

**Serrasentis Sagittifer Linton, 1889 (Acanthocephala: Rhadinorhynchidae)
from the Red Porgy *Pagrus pagrus* (Teleostei: Sparidae)
of the Red Sea, Egypt: A Morphological Study**

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Abstract: In the present study, an acanthocephalan parasite was recovered from the intestine of the red porgy *Pagrus pagrus* (Sparidae) captured from water locations along the Red Sea at Hurghada coasts, Egypt. The parasite was observed attached to the wall of the host intestine by an armed proboscis equipped by recurved hooks. 14 out of 40 fish specimens (35.0%) were found to be infected during winter season only. The mean intensity ranged from 4-10 parasites/infected fish. The recovered worms were creamy white, elongated with narrow posterior end. Light and scanning electron microscopy showed that the parasite has distinctive rows of spines (combs) on the ventral surface. Body was 3.55 ± 0.02 (3.33-3.58) mm long. Width at the base of proboscis was 0.10 ± 0.02 (0.08-0.12) mm. Proboscis club-shaped with a broad anterior end, equipped by longitudinal rows of hooks, each with 15-19 of curved hooks. Neck smooth, the double-walled receptacle was attached to the proboscis wall. Trunk was spinose anteriorly, spines arranged in 7-10 collar rows, each was equipped with 15-18 spines. Two lemnisci were variable in shape and length, arised from the base of neck, extended up to the med level of trunk to a level beyond the testes. Testes were ovoid, equal and in tandem. Primordia of the cement glands were located at the posterior end of the body. Female specimens were not detected. The present parasite was compared with the most similar species recorded previously from different hosts which showed that the parasite isolated is belonged to be *Serrasentis sagittifer*.

Key words: Acanthocephala • Sparidae • Rhadinorhynchidae • Red Sea • Morphology

INTRODUCTION

Members of phylum Acanthocephala are endoparasites without a digestive tract, the adult worms live in the intestinal lumen of fresh and salt water fish, attached to the wall of intestine, while the post-cystacanth stages are encapsulated in fish tissues [1]. They have a complex life cycle with arthropods as intermediate hosts and vertebrates as definitive hosts [2, 3]. These parasites possessed an armed proboscis as organ of attachment causing irreversible mechanical damage leading to pathological changes to the intestinal architecture in addition to loss/degeneration of intestinal villi, formation of the granular tissues and capsule

formation associated with host immune responses that seriously affect animal's digestive and absorptive efficiency. In heavy infections they cause occlusion of the gut and invasion and migrate into uncommon locations [4]. The genus *Serrasentis* was erected by Van Cleave [5]. *S. sagittifer* is one of the most important pathogenic parasites infecting the digestive system of fish, especially intestine [6]. This species have a wide range of hosts; they were reported from 13 fish species from the Arabian Gulf, especially from the coasts of Iran, Kuwait and Emirates [7]; from 5 fish hosts of Karachi coast [8]; from 20 species of the Atlantic Ocean [9]; and from 6 species of Brazilian coasts [10-12]. Eight synonyms are known for *S. sagittifer*. These are:

Echinogaster sagittifer Linton [13]; *Echinorhynchus sagittifer* Linton [13]; *S. chauhani* Datta [14]; *S. giganticus* Bilqeas [15]; *S. longus* Tripathi [16]; *S. longiformis* Bilqeas [15]; *S. scomberomori* Wang [17] and *S. socialis* Leidy [18]. Pathogenicity of acanthocephalans is caused mainly by two factors; worms' density and depth of parasite penetration into the host tissues according to Taraschewski [19, 20], who mentioned that pathological effects might be localized around individual worms in low infection, but in high parasitic load, total destruction of the tissue architecture occurred due to the collective pathological changes. In the present study, *S. sagittifer*, an acanthocephalan parasite isolated from the intestine and pyloric ceca as well as body cavity of the red porgy *Pagrus pagrus* during a recent parasitological survey on parasites of marine fish inhabiting the Red Sea at Hurghada, Egypt. The parasite was described by light and scanning electron microscopy.

