Research Article

©*ISISnet Publishers*

Bioscience Research, 4(1): 06-14, 2007
Available online at **www.isisn.org**
Print ISSN: 1811-9506

Two new anisakid nematode from marine fish, *Saurus indicus* (day) at india.

P. C. Gupta and I. Begum*

Department of Zoology, D.A - V College, Kanpur, **India**.
***Corresponding author**

Two new species of the genus *Hysterothylacium* Ward and Magth, 1917 *H.shamimi* sp.nov. and *H.vinodae* sp.nov are described from the intestine and liver of marine fish, *Saurus indicus* (Day) at Orissa, India. Both the new forms differs from *H. aduncum* Deardroff and Overstreet, 1980; (*A. adunca* Rudolphi,1802); *H.geschi* Torres *et.al.*, 1998 and *H.japonicum* Moravec and Nagasawa, 2000 in the absence of broad lateral alae. Further, *H.shamimi* sp.nov. differ from *H.habena* (Linton, 1900) Deardroff and Overstreet, 1980; *H.fortalezae* (Klein, 1973) Deardroff and Overstreet, 1980; *H.corrugatum* Deardroff and Overstreet, 1980; *H.carangis* (Kalyankar, 1971) Deardroff and Overstreet,1980; *H.serrani* (Kalyankar, 1971) Soota, 1983; *H.trichiuri* (Thwaite, 1927) Deardroff and Overstreet ,1980; *H.pelagicum* Deardroff and Overstreet ,1982 and *H.winterii* Torres *et.al.*, 2004 in the presence of unequal spicule. and *H.vinodae* sp.nov. differs from all species in the ratio of intestinal ceacum and ventriculas appendix 3:1 and from previously described species in the presence of deep transverse grooves on anterior end, absence of brush like structure on male tail and pointed expansion on female tail, shape and structure of lips and length of ceacum.

Key words: ***H. shamimi, H. vinodae,*** **sp. Nov, marine fish,** ***Saurus indicus,*** **India.**

Present communication deals in detail with the genus *Hysterothylacium* Ward and Magth, 1917 seventeen male and twenty three female nematode specimens were collected from the marine fish, *Saurus indicus* (Day) at Orissa, India of which ten male and thirteen female specimen were assigned as *H.shamimi* sp.nov. collected from intestine and seven male and ten female as *H.vinodae* sp.nov from liver of host.

MATERIAL AND METHOD

The nematode parasites were collected from the intestine of marine fish, *Saurus indicus* (Day) were fixed in 70% warm ethyl alcohol and also boiled water and preserved in 70% alcohol containing 5% glycerin. For detail study worms were manipulated by rolling them in glycerin under a cover glass. All diagrams were drawn with the help of camera Lucida. All measurements are in millimeter unless otherwise indicated.

RESULTS

1. *Hysterothylacium shamimi* sp.nov.

Presented in Plate I (fig. I - VIII)

Description general: Body long, cylindrical, tapering towards posterior extremity. Mouth surrounded by three large lips, two subventeral and a dorsal; subventeral lips; anteriorly drawns into two semilunar structure, not interlocking. Dentegerious ridges absent. Interlabials and lip pulp present. Each lip having a pair of papillae. Cuticle wide, finally striated, with transverse groove. Oesophagus bipartite. Ventriculas well developed. Ventricular appendix present. Intestinal ceacum present. Cervical papillae absent. Tail conical without any expensions on the tip of tail.

Male: Body, 30.06 - 34.25 long and 0.12 - 0.15 wide. Head diameater, 0.03 - 0.05. Anterior muscular oesophagus, 4.85 - 4.92 long, Posterior glandular oessophagus, 3.39 -

3.72 long. Entire oesophagus, 8.24 - 8.64 long. Ventriculas, 0.011 - 0.017 long. Ventricular appendix, 0.03 - 0.04 long. Intestinal ceacum, 0.35 - 0.36 long. Nerve ring at, 0.39 - 0.41 and excretory pore at, 0.51 - 0.55; both from anterior end. Caudal papillae, twenty five to thirty pairs, of which eighteen to twenty two preanal zero to two adnal three to six postanal. Spicules unequal, similar, nonalate, with balloon shaped sac at its distal end; right spicule, 0.26 - 0.31 long and left spicule, 0.20 - 0.26 long. Caudal alae and gubernaculam absent. Tail short, curved 0.02 - 0.04 long.

Female: Body, 33.34 - 38.25 long and 0.12 - 0.17 wide. Head diameater, 0.04 -0.08. Anterior muscular oesophagus, 3.93 - 4.02 long. Posterior glandular oesophagus, 3.09 - 3.22 long. Entire oesophagus, 7.02 - 7.24 long. Ventriculas, 0.02 - 0.03 long. Ventricular appendix, 0.03 - 0.04 long. Intestinal ceacum, 0.06 - 0.07 long. Nerve ring at, 0.35 - 0.39 and exceretory pore at, 0.56 - 0.63, both from anterior end. Vulva postequatorial, 0.32 - 0.59 from posterior end with two muscular lips. Tail with spike like structure, 0.036 - 0.039 long. Spike, 0.01 - 0.02 long.

Host: *Saurus indicus* (Day)
Site of infection: Intestine
Locality: Puri, Orissa
Prevalence: Ten male and thirteen female specimens from one host out of twenty four examined.
Date of collection: 15th January 2003
Etymology: Named in the honor Prof. Shamim Jairajpuri Ex-Vice Chancellor Maulana Azad Urdu University Hyderabad India.

