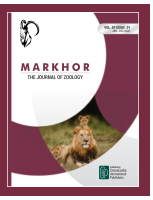
DOI: https://doi.org/10.54393/mjz.v6i3.173

MARKHOR
THE JOURNAL OF ZOOLOGY
https://www.markhorjournal.com/index.php/mjz
ISSN (E): 2790-4385, (P): 2790-4377
Volume 6, Issue 3 (July-Sep 2025)



Original Article

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Centrorhynchus saluni n.sp. (Acanthocephala: Centrorhynchidae) from the Greater Coucal *Centropus sinensis* (Cuculiformes: Cuculidae) in Saleh Pat, Sukkur, Sindh, Pakistan

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ARTICLE INFO

Keywords:
Centrorhynchus Saluni n.sp, Avian Acanthocephalan, Greater Coucal, *Centropus Sinensis*, Sukkur

How to cite:
Samejo, B. A., Soomro, F., & Birmani, N. A. (2025). Centrorhynchus saluni n.sp. (Acanthocephala: Centrorhynchidae) from the Greater Coucal Centropus sinensis (Cuculiformes: Cuculidae) in Saleh Pat, Sukkur, Sindh, Pakistan: Centrorhynchus saluni n.sp from the Greater Coucal Centropus sinensis. MARKHOR (The Journal of Zoology), 6(3), 02-07. https://doi.org/10.54393/mjz.v6i3.173

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Received Date: 13th July, 2025
Revised Date: 26th August, 2025
Acceptance Date: 1st September, 2025
Published Date: 30th September, 2025

ABSTRACT

The Greater Coucal (*Centropus sinensis*) is a widespread, non-migratory resident bird of Pakistan that inhabits diverse habitats, including agricultural landscapes and forested areas. **Objectives:** To describe a new species of *Centrorhynchus* from the Greater Coucal in Sindh, contributing to the knowledge of acanthocephalan diversity in Pakistan and the global taxonomy of the genus. **Methods:** Three Greater Coucals (*Centropus sinensis*) were collected through purposive sampling during routine avian surveys in Saleh Pat, Sukkur District, Pakistan. Gastrointestinal tracts were dissected and screened under a stereomicroscope. Worms were relaxed in hot water, fixed in AFA, stained with borax carmine, dehydrated through graded ethanol, cleared, and mounted in Canada balsam. Line drawings (Olympus BH2-DA) and photomicrographs (OMAX 10 MP) were prepared. Diagnostic features were consistent across specimens. The approach aligns with established acanthocephalan taxonomy protocols, where complete specimens validate new species, and the study focused on description rather than ecological statistics. **Results:** Seven acanthocephalans were recovered from the intestines of two Greater Coucals (*Centropus sinensis*), representing a new species, *Centrorhynchus saluni* n. sp. Male measured 6.27–6.70 mm, and female 7.41–7.92 mm. Diagnostic features include specific proboscis and receptacle dimensions, cylindrical lemnisci longer than the receptacle, tandem to slightly oblique testes, six elongated cement glands, and a posterior bursa in male. Female possess a uterine bell with eggs measuring 0.075–0.085 × 0.030–0.038 mm. **Conclusions:** *Centrorhynchus saluni* n. sp., discovered in the Greater Coucal from Sindh, Pakistan, enhances knowledge of *Centrorhynchidae* diversity and introduces new diagnostic traits.

INTRODUCTION

The Greater Coucal (*Centropus sinensis*) is a widespread, non-migratory resident bird of Pakistan that inhabits diverse habitats, including agricultural landscapes and forested areas. Its diet consists primarily of insects, caterpillars, and small vertebrates such as the saw-scaled viper (*Echis carinatus*), house lizard (*Hemidactylus frenatus*), and skinks (*Eutropis* spp.). Occasional feeding on snails, fruits, seeds, nestlings, and bird eggs has also been recorded [1]. Birds (Class *Aves*) represent one of the most abundant vertebrate groups and serve as important indicators of ecological health. Globally, approximately 11,276 avian species are recognized [2], with Pakistan harboring nearly 778 bird species [3]. Helminth parasites form a diverse group of metazoans infecting both humans and animals, with significant ecological and veterinary importance [4]. Their survival and transmission depend on multiple biotic and abiotic factors, including host–parasite interactions, environmental conditions, and dispersal strategies [5, 6]. Within this group, acanthocephalans are obligate intestinal parasites characterized by a proboscis

