***Contracaecum rudolphii* Hartwich, 1964 (Nematoda: Anisakidae) in a wild spot-billed pelican (*Pelecanus philippensis*): a case report**

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Abstract Post mortem examination of a spot-billed pelican (*Pelecanus philippensis*) revealed the presence of numerous anisakid nematodes in the proventriculus. The nematodes were processed in lactophenol as temporary mounts and were identified as *Contracaecum rudolphii* Hartwich, 1964 based on micrometry and morphological description of the anterior end, the sinuous uterus with sub globular thick-shelled eggs in female parasite and the tips of the spicules in male parasite. This is the first record of *C. rudolphii* in a wild spot-billed pelican from Andhra Pradesh, India.

Keywords *Contracaecum rudolphii* · Spot-billed pelican · Proventriculus · Andhra Pradesh · India

Introduction

Contracaecum is one of the genera in the family Anisakidae, order Ascaridida and phylum Nematoda. The life cycle of these anisakid nematodes is indirect involving marine mammals and piscivorous birds as definitive hosts, copepods as intermediate hosts and various species of fish as paratenic hosts (Moravec 2009). *Contracaecum rudolphii* is the common species of *Contracaecum* in birds and occurs in proventriculus of pelicans, herons,

mergansers and cormorants. The parasites cause gross hemorrhages and severe ulcerative eosinophilic granulomas on penetration of the mucosa of proventriculus (Rokicki et al. 2011) and even produce minor to extensive areas of necrosis leading to emaciation and death of birds (Dyer et al. 2002). Humans become infected with larval stages of *Contracaecum* spp. due to accidental ingestion of infected raw or improperly processed fish and show the symptoms of vomiting, diarrhoea and abdominal pain (Shamsi and Butcher 2011) as a result of hypersensitivity reactions of the host immune system to the larval substances that are released during the migration of larvae in the gastrointestinal tract (Audicana and Kennedy 2008). Hence the disease is considered now as an emerging food-borne zoonotic disease. Parasitic food-borne zoonoses are under recognized compared to food-borne diseases caused by microbial pathogens and biotoxins. Recently, the WHO (2007) initiated a reference group to estimate the global burden of food-borne diseases caused by microbial pathogens, parasites and biotoxins, to increase the awareness of these public health important diseases worldwide. Presence of *Contracaecum* spp. has been reported in Cormorants and pelicans from different parts of world viz., USA (Overstreet and Curran 2005), Brazil (Amato et al. 2006), Czech Republic (Moravec 2009) and Australia (Shamsi et al. 2009). Reports on occurrence of *Contracaecum* spp. in India are scanty. Recently, Islam and Talukdar (2009) reported *Contracaecum* sp. from Assam in a wild spot-billed pelican. Spot-billed pelican (*Pelecanus philippensis*) is an aquatic wild bird and is distributed in Tamil Nadu, Andhra Pradesh, Assam and Andaman and Nicobar Islands regions of India. The present communication reports the occurrence of *Contracaecum rudolphii* in a spot-billed pelican from the Guntur district of Andhra Pradesh, India.

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Materials and methods

A bird sanctuary at Uppalapadu village, Guntur (District), Andhra Pradesh is home to about sixty species of wild birds that includes spot-billed pelican, painted stork, white ibis, heron and cormorant. The water tanks in the village are unique as they provide refuge to many species of birds, including endangered spot-billed pelicans and Painted storks. The birds migrate here from various places viz., Siberia and Australia and use the center for nesting (Ali and Ripley 1978). In a lake of Uppalapadu bird sanctuary three spot-billed pelicans were found dead and floating. One of the dead birds that reached the bank was brought to Animal Disease Diagnostic Laboratory, Guntur on 16th November, 2014 by the Forest Range Officer for post mortem examination. During post mortem examination, a number of nematode worms were observed in the proventriculus of the bird. The worms were collected, washed in 0.85% normal saline, fixed in 10% formaldehyde solution and were sent to laboratory at NTR College of Veterinary Science, Gannavaram, Andhra Pradesh for identification. For species specific identification worms were measured and were processed in lactophenol as temporary mounts and were examined microscopically (Atkinson et al. 2008).

Results and discussion

On post mortem examination, the proventriculus was found distended. Cut section revealed numerous nematode worms attached to the mucosal surface of proventriculus (Fig. 1) obstructing the lumen. Small ulcers were also noticed on the mucosa. *C. rudolphii* form ulcerated eosinophilic granulomas and feed on blood (Amato et al. 2006). Rokick et al. (2011) also observed severe ulcerative gastritis at the

Fig. 1 Proventriculus with nematode worms

Fig. 2 Larva of *C. rudolphii* (×100)

Fig. 3 Anterior end of *C. rudolphii* (×100)

site of attachment of *C. rudolphii* and diffuse granulomatous gastritis in adjacent areas in the great cormorant. Microscopic examination of processed nematodes revealed larval stages (Fig. 2), male and female adult parasites of *Contracaecum rudolphii* Hartwich, 1964. The body of worms was thick with transverse cuticular striations. The anterior end of worms consisted of three lips and three inter-labia (Fig. 3). In male worms, the mean length and width of the body was 14.5 mm (13–16 mm) and 0.35 mm (0.3–0.4 mm), respectively. Tail was conical with pre anal

Fig. 4 Tail end of *C. rudolphii* showing caudal papillae ($\times 100$)

Fig. 7 Tail end of female *C. rudolphii* ($\times 40$)

Fig. 5 Tail end of male *C. rudolphii* showing spicules ($\times 40$)

Fig. 6 Sinuous uterus with subglobular eggs ($\times 100$)

papillae and post anal papillae (Fig. 4). Spicules were similar and almost equal in length (Fig. 5). The mean length of right and left spicule was 3.5 mm (3.0–4.2 mm) and 4.54 mm (4.0–5.1 mm), respectively. In female worms, the mean length and width of the body was 21.45 mm (18–26 mm) and 0.56 mm (0.5–0.7 mm) respectively. The uterus was sinuous with subglobular thick-shelled eggs (Fig. 6). The average distance between anus and the posterior end was 0.34 mm (0.32–0.45 mm) (Fig. 7). The morphological features and the measurements of the nematodes observed were in accordance with the findings of Amato et al. (2006) who reported *C. rudolphii* in cormorants. Whereas, the measurements observed were larger than those reported by Islam and Talukdar (2009) in a pelican. The variation in measurements of *C. rudolphii* identified in the present study and in different geographical areas supports the opinion of Mattiucci et al. (2002) and Shamsi et al. (2009) that *C. rudolphii* is a species complex consisting of several sibling species which were established through genetic studies. In the present case, the death of the pelican might be due to the heavy infestation of proventriculus with *C. rudolphii* that resulted in ulcers, hemorrhages and obstruction of digestive tract. To the author's knowledge this is the first report of *C. rudolphii* from proventriculus of a wild spot-billed pelican (*Pelecanus philippensis*) in Andhra Pradesh, India.

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