

# ***Euclinostomum heterostomum* (Rud., 1809) Travassos, 1928 (Trematodes: Clinostomidae: Euclinostominae): A New Record in Avian Host Little Cormorant (Aves: Phalacrocoracidae) of Pakistan**

**Muhammad Moosa Abro<sup>1\*</sup>, Ali Murtaza Dharejo<sup>2</sup>, Muhammad Munif Khan<sup>2</sup>  
and Nadir Ali Birmani<sup>2</sup>**

<sup>1</sup>Government College Hyderabad Postgraduate Center, Hyderabad, Sindh, Pakistan.  
<sup>2</sup>Department of Zoology, University of Sindh, Jamshoro, Pakistan.

## **Authors' contributions**

*This work was carried out in collaboration between all authors. All authors designed the study. Authors MMA and NAB performed experimental work. Authors AMD and MMK provided technical expertise. Author MMA wrote the first draft of manuscript. All authors read and approved the final manuscript.*

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## **ABSTRACT**

Present report is part of study carried out on helminths of little cormorants of ecological famous District Sanghar of southern province of Pakistan. Present study collected 26 trematodes having stout, linguiform, fleshy body, sub-terminal oral sucker, strongly muscular ventral sucker, 7-12 cecal diverticula, asymmetrical anterior and posterior testes, round cirrus sac and small vitellaria. These were collected from esophagus of host bird and identified as *Euclinostomum heterostomum* (Rud., 1809) Travassos, 1928. This trematode is recorded for the first time from little cormorant in Pakistan. However, reports are available on genus *Euclinostomum* of fish and other birds of Pakistan.

**Keywords:** Avian trematode; *Euclinostomum heterostomum*; new host record; Pakistan.

## 1. INTRODUCTION

*Euclinostomum heterostomum* is a trematode found in fish eating birds (final host), fishes (second intermediate host) and snails (first intermediate host). It belongs to the genus *Euclinostomum* of subfamily Euclinostominae [1]. Its infection depends upon distribution of hosts reported from Asia, Africa, America and Europe. There is no comprehensive study on mass mortality of hosts by this parasite but has been noted by a few researchers that it results in weight loss and disfigurement of skin, visceral organ and badly damages their tissues [2,3]. Present specimens collected from the bird little cormorant which is a piscivorous, migratory cum residential bird, commonly found in Sindh province, Pakistan [4]. Very few reports are available on the helminths of little cormorants in Pakistan by Akram, Dharejo and Abro [5-8]. Whereas, *Euclinostomum gastrocaecum*, *E. heteroecaecum* Bilquees, *E. nephrostomum* [9]; *E. robustum* Parveen [10] and *E. heterostomum* were found in freshwater fishes and *E. minutus* Zaidi and Khan [11] in birds of Pakistan [12,3]. It is new host record in Pakistan.

## 2. MATERIALS AND METHODS

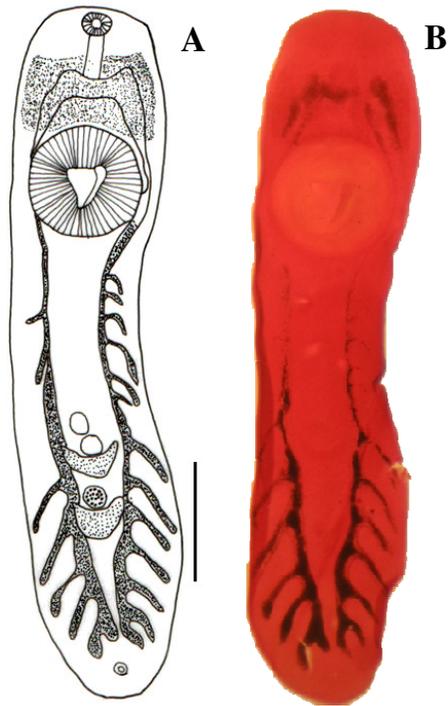
A total of 26 specimens of the genus *Euclinostomum* collected during examination of visceral organs of little cormorants in Parasitology laboratory of Department of Zoology, University of Sindh, Jamshoro. These live hosts were brought from Sanghar District of Sindh, Pakistan, anesthetized with chloroform and dissected for the collection of trematode parasites. The collected live trematodes were muscular and stout. After death, they were passed from graded alcohol series up to 70% for fixing; the muscular specimens were pressed and tied carefully overnight. Stained in borax carmine, dehydrated in graded alcohol series, cleared in clove oil and xylol. Finally mounted in Canada balsm. Drawing line and photographs of the specimens collected were taken with camera Lucida and Nikon digital camera. Measurements are given in millimeter (mm). Identification of *Euclinostomum* was carried out accordance to keys given by Gibson et al. [13], Yamaguti [1] and relevant literature.

