Research Article

New species of genus *Dipropus* Germar, 1839 (Coleoptera: Elateridae: Elaterinae) from Sindh, Pakistan

Shabana Mangi, Waheed Ali Panhwar* and Abdul Manan Shaikh

Department of Zoology, Shah Abdul Latif University, Khairpur-Pakistan

*Corresponding author's email: waheed.panhwar@salu.edu.pk

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Abstract

Click beetles are well known due to the unusual click mechanism they possess. These beetles belongs to family Elateridae. During the present study click beetles of genus *Dipropus* were collected from Mehrabpur (Nausherferoze district) of Sindh, Pakistan from the salinity plain areas from during August 2018 to September 2019. The detail study of genus *Dipropus* revealed in finding of new species i-e: *Dipropus sindhensis* sp.nov. Beside this, description of new species along with genitalia, spermetheca, and morphological characters are given.

Keywords: Click; *Dipropus*; Elateridae; Spermetheca; Pakistan

Introduction

The family Elateridae classified into seventeen subfamilies, in which of them Elaterinae is also subfamily it contains the ten tribes and recognized on the basis of taxonomical characteristics including anterior side of head convex, tapered; frontal carina incompletely reach up to anterior side of frons, and claws on tarsal joint, have not basal setae, brown to dark brown body coloration, 3 sections in legs (tarsomere), antennae eleven sections and mandible has tooth like structure [1-4]. *Dipropus* genus accommodates into subfamily Elaterinae is one of the most largest genus, it contains the more than 150 species in worldwide represented by South America, North, Central America, Antilles and 30 species were also recorded at Brazil [5-8]. Body brown to dark brown, yellowish longer than wider, elliptical, slightly convex, elytra

brown to yellowish, Integument highly punctured, antennomere and legs brown, anterior side of carina black. Pubescence long, light golden to yellow, the tarsomere three sections, and simple claws at tarsal and without setae [9]. The genus *Dipropus* recorded from the North America, Mesoamerican and difficult to recognize the various species identified the 8 species from the America north of Mexico [10, 11].

The current new species of this genus is *Dipropus sindhensis* nov, sp. has identified this genus on the basis of morphological and genitalial basis including such as body coloration dark brown and yellowish, elongated convex. Body sub-cylindrical longer than broader, covered with densely punctuation in umbilicate in shape, frontal edges widely arcuate, anterior sides of carina lengthened as compared to length of the rostrum, antenna of male, female are serrate,

with 11 sections, first two sections small with setae, sub-cylindrical; 3rd section serrati form smaller than 4th sections ; no difference between the pubescence of both sex, male specimens (3 to 5 and 6 to 10) dissimilar in measurements, wider carina (1 to 4) tarsomere shorter, membranous lobes [12] The samples of click beetles were collected from various localities including sim, bank on the sim, under stones, light, humid areas leaf litter, flower heads, light, stagnant water and., live in the soil, sand, or rotten wood, leaf litter, they mostly feed on plant material particularly roots and tubers but few click beetles are also predators hence damage to crops, and *Dipropus* feed on roots, seeds, tubers and stems of numerous vegetable and crops, the main injury caused is crop stand to loss . *Dipropus* genus contains the new species *Dipropus sindhensis* nov, sp. is a new species was first time reported from the Sindh Pakistan.

Materials and methods

Place for work

Present study was done on click beetles were recorded from the Khairpur, Nausherferoz, Hyderabad, Jamshoro, Dadu districts of Sindh Pakistan, taxonomical research was conceded at *Dipropus* genus reported first time new species *Dipropus sindhensis* nov, spp. at department of Zoology (Entomology

laboratory) at Shah Abdul Latif University Khairpur mirs.

Sampling collection

Various Samples of click beetles were collected from the different localities of various crops including from wetland (salinity), under stone, wheat, tomato, cotton, vegetables, stored corns, herbs, shrub and light traps etc. and also from light trap method, *Dipropus sindhensis* nov, sp. was collected bank of sim, manually by hand picking traditional methods and kept into bottles [13] .

Methods of imaging

Digital images of specimen (adult) were taken with high meji infinity camera 350 k pixel camera fitted on dissecting microscope Kyowa Medilux 20 at herbarium of Shah Abdul Latif University Khairpur mirs were used.

