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STUDIES ON DIGENETIC TREMATODES FROM MARINE FISHES OF INDIAN WATERS. PART. III

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ABSTRACT

Marine fishes harbouring different sea coasts of India were obtained for the observance of digenetic trematodes, during 1970-71. Out of the collection three trematodes belonging to the families Acanthocolpidae, Bucephalidae and Zoogonidae are described here as new forms. *Acanthoculpus caballeroi* sp. nov. is characterized by pedunculate acetabulum, attenuated postacetabular part of the body besides the shape of oral sucker and pharynx. *Alcicornis indicus* sp. nov. is characterized chiefly by the extension of the uterus and the caecum. *Steganoderma (Opisthoarchiotrema) indicus* subgen nov. et sp. nov. created under the genus. *Steganoderma* Stafford, 1904 and is characterized on the basis of its vitelline follicles; the species *Steganoderma parexocoti* Manter, 1954 is christened as *Steganoderma (Opisthoarchiotrema) parexocoti* Manter, 1954.

RESUMEN

Durante los años de 1970-1971 se realizó el estudio de peces marinos de diversas regiones de la costa de la India para conocer su fauna Trematológica y se obtuvieron tres tremátodos que pertenecen a las familias Acanthocolpidae, Bucephalidae y Zoogonidae que corresponden a nuevas especies. *Acanthocolpus caballeroi* sp. nov. se caracteriza por poseer un acetábulo pedunculado, porque la porción postacetabular del cuerpo es adelgazada y por la forma de la ventosa oral y de la faringe. *Alcicornis indicus* sp. nov. se diferencia ligeramente por la extensión del útero y del ciego intestinal. *Steganoderma (Opisthoarchiotrema) indicus* subgen. et sp. nov. se crea como subgénero de *Steganoderma* Stafford, 1904 teniendo en cuenta a las vitelógenas. La especie *Steganoderma parexocoti* Manter, 1954 es clasificada como *Steganoderma (Opisthoarchiotrema) parexocoti* Manter, 1954.

INTRODUCTION

Marine fishes which yielded these forms were caught off Ratnagiri, India. Fifty eight specimens of *Acanthocolpus caballeroi* were recovered from the small intestine of *Chirocentrus dorab* (Forskal) from among two out of eight hosts examined.

Sixty two specimens of *Alcicornis indicus* werie colleted from three out of fifteen hosts, *Pristopoma maculatum* (Day). *Steganoderma (Opisthoarchiotrema) indicus* were obtained from one out of eight *Belone cancila* (Cuv. and Val).

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MATERIALS AND METHOD

The specimens were treated with Bouin's fixative with minimum of pressure after being washed of debris attached to them. Few were fixed unpressed. Gowers acidified carmine was the stain with which these were subsequently treated for whole mounts. The holotype and paratype are deposited in the personal collection of the senior author at the University of Udaipur, India; collection number 792, 793 and 794.

Acanthocolpus caballeroi sp. nov.
Host: *Chirocentrus dorab* (Forskal)
Locality: Ratnagiri, India
Location: Intestine

DESCRIPTION

Alive, it is dusty brown in colour showing little body movements. Body thin, papery, cylindrical slender, attenuated immediately following post-acetabular region; cuticle aspinose. Anterior and tapering, posterior broadly rounded. Body 2.805-11.175 mm long; 0.285-0.615 mm maximum breadth at testicular level.

Oral sucker well developed, 0.075-0.210 × 0.075-0.195 mm across; roughly rounded, terminal in position. Ventral sucker pedunculate though pedicle short; larger than oral sucker, 0.165-0.450 × 0.165-0.530 mm in diameter; it lies 0.300-1.050 mm from oral sucker. Sucker ratio 1:2.4.

The mouth opening, surrounded by oral sucker leads into prepharynx which is 0.075-0.450 mm long; at times pharynx slids very close to oral sucker and prepharynx appears absent. Pharynx muscular, 0.090-0.255 × 0.075-0.105 mm spherical to oblong. Oesophagus short, 0.045-0.375 mm long, bifurcate 0.465-0.975 from anterior end; caeca run laterally and covered densely by vitellaria in post-testicular region (Fig. 1).