MATERIALS AND METHODS

forty specimens of the red porgy *P. pagrus* (Teleostei: Sparidae) were captured from locations along the Red sea at Hurghada city, Egypt, during the period from January to September 2017. After fish dissection, worms were isolated from the intestine and pyloric ceca, transferred to a saline solution and washed several times to remove any mucous or debris. Worms were relaxed in tap water, this was important for the proboscis to be fully everted then transferred and fixed in 10% formalin. After fixation, worms were washed in distilled water to remove the excess fixative and then processed for staining in acetic acid alum carmine for 5-10 minutes [21]. A differentiation step in dilute solution of HCl alcohol (0.5 ml in 1000 ml alcohol) should be carried out to remove the excess stain and observed under a binocular dissecting microscope to detect the end point of differentiation. This is followed by dehydration in an ascending series of ethanol, 30%, 50%, 70%, 90%, 95% and absolute ethanol, 2-5 minutes for each grade. Worms were then cleared in xylene for 10 minutes, mounted in Canada balsam and covered with cover glass and left to dry in an oven at 40°C. Prevalence of infection, mean abundance and worm measurements followed the guidelines of Bush *et al.* [22], minimum and maximum values were given, followed in parentheses by the arithmetic mean (\pm SD). For scanning electron microscopy, worms were fixed in 3% buffered glutaraldehyde, washed

in cacodylate buffer and dehydrated in an ascending ethyl alcohol series. After passing through an ascending series of the Genosolv-D, they were processed in a critical point drier "Bomer-900" with freon 13 and sputter coated with gold-palladium in a Technics Hummer V and examined with an Etec Autoscan at 20 kV Jeol scanning EM.

RESULTS

14 fish specimens (35.0%) out of 40 were naturally infected during winter only. The parasite was observed attached to the wall of the host intestine by an armed proboscis equipped with recurved hooks. The mean intensity ranged from 4-10 parasites/infected fish.

Serrasentis Sagittifer: Linton [13] and Van Cleave [5].

Description: Male worms were creamy white, elongated, curved with slight tegument annulations and a narrow posterior end. It was characterized by the presence of distinctive rows of spines (combs) on the ventral surface of the trunk. Body was 3.55 ± 0.02 (3.33-3.58) mm long. Width at the base of proboscis was 0.10 ± 0.02 (0.08-0.12) mm. Proboscis club-shaped with a broad anterior end, 0.75 ± 0.02 (0.71-0.77) mm long x 0.25 ± 0.02 (0.23-0.27) mm wide. Proboscis equipped by longitudinal rows of hooks, each with 15-19 of curved hooks. Proboscis hooks decreased in length from apex to base of proboscis, although apical hooks were slightly smaller than sub apical ones. Neck smooth, the double-walled receptacle was attached to the proboscis wall. Trunk was spinose anteriorly, spines arranged in 7-10 collar rows, each was equipped with 15-18 spines. Two lemnisci were variable in shape and length, arised from the base of neck, extended up to the med level of trunk to a level beyond the testes. Testes were ovoid, equal and in tandem. Primordia of the cement glands were located at the posterior end of the body. Female specimens were not detected.

