RESEARCH ARTICLE

SYSTEMATICOBSERVATIONOFMARINEPISCEANTETRAGONOCEPHALUMMOUNIESIS(SHIPLEYANDHORNELL,1905(CESTODA - LECANICEPHALIDEA)FROMTRYGONSEPHENATSINDUDARAG COAST MAHARASHTRA, INDIASINDUDARAGSUBSERVATIONSUBSERVATION

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DOI: https://doi.org/10.5281/zenodo.14736982	
Author affiliation:	ABSTRACT:
Department of Zoology,	The present investigation delineates a novel species
Karmaveer Hire Arts, Science,	of Lecanicephalidean cestode, Tetragonocephalum
Commerce and Education College,	mouniesis sp. nov., recovered from the spiral valve of the
Gargoti, Kolhapur (M. S.) India	marine fish host Trygon sephen sampled across diverse
*E-mail:	coastal locations within, Sindudarag Coast, Maharashtra.
jagtapvilas46@gmail.com,	Although exhibiting general morphological congruence
<u>sagarayan36@gmail.com</u>	with other members of the genus Tetragonocephalum, the
	new species is distinctly characterized by its overall length,
	an oval-shaped scolex, mature proglottids that are four
	times longer than broad, and unique attributes of the
	reproductive system, including the number, arrangement of
© Copyright: 2024 This is an	the testes,20 in number and a U-shaped ovary.
open access article under the	KEYWORDS: Lecanicephalidaen tapeworm, Trygon
terms JSRI	sephen, Sindudarag coast

INTRODUCTION:

Coastal and marine ecosystems are critical habitats that support a wide range of icthyofaunal diversity and are integral to global fisheries. Approximately 60% of the global fish harvest originates from these ecosystems. These habitats facilitate essential biological processes such as reproduction, foraging, and refuge for various marine teleost species. However, these ecosystems are inherently sensitive and face significant pressures from anthropogenic activities, overexploitation, and natural stressors, all of which threaten their ecological equilibrium and the sustainability of fish populations.

Parasitism is a prominent natural stressor that poses a considerable challenge to the health and viability of marine fish populations. Among the numerous parasitic groups, cestodes, or tapeworms, are particularly detrimental. These parasites can profoundly impact the physiological functions of their hosts, with larval stages causing severe damage by targeting visceral organs and, in some cases, penetrating muscle tissues, thereby diminishing the commercial value of affected fish. Beyond direct physical harm, cestode infections can alter host behavior, impair reproductive success, and inhibit growth, ultimately influencing population dynamics. Cestodes exhibit intricate life cycles involving one or more intermediate hosts, making them prevalent in marine ecosystems. Their presence can also serve as bioindicators of ecosystem health. A comprehensive understanding of the diversity and ecological impact of these parasitic organisms is crucial for the effective management of marine fish populations and the preservation of coastal fisheries.

The genus *Tetragonocephalum* was first introduced by Shipley and Hornell in 1905, with the designation of *T. trygonis* (Shipley et. Hornell, 1905) (formerly referred to as *Tylocephalum* trygonis) as its type species. Subsequently, Southwell documented an additional species, Trygon walga, in Ceylon. Cobmes later evaluated Tylocephalum pingue and recommended suppressing the genus Tylocephalum due to the unrecognizability of its type species. As a result, Tetragonocephalum was established as the valid genus, including species such as T. trygonis, T. uarnak, (Shipley et. Hornell, 1906) and T. minutum. (Southwell, 1925) In 1979, Deshmukh and Shinde expanded the genus with the description of three new species: T. raoi (Deshmukh & Shinde, 1979) from *Trygon zugei*, as well as *T. alli* (, Deshmukh & Shinde, 1979) and *T. sephenis* (Deshmukh & Shinde, 1979) from *Trygon sephen* collected along the Ratnagiri coast. *T. bhagwati* (Shinde, Mohekar & Jadhav,) (1985), T. yamagutti (1988) Murlidhar, T. ratnagiriensis (1990) Shinde & Jadhav T. *singhii* (2005), Pawar & Jadhav, *T. shinde* Bhagwan *et al.* (2004), *T. meenae* Bhagwan et al. (2004), T. ratnagiriensis (Bhagwan 2007) T. govindi Khamkar & Shinde (2012) T. panjiensis Khamkar, (Khamkar 2011); T. pulensis Kankale, (2014) (Kankale 2014); T. ratnagiriensis Khamkar, (Khamkar 2012); T. sepheni Lanka, Hippargi & Patil, 2013 (Lanka et al., 2013). Two new sp.nov Tetragonocephalum sabe sp.n and T. salrii 2016, Aminjan Ataback R. and Masoumesh malek More recently, Roohi Aminjan A. and Malek M. 2017 described two additional species of *Tetragonocephalum* from *Pastinachus sephen* (Myliobatiformes: Dasyatidae) in the Gulf of Oman.

