STUDIES ON ENTERIC PARASITIC DISEASES CAUSED BY PREVAILING HELMINTHES AMONG SOME MARINE FISHES FROM THE RED SEA

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Abstract

The present investigation was carried out on 326 marine fishes. They were represented as Orangespotted Jack (*Carangoides bajad*), Orangespine unicorn fish (*Naso lituratus*), Roving Grouper (*Plectroponus maculatus*), Yellow Strip Goatfish (*Mulloides flavolineatus*), Barred moray (*Echidna polyzona*), Spangled Emperor (*Lethrinus nebulosus*), Brassy chub (*Kyphosus valgiensis*), Red Sea Houndfish (*Tylosurus choram*) and Spanish Mackerel (*Scomberomorous maculates*) which collected along the coast of the Red Sea to identify the enteric helminth parasitic diseases that induces economic losses among marine fishes. The total prevalence rate was 69.3% among the examined fishes. The highest infection rate (100%) was recorded in *C. bajad* and *N. lituratus*, followed by (76.9%) in *P. maculates*, then (75%) in *S. maculates*, (71.4) in *M. flavolineatus*, (66.7%) in *E. polyzona*, (62.5%) in *L. nebulosus* and (50%) in *K. valgiensis*. No parasitic infection was recorded in *T. choram*. The total prevalence rate of digenean infection was 61.3%. The prevalence of digeneans *Steganoderma(Lecithostaphylus)nitens,Propseudaephnidiogensis chaetodoni*, *Dinurus scombri* and *Proacetabulorchis prashadi* in relation to the total number of infected fishes were 68.5, 19.5, 63 and 85% respectively. The prevalence of acanthocephalan infection (*Serrasentis sagittifer*) was 0.6%. *Tetraphyllidean* cestode larvae were only detected in the stomach of *S. maculates* in prevalence of 1.2%. The total prevalence of nematodes was 34.4%.

The prevalence rates of *Spirocammallanus* species, *Cammallanus lacustris*, *Cucullanus sphaerocephalus*, *Spinitectus gordoni* and *Paracapillaria gibsoni* were 57.1, 67.6, 41.1, 75 and 19.6% respectively. No pathognomonic clinical abnormalities were recorded in the naturally infected fishes with gastrointestinal digenesis, acanocephalosis, cestodiasis and nematodiasis. Internally, the digestive tract showed congestion. The morphological descriptions, the economic importance and the best methods for prevention and control of the recovered parasites were discussed.

INTRODUCTION

Marine living resources play an important economic role, in providing increasing source of protein especially in the developing countries. Freshwater resources that are suitable for aquaculture purposes are becoming scarce and with the reduction in wild capture fisheries, it is expected the development of the marine sector of the aquaculture industry in the next 10 years in Egypt. This expansion in marine culture will be hampered by the appearance of new pathogens. Among the various disease agents, enteric helminth parasites are amongst the most significant etiological agents of many fish diseases. It is well known that marine fishes may act as either final or intermediate hosts of a number of helminth parasites (Roberts, 2001, Shih *et al.*, 2004).

In Egypt, great attentions have been paid to helminthic parasites of freshwater fishes. On the other hand, the parasitic diseases of marine fishes have received less attention (El-Lamie, 2007). Helminthic parasites are poorly known and their zoogeographical distributions in the Red Sea need to be studied

The present investigation was undertaken to through the light on enteric parasitic helminth infections in some marine water fishes.

MATERIAL AND METHODS

Fishes

A total number of 326 marine fishes specimens including (12) Orangespotted Jack (*Carangoides bajad*), (28) Orangespine unicorn fish (*Naso lituratus*), (52) Roving Grouper (*Plectroponus maculatus*), (112) Yellow Strip Goatfish (*Mulloides flavolineatus*), (24) Barred moray (*Echidna polyzona*), (64) Spangled Emperor (*Lethrinus nebulosus*), (8) Brassy chub (*Kyphosus valgiensis*), (18) Red Sea Houndfish (*Tylosurus choram*) and (8) Spanish Mackerel (*Scomberomorous maculates*) were collected freshly along the Egyptian coast of the Red sea. Identification of fishes was carried out according to Hisck (1987).

Clinical and postmortem examinations

All fishes were transferred to the laboratory and subjected to clinical and postmortem examinations according to Amlacher (1970) and Lucky (1977).

Parasitological examination

All collected fishes were examined for detection of parasites from the digestive tract. The isolated parasites were preserved and processed as described by Whittlock, (1966) and Lucky (1977) then examined microscopically. Taxonomic identification of the isolated parasites was based on Arai and Dooley, (1964), Kardousha, (1991), Bunkley-Williams and Williams (1994), Moravec, (1994), Hassanine (1995) and Paperna, (1996).

RESULTS AND DISCUSSION

In view of the fast rate of population growth and limitation in freshwater resources, marine aquaculture constitute as one of the most important promising future for supplying animal protein. Parasitic infestations represent the majority of the known infectious diseases affecting fish (Eissa, 2002).

Out of 326 examined fishes, 226 (69.3%) have been found to be infected with enteric helminthic parasites (Table, 1). The highest infection rate (100%) was recorded in *C. bajad* and *N. lituratus*, followed by (76.9%) in *P. maculates*, then (75%) in *S. maculates*, (71.4) in *M. flavolineatus*, (66.7%) in *E. polyzona*, (62.5%) in *L. nebulosus* and (50%) in *K. valgiensis*. No parasitic infection was recorded in *T. choram.*

Nearly similar results were observed by El-Lamie, (2007) in the examined marine fishes collected from Suez Canal area (70%). While, Kardousha, (1991) and Hassanine (1995) in marine fishes collected from the Arabian Gulf (62.5%) and Red Sea (60%). A lower prevalence was reported by Raef (1991) and Yossef and Derwa (2005a) in Mediterranean and Suez canal marine fishes (22.15 and 15.7%, respectively). A higher percentage was reported by Amer *et al.,* (2007) in

Mediterranean sand smelt fish (100%).The differences may be attributed to locality, fish species, weight and length of fish, season, water quality, availability of intermediate hosts and feeding habits (Woo, 1995, Paperna, 1996 and El-Lamie, 2007).

