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**Research Article****New distributional records of genus *Hieroglyphus* Krauss, 1877 (Acrididae: Hemiacridinae) from upper Sindh-Pakistan****Iltaf Ahmed Soomro, Waheed Ali Panhwar, Abdul Manan Shaikh**

Department of Zoology, Shah Abdul Latif University Khairpur Mirs-Sindh, Pakistan.

ABSTRACT

The current study was conducted on the genus *Hieroglyphus* Krauss, 1877, from upper Sindh, Pakistan. A total of 225 specimens were collected from various districts of upper Sindh, Pakistan, over the years 2021 to 2023. The specimens were identified into two species: *Hieroglyphus nigrorepletus* Bolívar, 1912, and *Hieroglyphus perpolita* (Uvarov, 1933). This manuscript presents digital photographs of insect species exhibiting morphological characteristics. Moreover, distribution maps are supplied for each species present in upper Sindh, Pakistan. This study aims to establish a reference framework for future Orthopterists examining the *Hieroglyphus* fauna of this region.

Keywords: Acrididae; Hemiacridinae; *Hieroglyphus*; distribution; pest.

INTRODUCTION

True grasshoppers belong to order the Orthoptera family Acrididae. Acrididae are diverse group among the order Orthoptera. They are economically important and regarded as severe insect pests of agricultural crops thus causing loss to crops, vegetables, fruits, orchards and forests (Panhwar et al., 2024; Panhwar, 2018). Grasshoppers occur in grasslands and are significant trophic chain members. They play an important role as herbivores and omnivores. Thus, they balance role as predators as well as prey hence becomes the cause of nutrient recycling. The grasshoppers occur in a wide variety of habitats like rice fields, agriculture, bushes, and grasslands. They dynamically contribute to the energy, and nutrients cycling through the range of landscapes, making them dynamic provider of ecological balance due to their adaptability to every environment (Song et al., 2018; Baloch et al., 2023). An important contribution to the Acrididae fauna of the Indo-Pak continent was carried out by Kirby in 1914. The genus *Hieroglyphus* was established by Krauss in 1877 with Type species i-e: *Hieroglyphus daganensis*. The genus *Hieroglyphus* presently comprises of 13 valid species occurring worldwide i-e: *Hieroglyphus acuticercus* Kumar & Usmani, 2015, *H. africanus* Uvarov, 1922, *H. akbari* Sultana & Wagan, 2012, *H. annulicornis* (Shiraki, 1910), *H. banian* (Fabricius, 1798), *H. concolor* (Walker, 1870), *H. daganensis* Krauss, 1877, *H. indicus* Mason, 1973, *H. kolhapurnesis* Swaminathan, Swaminathan & Nagar, 2017, *H. nigrorepletus* Bolívar, 1912, *H. oryzivorus* Carl, 1916, *H. perpolita* (Uvarov, 1933) and *H. tonkinensis* Bolívar, 1912 (Cigliano et al., 2024). Several authors carried out significant work on genus *Hieroglyphus* of Indo-continent (Kirby, 1910; Bolivar, 1912; Kirby, 1914; Carl, 1916; Uvarov, 1922-1923, 1925, 1927, 1929,1931,1933, 1942,1943, 1954, 1966; Ahmed, 1958, 1980; Moeed, 1971; Mason, 1973; Wagan, 1990; Mazhar, 1993; Yousuf, 1996; Moizuddin, 1998; Garai, 2002; Mahmood et al., 2004; Mandal et al., 2007; Kumar and Usmani, 2015; Swaminathan et al., 2017; Nazir et al., 2014; Lecoq and Zhang, 2019; Panhwar et al., 2023; Sarki et al., 2023; Mustafa et al., 2024; Yasin et al., 2024).

**Correspondence**

Waheed Ali Panhwar
waheedalipanhwar11@gmail.com

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There was no work that has been done from the upper Sindh in recent years. It was thus present study was designed to investigate the *Hieroglyphus* species fauna of upper Sindh Pakistan.

