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Three species of *Magnibursatus* Naidenova, 1969 (Digenea: Derogenidae) from Atlantic and Black Sea marine teleosts

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Abstract. Three species of *Magnibursatus* Naidenova, 1969 are described from marine teleosts: *M. skrjabini* (Vlasenko, 1931), the type species of the genus, from the gobiid *Zosterisessor ophiocephalus* on the Bulgarian Black Sea coast; *M. bartolii* sp. n. from the sparid *Boops boops* off the Atlantic coast of Spain; and *M. minutus* sp. n. from the gobiid *Neogobius eurycephalus* on the Bulgarian Black Sea coast. *M. bartolii* differs from all other *Magnibursatus* species in its larger sinus-sac (length >250 μm, width >150 μm) and the more posterior location of testes. This species is also unusual in that it occurs in the branchial chamber and on the gills of its host. *M. minutus* is distinguished by the distinctly smaller dimensions of the body (length <1000 μm, width <200 μm), organs and eggs. These species are also distinguished from both *M. caudofilamentosa* (Reimer, 1971) and *Tyrrhenia blennii* Paggi et Orecchia, 1975. A key to the species of *Magnibursatus* is presented.

During a survey of parasites of bogue, *Boops boops* (L.), off the Atlantic coasts of Spain, we came across a species possessing characteristics of two halipegine derogenid genera, *Magnibursatus* Naidenova, 1969 and *Tyrrhenia* Paggi et Orecchia, 1975. In attempting to identify the specimens we have examined comparative material (27 specimens) from Black Sea gobiid fishes provisionally identified as *Magnibursatus skrjabini* (Vlasenko, 1931) Naidenova, 1969 by Dr. G. Dimitrov (Bulgarian Academy of Sciences). We have found that the Atlantic form and part of the Black Sea material both show some distinctive features, which led us to describe them as new species. This paper includes a redescription of *M. skrjabini* and descriptions of two new species of *Magnibursatus*, one collected from *B. boops* off the Northern Atlantic coasts of Spain and the other from Black Sea gobiids.

MATERIALS AND METHODS

The trematodes from *B. boops* were dissected out from freshly frozen fish, fixed in alcohol-formol-acetic acid (AFA), transferred to 70% ethanol, stained with iron acetocarmine (Georgiev et al. 1986) and mounted in Canada balsam. Specimens from Black Sea fishes were dissected out from freshly caught fish, killed in a hot normal saline solution, transferred to 70% ethanol, stained and mounted as above. The type and voucher material is deposited at The Natural History Museum, London [BM(NH)] and in the collections of both the Central Laboratory of General Ecology, Bulgarian Academy of Sciences (CLGE) and the Cavanilles Institute of Biodiversity and Evolutionary Biology, University of Valencia (ICBIBE).

The following abbreviations for ratios (expressed as percentages) are used in the text and table: FO/BL, forebody length as a proportion of body length; PT/BL, post-testicular field length as a proportion of body length; AT/BL, distance from ventral sucker to anterior testis as a proportion of body length; and OV/BL, post-ovarian field length as a proportion of body length. Measurements and scales are in micrometres.

RESULTS

Family D e r o g e n i d a e Nicoll, 1910
Subfamily H a l i p e g i n a e Poche, 1926
MAGNIBURSATUS Naidenova, 1969

Magnibursatus skrjabini (Vlasenko, 1931)

Fig. 1A, B, D

Redescription. Based on 12 whole-mounts. Measurements (see Table 1) taken from 10 adults. Body elongate, widest at level of ventral sucker or testes. Tegument thick, unarmed. Pre-oral lobe present. Oral sucker subterminal, spherical. Ventral sucker muscular, distinctly larger than oral sucker, cup-shaped, slightly protuberant. Forebody relatively long. Prepharynx absent. Pharynx subglobular. Oesophagus short. Intestinal bifurcation just posterior to pharynx. 'Drüsenmagen' present. Caeca with thick epithelial lining, end blindly fairly close to posterior end of body.