Regarding digenean infection, the total prevalence rate was 61.3% (Table, 2).The detected digeneans with its prevalence in different fishes in relation to the total number of infected fishes were *Steganoderma nitens* (68.5%), *Propseudaephnidiogensis chaetodoni* (19.5%), *Dinurus scombri* (63%) and Prosorchioposis *legendrel* (85%). The prevalence rate of *S. nitens* infection among *L. nebulosus*, *M. flavolineatus*, *P. maculates* and *N. lituratus* was 95, 71.3, 75 and 64.3%, respectively. While the prevalence of *P. chaetodoni* was 40, 25 and 75% in *L. nebulosus*, *M. flavolineatus* and *K. valgiensis* respectively. *D. scombri* was found in a percentage of 80, 87.5, 62.5 and 85.7% in *M. flavolineatus*, *P. maculates*, *E. polyzona* and *N. lituratus*, respectively. On the other hand, *P. legendrel* was observed in *L. nebulosus*, *M. flavolineatus*, *P. maculates*, *K. valgiensis*, *E. polyzona* and *N. lituratus* with prevalence 60, 90, 93.8, 100, 87.5 and 92.9%, respectively.

A nearly similar prevalence of digeanean parasites (65%) was recorded by Alves *et al.,* (2004). Lower prevalence 16.5, 11.7, 6.6, 8, 17.9 and 30%, were observed by Raef (1991), Kardousha, (1991), Yossef and Derwa (2005_a), El-Lamie, (2007) and Amer *et al.,* (2007) respectively.

Tetraphyllidean larvae were detected in the stomach of *S. maculates* only (Table, 3). The prevalence rate was 1.2%. Kardousha, (1991) detected 29.8% prevalence among Arabian Gulf fishes. Also, Amer *et al.,* (2007) found the *Tetraphyllidean* larvae with a percentage 90% in Mediterranean sand smelt fish. Raef (1991) recorded 0.3% of cestode infection in Mediterranean marine fish. El-Lamie, (2007) failed to detect cestode infection among the examined fishes.

Dealing with the acanthocephalan infection, the total prevalence rate was 0.6%. *Serrasentis sagittifer* was only identified in *S. maculates* with a prevalence of 25% among the examined fish (Table, 3). A nearly similar percentage was recorded in Mediterranean marine fish (0.59%) and Arabian Gulf fishes (0.5%) by

Raef (1991) and Kardousha, (1991). A higher prevalence 1.5, 5 and 6.7% was given Yossef and Derwa (2005b) and El-Lamie, (2007) respectively.

Regarding the nematodes recovered from the examined fish species, the total prevalence was 34.4% (Table, 4). The recovered nematodes from the examined fishes were *Spirocammallanus* species, *Cammallanus lacustris*, *Cucullanus sphaerocephalus*, *Spinitectus gordoni* and *Paracapillaria gibsoni* with total prevalence rates in relation to infected number were 57.1, 67.6, 41.1, 75 and 19.6% respectively. It is obvious from table (4) that there was no infection with adult nematode was recorded among *N. lituratus*, *E. polyzona*, *K. valgiensis*, *T. choram* and *S. maculates.*

The prevalence of *Spirocammallanus* species was 90, 82.1 and 80 % respectively among *P. maculates*, *M. flavolineatus* and *L. nebulosus*. *Cammallanus lacustris* was found infecting *C. bajad, P. maculates* and *M. flavolineatus* in prevalence rate 66.7, 80 and 92.9% respectively. While, *Cucullanus sphaerocephalus* was only recorded in *M. flavolineatus* and *L. nebulosus* with prevalence 50 and 90%, respectively. *Spinitectus gordoni* was identified in percentage of 100, 60, 75 and 90% respectively in *C. bajad, P. maculates*, *M. flavolineatus* and *L. nebulosus*. On the other hand, *Paracapillaria gibsoni* was only observed in *C. bajad* and *M. flavolineatus* (16.7 and 25% respectively). A nearly similar result 36.5% in the total prevalence was noticed by Alves *et al.*, (2002). On the other hand, lower observations 4.7, 29.8, 15.5 and 3% were recorded by Raef, (1991), Kardousha, (1991), Yossef and Derwa (2005_b) and El-Lamie, (2007) respectively.

The morphological description of the identified trematodes

All of the trematodes were collected from intestine except *Dinurus scombr* from stomach.

***Steganoderma (Lecithostaphylus) nitens* (Fig. 1)**

The body elongate, tapered towards the both ends, constricted slightly behind the acetabulum, spined, measured 2.80-4.40 mm long and 0.54-0.75 mm in amaximum width at acetabular zone.

Oral sucker sub-terminal, globular and measure 0.25-0.30 mm in diameter. Acetabulum sub-globular, pre-equatorial, slightly pedunculated, distinctly larger than the oral sucker and measures 0.36 -0.48 mm by 0.39 – 0.51 mm. The ratio between the oral sucker and acetabulum transverse diameters is about 1: 1.56 - 1.70.

The mouth leads immediately into a large globular pharynx measuring 0.18 - 0.27 mm in diameter. Esophagus short, measures 0.07-0.11 mm long, and bifurcates at about the mid- way between the anterior end and acetabulum into two simple intestinal ceca extending backwards to terminate blindly at the middle region between the testes and the posterior extremity.

Two tests are ovoid, longitudinally elongate, symmetrical and situated in the posterior region of the middle third of body. The right testis measures 0.36-0.35 by 0.26-0.29 mm, while the left one measure 0.35-0.50 by 0.26-0.31mm. Cirrus pouch long, highly muscle, wide, pre- acetabular, measures 0.52-0.76 mm long by 0.16- 0.20 mm wide, contains aslightly widing seminal vesicle, an oval pars prostatica, well developed prostatic cells and short ejaculatory duct. It extends diagonally from the level of the anterior border of the acetabulum to the short tubular genital atrium which leads into the outside through agenital porelying marginally sinistral to the cecal bifurcation.

Ovary spherical in shape, median, situated at a considerable distance behind the acetabulum and measures 0.20-0.28 mm in diameter. Seminal receptacle ovoid and lies immediately behind the ovary. laurer's canal opens in front of the left testis. mehils' gland well developed and situated between the ovary and the right testis, uterus very long ,highly coiled , mainly Post –testicular, and contains numerous eggs.

Vitellaria follicular present in two longitudinal chains – like rows, one on each side, relatively large and extending laterally from a short distance behind the tests.

Excretory vesicle short, elongate saccular, extending anteriorly from the postero-terminal excretory pore to near the posterior end of the ceca. Egg ovoid, thin-shelled, yellowish in color and measure 30-36X17-22 µm.