MATERIALS AND METHODS

The samples of *Hieroglyphus* species were collected from different localities of upper Sindh, Pakistan with the help of aerial insect-collecting net and by hand picking method. Collected samples were brought to Insect Systematics Lab, Department of Zoology, Shah Abdul Latif University Khairpur Sindh Pakistan. The samples were euthanized by potassium cyanide, not more than ten minutes left. The *Hieroglyphus* samples were pinned on the pronotum, samples were stretched on a stretching board and labeled with the name of species, locality, host plant name and name of the collector with the collection date. The identification of species was done with the available literature (Kumar and Usmani, 2015) and <http://Orthoptera.SpeciesFile.org>. The morphological features (name the parts) were noted and images were taken with the help Canon Camera. The measurements were taken with Vernier caliper in mm. The distributional maps of species were generated by using ArcGIS (Version 10.7) in relation to elevation data.

RESULTS AND DISCUSSION

Family Acrididae MacLeay, 1821

Subfamily Hemiacridinae Dirsh, 1956

Tribe Hieroglyphini Bolívar, 1912

Genus *Hieroglyphus* Krauss, 1877

Type species: *Hieroglyphus daganensis* Krauss, 1877.

Diagnosis. The body is medium to large in size. The antennae filiform and longer than the pronotum and head. Head short than the pronotum. Frons are oblique, fastigium of vertex longer and wide, having obtuse angular apex. The frontal ridge is sulcate. Dorsal view of pronotum cylindrical having 3-4 transverse sulci. The median carina is weak, lack lateral carina. Prozona is larger than metazona. Pronotal margins rounded or obtusely angular posteriorly. Prosternal process are bifurcate or acute conical, mesosternal interspace strongly constricted and elongated. Wings or tegmina shortened or fully developed. Series of regular transverse stridulatory veinlet are present in tegmina at radial area. Hind femur cylindrical, with external apical spine. Arolium is larger.

Note. Presently the genus *Hieroglyphus* Krauss, 1877 comprises 13 valid species occurring worldwide (Cigliano et al., 2024).

