Magnibursatus diplodii n. sp. (Derogenidae: Halipeginae) from white sea bream, *Diplodus sargus*, Off Sirt, Libya

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Abstract: Examination of the 35 specimens of White Sea bream, *Diplodus sargus* Linne 1758 (Sparidae)were caught from the Sirt Coast, Libya and revealed the presence of one new halpigian parasite, *Magnibursatus diplodii* n. sp. with incidence 25.7% (9 out of 35 fish examined). The main characters of the obtained parasite are ; the. Body is small and slender and at the same time, the forebody is shorter than the anterior one. Oral sucker is subterminal, and ventral sucker cup-shaped, strongly muscular, substantially larger than oral one, protuberant. Testes are two in number ,, oval in shaped and separated from each other. Seminal vesicle very elongate, coiled. Pars prostatica short, poorly developed. Ovary spherical to oval in shaped, and separated from posterior testis. Vitellarium comprises 2compact, entire, contiguous masses, situated side by side posterior to ovary. The morphological characters and measurements of the present parasite were discussed with the previously related species. Moreover, Sirt coast is considered a new geographical area for halpegian parasites.
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Key words: Parasite**,** Digenea, Derogenidae, *Magnibursatus diplodii*, *Diplodus sargus*.

1. Introduction

The perciform family Sparidae comprises more than 100 species worldwide. Sparids are demersal fishes living in coastal waters and occupying a variety of trophic niches (Bargelloni *et al*. 2005). Although the White Sea bream *Diplodus sargus* Linne, 1758, is a common and commercial sparid in the Eastern Atlantic Ocean and Mediterranean Sea (Whitehead *et al.* 1984), the digenean fauna is known mainly from the northern shore of the Mediterranean Sea (Bartoli 1987 a, b**;** Bartoli and Gibson 1989**;** Bartoli and Bray 1996**;** Bartoli *et al*. 1989a, b**,** 2005**;** Sasal *et al*. 1999; Ternengo *et al*. 2005**;** Pérez -del Olmo *et al*. 2006, 2007, 2008**&** Kostadinova and Gibson, 2009**)**. However, on the southern Mediterranean little work was done (Gargouri and Maamouri, 2008 & Gargouri *et al*. 2011).

Records of the derogenids subfamily Halipeginae Poche, 1926 are scarce and tend to restricted to small number of host groups. As far as we are aware, the halpegian genus *Magnibursatus* Naidenova (1969) consists of 7 nominal species, most of them being parasites of sparid fishes from Black – Sea and northern shore of the Mediterranean Sea fishes (Kostadinova *et al*. 2003 &2004; Kostadinova & Gibson, 2009). Consequently, the number of species is greater than previously believed, indicating some recent radiation, where additional material from *Diplodus sargus* may help reveal whether the morphometric variation reflects host or population differences (Kostadinova & Gibson 2009).

Thus, the present article aims to study the prevalence and light microscopical description of new halpigian species of the genus *Magnibursatus* Naidenova (1969), from *Diplodus sargus* Linne 1758, Sirt Coast, Libya.

2. Materials and methods

A total of 35 host fishes, *Diplodus sargus* Linne 1758, (Sparidae), were collected alive from fishermen in Sirt Coast, located in the middle of the Libyan coast between Tripoli and Benghazi (31°:12.19 N and 16°:35.18 W). After capture, fish were maintained alive in aquaria and anaesthetized and killed just before autopsy for parasites. After death, gills and the digestive tract were removed and each of its anatomical parts of the later isolated and opened. Digenean specimens were collected under a dissecting microscope and studied while still alive and later as permanent preparations. Individuals were fixed in Bouin's fluid between slide and coverslip without pressure, stained in acetic carmine and mounted in Canada balsam. Only ovigerous specimens were studied using a differential interference microscopy. Illustrations were made using a drawing tube. Measurements are given as the range in micrometers, with the mean in parentheses. All measurements are in micrometers. The term 'forebody' refers to the distance between the anterior extremity of the body and the anterior margin of the ventral sucker. The term 'hindbody' refers to the

distance between the posterior margin of the ventral sucker and the posterior extremity of the body.

3. Results

Family: Derogenidae Nicoll, 1910
Subfamily: Halipeginae Poche, 1926
Magnibursatus Naidenova, 1969
Magnibursatus diplodii sp. n.
Host: *Diplodus sargus* (L.) – white seabream (Perciforms: Sparidae).
Locality: Sirt Gulf, Libya.
Sites: Gills and oesophagus.
Prevalence: 9 of 35 fish 25.7% (9 out of 35 fish examined).
Intensity: 1-3
Etymology: *M. diplodii* is named after the specific name of the host, *Diplodus sargus*.
Description: (Figs. 1-3; Table 1).

