On a new species of *Neoechinorhynchus* Hamann, 1892 (Acanthocephala: Neoechinorhynchoidea Southwell et Macfie, 1925) from Indian threadfin fish, *Leptomelanosoma indicum* Shaw, 1804 from Visakhapatnam coast, Andhra Pradesh, India

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Abstract A new acanthocephalan of the genus *Neoechinorhynchus* Hamman, 1892 (Acanthocephala: Neoechinorhynchoidea Southwell et Macfie, 1925) parasitic on threadfin fish, *Leptomelanosoma indicum* Shaw, 1804 from Visakhapatnam coast, Andhra Pradesh, India is described. *Neoechinorhynchus indicus* sp. nov. is characterized by an enormous body size, structural characteristics of the hooks on proboscis, presence of body annulations, two guard cells, unequal lemnisci, sub-terminal genital pore and the host. *N. indicus* sp. nov. is included in the genus by the presence of three rows of six hooks each on the proboscis and a single layered proboscis receptacle.

Keywords *Neoechinorhynchus indicus* ·
Leptomelanosoma indicum · Proboscis · Lemnisci ·
Guard cells

Introduction

Polynemid fishes are commonly known as threadfins. These are epibenthic, found in the tropical and subtropical waters of all oceans. They occur along the entire coast of

India and support fisheries with significant importance throughout the year. Being migratory fishes, at least some of the species, occur not only in the sea but also in the river mouths and estuaries and offer chances for a variety of parasitic infections. These fishes are plagued with a number of metazoan parasites of different phyla (monogeneans, digeneans, nematodes, acanthocephalans, copepods and isopods). Moreover, they also act as good intermediate host for a number of trematode and cestode larval stages and serve as a potential paratenic hosts harbouring some juvenile stages of adult forms. The parasites of polynemid fish have the capability to serve as potential biological indicators (Rueckert et al. 2008). *Leptomelanosoma indicum* Shaw, 1804 is one of the polynemid fish occurring mainly over shallow muddy and sandy bottoms of the Continental shelf occasionally enters the river and rare beyond a depth of 60 m. These fishes are carnivorous in habit feeding mainly on small benthic crustaceans like prawns, crabs and small fishes which serve as primary intermediate hosts for the various metazoan parasites. *Neoechinorhynchus* is a freshwater acanthocephalan genus mostly reported from various freshwater and brackish water fishes worldwide (Rudolphi 1808; Linton 1889, 1932; Luhe 1911; Bhalerao 1936; Yamaguti 1939, 1963; Bullock 1963; Golvan 1969; Nickol and Thatcher 1971; Eure 1976; Chandra et al. 1984; Ching 1984; Amin and Vignieri 1986a, b; Durborow et al. 1988; Amin and Gunset 1992; Buckner and Buckner 1993; Hoffman 1999; Amin 2002; Amin et al. 2003; Santos et al. 2005; Elsayed and Faisal 2008; Rueckert et al. 2008; Amin and Heckmann 2009; Amin and Muzzall 2009 and Salgado et al. 2010). Reports of *Neoechinorhynchus* in marine fishes are very exceptional (Podder 1937; Yamaguti 1939; Chandra et al. 1984; Amin et al. 2002; Amin and Christison 2005 and Juan and Aguirre 2005). Until recently, only scanty

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attention has been paid on the study of acanthocephalans of polynemid fishes occurring in the Indian waters (Linton 1932; Podder 1937; Tripathi 1956; Chandra et al. 1984; Gupta and Fatma 1987; Gupta and Kumar 1987 and Bhattacharya and Benarjee 2003). In the present study, a new species of *Neoechinorhynchus indicus* from the intestine of polynemid fish, *Leptomelanosoma indicum* Shaw, 1804 at Visakhapatnam coast, A.P, India is reported, described and illustrated. The estuarine habits of *Leptomelanosoma indicum* Shaw, 1804 and its capacity to stand fresh waters may have facilitated its infection with a species of the primarily freshwater genus *Neoechinorhynchus*, as well as the possibility that this parasite can infect human beings from the consumption of this kind of threadfins.

