

***Dinurus gedrosiae* sp.n. (Trematoda: Hemiuridae) in Common Dolphinfish *Coryphina hippurus* (Perciformes: Coryphaenidae) of Gwadar coast, Balochistan, Pakistan**

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ABSTRACT: During the current study on metazoan parasites of Common dolphinfish *Coryphaena hippurus* (Perciformes: Coryphaenidae), a total of twenty four hosts were collected from the Gwadar coast of Balochistan, Pakistan. All of the twenty five hosts examined were infected with *Dinurus gedrosiae* sp.n. The present species differ from its congeners by having Pseudosegmentation in posterior half of hind body; oral sucker subterminal; pharynx almost round; esophagus elongated; ventral sucker larger; testes rounded in shape, pre-ovarian, oblique in position, separated from each other; cirrus sac large in size; ovary rounded, pre-equatorial, submedian, post-testicular, overlapped by uterine loops and vitellaria; uterus densely filled with eggs, starts behind the acetabulum reaching up to starting of fourth quarter of hind body; caeca diverticulate at level of ovary, reaching up to posterior half of hind body, encroaching into segmented region of body; excretory tube present; excretory pore terminal; eggs shelled, oval and other varying characters. However, this genus is being reported for the first time from Pakistan.

Keywords: Trematode, *Dinurus gedrosiae* sp.n., Common dolphinfish *Coryphaena hippurus*, Gwadar, Balochistan, Pakistan.

I. INTRODUCTION

Fishes are important source of human food and contributing Gross Domestic Product of many countries Tveteras *et al.*, 2012. Mahi-mahi or common dolphinfish *Coryphaena hippurus* Linnaeus, 1758 (Perciformes: Coryphaenidae) locally called as Aamadosk is among fastest-growing pelagic fish found in tropical and subtropical regions of the World mostly in warm seas from 20°C to 30°C temperature (Massuti, 1997) and is being eaten in various countries (Morgan, 2016). Being a marine fish Dolphinfish harbor several parasites of arthropods, trematodes, cestodes and blood parasites have been reported from different countries (Burnett-Herkes, 1974; Carbonell *et al.*, 1999; Dyer, Bunkley-Williams and Williams, 1997; Dyer, Williams and Bunkley-Williams, 1998).

Species of the genus *Dinurus* reported from Common Dolphinfish *Coryphaena hippurus* include *D. tornatus* (Rud., 1819) from Atlantic red sea; *D. barbatus* (Cohn, 1902) from Atlantic Pacific; *D. braviductus* Looss, 1907 from Beaufort, N. Carolina, Puerto Rico, Cuba and Curacao; *D. coryphaenae* Yamaguti, 1934 from Pacific coast, Inland sea, Tokyama Bay of Japan; *D. longisinus* Looss, 1907 from red sea, Secas Island,

Florida, Panama and Hawaii and *D. thapari* Gupta and Gupta, 1980 of Kerala, India. There is no record of trematode parasites of *Coryphaena hippurus* in Pakistan. *Dinurus gedrosiae* sp.n. is reported from Common Dolphinfish *Coryphaena hippurus* of Gwadar coast, Balochistan, Pakistan. This is first record of any metazoan parasite of Common Dolphinfish *Coryphaena hippurus* of Pakistan.

II. STUDY AREA

Gwadar is a southwestern Arabian Sea coastline of Pakistan, in Balochistan province (Fig. 1). It is about 700 km from Karachi and 120 km from the Iranian border. Gwadar is 0–300 meters above sea level, 600 km long coastline and is mainly dry, arid and hot (Gwadar-District development profile, 2011). The oceanic influence keeps the temperature lower in summer and higher in winter as compared to the inland. The mean temperature in the hottest month (June) remains between 30 °C to 42 °C. The mean temperature in the coolest month (January) varies from 10°C to 20.6°C and the marine water's average salinity is 38.71 ‰. The uniformity of temperature is a unique characteristic of the Makran coastal region.

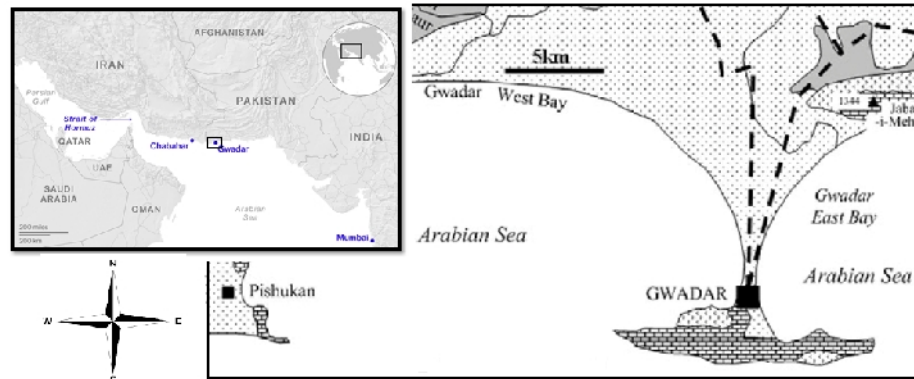


Fig. 1. Gwadar, the sampling area.