[Based on 20 whole-mounted adult specimens.] Body small, slender. The total body length measured 803-850 (827), widest at level of ventral sucker. Forebody relatively shorter than the anterior one; It was 295-326 (319) in length, its maximum width at lateral aspect were 78-94(89) and was 108-125 (119) at ventral aspect. Hindbody relatively long; 357-375 (361), its maximum width at lateral aspect were 83-95(91) and was 135-148 (142) at ventral aspect. Worms usually take up lateral position to make approximately right-angle when mounted (Fig.1a&2b). Tegument unarmed. Pre-oral lobe distinct [8-14 (12)]. Oral sucker subterminal, subglobular [41- 53 ×52 -64 (46×58)]. Ventral sucker cup-shaped, strongly muscular, substantially larger than oral sucker, protuberant [131-152×136-161(146×150)]. Prepharynx was absent. Pharynx subglobular; with dimensions [17-21×22–33(19×27)]. Oesophagus short. Intestinal bifurcation just posterior to pharynx. 'Drüsenmagen' present. Caecae with thick epithelial lining, end blindly fairly close to posterior end of body.

Testes 2, oval, smooth, oblique to tandem, separated from each other; anterior testis somewhat sinistral, [56-71×49-62 (65×50)], well-separated from ventral sucker by [16–23 (19) (AT/BL = 2.3%)]; posterior testis [61-73×49-62 (69×54)], at [186-198(191)] from posterior end of body (PT/BL = 23%). Seminal vesicle very elongate, coiled. Pars prostatica short, poorly developed. Hermaphroditic duct is short. Sinus-sac large, broadly oval, comparable in size to oral sucker, in anterior half of forebody, it measures [75-89×45-63(81×50)] and its posterior extremity separated by [74-85(81)] from ventral sucker. Its posterior 2/3 with multi-layered muscular wall, male and female ducts unite within its proximal thin-walled portion. Genital atrium is shallow. Permanent sinus-organ not observed. Genital pore is median, just posterior to level of pharynx or more anterior.

Ovary is spherical or transversely oval, entire, median, posterior to and separated from posterior testis by 23-31 (27). It is slightly smaller than testes and it measures [49-58×39-51 (54×46)]. Oviduct is with thick-walled. Laurer's canal thick-walled, not surrounded by gland-cells, terminates as Juel's organ. Proximal part of Juel's organ contains spermatozoa. Mehlis' gland strongly developed, delimited by membrane. Proximal part of uterus heavily convoluted, with some eggs, but nearly filled by spermatozoa, forming uterine seminal receptacle (Fig. 1&2), coils from level of ovary almost at posterior end of body, separated from the end of the body(Post-ovarian region) 113-124 (119), overlaps vitelline and Mehlis' gland dorsally. Uterine coils pass over dorsal faces of ovary and most of testes; large uterine loops present between anterior testis and ventral sucker; numerous uterine loops in forebody; uterus opens into posterior wall of sinus sac, forming muscular metraterm considerably shorter than sinus-sac (Fig. 3). Vitellarium comprises 2 compact, entire, contiguous masses, situated side by side posterior to ovary and measures 36-47×32-42 (42×38). Vitelline reservoir is absent. Vitelline duct short joins oviduct just prior to Mehlis' gland. Eggs numerous, operculate, with numerous fine, terminal threads filaments; threads very obvious in fully developed eggs from fore-body, but difficult to see in eggs from hind-body; It measures 10-15×5-9(13×7).

Excretory vesicle Y-shaped, with very short wide stem which bifurcates just posterior to Vitelline glands; arms wide, run forward in dorso-lateral field, re-unite dorsally at level of posterior pharynx. Excretory pore is terminal.

4. Discussion

The trematode under discussion is a parasite commonly referred to as "a derogenid". In the most recent revision of the family Derogenidae by Kostadinova & Gibson (2009), three species, *M. barretti, M. bartolii*, and *Magnibursatus* species were included in the genus *Magnibursatus* from the gills and oesophagus of *D. sargus*, Spain.