2. *Hysterothylacium vinodae* sp.nov.
Presented in plate II (Figs. I - VIII)

Description general: Body long, cylindrical, tapering towards posterior extremity. Mouth surrounded by three large lips, two sub venteral and dorsal. Subventeral lips anteriorly drawns into two semilunar structures, not interlocking. Dentegerious ridges absent. Interlabials and lip pulp present. Each lip having a pair of papillae. Cuticle wide, finally striated, with deep transverse grooves discontinuous on both sides; striations distinct middle of the body. Oesophagus bipartite. Ventriculas well developed. Ventricular appendix and Intestinal ceacum present. Cervical papillae absent.
Male: Body, 35.06 - 37.25 long and 0.08 - 0.11 wide. Head diameter, 0.04 - 0.08. Anterior muscular oesophagus, 2.73 - 2.92 long. Posterior glandular oesophagus, 2.39 - 2.72 long. Entire oesophagus, 5.12 - 5.64 long. Ventriculas, 0.11 - 0.13 long. Ventricular appendix, 0.10
-0.11 long. Intestinal ceacum, 0.32 - 0.35 long. Nerve ring at, 0.42 -0.59 and excretory pore at, 0.56 - 0.73, from anterior end. Caudal papillae nineteen pairs, of which thirteen Preanal; one adnal and five postanal. Spicules unequal, similar, nonalate, with balloon shaped sac at its distal end; right 0.24 - 0.36 long and left, 0.35 - 0.46 long. Caudal alae and gubernaculam absent. Tail short, curved, 0.16 - 0.20 long.

Female: Body, 39.06 - 40.25 long and 0.07 - 0.09 wide. Head diameter, 0.04 - 0.06. Anterior muscular oesophagus, 2.62 - 2.81 long, posterior glandular, 2.22 - 2.53 long. Entire oesophagus, 4.84 - 5.34 long. Ventriculas, 0.11 - 0.13 long. Ventricular appendix, 0.07 - 0.10 long. Intestinal ceacum, 0.28 - 0.30 long. Nerve ring at, 0.40 - 0.49 and excretory pore at,
0.56 - 0.69 both from anterior end. Vulva postequatorial, vagina muscular. Caudal papillae absent. Tail blunt, 0.09 - 0.12 long. Eggs small, oval, double walled, without polar filaments.

Host: *Saurus indicus* (Day)
Site of infection: Intestine
Locality: Puri, Orissa
Prevalence: Seven male and ten female specimens from one host out of four examined.
Date of collection: 18th January 2003
Etymology: Named in the honor of Prof. (Mrs.) Vinod Gupta, Department of Zoology, Lucknow University, Lucknow, India.

DISSCUSION:
1. *Hysterothylacium shamimi* sp.nov.
Deardroff and Overstreet (1980) in his review of the genus *Hysterothylacium* and *Iheringascaris* Pereira, 1935 (both previously = *Thynnascaris*), synonymised the genus *Ascaris, Contraceacum* Railliet and Henry, 1912 and *Thynnascaris* Doullfus,1933 with