Testes, oval to elongate situated posteriorly, postovarian, intercaecal, closely tandem; posterior testis overlaps half of anterior testis. Anterior testis measures 0.345-0.855 × 0.165-0.450 mm; posterior 0.375-0.385 × 0.335-0.345 mm across. Cirrus sac long with a swollen base and an attenuated, elongated anterior part, 1.015-1.875 mm long, 0.105-0.150 mm broad, the former enclosing bipartite vesicula seminalis, measuring 0.300-0.575 mm long, 0.105-0.150 mm broad; vesicula seminalis continues anteriorly into a small, narrow pars prostatica armed with spines and extends into long ductus ejaculatorius, measuring 0.450-0.600 mm long. Ductus ejaculatorius joins well differentiated, armed metraterm at its terminal end to form genital sinus. Genital sinus 0.750-0.975 mm long, armed with spines and opens out side just in front of acetabulum between intestinal bifurcation and acetabulum.

Ovary small, rounded, medianally situated just in front of anterior testis, 0.120-0.210 × 0.105-0.210 mm across. Shell gland complex a diffused structure. Laurer's canal present, receptaculum seminis absent. Uterus with few eggs, entirely preovarian; metraterm tubular, longer than cirrus sac. Vitelline follicle beginning from anterior end of cirrus

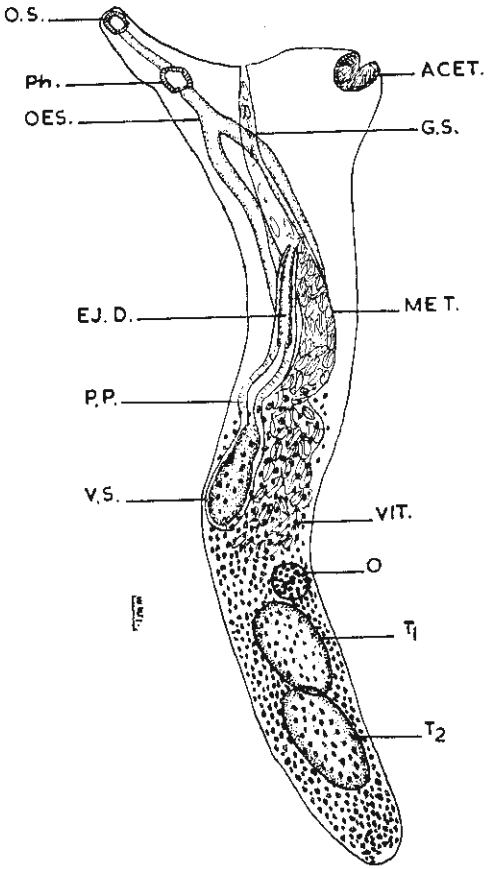

Fig. 1. *Acanthocolpus caballeroi* sp. nov. O.s. oral sucker; Ph. parynx; Oes. Oesophagus; EJ.D. ejaculatory duct; P.P. pars prostatica; V.s. vesicula seminalis; T. testes; O. ovary; Vit. vitellaria; Met. metraterm; G.S. genital sinus.