Study area and biogeography

Dipropus sindhensis was collected from the wetland (salinity) area at Mehrabpur, Mehrabpur is town and union council of district Nausherferoz in the province Sindh of Pakistan. It is located at 27.09N, 68.4E, temperature is 40c, elevation 28 m, and it is lies at the main railway line between the Karachi and Lahore and six link roads from north side (Fig. 1 & 2).

Figure 1. Showing the Map of district Naushahro Feroze

Figure.2. Sampling site of district NaushahroFeroze

Killing and preservation

Samples were killed into insect killing bottles, which have chloroform for (5 to 10) minutes carefully, draw out from chloroform samples were consciously replaced and well kept up into specific timber insect's boxes. Naphthalene balls were kept for protection from ants and fungus and samples were labelled as per method [14-16].

Identification of beetles

Collected beetles were identified to the lowest possible taxonomic level with the use of dissecting microscope (KYOWA MEDILUX 20) and references to taxonomic keys and morphological descriptions. Legs, antennae, head, pronotum, and elytra of beetles were dissected where necessary and observed.

Dissection of female genitalia

The female genitalial part spermatheca and its inner parts including genital coxites, ovipositor, bursa copulatrix were boiled into Potassium hydroxide (KOH) for 5-10 minutes, then terminalia genitalia was detached from the abdomen by the help of fine forceps and then observed under the dissecting microscope. After that female

genitalia was kept in microvials with a drop of glycerin and attached with the respective specimens [17, 18].

Measurements and line drawings (Illustrations) of female genitalia

The measurements of full specimens from head to apex, head, pronotum, elytra and full specimen body measurements by the scale [18].

Abbreviation used

LH: Length of head, WH: Width of head, LP: Length of pronotum, WP: Width of pronotum, LE: Length of elytra, WE: Width of elytra, TL: Total body length.

Results and discussion

***Dipropus sindhensis* sp. nov.**

Diagnosis

Genus *Dipropus* (Germar) described by Candeze (1859), as, (Schwarz, *Ischiodontus* Candeze (1906b), and [19-21]. This species identified as large size, Black mark present on the frontal area, more space between the humeral angles and abdomen, Yellowish spot on the dorsal surface of pronotum and anterior portions of scutellum yellowish, distinctly punctured on dorsal surface with elongated pubescence.

Description

Body of *Dipropus sindhensis* nov, sp. is longer than wider elliptical, slightly convex, complete body coloration is roughly brown to yellowish with dark infusate; head dark brown, antennae brownish, Pronotum dark brown, prontal angles black, legs reddish brown Pubescence elongated dark brown yellowish type colorations, black frontal carina, legs reddish brown.

Body elongated convex, head circular distinctly visibly punctuations, yellowish hairs present on the head frontal edges arcuate, carina sides denticated (0.4mm), width (0.7mm) almost paraclypeus equal to clypeus, antennae 12 section but highly elongated 2nd section cylindrical longer than other section, reaching to tip of hind angles, anterior portion are dark brown in color and posterior sections are light yellowish in color. Pronotum length (1mm), width (2mm) dorsal surface convex wider than longer, lateral margins convex, lateral edges carinate reaching up to anterior humeral margin; hind edges slightly pointed, concave, deep punctuations on the pronotum, slightly space between the punctuations, punctuation are oval elongated flagellated yellowish large round in shape, humeral angles pointed, tips black slightly concave, more space between the humeral angles and abdomen.

Elytra (1.6mm), width (0.2mm), convex plane, anterior side concave, crudely punctured, yellowish hairs present on the legs. Striae shallowly concave; apices separate, tarsomere have three joints, thin ventral membranous lobe .Total body length (3mm). Female genitalia spermathecal elongated, heart shaped at its base, ovipositor bifurcate.

Morphometry (mm)

LH=0.4, WH, 0.7, LP=1, WP, 2, LE=1.6, WE, 0.2, TL=3

Type material

Holotype female was reported from the wetland (salinity) area at Mehrabpur.

Etymology

The name of new species is derived from Sindh Province, where the species was collected.

