

Building evidence for conservation globally

# Journal of Threatened Taxa

10.11609/jott.2023.15.3.22771-22926  
[www.threatenedtaxa.org](http://www.threatenedtaxa.org)

26 March 2023 (Online & Print)  
15(3): 22771-22926  
ISSN 0974-7907 (Online)  
ISSN 0974-7893 (Print)



Open Access







ISSN 0974-7907 (Online); ISSN 0974-7893 (Print)

Publisher  
**Wildlife Information Liaison Development Society**  
[www.wild.zooreach.org](http://www.wild.zooreach.org)

Host  
**Zoo Outreach Organization**  
[www.zooreach.org](http://www.zooreach.org)

43/2 Varadarajulu Nagar, 5<sup>th</sup> Street West, Ganapathy, Coimbatore, Tamil Nadu 641006, India  
Registered Office: 3A2 Varadarajulu Nagar, FCI Road, Ganapathy, Coimbatore, Tamil Nadu 641006, India  
Ph: +91 9385339863 | [www.threatenedtaxa.org](http://www.threatenedtaxa.org)  
Email: [sanjay@threatenedtaxa.org](mailto:sanjay@threatenedtaxa.org)

#### EDITORS

##### Founder & Chief Editor

**Dr. Sanjay Molur**

Wildlife Information Liaison Development (WILD) Society & Zoo Outreach Organization (ZOO),  
43/2 Varadarajulu Nagar, 5<sup>th</sup> Street West, Ganapathy, Coimbatore, Tamil Nadu 641006, India

##### Deputy Chief Editor

**Dr. Neelesh Dahanukar**

Noida, Uttar Pradesh, India

##### Managing Editor

**Mr. B. Ravichandran**, WILD/ZOO, Coimbatore, India

##### Associate Editors

**Dr. Mandar Paingankar**, Government Science College Gadchiroli, Maharashtra 442605, India

**Dr. Ulrike Streicher**, Wildlife Veterinarian, Eugene, Oregon, USA

**Ms. Priyanka Iyer**, ZOO/WILD, Coimbatore, Tamil Nadu 641006, India

**Dr. B.A. Daniel**, ZOO/WILD, Coimbatore, Tamil Nadu 641006, India

##### Editorial Board

**Dr. Russel Mittermeier**

Executive Vice Chair, Conservation International, Arlington, Virginia 22202, USA

**Prof. Mewa Singh Ph.D., FASc, FNA, FNAsc, FNAPsy**

Ramanna Fellow and Life-Long Distinguished Professor, Biopsychology Laboratory, and  
Institute of Excellence, University of Mysore, Mysuru, Karnataka 570006, India; Honorary  
Professor, Jawaharlal Nehru Centre for Advanced Scientific Research, Bangalore; and Adjunct  
Professor, National Institute of Advanced Studies, Bangalore

**Stephen D. Nash**

Scientific Illustrator, Conservation International, Dept. of Anatomical Sciences, Health Sciences  
Center, T-8, Room 045, Stony Brook University, Stony Brook, NY 11794-8081, USA

**Dr. Fred Pluthero**

Toronto, Canada

**Dr. Priya Davidar**

Sigur Nature Trust, Chadapatti, Mavinahalla PO, Nilgiris, Tamil Nadu 643223, India

**Dr. Martin Fisher**

Senior Associate Professor, Battcock Centre for Experimental Astrophysics, Cavendish  
Laboratory, JJ Thomson Avenue, Cambridge CB3 0HE, UK

**Dr. John Fellowes**

Honorary Assistant Professor, The Kadoorie Institute, 8/F, T.T. Tsui Building, The University of  
Hong Kong, Pokfulam Road, Hong Kong

**Prof. Dr. Mirco Solé**

Universidade Estadual de Santa Cruz, Departamento de Ciências Biológicas, Vice-coordenador  
do Programa de Pós-Graduação em Zoologia, Rodovia Ilhéus/Itabuna, Km 16 (45662-000)  
Salobrinho, Ilhéus - Bahia - Brasil

**Dr. Rajeev Raghavan**

Professor of Taxonomy, Kerala University of Fisheries & Ocean Studies, Kochi, Kerala, India

##### English Editors

**Mrs. Mira Bhojwani**, Pune, India

**Dr. Fred Pluthero**, Toronto, Canada

**Mr. P. Ilangoan**, Chennai, India

**Ms. Sindhura Stothra Bhashyam**, Hyderabad, India

##### Web Development

**Mrs. Latha G. Ravikumar**, ZOO/WILD, Coimbatore, India

##### Typesetting

**Mrs. Radhika**, ZOO, Coimbatore, India

**Mrs. Geetha**, ZOO, Coimbatore India

#### Fundraising/Communications

**Mrs. Payal B. Molur**, Coimbatore, India

#### Subject Editors 2019–2021

#### Fungi

Dr. B. Shivaraju, Bengaluru, Karnataka, India

Dr. R.K. Verma, Tropical Forest Research Institute, Jabalpur, India

Dr. Vatsavaya S. Raju, Kakatiya University, Warangal, Andhra Pradesh, India

Dr. M. Krishnappa, Jnana Sahyadri, Kuvempu University, Shimoga, Karnataka, India

Dr. K.R. Sridhar, Mangalore University, Mangalagangothri, Mangalore, Karnataka, India

Dr. Gunjan Biswas, Vidyasagar University, Midnapore, West Bengal, India

#### Plants

Dr. G.P. Sinha, Botanical Survey of India, Allahabad, India

Dr. N.P. Balakrishnan, Ret. Joint Director, BSI, Coimbatore, India

Dr. Shonil Bhagwat, Open University and University of Oxford, UK

Prof. D.J. Bhat, Retd. Professor, Goa University, Goa, India

Dr. Ferdinando Boero, Università del Salento, Lecce, Italy

Dr. Dale R. Calder, Royal Ontario Museum, Toronto, Ontario, Canada

Dr. Cleofas Cervancia, Univ. of Philippines Los Baños College Laguna, Philippines

Dr. F.B. Vincent Florens, University of Mauritius, Mauritius

Dr. Merlin Franco, Curtin University, Malaysia

Dr. V. Irudayaraj, St. Xavier's College, Palayamkottai, Tamil Nadu, India

Dr. B.S. Kholia, Botanical Survey of India, Gangtok, Sikkim, India

Dr. Pankaj Kumar, Department of Plant and Soil Science, Texas Tech University, Lubbock, Texas, USA.

Dr. V. Sampath Kumar, Botanical Survey of India, Howrah, West Bengal, India

Dr. A.J. Solomon Raju, Andhra University, Visakhapatnam, India

Dr. Vijayasankar Raman, University of Mississippi, USA

Dr. B. Ravi Prasad Rao, Sri Krishnadevaraya University, Anantpur, India

Dr. K. Ravikumar, FRLHT, Bengaluru, Karnataka, India

Dr. Aparna Watve, Pune, Maharashtra, India

Dr. Qiang Liu, Xishuangbanna Tropical Botanical Garden, Yunnan, China

Dr. Noor Azhar Mohamed Shazili, Universiti Malaysia Terengganu, Kuala Terengganu, Malaysia

Dr. M.K. Vasudeva Rao, Shiv Ranjani Housing Society, Pune, Maharashtra, India

Prof. A.J. Solomon Raju, Andhra University, Visakhapatnam, India

Dr. Mandar Datar, Agharkar Research Institute, Pune, Maharashtra, India

Dr. M.K. Janarthnam, Goa University, Goa, India

Dr. K. Karthigeyan, Botanical Survey of India, India

Dr. Errol Vela, University of Montpellier, Montpellier, France

Dr. P. Lakshminarasimhan, Botanical Survey of India, Howrah, India

Dr. Larry R. Noblick, Montgomery Botanical Center, Miami, USA

Dr. K. Haridasan, Pallavur, Palakkad District, Kerala, India

Dr. Analinda Manila-Fajard, University of the Philippines Los Banos, Laguna, Philippines

Dr. P.A. Sinu, Central University of Kerala, Kasaragod, Kerala, India

Dr. Afroz Alam, Banasthali Vidyapith (accredited A grade by NAAC), Rajasthan, India

Dr. K.P. Rajesh, Zamorin's Guruvayurappan College, GA College PO, Kozhikode, Kerala, India

Dr. David E. Boufford, Harvard University Herbaria, Cambridge, MA 02138-2020, USA

Dr. Ritesh Kumar Choudhary, Agharkar Research Institute, Pune, Maharashtra, India

Dr. Navendu Page, Wildlife Institute of India, Chandrabani, Dehradun, Uttarakhand, India

Dr. Kannan C.S. Warrior, Institute of Forest Genetics and Tree Breeding, Tamil Nadu, India

#### Invertebrates

Dr. R.K. Avasthi, Rohtak University, Haryana, India

Dr. D.B. Bastawade, Maharashtra, India

Dr. Partha Pratim Bhattacharjee, Tripura University, Suryamaninagar, India

Dr. Kailash Chandra, Zoological Survey of India, Jabalpur, Madhya Pradesh, India

Dr. Ansie Dippenaar-Schoeman, University of Pretoria, Queenswood, South Africa

Dr. Rory Dow, National Museum of Natural History Naturalis, The Netherlands

Dr. Brian Fisher, California Academy of Sciences, USA

Dr. Richard Gallon, Llandudno, North Wales, LL30 1UP

Dr. Hemant V. Ghatge, Modern College, Pune, India

Dr. M. Monwar Hossain, Jahangirnagar University, Dhaka, Bangladesh

Mr. Jatishwor Singh Irungbam, Biology Centre CAS, Branišovská, Czech Republic.

