.2 in case of male pronotum and 0.6 in case of hind femur indicates that size of pronotum and hind femur are not much variable whereas value of 1.5 and 2.0 in case of tegmina and body length shows slightly variation. Standard deviation of 0.3 in case of female pronotum, 0.4 in case of tegmina and same 0.4 in case of hind femur indicates the size of pronotum, tegmina and hind femur are not much viable but total body length may varies.

b. *A. thalassnus tamulus* (Fabricius, 1798)

Gryllus tumulus Fabricius 1793 Ent: Syst: 195.
Dorsalis Thunberg, 1815, 1 Mem. Acad. Sci. St. Petersb.5: 229.
Gomphocerus tricolopers Burneister, 1838. Handb. Ent 2: 649.
Aiolopus tamulus Kirby, 1914. Faun. / Brit IInd. Acrid: 122.

Aiolopus thalassinus tamulus Hollis, 1968. Bull. Brit Musnat Hist (Ent).22: 347, 348.

Diagnostic characters

Small sized, Antenna long, filiform, about 22-24 segmented, slightly longer than head and pronotum together. Head sub conical, shorter than pronotum; fastigium of vertex angular, median carinulae absent lateral carinulae extended to anterior margin of eyes with straight apices; fastigial foveolae trapezoidal. Pronotum constricted in middle part less produced behind with rounded apex, median carina well developed. Lateral carinae absent dorsum crossed by two sulci Metasternal interspace open, wider than its greatest length and longer than its lobes. Supra anal plate long, conical with obtuse rounded apex. Sub-genital plate triangular, curved upward with obtuse apex.

Distribution

Pakistan, Africa, Japan, Sri Lanka, France, India and Australia

Table 3- Morphometric characteristics of *A. thalassinus tamulus*.

Body parts (mm)	Males				Females			
	N	Mean	Range	S.D ±	N	Mean	Range	S.D ±
Body length	20	15.5	16.19	0.8	20	20.00	20.22	1.8
Pronotum	20	3.00	25.30	0.2	20	4.5	3.5-5	0.5
Tegmina	20	18.5	18.20	0.7	20	22.00	21.26	1.6
Hind femur	20	8.0	8.9	0.3	20	10.6	8.12	1.0

Standard deviation of 0.2 in case of male pronotum and 0.3 in case of hind femur indicates that size of pronotum and hind femur are not much variable and value of 0.7 in case of tegmina and 0.8 in case of body length also shows that size of tegmina and body length similar. Standard deviation of 0.5 in case of female pronotum, 1.6 in case of tegmina and 1.0 in case of hind femur indicates the size of pronotum, tegmina and hind femur are much variable.

c. *A. simulatrix simulatrix* (Walker, 1870)

Aeolopus affinis Bolivar, 1902 *Annls, Sec.ent* Fr: 600.
Aeolopus laticosta Bolivar, 1912 Tranp. Lin.Soc. Lond. Zoo 15: 270.
ptrepsons deserticola, Uarov, 1922. *J.bombaynat.hist.*Soc.28:726.
List. Soc: 28: 726.
Aidopus simulartix simulatrix Hollis, 1968. *Bull. Brit Mus. nat. Hist (Ent) 22.70.*

Diagnostic Characters

Body small, Antenna filiform, 22-24 Segmented as long as head and pronotum together. Pronotum relatively together. Pronotum relatively narrow, median carina stronger in prozona than in metazoan, lateral carinae absent dorsum crossed by two sulci, prozona longer than metazoan posterior margin obtuse angular. Head conical shorter than pronotum; fatigium of vertex pentagonal, slightly longer than wide, moderately concave with well defined margins, forward angles narrowly rounded, fastigial foveolae trapezoidal, frontal ridge wide coarsely and densely pitted. Tegmina and wings fully developed. Hind femur broad, Hind tibia shorter than hind femur with 9 outer and 10 inner black tipped spines. Supra anal plate elongated, triangulted, with obtuse rounded apex. Sub genital plate curved.

Distribution

Burma, India, Iran, Pakistan, Turkey, East Africa, Egypt and Tanzania.

Table 4- Morphometric characteristics of *A. simulatrix simulatrix*.

Measurements (mm)	Males				Females			
	N	Mean	Range	S.D ±	n	Mean	Range	S.D ±
Body length	20	18.0	18-21	0.7	08	22.0	22-24	0.4
Pronotum	20	3.0	3.0	0.3	08	4.0-4.5	4-5	0.3
Tegmina	20	19.0	19-21	1.5	08	23.5	23-25	1.3
Hind femur	20	9.0	9.5	0.2	08	8.0	9-10	0.6

Standard deviation of 0.3 in case of male pronotum and 0.2 in case of hind femur indicates that size of pronotum and hind femur are not much variable and value of 1.5 in case of tegmina and 0.7 in case of body length also shows that size of tegmina and body length is slightly variable. Standard deviation of 0.3 in case of female pronotum, 1.3 in case of tegmina and 0.6 in case of hind femur indicates the size of pronotum and hind femur are not much variable, but size of tegmina is variable than pronotum and hind femur.

4. DISCUSSION

These three species of genus *Aiolopus* i.e. *A. thalassinus thalassinus, A. thalassinus tamulus* and *A. simlatrix simulatrix* are widely distributed in paddy crop and grasses of District Dadu. These short horned grasshoppers have hard and pointed mandibles which help in biting and chewing of food [10]. Adults and nymphs both feed vigorously paddy crop among rice, Maize, wheat, millet, sugarcane and other grasses [12]. Adults can cause severe damage and it is estimated that the one adult can damage and feeds as much as eight times the amount of food that it eats during nymphal life. Almost way of feeding is similar in all host plants. In present study, field observation, distribution has been discussed. Study reveals that three species of genus *Aiolopus* found in the District Dadu and it was recorded that maximum numbers of species *A. thalassinus thalassinus* was found which was 69% and minimum numbers of species *A. simulatrix simulatrix* was found in various habitats of District Dadu which was 10%.

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6. CONFLICT OF INTEREST

The authors have declared that there is no conflict of interest regarding the publication of this article.

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