***Hieroglyphus nigrorepletus* Bolívar, 1912 (Figure.5 ACEG)**

Material examined

Larkana region. Larkana: 22.iv.2022 2♀1♂ (Soomro I.A and Panhwar W.A). Naudero: 17.vi.2022 2♂ (Soomro I.A and Larik S.A) same but 07.iii.2023 3♀ (Soomro I.A and Mahar M.A). Ratodero: 04.ii.2022 1♀3♂ (Soomro I.A and Soomro K.A). Dokri: 03.vi.2022 2♀2♂ (Soomro I. A and Larik S. A) same but 18.iv.2023 2♀ (Soomro I.A and Napar S.A). Shikarpur: 04.ii.2022 2♂ (Soomro I.A and Panhwar W.A) same but 08.v.2023 2♀ (Soomro I.A and Larik S.A). Khanpur: 19. v.2022 2♂ (Soomro I. A and Mahar M. A) same but 3.iv.2023 3♀ (Soomro I.A and Panhwar W.A). Lakhi: 11.iii.2022 1♀2♂ (Soomro I. A and Larik S. A) same but 07.iv.2023 2♀1♂ (Soomro I.A and Panhwar W.A). Gari yaseen: 19.ii.2022 2♀1♂ (Soomro I.A and Soomro K.A) same but 07.v.2023 2♀ (Soomro I.A and Larik S.A). Jacobabad: 12. v.2022 2♀2♂ (Soomro I. A and Panhwar W. A) same but 17.iv.2023 2♀ (Soomro I.A and Mahar M.A). Garhi khairo: 17.iii.2022 2♀2♂ (Soomro I. A and Soomro K. A) same but 20.iv.2023 1♀2♂ (Soomro I.A and Larik S.A). Thull: 02.lix.2022 2♀2♂ (Soomro I.A and Panhwar W.A) same but 10.v.2023 3♀1♂ (Soomro I.A and Soomro K.A). Kashmore: 13.iv.2022 2♀ (Soomro I.A and Panhwar W.A) same but 21.iii.2023 2♂ (Soomro I.A and Larik S.A). Kandhkot: 12.v.2022 1♀1♂ (Soomro I.A and Panhwar W.A) same but 05.iii.2023 1♀2♂ (Soomro I.A and Soomro K.A). Tangwani: 12.ii.2022 2♀2♂ (Soomro I. A and Larik S. A) same but 05.iv.2023 1♀2♂ (Soomro I.A and Mahar M.A). Qambar: 11.xi.2021 3♀ (Soomro I. A and Panhwar W. A) same but 21.vi.2022 2♂ (Soomro I.A and Soomro F.A). Shahdadkot: 06.iii.2022 3♀1♂ (Soomro I.A and Larik S.A). Miro khan: 13.iii.2022 1♀2♂ (Soomro I.A and Samejo B.A) same but 22.v.2023 1♀2♂ (Soomro I.A and Mahar M.A). Nasirabad: 10.ii.2022 2♂ (Soomro I. A and Larik S. A) same but 21.iv.2023 3♀ (Soomro I.A and Panhwar W.A). Sukkur Region. Khairpur: 02. v.2022 1♀1♂ (Soomro I. A and Panhwar W. A) same but 07.vi.2023 2♀ (Soomro I.A and Larik S.A). Mirwah: 07.iv.2022 1♀1♂ (Soomro I. A and Mahar M. A) same but 19.vi.2023 1♀2♂ (Soomro I.A and Panhwar W.A). Kot Dijji: 12.iv.2023 2♀1♂ (Soomro I.A and Larik S.A). Gambat: 12. v.2022 1♀2♂ (Soomro I. A and Panhwar W. A) same but 14.iv.2023 2♀ (Soomro I.A and Larik S.A). Ghotki: 13.iv.2022 3♂ (Soomro I.A and Mahar M.A). Dharki: 03.iv.2022 2♀ (Soomro I.A and Panhwar W.A) same but 09.v.2023 2♂ (Soomro I.A and

Larik S.A). Mirpur mathelo: 06.iii.2022 1♀1♂ (Soomro I. A and Samejo B. A) same but 29.iv.2023 2♀1♂ (Soomro I.A and Larik S.A). Ubaro: 15.iv.2023 2♀1♂ (Soomro I.A and Panhwar W.A). (Figure. 1; 2)

Diagnosis

Body cylindrical, robust and medium to large in size. Fastigium of vertex longer and wide lacking median carinae. Antennae with 24-26 segments. The frontal ridge is broader and sulcated having lateral carina. Pronotum having 03 crossed transverse sulci dorsally, 02 parallel broad black bands connect these 03 sulci. Pronotum rounded obtusely at posterior margin. Prosternal process are acute apically and conical. Mesosternal interspace narrow, long, wide and rounded at margins. Wings and tegmina exceeding peak of hind femur having rounded tip. Hind femur is slender reaching upto tip of abdomen. Hind femur lager than the hind tibia having ten inner spines and nine external spines. Supra anal plate elongated, longer, wide, angular, obtuse at apex and narrow at apex. Cerci elongated, lager than supra anal plate somewhat pointed, truncated and incurved at apex. Valves of ovipositor broad, shorter and curved.