Dr. Ian J. Kitching, Natural History Museum, Cromwell Road, UK

For Focus, Scope, Aims, and Policies, visit [https://threatenedtaxa.org/index.php/JoTT/aims\\_scope](https://threatenedtaxa.org/index.php/JoTT/aims_scope)

For Article Submission Guidelines, visit <https://threatenedtaxa.org/index.php/JoTT/about/submissions>

For Policies against Scientific Misconduct, visit [https://threatenedtaxa.org/index.php/JoTT/policies\\_various](https://threatenedtaxa.org/index.php/JoTT/policies_various)

continued on the back inside cover

Cover: Green Bee-eater with colour pencils and watercolor wash by Elakshi Mahika Molur.



## Redefining *Pallisentis ophiocephali* (Thapar, 1930) Baylis, 1933 from two freshwater fishes of Channidae family of Hooghly District, West Bengal, India

Prabir Banerjee<sup>1</sup> & Biplob Kumar Modak<sup>2</sup>

<sup>1</sup>Jarura Sikshaniketan, P.O. Jarura, P.S. Polba, Dist. Hooghly, West Bengal 712138, India.

<sup>2</sup>Department of Zoology, Sidho-Kanho-Birsha University, Purulia, West Bengal 723104, India.

<sup>1</sup>banerjee.prabir@gmail.com, <sup>2</sup>bkmodak09@gmail.com (corresponding author)

**Abstract:** The genus *Pallisentis* has been mostly found among the freshwater fishes of Channidae family. *Pallisentis ophiocephali* is characterized with some unique characters of proboscis, hooks, and spines. However, initial description is a little sketchy and yet not updated. The present study communicates the detail morphology of an acanthocephalan species obtained from two host fishes of Channidae family—*Channa striatus* and *Channa punctatus*—during a one-year survey from different places of Hooghly District, West Bengal. The parasite is examined under light microscope as well as under scanning electron microscope. Unique four hook circles with different sizes, collar, and trunk spines, male and female genital organs are described for taxonomic study. Scanning electron microscopic study also provides the detailed information about the surface topography including longitudinal muscle, retractor muscles, and posterior ends. Comparing the studied specimen with other closely related species, the present acanthocephalan specimen has been identified as *P. ophiocephali* from *Channa striatus*. The retractable nature of proboscis has also been studied from the live specimens with the help of light microscope.

**Keywords:** Acanthocephalan, *Channa punctatus*, *Channa striatus*, retractable proboscis.

**Editor:** Arup Kumar Hazarika, Cotton University, Guwahati, Assam.

**Date of publication:** 26 March 2023 (online & print)

**Citation:** Banerjee, P. & B.K. Modak (2023). Redefining *Pallisentis ophiocephali* (Thapar, 1930) Baylis, 1933 from two freshwater fishes of Channidae family of Hooghly District, West Bengal, India. *Journal of Threatened Taxa* 15(3): 22841–22849. <https://doi.org/10.11609/jott.7847.15.3.22841-22849>

**Copyright:** © Banerjee & Modak 2023. Creative Commons Attribution 4.0 International License. JoTT allows unrestricted use, reproduction, and distribution of this article in any medium by providing adequate credit to the author(s) and the source of publication.

**Funding:** This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

**Competing interests:** The authors declare no competing interests.

**Author details:** P. BANERJEE—assistant teacher of Biology in Jarura Sikshaniketan (School), Hooghly and research scholar of Sidho-Kanho-Birsha University, Purulia, West Bengal. His research interest lies in the biosystematics of parasite of edible freshwater fishes. He is specialized in morphometric as well as molecular studies of myxozoans. B.K. MODAK—professor of Zoology, presently working at Sidho-Kanho-Birsha University, Purulia, West Bengal. He is mostly engaged in research on parasitology, ethnobiology and biodiversity. His parasitological works based on the biosystematics study of various invertebrate and vertebrate parasites like gregarines, myxozoans and helminthes.

**Author contributions:** Authors have the equal contributions to do the entire research work.

**Acknowledgements:** Authors would like to thank the Department of Zoology of Sidho-Kanho-Birsha University, Purulia for giving permission to do the work. Corresponding author is thankful to DSTFIST [No. SR/FST-LSI/2018/173(c) dated 18/09/2019 for infrastructural support. Authors are also like to express their sincere thanks to the fishermen of the district who generously spent time during the study and shared their expertise in connection with the local fishes.



## INTRODUCTION

Species of the genus *Pallisentis* has been mostly found among the freshwater fishes of Channidae family. The genus *Pallisentis* has been considered in the family of Quadrigyridae Van Cleave (1920) in the subfamily Pallisentinae Van Cleave (1928) (Harada 1935; Yamaguti 1963). Amin et al. (2000) revised the characters of the genus *Pallisentis* under the subgenus *Demidueterospinus*. Thapar (1930) & Baylis (1933) described the species *Pallisentis ophiocephali*. According to Thapar (1930), *Farzandia* is a new genus, whereas, Baylis (1933) considered the genus as synonymous to *Pallisentis*. The type species *P. ophiocephali* was first reported from fresh water fish *Channa marulius* in different places of India (Andhra Pradesh, Odisha, Uttar Pradesh). Soota & Bhattacharya (1982) revised the validity of the species in the genus *Pallisentis* from India. Later Gupta et al. (2012) mentioned two host fishes (family: Channidae) of the genus *Pallisentis* from Bareilly, Uttar Pradesh. Gupta et al. (2015) described the ultrastructure of another species, *P. punctati*, from Bareilly, Uttar Pradesh from the host *C. punctatus*. The present study has been carried out to understand the structural details of proboscis, hooks, spines, and genital parts from light microscopic as well as from scanning electron microscopic study and also to study the retractable nature of unique thorny proboscis from the live specimens.

## MATERIALS AND METHODS

In order to study the prevalence of intestinal acanthocephalan infection among different freshwater fishes from July 2014–August 2015, 50 specimens of *Channa punctatus* (average length 15.4 cm and weight 190 g) and 47 specimens of *Channa striatus* (average length 18.7 cm and weight 320 g) were examined in Chandannagore (22.86°N & 88.36°E) of Hooghly District, West Bengal (Figure 1).

The fish samples were identified after Dey (1996), Talwar & Jhingran (1991). The classification of fishes was done following the keys of Jayaram (1999). White tape-like parasites were found tightly anchored through the proboscis in the intestinal wall of the host fishes. The specimens were carefully removed with a fine brush. Then they were collected and preserved following the methods of Soota (1980). All the parasites were washed by shaking thoroughly in physiological saline and transferred to 70% alcohol for their use in light microscope (LM) study. Pictures were taken with the

help of Labomed CXL microscope. Measurements (based on 20 specimens) were recorded in millimetres and represented by mean followed by ranges. Schematic illustrations were drawn using the software CorelDraw 12, a vector graphics editor by Corel Corporation. For scanning electron microscopic study, specimens were preserved in 4% glutaraldehyde. Then they were transferred to 30%, 50%, and 70% alcohol respectively. After that the specimens were passed through a mixture of absolute alcohol and amyl acetate in 3:1, 1:1 for half an hour and then in 1:3 ratio for two hours. Lastly, they were transferred into 100% amyl acetate. After Critical Point Drying (CPD) the specimens were coated with gold and photos were taken under scanning electron microscope (Hitachi; S-530).

## RESULTS

The present acanthocephalan species were collected from the intestinal wall of the host fishes. Among the collected specimens of the parasite, 20 male and 25 female were identified after studying under a light microscope. The species showed the structural details under light and scanning electron microscopic study.

**General body structure:** White in colour, cylindrical and 5.9–19.4 mm in length (Figure 2A; Image 1A). The body is divided into three regions: proboscis, short neck, and elongated trunk region. Proboscis; with recurved hooks, looks globular just erecting from proboscis receptacle and it seems subglobular when fully erected (Figure 2C; Image 1C,3C). Proboscis receptacle is sac like; cylindrical, single walled, and measures 0.39 (0.38–0.42) mm x 0.104 (0.10–0.12) mm (Image 1B). Two unequal, ribbon like, coiled lemnisci are present within the body cavity. They measure 1.562 (1.553–1.575) mm and 1.861 (1.857–1.920) mm (Image 1B). Anterior and middle part of the body is marked by several circlets of characteristics collar spines and body or trunk spines.

