

On New Sp nov *Adelobothrium lankaii* (shipley 1900) (Eucestoda: lecanicephalidea) *Pastinaches Sephen* (Fabricus) in the Marine Waters of Sindhudurg, Coast India

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Abstract: The present study deals with the morphological observation of the cestode parasite *Adelobothrium lankaii* infecting *Pastinachus sephen* (Fabricus) collected from the coastal region of Sindhudurg coast of Maharashtra, India. Marine fish specimens were examined for the collection of cestode parasites and the collected specimens were processed using standard parasitological techniques for morphological study. Morphological characteristics of the cestode, including scolex, proglottids, and reproductive organs, were examined and compared with existing description to confirm species identification. The study support to the understanding of the parasitic fauna of marine elasmobranchs in Indian seas and provides background information for the future ecological study of the family Lecanicephalidea. The scolex is large in size, globular in shape. The posterior region of scolex bearing four suckers. The neck is medium in length. The testes are medium in size, round in shape, 139 (130-139) in number. The cirrus pouch is medium in size, oval in shape. The ovary is small in size, distinctly bilobed. The vagina is wide tube, posterior to the cirrus pouch. The vitellaria are granular. The study provides valuable information on the morphology of the genus and contribute to the understanding of cestode diversity in marine fishes from the Sindhudurg coastal region

Keywords: *Adelobothrium lankaii*, marine fish, Sindhudurg coast

I. INTRODUCTION

Marine fishes represent one of the most diverse groups of vertebrates inhabiting aquatic ecosystems and play a crucial role in maintaining marine biodiversity and ecosystem stability (Li, 2024). They inhabit a diverse variety of ecological niches within marine environments, including pelagic, shellfish, and demersal habitats (Torabi et al., 2024). They serve as one of the key sources of protein for human consumption and fisheries through aquaculture represent an important part of food security with steadily increasing production. However, growth and health status of cultures and, in some cases, wild fish may be negatively affected by diseases, including unicellular and metazoan parasites (Williams and Jones, 1944; Woo, 2006; Woo and Buchmann, 2012).

Fish parasitic diseases considered one of the most important roles in the biology of fish and can affect their health and distribution (Rohde, 1993), marine fish play serious roles as inter-mediate or definitive hosts for a number of parasites that decrease the aqua resource production, reduction in fish growth and increase susceptibility of fish to other pathogens and raising mortality rates (Shih et al., 2010). Tapeworms are the most important group of parasites infecting elasmobranch fishes (Haseli et al., 2012; Cairra et al., 2017b). of the recognized orders of tapeworms, those parasitizing elasmobranch fishes include representative from nine orders (1034 species in 202 genera) (Caira et al., 2017b), each



with vary distinct morphological differences, thus making this group most speciose infecting elasmobranch fishes (Caira and Healy, 2004). Parasites mediate interactions between hosts at all trophic levels, modifying competitive and consumer-resource interactions. These indirect effects of parasitism may be population-density mediated. There is also increasing realization regarding the importance of parasite-induced changes in hosts behaviour (termed trait-mediated, indirect interactions (Werner and Peacor, 2003), and such keystone effects may also influence community structure (Hatcher and Dunn 2011).

The parasites usually affect the marketability of commercially produced fish. Thus, raising public health concern especially in area where raw or smoked fish is eaten (Hoffman and Bauer, 1972; Paperna, 1996). However, fish parasites have enormous impact on fish given their negative impact on profitability and also cause zoonotic diseases in many areas of the world (Murrell, 2007). The study of fish parasites is important because parasites have been shown to lower fish productivity, decrease fish health making them more susceptible to other diseases and even cause mortalities in fish. Fish parasites result in loss of economic returns and loss of fish as protein sources (barber, 2004). Therefore, understanding parasite diversity, host-parasite relationships, and their impacts on fish health is important for fisheries science. Some recent investigations (Le et al., 2014; Leite et al., 2017; Sures et al., 2017; Ashmawy et al., 2018; Naggar et al., 2018; Al-Hasawi, 2019; Mehana et al., 2020) point towards the manifold importance of the study of fish parasites as biological indicators. Indirectly they serve as parameters to assess the extent of damage caused by human activities as a result of overexploitation of the marine and freshwater bodies used as “dumping ground” which combined together with the effects of climate change on aquatic ecosystem sends a warning signal (Palm, 2011).

The genus *Adelobothrium* was established by Shipley, in 1900. The genus *Adeolobothrium* comprises cestode parasites reported from marine fishes. Species of this genus characterized by the scolex, proglottid and reproductive organs. Detailed morphological study is necessary for classification and identification of these parasites. Therefore, the present investigation was undertaken to study the taxonomy and morphological characteristics of the cestode *Adeolobothrium lankaii* infecting marine fishes from the Sindhudurg coastal region of Maharashtra.

