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THYNNASCARIS LARVAE (NEMATODA, ANISAKIDAE) IN SYNODONTID FISH FROM ALEXANDRIA SHORE.

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ABSTRACT

A total of 287 specimens of fish belonging to family Synodontidae (2 spp.) caught from the Mediterranean Sea shores of Alexandria were examined for larval nematodes. 90.6 % of the examined fishes were heavily infected with ascaridoid larvae. Parasites were removed and identified as **Thynnascaris** larvae. Four types were described according to their morphology. Type I and type 2 were presumably identified as third stage larvae. Type 3 represented a late third or early fourth stage larva while type 4 was most probably fourth stage larva or preadult.

This is the first report of these nematode larvae from fishes of the family Synotontidae from Egypt.

INTRODUCTION

Chubb (1965) stated that, fish are the apex of the predator-prey pyramid within fresh waters and therefore tend to be infected by a considerable range of parasites, which may occur in large numbers. Larval Thynnascaris spp. occur both in fishes and invertabrates (Dogiel et al., 1958). However records from the literature of fishes and marine invertebrates indicate that the larvae are more prevalent in fishes. Markowski (1933) and Punt (1941) observed nematode larvae of the genus Thynnascaris and attributed these larvae to the species T. aduncum. Johnston and Mawson (1951 a & b) reported larval and adult representatives of Anisakis, Terranova, Contracaecum and Thynnascaris from Queensland fauna. Krusa (1959); Hutton et al. (1962) and Overstreet (1973) reported Thynnascaris larvae from a number of shrimps and other invertebrate hosts. Petter (1969) made some studies on the nematode parasites of Sardines in the region of Nanta (France). When these larvae were fed to young Mugil

cephalus, 4th stage Thynnascaris larvae were recovered from the intestine of the fish. Vitiello et al. (1970) recovered a nematode larvae from Sagitta setosa in a plankton sample from France. The larva was assigned to the genus Thynnascaris on the basis of the presence of an oesophageal appendix, an intestinal caecum and on the position of the excretory pore. Shiraki et al. (1973) classified the Thynnascaris nematodes found in Japan Sea. Cannon (1977) reported some larval Ascaridoids from southeastern Queensland marine fish. Of these Ascaridoids he studied Anisakis sp. Terranov spp., Contracaecum sp. and Thynnascaris spp. Within the genus Thynnascaris he described four presumably type III and IV which correspond to the third and fourth stage larvae. Jackson et al. (1978) found on examination of 1010 fish belonging to fourteen families and twenty genera, larvae of Anisakis, Porrocaecum, Thynnascaris, Goezia, Raphidascaris and other nematodes. Wooten (1978) reported larvae of Thynnascaris aduncum, Anisakis sp. and Contracaecum sp. found in small gadoids from Scottish waters. Natural infection of Thynnascaris larvae was detected by Inatomi (1982) from mackerel Scomber tapeinocephalus, jack mackerel Trachurus japonicus, croaker Nibea alliflora and anchovy Engraulis japonicus captured in the Seto Inland Sea in Japan. Deardorff et al. (1982) examined finfishes (134 spp.) caught near the Hawaiian Islands. Larval nematodes of the genera Anisakis (2 types), Hysterothylacium (Syn. Thynnascaris, 3 types), Raphidascaris (1 type) and Terranova (2 types) were recorded. The copepod Pseudocalanus elongatus was recorded by Solonchenko and Kovaleva (1985) as an intermediate host of Thynnascaris aduncum in the Black Sea for the first time. Moravec et al. (1985) while studying the parasitic nematodes from freshwater fishes in Japan, found that salmonid [illegible] were heavily parasitized by both larvae and adults of Hysterothylacium aduncum. The author pointed out that H. aduncum (a marine parasite) was probably capable to develop in fresh waters.