Hysterothylacium Ward and Magth, 1917. They categorized all described species in above mentioned genera into three tables. In his Table-1, they reported forty seven species in chronological order of discovery with the addition of one new species viz.; *H.aduncum* Deardroff and Overstreet, 1980; (*A.adunca* Rudolphi,1802); *H.amoyensis* Deardroff and Overstreet, 1980; (*C.amoyensis* Hsu, 1933); *H.arii* Deardroff and Overstreet, 1980; (*C.arii* Yamaguti, 1954); *H.assi* Deardroff and Overstreet, 1980; (*C.assi* Parukhin,1973); *H.auctum* Deardroff and Overstreet, 1980; (*A.aucta* Rudolphi, 1802); *H.baylisi* Deardroff and Overstreet, 1980; (*C.baylisi* Yamaguti, 1941); *H.bidentatum* Deardroff and Overstreet, 1980; (*A.bidentata* Linstow, 1899); *H.carangis* Deardroff and Overstreet, 1980; (*T.carangis* Kalyankar, 1971); *H.chaunaxi* Deardroff and Overstreet, 1980; (*C.chaunaxi* Olsen,1952); *H.clavatum* Deardroff and Overstreet, 1980; (*A.clavata* Rudolphi, 1809); *H.coiliae* Deardroff and Overstreet, 1980; (*C.coiliae* Yamaguti, 1941); *H.cornutum* Deardroff and Overstreet, 1980; (*A.cornuta* Stossich, 1904); *H.corrugatum* Deardroff and Overstreet, 1980; *H.cyclopteri* Deardroff and Overstreet, 1980; (*C.(Simplexonema) cyclopteri* Keris, 1952); *H.dollfusi* Deardroff and Overstreet, 1980; (*T.dollfusi* Schmidt, Leiby and Kritsky, 1974); *H.epinepheli* Deardroff and Overstreet, 1980; (*C.epinepheli* Yamaguti, 1941); *H.fabri* Deardroff and Overstreet, 1980; (*A.fabri* Rudolphi, 1819); *H.fortalezae* Deardroff and Overstreet, 1980; (*C.fortalezae* Klein, 1973); *H.gadi* Deardroff and Overstreet, 1980; (*A.gadi* Muller, 1776); *H.gracile* Deardroff and Overstreet, 1980; (*C.gracile* Yamaguti, 1935); *H.habena* Deardroff and Overstreet, 1980; (*A.habena* Linton, 1900); *H.haplalogenyos* Deardroff and Overstreet, 1980; (*C.hapalogenyos* Yamaguti, 1961); *H.haze* Deardroff and Overstreet, 1980; (*T.haze* Machida, Takahashi and Masuuchi, 1978); *H.histiophori* Deardroff and Overstreet, 1980; (*C.histiophori* Yamaguti, 1935); *H.ilishae* Deardroff and Overstreet, 1980; (*C.ilishae* Yamaguti, 1941); *H.increscens* Deardroff and Overstreet, 1980; (*A.increscens* Molin, 1858); *H.incurvum* Deardroff and Overstreet, 1980; (*A.incurva* Rudolphi, 1819); *H.longispiculam* Deardroff and Overstreet, 1980; (*C.Longispiculam* Fujita, 1949); *H.magnum* Deardroff and Overstreet, 1980; (*C.magnum* Smedley, 1934); *H.marinum* Deardroff and Overstreet, 1980; (*A.marina* Linnaeus, 1767); *H.melanogrammi* Deardroff and Overstreet, 1980; (*C.melanogrammi* Smedley, 1934); *H. melichthysi* Deardroff and Overstreet, 1980; (*C.melichthysi); H. murrayense* Deardroff and Overstreet, 1980; (*C.murrayense* Johnston and Mawson, 1940); *H.ogcocephali* Deardroff and Overstreet, 1980; (*C.ogcocephali* Olsen, 1952); *H.okadai* Deardroff and Overstreet, 1980; (*C.okadai* Fujita, 1940); *H.pagrosomi* Deardroff and Overstreet, 1980; (*C.pagrosomi* Yamaguti, 1935); *H.paralichthydis* Deardroff and Overstreet, 1980; (*C.paralichthydis* Yamaguti, 1935); *H.rectum* Deardroff and Overstreet, 1980; (*C.rectum* Yamaguti, 1961); *H.reliquens* Deardroff and Overstreet, 1980; (*T.reliquens* Norris and Overstreet, 1975); *H.rhacodes* Deardroff and Overstreet, 1980; (*T.rhacodes* Deardroff and Overstreet, 1979); *H. rigidum* Deardroff and Overstreet, 1980; (*A. rigida* Rudolphi, 1809); *H.saba* Deardroff and Overstreet, 1980; (*C.saba* Yamaguti, 1941); *H.salvelini* Deardroff and Overstreet, 1980; (*C.salvelini* Fujita, 1940); *H.scomberomori* Deardroff and Overstreet, 1980; (*C.scomberomori* Yamaguti, 1941); *H.seriolae* Deardroff and Overstreet, 1980; (*C.seriolae* Yamaguti, 1941); *H.trichuri* Deardroff and Overstreet, 1980; (*C.trichuri* Thwaite, 1927); *H.zenis* Deardroff and Overstreet, 1980; (*C.zenis* Baylis, 1929); *H.zenopsis* Deardroff and Overstreet, 1980; (*C.zenopsis* Yamaguti, 1941). They accommodated in their Table - 2 species of uncertain status which they argued to be actually *Hysterothylacium*. These species listed in Table 2, that contained intestinal ceacum and ventricular appendages and mature in alimentary canal of fishes, are: *C.filiforme* (Stossich, 1904); *C.macquariae* Jhonston and Mawson, 1940; *C.macrozarcium* Nigrelli, 1946; *C.mulli,* (Wedl, 1855); *C.naitoi* Fujita, 1932; *C.ochotense* Fujita, 1931; *C.serrani* Kalyankar, 1972; *C.synpapillus* Bilqees, Khaunam and Jehan, 1971.

And in table - 3 they accommodated the larval ascaridoids of uncertain status, some of which probably will be shown as referable to *Hysterothylacium* and some probably will be junior synonyms. The species in Table 3 are as follows: *C.aori* Khan and Yaseen, 1969 (in body cavity of *mystus aor*; excretory pore not mentioned; intestinal ceacum shorter than ventricular