The species within *Tetragonocephalum* are primarily distinguished by subtle morphological differences. Detailed documentation and analysis of these variations contribute to an enhanced understanding of the genus and its role within parasitology, offering valuable insights into the ecological dynamics of specific regions. This investigation aims to provide a thorough taxonomic analysis of *Tetragonocephalum mounesis* sp. nov., a newly identified species discovered in *Trygon sephen* along the Sindudarag coastline in Maharashtra.

MATERIALS AND METHODS:

For the taxonomical study of tapeworms, the fishes were collected during the period of 2023 of Sindudarag Coast. The hosts are easily identified by Day (1958). The viscera were brought to the laboratory immediately, repeatedly washed in cold saline, cut and observed under binocular microscope. The collected worms were washed in distilled water and fixed in

hot 4 % formalin for specific identification. passed in alcoholic grades, stained with Borax carmine and mounted in D.P.X. All drawings were made with the aid of camera lucida (Weesner, 1965). All measurements are in millimeters, unless otherwise indicated. The identification is made with the help of "Systema Helminthum" by Yamaguti (1959).

Description:

Six species of cestode parasites were collected from Spiral valve of a marine water fish, *Trygon sephen* at, Sindudarag Coast of India, in the month of April, 2022. The species were preserved in 4% formalin, mounted in Borax carmine and made whole mount slides, all measurements are given in millimeter. The scolex is small in size, divided into two region, anterior and posterior and measures 1.213 (1.195-1.232) in length and 0.919 (0.910-0.928) in breadth.

The anterior region is small in size, oval in shape and measures 0.642 (0.625-0.660) in length and 0.91 (0.892-0.910) in breadth and posterior region is almost large in size, bearing four accessory suckers and measures 0.687 (0.678-0.696) in length and 0.937 (0.928-0.946) in breadth. Accessory suckers are small in size, oval in shape arranged in two pairs, with muscular papilla, one in each half of the scolex, almost equidistantly and measures 0.135 (0.125-0.142) in length and 0.204 (0.0178-0.392) in breadth. Neck is present, short and measures 0.705 (0.696-0.714) in length and 0.383 (0.375-0.392) in breadth. The mature segments are large in size, anterior region is narrow than posteriorly, almost four time longer than broad, with small, short, blunt projection at the anterior end and measures 3.323 (3.318-3.329) in length and 0.721 (0.715-0.727) in breadth.

The testes small in size rounded in shape 20 in number preovarian, extended from ovary to anterior margin of the segment and measures 0.22 in diameter. The cirrus pouch is large in size, oval in shape, situated just anterior to the middle of the segments, upto the middle of the same and measures 0.175 (0.170-0.181) in length and 0.181 (0.159-0.204) in breadth. The cirrus is thin, coiled, placed within a cirrus and measures 0.403 (0.397-0.409) in length and 0.198 (0.193- 0.204) in breadth. The vas deferens thin, extends posterioly, runs up to the posterolateral side of cirrus pouch and measures 0.754 (0.839- 0.915) in length and breadth respectively

The ovary is large in size, almost 'U' shaped in appearance, extend anteriorly, upto the testes, lobes are medium in size, anteriorly directed, placed near the posterior margin of the segments and measures 0.925 (0.920-0.931) in length 0.175 (0.170-0.181) in breadth. The vagina is thin, anterior region to the cirrus pouch, starts from the genital pores, runs obliquely up to the middle of the segment, extends medially, reaches and opens in to the ootype and measures 2.403 (2.397-2.409) in length and 0.016 (0.011-0.022) in breadth. The ootype is small, in size, round in shape, preovarian, situated in between the ovarian lobes and measures about 0.0045 in diameter.