Propseudaephnidiogensis chaetodoni **(Fig. 2)**

The body oval to pyriform, flattened, rounded at both ends with more or less crenulated lateral margins, with spine cuticle, measures 1.20-1.90 mm long by 0.42-0.80 mm wide.

Oral sucker small, terminal, nearly rounded in shape, and measure 0.06-0.11 by0.07-0.13 mm. Acetabulum sub- spherical , embedded in the body , situated in the second quarter of body , and measures 0.11- 0.18 mm in diameter . The ratio between the oral sucker and acetabulum transverse diameter is about 1-1.38-1.42.

The mouth leads to a small muscular pharynx measuring 0.03-0.06X 0.04-0.08 mm. Esophagus relatively short , measures 0.08-0.16 mm long and bifurcates at about the mid-way between suckers into two simple intestinal ceca running backwards to end blindly near the posterior extremity.

Two tests are oval, intercecal, diagonal and situated anteriorly in the posterior half of body, just post – equatorial. The anterior testis measures 0.14 - 0.23X0.11-0.18 mm, while the posterior one measure 0.16 -0.25X 0.12 – 0.18 mm. A single vas deferens arises from the anterior of each testis and unites with the other one at a variable distance posterior to the acetabulum to form a short common vas deferens. The distal portion of the lateral organ connected to the cirrus pouch by a slight swollen external seminal vesiclecirrus pouch well developed, claviform, pre-acetabular, measures 0.26-0.39 mm long 0.08 -0.13 mm wide at its base, contain abipartite internal seminal vesicle and an ejaculatory duct surrounded by prostatic cells and extend diagonally from near the mid-way between acetabulum and cecal bifurcation to sub-marginal male genital pore which lies to left in the front of cecal bifurcation.

Ovary ovoid, smooth , sub – median to left , opposite to the anterior testis or slightly anterior , and measures 0.10-0.12X0.09 – 0.16 mm. Seminal receptacle small, irregular in shape and lies directly in front of ovary. Uterus short, intercecal and winding between the ovary and acetabulum, to left. The terminal uterine coil is muscular and forming a distinct metaterm running alongside the cirrus pouch to open into the female genital pore which lies at a short distance behind the male pore. Vitelline follicles numerous, small, irregular in shape, extending around ceca for their length, and leaving their anterior portions free. Excretory vesicle tubular and extends anteriorly from the postero-terminal excretory pore to the acetabulum. Eggs few in number, ovoid, yellowish, and measure 44 -52X30 -35 µm.

***Dinurus scombr* (Fig. 3)**

The body is slender, elongate, unarmed and consists of two distinct regions, soma (body proper) and ecsoma (retractile tail). It measures 3.30-5.06 mm in total length, soma measures 2.10-3.30 long X0.46-0.72 mm as maximum width at its poster end. Ecsoma thick, shorter and narrow than soma invaginated near the posterior end of soma, rounded posteriorly, and measures 1.36-2.0X0.28-0.40 mm. The cuticle surface is highly wrinkled in soma but not in ecsoma.

Oral sucker sub-terminal, slightly elongated, measures 0.34 -0.51X0.30-0.44 mm. Actabulum sub-spherical ,situated at a short distance behind the middle of the anterior half of soma , nearly equal to the oral sucker in size, and measure 0.33-0.50X 0.32- 0.46 mm.

The mouth leads directly into a globular muscular pharynx measuring 0.11-0.16 X 0.13-0.18 mm. Esophagus extremely short measures 0.02-0.05 mm long and bifurcates at amid- way between suckers into two narrow intestinal ceca extending backwards to terminate blindly near the posterior end of ecsoma.

Tests two, ovoid, close together and situated obliquely just behind the middle of soma. The anterior testis measures 0.18-0.26 X 0.22-0.30 mm, while the posterior one measure 0.20-0.30 X 0.24-0.35 mm. Seminal vesicle elongate,

constricted into four portions, and extend diagonally between the anterior testis and acetabulum. Pars prostatica long, s-shaped, and surrounded by less developed prostatic cells. Its distal end joins that of the uterus just in the front of the acetabulum to form a relatively short hermaphroditic pouch, and opening anteriorly into the base of the tubular genetal atrium which leads into the outside through agenital pore lying near the antero-ventral border of the oral sucker.

Ovary median, transversely elongate, situated directly or slightly behind the posterior testis, and measures 0.11-0.15 X 0.21-0.28 mm. Seminal receptacle rounded in shape and lies immediately behind the ovary. Uterus loosely coiled and extends posteriorly to the beginning of ecsoma. Vitellaria composed of seven long convoluted tubes arising directly from behind the ovary and extending posteriorly to near the beginning of ecsoma . excretory system in the form of along excretory system , extending anteriorly from the excretory pore which lies on the posterior tip of ecsoma to near the seminal vesicle , where it bifurcates into lateral excretory arms extending anteriorly and nuiting dorsal to oral sucker. Eggs ovoid, very numerous, thin–shelled, yellowish and measure 13-16 X 9-12 µm.

***Proacetabulorchis prashadi* (Fig. 4)**

The body is elongating slender, constricted slightly behind the acetabulum, measured 9.35-15.63 mm long and 1.30-1.80 mm in maximum width at acetabular zone. Oral sucker is terminal, globular in outline, 0.87-1.26 mm in length by 0.98-1.11 mm in width. Acetabulum is sub-spherical, pedunculated, situated at the middle of the body and measure 1.37-1.63 mm in length by 1.48-1.77mm in width. The mouth leads directly into a globular muscular pharynx measuring 0.26-0.45 X 0.28-0.36 mm. Esophagus is short measures 0.58- 6.3 mm long and bifurcates at about the mid way between the anterior and acetabulum into simple intestinal ceca extending into posterior tip of the body.

Two testes are ovoid, close together and situated obliquely just anterior to acetabulum. The anterior testis measured 0.40-0.48 X 0.27-0.29 mm, while the posterior one measures 0.43-0.54 X 0.28-0.34 mm. Seminal vesicle is large,

elongate, postero-dorsal to acetabulum, sacciform 0.21 to 0.34 X 0.07-0.10 mm. Efferent duct narrow, long continuing anteriorly to form shore, elongate pars prostatica surrounded by prostate cells.