Study Area:

The present study of was conducted in the coastal region of the Sindhudurg district located in southern part of Maharashtra, India. Devgad lies along the Konkan coastline and represents an important marine fishing zone in the region. Geographically, the study area is situated at approximately 16.1335° N latitude and 73.7389° E longitude.

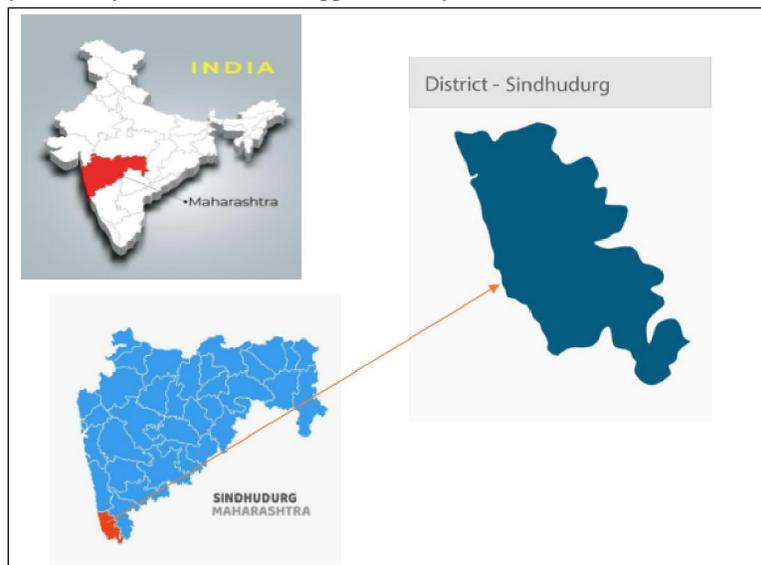


Fig 1 The location map of the Sindhudurg district



Material and Method:

Tapeworm collected from the fish intestine were gently washed with the saline water to remove debris and mucosa. The specimen was fixed in 4% formalin solution. Fixed specimen was washed with water, dehydrated in ascending grades ethanol, stained in hematoxylin, washed with distilled water, cleared in clove oil and mounted in D.P.X. drawings are made with the aid of Camera Lucida, Identification was carried out with the help of *Systema Helminthum* (Yamaguti, 1959).

Results:

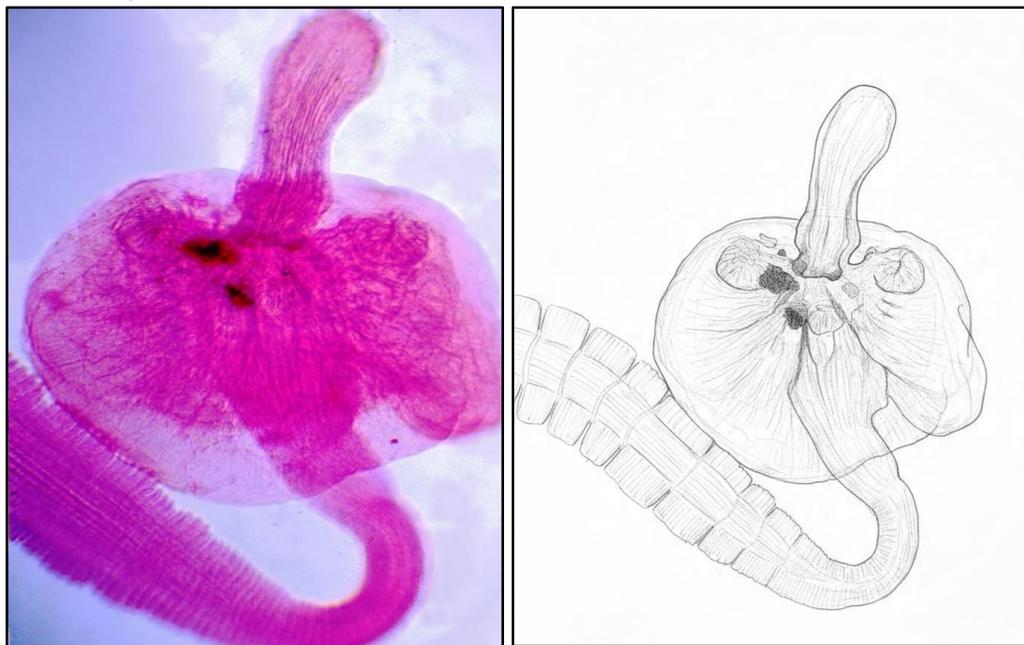
03 specimens of *Adeolobothrium* were found exclusively in the spiral intestine of marine fish *Pastinachus sephen*.