The genital pores are medium in size, oval in shape, open submarginally, situated at the anterior half of the segments, at 1/3rd from the anterior margin of the same, irregularly alternate and measures 0.136 (0.136-0.136) in length and 0.27 (0.256-284) in breadth. The vitellaria are granular, single in row on each lateral side from the anterior to the posterior margin of the segment. The longitudinal excretory cannels are medium 0.22 in width.

RESULTS AND DISCUSSION:

The genus *Tetragonocephalum* is established by Shipley and Hornell [4] from *Trygon walga* from Ceylon as type species *T. trygonis.* Later on the following species are added to this genus:

1) *T. uarnak* [4] 2) *T. minutum* Southwell, [5] 3) *T. raoii* [2]. 4) *T. alii* [2]. 5) *T. sepheni* [2]. 6) *T. shipley* [6]. 7) *T. bhagwati* [6]. 8) *T. yamagutti* [7]. 9) *T. aurangabadensis* [8]. 10) *T. shindi* [9]. 11) *T. meenae* [9]. 12) *T. singhii* [10]. *T. govindi* Khamkar & Shinde, 2012 (Khamkar and Shinde 2012); *T. panjiensis* Khamkar, 2011 (Khamkar 2011); *T. pulensis* Kankale, 2014 (Kankale 2014); *T. ratnagiriensis* Khamkar, 2012 (Khamkar 2012); *T. sepheni* Lanka, Hippargi & Patil, 2013 (Lanka *et al.*, 2013). *Tetragonocephalum sabe* and *T. salrii* 2016, Aminjan Ataback R. and Masoumesh. Roohi Aminjan A. and Malek M. described two additional species of T. mackenziei 2017, from *Pastinachus sephen* (Myliobatiformes: Dasyatidae)



Figure 1 A: Scolex





Figure 2 B: Mature Proglotttid



Figure 2 A: Scolex

Figure 2 B. Mature Proglotttid

Tetragonocephalum mouniesis

1. The cestode under discussion is having scolex is divided in two part. The anterior region is small in size, oval in shape, and the mature segment longer than broad, the testes are 20 in number, cirrus pouch is large in size, oval in shape, situated just anterior to the middle of the segments, ovary 'U' shaped, vagina anterior to the cirrus pouch, vitellaria granular, in

two lateral fields, differs from *T. trygoni* Shipley *et al.* (1905), which is having the length of the worm 27.0, width of the worm 0.8, length of the scolex 0.26, width of scolex 0.33, testes 7-12 in number, external seminal vesicle present and ovary massive, vitellaria follicular.

- 2. The present tapeworm, differs from *T. uarnak* Shipley *et al.* (1906), which is having the length of the worm 0.3, breadth of the worm 0.14-0.4, length of the scolex 0.22-0.28, breadth of the scolex 0.21-.41, testes 16-27 in number and ovary massive, bilobed.
- 3. The present worm, differs from *T. minutum* Southwell, (1925), which is having the length of the worm 20.0 breadth of the worm 0.68, length of the scolex 0.53, breadth of the scolex 0.44, testes 38-63 in number and ovary quadrandular follicular.
- 4. The present worm, differs from *T. raoi* Deshmukh & Shinde (1979), which is having the length of the worm 16-20, breadth of the worm 0.38, length of the scolex 0.63-0.89, breadth of the scolex 0.45-0.54 testes 50- 55 in number and ovary 'W' shaped, with follicles.
- 5. The present cestode, differs from *T. alii* Deshmukh *et al.* (1979), which is having the length of the scolex 0.74 width of the scolex 0.80, neck absent, testes 40 45 in number, presence of external seminal vesicles, ovary slightly 'U' shaped, with follicles.
- 6. The present tapeworm, differs from *T. sephenis* Deshmukh *et al.* (1979), which is having the length of the worm 10.00, breadth of the worms 0.73, length of the scolex 0.53-0.62 breadth of the scolex 0.52-0.55, testes 36-68 in number and ovary quadrangular with follicles.
- 7. The present worm, differs from *T. shipleyi* Shinde, Mohekar & Jadhav, (1885), which is having the length of the worm 40 breath of the worm 1.83, length of the scolex 0.50-0.56, in breadth of the scolex 0.38-048, testes 12 in number and ovary bilobed compact 'H' shaped.
- 8. The present cestode, differs from *T. bhagwati* Shinde *et al.* (1985), which is having the length of the worm 20-25, breadth of the worm 0.50-0.58, length of the scolex 0.40-0.46 breadth of the scolex 0.48- 0.56, neck absent, testes 37-38 in number and ovary bilobed, 'H' shaped.
- 9. The present worm, differs from *T. yamagutti* Murlidhar, *et al.* (1988), which is having the length of the worm 35- 38 breadth 0.78, mature segment 0.83-0.87, testes 54-56 in number, R seminialis absent, ovary rectangular with follicle genital pore sub marginal, irregularly alternate, vitellaria granular.
- 10. The present tapeworm, differs from *T. ratnagiriensis* Shinde & Jadhav, (1990), scolex length globular. Mature segment longer than broad, testes 40-44 rseminialis absent, ovary rectangular, genital pore marginal, vitellaria granular, corticular.
- 11. The present cestode, differs from *T. singhii* Pawar & Jadhav, (2005), scolex pentagonal length 0.55-0.56 and width 0.60 neck present mature segment longer than broad, testes