Materials and methods

For the present study, 55 *Leptomelanosoma indicum* were collected between July 2005 and June 2007 from various fish sampling sites of Visakhapatnam (17.67° N & 83.32° E), along the east coast of Bay of Bengal, Andhra Pradesh and brought to the laboratory for the thorough parasitological examination. Intestine is frequently found parasitized by the acanthocephalans that are visible to the naked eye. Intestine is carefully scraped and washed gently to remove parasites adhering to the intestinal mucosa, and the contents were observed under a stereo microscope. Acanthocephalans were collected and treated with warm distilled water to allow the proboscis to be projected out properly. Gentle to moderate pressing between the slides is given for thick acanthocephalans, post fixed in AFA (Alcohol, formaldehyde and acetic acid in 85:10:5) and stained with alum carmine. Conventional techniques were employed for permanent whole mount preparations (Hiware et al. 2003 and Madhavi et al. 2007). The Acanthocephalan species in the intestine of each fish was counted and identified according to the morphological criteria detailed in Yamaguti (1963) and literature available (Nikol and Thatcher 1971; Ching 1984; Hoffman 1999; Amin 2002; Santos et al. 2005 and Amin and Muzzall 2009). Proboscis size and shape, structural characteristics of hooks on the proboscis, number of cement glands, and number and arrangement of hooks were observed and recorded to reach the genus level of the target acanthocephalans. Microphotographs were taken with Nikon microscope at 30× and 40× magnification and scale was given accordingly. Figures were drawn with the aid of camera lucida (Reis with 4×, 10×, 25× and 40× magnifications). Measurements are given in millimeters. Holotypes and paratypes of the parasites were preserved and stored in Museum of Zoology Department, Andhra University, Visakhapatnam (ZDAU).

Results

Neoechinorhynchus indicus sp. nov. (Plate 1, Fig. 1, 1a, 2, 2a & 2b)

Prevalence: 16.36%

Intensity: 1.44

Family: Neoechinorhynchidae Van Cleave, 1919

Genus: *Neoechinorhynchus* Hamann, 1892

Females: Parasites are creamy white in colour, with annulations on body. Worms are gigantic with long ribbon like body, slightly curved towards the ventral side and measure 75.0–78.0 × 0.65–0.68. Proboscis short, round with short neck measuring 0.08–0.09 × 0.07–0.08. Proboscis covered with 3 rows of six hooks each. Hooks of anterior row are much larger than the other two rows. They are strongly curved at their bases and measure 0.06–0.07 in length from the height of the curve to the tip of the straight, backwardly pointing blade. Hooks of the middle and posterior circle are equal, smaller and measure 0.01–0.013 in length. Proboscis receptacle thin, single layered, cylindrical inserted at the base of the proboscis and measures 0.18–0.20 × 0.07–0.08. Nerve ganglion is at the base, measuring 0.03–0.05. Lemnisci two, unequal, elongated on the sides of the proboscis receptacle and right one measures 2.8–3.0 × 0.03–0.05 and left 0.17–0.18 × 0.03–0.05. Body is devoid of spines and lacunar system not visible. Body wall composed of thick outermost layer of cuticle with annulations on ventral side. Reproductive system consists of ovarian bells, uterine bell, uterus and vagina. Ovary broken into a number of ovarian balls measuring 0.08–0.09 × 0.06–0.07. At the posterior end of the uterine bell, there are two guard cells, which serve the function of separating the mature from the immature ova. Uterus thick-walled, swollen tube opening into the vagina. Vagina with a sphincter opening terminally.

Males: Not found

Species: *Neoechinorhynchus indicus* sp. nov.

Name of host: *Leptomelanosoma indicum* Shaw, 1804

Habitat: Intestine

No. of hosts infected: 9

No. of specimens: 13 female parasites

Material examined: *Holotype*. Female: INDIA: Andhra Pradesh, Visakhapatnam coast, Andhra University Campus, Coll. Mani.G, 15.vii.2006 (ZDAU). *Paratype*. 12 females, INDIA: Andhra Pradesh, Visakhapatnam coast, Andhra University campus.

Etymology: The species name is named after the species name of the host.

Discussion

Neoechinorhynchus is a freshwater genus mostly inhabiting freshwater fishes and brackish water fishes.

Plate 1 1 Microphotograph of *Neoechinorhynchus indicus* n.sp.—Female (Anterior) $\times 40$.