**Proboscis hooks:** The proboscis is armed with four circles (H1, H2, H3, and H4) of recurved hooks and each circlet contains eight hooks (Image 3C). The hooks are similar in shape but different in size (Figure 2F). The hooks are deeply rooted in the proboscis wall and without any striations or grooves. Hooks are dagger shaped (Figure 2G; Image 3D). Initial 0.020–0.028 mm of the hook is projected upwards and the rest bends outwardly. Each hook consists of a backwardly projected blade; a horizontally directed root and a handle embedded into the proboscis wall (Figure 2G; Image 3D).

**Neck:** A short neck, 0.19–0.29 mm, is present in

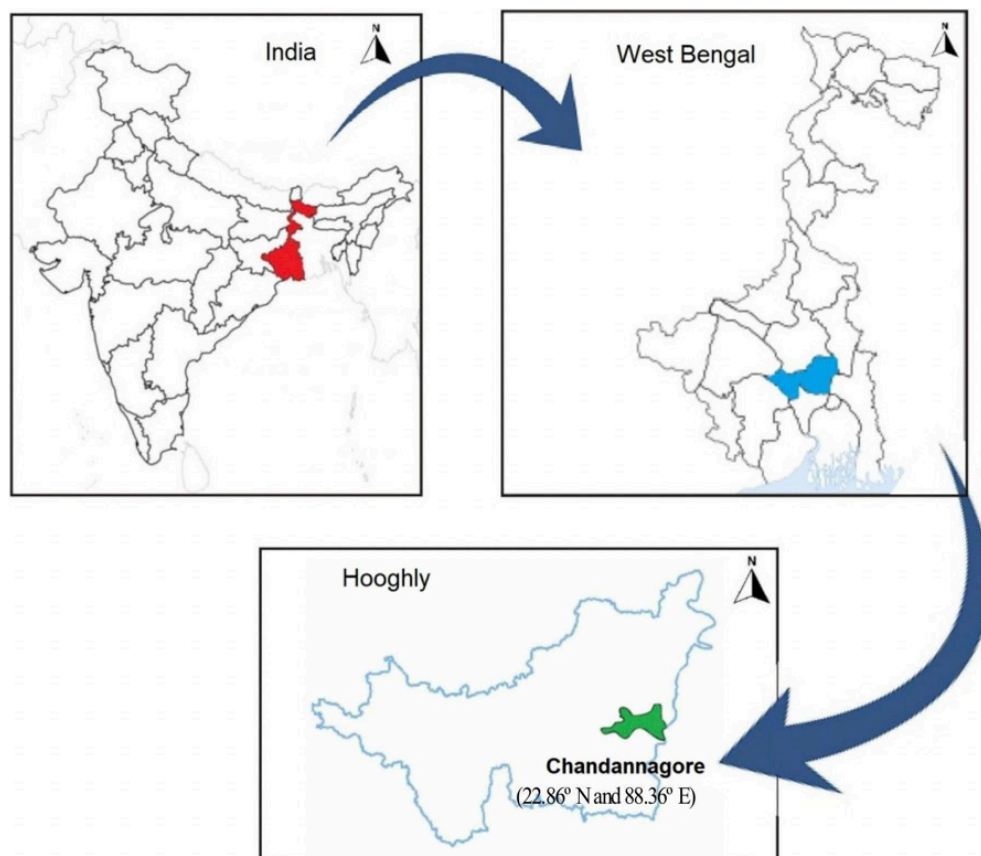


Figure 1. Survey area of *Pallisentis ophiocephali* (Thapar, 1930) Baylis (1933) Chandannagore (22.86°N & 88.36°E) in Hooghly, West Bengal, India.

between the proboscis and the body. The retractor muscles are seen in the neck region (Image 3B). The parasite retracts the proboscis along with the neck into the proboscis receptacle.

**Collar spines:** Behind the neck, there are 13–16 circlets of collar spines and measure 0.027 (0.026–0.030) mm (Figure 2A,H). Collar spines are peepal leaf shaped structure, from the base it tapers gradually but at the distal end it tapers abruptly and ends in a tip. The base of the spine is 0.044 mm in average. The middle portion of the spine bulges outwardly and forms convex surface (Figure 2H; Image 3E,F).

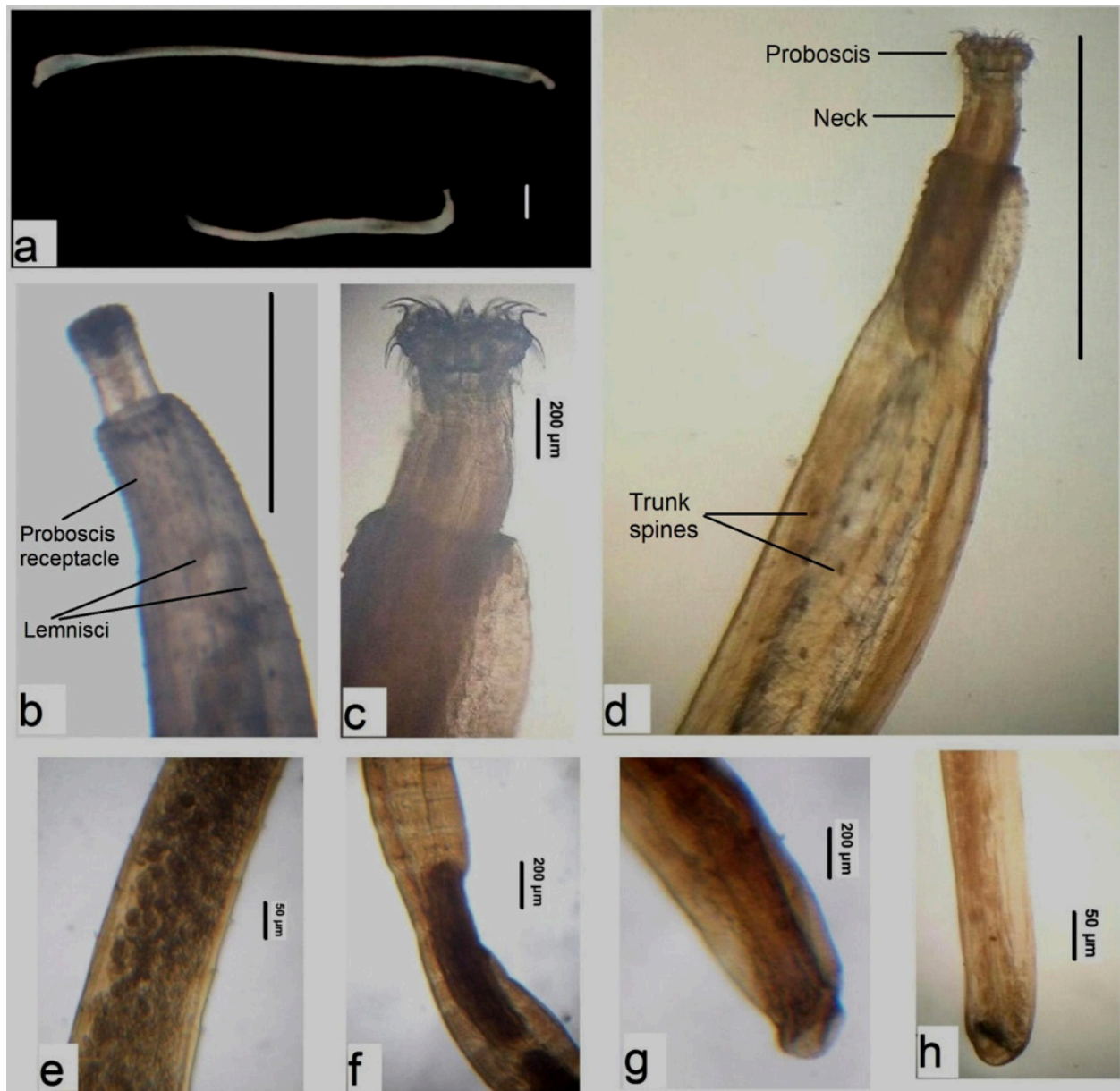
Collar spines zone is followed by a spine free zone of 0.11–0.165 mm and body spines zone.

**Body or trunk spines:** The spine is pointed and projected downwards from a strong rounded base. Body is lined with longitudinal striations. Cement gland is single and syncytial with four–five nuclei. Distance between two spines within a row is 0.075 (0.072–0.078) mm. Distance between two rows is 0.25 (0.244–0.252) mm. Striations are of 0.075 (0.072–0.076) mm distance from each other (Figure 2I; Image 3G,H).