The adult Thynnascaris was studied by many authors from different countries. Rasheed (1965) made an account of Thynnascaris inquies from the stomach of Rachycentron canadus from West Pakistan. Kalyankar (1972) found the same species in the stomach of Elacata sp. from India. Norris and Overstreet (1976) reported T. reliquens sp. n. from the intestine and pyloric caeca and occasionally stomach of Archosargus sp. and other fishes from Mississippi and Florida. Hysterothylacium aduncum was identified by Fagerholm (1982) among the parasitic fauna of common fish species from brackish and freshwater localities in Finland. Hysterothylacium (Syn. Thynnascaris) aduncum was also recorded from two knifenose chimaeras (Rhinochimaera atlantica) collected from the Northwest Atlantic Ocean by Hogans and Hurlbut (1984) and from the flatfish Pleuronectiformes from the southeast Baltic by Sulgostowska et al. (1987).

Studies on the parasites of fishes from the Mediterranean Sea in Egypt are few and the greatest attention was given to trematodes and cestodes rather than nematodes. The present work amied at studying the different larval nematodes found in two commonly consumed marine fishes in Egypt.

MATERIALS AND METHODS

This study was carried out on 287 fishes belonging to the family Synodontidae from the Mediterranean Sea shores of Alexandria. 135 Synodus saurus and 152 Saurida undosquamis fishes were dissected and the internal organs and body cavities were examined for any helminthic parasites. Larval nematodes were collected, fixed in warm 70 % ethyl alcohol and glycerine (5%), cleared and mounted in liquid de Feure or Hoyers solution. Prepared specimens were identified according to Hartwich (1974).

RESULTS

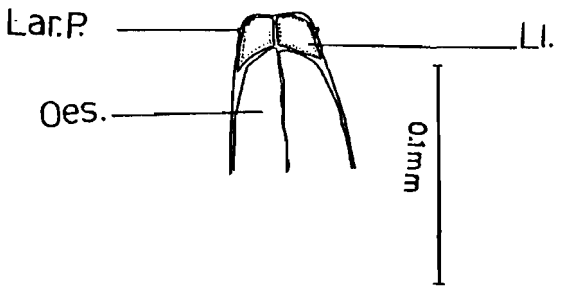
Larval nematodes belonging to the genus Thynnascaris were found in the body cavity, liver, intestine and encysted in the mesentries and other internal organs. The prevalence of infection was 94 % in Synodus and 87 % in Saurida. These larvae can be classified into the following types according to their measurements, site of infection and anatomical structure.

Type 1 : (Fig. 1)

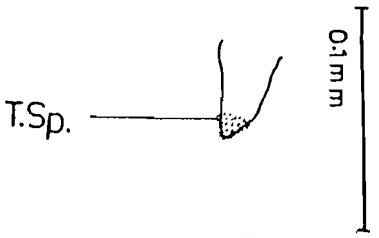
Present in the lumen of the intestine of both fishes. These larvae were found either free in the mucous secretion of the intestinal mucosa or attached to the mucosa. The larvae examined were ensheathed, retaining the cuticle closely adherent to the larval cuticle. They are thin, small to medium sized larvae measuring 3.30 - 4.95 mm in length and 0.06 - 0.20 mm in width. Cuticle is thick making it very difficult to differentiate the internal anatomy. The lips are small, distict below the larval cuticle. Some tiny papillae can be seen in some specimens. The excretory pore and nerve ring are not clear. The oesophagus measures 0.44 - 0.60 mm in length, its posterior end is differentiated into a globular ventriculus 0.03 - 0.07 mm long, the latter possesses an appendix. The intestine extends anteriorly forming an intestinal caecum 0.06 - 0.13 mm in length then extends posteriorly filling the remaining part of the body ending with the anus. Tail measures 0.07 - 0.08 mm in length, the tail end is pointed with numerous spines.

Type 2 : (Figs. 2 & 3)

This larval type was seen either free in the body cavity or encapsulated in the mesenteries of different organs eg. liver, intestine, gonads, spleen and pericardium. Some were found encapsulated in the internal muscle wall near the pectoral fin. These are medium to large larvae measuring 7.7 - 17.96 mm long and 0.19 - 0.42 mm wide. Lips are small



(A)



(B)

Fig. 1

Type 1 Thynnascaris larva
(A) : Anterior end.
(b) : Posterior end.