Comments:

Dipropus sindhensis nov, sp. resemble to *Conoderus methinesis* but it can be recognized on the basis of black mark present on the frontal area, more space between the humeral angles and abdomen, yellowish spot on the dorsal surface of pronotum and anterior portions of scutellum yellowish, distinctly punctured on dorsal surface with elongated pubescence [22, 23].

Remarks on Ecology of *Dipropus sindhensis* nov, sp.

During surveys, specimens were collected from the near water sources, hand picking method was used, they were found from the wetland (salinity) area at Mehrabpur taluka of district Nausherferoze, temperate, humid areas, in summer season high temperature, specimens of *Dipropus sindhensis* nov, sp. were chewing and sucking type of insects.

Discussion

The Current study of 9 species of 5 genera were belonging to Agrypninae, Cardiophorinae and Elaterinae subfamilies. The names of those species were given below, *Conoderus methiensis* Platia (2016), *Agriotes lineatus* Linaneus (1767), *Agriotes duhokensis* Platia (2013), *Agriotes sameki* Platia (2003), *Aptopus opata* Johnson (2017), *Dipropus sindhensis* sp.nov, *Agrypnus baghensis* Akhtar (2014), *Agrypnus piger* Candeze (1889), *Agrypnus argentosquamosus* Vatsand Karhyap (1992), study on taxonomy and biogeography of click beetles from certain areas the Khairpur, Hyderabad, Nausherferoz, Sukkur, Dadu, Larakana (Sindh) province, present study was first time study on click beetles its collection and identification reported from Sindh Pakistan [5, 10, 29, 30]. Current genus *Dipropus* globally distributed. The first time new genus described in Sindh as well as in

Pakistan including *Dipropus* was reported by Germar, (1839) with type of first time new species *Dipropus sindhensis* and still not reported this genus and with type of species, but huge work has been done in the oriental and Coahuila, Mexico, de Madre de Dios, Perú, eastern United States, west-central North America and Brazil region. A large number of species of genus *Dipropus* were reported from the different location at worldwide, *Dipropus rufulus* Johnson (2016) were reported from the southern Mexico, tropical lowlands and lower montane areas of coastal areas.

Dipropus amarakaeri, Johnson (2018), dorsal surface deeply infusate, brown yellow rough humeral lines (vittae) pale gold to whitish color of elytra with vague to distinct brown-yellow to dull brick red color (testaeus) discal vittae, legs ad antennae are burnet. Frontal margin bright black and golden to yellow elongated pubescence reported from the Madre de Dios, Peru.

Dipropus losamigos Johnson (2018), collected from Madre de Dios, Peru, head circular with highly punctuation, frontal edges arcuate, carina beaded, elongated antennae, tip of 8th section of antennae up to tip of humeral hind angle; 2nd section subglobular, 3rd section triangular, basal piece of aedeagus subquadrate, middle lobe thin, pointed at tip; arrow paramere lateral spine and tip slightly sclerotized.

Dipropus tequesta Johnson (2018), Integument brown to dark brown, venter moderately pale, antennae dull red, Pubescence slightly pale, paramere tip sagittate, middle lobe, concave, obtuse at tip described from eastern United States. *Dipropus soleatus* (Say) identified on the taxonomical characteristics body longer than wider, membrane among the tarsal erected from the eastern United States.

Dipropus asper (LeConte), 1890, aedeagus basically identical, powerful spines on tarsomere tarsal pads membranous isolated

from each other with sclerotized setae, highly narrow punctuation on head, eyes in female smaller than male antennae small 1st section long, 2nd and 11th section almost equal rounded collected from the eastern United States [22-24].

Dipropus pericu pronotum wider than longer, slightly convex, hind angles moderately convex at base, small upper carina, Striae smooth rounded punctuation, space convex, flat apically. *Dipropus reinae* lines of elytra have circular punctuation, legs concolorous, body castaneous antennae infusate, rufobrunneous legs and antennae, small [25].

Dipropus Sonora Johnson, P (2016). Body dark black over all, brownish black antennae, antennae slightly elongated reaching upto elytra, 8 sections antennae reaching up to hind angle, pronotum wider than longer, scutellum small, densely punctuation on whole body, strongly carinate at hind angle, strongly arcuate.