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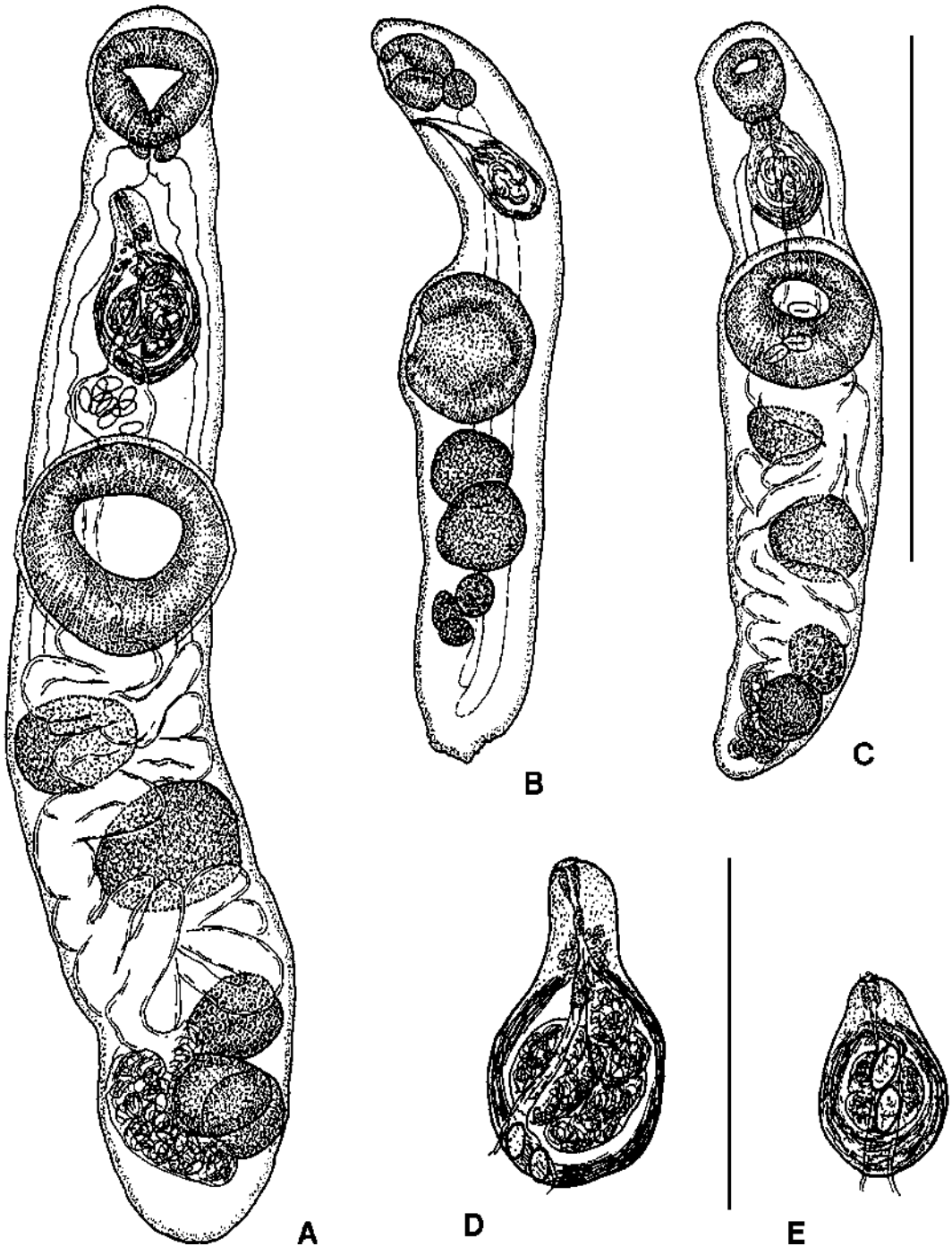

Fig. 1. *Magnibursatus* spp. **A** – *M. skrjabini* (Vlasenko, 1931) ex *Zosterisessor ophiocephalus*, mature adult, ventral view; **B** – *M. skrjabini*, immature specimen, lateral view; **C** – *M. minutus* sp. n. ex *Neogobius eurycephalus*, holotype, ventral view; **D** – *M. skrjabini*, terminal genitalia; **E** – *M. minutus*, terminal genitalia. Scale bars: A, B, C = 500 μm; D, E = 200 μm.

Testes 2, oval, entire, oblique, fairly close to each other or contiguous. Anterior testis always dextral, adjacent to posterior border of ventral sucker or separated from it by uterine coil; posterior testis sinistral, in mid-hindbody. Seminal vesicle elongate, tubular, c. 30 wide, coiled. Pars prostatica short; prostatic cells large. Hermaphroditic duct short. Sinus-sac large, broadly oval, comparable in size to oral sucker, in middle of forebody; its posterior 2/3 with multi-layered muscular wall up to 13–20 thick; male and female ducts unite within proximal thin-walled portion. Genital atrium shallow. Permanent sinus organ not observed. Genital pore median, at level of pharynx or slightly posterior.

Ovary sinistral, distinctly smaller than testes, transversely-oval, usually well separated from posterior testis. Laurer's canal and rudimentary seminal receptacle not seen. Uterine seminal receptacle well developed, coils from level of ovary to near posterior end of body, filled with spermatozoa and some eggs. Uterus fills much of hindbody, passes into forebody as narrow tube apparently restricted by bulk of ventral sucker, forms few coils in forebody. Metraterm nearly as long as sinus-sac, enters sinus-sac ventrally to male duct. Eggs small, operculate, with filaments. Vitellarium 2 compact, entire, partly overlapping oval masses, immediately posterior and adjacent to ovary.

Excretory pore terminal. Vesicle obscured by eggs; anterior arms unite dorsally to pharynx.

H o s t : *Zosterisessor ophiocephalus* (Pallas) (Gobiidae).

L o c a l i t y : Off Bourgas, Bulgarian Black Sea coast (42º30'N, 27º33'E), 11.iv.1994.

S i t e : Alimentary canal.

M a t e r i a l : BM(NH) 2002.8.16.9–10; CLGE, No. B.26.2.