Abbreviations used in the figures (1-5) :-

An. : anus; C.P. : caudal papilla; G.: gland; Int.: intestine; Int.C. : intestinal caecum; Lar. P. : larval papilla; Li.: lip; Mu.: muscles; Ner. R. : nerve ring; Oes.: oesophagus; Oes. G.: oesophageal gland; Re. : recutum; Spic.: spicule; T. Sp. : tail spine; Ut.D. : uterine duct; Vent. : ventriculus; Vent. Ap.: ventericular appendix; Vul.: vulva.

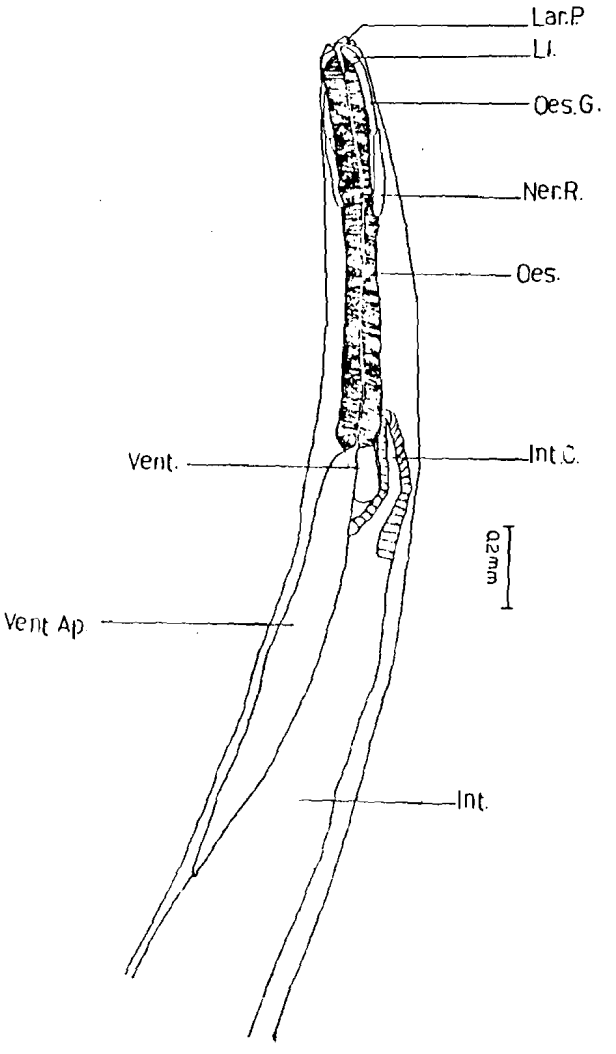


Fig. 2

Type 2 **Thynnascaris** larva showing the anterior end.