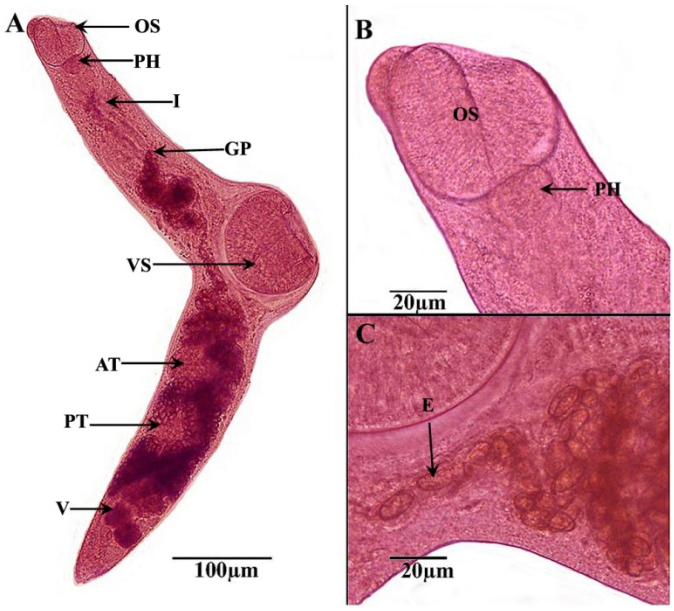

Fig. 1. Light microscopic photomicrographs of *Magnibursatus diplodii* sp. n. (A) Whole fluke (lateral view). Note: Fluke take up lateral position to make approximately right-angle. (B) Anterior end of the specimen showing the ventral sucker and the subglobular eosophagus. (C) The ventral sucker area showing operculate filamentous eggs. *Abbreviations*: AT, anterior testes; E, egg; GP, genital pore; I, intestine; OS, oral sucker; PH, pharynx; PT, posterior testes; V, vetelarium; VS, ventral sucker.

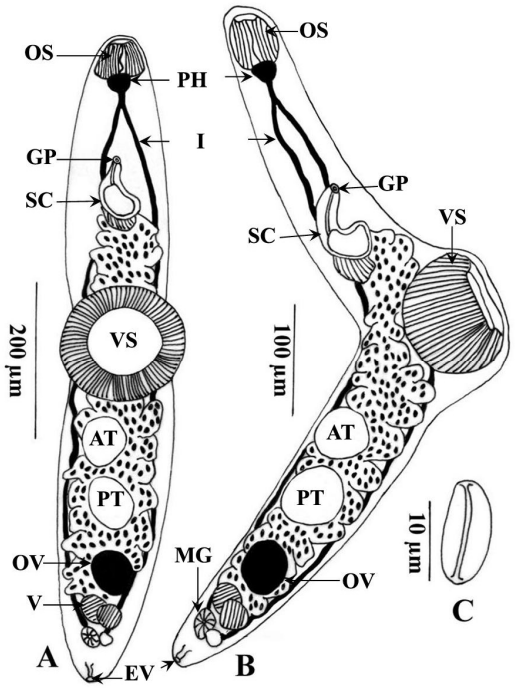

Fig. 2. Schematic drawing of *Magnibursatus diplodii* sp. n. **A)** Ventral view of flattened adult fluke. **B)** Lateral view of adult specimen, Note: Worm take up lateral position to make approximately right-angle. **C)** Egg. *Abbreviations*: AT, anterior testes; EV, excretory vesicle; GP, genital pore; I, intestine; MG, Mehlis' gland; OS, oral sucker; OV, ovary; PH, pharynx; PT, posterior testes; SC, sinus sac; V, vetelarium; VS, ventral sucker.

Table (1): Comparison between the previously described related species of *Magnibursatus* with the present material *Magnibursatus diplodii* (all measurements are in µm).