Uterus behind acetabulum to form a relatively short hermaphroditic pouch. Ovary median, situated directly or slightly behind the posterior acetabulum and measured 0.34-0.39 X 0.29-0.37 mm. Seminal receptacle is rounded in shape and lies behind the ovary. Eggs are ovoid and measured 21-30 X 17-22 µm.

Similar morphological descriptions were observed by Arai and Dooley, (1964), Bunkley-Williams and Williams, (1994), Moravec, (1994) and Hassanine, (1995).

The description of the cestode

***Tetraphyllidean* larvae (Fig. 5)**

It is a small, white in color with a short neck. The body length 1.48-1.53 mm with maximum width 0.40-0.46mm. Scolex has four suckers around a bulb measured 0.13-0.16X0.12-0.15 and a terminal sucker with no hooks measured 0.072-0.09x0.09-0.010.

Similar picture was recorded by Bunkley-Williams and Williams (1994) who mentioned that the plerocercoids migrating through digestive tract wall cause damaging adhesions and death if these larvae migrate through vital organs.

The morphological characters of the isolated Acanthocephalan

***Serrasentis sagittifer* (Fig. 6a & b)**

It was isolated from the intestine. The female body length 10.85-11.2 mm, maximum wide 0.80-0.86 mm. The proboscis is club shape, wider anteriorly and measures 1.15-1.19 mm long and 0.55-0.57 mm wide. It has 16-18 in curved hooks in each longitudinal row. It anterior large hooks measure 0.083-0.088 long and posterior small ones measure 0.068-0.070 long. The neek is smooth, small and measures 0.20-0.22 long by 0.50 -0.54 mm wide.

Proposcis receptacle has double walls and measure 1.20-1.25 long by 0.55 - 0.57 wide. Leminisci are long, thin, un equal and reaching to middle of the body, the short lemniscus measures 3.1-3.4 long by 0.10-.012 wide while the long one measures 3.20 -3.25 mm long by 0.1-.013 mm wide. Small ovarian balls are seen near the receptacle inside the ligament sac. Vagina measures 0.19-0.22 mm long and surrounded by 2 pairs of vaginal muscles the distance between uterine balls and genital pore is about0.86-0.88 mm. the uterus is conical shape and measures 0.067-0.069 mm long by 0.067-0.068 wide at its base.

Kardousha, (1991) detected a similar morphological characters in marine fishes of Arabian Gulf.

The morphological descriptions of the detected nematod

All of the identified nematodes were recovered from intestine.

***Spirocammallanus* species (Fig, 7a, b, c)**

It was small spiruroid worms. The cuticle was thick. The mouth opening was quadripapillated and its margin was provided with fine cutiular membrane. The buccal capsule not divided into valves, barrel shaped with transverse tridents and it measured 0.06-0.09 mm in length with maximum width 0.05-0.07 mm. The buccal capsule was followed by the esophagus. The esophagus was shorter in males than in females and divided into two parts, anterior muscular and longer posterior glandular parts. The muscular part of esophagus measured 0.29-0.41 mm in length, while the glandular part measured 0.46-0.47 mm in length. The esophagus opened into intestine through distinct valve.

Male

It is usually smaller than females and measured 3.47-4.99 mm in length and 0.15-0.17 mm in maximum width. Nerve ring was at 0.13-0.19 mm from anterior end. The tail was short, curved ventrally, conical and provided with narrow alae and measured 0.04-0.05 mm in length. There were eight pairs of pedunculated preanal papillae of which two pairs of small papillae surrounding the cloaca and three to

four pairs of postanal papillae. Spicules were unequal and weakly sclerotized. The left one being slender and very short unable to be seen at once and about 0.03 mm long, while the right one was slender and being 0.09-0.14 mm long.

Female

It measured 6.10-11.95 mm in length and 0.16-0.34 mm in maximum width. Nerve ring was at 0.17-0.26 mm from anterior end. Uterus of full mature female was filled with larvae. The vulva was almost equatorial. The tail was conical in shape, ended by one cone-shaped process. It measured 0.15-0.18 in length and the cone shaped process measured 0.01-0.02 mm.

***Cammallanus lacustris* (Fig, 8a, b, c, d)**

Medium sized nematodes with smooth cuticle, body of living nematode yellowish to reddish in color, head end fairly wide, provided with large orange–brown buccal capsule consisting of two sclerolized lateral valves, short basal ring and two well developed tridents (dorsal and ventral). Inner surface of each value supported by (16 – 25) bands, anterior margin of value bearing two small oval superficial sclerotized plates. Tridents shorter than length of buccal capsule proper. Their ends only slightly exceeding posterior border of basal ring. Oral opening slid-like, surrounded by four sub apical mouth papillae.

Esophagus divided into approximately equally long portions, anterior muscular and posterior glandular ones . Nerve ring encircling anterior part of muscular esophagus, excretory pore situated some what below nerve ring level.

Female

The body length 3.62 -11.00 mm, maximum width 0.163 -0.320 mm .length of buccal capsule 0.117 -0.165 mm ,with 0.120 -0.156 mm , length tridents 0.063 – 0.135 mm. The muscular oesophagus measuring 0.421 -0.643 mm, glandular oesophagus 0.530-0.868 mm. Distance of nerve ring from anterior extremity 0.231 -0.312 mm, tail straight, conical, ending in three small processes 0.003 mm long. Vulva postequatorial , 2.09 -4.76 mm from anterior extremity, vulvar lips distinctly

elevating. Vagina muscular, directed posteriorly. Uteus amphidelphic, in gravid female filled with motile larvae 0.408 -0.505 mm long.

Male

The body length 2.29-6.23 mm, maximum width 0.093-0.221 mm. length of buccal capsule 0.084 -0.108 mm, width 0.081-0.111 mm and length of tridents 0.054 - 0.090 mm. The muscular oesophagus measuring 0.299– 0.729 mm, glandular one 0.299 – 0.557mm. The distance of nerve ring from anterior extremity 0.15 or 0.250 mm , of deirids 0.291 – 0.30 mm . posterior end of the body conical, ventrally bent, provided narrow sub ventral membranous alae. Total of 7 pairs of pedunculate preanal papillae present of which first bsnd second being closed to each other. Postanal papillae 6 pairs, papillae of first three pairs close together, second pair being more shifted to median line than other pairs, papillae of last post anal pair very small. cloocal opening surrounded by two transverse mounds , appearing in lateral view as two pairs of small sessile papillae – spicules slender ,simple , unequal , with pointed distal tip. Length of large (right)spicule 0.111 - 0.150 mm , that of smaller (left), less sclerotized spicule 0.063 -0.116 mm . Tail 0.066 – 0.122 mm long, with obtusely conical to rounded tip.