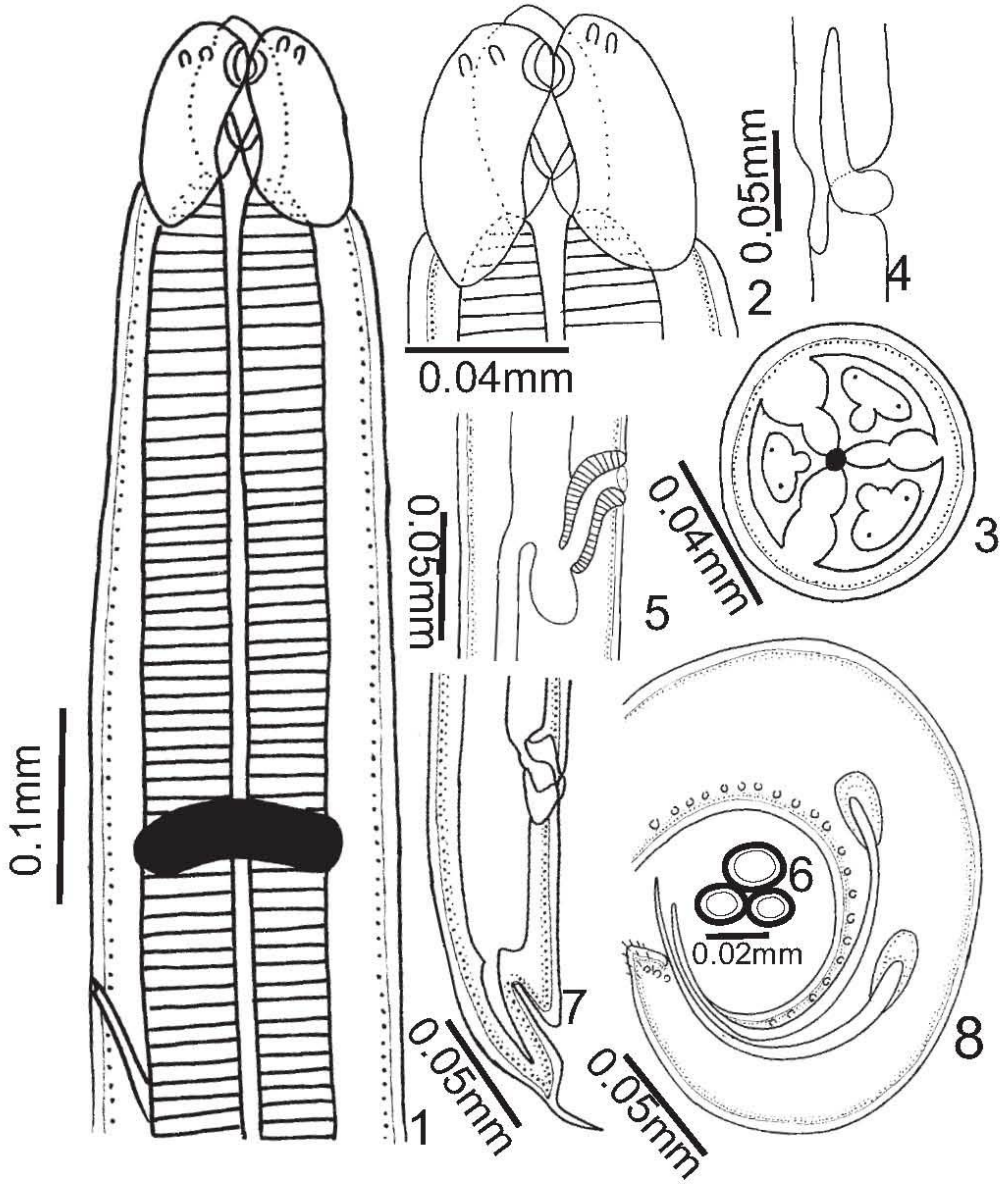

Plate I (fig. I - VIII): *Hysterothylacium shamimi* sp.nov.

1. Anterior end male (Holotype)
2. Cephalic region female (Holotype)
3. Endon view female
4. Intestinal ceacum ventriculas appendix female (Paratype)
5. Vulva region female (Paratype)
6. Eggs (Paratype)
7. Posterior end female (Holotype)
8. Posterior end male (Holotype)

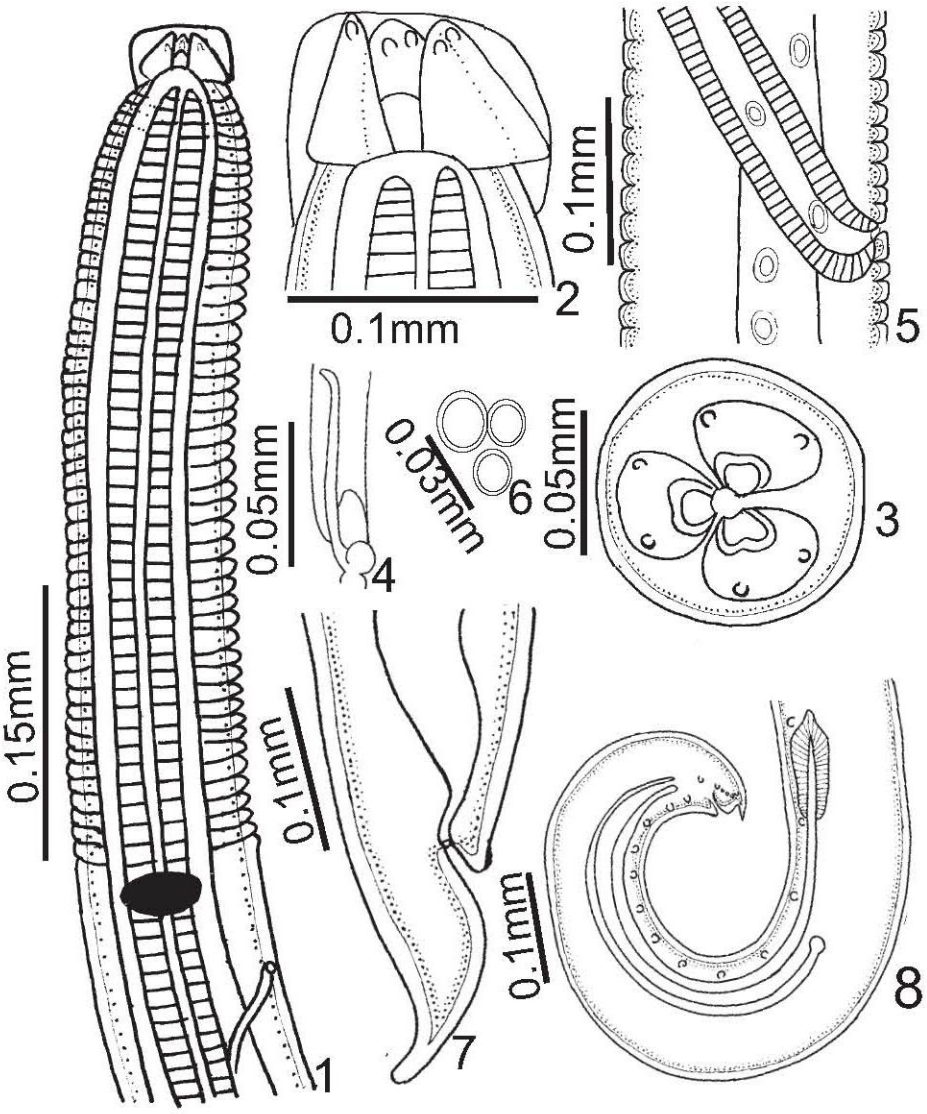

Plate II. (Figs. I - VIII): *Hysterothylacium vinodae* sp.nov.