Morphometric (mm)

♂: body: 35.5; pronotum: 6.21; antenna: 15.5; tegmina: 21.18; hind femur: 14.15. ♀: body: 42.18; pronotum: 7.98; antenna: 12.51; tegmina: 16.12; hind femur: 16.23

Hieroglyphus perpolita (Uvarov, 1933) (Figure.5 BDFH)

Material examined

Larkana region. Larkana: 12.x.2021 1♀1♂ (Soomro I.A and Panhwar W.A) same but 17.iii.2022 2♀ (Soomro I.A and Larik S.A). Naudero: 12.x.2021 2♂ (Soomro I.A and Soomro I.A and Mahar M.A) same but 07.iii.2023 2♀2♂ (Soomro I.A and Panhwar W.A). Ratodero: 04.ii.2022 2♀1♂ (Soomro I.A and Soomro K.A). Dokri: 13. v.2022 2♀2♂ (Soomro I. A and Panhwar W. A) same but 08.vi.2023 1♀2♂ (Soomro I.A and Larik S.A). Shikarpur: 14.iii.2022 1♂ (Soomro I. A and Panhwar W. A) same but 18.iv.2023 2♀ (Soomro I.A and Mahar M.A). Khanpur: 22.iii.2022 2♂ (Soomro I. A and Soomro K. A) same but 13.iv.2023 2♀ (Soomro I.A and Panhwar W.A). Lakhi: 27.ii.2022 3♂ (Soomro I. A and Larik S. A) same but 17.iv.2023 2♀ (Soomro I.A and Panhwar W.A). Gari yaseen: 10.iii.2022 1♀1♂ (Soomro I. A and Mahar M. A) same but 17.iv.2023 2♀ (Soomro I.A and Panhwar W.A). Jacobabad: 02.iv.2022 1♀1♂ (Soomro I.A and Panhwar W.A) same but 07.v.2023 2♀ (Soomro I.A and Larik S.A). Garhi khairo: 21.iii.2022 2♀2♂ (Soomro I. A and Soomro K. A) same but 10.iv.2023 2♂ (Soomro I.A and Larik S.A). Thull: 12.ix.2022 2♀2♂ (Soomro I. A and Panhwar W. A) same but 10.vi.2023 2♀1♂ (Soomro I.A and Mahar M.A). Kashmore: 23. v.2022 2♀ (Soomro I. A and Panhwar W. A) same but 11.ii.2023 3♂ (Soomro I.A and Larik S.A). Kandhkot: 22. v.2022 2♀2♂ (Soomro I. A and Panhwar W. A) same but 15.iv.2023 2♀ (Soomro I.A and Soomro K.A). Tangwani: 22.iii.2022 1♀2♂ (Soomro I.A and Mahar M.A) same but 15.v.2023 1♀1♂ (Soomro I.A and Panhwar W.A). Qambar: 23.x.2022 2♀1♂ (Soomro I.A and Larik S.A). Shahdadkot: 16.iii.2022 1♀1♂ (Soomro I. A and Panhwar W. A) same but 12.iv.2023 2♂ (Soomro I.A and Samejo B.A). Miro khan: 03.ii.2022 1♀2♂ (Soomro I. A and Larik S. A) same but 12.iv.2023 2♀ (Soomro I.A and Panhwar W.A). Nasirabad: 24.iii.2022 1♀1♂ (Soomro I.A and Mahar M.A). Sukkur Region. Khairpur: 14.vi.2022 1♀1♂ (Soomro I.A and Panhwar W.A). Mirwah: 17. v.2022 1♀1♂ (Soomro I. A and Larik S. A) same but 18.vi.2023 2♀ (Soomro I.A and Panhwar W.A). Kot Diji: 02.v.2023 2♀3♂ (Soomro I.A and Mahar M.A). Gambat: 02.iv.2022 2♀ (Soomro I.A and Larik S.A) same but 04.v.2023 2♂ (Soomro I.A and Panhwar W.A) (Figure. 3; 4)

Diagnosis

Body cylindrical, robust, medium to large with 28-29 antennal segments. The fastigium of vertex wide, long and lacking median carina. The frontal ridge is broad, sulcated having lateral carina exceeding upto clypeus. The margins are mostly parallel; 04 transverse sulci present on the dorsal side of the pronotum. Posterior margins of pronotum angular obtusely. The prosternal process is bifurcate, mesosternal interspace is narrow, longer, and wide and rounded at margins. Wings and tegmina exceeding tip of hind femora having tip rounded. The hind femur is slender somewhat reaching at the apex of the abdomen. The hind femur has nine internal spines and eight external spines, hind tibia is shorter hind femur. The supra anal plate broader at the base, angular, longer, wide and obtuse at the apex. Cerci are modest, thicker, longer three times as wide. Valves of ovipositor are curved, shorter and broader.