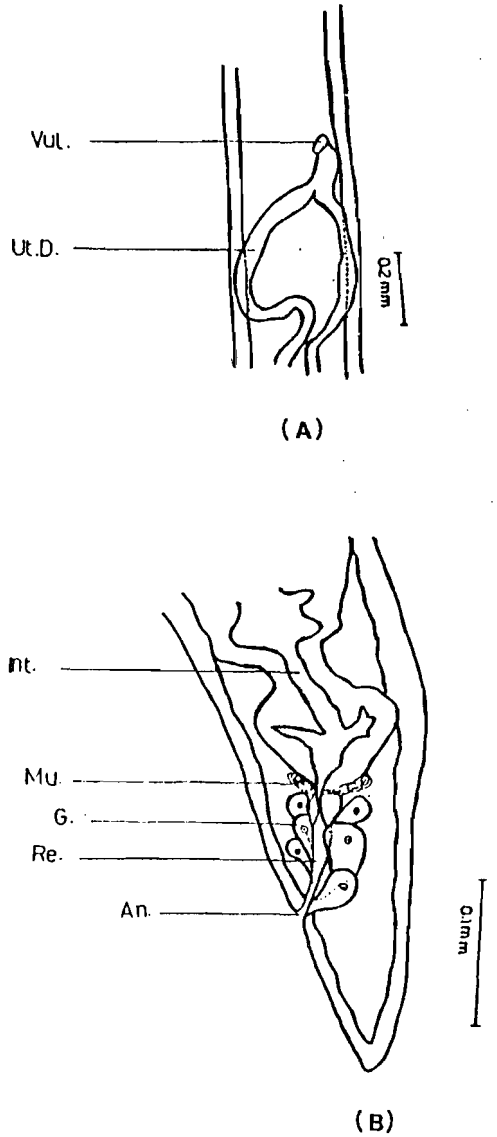


Fig. 3

Type 2 Thynnascaris larva showing :
(A) : Part of the femal genital system.
(B) : Posterior end of the larva.

with papillae and the cuticle is thin and smooth. The excretory pore is in the same level of the nerve ring, at a distance of 0.29 - 0.40 mm from the anterior extremity. The oesophagus is tapering anteriorly and cylindrical posterioly, measuring 0.56 - 1.07 mm in length, ending with a globular ventriculus, measuring 0.05 - 0.16 mm long, from which a ventricular appendix extends posteriorly to a distance of 0.60 - 1.15 mm having a triangular shape with a pointed end, usually overlaping the anterior part of the intestine. Intestinal caecum measures 0.20 - 0.44 mm in length. The intestine fills the remaining part of the body ending with the rectum which has a sphincter and is surrounded by several glands, and opens to the outside by the anus. The tail is tapering with a mucronate process, measuring 0.11 - 0.34 mm long. Sometimes a single spine can be seen on the tip of the tail. Gonads are distinct. The male larvae have a long undulated ventral tube. In females the genital organ forms two parallel lateroventral cords. Towards the anterior extremity the two form two short uterine ducts that unite once more in a short single duct ending with the vulva, at a distance of 3.55 mm from anterior extremity.

Type 3 : (Fig. 4)

Most of the individuals of this type were ensheathed within the former larval cuticle, sometimes the posterior part of this shed moult appeared identical with the tail morphology of Type 2. These are medium sized larvae measuring 2.72 - 9.37 mm in length and 0.06 - 0.20 mm in width. The cuticle is thick and smooth in exsheathed individuals but slightly annulated in the ensheathed ones. Three lips well developed with 4 papillae (2 dorso-lateral and 2 ventro-lateral) in the anterior end. The nerve ring is at a distance of 0.34 mm from anterior end. The excretory pore is at the same level. The oesophagus is 0.54 - 0.87 mm in length ending with a 0.07 - 0.10 mm long ventriculus, ventricular appendix measuring 0.67 - 1.07 mm long and intestinal caecum measuring 0.12 - 0.19 mm long. Tail is bluntly rounded measuring 0.06 - 0.17 mm long with fine spines. Gonads can be seen in the middle of the body, further details are not clear since the cuticle is very thick.

Type 4 : (Fig. 5)

Larvae were present in the lumen of the intestine of few individuals of both Synodus saurus and Saurida undosquamis. These are large larvae measuring 17.82 - 50.00 mm long and 0.35 - 0.87 mm wide. The cuticle is very thick and the anterior ends with one dorsal well developed lip and with two dorsolateral papillae and two lateroventral lips each with one ventrolateral papilla. The lips measure 0.05 - 0.24 mm in length and interlabia clear. The excretory pore is at the same level of the nerve ring at distance of 0.60 mm from anterior extremity. The oesophagus is 2.10 mm long and the ventriculus is 0.15 mm long. The ventricular appendix is