Cucullanus sphaerocephalus **(Fig. 9a, b)**

Large nematode with thick cuticle. Head end rounded, dorsally bent. mouth formed by two lateral valves, each of them bearing one dorsal and one ventrilateral papillae and lateral amphid. Oral opening slit- like, situated somewhat obliquely to longitudinal axis of body (oriented more dorsally),head end provided sometimes with small dorsal protuberance located at short distance below mouth aperture . Two very narrow lateral alae extending along anterior part of body, starting below level of posterior end of pseudobuccal capsule. Deirids somewhat asymmetrical, located behind nerve ring level. Esophagus expanded at both ends ,opening into intestine through small valves, anterior expanded end of oesophagus

forming pseudobuccal capsule with internal cuticularlining licker on dorsal side than on ventral side , excretory pore situated below level of deirids.

Male

The body length 11.24 -22.71 mm maximum width 0.312 -0.480 mm, entire oesophagus 1.64 -2.12 mm long. The distance of nerve ring from anterior exterior extremity 0.468 – 0.640 mm, of aeirids 0.647 -0.671 mm. posterior end of body ventrally bent, provided with well developed precloacal , 5 pairs preanal and 6 pairs postanal. All preanal papillae sub ventral, first two pairs being close to one another, papillae of two last pairs surrounding sucker. postanal papillae , first , third and sixth pairs subventral, second, fourth and fifth pairs lateral, small papillae of fourth pair being in fact outlets of ohasmids. Spicules short, equal, length 0.270 -0.440 mm, small gubernaculums 0.075 -0.096 mm long present Tail conical, 0.265 -0.374mm long, sharply pointed at tip.

Spinitectus gordoni **(Fig. 10a, b, c, d)**

Small, whitish nematodes. Body surface with transverse rings of small cuticular spines, rings interrupted at both sides of body by lateral lines. First two rings closed to each other. The size of spine in rings gradually diminishing posteriorly, spines in posterior part of body almost indistinct. First ring consists of 32-42 cuticular spines. Oral opening terminal, two small lateral pseudolabia present, each being provided with 2 small papillae and amphid. Vestibule distinctly distended at its anterior part to form funnel shaped prostom in lateral view. Anterior end of body may be withdrawn. Oesophagus distinctly divided into short anterior muscular section and glandular section. Nerve ring at level of second ring of spines or slightly below it. Excretory pore situated below fourth ring.

Male

The body length 2.66 -4.65 mm, maximum width 0.114 -0.213 mm. maximum length of circular spines 0.007 -0.008 mm. length of whole vestibule including prostom 0.039 -0.054 mm . Muscular esophagus and glandular one measuring 0.190 -0.290 mm and 0.91 – 1.48 mm, respectively. Distance of nerve ring from

anterior extremity 0.089 – 0.1333 mm, that of excretory pore 0.165 – 0.204 mm. tail spirally coiled. Caudal alae stating at short distance anterior to cloaca. Tail conical 0.099 -0.115 mm long, ending in small cuticular spike. precloacal cuticular ridges present . caudal papillae : altogether 10 pairs of pedunculate papillae of which 4 pairs preanal , 1 pair adanal and 5 pairs postanal , last three pairs close to each other , their papillae being smaller than those of other pairs , last but one pair shifted ventrally . Large (left) spicule slender, 0.370 -0.450 mm long. Small (right) soicule boat –shaped, length 0.082 -0.119 mm.

Female

The body length of gravid female 3.13 -5.07 mm, maximum width 0.190 – 0.370 mm. The length of vestibule including prostom 0.039 – 0.052 mm, of muscular oesophagus 0.220 -0.263 mm, of glandular oesophagus 0.98 – 1.10 mm. Nerve ring and excretory pore 0.095 -0.132 mm and 0.165 -0.210 mm, respectively , from anterior extremity, vulva situated at posterior extremity, muscular vagina directed anteriorly. Uterus amphidelphic, anteriorly reaching up to end of oesophagus posteriorly to short distance anterior to anus. Mature eggs oval, thick-walled, contain larva, egg surface smooth, size of eggs 0.039 -0.045 * 0.023 -0.033 mm. Tail conical, 0.089 -0.115 mm long.

***Paracapillaria gibsoni* (Fig. 11a, b)**

Female small nematodes, two lateral bacillary bands of rough structure extending along almost whole body length. Head and rounded. The body length of gravid female 6.00 -8.58 mm, maximum width 0.054 – 0.068 mm. Length of entire oesophagus 0.270 -0.285 mm, nerve ring 0.060 -0.063 mm from anterior end, vulva situated 0.030 -0.045 mm behind level of junction of oesophagus and intestine ,vulvar lips not elevating. Only small amount of eggs present in uterus of gravid female, these being arranged in one row. Eggs oval-shaped, some of them, some what narrowed equatorially, polar plugs not protruding, egg wall 0.3 mm thick, two- layered, outer layer relatively thick, with rough sculpture (stippled) on surface content of eggs 0.057 – 0.069 X 0.024 – 0.030 mm. Ovary reaching

posteriorly to level of rectum. Anus sub-terminal, tail broadly rounded length 0.009 -0.012 mm.

Similar morphological characters were noticed by Kardousha, (1991), Bunkley-Williams and Williams, (1994), Moravec, (1994), Hassanine, (1995) and Paperna, (1996).

No pathognomonic clinical abnormalities were recorded in the naturally infested fishes with gastrointestinal digeneasis, acanocephalosis, cestodiasis and nematodiasis. However, some fishes may show slight abdominal distension. Internally the digestive tract showed congestion, distension and thickening of the heavily infected fishes (Fig. 12, 13,14,15,16 and 17). Post, (1983), Egusa (1992), Paperna, (1996), Amer *et al.,* (2007) and El-Lamie, (2007) did not record any abnormalities. Schaperclaus *et al.,* (1992) recorded that the clinical signs due to worm infection are slight. The recorded postmortem changes were nearly similar to Post, (1983), Eissa, (2002) and El-Lamie, (2007). *Tetraphyllidean* larvae were found as small whitish rods in the stomach. A sever congestion was observed in the wall of infected fish stomach. However, Bunkley-Williams and Williams (1994) mentioned that tetraphyllidean larval forms usually cause little harm unless they occur in very high numbers up to 4500 worms per fish have been reported in the intestines of small white and striped mullets in the Gulf of Mexico. This number would probably kill or stunt these fishes.