**Male (Based on 20 specimens):** The male is short and measures 6.1 (5.9–8.2) x 0.32 (0.28–0.33) mm (Figure 2C). Proboscis is 0.16 (0.16–0.18) x 0.21 (0.19–0.23) mm. Hooks in first–fourth circle are in the measure of 0.065 (0.064–0.067) mm, 0.06 (0.059–0.062) mm, 0.044 (0.042–0.047) mm, and 0.032 (0.031–0.034) mm respectively. Neck is 0.203 (0.19–0.21) x 0.209 (0.207–0.21) mm. Collar spines are in 13–14 transverse circles, each with 16–17 spines. The length of the collar spines is 0.023 (0.022–0.024) mm. Trunk spines are in 26–29 circles. Numbers of trunk spines range from 14–15 in each circle. The length of the spines is 0.034 (0.032–0.036) mm. Testes are equal and measures 0.621 (0.616–0.643) mm. From each testis a vas deferens emerges and associates with cement gland, cement reservoir, and joins bursa. The bursa measures 0.181 (0.176–0.192) mm in length (Image 1G).

**Female (Based on 25 specimens):** Females are larger than males. It measures 17.1 (16.7–19.4) x 0.54 (0.52–0.60) mm (Figure 2D). Proboscis measures 0.18 (0.17–0.20) x 0.21 (0.19–0.23) mm. Proboscis hooks measure 0.079 (0.077–0.080) mm, 0.067 (0.065–0.072)





**Image 1.** Light microscopic pictures of *Pallisentis ophiocephali* (Thapar, 1930) Baylis, 1933: A—Adult specimens | B—Anterior region of male | C—Proboscis | D—Anterior region of female | E—Middle portion of female | F—Middle portion of male | G—Posterior region of male | H—Posterior region of female. (Bar = 1 mm). © Prabir Banerjee.

mm, 0.052 (0.048–0.053) mm, and 0.037 (0.032–0.044) mm respectively in the four successive circlets. The neck measured 0.282 (0.280–0.293) x 0.206 (0.202–0.21) mm. Collar spines are arranged in 14–16 circles. Each circle of collar spines is layered with 16–17 spines. Collar spines are 0.027 (0.026–0.030) mm in length. Numbers of circles of body spines range from 57–60 and, there are 14–15 spines in each circle. Trunk spines are 0.044 (0.042–0.046) mm in length. Whole body cavity of mature worm is filled with large number of eggs (Figure 2J; Image 1H). Eggs are 0.053 (0.051–0.062) x 0.022 (0.021–0.033) mm

and ovarian balls are 0.107(0.105–0.113) x 0.051(0.050–0.054) mm (Image 1E). The posterior region is rounded with a small gonopore (Figure 2E & Image 1H).

#### Observations on retractable proboscis

The inward and outward movement of retractable proboscis from the proboscis receptacle was observed on ten live specimens. The time of stretching in and out of the proboscis for each step was also calculated. The total process can be divided into three consecutive steps. First step is the emergence of the proboscis from

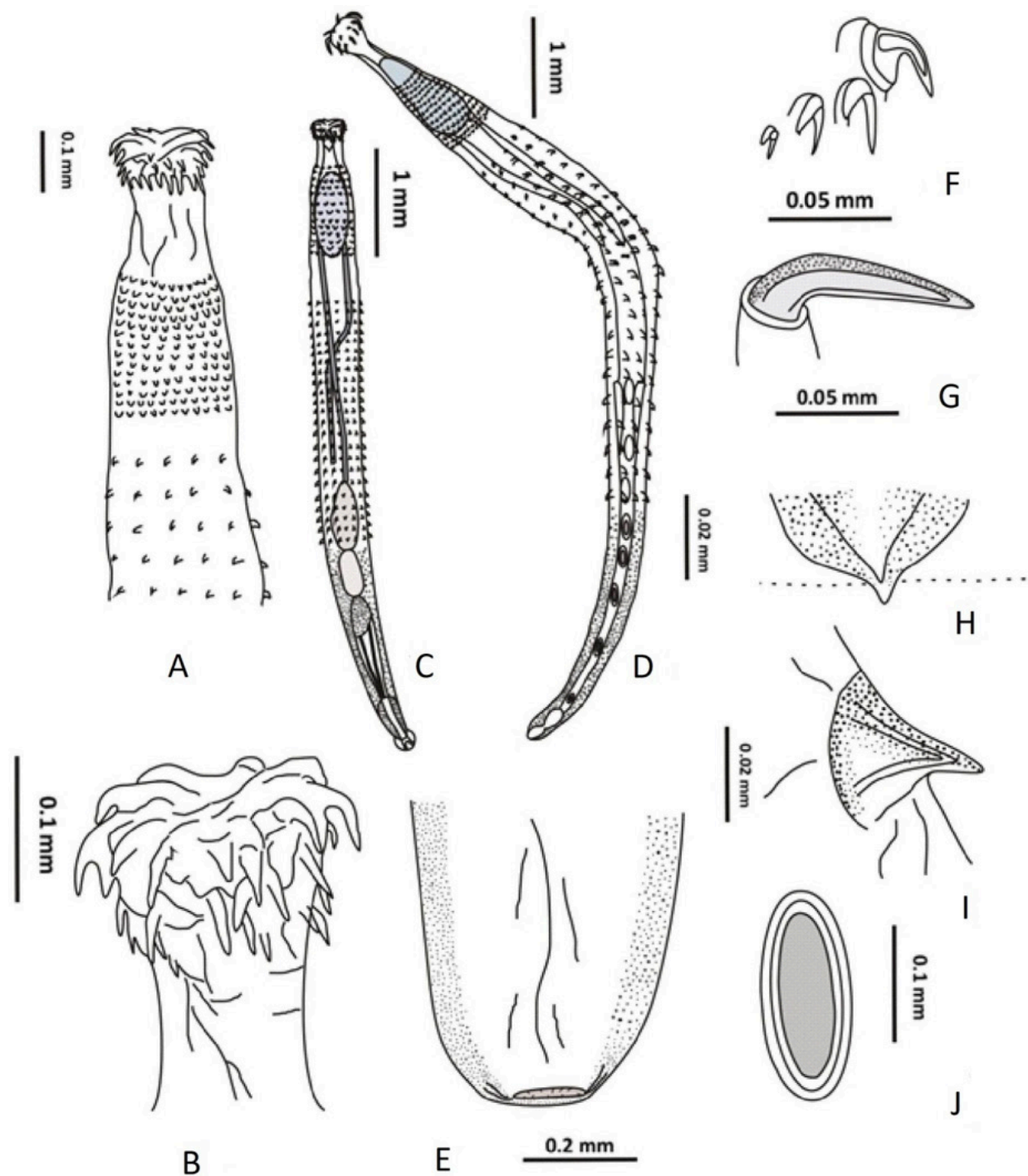


Figure 2. Schematic illustrations of *Pallisentis ophiocephali* (Thapar, 1930) Baylis, 1933: A—Anterior region | B—proboscis | C—Male specimen | D—Female specimen | E—Posterior region of female | F—Different types of proboscis hooks | G—Proboscis hook | H—Collar spine | I—Body spine | J—Egg.

proboscis receptacle and the recorded time was 27.3 (27.12–27.42) seconds (Image 2A–E). After emerging, the fully stretched proboscis paused for 32.52 (32.48–32.58) seconds (Image 2F). Lastly, the species took 12.08 (11.90–12.11) seconds for the inward movement, i.e.,

retraction was much faster than eversion. The total time for the completion of the whole process was 71.90 (71.84–72.33) seconds. The repetition of the whole process began after a pause of 19.20 (15.55–22.73) seconds.

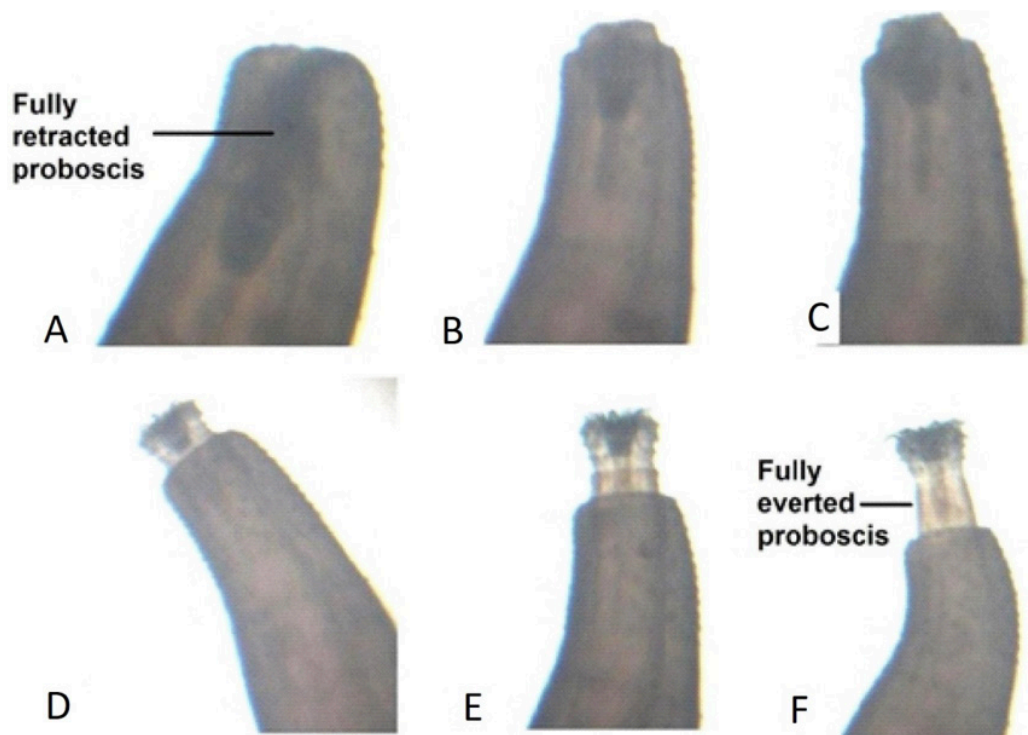


Image 2. Light microscopic pictures of retractable proboscis of *Pallisentis ophiocephali* (Thapar, 1930) Baylis, 1933 in different stages: A—Fully retracted proboscis | B–E—Outward movement of the proboscis | F—Fully stretched proboscis. © Prabir Banerjee.