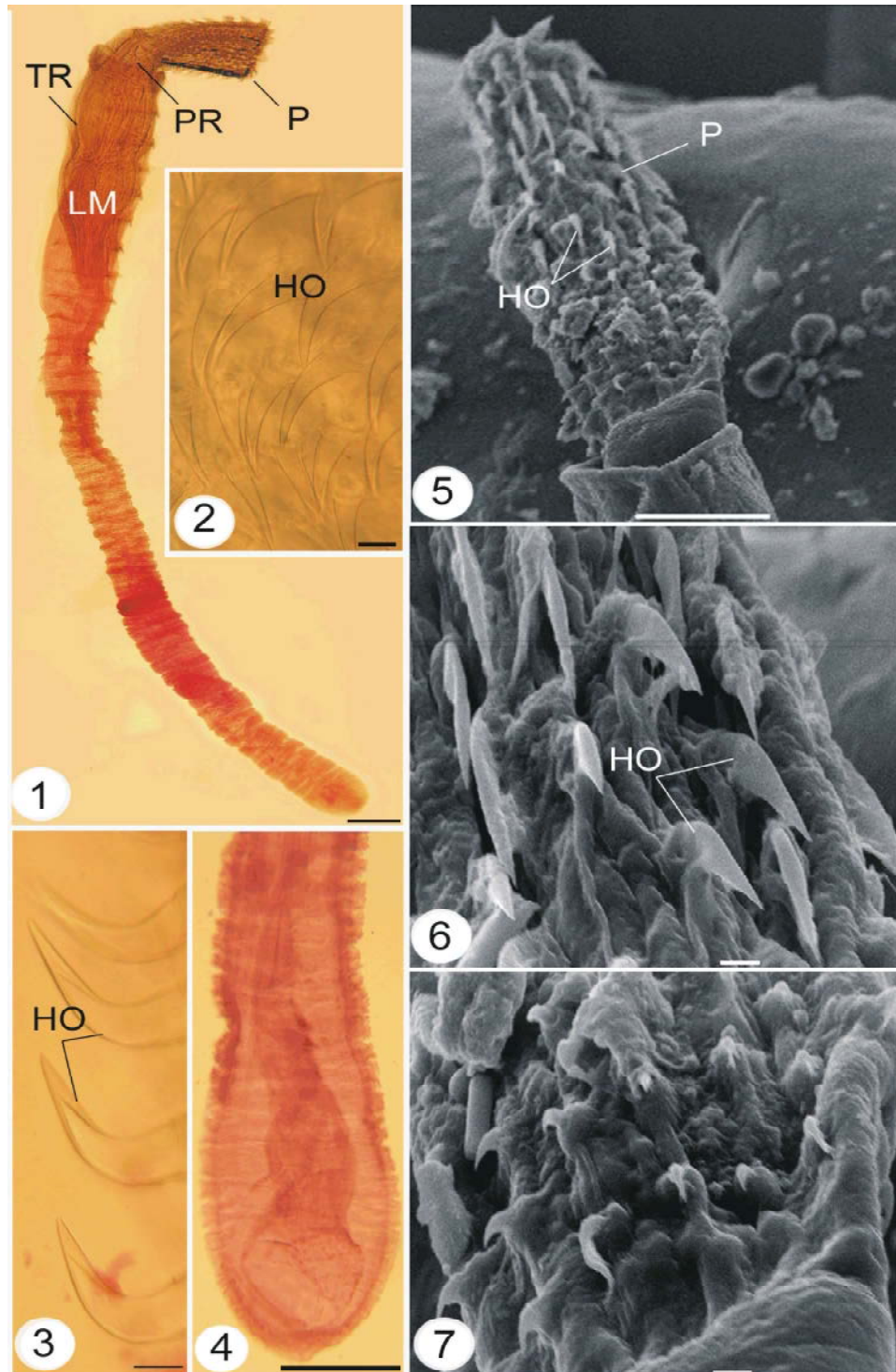
Taxonomic Summary

Family: Rhadinorhynchidae Travassos [23]

Type Host: Red porgy *P. pagrus* (Teleostei, Sparidae)

Infection Site: Intestine, pyloric ceca, body cavity, mesenteries and external surfaces of internal organs (as an encysted form).

Type Locality: Hurghada coasts, Red Sea, Egypt.



Figs. 1-4: Photomicrographs of male *Serrasentis sagittifer* infecting the common sea bream *Pagrus pagrus* fish showing: 1, Whole mount preparation with a long proboscis (P) equipped by hooks, proboscis receptacle (PR), trunk region (TR), lemnisci (LM), bar, 100 μ m. 2, 3, Proboscis hooks (HO), bar, 10 μ m. 4, Posterior end, bar, 100 μ m. Figs. 5-7: Scanning electron micrographs showing high magnifications of: 5, Proboscis (P) with multiple rows of hooks (HO), bar, 100 μ m. 6, 7, Proboscis hooks (HO), bar, 10 μ m.