Woo (1995) mentioned that the high number of enteric parasites decrease the intestinal lumen by more than 50% causing intestinal distension which affect the movement of feed through out the intestine.

The most important method for controlling helminthic parasites is the elimination of intermediate hosts (Woo, 1995, Paperna, 1996). However, experience with the treatment of adult helminthes is lacking. A very promising future research is the study of immune response in parasitic infections and development vaccine against the most important pathogenic parasites.

Table 1. The total prevalence rate of parasitic infection in different examined fish species.

Fish species	No. of Examined	No. of Infected	%
C. bajad	12	12	100
N. lituratus	28	28	100
P. maculatus	52	40	76.9
S. maculatus	8	6	75
M. flavolineatus	112	80	71.4
E. polyzona	24	16	66.7
L. nebulosus	64	40	62.5
K. valgiensis	8	4	50
T. choram	18	0	0
Total	326	226	69.3

Table 2. Prevalence of digenetic trematodes among the examined fishes

Fish Species	No. of exam. fish	No. of infected fish		*Steganoderma nitens*		*Propseudaephnidiog ensis chaetodoni*		*Dinurus scombri*		*Proacetabulorchis prashadi*	
		No.	%	No.	%	No.	%	No.	%	No.	%
C. bajad	12	0	0	0	0	0	0	0	0	0	0
N. lituratus	28	28	100	18	64.3	0	0	24	85.7	26	92.9
P. maculatus	52	32	80	24	75	0	0	28	87.5	30	93.8
M. flavolineatus	112	80	71.4	57	71.3	20	25	64	80	72	90
E. polyzona	24	16	66.7	0	0	0	0	10	62.5	14	87.5
L. nebulosus	64	40	62.5	38	95	16	40	0	0	24	60
K. valgiensis	8	4	50	0	0	3	75	0	0	4	100
T. choram	18	0	0	0	0	0	0	0	0	0	0
S. maculatus	8	0	0	0	0	0	0	0	0	0	0
Total	326	200	61.3	137	68.5	39	19.5	126	63	170	85

Table 3. Prevalence of cestode and acanthocephala among the examined fishes.

Fish Species	No. of exam. fish	Cestode		Acanthocephalan	
		Tetraphyllidean larvae		*Serrasentis sagitttifer*	
		No. infected	%	No. infected	%
C. bajad	12	0	0	0	0
N. lituratus	28	0	0	0	0
P. maculatus	52	0	0	0	0
S. maculatus	8	4	50	2	25
M. flavolineatus	112	0	0	0	0
E. polyzona	24	0	0	0	0
L. nebulosus	64	0	0	0	0
K. valgiensis	8	0	0	0	0
T. choram	18	0	0	0	0
Total	326	4	1.2	2	0.6

Table 4. Prevalence of nematodes among the examined fishes.

Fish Species	No. of exam. fish	No. of infected fish		*Spirocammallanus* species		*Cammallanus lacustris*		*Cucullanus sphaerocephalus*		*Spinitectus gordoni*		*Paracapillaria gibsoni*	
		No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
C. bajad	12	12	100	0	0	8	66.7	0	0	12	100	2	16.7
N. lituratus	28	0	0	0	0	0	0	0	0	0	0	0	0
P. maculatus	52	20	38.5	18	90	16	80	0	0	12	60	0	0
S. maculatus	8	0	0	0	0	0	0	0	0	0	0	0	0
M. flavolineatus	112	56	50	46	82.1	52	92.9	28	50	42	75	20	25
E. polyzona	24	0	0	0	0	0	0	0	0	0	0	0	0
L. nebulosus	64	24	37.5	16	80	0	0	18	90	18	90	0	0
K. valgiensis	8	0	0	0	0	0	0	0	0	0	0	0	0
T. choram	18	0	0	0	0	0	0	0	0	0	0	0	0
Total	326	112	34.4	64	57.1	76	67.6	46	41.1	84	75	22	19.6

LEGEND OF FIGURES

Fig. (1): *Steganoderma nitens*

Fig. (2): *Propseudaephnidiogensis chaetodoni*

Fig. (3): *Dinurus scombri*

Fig. (4): *Proacetabulorchis prashadi*

Fig. (5): *Tetraphyllidean* larvae

Fig. (6): *Serrasentis sagittifer.* (a) Anterior end. (b) Posterior end.

Fig. (7): *Spirocammallanus* species. (a) Anterior end. (b) Male posterior end. (c) Female posterior end.

Fig. (8): *Cammallanus lacustris.* (a) Anterior end. (b) Male posterior end. (c) Female vulval part. (d) Female posterior end.

Fig. (9): *Cucullanus sphaerocephalus.* (a) Anterior end. (b) Male posterior end.

Fig. (10): *Spinitectus gordoni.* (a) Anterior end. (b) Male posterior end. (c) Female vulval part. (d) Female posterior end.

Fig. (11): *Paracapillaria gibsoni.* (a) Anterior end. (b) Female posterior end.

Fig. (12): Stomach of *N. lituratus* congested due parasitic infection.

Fig. (13): Opened stomach of *N. lituratus* congested due parasitic infection.

Fig. (14): *Dinurus scombri* and *Proacetabulorchis prashadi* recovered from *P. maculates* fish.

Fig. (15): *Steganoderma nitens* and *Proacetabulorchis prashadi* in Petri dish recovered from *M. flavolineatus* fish.

Fig. (16): *Cammallanus lacustris* from *C. bajad.*

Fig. (17): Stomach of *S. maculatus.* Infected with *Tetraphyllidean* Larvae.