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armed with hooks, enabling firm attachment to host intestines. The genus *Centrorhynchus* Lühe, 1911 is globally distributed, occurring mainly in avian predators, including raptors and corvids, with a few records from other avian groups. Despite its wide distribution, the genus remains poorly documented in South Asia, including Pakistan. Only limited studies have reported acanthocephalans from avian hosts in the country, including those by Galaktionov and Atrashkevich [7], Amin *et al.* [8], Bilqees and Aly [9], Birmani *et al.* [10], Khan and Bilqees [11], Khan *et al.* [12], Khan *et al.* [13], Bushra *et al.* [14] and Naz *et al.* [15].

This study aims to describe a new species of *Centrorhynchus* from the Greater Coucal in Sindh, thereby contributing to the knowledge of acanthocephalan diversity in Pakistan and the global taxonomy of the genus.

METHODS

Three Greater Coucals (*Centropus sinensis*) were collected through purposive sampling during routine avian surveys in Saleh Pat, Sukkur District, Pakistan (Jan 2024 to July 2025). This targeted approach was used because this bird species is a known host for *Centrorhynchus* parasites in the region. Three hosts were captured during routine surveys. Gastrointestinal tracts were dissected and screened under a stereomicroscope. Worms were relaxed in hot water, fixed in AFA, stained with borax carmine, dehydrated through graded ethanol, cleared, and mounted in Canada balsam. Line drawings (Olympus BH2-DA) and photomicrographs (OMAX 10 MP) were prepared. Measurements are in millimeters (mm) and identifications followed standard Centrorhynchus literature. This study is a taxonomic description of a new acanthocephalan species, *Centrorhynchus saluni* n. sp., based on morphological and morphometric analyses. The research follows a descriptive parasitological approach, focusing on the identification and characterization of the parasite recovered from the Greater Coucal (*Centropus sinensis*) in Saleh Pat, Sukkur, Sindh, Pakistan. While only three hosts were examined, this meets taxonomic requirements because seven intact parasite specimens were recovered, enabling full morphological characterization diagnostic features were consistent across specimens the approach aligns with established acanthocephalan taxonomy protocols where complete specimens validate new species; and the study focused on description rather than ecological statistics Three live specimens of the Greater Coucal (*Centropus sinensis*) (Cuculiformes: Cuculidae) were collected during routine bird surveys using mist nets and hand capture with the assistance of local bird trappers. Captured birds were transported in ventilated cages to the field station and handled following ethical guidelines to minimize stress and ensure humane treatment. Birds were euthanized following accepted protocols, and complete necropsies were performed under laboratory conditions. The gastrointestinal tracts were removed and examined under a stereomicroscope, yielding seven acanthocephalans belonging to the genus *Centrorhynchus* Lühe, 1911 from two of the three birds. Recovered specimens were transferred to 0.9% saline solution for cleaning and relaxation, then fixed under mild cover glass pressure in alcohol–formalin–acetic acid (AFA). Worms were stained with borax carmine, dehydrated through a graded ethanol series, cleared, and mounted permanently in Canada balsam. Illustrations were prepared using an Olympus BH2-DA drawing attachment, and photomicrographs were taken with an OMAX digital trinocular LED microscope (10 MP resolution). All measurements are given in millimeters (mm), and identifications were made using standard taxonomic literature for the genus. Family: *Centrorhynchidae* Lühe, 1909. Genus: *Centrorhynchus* Lühe, 1911 Species: *Centrorhynchus saluni* n. sp. (Figures 1–2). Type host: Greater Coucal Centropus sinensis (Cuculiformes: Cuculidae). Type locality: Saleh Pat, Sukkur, Sindh, Pakistan. Site of infection: Large intestine. Number of hosts examined: 3. Number of hosts infected: 2. Number of specimens recovered: 7.