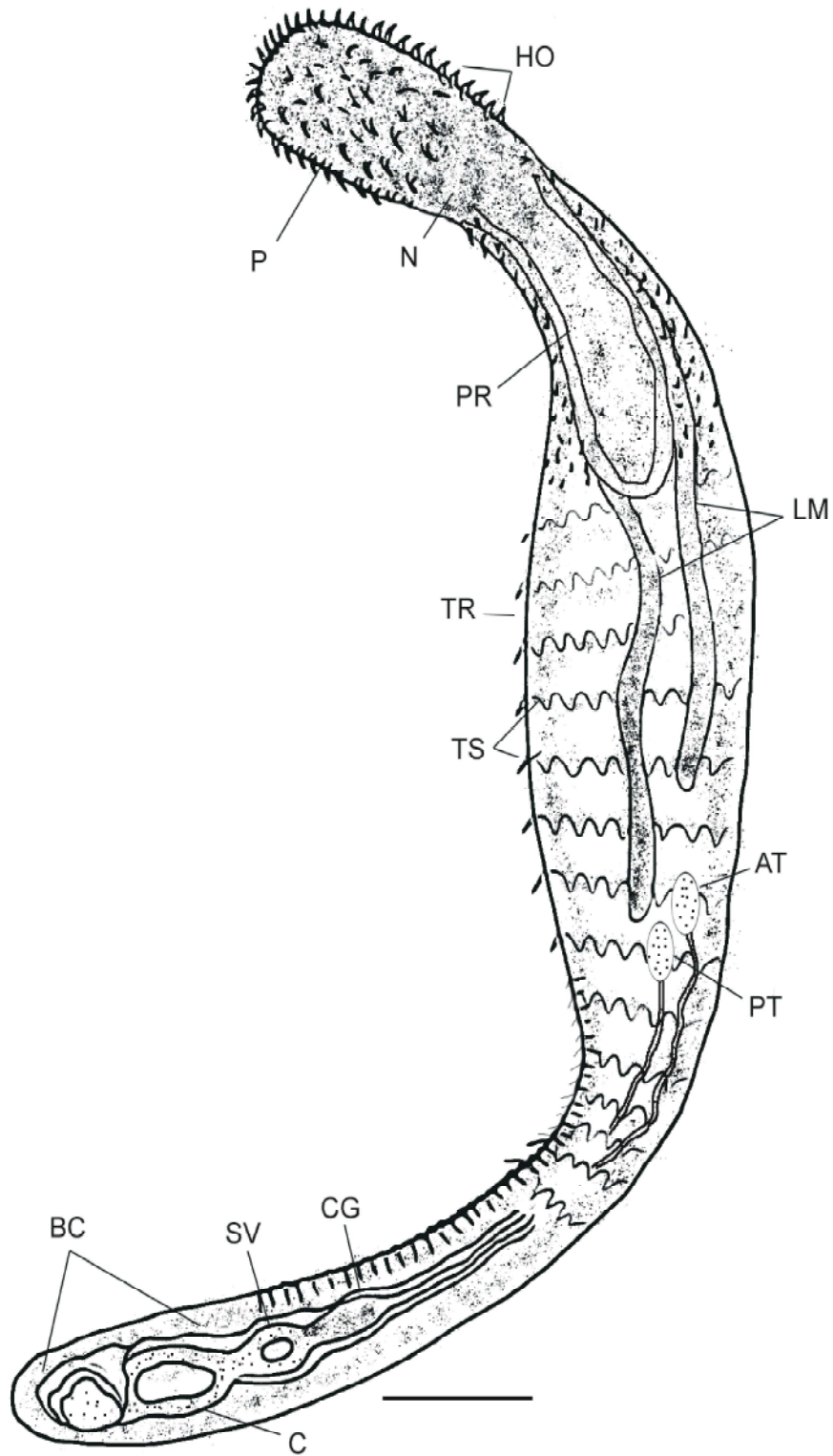


Fig. 8: *Serrasentis sagittifer* (male), lateral view, P, proboscis; pr, proboscis receptacle; N, neck; HO, hooks; L, leminisci; T, trunk; TS, trunk spines; AT, anterior testis, PT, posterior testis; BC, bursa copulatrix; C, cirrus; CG, cement gland, SV, seminal vesicle, bar, 100 μ m.

Table 1: Comparative data (mm) of male *Serrasentis sagittifer* recorded in the present study and those of other previously described species.

Species	<i>S. sagittifer</i>	<i>S. sagittifer</i>	<i>S. sagittifer</i>	<i>S. sagittifer</i> (Present study)
Referance	Al-Zubaidy and Mhaisen [16]	Abdel-Ghaffar <i>et al.</i> [26]	Kardousha [7]	(Present study)
Host	<i>Thunnus tonggol</i> , <i>Sphyraena barracuda</i> , <i>Pomadasys argenteus</i> and <i>Lutjanus gibbus</i>	<i>Sparus aurata</i>	<i>Saurida undosquamis</i>	<i>Pagrus pagrus</i>
Body length	7.5-9.0 (8.4)	6.9-8.6 (7.6±0.2)	7.75-8.8	3.55±0.02 (3.33-3.58)
Body width	0.62-0.75 (0.69)	0.57-0.73 (0.63±0.02)	0.64-0.72	0.10±0.02 (0.08-0.12)
Proboscis length	1.0- 1.3 (1.1)	0.97-1.6 (1.2±0.2)	1.1-1.2	0.75±0.02 (0.71-0.77)
Proboscis width	0.23-0.25 (0.24)	0.20-0.24 (0.22±0.002)	0.24-0.26	0.25±0.02 (0.23-0.27)
Number of rows	22	9-11	24	15-19
Number of spines	16	15-18	---	15-18
Length of receptacle	1.44-2.2 (1.89)	---	1.45-2.40
Location	Red Sea, Yemeni coastal waters.	Coasts of the Red Sea at Hurghada City, Egypt.	Emirat	Coasts of the Red Sea at Hurghada City, Egypt.

