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# *Pseudorhabdosynochus dammami* sp. Nov. (Monogenea: Diplectanidae) from greasy grouper, *Epinephelus tauvina* from the Arabian Gulf, off Dammam, Saudi Arabia

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**Abstract:** Monogenea is one of the most important external parasites that infest groupers especially greasy grouper and little attention has paid in this direction. Therefore, gill of 36 greasy grouper, *Epinephelus tauvina* are collected from the Arabian Gulf, off Dammam, Saudi Arabia and examined for the presence of monogeneans. Gills examination revealed that they compress one species of monogenea with prevalence 33.3%. Based on 30 temporary and 5 (holotype and 4 paratypes) permanently mounted specimens, the obtained monogenean parasites were belonging to Diplectanids. It is characterized by a compact, sclerotised vagina sinistral with a robust trumpet, long primary canal and well developed accessory structure. The morphological characters and measurements of the present material were compared with the related species. Consequently, it considered as *Pseudorhabdosynochus dammami* n. sp. and Arabian Gulf, off Dammam recorded a new geographical distribution area.

**Key words:** *Epinephelus tauvina* · Monogenea · Diplectanidae · *Pseudorhabdosynochus*

## INTRODUCTION

Arab Gulf is a treasure rich by different types and formats of fish and other marine life, the less that is available in other seas and it is semi-isolation is a unique marine environment. *Epinephelinae* (Telostei: Serranidae) includes fish of considerable importance in the commercial, sport and artisanal fisheries of tropical and subtropical seas. Groupers, *Epinephelus* spp. represent one of the most important resources targeted by coastal fisheries and aquaculture in Saudi Arabia. In the world, 98 species of *Epinephelus* are known [1& 2].

Parasitic infections by monogeneans have already been mentioned for various species of *Epinephelus* in relation to aquaculture [3, 4] and the systematic knowledge of the diplectanids could be of practical interest, in addition to its interest for the understanding of marine biodiversity [5& 6].

Diplectanid monogeneans on the gills of groupers are diverse and generally strictly species-specific [7-9]. *Pseudorhabdosynochus* Yamaguti, 1958 was erected by Yamaguti [10] for *P. epinepheli* Yamaguti, 1958 from *Epinephelus akaara* off Japan. A total of 45 species of *Pseudorhabdosynochus* Yamaguti, a taxon found mainly on the gills of *Epinephelus* spp. have been reported [6, 7, 9 & 11]; thus, it is a safe prediction that many other species of *Pseudorhabdosynochus* are still undescribed. It is characterized by the presence of a sclerotised male copulatory organ, composed of four chambers [13-15].

Where little attention were carried out about fish parasite in general and especially that of grouper from Arabian Gulf, off Dammam, Saudi Arabia. Therefore, the present study aims to investigate the monogeneans parasites infecting greasy grouper, *Epinephelus tauvina*.

## MATERIALS AND METHODS

Fishes were collected weekly during October 2011 from The Arabian Gulf, off Dammam, Saudi Arabia ('26° 26 N and '07 ° 50 E). Thirty six (36) fish specimens were collected and classified according to Heemstra & Randall [1] as of *Epinephelus tauvina* (Forsskål) ('greasy grouper'; local name: 'Hamour')

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To investigate the monogenean infections, gills were extracted and examined in seawater with a dissecting microscope. Monogeneans were individually picked of the gills with fine needles and immediately prepared for staining with carmine by an initial flattening between a slide and a coverslip in 70% ethanol [13]. Monogenean specimens were mounted temporarily in ammonium picrate glycerine to study the sclerotised parts of the reproductive organs, squamodiscs, anchors, connecting bars and marginal hooklets according to [16]. The worms were examined using a Leica DM5000B with DIC optics.

All Measurements in micrometers unless otherwise stated, were made according to the terminology outlined by Justine and Henery, [8] and are presented as the range followed by the mean and the number measured in parentheses.

## RESULTS

*Type-host: Epinephelus tauvina* (Valenciennes).
*Type-locality:* Off Dammam, Saudia Aribia.
*Site of infection:* Between secondary gill lamellae.
*Prevalence:* 33.3% (12 out of 36 fish examined)
Family Diplectanidae Bychowsky, 1957
Pseudorhabdosynochus dammami sp. nov. (Fig. 1&2)
*Etymology: P. dammami* is named after the specific name of the locality, Dammam.