1. Anterior end male (Holotype)
2. Cephalic region female (Holotype)
3. Endon view male
4. Intesinal ceacum, ventriculas & ventricular appendix (Paratype)
5. Vulva region female (Paratype)
6. Eggs (Holotype)
7. Posterior end female (Holotype)
8. Posterior end male (Holotype)

appendage ;Probably fourth stage of larva; *C.benimasu* Fujita, 1982 (in body cavity of *Oncorhynchus* spp.; Site of infection excretory pore is not mentioned; vagina opening to rectum (?) Probably fourth stage of larva; *C.breviceacum* Khan and Yaseen, 1969 (in body cavity of "sawfish," excretory pore slightly posterior to level of nerve ring; third stage of larva; *C.collieri* Chandler, 1935 (in body cavity of *Cyprinodon variegates*; excretory pore not mentioned; intestinal ceacum longer than ventricular appendages third stage of larva; *C.hippoglossi* Fujita, 1932

(in body cavity of several fishes; Site of infection, excretory pore not mentioned; intestinal ceacum longer than ventricular appendages ; vulva opens to rectum (?) ; Probably developing fourth stage of larva with in third stage of molt; *C.hypomesi* Fujita, 1932 (in body cavity of *Hypomesus* spp., *Clupea pallasi,* and *Oncorhynchus nerka* (as well as intestine); Site of infection excretory pore not mentioned; intestinal ceacum longer than ventricular appendages ; probably fourth stage of larva; *C.mesopi* Fujita, 1940 (in body cavity of *Mesopus olidus*; excretory pore near nerve ring; male unknown; Probably fourth stage of larva; *C.(T.)nototheniae* Johnston and Mawson, 1945 Immature specimen from *Notothenia rossi* and *N.macrocephala*; broad cervical alae of unequal length; Site of infection of excretory pore not mentioned Probably fourth stage of larva; *C.oshoroensis* Fujita, 1940 (in body cavity of *Oncorhynchus keta* and *Mesopus olidus*; excretory pore indistinct Probably fourth stage of larva; *C.taii* Fujita, 1932 (in body cavity of *taius tumifrons*; excretory pore not mentioned; Probably developing fourth stage of larva; *C.(T.)tasmaniense* Johnston and Mawson, 1945 Site of infection not mentioned; from *Notopogon liliei* and *Coclorhynchus australis*; location of excretory pore not mentioned; intestinal ceacum longer than ventricular appendages Probably fourth stage of larva and *C.vittaii* Khan and Begum,1971 (in body cavity of *Upeneus vittatus*; excretory pore near nerve ring; third stage of larva.

Further, Soota (1983) accommodated *A. plagiostomorum* v.Linstow, 1905, *T.serrani* Kalyankar, 1972 and *C.synapapillus* Bilqees Khaunam and Jehan, 1971 under the genus *Hysterothylacium*. Later, Soleim (1984) reviewed the genus *Thynnascaris* and *Contraceacum* and amended the generic definition. Authors are in agreement with Deardroff and Overstreet (1980) and Soota (1983).

Subsequently species were added under the genus *Hysterothylacium,* viz: *H.pelgicum* Deardroff and Overstreet, 1982; *H.clupleola* Vicente *et.al.*, 1982 from *Oligoplites saurus* and *Mycteropera bonci* from the Brazilian costal water; *H.pseudotumbili* Lakshmi, Rao and Shayamsundari, 1991 from marine fishes *Chrorinemus tol* (Cuvier) *Saurida undosquamis* (Richardson), *Lutianus russelli* (Bleeker), *Rastrilliger kanagurta* (Cuvier) and *Saurida Pseudotumbili* of Visakhapatnam, Bay of Bengal; *H.petteri* Sheenko,1991 from the pacific ocean sword fish; *H.kirani* Lakshmi (1993) from the body cavity of *Channa punctatus* at Andhra Pradesh; *H.cenotue* Moravec *et.al.*, 1995 from fishes of cenotes (=sinkholes) from Peninsula of Yucatan, Mexico; *H.rhamdiae* Brizzola and Tanzola, 1995 from fresh water fish of Argentina; *H.patagonense* Moravec *et.al.,*1997 from fresh water fishes of Patagonioa Argentina; *H.geschi* Torres *et.al.*, 1998 from the intestine of *Cauque mauleanum* (Steindachner) from lake Panguipulli, Chili; *H.japonicum* Moravec and Nagasawa, 2000 from *Trachipterus ishikawai* and *H.winteri* Torres *et.al.*, 2004 from marine -estuarine fish at gulf of Ancud, Chile.

Up to now Haung (1988); Lakshmi, Rao and Shayamsundari (1990); Moser and Hsieh (1992) and Graca costa et. al. (2004) recognized the genus *Hysterothylacium* from different fish hosts and varied geographical locations, however due to lack of specimens and so on did not classify these specimens under a separate species status.

