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Marine Fish Trematodes of W. Pakistan. X. *Tormopsolus spatulatum* sp. n. (Acanthocolpidae: Acanthocolpinae) from a Fish off Karachi Coast¹

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ABSTRACT: *Tormopsolus spatulatum* sp. n. is described from a fish belonging to genus *Cybius* taken off the Karachi coast. It is characterized by possessing a long forebody, very long prepharynx and esophagus, wider spatulate prepharyngeal region, and vitellaria interrupted at level of ovary and each testis.

Four species of the genus *Tormopsolus* Poche, 1926, are known: *Tormopsolus osculatus* (Looss, 1901) Poche, 1926, from *Motella*

vulgaris of Trieste; *T. orientalis* Yamaguti, 1934, from *Seriola quinqueradiata* (T. Schl.), *S. aureovittata* (T. Schl.), and *Epinephelus akaara* (Blkr.) of Japan, and *Zonichthys fasciatus* (Bloch.) of Burmuda; *T. lintoni* Caballero,

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1952, from *Enchelyopus cimbrius* (L.) of Woods Hole; *T. filiformis* Sogandares-Bernal and Hutton, 1959, from *Rachycentron canadus* (L.) from Gulf of Mexico. A fifth species, *Tormopsolus spatulatum*, is described herein from fish belonging to the genus *Cybbium* (Cuv.).

Materials and Methods

Viscera of 59 *Cybbium* sp. were collected from Saddar Fish Market, Karachi. The fish species was not determined as only the viscera were available. Three trematodes were recovered from the intestine of a single fish, fixed in 70% alcohol-glacial acetic acid mixture (95:5) under slight coverglass pressure for about 8 hr, stained with acetocarmine, and mounted permanently in Canada balsam. Diagrams were made with the aid of a camera lucida. Measurements are length by width in millimeters.

Family Acanthocolpidae Lühe, 1906 *Tormopsolus spatulatum* sp. n.

HOST: *Cybbium* sp.

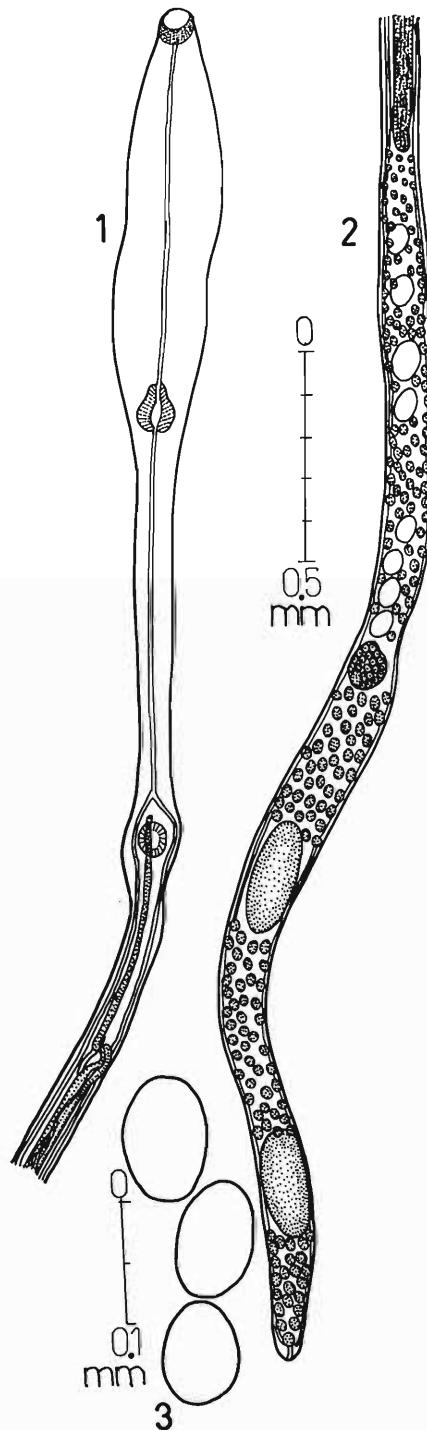
LOCATION: Intestine.

LOCALITY: Karachi coast, Arabian Sea.