**Type Specimens:** Hapantotypes are deposited in the parasitological collection of the Zoology Department, Faculty of Science, Ain Shams University, No. 1707.

**Description:** [Based on 30 temporary and 5 (holotype and 4 paratypes) permanently mounted specimens].

Body fusiform, slightly dorso-ventrally flattened, 15.1±1.7 (13.5-17.4) mm. long, 238±18 (224-260) wide, with greatest width usually at level of ovary. Tegument armed with scales in region of haptoral peduncle. Cephalic region with 3-6 pairs of head organs linked to lateral cephalic glands and one pair of eye-spots. Mouth ventrally subterminal; pharynx subspherical to subovate, 63±4 (56-69). Oesophagus short or apparently absent; intestinal bifurcation almost immediately posterior to pharynx. Intestinal caeca blind, end posterior to testes. Anterior region with 3 pairs of head organs and one pairs of eye-spots. Haptor differentiated from rest of body, wider than body, provided with 2 similar squamodiscs, 2 pairs of lateral hamuli, 3 bars and 14 marginal hooklets; haptor width 252± 11(245-267). Ventral squamodisc round, length 32, width 37, made up of 9 rows of rodlets; 2 central rows of rodlets form closed circles; first row with very few (5) rodlets; rodlets adjacent in central rows, progressively more loosely connected in peripheral rows; last row with thinner, isolated rodlets. Number of rodlets in each row 5-6-7-7-6-7-8-8-7. Total number of rodlets 61. Each Squamodisc with 8-10 concentric rows of dumbbell-shaped rodlets which tend to articulate with neighbors in same row; innermost row virtually complete; other rows form incomplete circles which open anteriorly. Dorsal squamodisc 39-64.5• 42-63.5 (48 • 50.8, 20); ventral squamodisc 43-57 • 48-66.6 (48.2 - 58.2, 20).

Ventral hamulas with elongate roots, straight shaft and curved tapering tip; inner length 23.7±0.8 (21.4-25.4); outer length 26.7±1.5 (24.7-28.2); inner root 5.2±0.9 (4.4-6.7); outer root 5.9±0.6 (4.7-6.3). Dorsal hamulas with sub-triangular base, slightly curved shaft and point; inner length 19.2±0.8 (17.3-21.7); outer length 27.4±0.7 (25.7-29.6); point length 5.2±0.5 (4.2-5.9). Ventral bar stout, 62.2±1.4 (58.4-65.7) long; 8.9±0.3 (7.6-9.7) wide, with tapered ends, slightly constricted medially; ventral groove more conspicuous medially. Paired dorsal bars stout, with medial ends enlarged and outer ends curved, 40.7±1.2 (38.3-43.7) long; 5.9±0.5 (3.8-6.8) wide. Hooks similar, 10.8±0.05 (11-13) long.

Testis subspherical, intercaecal, length 38±1.4 (34-43.6). Vas deferens passes anteriorly from testis, dilates to form seminal vesicle; male duct then narrows, loops medially and enlarges again to form oval, muscular ejaculatory bulb prior to entering proximal end of male copulatory organ (Figs. 1B &2A).

Quadriloculate male copulatory organ with fourth (posterior) chamber as sclerotised as 3 anterior chambers; all with approximately similar wall thickness; fourth chamber ends in barely differentiated cone, prolonged by thin-walled sclerotised tube; total length 46.7±3.6 (41.5-50.2); internal length 22.5±2.1 (18-26); outer length 40.6±3.2 (35-46); cone length 7.8±0.4 (5.7-8.7); filament length 40.0±1.5 (36.7-43.5). Tubular part continues as unsclerotised duct leading to genital pore after making inverse loop immediately after leaving tubular part of copulatory organ. Genital pore submedial between level of copulatory organ and ovary.