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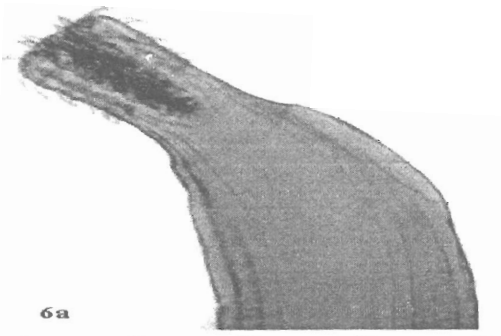

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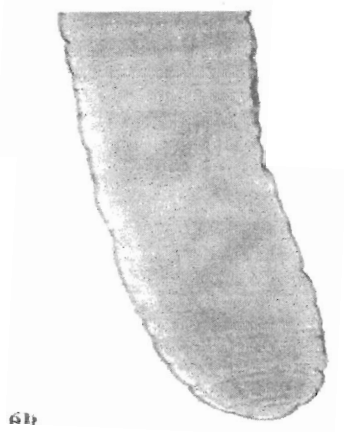

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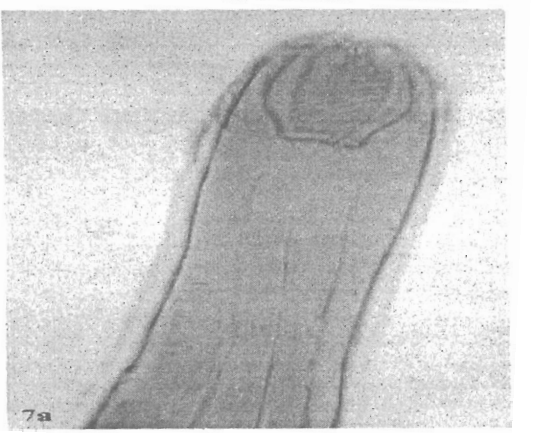

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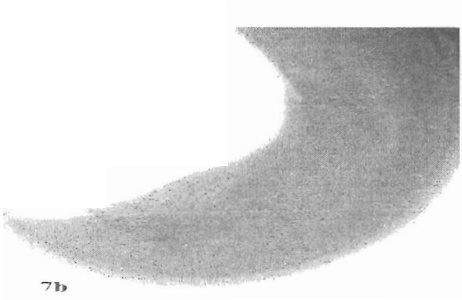

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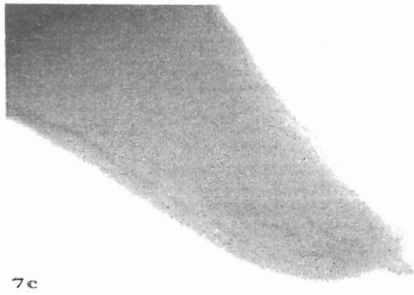

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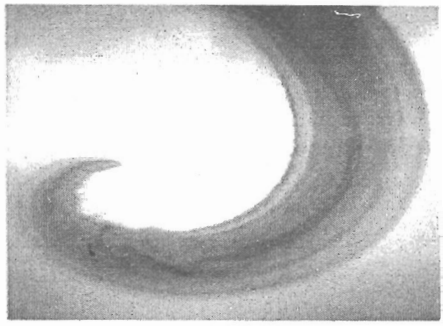

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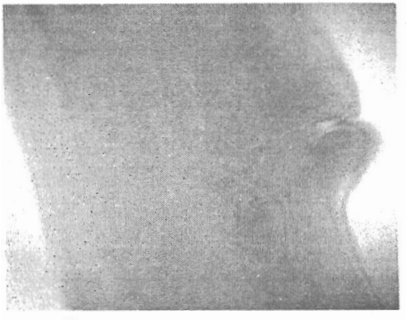

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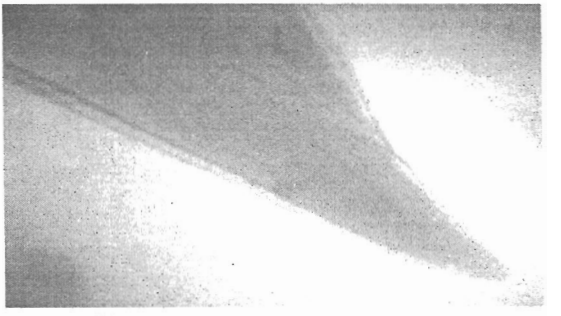

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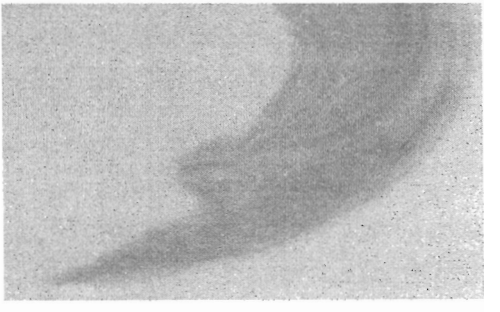

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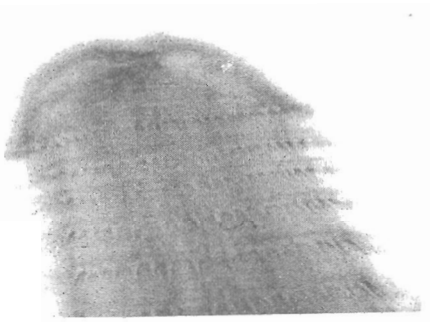

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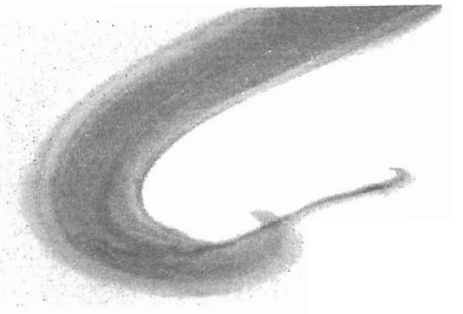

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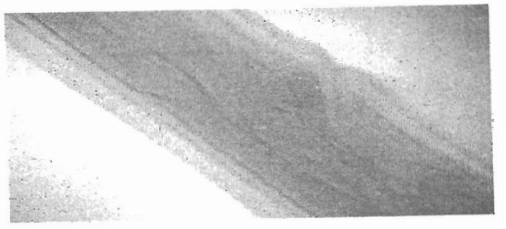

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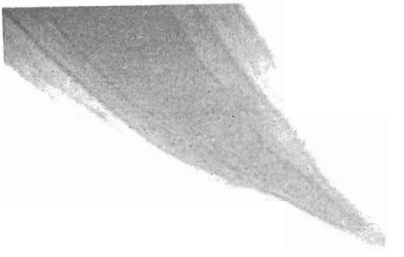