RESULTS

The body is fusiform and aspinose. Proboscis cylindrical, not divided into two sections, with 30–34 longitudinal rows of hooks, each row bearing 12–13 hooks. Proboscis receptacle claviform, extending up to the middle of the proboscis. Neck short. Lemnisci cylindrical, longer than the proboscis's receptacle. Testes are tandem to slightly oblique, situated in the anterior part of the trunk. Cement glands are elongated, six in number. Bursa is present at the posterior extremity. Seven acanthocephalans were recovered from the intestines of two Greater Coucals (*Centropus sinensis*) in Sindh, Pakistan, representing a new species, *Centrorhynchus saluni* n. sp. The species is characterized by a fusiform, aspinose body and a cylindrical proboscis bearing 30–34 longitudinal rows of 12–13 hooks. Male measured 6.27–6.70 mm, and female 7.41–7.92 mm. Diagnostic features include specific proboscis and receptacle dimensions, cylindrical lemnisci longer than the receptacle, tandem to slightly oblique testes, six elongated cement glands, and a posterior bursa in males. Females possess a uterine bell with eggs measuring 0.075–0.085 × 0.030–0.038 mm (Table 1).

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Table 1: Measurements (in millimeters) of Male and Female *Centrorhynchus saluni* n. sp

Character	Male	Female
Entire worm	6.27–6.70	7.41–7.92
Proboscis	0.15–0.66 × 0.59–0.75	0.60–0.77 × 0.70–0.77
Neck	Short	Short
Proboscis receptacle	0.75–0.91 × 0.25–0.36	0.72–0.83 × 0.85–0.94
Lemnisci	0.65–0.91	0.85–0.91
Anterior testis	0.78–0.91 × 0.55–0.66	–
Posterior testis	0.82–0.84 × 0.56–0.68	–
Bursa	1.00–1.05 × 0.50–0.59	–
Eggs	–	0.075–0.085 × 0.030–0.038

The proboscis of the male shows a distinct arrangement of hooks in longitudinal rows, which represents a key diagnostic feature of the species. The anterior trunk region displays the proboscis receptacle, paired lemnisci, and testes, highlighting the internal organization of male reproductive structures. The middle trunk reveals the series of tubular cement glands, important for copulatory processes, while the posterior trunk shows the bursa. In the female, the proboscis exhibits a similar hook pattern to the male, whereas the posterior trunk depicts the uterine bell, representing the reproductive system of the female. A. Proboscis of male showing arrangement of hooks and neck; B. Anterior portion of trunk of male showing proboscis receptacle, lemnisci and testes; C. Middle portion of trunk of male showing tubular cement glands; D. Posterior portion of trunk of male showing bursa; E. Proboscis of female showing arrangement of hooks and neck; F. Posterior portion of trunk of female showing uterine bell (Figure 1).

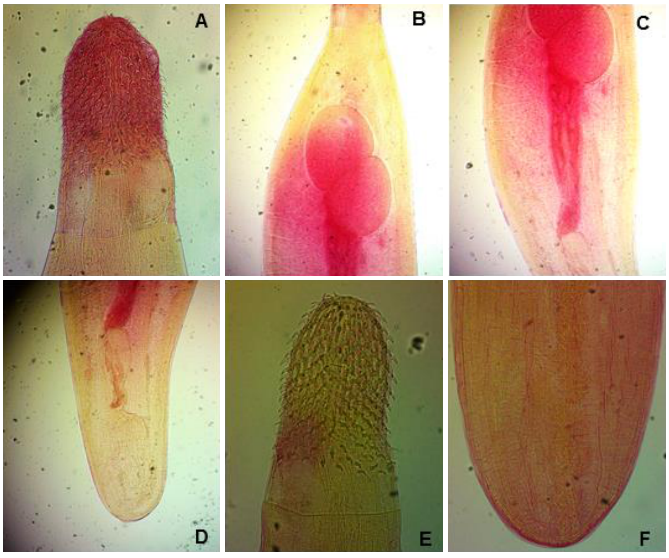

Figure 1: *Centrorhynchus saluni* n. sp. A. Proboscis of Male, B. Anterior Portion of Trunk of Male, C. Middle Portion of Trunk of Male, D. Posterior Portion of Trunk of Male, E. Proboscis of Female, F. Posterior Portion of Trunk of Female

The complete body form of both male and female worms is shown, clearly demonstrating sexual dimorphism in overall body structure. Enlarged views of the proboscis in both sexes highlight the arrangement and gradation of hooks, with males and females exhibiting comparable patterns but with minor variations. Scale bars indicate the relative sizes, with 1 mm for the whole worms and 0.3 mm for the proboscis enlargements. Scale bars: A and B. 1 mm; C and D. 0.3 mm (Figure 2).