Remarks. There are few published descriptions of *M. skrjabini.* Vlasenko (1931) described *Derogenoides skrjabini* Vlasenko, 1931 apparently on the basis of a single worm from the intestine of *Gaidropsarus mediterraneus* (as *Onos tricirrata*) off the Crimean coast of the Black Sea. Skrjabin and Guschanskaya (1955) tentatively retained the species in *Derogenoides* Nicoll, 1913, suggesting that its position needs further clarification. Naidenova (1969) erected *Magnibursatus* for this species and redescribed it on the basis of newly-collected material from *Gobius niger*, *G. cobitis*, *G. paganellus*, *Neogobius platyrostris*, *Zosterisessor ophiocephalus*, *Neogobius cephalarges*, *G. mediterraneus* and *Lepidogaster lepidogaster lepidogaster* from various localities off the Ukrainian Black Sea coast.

Although adequate, the redescription by Naidenova (1969) provided little morphometric information (see Table 1) that would help in discrimination of new forms. Not surprisingly, Gibson and Køie (1991) encountered difficulties in distinguishing *M. caudofilamentosa* (Reimer, 1971) Gibson et Køie, 1991 from *M. skrjabini* when using data taken from the drawing of Naidenova (1969). The size range given by this author, and briefly reiterated by Gaevskaya et al. (1975), is, in our opinion, far too wide to reflect only intraspecific variation (see Table 1). Furthermore, the lower ranges of the measurements are substantially smaller than the upper, and this suggests either some uncertainty concerning the state of development of Naidenova's specimens, or whether the wide range of variation reported by Naidenova (1969) might be due to the description of composite material. In their description of *M. caudofilamentosa* based on mature worms, Gibson and Køie (1991) stated that 'immature worms as small as 350–400 μm in length were also found', and these dimensions appear fairly close to the lower range limits (345 μm) provided by Naidenova (1969) for mature worms (upper size limit 1,125 μm) (see Table 1 for details). On the other hand, one immature worm in our set of *M. skrjabini* (Fig. 1B) measured 750 μm in length. Overall, our metrical data for *M. skrjabini* agree well with the upper measurement ranges provided by Naidenova (1969), although indicating a slightly more posterior location of the ventral sucker in the present material (FO/BL 30.5–37.8 *vs* 27.4%). This difference, however, might be due to the fact that the comparison comes from a single specimen in the drawing of Naidenova (1969); the ratio is also affected by the allometric growth.

The differentiation of *M. skrjabini* from *M. caudofilamentosa* is not clear-cut with respect to morphometric features which tend to show overlapping ranges, although with higher upper limits for all characters in the latter species (Table 1). The ratio FO/BL calculated from the drawing by Gibson and Køie (1991) is smaller, which suggests that the ventral sucker is more anterior in *M. caudofilamentosa*. However, the values calculated from ranges given in the text fall within the range of *M. skrjabini* (Table 1). Yet, in *M. caudofilamentosa* the sinus-sac occupies most of the forebody, its muscular wall is thicker (in relation to the space occupied by the seminal vesicle), the ovary is not separated from the posterior testis by uterine coils and the vitelline masses are more elongate. The different hosts and geographical disparity also tend to support their distinct status, as indicated by Gibson and Køie (1991).

Magnibursatus bartolii sp. n. Fig. 2A, B, C

Description. Based on 10 whole-mounts. Measurements in description from holotype (Fig. 2A), overall ranges given in Table 1. Body elongate, widest at ventral sucker, 1,781 × 363. Worms usually take up lateral position when mounted due to strongly muscular, protuberant ventral sucker to form from shallow '3'-shape to right-angle (Fig. 2B). Tegument unarmed. Preoral lobe distinct, 29 long. Oral sucker subglobular, subterminal, 146 × 154, with 6 papillae on its anterior rim. Ventral sucker substantially larger than oral sucker, 284 × 325, sub-spherical, with deep cavity, distinctly protuberant on slight eminence narrower than sucker itself. Sucker-width ratio 1 : 2.11; sucker-length ratio 1 : 1.72. Forebody 734 long (FO/BL = 41.2%). Prepharynx absent. Pharynx subglobular, 79 × 67. Two groups of gland-cells present lateral to pharynx or just posterior; associated ducts probably open into pharynx. Oesophagus short. 'Drüsenmagen' present. Caeca end blindly at about level of vitellarium; their course in hindbody is obscured by extensive uterine loops.

Testes 2, oval, smooth, oblique to tandem, very close to each other or contiguous; anterior testis somewhat sinistral, 117 × 154, well-separated from ventral sucker by 104 (AT/BL = 5.8%); posterior testis 175 × 163, at 396 from posterior end of body (PT/BL = 22.2%). Seminal vesicle very elongate, c. 75 wide, coiled. Pars