Dipropus sus (Candèze) Johnson (2017), body longer than wider, black to dark black, body coloration to piceocastaneous; pubescence chalceous, antenna longer reaching upto femora, 8 section of antennae reaching upto tip of hind angle, aedeagus longer than wider, parameres rounded. *Dipropus warneri*, antennae 8 sections elongated getting upto elytra, pronotum moderately longer than wider, quadrilateral shape, lateral edges toughly, carinate, dorsal surface covered with spotted punctuation umbilicate and convex hind angles, lines separated on elytra and convex, elongated aedeagus at basal piece, paramere longer than wider, reported from the united states, Mexico, Chihuahua and Texas [26, 27].

Dipropus yaqui, frons of head and vertex have a punctuations, umbilicate in shape, frons concave, Compound eyes elongated, 8 antennomere passing upto hind angle, 3 and 10 antennomere slightly serrate, intervals of elytra convex, scutellum small, pronotum, covered with umbilicate punctuations,

aedeagus longer than wider, parameres truncated. *Dipropus ferreus* (LeConte), Body longer than wider, ferruginotestaceous to piceocastaneous, Pubescence dark brown, antenna slightly small reaching to meta femoral nick; United States, Sonora, Mexico, Arizona and Santa Cruz, Baja California [28, 29].

Dipropus simplex LeConte (1890), Body chestnut, antennae brownish, elongated, reaching up to anterior sides abdominal have a porous, 8 antennal sections reaching upto tip of pronotum wider than longer, 0.54 total measurements of basal piece of aedeagus, 0.43 total length of paramere Missouri, Michigan, Delaware, *Dipropus soleatus* (Say) Body elongated than wider, legs concolorous to body, castaneous to piceocastaneous, antennae brownish to infusate. Antennae median in length, 9 section of antennae reaching tip of hind angle, pronotum wider than longer. 0.55 total length of aedeagus with basal piece, 0.46 total length, paramere 0.35 total length, body form moderately robust; antenna small, reaching tip of pronotal hind angle, Mississippi and Missouri [30].

Dipropus brasiliensis (Germar), larva have a smaller punctuations, tergite A9 with

tubercles, lines on abdominal have striate and parallel” and *Dicrepidius* larva as: “A9 tergite with tubercles longer than punctuation, Striae of abdominal striate have bended, reported from the Brazil [31].

Current species diagnosis on the taxonomical characteristics represented by Black mark present on the frontal area, more space between the humeral angles and abdomen, yellowish spot on the dorsal surface of pronotum, anterior portions of scutellum yellowish, antennae brownish antennae 12 section but highly elongated 2nd section cylindrical longer than other section, dark brown and yellowish, Paraclypeus almost equal to clypeus elongated convex. Head dark brown circular, pronotum dark brown convex wider than longer, lateral margins convex, deep punctuations on the pronotum, Legs reddish brown. Punctuation are oval elongated flagellated yellowish large round in shape. Humeral angles pointed, tips black slightly concave. Elytra convex plane, anterior side concave, yellowish hairs present on the head and legs and therefore current study as new species added to science reported from Sindh, Pakistan (Table 1 & Fig. 3 A-F).

Table 1. Showing the Genital characters, collecting month and collecting locality of species *Dipropus sindhensis* nov, sp.

Characteristics	<i>Dipropus sindhensis</i> . nov, sp.
Spermatheca elongated	base, ovipositor bifurcate
Spermatheca oval or heart shaped	Two spermathecal duct elongated
Collecting month	June
Collecting locality	Mehrampur, Nausherferoz Sindh Pakistan

A. head dorsal view

B. Abdomen dorsal view

C. head ventral view

D. Abdomen ventral view

E. Female genitalia spermatheca dorsal view

F. Female genitalia spermatheca ventral view

Figure 3(A-F). Showing the digital images along with genitalia

Conclusion

It is concluded from the present study that geographical features of the Naushahroferoze are diverse and is suitable for the diversity of insects including elaterids beetles. If more

surveys will be carried that may lead to more diversity of these beetles.

Authors' contributions

Conceived and designed the experiments: S Mangi, WA Panhwar & AM Shaikh,
 Performed the experiments: S Mangi,

Analyzed the data: S Mangi, WA Panhwar & AM Shaikh, Contributed materials/ analysis/ tools: S Mangi, WA Panhwar & AM Shaikh. Wrote the paper: S Mangi.

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