**Type host:** *Channa marulius* (Hamilton, 1822).

**Other host from different genera:** *Nandus nandus* (Hamilton), *Grihiria (Cirrhina) cupla*, *Ompokpabda* (Hamilton), *Xenentodon cancila* (Hamilton), *Rana trigrina* (Daudin).

**Other hosts in this study:** *Channa punctatus* (Bloch, 1793) and *Channa striatus* (Bloch, 1793).

**Distribution:** Andhra Pradesh, Uttar Pradesh, Odisha, West Bengal of India.

**Site of infection:** Mostly in stomach, in few cases in proximal intestine.

**Present collection Locality:** Chandannagore (22.86 N & 88.36 E), Hooghly, West Bengal.

## DISCUSSION

The present species has been collected from the wall of the intestinal tract of *Channa punctatus* and *Channa striatus*. Prevalence of the infection in two host fishes were recorded 26% and 21.2%, respectively. According to Soota & Bhattacharya (1982) and Bhattacharya (2007), members of the genus *Pallisentis* can be differentiated by the shape and size of the proboscis and hooks. The studied specimens are compared with *P. ophiocephali* (Thapar, 1930) Baylis, 1933, *P. colisai*

(Sarkar, 1954) and *P. punctati* (Gupta et al. 2015). Comparing the present specimen with other closely related species, the present acanthocephalan species has been considered as *P. ophiocephali* as described by Thapar (1930) and later Baylis (1933) (Table 1). The species has been reported from Hooghly for the first time. In the description of type species, the geographical distribution was not specifically mentioned. Gupta et al. (2012) mentioned *Channa punctatus* as a host of *P. ophiocephali*. SEM studies reveal the detailed proboscis structure, arrangement of hooks and retractor muscles in the neck region. The scanning electron microscopic pictures also provide the surface structural details with high magnification that facilitates the understanding of the spatial relationships among surface structures and other minute organelle. Hooks and spines are some useful taxonomic tools for differentiating subgenera and species of acanthocephala. Morphometrically identical species generally have been examined and identified with the help of arrangements of hooks and spines. Moreover, some preliminary data has also been recorded from the retractable movements of the proboscis along with the required time span. The inward movement of the proboscis is comparatively faster than the outward movement. Further examinations are required to explore the untouched area of acanthocephalan biology.



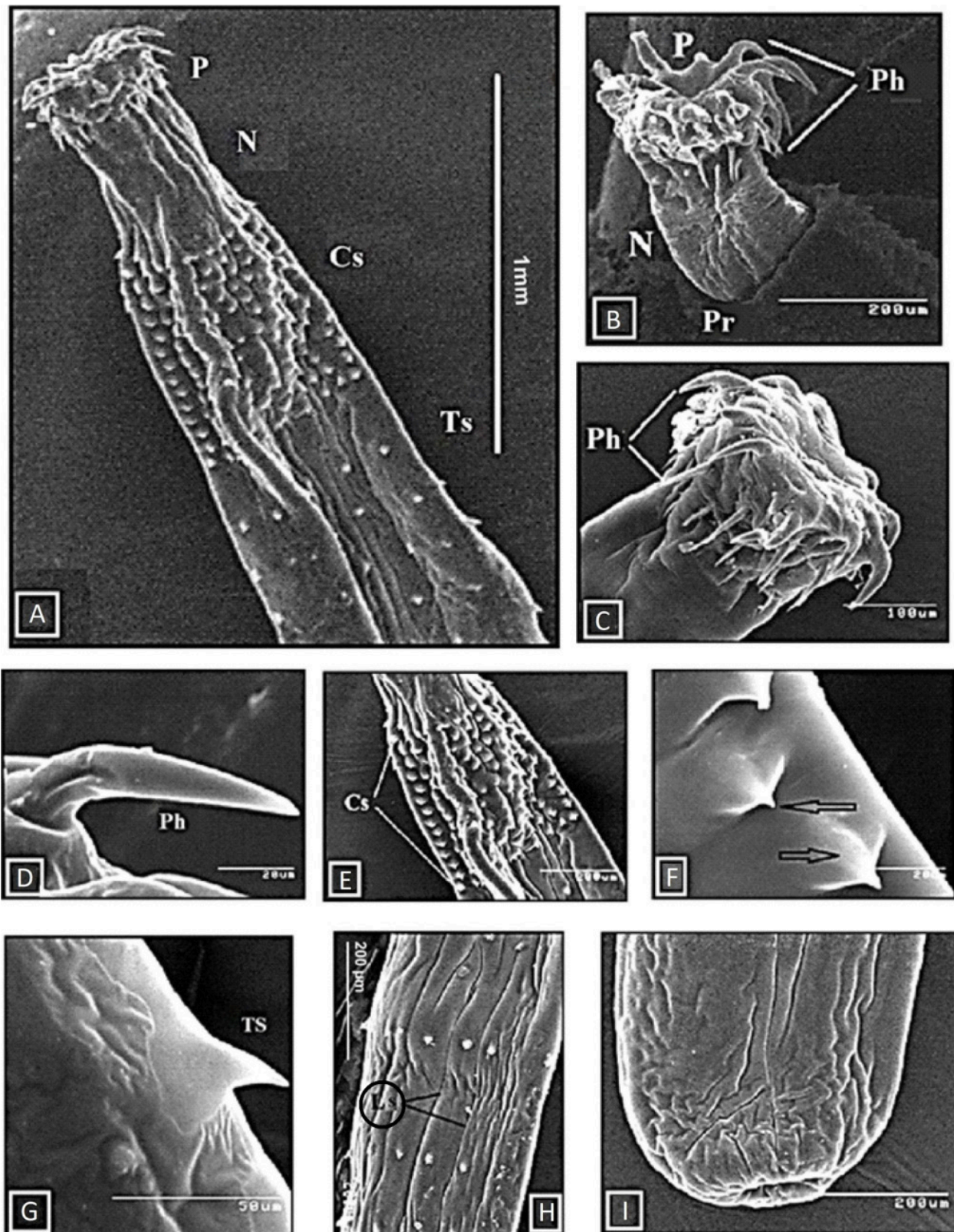


Image 3. Scanning Electron Microscopic pictures of female specimen of *Pallisentis ophiocephali* (Thapar, 1930) Baylis, 1933: A–C—Pictures showing the body with proboscis (P—Proboscis, N—Neck, Cs—Collar spine, Bs—Body spine, Ph—Proboscis hooks, Pr—Proboscis receptacle) | D—One proboscis hook | E–F—Collar spines (←) shows pointed tip and (→) indicates convex surface | G–H—Trunk spine (Ts—Trunk spine, Ls—Longitudinal striations) | I— Male posterior end (with retracted bursa). © Prabir Banerjee.

Table 1. Morphometric comparison of *Pallisentis ophioccephali* (Thapar, 1930) Baylis (1933) with other closely related species.