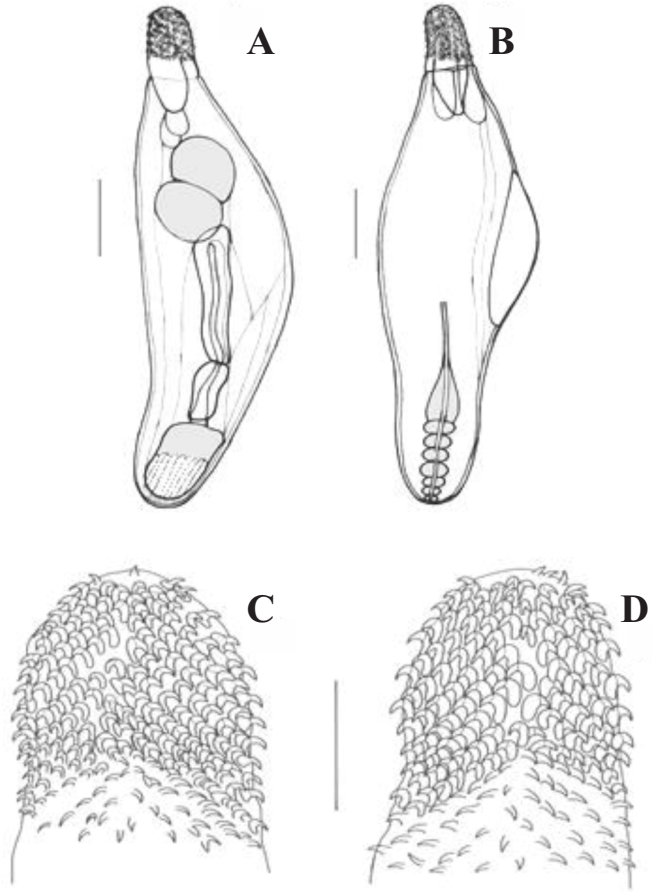

Figure 2: *Centrorhynchus saluni* n. sp. A. Entire Male; B. Entire Female; C. Proboscis of Male Worm Enlarged; D. Proboscis of Female Worm Enlarged

In Pakistan, several species of *Centrorhynchus* have been reported from avian hosts (Table 2).

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Table 2: Different Species of Genus *Centrorhynchus* Lühe, 1911 Reported from Pakistan