III. MATERIAL AND METHODS

During this study, a total of twenty four host fishes were collected from Gwadar coast of Balochistan, Pakistan during 2017-2019. Freshly captured fishes were preserved in ice boxes and brought to the Department of Zoology, University of Sindh, Jamshoro for parasite isolation. After specifying gender and measurement of length, girth and weight of host fishes, they were cut longitudinally on the dissecting tray. All viscera were separated in petri plates and examined under stereomicroscope. Worms were separated with fine brush from mucous and placed in normal saline solution. Trematodes were killed in hot distilled water and processed for dehydration from 10% to 70% ethanol solutions. Trematodes were flattened by pressing them in between plain slide and cover glass and tied with cotton thread by applying tolerable pressure which could not cause any damage to the specimens. The flattened specimens were fixed in 70% ethanol for overnight. After the process of fixation, these specimens were stained with Grenacher's alcoholic Borax-carmin. The specimens were washed in 70% alcohol two to three times to remove excess stain and transferred to 80%, 90% and 100% ethanol solutions for complete dehydration process. After dehydration, specimens were shifted to the clove oil and xylene (clearing reagents). Finally specimens were mounted permanently in Canada balsam (Garcia and Ash, 1979; Schmidt, 1988).

Drawings were made with the help of Olympus BH2-DA drawing attachment. Photographs are taken with OMAX Digital Trinocular LED Microscope with 10MP Digital USB Microscope Camera. Measurements of the body and other structures are given in millimeters (mm) whereas those of eggs in micrometer (μm). Vials are labeled, indicating the name of parasite, host, location, locality and date (Yamaguti, 1953). All labeled slides are stored in slide trays in horizontal position. Holotypes and paratypes are deposited in the Parasitology Laboratory of Zoology Department, University of Sindh, Jamshoro, Pakistan and will be made available to scientists and researchers for reference purpose.

IV. RESULTS AND DISCUSSION

Family Hemiuridae Looss, 1899

Genus *Dinurus* Looss, 1907

Dinurus gedrosiae n.sp.

Table-1

Description: (Measurement is based on 10 specimen and given in range, mean and standard deviation): Body elongated, broader anteriorly, tapering posteriorly, measuring $4.986\text{--}6.20$ (5.3624) $\pm 0.355 \times 0.849\text{--}0.99$ (0.928) ± 0.0416 ; pseudosegmentations present in posterior half of hindbody (Fig.2); maximum width was at middle of hindbody. Oral sucker subterminal, larger than ventral sucker, measuring $0.342\text{--}0.4$ (0.3612) $\pm 0.0155 \times 0.315\text{--}0.377$ (0.34) ± 0.0196 . Pharynx almost round, sharing edges with oral sucker. Esophagus elongated, diverticulate into intestinal ceca which is densely overlapped by uterus. Ventral sucker muscular, much larger than oral sucker, postero-lateral to oral sucker, measuring $0.602\text{--}0.7$ (0.6299) $\pm 0.0267 \times 0.821\text{--}1.0$ (0.864) ± 0.0514 . Testes almost round, pre-ovarian, oblique in position, separated from each other, situated in first quarter of hindbody; anterior testis measuring $0.385\text{--}0.7$ (0.460) $\pm 0.099 \times 0.301\text{--}0.60$ (0.374) ± 0.0969 . Distance between anterior testis and ventral sucker is $1.273\text{--}1.50$ (1.346) ± 0.0720 ; posterior testis measuring $0.369\text{--}0.60$ (0.415) $\pm 0.0646 \times 0.273\text{--}0.50$ (0.324) ± 0.0699 . Cirrus sac tubular, very large, measuring $0.739\text{--}1.02$ (0.858) $\pm 0.105 \times 0.109\text{--}0.50$ (0.2619) ± 0.1413 , commencing from level of testes, extending anteriorly counting cirrus reaching up to the level of oral sucker and open into common genital pore. Ovary round, pre-equatorial, submedian, post-testicular, measuring $0.027\text{--}0.07$ (0.045) $\pm 0.0141 \times 0.273\text{--}0.07$ (0.045) ± 0.014 , overlapped by uterine loops and vitellaria. Uterus extending from posterior margins of acetabulum up to posterior part of body, not reaching posterior extremity. Uterus densely filled with eggs. Vitellaria tubular, commencing from level of ovary, reaching up to posterior half of hindbody, encroaching into segmented part of body. Caeca diverticulates at the level of acetabulum, reaching up to posterior extremity of body. Excretory tube present. Excretory pore terminal. Eggs shelled and oval in shape.