Sclerotised vagina sinistral, a complex structure (Figs. 1C &2B). Vagina sinistral, with medial sclerotised region and unsclerotised ducts on either side. Distal aperture of vaginal hard-parts links to genital pore via unsclerotised duct. Hard-parts of vagina comprise long sclerotised tube which is expanded close to distal opening; long middle region slightly sinuous until it

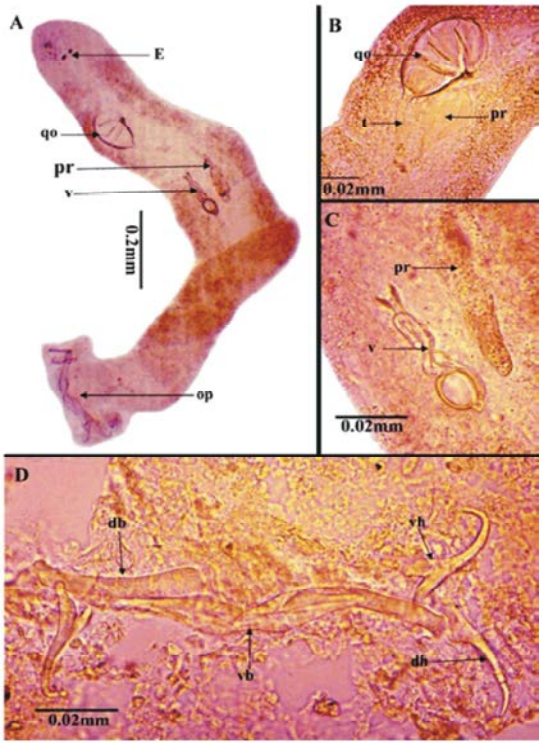


Fig. 1: (A-D) Photomicrograph of Pseudorhab dosynochus dammami sp. n: A. Whole mounted stained specimen (holotype, ventral view); B. Male quadriloculate organ; C. Sclerotised vagina; D. haptoral hard parts. Abbreviations: as, accessory structure; Ch1- Ch4, chamber numbers; Ch2, secondary chamber; db, dorsal bar; dh, dorsal hamulas; f, filament; pch, , primary chamber; pr, prostatic reservoir; sch, secondary chamber; t, tube; tr, trumpet; vb, ventral bar; vh, ventral hamulas.

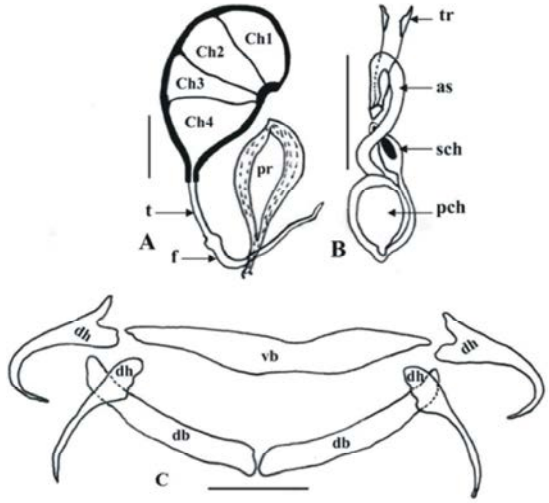


Fig. 2: (A-C) Schematic drawings of the hard taxonomic parts of Pseudorhabdosynochus dammami sp. n.: A. Male quadriloculate organ; B. Sclerotised vagina; C. haptoral hard parts. Abbreviations: as, accessory structure; Ch1- Ch4, chamber numbers; Ch2, secondary chamber; db, dorsal bar; dh, dorsal hamulas; f, filament; pch, , primary chamber; pr, prostatic reservoir; sch, secondary chamber; t, tube; tr, trumpet; vb, ventral bar; vh, ventral hamulas. Scale-bars 20µ.

reverses its course sharply at point of attachment of distinct accessory patch; proximal end of vaginal tube bifurcates and shorter, more posterior branch connects with unsclerotised vaginal duct; total length of sclerotised vagina 45.0±1.4 (41-47), primary chamber dimensions 15.6±1.2 (13.5-16.8) ×11.6±1.0 (10.7-12.3) length by width and Secondary chamber width 5.0±0.41 (4.6-5.9). Internal diameter of trumpet 3, corresponds to diameter of tube of quadriloculate organ.