Description: Family Diagnosis

The scolex is medium in size, globular in shape, divided into two regions, distinctly marked off from the strobila and measures 0.642 (0.625-0.659) in length and 1.056 (1.045-1.068) in breadth. The anterior region is small in size, oval in shape, represented by two globular flaps, placed opposite to each other and measures 0.707 (0.704-0.710) in length and 0.181 (0.170-0.193) in breadth. The posterior region of the scolex large in size, globular in shape, bearing four medium accessory suckers arranged at corner of the scolex and measures 0.749 (0.738-0.761) in length and breadth respectively. The flap is medium in size, sub-globular in shape and measures 0.704 (0.693 -0.715) in length 0.261 (0.2500.272) in breadth. Accessory suckers are small in size round in shape and measure 0.0025 in diameter. The neck is medium in length, which narrow anteriorly, broad posteriorly and measures 0.954 (1.000-1.954) in length and 0.142 (0.136-0.147) in breadth.

The mature segments are almost 2 times longer than broad, cylindrical in shape, with straight or slightly convex lateral margins, with projections at the anterior or the posterior corners of the proglottids and measures 3.328 (3.317-3.340) in length and 1.088(1.075-1.1022) in breadth.

The testes are medium in size, round in shape, 130 (140-144) in number preovarian, almost unevenly distributed, present in central medulla, in two lateral fields, from the ovary to the anterior margin of the same, bounded laterally by longitudinal excretory canals and measures 0.169 in diameter.



(a)

(b)



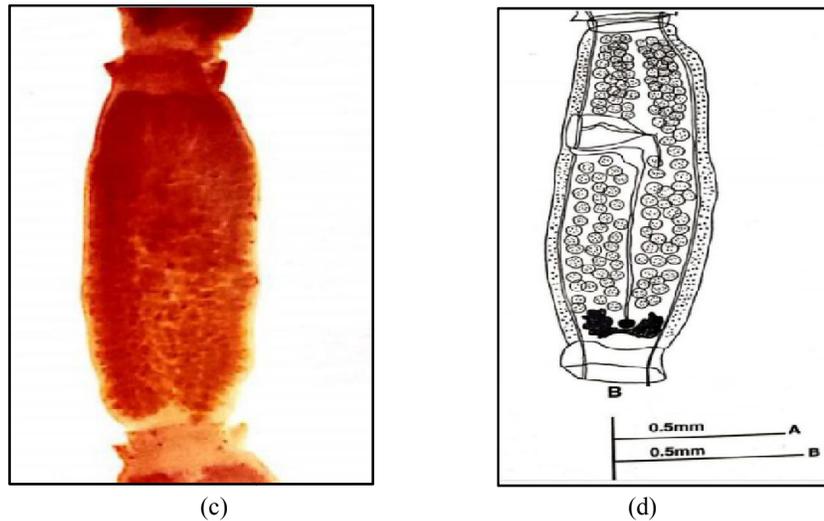


Fig 2. (a). Scolex of *Adelobothrium lankaii* n. sp. (b). drawing of Scolex (c) mature proglottid (d). drawing of mature segment.

The cirrus pouch is medium size, oval in shape, situated in the anterior half of the segments, almost at $\frac{1}{3}$ rd from anterior margin of the same, opens submarginally and measures 0.522 (0.511-0.534) in length and 0.409 (0.3970-0.420) in breadth. The cirrus is medium wide width, slightly coiled, contained within the cirrus pouch and measures 0.165 (0.160-0.169) in length and 0.126 (0.212-0.131) in breadth. The vas deferens is thin, short and measures 0.162 (0.160-0.165) in length and 0.126 (0.212-0.131) breadth.

The ovary is small in size, distinctly bilobed, situated near the posterior margin of the segments, extends laterally up to the cortical region of the same and measures 0.330 (0.325-0.334) in length and 0.109 (0.106-0.111) in breadth. The vagina is wide tube, posterior to the cirrus pouch, starts from the genital pores, runs posteriorly, almost in the middle of the segments, reaches and opens into the ootype and measures 0.800 (0.786-0.815) in length and in 0.2 (0.0110-0.00056) in breadth. The ootype is small in size, round in shape, preovarian, situated in concavity of the ovary and measures 0.022 in diameter.

The genital pores are medium in size, oval in shape, elongated, placed in the anterior $\frac{1}{3}$ rd of the segments, submarginal, irregularly alternate and measures 0.123 (0.121-0.126) in length and breadth respectively. The vitellaria are granular, cortical, in both lateral fields and from anterior to posterior margin of the segments. The longitudinal canals are medium in width and measures 0.15 in width.