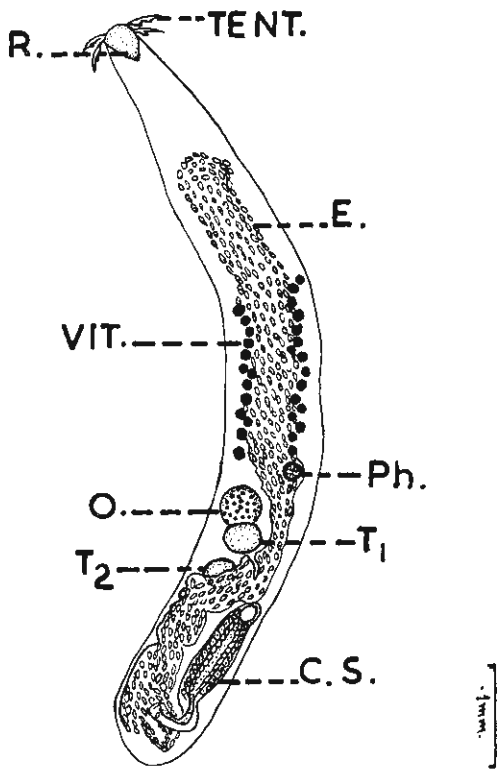

Fig. 2. *Alcicornis indicus* sp. nov. C.S. cirrus sac; E. egg; O. ovary; Ph. pharynx; R. rhynchus; T^1 T^2 testes; Tent. tentacle; VIT. vitellaria.

sac extends a little behind posterior end which area is uncovered by it; follicles situated more laterally and confluent post-testicularly. Eggs yellowish, unfilamented, non-operculate, 0.060 × 0.030 mm across.

Excretory opening subterminal, ventral; excretory vesicle Y shaped.

DISCUSSION

Luhe, (1906) created the genus *Acanthocolpus* and assigned it under the subfamily Acanthocolpinae Luhe, 1906 for digenetic trematodes recovered by Herdman and Honell from Ceylonese fishes. Subsequently (Luhe, 1909) erected the family Acanthocolpidae for this genus. (Srivastava, 1939) described three more new species *A. luhei, A. indicus* and *A. orientalis.* Yamaguti (1958) synonymised *A. luhei* Srivastava, 1939 with *A. liodorus* Luhe, 1906 the genotype. Skrjabin in keys to trematodes of animals and man (1964) upheld the view of Yamaguti (1958) and gave a key to the species of the genus *Acanthocolpus* Manter (1963) added one more species *A. tenuis* and agreed with the proposed synonymy of *A. luhei* with that of *A. liodorus.* However, the present authors do not agree with the synonymy and uphold the validity of *A. luhei* in view of the extension of vitelline follicles which are found extending more anteriorly than any of the species described under this genus.

The present form is distinct from *A. luhei, A. indicus* and *A. orientalis* in having the pedunculate acetabulum and thus comes closer to *A. liodorus* and *A. tenuis.* It resembles *A. tenuis* in having a post attenuated acetabular region of the body and also a bigger genital sinus but it differs from it in having a semicircular oral sucker and oblong pharynx

Key to species of genus *Acanthocolpus*

	Ventral sucker considerably larger than oral sucker	1
1.	Oral sucker spherical	2
	Oral sucker funnel shaped	*A. tenuis*
2.	(a) Cirrus sac short	*A. luhei*
	(b) Cirrus sac bigger	*A. caballeroi* sp. nov.
3.	Genital pore at level of anterior edge of ventral sucker	*A. liodorus*
4.	Genital sinus traversing anteriomedial wall of acetabulum	*A. indicus*
5.	Ventral and oral suckers sub-equal	6
6.	Cirrus sac extremely elongate, genital pore at level of anterior edge of acetabulum	*A. orientalis*

Alcicornis indicus sp. nov.

Host: *Pristipoma maculatum* (Day)
Locality: Ratnagiri, India
Location: Intestine

where as in *A. tenuis* oral sucker is elongate and pharynx is also a little bit elongated. It resembles *A. liodorus* in having the semicircular type of oral and ventral suckers but it differs from this in having postacetabular attenuated part of the body which is not present in *A. liodorus*.

DESCRIPTION

Alive, it is whitish in colour with slight body movements. Body thin elongate, cylindrical, anterior end flat, posterior end broadly rounded; cuticle aspinose. Body 3.150-5.025 mm long, 0.330-0.370 mm maximum breadth at testicular level, breadth progressively decreases anteriorly. Anterior end charasterized by wedge-shaped rhynchus with seven tentacles; each tentacle measures 0.110-0.180 mm long, 0.025-0.035 mm broad at base and possess two prongs and terminal filament; filament as long as tentacle, some tentacles may drop out; wedge of rhynchus continues posteriorly and assumes a funnel like depression. Due to wedge lateral body margins appear incurved. Rhynchus measures 0.120-0.165 × 0.090-0.150 mm.