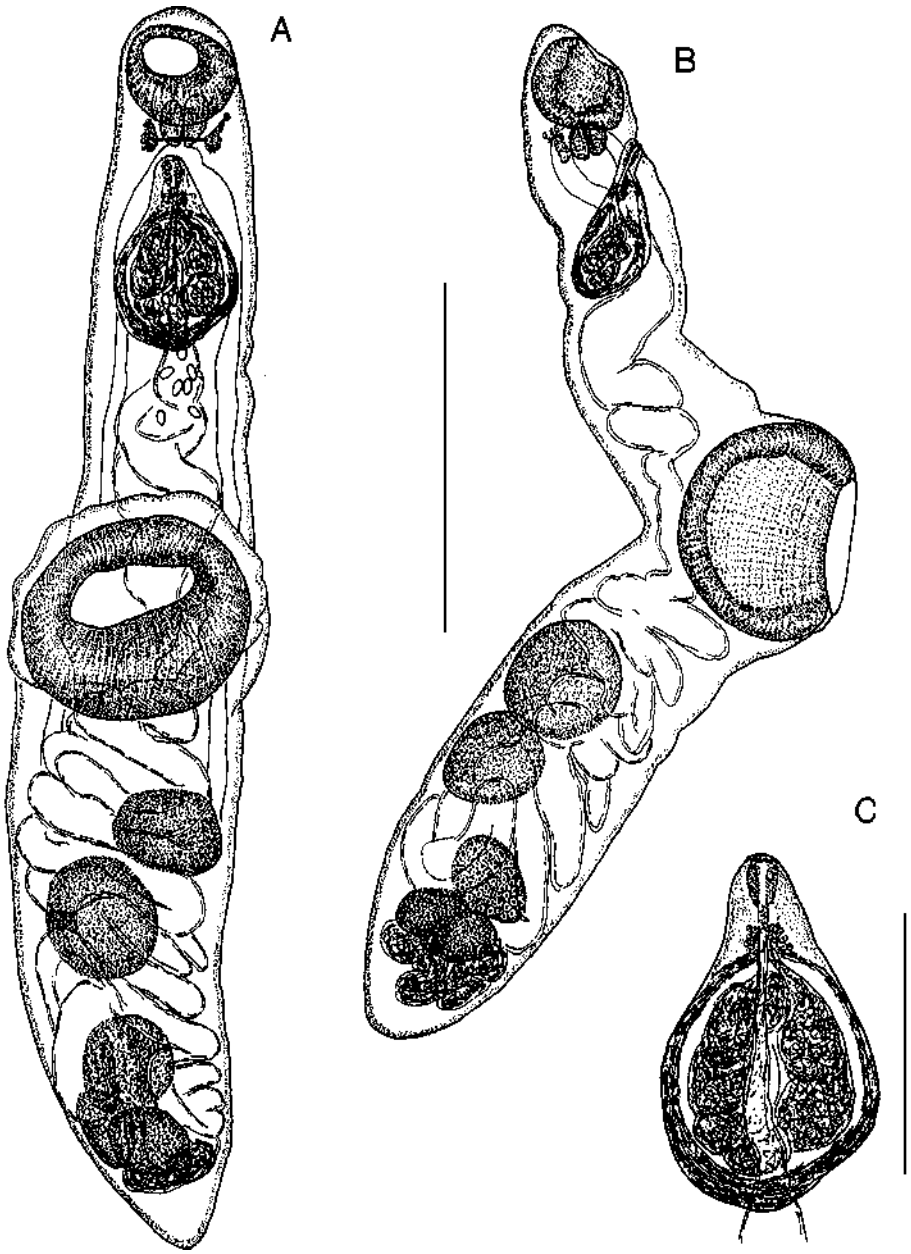

Fig. 2. *Magnibursatus bartolii* sp. n. ex *Boops boops*. **A** – holotype, ventral view; **B** – paratype, lateral view; **C** – terminal genitalia. Scale bars: A, B = 500 μm; C = 200 μm.

prostatica short, poorly developed. Hermaphroditic duct short. Sinus-sac large, broadly oval, comparable in size to oral sucker, in anterior half of forebody; its posterior 2/3 with multi-layered muscular wall up to 21–30 thick; length (posterior margin to genital pore) 275, maximum width 179; male and female ducts unite within its proximal thin-walled portion. Genital atrium shallow. Permanent sinus-organ not observed. Genital pore median, just posterior to level of pharynx or more anterior.

Ovary large, subspherical, separated from posterior testis by uterine coils, dorso-medial. Post-ovarian region 213 long, OV/BL 5.8%. Laurer's canal not seen due to extensive development of uterus but small (?) rudimentary seminal receptacle observed in one specimen. Uterine seminal receptacle well developed; main bulk posterior to vitellarium, filled with spermatozoa and a relatively small number of eggs. Uterus fills much of hindbody, passes into posterior forebody as narrow tube constricted by bulk of ventral sucker, where it again forms numerous coils. Metraterm short, enters sinus-sac ventrally to male duct. Eggs small, 22–25 × 13–14, operculate; filaments or threads present but not readily seen in whole-mounts. Vitellarium in 2 compact, entire, partly overlapping subglobular masses posterior to and