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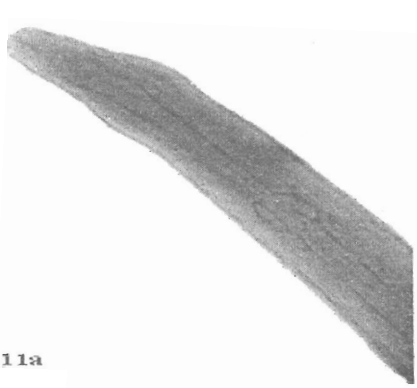

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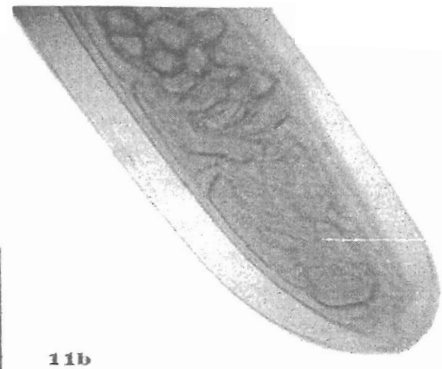

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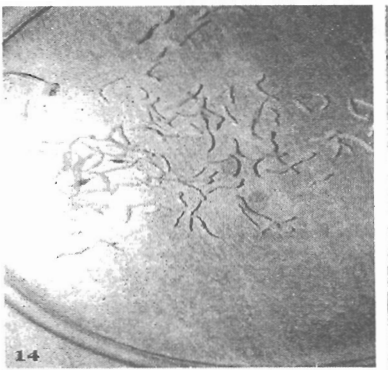
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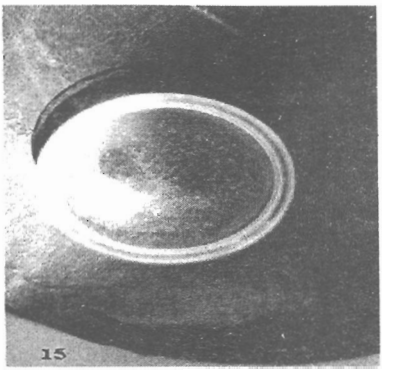
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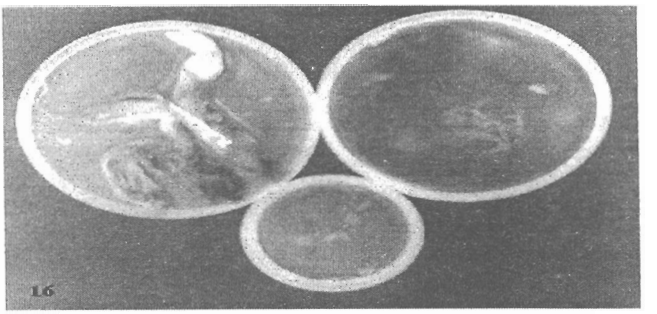
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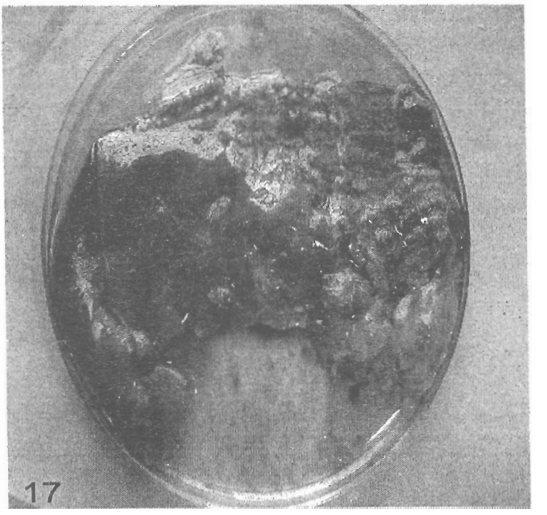
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دراسات عن الأمراض الطفيلية الناخمة عن الديدان المعوية السائدة فى بعض أسماك المياه المالحة من البحر الأحمر

أحمد محمد محمود الأشرم ، جيهان إبراهيم عبد البر شـــجر

قسم أمراض الأسماك – المعمل المركزي لبحوث الثروة السمكية بالعباسة – مركز البحوث الزراعية

تم إجراء هذا البحث علي عدد ٣٢٦ من الأسماك البحرية والتي تم تجميعها علي طول شاطىء البحر الأحمر والتى تشمل البياض ، الرهو ، الناجل ، البربوني ، ثعبان البحر ، الشعور ، تهمل، وخرمان ودراك. وذلك لدراسة الأمراض الناجمة عن الديدان الطفيلية الداخلية والتى تتسبب فى خسائر أقتصادية والتى قد تكون ذات قيمة كبيرة عند استزراع هذه الأسماك. وكانت النتائج كالتالى:

- أظهرت الدراسة أن نسبة الإصابة الكلية بين الأسماك التي تم فحصها هي ٦٩,٣ %. كما أوضحت الدراسة أن أعلى نسبة للإصابة كانت بين أسماك البياض والرهو هى ١٠٠%. فى حين لم تظهر اى اصابة بالطفيليات الداخلية فى أسماك الخرمان.
- كان معدل الاصابة الكلية بطفيليات تريماتودا ثنائية العائل هى ٦١,٣ %، وتشمل ستيجانوديرما نيتـيس (٦٨,٥%)، برويسودايفنيديوجينسـيس (١٩,٥%)، ديتيـريس سـكومبرى (٦٣%)، برواستابيلوركيس براشادى (٨٥%).
- أوضحت النتائج ان معدل الأصابة بالديدان الخيطية هى ٣٤,٤%. وتشـمل سـبيروكامالانيس (٥٧,١%)، كامالانيس لاكيستريس (٦٧,٦%)، كوكولانيس سفروسفاليس (٤١,١%)، سبيتكتس جوردونى (٧٥%) وباراكابيلاريا جيبسوني (١٩,٦%).
- تبين من النتائج ان معدل الأصابة بطفيليات شوكية الرأس هـى ٠,٦%، حيـث تـم تسـجيل سيراسينتيس ساجيتيفير فى أسماك الدراك فقط.
- تم تسجيل الأصابة ليرقات التيترافيليدان بنسبة ١,٢% فى أسماك الدراك فقط.
- لم تظهر على الأسماك المصابة أى علامات مرضية. على الجانب الآخر كان هناك احتقان فى القناة الهضمية.

تم عرض الوصف التفصيلي والأهمية الاقتصادية وأفضل الطرق للوقاية والعلاج من الإصـابة بالطفيليات المعزولة .