Morphometric (mm)

♂: body: 42.12; pronotum: 8.16; antenna: 16.12; tegmina: 31.52; hind femur: 18.21. ♀: body: 57.55; pronotum: 12.11; antenna: 19.52; tegmina: 42.23; hind femur: 24.12.

Acrididae are regarded as diverse amongst Orthopterans and considered as an important pests of fruits, agriculture, grasslands and herbs. Thus causing a loss to the economy of the country (Panhwar *et al.*, 2024). Extensive field investigations were carried out during the year 2021 to 2023. A total 225 samples were collected from various districts of upper Sindh Pakistan. The samples were identified into single genus *Hieroglyphus* Krauss, 1877 with two species i-

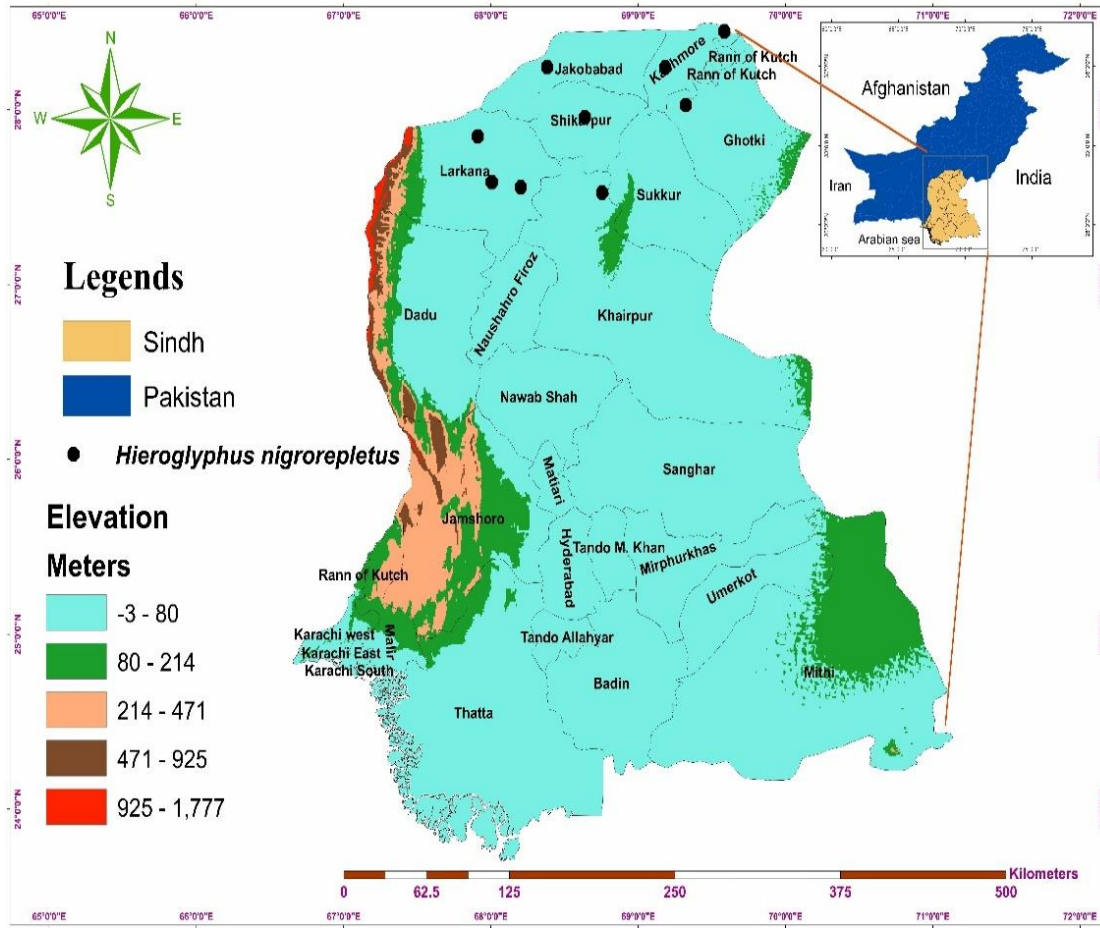


Figure 1. Distribution of *Hieroglyphus nigrorepletus* Bolívar, 1912 in upper Sindh, Pakistan.

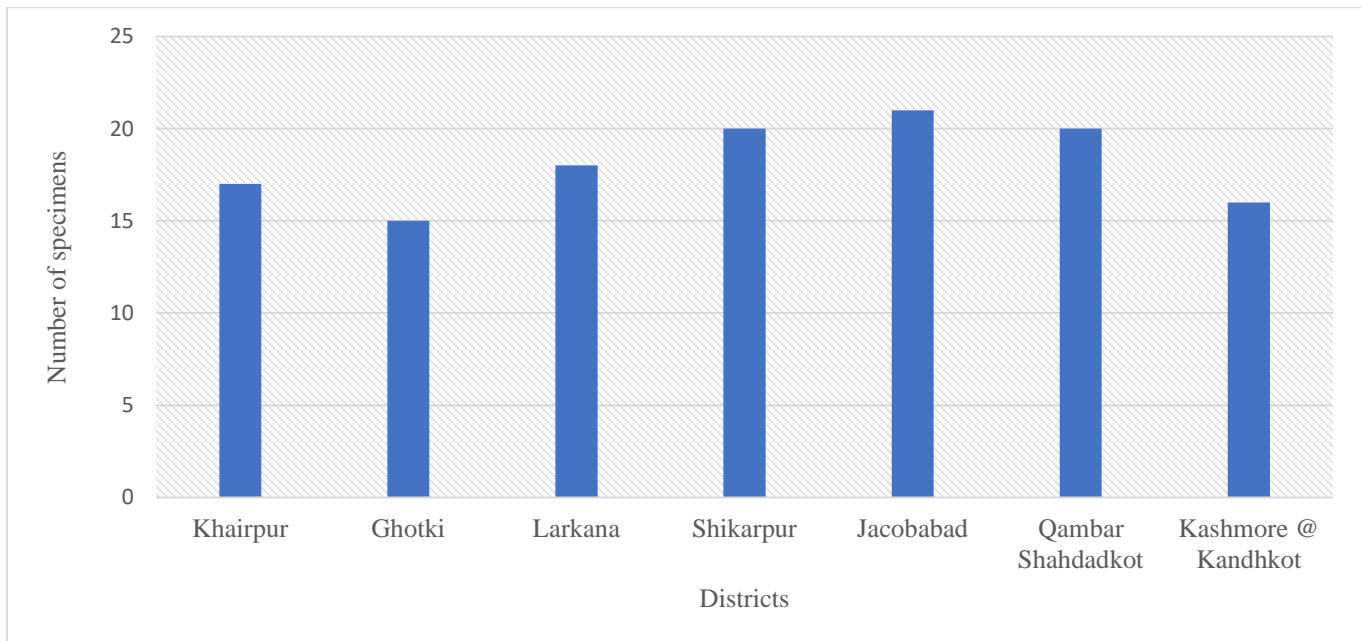


Figure 2. Samples of *Hieroglyphus nigrorepletus* collected from various districts of upper Sindh, Pakistan.