	<i>P. ophioccephali</i> (Thapar, 1930) Baylis, (1933) (Present species)	<i>P. ophioccephali</i> (Thapar, 1930) Baylis, (1933) (Type species)	<i>P. colisai</i> (Sarkar 1954)	<i>P. punctati</i> (Gupta et al. 2015)
Host	<i>Channa punctatus</i> , <i>Channa striatus</i>	<i>Channa marulius</i>	<i>Colisa fasciatus</i>	<i>Channa punctatus</i>
Location	Hooghly, West Bengal	Different places of India	Delhi	Bareilly, Uttar Pradesh
Size of body (L x W)	♂ 6.1 (5.9–8.2) x 0.32 (0.28–0.33) ♀ 17.1 (16.7–19.4) x 0.54 (0.52–0.60)	♂ 05.99 x 0.34 ♀ 14.3 x 0.495	♂ 4.13 x 0.39 ♀ 5.4–12.9 x 0.610	♂ (3.015–5.899) x (0.307–0.461) ♀ (5.472–14.791) x (0.461–0.820)
Size of proboscis (L x W)	♂ 0.16 (0.16–0.18) x 0.21 (0.19–0.23) ♀ 0.18 (0.17–0.20) x 0.21 (0.19–0.23)	♂ 0.14 x 0.22 ♀ 0.175 x 0.242	♂ 0.13 x .15 ♀ –	♂ (0.104–0.118) x (0.090–0.120) ♀ (0.126–0.180) x (0.140–0.198)
Length of neck (L x W)	♂ 0.203 (0.19–0.21) x 0.209 (0.207–0.21) ♀ 0.282 (0.280–0.293) x 0.206 (0.202–0.21)	♂ 0.198 x 0.22 ♀ 0.308 x 0.22	♂ 0.26 x 0.17 ♀ –	♂ (0.190–0.255) x (0.108–0.118) ♀ (0.288–0.558) x (0.162–0.273)
Proboscis hooks length H1	♂ 0.065 (0.064–0.067), ♀ 0.079 (0.077–0.080)	0.076–0.085	0.08 x 0.007	♂ 0.057, ♀ 0.073
H2	♂ 0.06 (0.059–0.062), ♀ 0.067 (0.065–0.072)	0.068–0.076	0.07	♂ 0.054, ♀ 0.063
H3	♂ 0.044 (0.042–0.047), ♀ 0.052 (0.048–0.053)	0.051	0.03	♂ 0.021, ♀ 0.025
H4	♂ 0.032 (0.031–0.034), ♀ 0.037 (0.032–0.044)	0.034–0.0425	0.026	♂ 0.018, ♀ 0.018
Lemnisci	1.861 (1.857–1.920)	1.925	2.2 x 0.05	–
No. of collar spines	♂ 13–14 x 16–17 ♀ 14–16 x 16–17	♂ 11–13 x 14–16 ♀ 13–14 x 14–16	♂ 16 x 14–16, ♀ –	♂ 14, ♀ 22
Collar spines length	♂ 0.023 (0.022–0.024) x (0.016–0.018), ♀ 0.027 (0.026–0.03) x 0.023 (0.022–0.025)	–	–	♂ (0.021–0.028) x (0.010–0.014) ♀ (0.025–0.046) x (0.010–0.025)
No. of body spines	♂ 26–29 x 14–15 ♀ 57–60 x 14–15	♂ 28–34, ♀ 60–65	♂ 22 x 12–16, ♀ 67	♂ 12, ♀ 14–18
Body spines length	♂ 0.034 (0.032–0.036) x 0.013 (0.010–0.016) ♀ 0.044 (0.042–0.046) x 0.016 (0.014–0.022)	–	–	♂ (0.021–0.028) x (0.010–0.018) ♀ (0.036–0.057) x (0.014–0.025)
Testis	0.621 (0.616–0.643)	0.605–0.66	(1) 0.39 x 0.17 (2) 0.35 x 0.17	(0.374–0.684) x (0.133–0.216)
Egg	0.053 (0.051–0.062) x 0.022 (0.021–0.033)	0.068 x 0.025	–	(0.028–0.061) x (0.010–0.025)
Ovarian balls	0.107 (0.105–0.113) x 0.051 (0.50–0.054)	–	–	(0.039–0.064) x (0.025–0.054)

## REFERENCES

- Amin, O.M., R.A. Heckmann, N. Van Ha, P. Van Luc & P.N. Doanh (2000). Revision of the genus *Pallisentis* (Acanthocephala: Quadrigyridae) with the erection of three new subgenera, the description of *Pallisentis* (*Brevitritospinus*) *vietnamsis* subgen. et sp. n., a key to species of *Pallisentis*, and the description of a new Quadrigyrid genus, *Pararaosentis* gen. n. *Comparative Parasitology* 67(1): 40–50.
- Baylis, H.A. (1933). On some parasitic worms from Java with remarks on the acanthocephalan genus *Pallisentis*. *Annals and Magazine of Natural History* 10(12): 559–573.
- Bhattacharya, S.B. (2007). Handbook on Indian Acanthocephala. Zoological Survey of India, Kolkata, pp. 1–255 <https://agris.fao.org/agris-search/search.do?recordID=US201300123591>
- Dey, V.K. (1996). Ornamental Fishes and Handbook of Aqua farming. The Marine Products Export Development Authority, Cochin. Entrepreneurship Development. Central Institute of Freshwater Aquaculture, Bhubaneswar: 1–6
- Gupta, N., D.K. Gupta & P. Singhal (2015). Description of *Pallisentis* (*Brevitritospinus*) *punctati* n. sp. (Acanthocephala: Quadrigyridae) from *Channapunctatus* in Bareilly, Uttar Pradesh, India. *Iranian Journal of Parasitology* 10(4): 605–616. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4724838/>
- Gupta, N., P. Singhal & D.K. Gupta (2012). Population dynamics of a parasite *Pallisentis* in two species of fish *Channapunctatus* and *Channa striatus*. *Journal of Environmental Biology* 33: 195–199.
- Harada, I. (1935). Zur Acanthocephalen fauna von Japan. Memoirs of the Faculty of Science and Agriculture, Taihoku Imperial University 14: 7–23.
- Jayaram, K.C. (1999). The freshwater fishes of the Indian region. Narendra Publishing House, New Delhi, India, pp 1–551
- Sarkar, H.L. (1954). On a new acanthocephalan *Pallisentis colisai*, from the fish *Oolisajasciatus* (Bloch & Schn.) with a note on *Acanthogyrus acanthogyrus* Thapar, from the fish *Labeorohita* (Hamilton) *Records of the Indian Museum* 52: 349–362
- Soota, T.D. (1980). Collection and preservation of trematodes and cestodes. *Proceedings of the Workshop on Techniques in Parasitology Zoological Survey of India*, pp 27–29

**Soota, T.D., & S.B. Bhattacharya (1982).** On the validity of the species of the genus *Pallisentis* Van Cleave, 1928(Acanthocephala: Pallisentidae) from the Indian subcontinent. *Records of the Zoological Survey of India* 80: 157–167.

**Talwar, P.K. & A.G. Jhingran (1991).** Inland fishes of India and adjacent countries. Vol. 1 & 2. Oxford & IBH Publishing Co. Pvt. Ltd. New Delhi, 1–1158

**Thapar, G.S. (1930).** On *Farzandia*, a new genus of Acanthocephalid worms, from the intestine of *Ophiocephalus marulius*. *Annals and*

*Magazine of Natural History* 10(9): 76–8.

**Van Cleave, H.J. (1920).** Notes on life-cycle of two species of Acanthocephala from fresh water fishes. *Journal of Parasitology* 6(4): 167–172.

**Van Cleave, H.J. (1928).** Two new genera and species of Acanthocephala from fishes of India. *Records of the Indian Museum* 30(2):147–149.