Species	*C. saluni n. sp.*	*C. cribbi*	*C. globirostris*	*C. faciatum*	*C. gibsoni*	*C. nickoli*
Reference	Present species	[14]	[8]	[9]	[16]	[12]
Body	Fusiform, spinose, 6.27–7.92	Elongated, 23.0–24.12 X 1.12–1.34	long, cylindrical with prominent anterior ovoid dilation, 12.50–23.75 X 0.47–0.95	Cylindrical, with conspicuous swelling near anterior end, 10.0–11.1X1.2–1.5	elongate with anterior end pointed and posterior rounded,14.6–16.3 X 3.08–3.64	–
Proboscis	Cylindrical, not divided into two parts, 0.15–0.77 X 0.59–0.77	Small, globular not divided, 1.0–1.12 X 0.32–0.36	Globular, tilted ventrad, not divided, 603–700 X 364–468	Nearly cylindrical, 0.72–0.74 X 0.18–0.19	cylindrical 0.50–0.57	–
Longitudinal rows of hooks	30–34	14–16	24–25	12–13	14	16
Hooks in each row	12–13	12–14	10–11	6–18	20	20–24
Proboscis receptacle	Claviform, inserted inside proboscis up to middle of it, 0.72–0.91 X 0.25–0.94	Elongated inserted at middle of proboscis, 1.20–1.46 X 0.56–0.57	double-walled, about twice as long as proboscis, 1.16–1.50 X 0.17–0.32	0.91–0.92 X 0.21–0.22	relatively small, elongate	–
Neck	Short	–	Neck prominent	Absent	–	–
Lemnisci	Cylindrical, larger than proboscis receptacle	long, slightly sub-equal, right measuring 2.96–3.04 X 0.16, left 3.0–3.14 X 0.16–0.17	Lemnisci digitiform, equal, about three times as long as proboscis receptacle, 1.51–2.37	about 3–4 times longer than length of proboscis receptacle extending well beyond it but not reaching posterior end of body	Sub-equal	–
Testes	Tandem to slightly oblique, situated in the anterior half of the body	Situated in anterior half of body, anterior, 1.24–1.32 X 0.64–0.80 while posterior 0.96–1.20 X 0.80–0.84	Relatively large, elliptical, not contiguous, anterior testis 0.60–1.50 X 0.27–0.45, posterior testis 0.57–1.40 X 0.19–0.62	oval, tandem, sometimes overlapping, located in anterior swelling of trunk, 0.05–0.5 X 0.04–0.42	–	–
Cement glands	06 long, 0.652–0.916	04 tubular, 11.10–12.80 X 0.36–0.40	04 tubular, 6.25–13.12 X 0.10–0.32	03	–	–
Host	*Centropus sinensis*	*Centropus sinensis*	*Centropus sinensis*	*Butastur teesa*	*Corvus splendens*	*Coracias garrulous*
Locality	Saleh Pat, Sukkur, Sindh	Nausharo Feroze, Sindh	Oderolal, Sindh	Karachi, Sindh	Oderolal, Sindh	Mirpurkhas, Sindh

DISCUSSION

The genus *Centrorhynchus* Lühe is a well-defined group of parasitic worms from the class Acanthocephala that mature in the alimentary canals of birds [17]. In Pakistan, several species of *Centrorhynchus* have been reported from avian hosts. *C. cribbi* Siyal *et al.* from *Centropus sinensis* (Nausharo Feroze, Sindh) differs from the present species in having a larger elongated body, 14–16 longitudinal rows of hooks, elongated proboscis receptacle, long subequal lemnisci, and four cement glands [14]. *C. globirostris* Amin *et al.* also from *C. sinensis* (Oderolal, Sindh), has a globular proboscis tilted ventrad, 24–25 longitudinal rows of hooks with 10–11 per row, a proboscis receptacle twice as long as the proboscis, non-contiguous testes, and four cement glands [8]. *C. fuscum* (Westrumb, 1821), recorded by Bilqees and Khan from *Butastur teesa* (Karachi, Sindh), is characterized by a cylindrical trunk, 12–13 longitudinal rows of hooks, larger lemnisci crossing mid-body, five cement glands, and a larger bursa [9]. *C. gibsoni* Khan, Ghazi and Bilqees, from *Corvus splendens* (Oderolal, Sindh) has a smaller proboscis divided by slight insertion, 14 rows with 20 hooks per row, smaller proboscis receptacle, and unequal lemnisci [16]. *C. nickoli* Khan, Bilqees and Ghazi, 2001 from *Coracias garrulus* (Mirpurkhas, Sindh) differs by its smaller cylindrical body, proboscis divisible into two portions, 16 rows with 20–24 hooks per row, larger double-walled proboscis receptacle, and larger lemnisci [12]. Outside Pakistan, numerous species differ markedly from the present taxon. For example, *C. aluconis* (Müller, 1780) Lühe, 1911 from various European raptors has 26–30 rows with 15–18 hooks per row and longer lemnisci; *C. amphibius* Das, 1950 from *Buteo buteo* (Bulgaria) has a cylindrical body, larger proboscis