Table 1. Measurements of *Magnibursatus* spp. and *Tyrrhenia blennii.*

Species	*Magnibursatus skrjabini* (Vlasenko, 1931)	*Magnibursatus skrjabini* (Vlasenko, 1931)	*Magnibursatus caudofilamentosa* (Reimer, 1971)	*Magnibursatus bartolii* sp. n.	*Magnibursatus minutus* sp. n.	*Tyrrhenia blennii* Paggi et Orecchia, 1975
Host	Gobiidae, Lotidae, Gobiesocidae	*Zosterisessor ophiocephalus*	*Gasterosteus aculeatus*	*Boops boops*	*Neogobius eurycephalus*	*Blennius gattorugine*, *B. sanguinolentus*
Source	Naidenova (1969)	Present study	Gibson and Køie (1991)	Present study	Present study	Paggi and Orecchia (1975)
Body length	345–1,125	1,163–1,389	1,060–1,420	1,318–1,781	571–826	1,270–2,600
Body maximum width (ventral aspect)	51–375	209–250	295–365	363	150–154	250–470
Body maximum width (lateral aspect)	–	192–259	–	250–304	142–192	–
Hindbody maximum width (ventral aspect)	–	209–254	295–365	334	150	–
Hindbody maximum width (lateral aspect)	–	192–254	–	146–279	133–158	–
Pre-oral lobe length	–	13–38	up to 30	13–29	13–25	–
Oral sucker length	47–96	104–113	116–153	100–146	63–75	150–260
Oral sucker width	58–124	96–129	124–163	100–154	46–88	140–250
Pharynx length	–	46–54	48–67	42–79	25–42	70–100
Pharynx width	23–40	50–58	46–64	46–67	25–42	80–140
Sinus-sac length	–	129–196	122–215	275	113	170–220
Sinus-sac width	–	104–117	70–140	179	75	100–130
Ventral sucker length	–	175–229	230–305	259–313	104–150	180–250
Ventral sucker width	87–202	196–213	230–310	325	138	180–260
Anterior testis length	47–164	92–150	70–190	88–175	54–92	100–160
Anterior testis width	40–124	117–138	100–190	154	71	130–200
Posterior testis length	as above	104–158	60–190	67–175	71–83	100–170
Posterior testis width	as above	129–154	95–232	163	92	140–170
Ovary length	31–140	71–88	70–150	50–129	50–63	80–200
Ovary width	31–78	92–113	92–152	125	63	110–160
Vitellarium 1 length	28–87	42–96	50–118	58–121	33–63	80–150
Vitellarium 1 width	25–62	67–125	74–120	38–75	33–63	70–110
Vitellarium 2 length	as above	50–92	70–126	46–96	38–63	as above
Vitellarium 2 width	as above	58–92	58–104	42–113	26–63	as above

Table 1. Continued.

Forebody length	–	354–471	325–475	525–734	188–313	–
Anterior testis to ventral sucker	–	0–67	–	92–179	4–21	–
Post-testicular region	–	317–396	–	284–396	125–234	–
Post-ovarian region	–	175–254	–	154–234	75–154	–
Anterior end to centre of ventral sucker	–	459–584	–	617–880	271–384	–
FO/BL %	27.4*	30.5–37.8	26.2* 30.7–33.5**	35.9–41.8	27.1–40.1	43.0*
PT/BL %	31.6*	25.8–33.0	29.6*	20.8–24.9	21.9–30.4	23.0*
OV/BL %	16.8*	12.6–21.9	22.3*	11.3–14.5	13.1–19.3	15.7*
AT/BL %	2.1*	0–4.9	0.5*	5.8–10.5	0.5–4.8	14.0*
VS/BL %	34.7*	39.3–45.5	34.5*	43.8–51.1	38.9–47.4	47.2*
Sucker length ratio	2.86*	1.68–2.03	2.0* 1.98–1.99**	1.95–2.84	1.65–2.26	0.94* 0.96–1.20**
Sucker width ratio	2.14* 1.50–1.63**	1.62–2.13	2.15* 1.85–2.15	2.11	1.86–1.94	1.07* 1.04–1.29**
Egg length						
range	25–31	22–28	24–30 (26–28)	18–26	22–30	20–25
mean ± SD		26 ± 1.7		24 ± 1.7	25 ± 1.9	
n		60		75	34	
Egg width						
range	12–16	11–17	8–15 (10–12)	9–14	11–15	8–10
mean ± SD		13 ± 1.2		12 ± 1.1	13 ± 1.0	
n		60		75	34	

* Calculated from published drawing; ** calculated from range measurements

contiguous with ovary; anterior 121 × 71; posterior 96 × 113.

Excretory pore ventrally subterminal. Vesicle obscured by eggs; arms unite dorsally to pharynx.

T y p e h o s t : *Boops boops* (L.) (Sparidae).

L o c a l i t i e s : Off Ondárroa, Spain, Bay of Biscay (43º19'N, 2º25'W) (type locality), 06.vi.2001; and Malpica, Spain, North Atlantic (43º19'N, 8º49'W), 27.xi.2001.

S i t e s : Branchial chamber and gills.

M a t e r i a l : Holotype BM(NH) 2002.8.16.1; paratypes BM(NH) 2002.16.2–3; paratypes ICBIBE, GMB 5, 8, 21, 23, 24.

E t y m o l o g y : This species is named for Professor Pierre Bartoli, Centre d'Océanologie de Marseille, in recognition of his major contributions to the taxonomy and ecology of fish digeneans of the Mediterranean region.

Remarks. *Magnibursatus bartolii* resembles *M. skrjabini* (see above) but has a larger body, larger testes, a larger ovary and a longer forebody. It possesses a distinctly larger sinus-sac, which is located in the anterior half of the forebody, and a substantially larger ventral sucker. The anterior testis is well separated from the ventral sucker by uterine coils (AT/BL 5.8–10.5 *vs* 0–4.9%) (see also Table 1).