**Yamaguti, S. (1963).** Systema Helminthum. Vol. 5: Acanthocephala. Interscience Publish. New York, London, 423 pp.







Dr. George Mathew, Kerala Forest Research Institute, Peechi, India  
Dr. John Noyes, Natural History Museum, London, UK  
Dr. Albert G. Orr, Griffith University, Nathan, Australia  
Dr. Sameer Padhye, Katholieke Universiteit Leuven, Belgium  
Dr. Nancy van der Poorten, Toronto, Canada  
Dr. Kareen Schnabel, NIWA, Wellington, New Zealand  
Dr. R.M. Sharma, (Retd.) Scientist, Zoological Survey of India, Pune, India  
Dr. Manju Siliwal, WILD, Coimbatore, Tamil Nadu, India  
Dr. G.P. Sinha, Botanical Survey of India, Allahabad, India  
Dr. K.A. Subramanian, Zoological Survey of India, New Alipore, Kolkata, India  
Dr. P.M. Sureshan, Zoological Survey of India, Kozhikode, Kerala, India  
Dr. R. Varatharajan, Manipur University, Imphal, Manipur, India  
Dr. Eduard Vives, Museu de Ciències Naturals de Barcelona, Terrassa, Spain  
Dr. James Young, Hong Kong Lepidopterists' Society, Hong Kong  
Dr. R. Sundararaj, Institute of Wood Science & Technology, Bengaluru, India  
Dr. M. Nithyanandan, Environmental Department, La Ala Al Kuwait Real Estate. Co. K.S.C., Kuwait  
Dr. Himender Bharti, Punjabi University, Punjab, India  
Mr. Purnendu Roy, London, UK  
Dr. Saito Motoki, The Butterfly Society of Japan, Tokyo, Japan  
Dr. Sanjay Sondhi, TITLI TRUST, Kalpavriksh, Dehradun, India  
Dr. Nguyen Thi Phuong Lien, Vietnam Academy of Science and Technology, Hanoi, Vietnam  
Dr. Nitin Kulkarni, Tropical Research Institute, Jabalpur, India  
Dr. Robin Wen Jiang Ngiam, National Parks Board, Singapore  
Dr. Lionel Monod, Natural History Museum of Geneva, Genève, Switzerland.  
Dr. Asheesh Shivam, Nehru Gram Bharti University, Allahabad, India  
Dr. Rosana Moreira da Rocha, Universidade Federal do Paraná, Curitiba, Brasil  
Dr. Kurt R. Arnold, North Dakota State University, Saxony, Germany  
Dr. James M. Carpenter, American Museum of Natural History, New York, USA  
Dr. David M. Claborn, Missouri State University, Springfield, USA  
Dr. Kareen Schnabel, Marine Biologist, Wellington, New Zealand  
Dr. Amazonas Chagas Júnior, Universidade Federal de Mato Grosso, Cuiabá, Brasil  
Mr. Monsoon Jyoti Gogoi, Assam University, Silchar, Assam, India  
Dr. Heo Chong Chin, Universiti Teknologi MARA (UiTM), Selangor, Malaysia  
Dr. R.J. Shiel, University of Adelaide, SA 5005, Australia  
Dr. Siddharth Kulkarni, The George Washington University, Washington, USA  
Dr. Priyadarsanan Dharma Rajan, ATREE, Bengaluru, India  
Dr. Phil Alderslade, CSIRO Marine And Atmospheric Research, Hobart, Australia  
Dr. John E.N. Veron, Coral Reef Research, Townsville, Australia  
Dr. Daniel Whitmore, State Museum of Natural History Stuttgart, Rosenstein, Germany.  
Dr. Yu-Feng Hsu, National Taiwan Normal University, Taipei City, Taiwan  
Dr. Keith V. Wolfe, Antioch, California, USA  
Dr. Siddharth Kulkarni, The Hormiga Lab, The George Washington University, Washington, D.C., USA  
Dr. Tomas Ditrich, Faculty of Education, University of South Bohemia in Ceske Budejovice, Czech Republic  
Dr. Mihaly Foldvari, Natural History Museum, University of Oslo, Norway  
Dr. V.P. Uniyal, Wildlife Institute of India, Dehradun, Uttarakhand 248001, India  
Dr. John T.D. Caleb, Zoological Survey of India, Kolkata, West Bengal, India  
Dr. Priyadarsanan Dharma Rajan, Ashoka Trust for Research in Ecology and the Environment (ATREE), Royal Enclave, Bangalore, Karnataka, India

**Fishes**

Dr. Neelesh Dahanukar, IISER, Pune, Maharashtra, India  
Dr. Topiltzin Contreras MacBeath, Universidad Autónoma del estado de Morelos, México  
Dr. Heok Hee Ng, National University of Singapore, Science Drive, Singapore  
Dr. Rajeev Raghavan, St. Albert's College, Kochi, Kerala, India  
Dr. Robert D. Sluka, Chiltern Gateway Project, A Rocha UK, Southall, Middlesex, UK  
Dr. E. Vivekanandan, Central Marine Fisheries Research Institute, Chennai, India  
Dr. Davor Zanella, University of Zagreb, Zagreb, Croatia  
Dr. A. Biju Kumar, University of Kerala, Thiruvananthapuram, Kerala, India  
Dr. Akhilesh K.V., ICAR-Central Marine Fisheries Research Institute, Mumbai Research Centre, Mumbai, Maharashtra, India  
Dr. J.A. Johnson, Wildlife Institute of India, Dehradun, Uttarakhand, India  
Dr. R. Ravinesh, Gujarat Institute of Desert Ecology, Gujarat, India

**Amphibians**

Dr. Sushil K. Dutta, Indian Institute of Science, Bengaluru, Karnataka, India  
Dr. Annemarie Ohler, Muséum national d'Histoire naturelle, Paris, France

**Reptiles**

Dr. Gernot Vogel, Heidelberg, Germany  
Dr. Raju Vyas, Vadodara, Gujarat, India  
Dr. Pritpal S. Soorae, Environment Agency, Abu Dubai, UAE.  
Prof. Dr. Wayne J. Fuller, Near East University, Mersin, Turkey  
Prof. Chandrashekher U. Rivonker, Goa University, Taleigao Plateau, Goa. India  
Dr. S.R. Ganesh, Chennai Snake Park, Chennai, Tamil Nadu, India  
Dr. Himansu Sekhar Das, Terrestrial & Marine Biodiversity, Abu Dhabi, UAE

**Birds**

Dr. Hem Sagar Baral, Charles Sturt University, NSW Australia  
Mr. H. Byju, Coimbatore, Tamil Nadu, India  
Dr. Chris Bowden, Royal Society for the Protection of Birds, Sandy, UK  
Dr. Priya Davidar, Pondicherry University, Kalapet, Puducherry, India  
Dr. J.W. Duckworth, IUCN SSC, Bath, UK  
Dr. Rajah Jayapal, SAGON, Coimbatore, Tamil Nadu, India  
Dr. Rajiv S. Kalsi, M.L.N. College, Yamuna Nagar, Haryana, India  
Dr. V. Santharam, Rishi Valley Education Centre, Chittoor Dt., Andhra Pradesh, India  
Dr. S. Balachandran, Bombay Natural History Society, Mumbai, India  
Mr. J. Praveen, Bengaluru, India  
Dr. C. Srinivasulu, Osmania University, Hyderabad, India  
Dr. K.S. Gopi Sundar, International Crane Foundation, Baraboo, USA  
Dr. Gombobaatar Sunde, Professor of Ornithology, Ulaanbaatar, Mongolia  
Prof. Reuven Yosef, International Birding & Research Centre, Eilat, Israel  
Dr. Taej Mundkur, Wetlands International, Wageningen, The Netherlands  
Dr. Carol Inskipp, Bishop Auckland Co., Durham, UK  
Dr. Tim Inskipp, Bishop Auckland Co., Durham, UK  
Dr. V. Gokula, National College, Tiruchirappalli, Tamil Nadu, India  
Dr. Arkady Lelej, Russian Academy of Sciences, Vladivostok, Russia  
Dr. Simon Dowell, Science Director, Chester Zoo, UK  
Dr. Mário Gabriel Santiago dos Santos, Universidade de Trás-os-Montes e Alto Douro, Quinta de Prados, Vila Real, Portugal  
Dr. Grant Connette, Smithsonian Institution, Royal, VA, USA  
Dr. M. Zafar-ul Islam, Prince Saud Al Faisal Wildlife Research Center, Taif, Saudi Arabia

**Mammals**

Dr. Giovanni Amori, CNR - Institute of Ecosystem Studies, Rome, Italy  
Dr. Anwaruddin Chowdhury, Guwahati, India  
Dr. David Mallon, Zoological Society of London, UK  
Dr. Shomita Mukherjee, SAGON, Coimbatore, Tamil Nadu, India  
Dr. Angie Appel, Wild Cat Network, Germany  
Dr. P.O. Nameer, Kerala Agricultural University, Thrissur, Kerala, India  
Dr. Ian Redmond, UNEP Convention on Migratory Species, Lansdown, UK  
Dr. Heidi S. Riddle, Riddle's Elephant and Wildlife Sanctuary, Arkansas, USA  
Dr. Karin Schwartz, George Mason University, Fairfax, Virginia.  
Dr. Lala A.K. Singh, Bhubaneswar, Orissa, India  
Dr. Mewa Singh, Mysore University, Mysore, India  
Dr. Paul Racey, University of Exeter, Devon, UK  
Dr. Honnavalli N. Kumara, SAGON, Anaikatty P.O., Coimbatore, Tamil Nadu, India  
Dr. Nishith Dharaiya, HNG University, Patan, Gujarat, India  
Dr. Spartaco Gippoliti, Socio Onorario Società Italiana per la Storia della Fauna "Giuseppe Altobello", Rome, Italy  
Dr. Justus Joshua, Green Future Foundation, Tiruchirappalli, Tamil Nadu, India  
Dr. H. Raghuram, The American College, Madurai, Tamil Nadu, India  
Dr. Paul Bates, Harison Institute, Kent, UK  
Dr. Jim Sanderson, Small Wild Cat Conservation Foundation, Hartford, USA  
Dr. Dan Challender, University of Kent, Canterbury, UK  
Dr. David Mallon, Manchester Metropolitan University, Derbyshire, UK  
Dr. Brian L. Cypher, California State University-Stanislaus, Bakersfield, CA  
Dr. S.S. Talmale, Zoological Survey of India, Pune, Maharashtra, India  
Prof. Karan Bahadur Shah, Budhanilakantha Municipality, Kathmandu, Nepal  
Dr. Susan Cheyne, Borneo Nature Foundation International, Palangkaraja, Indonesia  
Dr. Hemanta Kafley, Wildlife Sciences, Tarleton State University, Texas, USA