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with 32 rows of 20 hooks, and longer proboscis receptacle; *C. globocaudatus* (Zeder, 1800) Lühe, 1911 from falcons in Bulgaria has a long neck and larger testes with 30 rows of 18–19 hooks; *C. falconis* (Johnston and Best, 1943) Golvan, 1956 from *Spilornis cheela* (Sri Lanka) has 38–40 rows with 27–29 hooks and larger testes; and *C. buteonis* (Schrank, 1788) Kostyler, 1914 from Sri Lanka and India bears 35 rows with 23–24 hooks per row and a larger proboscis divisible into two parts. Indian records also reveal diagnostic differences: *C. clitorideus* (Meyer, 1931) [18] from *Athene brama* has a proboscis with 30–32 rows and 19–21 hooks per row, elongated testes, and a funnel-shaped bursa; *C. milvus* [19] from Milvus migrans govinda possesses 36 rows with 22–23 hooks; *C. atheni* [20] resembles the present species in body size but has a more elongated proboscis, smaller eggs, and digitiform genital appendages; *C. lucknowensis* [21] from *Haliaster indus* bears only three cement glands; and *C. sikkimensis* Bhattacharya, 2003 from eagles of India is the largest species, with 40–42 rows and 28–30 hooks per row, central ganglion, and two cement glands. These morphological comparisons demonstrate that *Centrorhynchus saluni* n. sp. differs from all previously described congeners in its combination of body size, cylindrical proboscis with 30–34 rows of 12–13 hooks, claviform proboscis receptacle, six cement glands, and the relative dimensions of the lemnisci and reproductive structures. The present study is based on only three specimens of the Greater Coucal (*Centropus sinensis*), two of which were infected, yielding seven worms. Although sufficient for species description, this small host sample size limits the ability to assess prevalence, host–parasite relationships, and intraspecific variation. Future studies with larger sample sizes and broader geographic coverage will be necessary to confirm the distribution, host range, and morphological variability of *C. saluni* n. sp.

CONCLUSIONS

The study concluded that a new acanthocephalan species, *Centrorhynchus saluni* n. sp., infects the Greater Coucal (*Centropus sinensis*) in Sindh, Pakistan. Distinctive features, including proboscis hook arrangement, reproductive structures, and sexual dimorphism, differentiate it from related species. This study adds to the understanding of avian acanthocephalan diversity in the region.

Authors Contribution

Conceptualization: BAS
Methodology: BAS
Formal analysis: BAS, FS
Writing review and editing: BAS, FS, NAB

All authors have read and agreed to the published version of the manuscript

Conflicts of Interest

All the authors declare no conflict of interest.

Source of Funding

The author received no financial support for the research, authorship and/or publication of this article.

REFERENCES

[1] Ramel G. Domestic Birds: Greater Coucal or the Crow Pheasant. 2023 Jul. https://earthlife.net/greater-coucals/.
[2] Gill F, Donsker D, Rasmussen P. (Eds). IOC World Bird List(v14.2). 2024. doi: 10.14344/IOC.ML.14.2.
[3] Saleem M, Javid A, Hussain A, Mehmood S. Diversity and Molecular Identification of Bird Species from South Punjab, Pakistan. Journal of Wildlife and Biodiversity. 2025 Jan; 9(1): 280-99.
[4] Scott ME. Helminth-Host-Environment Interactions: Looking Down from the Tip of the Iceberg. Journal of Helminthology. 2023 Jan; 97: e59. doi: 10.1017/S0022149X23000433.
[5] Giari L, Castaldelli G, Timi JT. Ecology and Effects of Metazoan Parasites of Fish in Transitional Waters. Parasitology. 2022 Dec; 149(14): 1829-41. doi: 10.1017/S0031182022001068.
[6] Loke PN and Harris NL. Networking Between Helminths, Microbes, and Mammals. Cell Host and Microbe. 2023 Apr; 31(4): 464-71. doi: 10.1016/j.chom.2023.02.008.
[7] Galaktionov KV and Atrashkevich GI. Patterns in Transmission of Marine Bird Parasites in the High Arctic: The Case of Acanthocephalans Polymorphus Phippsi (Palaeacanthocephala, Polymorphidae). Biology Bulletin Reviews. 2023 Dec; 13(Suppl 2): S144-54. doi: 10.1134/S2079086423080042.
[8] Amin OM, Heckmann RA, Wilson E, Keele B, Khan A. The Description of Centrorhynchus Globirostris N. Sp. (Acanthocephala: Centrorhynchidae) from the Pheasant Crow, Centropus Sinensis (Stephens) in Pakistan, with Gene Sequence Analysis and Emendation of the Family Diagnosis. Parasitology Research. 2015 Jun; 114(6): 2291-9. doi: 10.1007/s00436-015-4424-0.
[9] Bilqees FM and Aly Khan AK. Two new helminth parasites from Pakistan, with redescription of the acanthocephalan Centrorhynchus fasciatum (Westrumb, 1821). Pakistan Journal of Zoology. 2005; 37(4): 257-263.
[10] Birmani NA, Dharejo AM, Khan MM. A New Species of Polymorphus Lühe, 1911(Acanthocephala: Polymorphidae) in Black Coot, Fulica atra (Aves:

DOI: https://doi.org/10.54393/mjz.v6i3.173

Rallidae), Pakistan. Zootaxa. 2011 Jun; 2929(1): 64-8. doi: 10.11646/zootaxa.2929.1.7.

[11] Khan A and Bilqees FM. On a New Acanthocephala parasite from Common House Crow in Sindh, Pakistan. Pakistan Journal of Zoology. 1998; 30(1): 35-7.

[12] Khan A, Bilqees FM, Ghazi RR. Acanthocephalan Parasite Centrorhynchus Nickolin. Sp. From Eurasian Roller (Coracias Garrulus Linn.). Proceedings of Parasitology. 2001; 32: 33-9.

[13] Khan A, Khatoon N, Bilqees FM. A New Acanthocephalan Species Porrorchis jonesae from a Bird, Acridotheres tristis (Linn.) from Karachi, Sindh. Pakistan Journal of Zoology. 2010 Apr; 42(2).

[14] Bushra S, Khan A, Das SN, Ghazi RR. Centrorhynchus Cribbi Sp. N. (Acanthocephala: Centrorhynchidae) in Centropus Sinensis, (Pheasant Crow) from Nausharo Feroze, Sindh, Pakistan. International Journal of Biology and Biotechnology. 2020; 17(4): 745-751.

[15] Naz S, Birmani NA, Fatima I, Jokhio JI. Helminthological Studies in Francolins (Galliformes: Phasianidae) of Sindh, Pakistan with Two New Species and Epidemiological Parameters. Veterinary Parasitology: Regional Studies and Reports. 2021 Jan; 23: 100540. doi: 10.1016/j.vprsr.2021.100540.

[16] Khan A, Ghazi RR, Bilqees FM. Two New Species of Acanthocephalan Parasites of House Crow (Corvus splendens Vieillot). Pakistan Journal of Zoology. 2002; 34(2): 139-146.

[17] Zhao Q, Muhammad N, Chen HX, Ma J, Suleman, Li L. Morphological and Genetic Characterisation of Centrorhynchus Clitorideus (Meyer, 1931) (Acanthocephala: Centrorhynchidae) from the Little Owl Athene noctua (Scopoli)(Strigiformes: Strigidae) in Pakistan. Systematic Parasitology. 2020 Oct; 97(5): 517-28. doi: 10.1007/s11230-020-09930-8.

[18] Golvan YJ. The Genus Centrorhynchus Lühe 1911 (Acanthocephala-Polymorphidae). Revision of the European Species and Description of a New African Parasitic Species of Diurnal Raptor. Bulletin of the Fundamental Institute of Black Africa. 1956: 732-85.

[19] Ansari MA. Black Kite Milvus Migrans. Ashok Yakkaldevi. 2023 Apr.

[20] Gupta V, Fatma S. On Five New Species of the Genus Centrorhynchus Luhe, 1911 (Acanthocephala: Centrorhynchidae Van Cleave, 1916) from Avian and Amphibian Hosts of Lucknow, Uttar Pradesh. Indian Journal of Helminthology. 1981; 33(2): 105–120.

[21] Van Cleave HJ and Pratt EM. A New Species of the Genus Centrorhynchus (Acanthocephala) from the Barred Owl. The Journal of Parasitology. 1940 Aug; 26(4): 297-300. doi: 10.2307/3272102.