## 3. RESULTS

Description is based on 26 specimens: Body stout, fleshy, linguiform, attenuated anteriorly, slightly round posteriorly, measuring 5.5-4.5 in length and 1.34-1.12 in width. Greatest width at pre-acetabular region and testicular level. Cuticle thin, smooth. Oral sucker small, subterminal, measuring 0.241-0.231 in length and 0.310-0.210 in width. Ventral sucker well developed, strongly muscular, almost round marginally and heart shaped internally, situated at the end of first quarter of body, measuring 0.86-0.72 in length and 1.034-1.015 in width, sharing lateral borders with ceca. Pharynx was not visible. Esophagus 0.37-0.33 long, bifurcated into long diverticulated ceca extending up to posterior extremity. Left cecum with seven simple branches while right cecum with twelve simple branches. Cecal branches elongated, lobed, appear finger like processes with somewhat swollen extremities. Testes asymmetrical, tandem, situated in third quarter of body. Anterior testis wider than long, measuring 0.206-0.156 long and 0.517-0.416 wide. Distance between anterior testis and ventral sucker 1.5-1.35. Posterior testis also asymmetrical, slightly lobed, measuring 0.41-0.206 long and 0.31-0.21 wide. Ovary almost round, small, lies laterally on upper corner of anterior testis, measuring 0.20-0.15 in diameter. Cirrus sac round, situated in front of anterior testis, measuring 0.137-0.126 in diameter. Uterus long, intercecal, situated in mid of body, extending anteriorly up to ventral sucker. Vitellaria was small, inconspicuous and eggs were not seen.

### 3.1 Taxonomic Summary

Family:	Clinostomidae
Subfamily:	Euclinostominae
Genus:	<i>Euclinostomum</i> Travassos, 1928
Species:	<i>Euclinostomum heterostomum</i> (Rud., 1809) Travassos, 1928
No. of specimens recovered:	26
No. of hosts found positive:	02
Site of infection:	Esophagus
Rate of infection	18.18%
Locality:	Sanghar, Sindh, Pakistan
Record:	New host and locality record



**Fig. 1A & B. Line drawing and photograph of *Euclinostomum heterostomum* (Rud., 1809) Travassos, 1928 collected during present study; Scale bar: A.1 mm**

#### 4. REMARKS

Genus *Euclinostomum* was established by Travassos, 1928 to include *Clinostome* which have well developed diverticulated ceca. Moreover, *Euclinostomum* is the type genus of subfamily Euclinostominae, found in buccal cavity and esophagus of piscivorous birds including *Ardea purpurea*, *Anhinga rufa*, *Ardeola ralloides*, *Garzetta garzetta*, *Ardea goliath*, *A. cinerea*, *Demiegretta asha*, *Bulbicus ibis*, *Nycticorax nycticorax*, *Scopus umbretta*, and *Phalacrocorax africanus* frequently collected from different countries of Europe, Asia, Africa and America. Dubois (1930) recorded *Euclinostomum clarias* from the body cavity of *Clarias angolense*; he also described *Euclinostomum heterostomum* from pharynx of *Ardeola ralloides* of Niger Valley in 1932. The key of Clinostomidae was reviewed by Bear (1933) and he also developed a key for classification of *Euclinostomum* species by designating *Euclinostomum heterostomum* Rudolphi, 1809 as type species of this genus. In Phillipine, Tubangi (1935) added *E. multicaecum* from muscular tissue of *Ophicephalus striatus*.