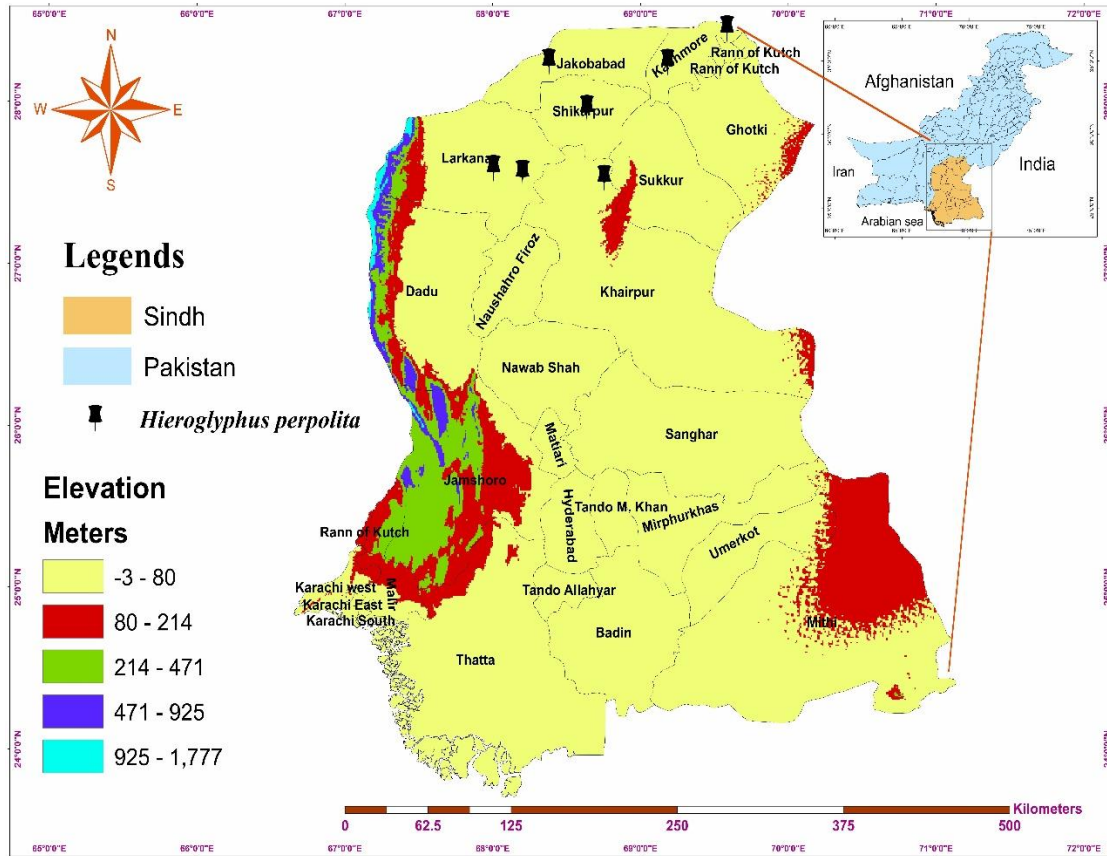


Figure 3. Distribution of *Hieroglyphus perpolita* (Uvarov, 1933) in upper Sindh, Pakistan.