Ovary subequatorial, intercaecal, pretesticular, grades into oviduct, loops right caecum from dorsal to ventral side; oviduct passes medially to form oötype which is enclosed within Mehlis gland. Oötype short opens into uterus. Uterus large, distinct, leads directly towards and opens into dextral uterine pore at about level of posterior margin of proximal chamber of male copulatory organ. Vitelline glands coextensive with intestinal caeca, reach from level of just posterior to pharynx in 2 bilateral fields to region just anterior to squamodiscs.

## DISCUSSION

Firstly, correct identification of hosts is a prerequisite to parasitological work and is particularly important for the understanding of parasite specificity where, all species of *Pseudorhabdosynochus* that previously described are species-specific with the exception of *P. cyanopodus*, which was from two host species, *Epinephelus cyanopodus* and *E. chlorostigma.* [16-19].

*Pseudorhabdosynochus* possess a male quadriloculate organ with characteristic morphology without equivalent in any other diplectanids [17, 18&20]. For the present material; that has a male quadriloculate organ which is the most distinguishable characteristic feature from all other diplectanids. Due to the presence of a quadriloculate organ with a typical structure, despite its suboptimal condition of the material, this species belongs to *Pseudorhabdosynochus*.

Table 1: Comparison between the previously described related species of Pseudorhabdosynochus with the present material Magnibursatus dammami (all measurements are in µm, unless otherwise stated)

| Aspect | Present Material | P. quadratus holotype (Schoelinck& Justine, 2011a) | P. epinepheli holotype (Justine *et al*. 2009) | E. chlorostigma (Justine& Henry, 2010) |
|---|---|---|---|---|
| Body length | 15.1±1.7 (13.5-17.4) mm. | 350 | 580 | 324 (250-395) |
| Body width | 238±18 (224-260) | 100 | 120 | 219 (180-260) |
| Haptor width | 252± 11(245-267) | 220 | 130 | 150(140-165) |
| Pharynx diameter | 63±4 (56-69) | - | 28× 17 | 30 (24-35)× 27 (23-28) |
| Vagina length | 45.0±1.4 (41-47) | 15 | 33 | 33 (29-35) |
| Primary chamber length | 15.6±1.2(13.5-16.8) | - | 16 | 19 (16-20) |
| Primary chamber width | 11.6±1.0(10.7-12.3) | - | 10 | 13 (11-15) |
| Secondary chamber width | 5.0±0.41 (4.6-5.9) | - | 7 | 5 (4-5.5) |
| Qudrilocated Organ Inner length | 22.5±2.1 (18-26) | 57 | 53 | 46 (44-47) |
| Total length | 46.7±3.6 (41.5-50.2) | - | - | - |
| Outer length | 40.6±3.2 (35-46) | - | | |
| Cone length | 7.8±0.4 (5.7-8.7) | 6 | 7 | 5 (4-6) |
| Tube length | 17.8±1.4 (15.7-19.3) | 10 | 24 | 24 (22-26) |
| Filament length | 40.0±1.5 (36.7-43.5) | - | 11 | |
| Prostatic reservoir length | 39.0±1.6 (36.4-43.5) | - | | - |
| Prostatic reservoir width | 21.1±1.3 (19.2-24.6) | - | | - |
| Dorsal bar length | 40.7±1.2 (38.3-43.7) | 98 | 58-61 | 56 (54-58) |
| Dorsal bar width | 5.9±0.5 (3.8-6.8) | 18 | 17-18 | 13 (11-14 |
| Dorsal hamulas outer length | 27.4±0.7 (25.7-29.6) | 36 | 37-38 | 34 (32-35) |
| Dorsal hamulas inner length | 19.2±0.8 (17.3-21.7) | 21 | 24 | 22 (21-23) |
| Point length | 5.2±0.5 (4.2-5.9) | - | | - |
| Ventral bar length | 62.2±1.4 (58.4-65.7) | 120 | 83 | 74 (69-80 |
| Ventral bar width | 8.9±0.3 (7.6-9.7) | 15 | 14 | 11 (9-16 |
| Ventral hamulas outer length | 26.7±1.5 (24.7-28.2) | 42 | 40 | 35 (31-38) |
| Ventral hamulas inner length | 23.7±0.8 (21.4-25.4) | 32 | 35 | 33 (30-37 |
| Inner root length | 5.2±0.9 (4.4-6.7) | - | - | - |
| Outer root length | 5.9±0.6 (4.7-6.3) | - | - | - |

Moreover, the parasite under discussion has sclerotised vagina which considered another important structural identification key between different species of *Pseudorhabdosynochus* [19,20,22]. In the present material, its anterior chambers of Quadriloculate male copulatory organ with approximately similar wall thickness that differ from all previously described species. Another difference concerns the number of eyes; it may be considered as intraspecific variation [9&21]. All the previous described species of *Pseudorhabdosynochus* have two pairs of eye spots, except *P. epinepheli* that collected from *E. chlorostigma* [9] and the present material.