Bhalerao [14] found *E. indicum* metacercaria in the body cavity of *Ophicephalus punctatus* in Poona. Jaiswal [15] added three more forms from birds and fish of Hyderabad, India; which include *E. bhagavantami*, *E. heptacaecum* and *E. channai*. However, Yamaguti [1] preferred *E. bhagavantami* and *E. channai* as synonymous of *E. heterostomum*. Along with these species, certain other species have been reported including *E. africanum* Stossich ann Galli-Valerio, 1906; *E. dollfusi* Fischthal and Kuntz, 1963; *E. vanderkuypi* Fischthal and Kuntz, 1963; *E. gastrocaecum* Bilqees, 1972 [9]; *E. heterocaecum* Bilqees, 1972 [9]; *E. nephrostomum* Bilqees, 1972 [9]; *E. lauroi* Tendeiro, Travassos Santos Dias and Fazendeiro do Carmo Martins, 1974, *E. minutus* Zaidi and Khan, 1975 [11]; *E. ardeolae* El-Naffar and Khalifa, 1981 [16] and *E. robustum* Perveen, 2011 [10]. Many forms such as *E. skrajabini*, *E. dollfusi*, *E. vanderkuypi* and *E. bhagavantami* are considered as synonyms of *E. heterostomum* [17,1,2,3].

Present fluke belongs to genus *Euclinostomum*. It is compared with type and other species *E. heterostomum*, *E. bhagavantami* and *E. minutus*. These species are recorded from avian host including *Ardea cinerea*, *Egretta gazette* and *Demiegretta ash* from different countries like Egypt, Pakistan and India. According to comparative study observations, present fluke (5.5-4.5 X 1.344-1.12) resembles *E. heterostomum* (5.65-7.975 X 2.29-2.925), *E. minutus* (4.484-6.66 X 1.66-2.424) and is smaller than *E. bhagavantami* (12.7 X 3.37). The oral sucker is subterminal in present species (0.24-0.231 X 0.310-0.21) closely resemble to *E. minutus* (0.235-0.392 X 0.245 X 0.392) but smaller than *E. bhagavantami* (0.53 X 0.380) and larger than *E. heterostomum* (0.19-0.4 X 0.1-0.15). The ventral sucker in present species (0.86-0.72 X 1.034-1.015) is similar to *E. heterostomum* (0.85-1.9 X 0.75-1.7) and larger than *E. minutus* (0.818-0.909 X 0.818-0.909). However, internal structure of ventral sucker differs from *E. heterostomum* and *E. bhagavantami* but resembles *E. minutus* which is heart shaped. Esophagus is visible in present species as well as in *E. bhagavantami* but absent in types species. Ceca bifurcated in front of ventral sucker in all referred species. There is difference in number of diverticula in each cecum. Present species have simple unbranched 7-12 diverticula. *E. heterostomum* has 9-12 branched cecal diverticula. Moreover, in *E. bhagavantami* these are simple branched and

9-12 in number. In *E. minutus* diverticula are 12-15 in number. This is a prominent difference in compared species. Testes are tandem in all compared species, anterior testis of present worm is smaller than *E. heterostomum*, *E. bhagavantami* and *E. minutus*. Ovary of present fluke (0.15-0.206) differs from *E. heterostomum* (0.6-0.72 X 0.1-0.15), *E. minutus* (0.245-0.333 X 0.235-0.393) and *E. bhagavantami* (0.6 X 0.26). Therefore, present fluke differs from *E. bhagavantami* in body size, internal structure of ventral sucker, oral sucker and testes size and number of cecal diverticula. It resembles with *E. bhagavantami* in having almost same size of ventral sucker, simple branched diverticula and size of ovary. The present fluke is somehow close to *E. minutus* in size of various organs but significantly difference in number of diverticula in cecum. Present species closely resembles *E. heterostomum* in size and shape of body and various organs. There is also slight difference in number of diverticula which is 7-12 in present fluke and 9-12 in *E. heterostomum*. Furthermore, these diverticula are simple in present species and branched in *E. heterostomum*. It is the significant characteristic of the genus and its variation cannot be ignored. However, Yamaguti [1] demoted *E. heptacaecum* which have seven diverticula places it as synonym of *E. heterostomum*. Therefore, on the basis of these characteristics, this species is identified as *E. heterostomum*. This is new record of *E. heterostomum* from *Phalacrocorax niger* from Pakistan.

## 5. CONCLUSION

*Euclinostomum heterostomum* was recorded from an avian host Little cormorant of Sanghar, Sindh, Pakistan. It was identified on the basis of body shape and size, number of cecal diverticula, shape, size and position of ovary, testes, cirrus sac, uterus and posterior and anterior extremities. This genus is being reported for the first time from Little cormorant of Pakistan.

## COMPETING INTERESTS

Authors have declared that no competing interests exist.

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