This new species differs from *M. caudofilamentosa* (as described by Gibson and Køie 1991) in: the relative width of the space occupied by coils of the seminal vesicle in the ventral plane; the larger proportion of the uterus in the forebody; a larger sinus-sac; and, notably, a longer forebody (FO/BL 35.9–41.8 *vs* 26.2–33.5%); more posteriorly located testes (AT/BL 5.8–10.5 *vs* 0.5%) – still separated from the ovary, which is also more posteriorly located (OV/BL 11.3–14.5 *vs* 22.3%); and the egg-size [18–26 × 9–14 (mean 24 × 12) *vs* 24–30 × 8–15 μm].

But for the number of specimens recovered, the unusual site of the parasite in the branchial cavity might indicate a post-mortem migration from the stomach, as occasionally occurs in the case of individual specimens of the related derogenid *Derogenes varicus* (Müller, 1784).

This new species is morphologically similar to *M. minutus* sp. n., which is discussed below.

Magnibursatus minutus sp. n. Fig. 1C, E

Description. Based on 6 whole-mounts. Measurements in description from holotype; overall ranges given in Table 1. Body very small, 730 × 154, elongate, widest at level of ventral sucker and anterior testis. Tegument smooth. Pre-oral lobe present, 17 long. Oral sucker subterminal, spherical, 75 × 71. Ventral sucker muscular, distinctly larger than oral sucker, subglobular, on slight protuberance, 129 × 138. Sucker-width ratio 1 : 1.94; sucker-length ratio 1 : 1.72. Forebody 221 long (FO/BL = 30.3%). Prepharynx absent. Pharynx spherical, 33 × 33. Oesophagus short. 'Drüsenmagen' present. Caeca blind, end relatively close to posterior extremity of body.

Testes 2, oval, entire, slightly oblique, relatively close together or contiguous; anterior testis dextral, 54 × 71, contiguous with posterior border of ventral sucker or slightly posterior to it, at 17 (AT/BL = 2.3%) from ventral sucker; posterior testis sinistral, 83 × 92, in mid-hindbody, at 200 from posterior extremity of body (PT/BL = 27.4%). Seminal vesicle elongate, tubular, up to 30 wide, coiled. Pars prostatica and hermaphroditic duct short. Sinus-sac 113 × 75, broadly oval, comparable in size to oral sucker, occupies most of forebody; its posterior 2/3 with multi-layered muscular wall up to 25 thick; male and female ducts unite within its proximal thin-walled portion. Genital atrium shallow. Permanent sinus-organ not seen. Genital pore median, at level of pharynx.

Ovary sinistral, smaller than testes, oval, adjacent to or apart from posterior testis. Post-ovarian region 117 long (OV/BL = 16.0%). Laurer's canal and rudimentary seminal receptacle not seen. Uterine seminal receptacle well developed, coils between level of ovary and almost posterior extremity of body. Main bulk of uterus in hindbody; few coils in forebody. Metraterm indistinct, enters sinus-sac ventrally. Eggs large in relation to size of body, 24–28 × 13–15, operculate, filamented. Vitellarium 2 compact, almost entirely overlapping, smooth, oval masses, posterior and adjacent to ovary, 63 × 63.

Excretory pore terminal. Vesicle obscured by eggs; arms unite postero-dorsally to oral sucker.

T y p e h o s t : *Neogobius eurycephalus* (Kessler) (Gobiidae).

T y p e l o c a l i t y : Off Cape Atiya, Bulgarian Black Sea coast (42º28'N, 27º37'E), 14.viii.1996.

S i t e : Alimentary canal.

M a t e r i a l : Holotype BM(NH) 2002.8.16.4; paratypes BM(NH) 2002.8.16.5-8.

Remarks. *Magnibursatus minutus* differs from *M. skrjabini* (see above), *M. caudofilamentosa* (as described by Gibson and Køie 1991) and *M. bartolii* (see above) in its distinctly smaller dimensions (size of body and all organs, see Table 1). We have no doubt about the state of maturity of these worms, since the uterine development is at a stage comparable to the other forms and the hindbody is virtually filled with eggs (see also Fig. 1 for a comparison with an immature specimen of *M. skrjabini*).

In the position and space occupied by the sinus-sac in the forebody and the relative thickness of its muscular wall (in relation to the width of the space occupied by the seminal vesicle in the ventral plane), *M. minutus* closely resembles only *M. caudofilamentosa*. These two species are similar also in the presence of a few uterine coils in the forebody, since the sinus-sac leaves little space anterior to the ventral sucker. In addition to the different hosts and localities, *M. minutus* can be clearly

differentiated from *M. caudofilamentosa* in the substantially smaller dimensions of the body and all its organs (almost half the size, see Table 1), as well as in its more posteriorly located ventral sucker (VS/BL 38.9–47.4 *vs* 34.5%) (although it could be argued that this is an age-related feature, as indicated above, our specimens are fully mature).

In addition to distinct size differences, *M. bartolii* has more posteriorly located testes, especially the anterior testis (AT/BL 5.8–10.5 *vs* 0.5–4.8%), and smaller eggs. Although ranges for egg length and width tend to overlap (see Table 1), statistical comparison of the egg-size of the three forms described above, revealed significant differences for both length ($F_{2,168} = 12.25$, $p = 0.0000$) and width ($F_{2,168} = 16.86$, $p = 0.0000$) and discriminated the Spanish material as having lower mean values, from the Black Sea specimens (Tukey's comparison of means, $Q = 3.314$, $p < 0.05$). Although the two lots from the Black Sea (i.e. *M. skrjabini* and *M. minutus*) did not show statistically significant differences in egg-size, the eggs in *M. minutus* are larger in relation to body size, and this may also serve as a distinguishing feature (see also Fig. 1C and Key).