Table 1. Morphological comparison of *Adelobothrium lankaii* n. sp. with the other 3 valid species

Character	<i>A. aetiobatidis</i> 1900	<i>A. carcharisase</i> 2011	<i>A. Kakinadinsis</i> 2011	<i>Adelobothrium lankaii</i>
Scolex	Anterior region rounded	Anterior blunt posterior round	-----	Globular
Flaps	-----	-----	-----	Two globular flap
Suckers	Round	Oval	Oval	Round
Neck	Absent	Short	-----	Medium
M. Segments	Broader than long	Longer than broad	-----	Longer than broad
Testes	130-150	90-95	300-310	130 (140-144)
Vagina	Postventral to cirrus pouch	Postventral to cirrus	Anterior to cirrus pouch	Posterior to cirrus pouch



Genital pore	Irregularly alternating	Submarginal	Marginal alternate	irregularly	Submarginal
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Discussion:

The species described herein shares a set of morphological criteria consistent with the diagnosis for *Adelobothrium* established by Shipley (1900). Although *Adelobothrium lankaii* n. sp. described above shows similarities to the other species of the genus in morphology, especially scolex morphology.

Adelobothrium lankaii n. sp. is easily distinguishable from other species of the genus that were recovered from *P. sephen* during this survey. *Adelobothrium lankaii* n. sp. is different than *Adelobothrium aetiobatidis* in terms of size and morphology (Table 1). However, A. suckers are small in size round in shape (0.0025 diameter) than *A. aetiobatidis* suckers are small and weak. Mature segments are 2 times longer than broad, cylindrical in shape in *Adelobothrium lankaii* than craspedote longer than they are broad in *A. aetiobatidis* (0.328 l & 1.088 b vs 1.25 l & 0.85b), testes are round (139 vs 150). *Adelobothrium lankaii* and *A. aetiobatidis* possess bilobed ovary (0.030 vs 0.34), cirrus sac of *Adelobothrium lankaii* n. sp. is most similar being oval in shape in all other species described but vary in length (0.165 mm vs 0.28 mm). Vitellaria are granular. Vagina is wide in *Adelobothrium lankaii* n. sp. than thin and tubular in *Adelobothrium lankaii* (0.800 mm vs 1.15 mm), genital pore is irregularly alternate (0.123 mm vs 0.075 mm)

Another species described *Adelobothrium carcharisase* Ashok mote, (2011) differ from the described species of the genus *Adelobothrium lankaii* n. sp. size (1.295-12.022) having short wide neck (0.409- 0.007), suckers are 4 in number (0.257-0.537), mature segments are craspedate almost 2 times longer than broad, testes are round in shape (90-95), cirrus pouch is large and oval (0.310), vagina is postventral to cirrus (0.446), genital pore is similar (1.068) and vitellaria is follicular in two rows respectively. Therefore, the new species described herein can clearly be distinguished from *A. carcharisase*.

Of the remaining species *Adelobothrium Kakinadensis*(2011) species *Adelobothrium lankaii* n. sp. is differ in its general morphology. *Adelobothrium kakinadensis* is characterized by the presence of about 300-310 testes, distributed throughout the segment, on all sides of ovary, with a few located on the ovarian lobes, and each measuring approximately 1.007 in diameter. Cirrus pouch is oval (0.280 mm), vagina anterior to the cirrus pouch (1.129 mm), genital pore is irregularly alternate (0.075 mm).

The above noted characters, are enough to accommodate these worms, into a new species and hence the name *Adelobothrium lankaii* sp.nov is proposed, after Dr.lanka, professor and Head, Department of Zoology, Devchand College Arjunnagar (M.S) who has contributed so much, in our knowledge of Helminthology.

II. CONCLUSION

The present investigation provides a detailed morphological information of cestode parasites belonging to the genus *Adelobothrium lankaii* collected from the marine fish *Pastinachus sephen* of Sindhudurg district along the west coast of India. The parasites were examined using standard parasitological techniques, and their diagnostic morphological characters such as, scolex, proglottid segments, reproductive organs, were carefully analysed.

The observed characters of the species were compared with previously described species of the genus to determine their taxonomic status. The study shows that distinguishing characters which helps classification and identification of the species. These findings provide significant taxonomic information for the genus and support current diversity of cestode fauna. The study also highlights the prevalence and variety of cestode parasites in marine fish from the Sindhudurg coast. Such analysis is important for understanding parasite biodiversity, host-parasite relationships, and the overall distribution of parasitic fauna in marine environment.



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