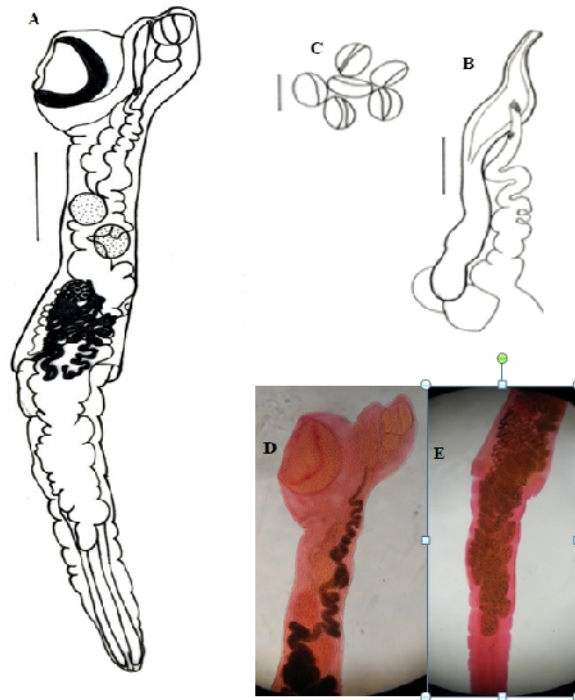


Fig. 2. *Dinurus gedrosiae* n. sp. (A) Entire worm; (B) Cirrus sac; (C) Eggs. (D) Photograph of anterior part of worm; (E) Photograph of posterior part of worm. Scale bar: A. 1 mm; B.0.3 mm; C. 0.05 μ m.

Taxonomic Summary:

Type Host: Common dolphinfish *Coryphaena hippurus* marine edible fish.

Type locality: Gwadar coast (25° 7 35 N, 62° 19 21 E) Balochistan Province, Pakistan.

Number of hosts examined: 24

Number of specimens recovered: 2061

Site of infection: Stomach/Intestine

Type specimens: Deposited in the department of Zoology, University of Sindh, Jamshoro, Pakistan.

Etymology: Specific name “Gedrosia” refers to an ancient Greek name of the area (Newly Makran Division, Balochistan).

The genus *Dinurus* was proposed by Looss in 1907 to accommodate trematodes collected from marine fishes. *D. breviductus* differs from present specimens in having long body with single pseudosegment at middle, anterior segment broader, tubular; oral sucker terminal, larger in size; ventral sucker smaller; shorter distance between oral and ventral suckers; anterior testis close to ventral sucker, elongated, smaller and broader than present species; posterior testis sharing edge with anterior testis; shorter distance between anterior testis and ventral sucker; both testes overlapped; larger distance between testes and ovary and from ovary to posterior extremity; shorter distance between uterus ending and posterior extremity; vitellaria commencing from level of posterior testis, not entering posterior pseudosegment and diverticulating caeca.

D. longisinus collected from the Dolphinfish *Coryphaena hippurus* of Puerto Rico differs from present species in having smaller body with single

pseudosegment; oral and ventral suckers smaller in size; distance between both suckers is larger; both testes overlapped, much smaller than the testes of present species; shorter distance between anterior testis and ventral sucker and between testes and ovary; shorter distance between uterus ending and posterior extremity; vitellaria commencing from level of ovary, not entering posterior pseudosegment and caeca diverticulating.

D. tornatus collected from the *Coryphaena hippurus* from Puerto Rico differ from the present species in having larger and muscular body; oral sucker terminal, slightly smaller than ventral sucker; ventral sucker smaller and muscular; greater distance between oral and ventral sucker; testes overlapped, anterior testis laterally elongated, well apart from ventral sucker, posterior testis smaller, overlapped by anterior testis; larger space between testis and ovary; distance between ovary and posterior extremity is larger; distance between uterus ending and posterior extremity is larger; vitellaria commencing from mid-level of posterior testis and ovary, entering into posterior pseudosegment.

On the basis of diagnostic differences including pseudosegmented body, position of oral and ventral sucker in relation to each other, distance between both suckers, separated testes and extension of vitellaria, a new species *Dinurus gidrosia* is proposed. The name of new specie refers to Gidrosia, the name of coastal Baluchistan that roughly corresponds to today's Makran Division. Recovery of new species is the indication that the host under study is infected with diverse parasitic forms, therefore, it must be studied histopathologically.