39 in number recepticulum seminalis present, ovary 'U' shaped, genital pore marginal, irregular alternate, vitellaria granular.

- 12. The present cestode parasite, differs *T. shinde* Bhagwan *et al.* (2004), which is having scolex is medium in size, globular in size, accessory suckers small in size, oval in shape. Neck present, mature segment are longer broad, testes are oval 17 in number, cirrus pouch is oval in shape, eseptaclum seminis present, ovary 'U' shaped, genital pores large in size, oval in shape, vitellaria granular.
- 13. The present tapeworm, differs *T. meenae* Bhagwan *et al.* (2004), which is having scolex large in size, globular in shape, accessory suckers present, neck present, mature segment longer than broad, almost three time longer than broad, testes 45 in numbers, cirrus pouch, almost bean shaped, cirrus slightly coiled, ovary 'U' shaped, vagina anterior to cirrus pouch, genital pore oval, vitellara granular.
- 14. The present cestode parasite, differs from *T. ratnagiriensis* (2007), which is having scolex small, oval, neck medium, mature segment longer than broad, testes medium, oval, 34 to 36 in number, cirrus pouch irregular alternate, sub marginally, ovary 'U' shaped, vagina posterior to cirrus pouch, vitellaria granular.
- 15. The present cestode parasite, differs from *T.sepheni* lanka,Hippargi and patil (2013) which is having scolex divided into two regions anterior & posterior. Anterior region is quadrangular & posterior region is oval having suckers. Short neck & cylindrical shape. Mature segments longer than broad. Testes are oval to round & are pre-ovarian distributed in two fields. The cirrus pouch is oval in shape & it is thin ciliated. The genital pore is marginal. Ovary is large, compact & it is in the form of 'U' shape. The vagina is slight curved, ootype is small, oval in shape; receptaculum seminilis is present. The gravid segment, uterus is large saccular & occupied by numerous eggs; vitellaria are granular corticular, thin strips
- 16. The present cestode parasite, differs from *Tetragonocephalum sabe (2016)* and the number of proglottids (43-53), Testes (42-50), mature proglottids (802-1333-226)
- 17. The present cestode parasite, differs from *T. salrii* (2016). The number of proglottids (77-78)
- The present cestode parasite, differs from *T. mackenziei* immature proglottids, body length (7.7–17.5 mm), body width (213–288 μm), number of proglottids (34–49), number of testes (10–14), size of scolex (228–315 μm × 213–288 μm) and size of acetabula (56–73 μm × 61–75 μm).
- 19. The present cestode parasite, differs from *Tetragonocephalum kazemii* (2017) is morphologically distinguishable from its valid congeners and *T. mackenziei* based on a combination of characteristics, including body length (28.8–36.6 mm), number of proglottids (50–65), number of testes (30–42), size of scolex (388–564 μm × 326–448 μm), size of acetabula (62–86 μm × 57–90 μm) and testes (25–39 × 21–32).

CONCLUSION:

Based on the observed characteristics, it is desirable to establish a new species to accommodate these worms. The name *Tetragonocephalum mounisis* sp. nov. is proposed, honoring our parent institute, Shri Mouni Vidyapeeth, Gargoti, which has given me the opportunity to serve as a teacher in such a reputed and well-established academic institution.

Type species: Tetragonocephalum mounisis sp.nov.

Host: Trygon sephen

Habiat: Spiral valve.

Locality: Sindhurg Coast India.