Species	***M. barretti***	***M. bartolii***	***M. bartolii***	***Magnibursatus* sp.**
Host	*Diplodus sargus*	*Diplodus sargus*	*Boops boops*	*Diplodus sargus*
Locality	Off Burriana (Spain)	Off Santa Pola (Spain)	NE Atlantic coast (Spain)	Off Burriana (Spain)
Source	Kostadinova & Gibson (2009)	Kostadinova & Gibson (2009)	Kostadinova *et al*. (2003)	Kostadinova & Gibson (2009)
Site	oesophagus	Gills & oesophagus	oesophagus	oesophagus
Measurements	**Range**	**Range**		
Body length	520–605		1.32 – 1.78	697
Forebody maximum width (ventral aspect)	130–155	–	363	–
Forebody maximum width (lateral aspect)	117	189–233	250–304	139
Hindbody maximum width (ventral aspect)	59–86	–	334	–
Hindbody maximum width (lateral aspect)	73	138–139	146–279	97
Pre-oral lobe length	8–11	13–15	13–29	11
Oral sucker	42–63 × 38–71	86–105 × 76–96	100–146 × 100–154	74 × 63
Pharynx	25–29 × 25–31	32–34 × 40–42	42–79 × 46–67	32 × 25
Ventral sucker	115–149 ×115–143	185–225 × 185–225	259–313 × 325	166 × 166
Sinus-sac	71–76 ×19–42	162–174 × 76–94	275× 179	130 × 65
Anterior testis	42–48 × 31–48	86–90 × 78–86	88–175 × 154	76 × 53
Posterior testis	36–52 × 32–50	96–99 × 82–97	67–175 × 163	82 × 55
Ovary	27–32 × 29–36	57–76 × 76–84	50–129 × 125	53 × 46
Vitelline masses	24–28 × 19–23	51–56 × 42–46	46–121 × 38–113	39 × 28
Eggs	13–19 × 7–9 (16 × 8)	23–25 × 11–12 (25 ± 0.7 × 11 ± 0.3)	18–26 × 9–14 (24 × 12)	–
Distances				
Forebody length	166–178	327–548	525–734	246
Hindbody length				
Posterior extremity of sinus sac to ventral sucker				
Anterior testis to ventral sucker	13–42	31–153	92–179	23
Posterior testis to ovary				
Post-testicular region	145–180	220–405	284–396	185
Post-ovarian region	109–136	143–248	154–234	153
Ratios				
FO/BL (%)	29–32	35–36	36–42	36- 41
AT/BL (%)	2–7	3–10	6–11	3
PT/BL (%)	27–30	24–27	21–25	6-11
OV/BL (%)	21–23	15–16	11–15	11-14
Sucker-width ratio	1:2.01–3.03	1:2.34–2.43	1:2.11	1:2.63
Sinus-sac length /forebody length ratio			1: 2.5-4.8 (3.3)	
Ventral sucker to ovary			134-403 (252)	
Posterior testis to ovary			0-33 (3)	

Table 1. *Continued*

Species	***M. minutus***	***M. blennii***	***M. diplodii***
Host	*Neogobius eurycephalus*	Three diff. fish species	*Diplodus sargus*
Locality	Black Sea	off Corsica (France)	off Sirt coast (Libya)
Source	Kostadinova *et al*. (2003)	Kostadinova *et al*. (2004)	Present study (n = 13)
Site	Alimentary canal	Oesophagus & Ant. Intestine	Gills & oesophagus
Measurements	**Range**		**Rang (Mean)**
Body length	571–826	675-1.406 (1.036)	803 -850 (827)
Forebody maximum width (ventral aspect)	150–154		108 - 125 (119)
Forebody maximum width (lateral aspect)	142–192		78 -94(89)
Hindbody maximum width (ventral aspect)	150		135 -148 (142)
Hindbody maximum width (lateral aspect)	133–158		83 -95 (91)
Pre-oral lobe length	13–25		8-14 (12)
Oral sucker	63–75 × 46–88	88-154 × 86-165 (120 × 112)	41- 53 ×52 -64 (46×58)
Pharynx	25–42 × 25–42	32-64 × 35-80 (44 × 59)	17 -21 ×22 –33 ((19×27)
Ventral sucker	104–150 × 138	106-176 (134)	131-152 ×136-161 (146×150)
Sinus-sac	113 × 75	95-186 × 63-103 (134 × 85)	75-89 ×45-63 (81×50)
Anterior testis	54–92 × 71	58-147 × 77-205 (109 × 134)	56-71 ×49-62 (65×50)
Posterior testis	71–83 × 92	59-176 × 92-208 (114 × 138)	61-73 ×49-62 (69×54)
Ovary	50–63 × 63	44-128 × 63-160 (76 × 105)	49-58 ×39-51 (54×46)
Species	M. minutus	M. blennii	M. diplodii
Vitelline masses	33–63 × 26–63		36-47×32-42 (42×38)
Eggs	22–30 × 11–15 (25 × 13)	23-29 × 11-14 (26 × 12.5) (n = 55)	10-15×5-9(13×7) (n=50)
Distances			
Forebody length	188–313	285-591 (440)	295 - 326 (319)
Hindbody length		275-724 (473)	357 – 375 (361)
Posterior extremity of sinus sac to ventral sucker		63-250 (152)	74 -85 (81)
Anterior testis to ventral sucker	4–21	16-96 (52)	16 - 23 (19)
Posterior testis to ovary			23 - 31 (27)
Post-testicular region	125–234	139-348 (227)	186 -198 (191)
Post-ovarian region	75–154	96-240 (151)	113- 124 (119)
Ratios			
FO/BL (%)	27–40	37.4-47.5 (42.6) %	38.6
AT/BL (%)	0.5–4.8	1.6-9.2 (5.0) %	2.3
PT/BL (%)	22–30	18.6-26.4 (21.6) %	23
OV/BL (%)	13–19		14.0-14.6 (14.4)
Sucker-width ratio	2.11	1:0.93-1.22 (1.12)	1:2.52-2.62 (1:2.58)
Sinus-sac length /forebody length ratio			1:3.9
Ventral sucker to ovary			2.7:1
Posterior testis to ovary			1.28:1

FO/BL, forebody mean length as a proportion of body mean length; **PT/BL**, post-testicular field mean length as a proportion of body mean length; **AT/BL**, distance from ventral sucker to anterior testis as a proportion of body mean length; and **OV/BL**, post-ovarian field mean length as a proportion of body mean length.