Oral sucker absent. Pharynx spherical to oblong, 0.120-0.165 × 0.090-0.150 mm across but constantly present, situated between ovary and posterior end of vitelline column. Intestine tube like extending equally both towards anterior and posterior side from level of pharynx, caeca extends anteriorly upto vitelline level which is 0.090-0.105 mm from pharnyx while posteriorly nearer hinder testis. In some forms extension of caeca was not observed due to over-shadowing by uterine coil (Fig. 2).

Testes spherical, post ovarian, post-equatorial, submedian, situated close to one another tandemly, separated by uterine coils and receptaculum seminis; anterior testis measures 0.090-0.165 × 0.090-0.150 mm, posterior testis 0.105-0.240 × 0.105-0.165 mm. Cirrus sac long, tubular, thick walled located in posterior part of body, 0.525-0.720 × 0.105-0.135 mm across; it encloses small ovoid seminal vesicle which continues posteriorly into a well differentiated pars prostatica, surrounded by prostate gland cells. Pars prostatica extends into an unarmed, weakly developed cirrus which in turn opens into a genital atrium which is specially cuticularized; genital atrium 0.120-0.195 mm from posterior end of body.

Ovary entire, spherical, pretesticular, closely applied to anterior testis, 0.120-0.180 × 0.120-0.182 mm across. Receptaculum seminis uterinum in some present between testes. Uterine coils descend primarly to reach near hinder end and then ascends anteriorly somewhere half the way between anterior tip of vitelline follicles and rhynchus.

Vitellaria scanty, arranged in two groups laterally, in linear fashion; 11-17 follicles on left and 9-16 on right side; anterior extension of vitelline follicles reach a little more than equator; posterior extension near ovarian level; vitelline follicles nearly equal, 0.060-0.075 × 0.045-0.060 mm in size.

Eggs numerous, small, 0.007-0.021 × 0.007-0.015 mm. Excretory vesicle tubular.

DISCUSSION

The genus *Alcicornis* was erected by MacCallum in the year 1917 for a digenetic trematode recovered from the marine fish, *Caranx ruber* from Florida; *A. carangis* being the genotype. Eckmann (1932) raised controversy regard-

ing its validity and opinioned that it should be suppressed in synonymy with *Bucephalus* Bear, 1826. Yamaguti (1958), however does not agree with this proposed synonymy and keeps it as a distinet genus. The present authors also agree with Yamaguti in treating it as a valid and distinct genus.

Nagaty (1939) and Manter (1954), contributed two more species to this genus, it being *A. baylisi* and *A. longicornutus*. Subsequently Velásquez (1959) added one more to the list of the species, this being *A. cirrudiscoides*. The genotype, *A. carangis* was redescribed by few workers at a later state in view of its incomplete and inadequate description by its original author. Pérez Vigueras (1955) gave a more detailed and complete description of this species. Later on Siddiqui and Cable (1960) got this parasite again from the same host i.e. *Caranx ruber* in Puerto Rico and assumed that the redescription of this species by Pérez Vigueras was perhaps still lacking in few more details hence the necessity for its redescription. One of the joint authors of this redescription in the co-autorship of another contradicted thir earlier statement and showed that the form on the basis of which they had based their view necessiating redescription, as a new species and not *A. carangis*. Nahas and Cable, (1964) renamed *A. carangis* of Siddiqui and Cable, (1960) concept as *A. siddi-*They compared this new species from that of *A. carangis* and found the distinction between the two valid.