The species reported under the genus *Thynnascaris* are: *T.hanumantharoi* Lakshmi and Shayamsundari, 1989 from the marine fish *Xiphias gladius*; *T.shayamsundarii* Lakshmi and Rao, 1989 from the marine fish; *T.neorhacodes* Lakshmi Rao and Shayamsundari,1990 from the stomach of marine fish *Rachycentron canadus* and *T.visakhensis* Bharathlakshmi, 1999 from the intestine of marine fish *Saurida undosoquamis*.

Deardroff and Overstreet (1980) separated the forms having weak transverse grooves and absence of transverse grooves from *Thynnascaris* and accommodated them under the genus *Hysterothylacium.* Accordingly, due to absence of transverse grooves above mentioned species of the genus *Thynnascaris* transferred under the genus *Hysterothylacium.* Presently the forms are *H.neorhacodes* (Lakshmi Rao and Shayamsundari, 1989) n.comb.; *H.hanumantharoi* (Lakshmi and Shayamsundari, 1989) n.comb.; *H.shayamsundarii* (Lakshmi and Rao, 1989) n.comb. and *H.visakhensis* (Bharathlakshmi,1999) n. comb.

Present specimens differ from *H.incurvum* (Rudolphi, 1819) Deardroff and Overstreet (1980); *H.synapillus* (Bilqees Khaunam and Jehan, 1971) Soota, 1983; *H.pseudotumbili*

Lakshmi Rao and Shayamsundari, 1991b; *H.petteri* Sheenko, 1991; *H.visakhensis* (Bharathlakshmi, 1999) n.comb.; *H.japonicum* Moravec et al. 2000 in the presence of ventricular appendix that is shorter than intestinal ceacum . Further, it can be differentiated from *H.habena* (Linton, 1900) Deardroff and Overstreet, 1980; *H.fortalezae* (Klein, 1973) Deardroff and Overstreet, 1980; *H.corrugatum* Deardroff and Overstreet, 1980; *H.carangis* (Kalyankar, 1971) Deardroff and Overstreet, 1980; *H.serrani* (Kalyankar, 1971) Soota, 1983; *H.trichiuri* (Thwaite, 1927) Deardroff and Overstreet, 1980; *H.pelagicum* Deardroff and Overstreet, 1982 and *H.winterii* Torres *et.al.*, 2004 in the presence of unequal spicule instead of equal. Specimens can be distinguished from *H.geschi* Torres *et.al.*, 1998 in the absence of broad lateral alae.

Accordingly, present specimens are considered as a new species with a specific name *Hysterothylacium shamimi* sp.nov. Named in the honor Prof. Shamim Jairajpuri Ex - Vice Chancellor Maulana Azad Urdu University Hyderabad.

2. *Hysterothylacium vinodae* sp.nov.

Present specimens are differ from all the valid species and previously described *H.shamimi* sp.nov. of the genus *Hysterothylacium* Ward and Magth, 1917 in the ratio of intestinal ceacum and ventriculas appendix 3:1. Further, it distinguished with *H. aduncum* Deardroff and Overstreet, 1980; (*A. adunca* Rudolphi,1802); *H.geschi* Torres *et.al.*, 1998 and *H.japonicum* Moravec abd Nagasawa, 2000 in the absence of broad lateral alae and from previously described species in the presence of deep transverse grooves on anterior end, absence of brush like structure on male tail and pointed expansion on female tail, shape and structure of lips, length of ceacum; ventricular appendix and size and shape of various body organs.

Accordingly, present specimens are considered as a new species with a specific name *Hysterothylacium vinodae* sp.nov. named in the honor of Prof. (Mrs.)Vinod Gupta, Department of Zoology, Lucknow University, Lucknow.

REFERANCES

Baylis, H.A. (1929) Parasitic nematoda and Accanthocephala collected in 925 - 1927. Discovery Rep. 1: 541 - 560.

Bharathlakshmi,B. (1999) On a new species *Thynnascaris visakhensis* (Nematoda : Anisakidae) from the intestine of *Saurida undosoquamis* (Richardson) of Visakhapatnam. U.P. J.Zool.:19. 65-69.

Bilqees, F.M., Khanum, Z. & Jehan,Q. (1971) Marine fish, nematodes of West Pakistan. I. Description of seven new species of Karachi coast. J. Sci. Karachi 1:175 - 178.

Brizzola,S.M.& Tanzola, R.D. (1995) *Hysterothylacium rhamdiae* n.sp., (Ascaridoidea : Anisakidae from a Neotropical cat fish *Rhamdia sapo* (Pisces: Pimelodidae). Mem. Inst. Oswaldo Cruz 90: 349 - 352.

Deardroff, T.L. & Overstreet, R.M. (1978)*Thynnascaris rhacodes* sp.n. (Nematoda :Ascaridoidea) in fishes from the Israeli Mediterranean coast. Ann. Parasitol. Hum. Comp. 53: 519 - 525.

Deardroff, T.L. & Overstreet, R.M. (1981): Review of *Hysterothylacium* and *Iheringascaris* (both previously =*Thynnascaris*)(Nematoda :Anisakidae) from the northern Gulf of Mexico.Proc. Biol. Soc. Wash., 93:1035 - 1079.

Deardroff,T.L. & Overstreet R.M.(1982) :*Hysterothylacium pelagicum* sp. nov. and *H.cornutum* (Stossich, 1904) (Nematoda : Anisakidae) from marine fishes. Proc. Helminthol. Soc. Wash. 49 : 246 - 251.