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REFERENCES:

- Bhagwan, H. K., Mohekar, A. D., Kamble, S. M., & Shinde, G. B. (2004). Two new species of *Tetragonocephlum* Shipley et. Hornell, 1906 (cestode: Teragonocephlidae) from Ratnagiri India. *Rivista Di parasitologia*, *XXXLXV*(1), 147-152.
- 2. Ducklow. (2000). *Deep-Sea Research*, 40, 245–263.
- Deshmukh, R. A., & Shinde, G. B. (1979). Three new species of *Tetragonocephalum*, Shipley et. Hornell, 1905 (cestoda: Tetragonocephalidea) from marine fishes, West Coast of India. *Biores*, *3*, 19-23.
- 4. Haseli, M. (2013). Trypanorhynch cestodes from elasmobranchs from the Gulf of Oman, with the description of *Prochristianella garshaspi* n. sp. (Eutetrarhynchidae). *Systematic Parasitology*, *85*, 271–279.
- ICZN. (2016). International Code of Zoological Nomenclature. Fourth Edition. International Commission on Zoological Nomenclature. Retrieved from http://www.nhm.ac.uk/hosted-sites/iczn/code/index.jsp
- Khamkar, D. D. (2011). A new species *Tetragonocephalum panjiensis* n. sp. (Eucestoda: Lecanicephalidae) from *Trygon zugei* at Panji, Goa, India. *Journal of Experimental Sciences,* 2(1), 13–14. Retrieved from <u>http://scienceflora.org/journals/index.php/jes/article/view/1825/1808</u>
- Khamkar, D. D. (2012). A new species *Tetragonocephalum ratnagiriensis* n. sp. (Eucestoda: Lecanicephalidea) from *Trygon zug*ei at Ratnagiri (MS), India. *World Journal of Science and Technology*, 2(1), 3–4.
- Khamkar, D. D., & Shinde, G. B. (2012). A new species *Tetragonocephalum govindi* n. sp. (Eucestoda: Lecanicephalidea) from *Trygon zugei* at Panji, Goa, India. *Trends in Parasitology Research*, 1(1), 22–24.

- 9. Maleki, L., Malek, M., & Palm, H. W. (2013). Two new species of *Acanthobothrium* (Tetraphyllidea: Onchobothriidae) from Pastinachus cf. sephen (*Myliobatiformes: Dasyatidae*) from the Persian Gulf and Gulf of Oman. *Folia Parasitologica*, *60*(1), 448–456.
- Murlidhar, A. (1988). A new cestode *Tetragonocephalum yamaguti* n.sp. (Cestoda: Tetragonocephalidae) from a marine fish, Trygon Walga at Madras (East Coast of India). *Rivista Di Parasitologia, V*, 257-260.
- 11. Shinde, G. B., Mohekar, A. D., & Jadhav, B. V. (1985). Two new species of the genus *Tetragonocephalum*, from West Coast of India. *Indian Journal of Parasitology*, 9(1), 79-82.
- 12. Shinde, G. B., & Jadhav, D. H. (1990). Two new species of genus *Tetragonocephalum* (Cestoda: Tetragonocephalidea) at Ratnagiri, M.S. India. *Indian Journal of Parasitology*, *14*(1), 9-12.
- Shipley, A. E., & Hornell, J. (1905). Two new species of the genus *Tetragonocephalum* (Cestoda: Lecanicephalidae) from West Coast of India. *Indian Journal of Parasitology*, 9(1), 79-82.
- 14. Southwell, T. (1925). On the genus *Tetracampos wedl*, 1861. *Annals of Tropical Medicine and Parasitology*, 19(1), 315-317.
- Pawar, L. B., & Jadhav, B. V. (2005). On a new species of the genus *Tetragonocephalum* (Shipley et Hornell, 1905) from Trygon sephen at Bhatye, Ratnagiri (M.S.) West Coast of India. *Tropical Life Sciences India*, 20(2), 113-116.
- 16. Aminjan, A. R., & Malek, M. (2016). Two new species of *Tetragonocephalum* Shipley and Hornell, 1905. *Zookeys*, *623*(1), 1-13.
- 17. Aminjan, A. R., & Malek, M. (2017). Two new species of *Tetragonocephalum* (Cestoda: Lecanicephalidea) from *Pastinachus sephen* (Myliobatiformes: Dasyatidae) from the Gulf of Oman. *Folia Parasitologica*, *64*(1), 014.A.