The present form, however, differs from all the other species in the points which distinguish it from *A. carangis* MacCallum, 1917 to which it resembles in many points e.g. in the presence of tentacular filaments and anterior extension of the uterus. The new species differs from *A. carangis* in body size, inhaving smaller rhynchus and an intestine which extends in both the directions, anterior as well as posterior besides the size of its eggs. This resembles *A. siddiquii* Nahas and Cable, 1964 having the rhynchus of the same size but differs in having the tentacular filaments. However, the egg size of the new species differs from *A. siddiquii* in being of smaller size. The new species also differs from *A. longicornutus* Manter, 1954 in having tentacles not as big as *A. longicornutus*. In the size of smaller eggs this form resembles *A. cirrudiscoides* Velásquez, 1959 but differs from this and *A. baylisi* Nagaty, 1939 in shape and form of intestine. This further differs from *A. baylisi* in the extension of viteilaria which do not extend as anteriorly as they do in the present form. Thus these characters warrant its creation as a new species and is named *A. indicus* since this genus is reported and represented for the first time from India.

Steganoderma (*Opisthoarchiotrema*) *indicus* subgen. nov. et sp. nov.

Host: *Xenentodon cancila* (Ham)
Locality: Ratnagiri, India
Location: Intestine

DESCRIPTION

Alive, it is whitish in colour with sluggish body movement. Body elongated, some times shows bend at acetabular level; broadly rounded at posterior

end; cuticle aspinose. Body measures 4.275-4.770 mm long, 0.900-1.050 mm maximum broad at acetabular region. Pre and post-acetabular region uniformly wide except at ends.

Oral sucker well developed, spherical, terminal, 0.225-0.300 × 0.300-0.375 mm across. Ventral sucker bigger than oral sucker, surmounted by puckered body wall, unlike specimens of *Steganoderma* where ventral sucker is encircled by a rim of body wall; it is 1.350-1.370 mm from anterior end and measures 0.425-0.475 × 0.595-0.625 mm across; sucker ratio 1:1.6.

The mouth opening, surrounded by oral sucker, leads into a small prepharynx, 0.045-0.060 mm long. Pharynx globular, 0.180-0240 × 0.240-0.285 mm across. Oesophagus short, distinct, 0.045-0.075 mm long, it bifurcates 0.525-0.555 mm from anterior end; caeca wide mostly run straight, sometimes close together to make acetabulum extracaecal, terminantes 0.420-0.525 mm from posterior end. (Fig. 3).

Testes postequatorial, postacetabular, post-ovarian, extracaecal or ventral to caeca, symmetrical in position. Left testis 0.375-0.420 × 0.285-0.300 mm, right testis 0.375-0.495 × 0.285-0.315 mm. Cirrus pouch very characteristic, more or less tubular with parallel wall except at anterior end where it narrows down to form a nozzle; it is well developed, thick walled, 0.135-0.150 mm wide, 0.600-0.625 mm long. Seminal vesicle elongated, cylindrical, uncoiled, prostatic vesicle ovoid; cirrus short, indistinctly demarcated.

Ovary 0.195-0.210 × 0.270-0.285 mm across, semicircular, postacetabular, pretesticular, preequatorial, medianally situated, 0.300-0.375 mm from acetabulum. Receptaculum seminis and Laurer's canal not seen. Uterus much coiled, filling most of posterior part of body; it ascends forward to open into genital pore. Metraterm absent, terminal part