Dollfus,R.Ph.(1935a) Sur *Contracaecum, Thynnascaris et Amplicaecum.* Bull. Soc. Zool. France 60 :88 - 92.

Dollfus,R.Ph.(1935b) Sur quelques parasites de poissions recoltes a castiglione (Algerie) Bull. Stat. Aquicult. Castiglione (Aliger) Jg. 1933:199 - 279.

Fujita,T.(1940) Further notes on nematodes of salmonoid fishes, in Japan. Japanese J.Zool. 8: 377 - 394.

Fujita,T. (1949a) Res. in micrometeorology, part 2, fine structure of a cold front and its environment : presentation appendix, p.1 - 18. (in Japanese)

Fujita,T. (1949b) Res. on micrometeorology, part 3, on the analysis of Typhoon della : presentation appendix, p.9 - 26. (in Japanese).

Graca Costa; Ana Madeira; Tania Pontes & Stefano D' Amelio (2004) Anisakid nematodes of blackspot seabream, Pagellus bogaraveo, from Madeiran waters, Portugal. Acta Parasitol. 49: 156 - 161.

Haung,Y.(1988) The Convergent Solution of

Clamped Rectangular plate. Acta Mechanica Solida Sinica, 9: 165 - 169.

Hsu,H.F.(1933) On some parasitic nematodes from fishes China. Peking nat. Hist. Bull.8 :147 - 154+1pl.

Johnston,T.H.& Mawson,P. (1940) Some nematodes parasites in Austrilian and fresh water fish. Tr. Roy. Soc. Australia 64: 95 - 100.

Johnston,T.H.& Mawson,P. (1945) Parasitic Nematodes. Rep. B. A. N. Z.Antarctic Res. Exped. 1929 - 1931, ser b. ,5 : 73 - 159.

Kalyankar, S.D. (1971) *Thynnascaris carangis* sp.n.,a new nematode (Nematoda, Stomachidae,Raphidascaridinae) from an Indian fish, *Caranx malabaricus* Day. Acta Parasit. Pol., 19: 147 - 150.

Kalyankar, S.D. (1972) A report on *Thynnascaris inquies* (Linton, 1901) Rasheed,1965 from India (Ascarididea: Stomachidae). Marathwada Univ. J. Sci., 11: 95 - 98.

Khan,D.and Begum,A.(1971) Helminth parasites of fishes from West Pakistan I. Nematodes. Bull.Dept. Zool. Univ. Punjab 5: 1-22.

Khan,D. & Yaseen, T. (1969) Helminth parasites of fishes of East Pakistan I. Nematodes. Bull. Dept. Panjab. Univ. Article 4: 1 - 33.

Klein,V.L.M. (1973) Helmithos parasitos das especies *Scomberomorus cavalla* (Cuvier) *Scomberomorus maculates* (Mitchill) do litoral Cearense. *Contracaecum fortalezae* sp. n. (Nematoda: Ascarioidea). Mem. Inst. Oswaldo Cruz, 71:199 - 202.

Lakshmi, R.I. (1993) *Hysterothylacium kirani* n.sp. from the body cavity of *Channa punctatus.* Indian J.Parasit., 17 :83 - 88.

Lakshmi, I.R. & Rao,K.H. (1989) Description of a new species of *Thynnascaris* Dollfus, 1933 (Nematoda : Anisakidae) from the stomach of marine teleost fish *Rachycentron canadus* . Bol. Chil. Parasit. 44: 3 - 8.

Lakshmi,I.R. & Shayamsundari,K. (1989) *Thynnascaris hanumantharaoi* n. sp. from the marine teleost fish *Xiphias gladius* (Linnaeus) of Visakhapatnam (Bay off Bengal). Riv. Parasit. (XLIX): 359 - 365.

Lakshmi, I.R. Rao, K. H. & Shayamsundari, K. (1990) Description of a new species of *Thynnascaris* Dollfus, 1933 (Nematoda : Anisakidae) from the intestine of eel *Muraenesox talabanoides*. Acta Parasit. Pol. 35: 53 –60.

Lakshami, I. R.; Rao, K. H. & Shayamsundari, K. (1991) New records of *Porrocaecum* sp.and *Hysterothylacium* sp. (Nematoda :Anisakidae) from fishes of Bay of Bengal. Bol.Chil Parasitol. 45:91 - 93

Linton, E. (1900) Fish parasites collected at Wood Holes in 1898. Bull.U.S. Fish Comm. (1899) 19: 267- 304.

Machida, M. Takahashi, K. Masuuchi, S. (1978) *Thynnascaris haze* n.sp. (Nematoda, Anisakidae) from goby in the Bay of Tokyo. Bull.Natl. Sci. Mus. Ser A (Zool.) 4: 241-244.

Molin.R. (1858) Prospectus helminthum, quae in prodromo faunae helminthologicae Venetiae continentur.Sitz. –Ber.Math. - Nat. Cl. K. Acad.Wiss.Wien 30: 127 - 158.

Moravec,F. &Nagasawa,K. (1998) *Hysterothylacium japonicum* sp. n. (Nematoda, Anisakidae) from the rare marine fish *Trachipterus ishikawai* in Japan. Acta Parasitol., 43 :39 - 42.

Moravec,F. Vidal - Martinez,V.M., Varagas - Vazquez,J, Vivas - Rodriguez,C., Gonazalez - Solis,D., Mendoza -Franco, E., Sima - Alvarez,R., Guemez – Ricalde (1997) Helminth parasites of *Epinephelus morio* (Pisces : Serranidae) of Yucatan Peninsula, southeastern Mexico. Folia Parasitol. (Praha), 44 (4) 255 - 266.