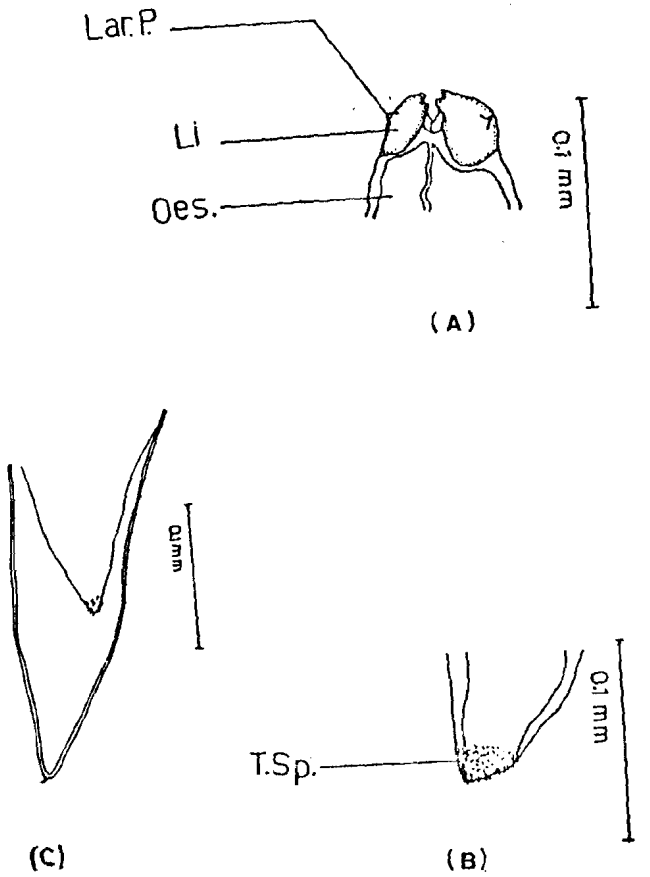
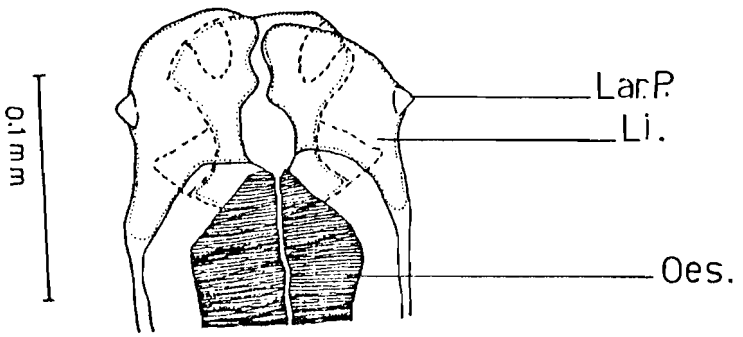
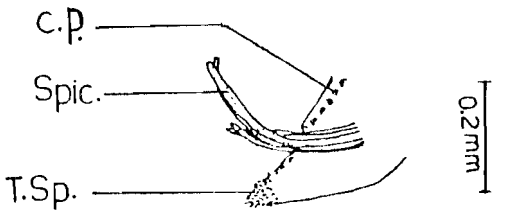


Fig. 4

Type 3 Thynnascaris larva showing :
(A) : Anterior end. (B) : Posterior end.
(C) : Tail ensheathed within the former larval cuticle.



(A)



(B)

Fig. 5

Type 4 Thynnascaris larva showing :
(A) : Anterior end.
(B) : Posterior end of male larva.

1.39 mm long. Intestinal caecum measures 0.47 mm long. Rectum is with sphincter and several glands. The tail measures 0.10 - 0.16 mm in length and 0.09 - 0.14 mm in width, and ends with spines. Gonads are well developed. Males are with caudal papillae and distinct ejaculatory spicules projecting from the cloacal opening.

DISCUSSION

From the description of the present nematode specimens, the presence of three lips justified the classification of these parasites to the superfamily Ascaridoidea. In addition the presence of an oesophageal appendix, intestinal caecum and the position of the excretory pore at the same level of the nerve ring, attributed these larvae to the family Anisakidae, genus Thynnascaris (Dolfus, 1933). This is in accordance with Hartwich (1974). Deardorff and Overstreet (1981) has recently considered Hysterothylacium to be valid genus to include those species previously considered as members of the junior synonym Thynnascaris; these species were considered members of Contracaecum in the past. Specific identification of the present larvae to a definite species is impossible since the experimental realization of the life cycle that allow us to study the adult is very difficult and inadequately studied. This is in agreement with Norris and Overstreet (1976) and Cannon (1977) who declared that although some of the larvae reported were fourth stage larvae, it seemed impossible to attribute them to a determined species before recognizing the adults that parasitise the carnivores fish that live in the same region.