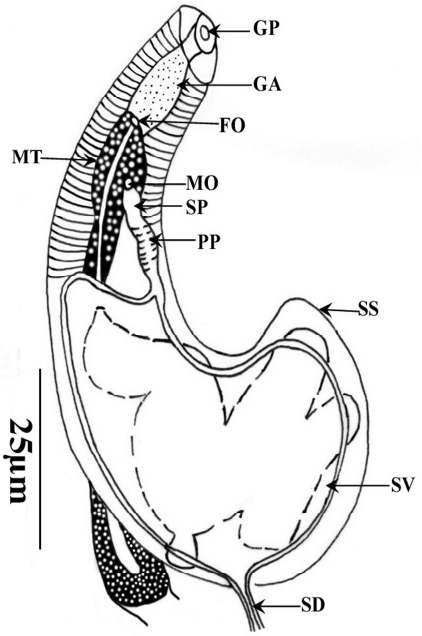

Fig. 3. Schematic drawing showing details of the terminal genitalia (Dorsal view of the sinus-sac). *Abbreviations*: GA, genital atrium; GP, genital pore; HD, hermaphroditic duct; FO, female genital opening; MO, male genital opening MT, metraterm; PP, pars prostatica; SD, spermiduct; SP, sphincter; SS, sinus-sac; SV, seminal vesicle.

As proposed by Gibson & Bary (1979) and Kostadinova *et al*. (2009), the parasite under discussion possessed the characteristic features of the genus *Magnibursatus* (Halipeginae). It was identified as, *M. diplodii* n. sp. due to; the possession of a large muscular ventral sucker which is substantially larger than the oral sucker; the position and space occupied by the sinus-sac in the forebody; the distribution of the uterine coils in the forebody; the relative length of the forebody; the position of the gonads; and having an anterior testis that well separated from the posterior one and from the ventral sucker by uterine coils.

Comparing the present material with the previously closed related species (table 1), It show that a relatively differences in measurements. After comparison of Kostadinova *et al*. (2003 & 2004) and Kostadinova & Gibson (2009)'s materials; and the present specimen, it was observed that most measurements of the present fluke has great deference in almost measurements; especially that of suckers, and testis and ovary (table 1).

M. diplodii n. sp. differs from *M. bartolii* Kostadinova *et al*. (2003), *M. blennii* Kostadinova *et al*. (2004), *M. caudofilamentosa* (Gibson and Køie, 1991) and *M. skrjabini*, Vlasenko (1931) in its slender body with markedly smaller dimensions (size of body and all organs), relatively short forebody and notably larger sucker-width ratio. The new species appears most similar to *M. minutus* Kostadinova, *et al*. (2003) and a form with similar body dimensions that described from a gobiid host in the Black Sea (Kostadinova *et al*., 2003). Moreover, The new species can be further distinguished from *M. minutus* by: (i) its distinctly smaller oral sucker (41-53×52-64(46×58) vs.63-75×46-88, ventral sucker (sucker-width ratio 1:2.52-2.62(1:2.58) vs. 1:1.86–1.94); (ii) more posterior located ovary (OV/BL 14.0-14.6 (14.4) vs. 13–19%); and (iii) much smaller eggs (10-15×5-9(13×7) vs. 22–30×11–15(25×13). The above differences and the considerable geographical and host separation justify, in our opinion, the distinct status of *M. diplodii* n. sp.

However, the present specimens measured are somewhat smaller (within the lower range for body size of *M. bartolii*) and this results in most metrical features varying within or below the lower limits reported for *M. bartolii* in Boops boops from the NE Atlantic by Kostadinova *et al*. (2003) (Table 1).

From the above we can concluded that the present derogenid; *M. diplodii*; is a new species and Sirt Coast is a new geographical area. Moreover, the results of the current and previously obtained can conclude that the restriction of some digeneans to only one host species relates to the transmission

modality of the infective stages of parasites and with the diet of the host (Bartoli, 1987b).

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