DISCUSSION

The three forms described above share the large muscular ventral sucker, which is located at about mid-body and is substantially larger than the oral sucker, as well as the characteristic thick-walled, broadly oval sinus-sac with a long, coiled internal seminal vesicle.

They show similarity with respect to these features, to the halipegine derogenid genus *Magnibursatus* Naidenova, 1969. Initially, the three forms keyed down to the monotypic genus *Tyrrhenia* Paggi et Orecchia, 1975 in the key of derogenid genera in Gibson and Bray (1979), the essential feature differentiating *Magnibursatus* from *Tyrrhenia* being the presence of numerous filaments or threads at each end of the egg of the former. However, careful observation, allowed us to see filaments on the eggs in whole-mounts, even though, as pointed out by Naidenova (1969) and Gibson and Køie (1991), filaments are readily visible in live specimens but difficult to detect in whole-mounts.

A comparison of the diagnoses of the two genera in Gibson (2002) show that the two genera also differ in the position of the ventral sucker (in the anterior half of the body in *Magnibursatus vs* near the middle of the body in *Tyrrhenia*), the shape of the seminal vesicle (coiled, tubular *vs* saccular, attenuated distally), the presence (in *Magnibursatus*) or absence (in *Tyrrhenia*) of a permanent sinus-organ and Juel's organ, and the different extent of the uterus (extends posterior to the vitellarium in *Magnibursatus* and into the forebody in *Tyrrhenia*). Although the species described above exhibit somewhat more posterior location of the ventral sucker, and in this tend to resemble *Tyrrhenia* rather than *Magnibursatus*, they are close to *Magnibursatus* in all other morphological aspects.

Nevertheless, we believe that it is also necessary to compare the present species with *Tyrrhenia*, especially because a worm called '*Tyrrhenia* sp.' was listed by Cordero del Campillo et al. (1994; quoted from thesis of Pellicer Carrasco 1992) from *Sarpa* [as *Boops*] *salpa* off the Mediterranean coast of Spain [although not reported by López-Román and Guevar-Pozo (1971) in a survey of this host in the same region]. The type and only species of the genus, *T. blennii* Paggi et Orecchia, 1975 (as described by Paggi and Orecchia 1975), differs from all three forms described above in having both suckers of a similar size; a sinus-sac which is claviform, thin-walled and rather small in relation to the size of the oral sucker; and an anterior testis well posterior to the ventral sucker. Other differences, relating to individual species of *Magnibursatus*, are as follows (see also Table 1):

• *Magnibursatus skrjabini* differs from *T. blennii* in: the smaller dimensions of the body, oral sucker, pharynx, testes and ovary; the larger sucker-ratios (width 1 : 1.62–2.13 *vs* 1 : 1.07; length 1 : 1.68–2.03 *vs* 1 : 0.94); the shorter forebody (FO/BL 30.5–37.8 *vs* 43.0%); and the testes being more anteriorly located in the hindbody (AT/BL 0–4.9 *vs* 14.0% and PT/BL 25.8–33.0 *vs* 23.0%).

• In *M. bartolii* the sinus-sac is larger, broadly oval, comparable in size to the oral sucker and possesses a thick muscular wall; the ventral sucker is strongly muscular, much larger and about twice the size of the oral sucker (for type specimens, sucker-width ratio 1 : 2.11 *vs* 1 : 1.07 in *T. blennii*; sucker-length ratio 1 : 1.72 *vs* 1 : 0.94); and the anterior testis is not as distant from the ventral sucker (AT/BL 5.8–10.5 *vs* 14.0%).

• As compared to *M. minutus*, *T. blennii* has a relatively longer forebody and a more posteriorly located anterior testis (AT/BL 14.0 *vs* 0.5–4.8%), a claviform sinus-sac which occupies a small proportion of the forebody, a smaller sucker-ratio and somewhat smaller eggs (20–25 × 8–10 *vs* 22–30 × 11–15 μm).

Our study suggests that *Magnibursatus* may have a wider distribution and greater range of host species than was supposed. As far as we are aware, the only record of a derogenid in *B. boops* refers to specimens listed as *Derogenes varicus* (Müller, 1784), reported from samples taken at the Gulf of Lyons and Tunisian coasts (Cook et al. 1981, Anato et al. 1991, Renaud et al. 1980). The historical biogeography of fish halipegines related to *Magnibursatus*, such as *Arnola* Strand, 1942, was commented upon by Gibson and Bray (1979), who suggested a link with the ancient Sarmatic Sea of Central Asia. This and a link with the Tethys Sea was developed in more detail by Gibson and Køie (1991). However, the latter authors found that *Magnibursatus* was a bit of an anomaly, with a disjunctive distribution – the Black Sea and eastern Danish / western Baltic waters. As the present finding of a species of this genus

off the Atlantic coast of Spain is approximately halfway between these localities, it makes the northerly records look less extreme and supports Gibson and Køie's suggestion regarding the northerly movement of the fauna along the Atlantic coast of Europe after the last ice-age.