In comparison with the larvae obtained from the body cavity of Sagitta setosa Vitiello et al. (1970), type 1 found in the present study resembled these larvae as regards the diagnostic characteristics of Thynnascaris larvae and the absence of the genital tubes, only with slight differences in measurements. These authors did not mention whether the tail carried spines or not, while type 1 in the present study carried numerous spines. Hurst (1984) stated that T. adunca (= H. aduncum) larvae occurred in chaetognaths (Sagitta spp.) were all morphologically similar to stage III larvae from teleost.

Type 2 larvae in the present study resembled Cannon's type III (1977) as regards the tail having a short process and gonads developing in the ventral region. They also resembled Petter's (1969) specimens, from the body cavity of Sardines, in its structure. Only slight differences existed in the measurements. In the present study the intestinal caecum was shorter in length than the ventricular appendix, while in Cannon's and Petter's specimens it was nearly of the same length. The latter authors identified these larvae as most probably third stage larvae with distinct genital tubes and a tail terminating with a small mucronate process.

Furthermore type 3 described in the present study with a tail having spines, resembled those large larvae described

by Petter (1969) in Sardines. The author described the tail under the cuticle in these larvae as having spines at the posterior extremity and the anterior end with three lips distinct under the larval cuticle.

In addition type 4 in the present study resembled but with greater dimensions than those larvae recovered by Petter from the intestine of young **Mugil cephalus** fed on the larvae from Sardines. Petter (1969) declared that they showed the features of fourth stage larvae, i.e. head with three lips, interlabia were distinct and four clear papillae while the other structures were similar to the larva found in Sardines with the posterior extremity carrying numerour spines. Also there was a slight resemblance between type 4 in the present study and Cannon's type IV but the latter's specimens were of a smaller size. Cannon (1977) identified those nematode larvae (types III and IV) found in the same fish host as most probably third and fourth stage larvae of one species.

From the above comparison and from the preceeding literatures of these larvae, one can come to the following findings:

Type 1 larvae present in the alimentary canal with well developed digestive canal, but no genital tubes can be presumably identified as early third stage larvae which according to Cheng (1976) represents specimens recently arrived at that site as the result of ingestion by the fish, if this host was compatible these larvae will develop to maturity if not they penetrate the stomach or intestinal wall and survive either encapsulated or free in the liver, peritoneum or other tissue and no further development except for minimal growth and the fish host is said to be a paratenic host. If an additional molt occur the fish serve as second intermediate host. Thus from the above information, type 2 was also most probably third stage larvae, but late stage because the genital organs were distinct. Type 3 which was sometimes encased in remnant of shed molt similar to the tail morphology of type 2, represented late third or early fourth stage larva with distinct lips and developed genital tubes. This proposition was supported by Cheng's statement that in most cases larvae occurring in organs and tissues other than the alimentary tract will be most probably third stage larvae. Type 4 was most probably fourth stage larvae or preadult since the lips, papillae, interlabia, digestive canal and genital system were well developed, furthermore in some individuals spicules were seen. The presence of this type 4 in the intestine or stomach of fish need not to indicate that the host had ingested intermediate host harboring third stage larvae.

In conclusion, it can not be stated with certainity if these larvae reported in the present study from the same host belong to the same species of **Thynnascaris** or not, but the possibility that they are of the same species can be

supported by the finding of type 3 sometimes encased in remnant of shed molt identical with the tail morphology of Thynnascaris type 2 (same phenomenon reported by Cannon, 1977). Moravec et al. (1985) recorded various advanced third-and fourth-stage Hysterothylacium aduncum larvae in addition to adults, from the stomach and intestine of Salvelinus leucomaenis which made it possible to compare them with the larvae found in other host species. The same author stated that fishes harboring encysted H. aduncum larvae probably serve as paratenic or intermediate hosts for this parasite.

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