Generally, it is clear that the body length, body width and Haptor width of monogenean under discussion are larger than that of the other related species (Table 1). Although fits the morphological description to a large extent between the parasite under discussion with *P. quadrates* [20], but when comparing of the measurements both monogeneans species; it is clear that: the sclerotised vagina and male quadriloculate organ of the present parasite (Table 1) larger than that of *P. quadrates*. On contrary, the opithohaptoral parts of *P. quadrates* larger than of the present parasite. The same deference in measurements reported also for *P. epinepheli* [19] and *E. chlorostigma* [20]. Moreover, the present study depends on a large number of monogenean parasites (n) if compared with the previous ones and give more descriptive measurement, especially for haptoral anchors.

The description of the present species depended on morphological characters and metric measurements for most organs. The results above (Table 1) show differences in body length and width, haptor width and haptoral hard parts with most previously described related species that is enough to consider the specimen as a new species and Arabian Gulf especially off Dammam as a new geographical distribution for *Pseudorhabdosynochus*.

## REFERENCES

1. Heemstra, P.C. and J.E. Randall, 1993. FAO Species Catalogue. Vol. 16. Groupers of the world (Family Serranidae, Subfamily Epinephelinae). An annotated and illustrated catalogue of the grouper, rockcod, hind, coral grouper and lyretail species known to date. FAO Fisheries Synopsis No. 125. Rome: FAO, pp: 382.