Moser, M. & Haies, J. (1992) Biological tags for stock sepatrations in pacific herring clupeaharengus pallasi in California. J.Parasitology, 78: 54 - 60.

Mosgovoi, A.A. (1953) Ascaridata in animals and man and diseases caused by them. I 35 pp. & II 615 pp. Osnovy nematodologii *II. Moskava*. (in Russian)

Nigrelli,R.F. (1946) Studies of marine resources of southern new England. V. Parasites and Diseases of the Ocean pout, Macrozoarces *americanus*. Bull. Bingham Oceanogr. Collect. 9 :185 - 221 + plates.

Norris, D.E. & Overstreet, R.M. (1975) *Thynnascaris reliquens* sp.n. and *T. habena* (Linton, 1900) Nematoda :Ascaridioidea) from fishes of the northern Gulf Of Mexico and eastern U.S.seaboard. J.Parasitol. 61: 330 - 336.

Olsen, L.S. (1952) Some nematode parasitic in marine fishes.*Publs. Inst. Mar.* Sci. Univ.Tex. 2: 173 - 215.

Parukhin,A.M. (1973) Nematodes from Southern Sea fish .*Biol. Morya Kiew* 31

:162 - 177. (In Russian)
Railliet,A & Henry,A (1912) Observation sur les Strongylides du genere "*Nematodirus*" Ibid. 5: 35.
Rasheed, S (1965) On a remarkable new nematode, *Lappetasscaris lutjani*, gen.et. sp. nov. (Anisakidae :Ascaridoidea) from marine fishes of Karachi and an account of *Thynnascaris inquies* (Linton, 1901) n. comb. and *Goezia intermedia* n.sp. J.Helminthol., 39: 313 - 342.
Rudolphi,C.A.(1819) Entozoorum synopsis cui accedunt mantissa duplex et indices. *locupletissimi*. Berolini, 811 pp.
Rudolphi,C.A. (1901 – 02) Beobachtungen uber die Einge Weidewurmer . Acth.f. Zool. U. Zoot. Brnschng. 2:65pp. and Fortsetzung der, etc. 66 pp.
Rudolphi,C.A.(1909) Entozoorum Siv vermium intestinalium historia naturalis 1: xxvi+527 +xxvi pp. Amstclaedami.
Schmidt, G.D., Leiby, P.D & Kritsky, D.C. (1974) Studies on helminth of North Dakota. VIII. Nematodes from the paddlefish, *Polyodon spathula* (Walbaum) including *Thynnascaris dollfusi* sp. nov. (Nematoda: Stomachidae). Canadian J. Zool., 52: 261 - 263.
Sheenko, P.S.(1991) *Hysterothylacium petteri* sp.n. (Nematoda: Ascaridata) from the Pacific Ocean Swordfish. Parazitologiia, 25: 419 - 425.
Smedley, E.M. (1934) Some parasitic nematodes from Canadian fishes. J.Hilmenthol., 12 :210 - 219.
Soleim, O. (1984) A synonypsis of the genera *Thynnascaris* and *Contracaecum* Nematoda : Ascaridoidea with an emendation of the generic definitions. Acta Parasit.Pol., 29 : 85 - 96.
Soota,T.D.(1983) Studies on nematode parasites of Indian vertebrates Fishes. Rec. Zool. Surv. India Misc.Pub.Occas.Paper.No.54, 352pp
Stossich,M.(1904) Sopra alcuni nematodi. Ann. Mus. Zool. R. Univ. Napoli n.s., I.15 :1 - 4.
Thwaite, J.N. (1927) On a collection of nematodes from Ceylone. Ann. Trop. Med. Parasitol., 21:225 - 244.
Torres,P., Andrade,P. & Silva,R. (1998) On a new species of *Hysterothylacium* (Nematoda : Anisakidae) *Cauqe mauleanum* (Pisces :Atherinidae) by brighfield and electron microscopy. Mem.Inst.Oswaldo Cruz., 93 : 745 - 752.
Torres,P. & Soto,M.S. (2004) *Hysterothylacium winteri* sp.n. (Nematoda Anisakidae), a parasite of Chilean rock cod, *Eleginops maclovinus* (Perciformes :Eleginopidae), from South Chile. Folia Parasitol. (Praha), 51:55 - 60.
Ward, H,B. & Magath, T.B. (1917) Notes on some nematodes from fresh water fishes. J.Parasitol., 3 :57 - 65.
Wedl,C. (1855) Uber das Herz von *Menopon pallidum.* K.Akad. Wisa [Vienna], Math naturw. Kl. Sitzber., 17: 173 - 180.
Yamaguti,S. (1935) Studies on the helminth fauna of Japan. Part 9. Nematodes of fishes, I. Japanese J.Zool., 6 :337 - 386.
Yamaguti,S. (1941) Studies on the helminth fauna of Japan. Part 33. Nematodes of fishes, II. Japanese J.Zool., 9 :343 - 396+4 - 7pls.
Yamaguti,S. (1954) Parasitic worms mainly from Celebes Part 9.Nematodes of fishes. Acta Med. Okayama, 9: 122 - 133.
Yamaguti,S. (1961) Studies on the helminth fauna of Japan Part 57. Nematodes of fishes, III. J.Helminthol., R.T. Leiper Suppl. :217 - 228.
Yamaguti,S. (1962) Systema Helminthum. Vol. III. The Nematodes Parasites of Vertebrates. Interscience, Inc; NewYork, 1261 pp.