1a Microphotograph of *N. indicus* n.sp.—Female (Posterior) $\times 30$.

2 Anterior region of *Neoechinorhynchus indicus* n.sp.—Female

(PR Proboscis, LM Lemnisci) 25×10 —Camera lucida.

2a Proboscis (PR)—Enlarged view showing hooks (HO) 10×40 —Camera lucida.

2b Posterior region of *N. indicus* n.sp.—Female (UB Uterine bell, GC Guard cells, UT Uterus, OB Ovarian ball, VA Vagina) 25×10 —Camera lucida

2

2A

2B

Leptomelanosoma indicum Shaw, 1804 is an estuarine polynemid fish and has ability to tolerate fresh waters might have aided its infection with a species of this primarily freshwater genus *Neoechinorhynchus*. The present parasites are placed in the genus *Neoechinorhynchus*

Hamann, 1892 because of the presence of three circles of six hooks each on the proboscis and a single layered proboscis sheath with ganglion at its base. Present parasites were compared with three species, *N. johnii* (Yamaguti 1939); *N. topseyi* (Podder 1937) and *N. argentatus*

Table 1 Measurements of closely related species of *Neoechinorhynchus*

Species	Host	Body size	Proboscis	Proboscis Hooks	Lemnisci
<i>N. johnii</i> Yamaguti (1939)	<i>Johnius goma</i>	Female: 40.00–63.00	0.11–0.12 × 0.11–0.12	(I) 0.090–0.100 (II) 0.021–0.024 (III) 0.021–0.024	2.50–3.80 × 0.10–0.11
<i>N. topseyi</i> Podder (1937)	<i>Polynemus heptadactylus</i>	Male: 1.30–28.0 × 0.170–1.100	0.15 × 0.14	(I) 0.095 (II) 0.025 (III) 0.024	(I) 0.990 × 0.066 (II) 0.836 × 0.066
		Male: 0.5–0.51 × 0.06–0.07	0.05–0.06 × 0.06–0.07	(I) 0.05–0.55 (II) 0.02–0.023 (III) 0.01–0.013	0.22–0.24 × 0.02–0.03
	<i>Polydactylus sextarius</i>	Female: 0.58–0.59 × 0.08–0.09	0.05–0.06 × 0.06–0.07	(I) 0.05–0.06 (II) 0.005–0.008 (III) 0.003–0.005	0.30–0.32 × 0.02–0.03
<i>N. argentatus</i> Chandra et al. (1984)	<i>Pennahia argentata</i>	Female: 19–20 × 0.312	0.123 × 0.090	(I) 0.096 (II) 0.018 (III) 0.012	1.092 × 0.036
<i>N. indicus</i> n.sp.	<i>Leptomelanosoma indicum</i>	Female: 75.0–78.0 × 0.658–0.684	0.08–0.09 × 0.07–0.08	(I) 0.06–0.07 (II) 0.013–0.015 (III) 0.010–0.012	(I) 2.8–3.0 × 0.03–0.05 (II) 0.17–0.18 × 0.03–0.05

(Chandra et al. 1984) due to their close resemblances in few characters. Present parasites resemble *N. johnii* (Yamaguti 1939) collected from *Johnius goma* in having strongly curved hooks on the anterior circle of the proboscis and equal sized smaller hooks on the posterior two circles. But it differs from *N. johnii* in having enormous body size, body annulations of ventral side, 2 guard cells, unequal lemnisci and measurements. Present species also resembles *N. topseyi* (Podder 1937) in having unequal lemnisci and the host fish belonging to same family. But *N. topseyi* differs from the present parasite in its body size, which is microscopic whereas present parasite is gigantic. It also differs in having body annulations and guard cells. This species also resembles *N. argentatus* Chandra et al. (1984) reported from *Pennahia argentata* in having strongly recurved anterior proboscis hooks. But it can be differentiated from the above said species on the basis of the body annulations, 2 guard cells, unequal lemnisci and sub-terminal genital pore, besides measurements and different host. A table comparing the measurements of present species with the other three species is given (Table 1). Hence, it is justified to erect it as a new species and proposed to name as *Neoechinorhynchus indicus* n.sp after the species name of the host.

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