**Other Disciplines**

Dr. Aniruddha Belsare, Columbia MO 65203, USA (Veterinary)  
Dr. Mandar S. Paingankar, University of Pune, Pune, Maharashtra, India (Molecular)  
Dr. Jack Tordoff, Critical Ecosystem Partnership Fund, Arlington, USA (Communities)  
Dr. Ulrike Streicher, University of Oregon, Eugene, USA (Veterinary)  
Dr. Hari Balasubramanian, EcoAdvisors, Nova Scotia, Canada (Communities)  
Dr. Rayanna Hellem Santos Bezerra, Universidade Federal de Sergipe, São Cristóvão, Brazil  
Dr. Jamie R. Wood, Landcare Research, Canterbury, New Zealand  
Dr. Wendy Collinson-Jonker, Endangered Wildlife Trust, Gauteng, South Africa  
Dr. Rajeshkumar G. Jani, Anand Agricultural University, Anand, Gujarat, India  
Dr. O.N. Tiwari, Senior Scientist, ICAR-Indian Agricultural Research Institute (IARI), New Delhi, India  
Dr. L.D. Singla, Guru Angad Dev Veterinary and Animal Sciences University, Ludhiana, India  
Dr. Rupika S. Rajakaruna, University of Peradeniya, Peradeniya, Sri Lanka  
Dr. Bahar Baviskar, Wild-CER, Nagpur, Maharashtra 440013, India

**Reviewers 2019–2021**

Due to pausity of space, the list of reviewers for 2018–2020 is available online.

The opinions expressed by the authors do not reflect the views of the Journal of Threatened Taxa, Wildlife Information Liaison Development Society, Zoo Outreach Organization, or any of the partners. The journal, the publisher, the host, and the partners are not responsible for the accuracy of the political boundaries shown in the maps by the authors.

Print copies of the Journal are available at cost. Write to:  
The Managing Editor, JoTT,  
c/o Wildlife Information Liaison Development Society,  
43/2 Varadarajulu Nagar, 5<sup>th</sup> Street West, Ganapathy, Coimbatore,  
Tamil Nadu 641006, India  
ravi@threatenedtaxa.org

**Journal of Threatened Taxa** is indexed/abstracted in Bibliography of Systematic Mycology, Biological Abstracts, BIOSIS Previews, CAB Abstracts, EBSCO, Google Scholar, Index Copernicus, Index Fungorum, JournalSeek, National Academy of Agricultural Sciences, NewJour, OCLC WorldCat, SCOPUS, Stanford University Libraries, Virtual Library of Biology, Zoological Records.

NAAS rating (India) 5.64



[www.threatenedtaxa.org](http://www.threatenedtaxa.org)

OPEN ACCESS



The Journal of Threatened Taxa (JoTT) is dedicated to building evidence for conservation globally by publishing peer-reviewed articles online every month at a reasonably rapid rate at [www.threatenedtaxa.org](http://www.threatenedtaxa.org). All articles published in JoTT are registered under [Creative Commons Attribution 4.0 International License](https://creativecommons.org/licenses/by/4.0/) unless otherwise mentioned. JoTT allows unrestricted use, reproduction, and distribution of articles in any medium by providing adequate credit to the author(s) and the source of publication.

ISSN 0974-7907 (Online) | ISSN 0974-7893 (Print)

March 2023 | Vol. 15 | No. 3 | Pages: 22771–22926

Date of Publication: 26 March 2023 (Online & Print)

DOI: 10.11609/jott.2023.15.3.22771-22926

## Article

**Documenting butterflies with the help of citizen science in Darjeeling-Sikkim Himalaya, India**

– Aditya Pradhan, Rohit George & Sailendra Dewan, Pp. 22771–22790

## Communications

**Determinants of diet selection by Blackbuck *Antelope cervicapra* at Point Calimere, southern India: quality also matters**

– Selvarasu Sathishkumar, Subhasish Arandhara & Nagarajan Baskaran, Pp. 22791–22802

**An update on the conservation status of Tibetan Argali *Ovis ammon hodgsoni* (Mammalia: Bovidae) in India**

– Munib Khanyari, Rigzen Dorjay, Sherab Lobzang, Karma Sonam & Kulbhushansingh Ramesh Suryawanshi, Pp. 22803–22812

**An annotated checklist of the avifauna of Karangadu mangrove forest, Ramanathapuram, Tamil Nadu, with notes on the site's importance for waterbird conservation**

– H. Byju, N. Raveendran, S. Ravichandran & R. Kishore, Pp. 22813–22822

**Habitats and nesting habits of Streaked Weaver *Ploceus manyar* in select wetlands in the northern districts of Tamil Nadu, India**

– M. Pandian, Pp. 22823–22833

**Genetic evidence on the occurrence of *Channa harcourtbutleri* (Annandale, 1918) in Eastern Ghats, India: first report from mainland India**

– Boni Amin Laskar, Harikumar Adimalla, Shantanu Kundu, Deepa Jaiswal & Kailash Chandra, Pp. 22834–22840

**Redefining *Pallisentis ophiocephali* (Thapar, 1930) Baylis, 1933 from two freshwater fishes of Channidae family of Hooghly District, West Bengal, India**

– Prabir Banerjee & Biplob Kumar Modak, Pp. 22841–22849

**A new termite species of the genus *Bulbitermes* (Blattodea: Isoptera: Termitidae) from Meghalaya, India**

– Khired Sankar Das & Sudipta Choudhury, Pp. 22850–22858

**First report of the beetle *Henosepilachna nana* (Kapur, 1950) (Coleoptera: Coccinellidae) from Maharashtra with special reference to molecular phylogeny and host plants**

– Priyanka B. Patil & Sunil M. Gaikwad, Pp. 22859–22865

**Assessment of population, habitat, and threats to *Cycas pectinata* Buch.-Ham. (Cycadaceae), a vulnerable cycad in Bhutan**

– Sonam Tobgay, Tenjur Wangdi, Karma Wangchuck, Jamyang Dolkar & Tshering Nidup, Pp. 22866–22873

**Ecological niche modeling to find potential habitats of *Vanda thwaitesii*, a notified endangered orchid of Western Ghats, India**

– S. William Decruse, Pp. 22874–22882

**Occurrence of opportunistic invasive macroalgal genus *Caulerpa* and *Halimeda opuntia* in coral reefs of Gulf of Mannar**

– Chatragadda Ramesh, Koushik Sadhukhan, T. Shunmugaraj & M.V. Ramana Murthy, Pp. 22883–22888

## Short Communications

**Diversity of bees in two crops in an agroforestry ecosystem in Kangsabati South Forest Division, Purulia, West Bengal, India**

– Pallabi Das & V.P. Uniyal, Pp. 22889–22893

**An extended distribution and rediscovery of *Rhynchosia suaveolens* (L.f.) DC. (Fabaceae) for Maharashtra, India**

– Ajay K. Mishra, Vedhika Gupta, Ajay V. Rajurkar, Pankaj A. Dhole & Vijay V. Wagh, Pp. 22894–22899

## Notes

**New distribution records of two uncommon microhylid frogs, *Melanobatrachus indicus* Beddome, 1878 and *Mysticellus franki* Garg & Biju, 2019 from Nelliampathy, Kerala, India**

– Madhura Agashe, Avrajjal Ghosh, K. Dilshad, Maitreya Sil & Aniruddha Datta-Roy, Pp. 22900–22904

**First record of Brilliant Flash *Rapala melida nicevillei* (Swinhoe, 1911) (Lepidoptera: Lycaenidae: Theclinae) to Meghalaya, India**

– Suman Bhowmik, Atanu Bose, Jayant Ghanshyam Bhoir, Atanu Bora, Suraj Das, Shyamal Kumar Laha & Ngangom Aomoa, Pp. 22905–22907

**A note on the occurrence of *Cremnuchonchus conicus* (Blanford, 1870) in Mumbai, India**

– Naman Kaji & Shubham Yadav, Pp. 22908–22910

***Jasminum angustifolium* (L.) Willd. var. *angustifolium* (Oleaceae): a new distribution record for West Bengal, India**

– Keya Modak & Monoranjan Chowdhury, Pp. 22911–22915

***Cyrtosia falconeri* (Hook.f.) Aver. (Orchidaceae): an addition to the flora of Jammu & Kashmir, India**

– Mushtaq Ahmed & Manjul Dhiman, Pp. 22916–22919

**New distribution record of *Roridomyces* cf. *phyllostachydis* (Agaricales: Mycenaceae), a bioluminescent fungus from Namdapha National Park, Arunachal Pradesh, India**

– Arijit Dutta, Sourav Gupta, Jayanta K. Roy & M. Firoz Ahmed, Pp. 22920–22923

**Photographic evidence of bioluminescent mushroom *Mycena chlorophos* (Mycenaceae) from Goa, India**

– Swanand R. Patil, Mirjoy M. Mathew, Abhijeet V. Patil, Ramesh N. Zarmekar, Pankaj R. Lad & Grenville Dcosta, Pp. 22924–22926

Publisher & Host