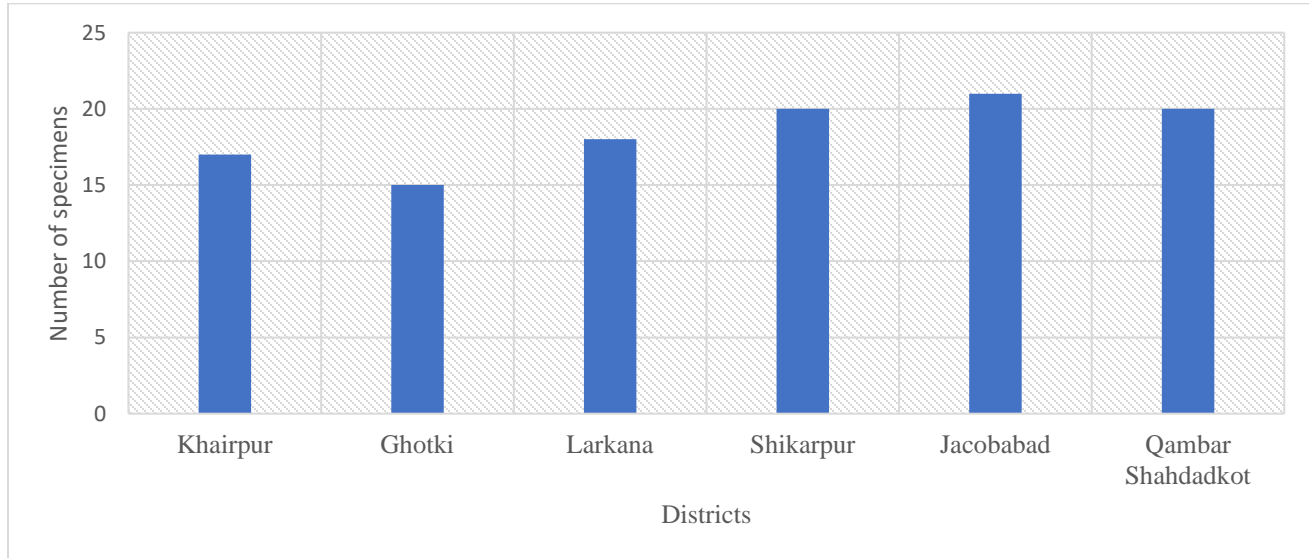


Figure 4. Samples of *Hieroglyphus perpolita* collected from various districts upper Sindh, Pakistan.



Figure 5. *Hieroglyphus nigrorepletus* Bolívar, 1912 (A, C, E, G); *Hieroglyphus perpolita* (Uvarov, 1933) (BDFH), A, B Lateral view ♀; E, F same but dorsal view; C, D Lateral view ♂; G, H same but frontal view. e: *Hieroglyphus nigrorepletus* Bolívar, 1912 and *Hieroglyphus perpolita* (Uvarov, 1933) respectively.

Memon and Panhwar (2021) while studying the diversity of Acrididae from district Dadu revealed the presence of 05 species, 01 sub-species: viz *Cyrtacanthacris tartarica*, *Oxya velox*, *Anacridium rubrispinum*, *Truxalis eximia* *Aiolopus thalassinus thalassinus*, and *Acrida exaltata*. Baloch (2002) reported 39 species of Acrididae from Punjab Pakistan. Bughio (2012) reported 36 species of Oedipodinae species from Sindh Province Pakistan. Ali & Panhwar (2017) studied family Acrididae and reported 11 subfamilies, 38 genera with 73 from Hazara region of Khyber Pakhtunkhwa province of Pakistan. Subfamilies were Acridinae Tropidopolinae, Oedipodinae, Oxyinae, Gomphocerinae and Cyrtacanthacridinae. During the present study, the highest population was observed for the *Hieroglyphus nigrorepletus* and lowest the population was observed for *Hieroglyphus perpolita* (Figure 2; 4). Moreover, the morphological features of each species are given with digital photographs. Expectantly, this study will formulate a reference line for future researchers dealing with *Hieroglyphus* fauna of this region.

CONCLUSION

Record and distributional data for *Hieroglyphus* species is updated in the upper Sindh Pakistan. As these are the pests of paddy and other crops like maize, bajra, wheat etc., so further research on this genus should be carried out to know their pest status. Many pathogens and parasitoids (*Nosema* sp, *Scelio* sp, *Eutrombidium* sp, *Entomophaga* sp, *Aspergillus* sp, *Beauveria* sp, *Metarhizium* sp etc.) can be used as biological control agents for this group so we highly recommend for future studies.

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