More extensive sampling and possibly molecular evidence would be useful in assessing the status of the new forms described above. Considering their distinct species status, which we have endorsed here, we subscribe to the poetic metaphor of the late Dr. A.A. Shigin, that "if not described, such forms would remain unnoticed, pale animal shadows", thus drawing attention to this little-known group.

In order to help distinguish the four species of *Magnibursatus*, a key is presented below.

Key to the species of *Magnibursatus*

1 Sinus-sac large (length >250 µm, width >150 µm). Anterior testis well apart from ventral sucker (AT/BL > 5%) ……..... *M. bartolii* sp. n. (Host: *Boops boops*)
– Sinus-sac smaller (length <250 µm, width <150 µm). Anterior testis contiguous with posterior border of ventral sucker or slightly posterior (AT/BL < 5%) …...……...……..... 2

2 Sinus-sac/forebody length ratio 1 : <2. Muscular wall of sinus-sac thick (width 1/2–1/4 of width of space occupied by seminal vesicle) ..…….. 3
– Sinus-sac/forebody length ratio 1 : >2. Wall of sinus-sac relatively thin (width 1/6 of width of space occupied by seminal vesicle) ... *M. skrjabini* . (Hosts: gobiids)

3 Body very small (length <1,000 µm, width <200 µm); oral sucker dimensions <100 µm; ventral sucker dimensions <150 µm. Eggs large in relation to body size (length c. 3.5–4% of body length) ……..... *M. minutus* sp. n. (Host: *Neogobius eurycephalus*)
– Body large (length >1,000 µm, width >200 µm); oral sucker dimensions >100 µm; ventral sucker dimensions >200 µm. Eggs smaller in relation to body size (length c. 2.0–2.5% of body length) ...…….. *M. caudofilamentosa* (Host: *Gasterosteus aculeatus*)

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REFERENCES

ANATO C.B., KTARI M.H., DOSSOU C. 1991: La parasitofaune métazoaire de *Boops boops* (Linné, 1758), poisson téléostéen Sparidae des côtes tunisiennes. Oebalia 17: 259–266.

COOK J.-M., BLANC G., ESCOUBET P. 1981: Parasites et poissons d'aquariums méditerranéens. Vie Marine 3: 139–144.

CORDERO del CAMPILLO M., ORDOÑEZ L.C., FEO A.R. 1994: Indice-Catálogo de Zooparásitos Ibéricos. Universidad de León, León, 650 pp.

GAEVSKAYA A.V. et al. (Eds.) 1975: [Keys to the parasites of vertebrates of Black and Azov Seas. Parasitic invertebrates of fishes, fish-eating birds and marine mammals.] Naukova Dumka, Kiev, 551 pp. (In Russian.)

GEORGIEV B.B., BISERKOV V.Y., GENOV T. 1986: *In toto* staining method for cestodes in iron acetocarmine. Helminthologia 23: 279–281.

GIBSON, D.I. 2002: Family Derogenidae Nicoll, 1910. In: D.I. Gibson, A. Jones and R.A. Bray (Eds.), Keys to the Trematoda. Vol. 1. CAB International, Wallingford, pp. 351–368.

GIBSON D.I., BRAY R.A. 1979: The Hemiuroidea: terminology, systematics and evolution. Bull. Br. Mus. (Nat. Hist.) Zool. 36: 35–146.

GIBSON D.I., KØIE M. 1991: *Magnibursatus caudofilamentosa* (Reimer, 1971) n. comb. (Digenea: Derogenidae) from the stickleback *Gasterosteus aculeatus* in Danish waters: a zoogeographical anomaly? Syst. Parasitol. 20: 221–228.

LÓPEZ-ROMÁN R., GUEVAR-POZO D. 1971: Parasite fauna of fish from Mediterranean coast of Granada (Spain). Intestinal digenea of *Boops salpa* (L.). Proc. Second Int. Congr. Parasitol., Washington, 6–12 September, 1970. J. Parasitol. 56: 216.

NAIDENOVA N.N. 1969: [Erection of a new trematode genus, *Magnibursatus* nov. gen. (Hemiurata: Halipegidae), from Black Sea fishes.] Materialy Nauchnoy Konferentsii Vsesoyuznogo Obshchestva Gel'mintologov 1: 187–195. (In Russian.)

PAGGI L., ORECCHIA P. 1975: *Tyrrhenia blennii* g.n. sp.n. (Hemiurata: Halipegidae Poche, 1925) parassita di *Blennius gattorugine* e *Blennius sanguinolentus*. Parassitologia 17: 57–64.

RENAUD F., ROMESTAND B., TRILLES J.-P. 1980: Faunistique et écologie des métazoaires parasites de *Boops boops* Linnaeus, 1758 (Téléostéen Sparidae) dans le Golfe du Lion. Ann. Parasitol. Hum. Comp. 55: 467–476.

SKRJABIN K.I., GUSCHANSKAYA L.K. 1955: [Suborder Hemiurata (Markevitsch, 1951) Skrjabin et Guschanskaya, 1954. Second part.]. Osnovy Trematodologii 11: 613–615 (In Russian.)

VLASENKO P.V. 1931: [On the parasitic worm fauna of fishes of the Black Sea.] Trudy Karadagskoy Biologichnoy Stantsii Imeni T.I. Vyazemskogo 4: 88–136. (In Russian.)

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