DISCUSSION

Acanthocephalan species of family Rhadinorhynchidae were previously reported from the Red Sea, of them *Sclerocollum rubrimaris* isolated from *Siganus luridus* from the coast of Sharm El-Sheikh, South Sinai [24], *Neoechinorhynchus qatanesis*, *Nemipterus japonicas* from tropical and sub-tropical Indo west Pacific region [25], *Neoechinorhynchus dimorphospinus* isolated from *Dorodoma nasus* in pisces from Kuwait and *S. sagittifer* Amin *et al.* [24], *Thunnus tonggol*, *Sphyraena barracuda*, *Pomadasys argenteus*, *Lutjanus gibbus* from *Saurida undosquamis* of the Arabian Gulf, Emirati Coasts [7] and from the gilthead Sea bream *Sparus aurata* Abdel-Ghaffar *et al.* [26]. The most recent published list of species is that of Amin [27], who recognized 14 species: *S. sagittifer*, the type species, *S. chauhani* Datta [14]; *S. engraulisi* Gupta and Gupta [28]; *S. fotedari* Gupta and Fatma [29]; *S. golvani* Gupta and Jain [30]; *S. lamelliger* Diesing [31]; *S. manazo* Bilqees and Khan [8]; *S. mujibi* Bilqees [15]; *S. nadakali* George and Nadakal [32]; *S. niger* Bilqees and Khan [33]; *S. psenesi* Gupta and Gupta [28]; *S. sauridae* Surekha and Vijayalakshmi [2]; *S. sciaenus* Bilqees [15]; and *S. sidaroszakaio* Tadros *et al.* [34]. Amin [27] either had not noted or did not recognize the determinations of Gupta and Jain [30] that *S. chauhani*, *S. engraulisi*, *S. fotedari*, *S. mujibi* and *S. psenesi* were synonyms of *S. sagittifer*. Moreover, *S. indicus* was placed in synonymy with *S. sagittifer* by Bhattacharya [35] but not recorded by Amin [27]. *S. sagittifer* appears to be widely distributed in tropical and sub-tropical waters, having been reported, either as adults or as encysted cystacanths, from the eastern North American coast [5, 13], the Gulf of Mexico [36], Brazil [37], the

Mediterranean sea [38], West Africa [39, 40], Nigeria [41], Iran, the Persian Gulf and the Sea of Oman [7, 42], India [35], Bangladesh [43], Sumatra [43] and Java [44], as well as Australia [45]. Similarities between species of acanthocephalan parasites should include many parameters which represent an important categories during their taxonomic identification such as; body dimensions, rows and shape of spines surrounding proboscis and the combs of trunk spines. Morphologically, the present parasite similar in morphology with *S. sagittifer* previously recorded from *Thunnus tonggol* from the coasts of Hodeidah, Yemen by Al-Zubaidy and Mhaisen [46] and from *Saurida undosquamis* from the Arabian Gulf by Kardousha [7]. In comparison with the other *Serrasentis* species, the present species differed from *S. longus* Tripathi [16] in the number of trunk spines (which were 12 in number) followed by 3 small spines posteriorly compared to the present species which had 16-20 rows. Also, the proboscis was equipped by longitudinal rows of spines which were 6, each row with 15-16 spines in *S. longus* compared to 9-11 rows, each with 15-18 spines in the species under the study. Table 1. Showed a comparative measurements of male *Serrasentis sagittifer* recorded in the present study and those of other previously described species.

CONCLUSION

It was generally concluded that, the increasing awareness of the variability in species of Rhadinorhynchidae which were observed from the different studies carried out on this family and the additional variations called for the need to provide a new expanded diagnosis and morphology of the family.

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