NUMBER: 3 in 1 host; 59 hosts examined.

HOLOTYPE: USNM Helm. Coll. No. 72130.

Body long, delicate, cylindrical, 5.2–6.1 long, maximum width 0.2–0.25 at prepharyngeal region. Tegument unspined. Forebody 1.7–1.9 long. Prepharyngeal region spatulate. Oral sucker terminal, 0.04–0.06 by 0.05–0.055. Acetabulum in anterior $\frac{1}{4}$ of body, 0.08–0.09 by 0.06–0.07. Sucker width ratio 1:1.2–1.45. Prepharynx slightly less than half length of the forebody, 0.7–0.8 long. Pharynx 0.9–1.3 by 0.7–0.9. Esophagus very long, delicate, almost as long as prepharynx, 0.7–0.85, bifurcating slightly anterior to acetabulum. Genital pore median, immediately preacetabular. Testis two, intercecal, tandem, in posterior $\frac{1}{4}$ of body; anterior testis 0.2–0.28 by 0.1–0.13; posterior 0.24–0.28 by 0.12–0.14. Cirrus sac mainly intercecal, dextral, extending from slightly postequatorial region of body to enter hermaph-



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Figures 1, 2. Entire length of *Tormopsolus spatulatum* sp. n., holotype, ventral view.

Figure 3. Eggs.

roditic duct. Cirrus sac 0.5–0.67 long containing elongated seminal vesicle, prostatic complex, and cirrus. Hermaphroditic duct long, measuring 0.4–0.6 in length, extending intercecally from genital pore.

Ovary intercecal, in posterior $\frac{1}{3}$ of body, 0.11–0.13 by 0.10–0.12. Vitelline follicles relatively large, completely surrounding body ventrally and dorsally from posterior tip of cirrus sac to posterior end of body, interrupted at level of ovary and each testis. Uterus extending intercecally from ovary differentiating into metraterm near junction with hermaphroditic duct. Receptaculum seminis uterinum present. Eggs relatively few, large 0.07–0.12 by 0.06–0.08. Excretory vesicle Y-shaped.

Remarks

Tormopsolus spatulatum is close to *T. filiformis* as far as long prepharynx, long forebody, vitellaria interrupted at level of ovary and each testis, and posterior extent of cirrus sac but differs from it by possessing a spatu-

late prepharyngeal region and very long esophagus. *T. spatulatum* is separated from *T. osculatus* and *T. orientalis* in having a much longer forebody (proportionately twice as long), longer prepharynx, spatulate pharyngeal region, and very long esophagus; in *T. orientalis* the esophagus is absent, and in *T. osculatus* it is very small. The vitelline follicles are interrupted at the level of each testis and ovary in *T. orientalis* as in the new species. In *T. lintoni* the ovary is not separated from the anterior testis by a band of vitellaria and the prepharyngeal region is not spatulate in addition to other morphological differences.

The specific name *spatulatum* refers to the shape of prepharyngeal region.

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Cryopreservation of Infective Third-Stage Larvae of *Trichostrongylus axei* and *T. colubriformis*

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ABSTRACT: *Trichostrongylus axei* and *T. colubriformis* infective third-stage larvae were frozen and stored for varying periods at -170°C : 10 to 80 days for *T. axei* and 10 to 38 days for *T. colubriformis*. Thawed, surviving larvae were used to infect rabbits. Survival percentages changed little between worms stored for the period of the test. Larvae surviving freezing, storage, and thawing were as infective as non-frozen larvae in rabbits.

Several benefits could be gained from long-term storage of nematode infective larvae. The considerable expenditure of time, labor, and funds to continually maintain monospecific isolates in culture animals would be reduced and the risk of accidental contamination would be minimized. Moreover, many monospecific isolates with particular genetic characteristics could be set aside for future study.

Various accounts concerning the ability of

nematodes to survive the effects of subzero temperatures date back as far as Spallanzini (1776). Since then, sufficient evidence from various workers (Weinman and McAllister, 1947; Anderson and Levine, 1968; Muller, 1970) has accumulated to indicate that cryopreservation of nematodes is feasible and could be an important and useful laboratory procedure.

Therefore, the following study on cryo-