Table 1: Comparative characteristics of various species of genus *Dinurus* Looss, 1907 collected from marine fish *Coryphaena hippurus*.

Parameters	Present species	<i>D. breviductus</i>	<i>D. longisinus</i>	<i>D. tornatus</i>	<i>D. ivanosi</i>
Reference	Present study	Dyer, William and William, 1997	Dyer, William and William, 1997	Dyer, William and William, 1997	Rekha and John, 2004
Body	Long with multiple pseudosegments in posterior half of hind body 4.986 -6.20 (5.3624) ± 0.355 × 0.849-0.99 (0.928) ± 0.0416	Long with single pseudosegment at middle of body; anterior segment broader, tubular, 5.217–0.860	Smaller with single pseudosegment, 0.81 × 0.08	Larger, muscular, 13.886 × 1.358	8.5
Oral sucker	Subterminal 0.342-0.4 (0.3612) ± 0.0155 X 0.315-0.377 (0.34) ± 0.0196	Terminal, 0.608	Smaller, 0.022 × 0.014	Terminal, slightly smaller than ventral sucker, 0.490 × 0.566	Terminal, oval 0.152-0.252 × 0.226-0.232
Ventral Sucker	Muscular, larger than oral sucker, postero-lateral to oral sucker 0.602 -0.7 (0.6299) ± 0.0267 × 0.821-1.0 (0.864) ± 0.0514	Muscular, smaller, 0.517 × 0.652	Smaller, 0.055 × 0.048	Smaller, muscular, 0.566 × 0.679	0.412-0.339 × 0.345-0.399
Distance between oral & ventral suckers	Shorter, 0.479-0.80 (0.5383) ± 0.0883	Shorter, 0.608	Larger, 0.029	Larger, 0.867	0.399-0.465
Anterior testis	Almost round, pre-ovarian, 0.385-0.7 (0.460) ± 0.099 X 0.301-0.60 (0.374) ± 0.0969	Close to ventral sucker, elongated 0.347 × 0.739	Oval-shaped 0.029 X 0.033	Latterly elongated, well apart from ventral sucker 0.41 × 0.52	Pre-ovarian, contiguous, 0.252-0.385 × 0.438-0.532
Posterior testis	oblique in position, separated 0.369-0.60 (0.415) ± 0.0646 × 0.273-0.50 (0.324) ± 0.0699	Sharing edge with anterior testis 3.690 X 2.826	Oval-shaped, 0.029 X 0.033	Overlapped by anterior testis and smaller, 0.301 × 0.452	0.239-0.399 × 0.345-0.359
Distance between anterior testis & ventral sucker	1.273-1.50 (1.346) ± 0.0720	0.869	0.555	1.622	0.385-0.651
Distance between both testes	Not overlapped,	Overlapped	Overlapped	Overlapped	—
Distance between testes & ovary	Shorter, 0.356-0.50 (0.390) ± 0.0380	Larger, 0.739	Shorter, 0.140	Larger, 0.566	—
Distance between ovary & posterior extremity	2.80-3.4 (3.02) ± 0.189	4.130	—	Larger, 7.660	—
Ovary	Well part from ventral sucker, 0.027-0.07 (0.045) ± 0.0141 × 0.273-0.07 (0.045) ± 0.014	Close to ventral sucker 0.826 × 0.391	Bean-shaped, 0.037 × 0.033	0.301–0.339	Oval, single, 0.172-0.159 × 0.292-0.266
Distance between Uterus ending & Posterior extremity	Shorter, 1.465-1.75 (1.597) ± 0.0953	Shorter, 0.913	Shorter, 0.244	Larger, 3.924	—
Cirrus sac	0.739–1.02 (0.858) ± 0.105 × 0.109-0.50 (0.2619) ± 0.1413	—	—	1.66 × 0.188	—
Vitellaria	Commencing from level of ovary, entering into posterior pseudosegment	Commencing from level of posterior testis, not entering posterior pseudosegment	Commencing from level of ovary, not entering posterior pseudosegment	Commencing from mid-level of posterior testis and ovary, entering into posterior pseudosegment	—
Caeca	Straight	Diverticulating	Diverticulating	Straight	Straight
Host	<i>Coryphaena hippurus</i>	<i>Coryphaena hippurus</i>	<i>Coryphaena hippurus</i>	<i>Coryphaena hippurus</i>	<i>Coryphaena hippurus</i>
Country	Pakistan	Puerto Rico	Puerto Rico	Puerto Rico	India

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Conflict of Interest. There is no conflict of interest.

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