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Some digenetic trematodes of the olive ridley sea turtle, *Lepidochelys olivacea* (Testudines, Cheloniidae) in Costa Rica

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Summary

Three species of digeneans including 1 Gorgoderidae (*Plesiochorus cymbiformis*) from the urinary bladder, 1 Plagiorchiidae (*Enodiotrema megachondrus*) from the duodenum, and 1 Pachypsolidae (*Pachypsolus irroratus*) from the stomach were recovered from 2 of 3 olive ridley turtles (*Lepidochelys olivacea*) found stranded along the Pacific coast of Costa Rica. All trematodes represent new locality records. Histopathological changes associated with eggs of cardiovascular flukes (Digenea, Spirorchiidae) were described from the lungs, spleen, and intestine of a single turtle.

Key Words: *Lepidochelys olivacea*; olive ridley turtle; digeneans; spirorchiid eggs; Costa Rica

Introduction

The olive ridley turtle (*Lepidochelys olivacea* Eschscholtz, 1829) is the smallest living sea turtle. It is an omnivorous and opportunistic feeder, highly migratory distributed in the tropical and subtropical Atlantic, Indian, and Pacific oceans (Pritchard & Trebbau, 1984). Few data exist on the digeneans of olive ridley turtle. To our knowledge the only reports from the Western Hemisphere are from Mexico by Parra (1983) and Pérez-Ponce de León *et al.* (1996). Here we report for the first time digenetic trematodes of olive ridley turtles from Costa Rica (Central America). Histopathological changes associated with eggs of cardiovascular flukes (Digenea, Spirorchiidae) were also described from internal tissues of a single turtle.

Materials and Methods

In March, August and October 2004, 2 juvenile (1 male and 1 female) and 1 adult female olive ridley turtles were collected from the Pacific coast of Costa Rica. The 2 juveniles that were obtained from the Gulf of Nicoya (9˚34´ 44“N, 84˚36´34“W) were found stranded, alive, and severely debilitated with lesions on their flippers which were consistent with lesions caused by fishing nets. The debilitated turtles were brought to the Parque Marino de Puntarenas where they died a few days later. The adult female was found dead on the beach of Ostional (10˚00´00“N, 86˚45´ 50“W), on the Nicoya peninsula. Curved carapace length (CCL) was measured and the chelonians were necropsied following the methods of Wolke and George (1981). Principal organs including the heart, great vessels, lungs, oesophagus, stomach, intestine, spleen, liver, gall bladder, kidneys, urinary bladder, and oviduct of the 2 juvenile turtles were examined for parasites following the methods of Greiner *et al.* (1980). Only the stomach and urinary bladder of the adult female were available for parasite examination. Trematodes were fixed in AFA (alcohol-formalin-acetic acid), stained with Mayer’s acid carmine, and mounted in Canada balsam for identification. Measurements are reported in micrometers (except when indicated) with the mean and standard deviation followed by the range in parenthesis.

Samples for histopathological examination were also obtained from the 2 juvenile turtles and routinely processed. Whole mounts and histological sections were studied by light microscopy. Voucher specimens were deposited in the Harold W. Manter Laboratory of Parasitology (HWML), Nebraska State Museum, Lincoln, Nebraska, U.S.A.

For comparative purposes specimens were borrowed from the Colección Nacional de Helmintos, Instituto de Biología, Universidad Nacional Autónoma de México (CNHE):

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Plesiochorus cymbiformis (Rudolphi, 1819) Looss, 1901 (CNHE 233 – 8), *Enodiotrema megachondrus* (Looss, 1899) Looss, 1901b (CNHE 250 – 10), and *Pachypsolus irroratus* (Rudolphi, 1819) Looss, 1902 (CNHE 253 – 12).

Results and Discussion

Three species of digeneans including 31 *Plesiochorus cymbiformis* (Gorgoderidae) from the urinary bladder, 3 *Enodiotrema megachondrus* (Plagiorchiidae) from the duodenum, and 1 *Pachypsolus irroratus* (Pachypsolidae) from the stomach were found in 2 of 3 olive ridley turtles.

The juvenile male (CCL 53 cm) was negative for adult parasites, but was the only one positive for spirorchiid eggs. Histologically, fusiform eggs were seen within the lungs, spleen and intestine, and were associated with granulomatous reactions. Lesions consisted of 1 – 5 degenerate eggs surrounded by histiocytes, lymphocytes, and giant cells. Myointimal and perivascular proliferation of fibrous connective tissue bordered by giant cells and few lymphocytes were observed from the small peripheral vessels of lungs and spleen. Vasculitis was associated with the eggs trapped in the lumen of minute vessels. No adult cardiovascular flukes or gross pathological changes associated with parasites were observed by necroscopy.

Spirorchiids are cosmopolitan flukes. Adult trematodes inhabit the cardiovascular system, where they copulate and lay eggs. The eggs migrate to tissues, where they elicit a granulomatous response in multiple organs (Glazebrook *et al.*, 1989; Aguirre *et al.,* 1998; Gordon *et al.*, 1998; Jacobson *et al.,* 2006). To date the life cycle of the marine spirorchiids is unknown. Histophatological changes described here were consistent with the lesions reported previously in other sea turtle species (Glazebrook *et al.*, 1989; Aguirre *et al.,* 1998; Gordon *et al.*, 1998).