2. Craig, M.T., D.J. Pondella, J.P.C. Franck and J.C. Hafne, 2001. On the status of the serranid fish genus *Epinephelus*: evidence for paraphyly based upon 16S rDNA sequence. Mol. Phyl. Evol., 19, 121-130.
3. Bu, S.S.H., T.S. Leong, S.Y. Wong, Y.S.N. Woo and R.W.T. Foo,1999. Three diplectanid monogeneans from marine finfish (*Epinephelus* spp.) in the Far East. J. Helminthol., 73: 301-312.
4. Santos, C.P., K. Buchmann and Gibson, 2000. *Pseudorhabdosynochus* spp. (Monogenea: Diplectanidae) from the gills of D.I. *Epinephelus* spp. in Brazilian Waters. Sys. Parasitol., 45: 145-153.
5. Justine, J.L., 2007a Parasite biodiversity in a coral reef fish: twelve species of monogeneans on the gills of the grouper *Epinephelus maculatus* (Perciformes: Serranidae) off New Caledonia, with a description of eight new species of *Pseudorhabdosynochus* (Monogenea: Diplectanidae). Sys. Parasitol., 66: 81-129.
6. Justine J.L., 2007b. *Pseudorhabdosynochus argus* n. sp. (Monogenea: Diplectanidae) *from Cephalopholis argus*, *P. minutus* n. sp. and *Diplectanum nanus* n. sp. from *C. sonnerati* and other monogeneans from *Cephalopholis* spp. (Perciformes: Serranidae) off Australia and New Caledonia. Sys. Parasitol., 68: 195-215.
7. Sigura, A. and J.L. Justine, 2008. Monogeneans of the speckled blue grouper, *Epinephelus cyanopodus* (Perciformes, Serranidae), from off New Caledonia, with a description of four new species of *Pseudorhabdosynochus* and one new species of Laticola (Monogenea: Diplectanidae) and evidence of monogenean faunal changes according to the size of fish. Zootaxa, 1695: 1-44.
8. Justine, J.L. and È. Henry, 2010. Monogeneans from *Epinephelus chlorostigma* (Val.) (Perciformes: Serranidae) off New Caledonia, with the description of three new species of diplectanids. Sys. Parasitol., 77: 81-105
9. Schoelinck, C. and J.L. Justine, 2011b. *Pseudorhabdosynochus quadratus* n. sp. (Monogenea: Diplectanidae) from the white-streaked grouper *Epinephelus ongus* (Bloch) (Perciformes: Serranidae) off New Caledonia. Sys. Parasitol., 79: 77-80.
10. Yamaguti, S., 1958. Studies on the helminth fauna of Japan. Part 53. Trematodes of fishes. XII. Pub. Seto Mar. Lab., 5: 53-88.
11. Justine, J.L.T., 2008. Two new species of *Pseudorhabdosynochus Yamaguti*, 1958. (Monogenea: Diplectanidae) from the deep-sea grouper *Epinephelus morrhua* (Perciformes: Serranidae) off New Caledonia. Sys. Parasitol., 71: 145-158.
12. Luo, Y.F. and T.B. Yang, 2010. Seasonal population dynamics of the monogeneans Pseudorhab dosynochus coioidesis and *P. serrani* on wild versus cultured groupers in Daya Bay, South China Sea. Helminthol., 47(4): 241-250.
13. Justine, J.L., 2005a. Species of Pseudorhab dosynochus Yamaguti, 1958. (Monogenea, Diplectanidae) from *Epinephelus fasciatus* and *E. merra* (Perciformes, Serranidae) off New Caledonia and other parts of the Indo-Pacific Ocean, with a comparison of measurements of specimens prepared with different methods and a description of *P. caledonicus* n. sp. Sys. Parasitol., 62: 1-37.
14. Justine, J.L., 2005b. *Pseudorhabdosynochus hirundineus* n. sp. Monogenea: Diplectanidae) from *Variola louti* (Perciformes: Serranidae) off New Caledonia. Sys. Parasitol., 62: 39-45.
15. Tingbao, Y., D.I. Gibson and Z. Bijian, 2005. *Pseudorhabdosynochus summanoides* n. sp. (Monogenea: Diplectanidae) from *Epinephelus coioides* in Dapeng Bay, South China Sea, with observations on several similar species of *Pseudorhabdosynochus Yamaguti*, 1958. Sys. Parasitol., 62: 221-239.
16. Lim, L.H.S., 1995. Two new species of *Pseudodactylogyroides* Ogawa, 1986 (Monogenea) from two species of Eleotridid fishes of Peninsular Malaysia. Sys. Parasitol., 31: 25-32 .
17. Oliver, G., 1992. La spècificitè parasitaire des Diplectanidae Bychowsky, 1957 (Monogenea, Monopisthocotylea): un facteur pour la connaissance des poissons-hôtes. Cybium, 16: 361-366.
18. Hinsinger, D.D. and J.L. Justine, 2006. The '*Pseudorhabdosynochus cupatus* group' (Monogenea: Diplectanidae) on *Epinephelus fasciatus*, *E. howlandi*, *E. rivulatus* and *E. merra* (Perciformes: Serranidae) off New Caledonia, with descriptions of *Pseudorhabdosynochus cyathus* n. sp. and *P. calathus* n. sp. Sys. Parasitol., 64: 69-90.
19. Justine, J.L., C. Dupoux and T.H. Cribb, 2009. Resolution of the discrepant host-specificity of *Pseudorhabdosynochus* species (Monogenea, Diplectanidae) from serranid fishes in the tropical Indo-Pacific. Acta Parasitol., 54: 119-130.

20. Schoelinck, C., C. Cruaud and J.L. Justine, 2012. Are all species of *Pseudorhabdosynochus* strictly host specific? -A molecular study. Parasitol. Int., 61(2): 356-359.
21. Justine, J.L. and L. Euzet, 2006. Diplectanids (Monogenea) parasitic on the gills of the coral groupers *Plectropomus laevis* and *P. leopardus* (Perciformes, Serranidae) off New Caledonia, with the description of five new species and the erection of Echinoplectanum n. g. Sys. Parasitol., 64: 147-172.
22. Schoelinck, C. and J.L. Justine, 2011a. Four species of *Pseudorhabdosynochus* (Monogenea: Diplectanidae) from the camouflage grouper *Epinephelus polyphekadion* (Perciformes: Serranidae) off New Caledonia. Sys. Parasitol., 79: 41-61.