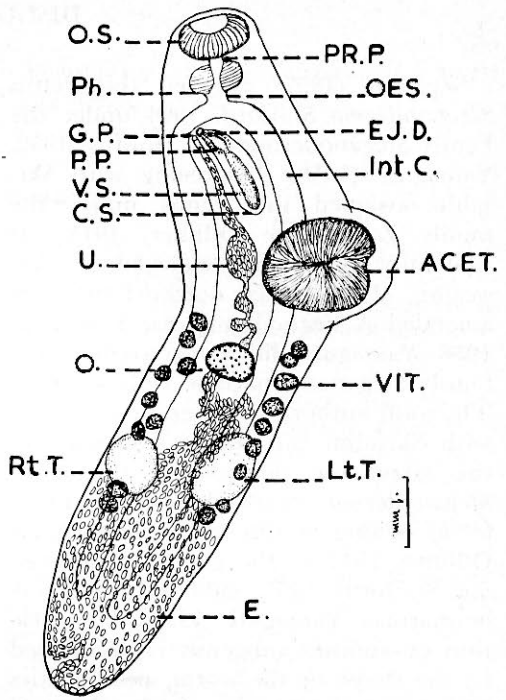

Fig. 3. *Steganoderma* (*Opisthoarchiotrema*) *indicus* subgen. nov. et sp. nov. ACET. acetabulum; C.S. cirrus sac; E. egg; E.J.D. ejaculatory duct; G.P. genital pouch; Int. C. intestinal caecum; L.T. left testis; O. ovary; O.S. oral sucker; OES. oesophagus; P.P. pars-prostatica; PR.P. prepharynx; Ph. pharynx; Rt.T. right testis; U. uterus; V.S. vesicula seminalis; VIT. vitellaria.

of uterus runs parallel to the left of cirrrus sac.

Vitellaria follicular, divided into several fairly big sized follicles, arranged laterally mostly in linear fashion, extracaecal or sometimes overlapping the caeca, extending from behind acetabular to post testicular position; 9-11 follicles on left side, 9-10 on right, out of these atleast 2 in post-testicular field, 2 on dorsal side of testis while rest in pretesticular field or extending to ovarian level.

Eggs numerous, moderately sized, operculate, unfilamented, 0.030 × 0.015 mm. Excretory vesicle tubular.

DISCUSSION

Skrjabin (1957) assigned this genus *Steganoderma* Stafford, 1904 under the family Steganodermatidae Dollfus, 1952. Yamaguti (1958) disagreeing with Skrjabin assigned this genus under the family Zoogonidae Odhner, 1911; its subfamily being Steganoderminae, Yamaguti (1934) which nomenclature was amended as Stegnodermatinae Yamaguti, 1958. Yamaguti did not recognize the family Steganodermatidae Dollfus, 1952. The joint authors, however, do not agree with Skrjabin but follow Yamaguti in the taxonomic position of the genus *Steganoderma* Stafford, 1904. These forms belong to the family Zoogonidae Odhner, 1911 to the genus *Steganoderma* Stafford, 1904, subfamily Steganodermatinae Yamaguti, 1958. The creation of another subgenus is occasioned by the shape of the worm, peculiarities of its ventral sucker and disposition of vitelline follicles. The body on account of the peculiarity of ventral sucker and it being surmounted by puckered body wall, bends the body forming an angle in the acetabular region. The extension of the vitellaria has been given specific emphasis in the family, subfamily and also in the generic diagnosis; it is anterior to tests when paired as mentioned in the family diagnosis, it forms symmetrical clusters but always anterior to testes as mentioned in the subfamily diagnosis and follicles forming longitudinally elongted group in the acetabulotesticular region as mentioned in the generic diagnosis. Since the number of forms recovered is only two and the comparision of the different morphological and anatomical details and confirmation of the constancy of the important characters could not be assertained hence it is included for the time being under the genus *Steganoderma*. When the creation of two subgenera under this genus could be possible only on the extension of the caecal end whether reaching testis or not or further backwards than testis is feasible then the extention of the vitelline follicles which has its special significance in the family, subfamily and genus when it extends posterior to testis has greater force to demand the creation of another subgenus under it, hence this subgenus. Since the vitelline follicles extend to be even posterior to the testis it is named as (*Opisthoarchiotrema*); *Steganoderma parexocoti* Manter, 1954 in view of having vitelline follicles extending behind the caecal end is recommended to be assigned under this new subgenus and is nomenclatured as *Steganoderma* (*Opisthoarchiotrema*) *parexocoti*.

Key to the subgenera of *Steganoderma*

1. Vitelline follicles extended in acetabulo-testicular region 3
2. Vitelline follicles extend in post-testicular región 4
3. Caeca reaching tests or not, shape flat .... (*Steganoderma*)
4. Caeca reaching further backward, shape flat .... (*Lecithostaphylus*)
5. Caeca reaching further backwards, shape cylindrical and fusiform .... (*Opisthoarchiotrema*) subgen, nov.

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