All trematodes represent new locality records. Flukes here found are generalist in sea turtles and have been collected previously from olive ridley, hawksbill (*Eretmochelys imbricata*), loggerhead (*Caretta caretta*), and green (*Chelonia mydas*) sea turtles (see below).

TREMATODA

Family: Gorgoderidae Looss, 1901

1. *Plesiochorus cymbiformis* (Rudolphi, 1819) Looss, 1901

Host: *Lepidochelys olivacea*, gravid adult female (CCL 68 cm).

Locality and collection date: Ostional National Wildlife Refuge (10˚00´00“N, 86˚45´50“W), on the Nicoya peninsula, north Pacific coast of Costa Rica; on October 2, 2004.

Site of infection: urinary bladder.

Prevalence and intensity of infection: 1 of 3 hosts infected (33.3 %) with 31 specimens.

Voucher specimens deposited: HWML 48249.

Remarks: Thirty-one specimens found in the urinary bladder of the adult female concurred with the description of *P. cymbiformis* as given by Looss (1901b), Caballero y C. (1954), and Blair and Limpus (1982). *P. cymbiformis* is the only member of the genus. *P. cymbiformis* has a worldwide distribution. It has been reported from loggerheads in Australia, Egypt, Florida (U.S.A.), Greece, Italy, and New Guinea (Sonsino, 1893; Stossich, 1895, 1897; Braun, 1899; Looss, 1901a,b, 1902; Pratt, 1914; Cary, 1930; Pigulevsky, 1953; Sey, 1977; Blair & Limpus, 1982; Manfredi *et al.*, 1996), from green turtles in Egypt, Italy, Pacific coast of Panama, and south India (Rudolphi, 1819; Looss 1901a,b, 1902; Caballero y C., 1954; Chattopadhyaya, 1970), from hawksbills in south India (Chattopadhyaya, 1970) and Puerto Rico (Fischthal & Acholonu, 1976), and from olive ridleys in Japan (Oguro, 1942) and Pacific coast of Mexico (Parra, 1983). Specific *P. cymbiformis* variations reported by most authors were discussed by Blair and Limpus (1982). Principal variations occurred for size and body shape, and testis and vitellaria shape and position. Smallest and largest specimens were 2.5 mm (Caballero y C., 1954) and 12 mm (Looss, 1901b), respectively. Our specimens were larger than largest fluke by Looss (1901b); the testes were dentritic in shape and overlapped the caeca reaching the lateral margin of body; vitelline glands were inter and extracaecal.

Measurements: (N = 10) Body 14 ± 1.0 (12.8 – 15.7) mm by 5.1 ± 0.2 (4.5 – 5.4) mm; oral sucker 960 ± 86.6 (840 – 1,071) by 1,242 ± 58.6 (1,140 – 1,323); ventral sucker 1,720 ± 129.6 (1,512 – 1,890) by 1,739 ± 119.5 (1,575 – 1,890); oesophagus 441 ± 102.8 (315 – 567); pharynx 326 ± 40.6 (252 – 378) by 376 ± 5.7 (360 – 378); right testis 2,835.6 ± 378.4 (2,394 – 3,465) by 1,932 ± 197.7 (1,575– 2,142); left testis 2,905 ± 311.0 (2,400 – 3,402) by 1,956.6 ± 171.7 (1,638 – 2,205); ovary 536 ± 79.6 (441 – 630) by 570 ± 95.1 (378 – 693); right vitelline gland 796 ± 169.5 (567 – 945) by 509 ± 115.8 (315 – 630); left vitelline gland 731 ± 111.2 (567 – 882) by 571 ± 50.5 (504 – 567); Mehlis´ gland 283 ± 45.7 (184 – 315) by 283 ± 53.5 (189 – 378); eggs (N = 10) 34 ± 3.1 (32 – 39) by 32 ± 0.0.

Family: Plagiorchiidae Lühe, 1901 (Ward, 1917)

2. *Enodiotrema megachondrus* (Looss, 1899) Looss, 1901b

Host: *Lepidochelys olivacea*, juvenile female (CCL 35 cm).

Locality and collection date: Gulf of Nicoya (9˚34´44“N, 84˚36´34“W), Puntarenas province, north Pacific of Costa Rica; on March 29, 2004.

Site of infection: duodenum.

Prevalence and intensity of infection: 1 of 2 hosts infected (50 %) with 3 specimens.

Voucher specimens deposited: HWML 48250.

Remarks: Three flukes from the duodenum of the juvenile female concurred with the description of *E. megachondrus* as given by Looss (1899, 1901b). According to Blair and Limpus (1982) the genus *Enodiotrema* includes 7 species: *E. megachondrus*, *E. reductum* Looss, 1901b, *E. instar* Looss, 1901b, *E. acariaeum* Looss, 1902, *E. microvitellatus* Chattopadhyaya, 1970, *E. schikhobalovae* Gupta & Mehrotra 1976, *E. carettae* Blair & Limpus 1982. *E. megachondrus* is the only species in the genus reported to date from an olive ridley. *E. megachondrus* has been detected in loggerheads from Egypt, France, Italy, and Spain (Braun,

1901; Looss, 1901b, 1902; Euzet & Combes, 1962; Manfredi *et al.*, 1996; Aznar *et al.*, 1998), in green turtles from Egypt (Looss, 1901b), in hawksbills from Cuba (Groschaft *et al.*, 1977), and in olive ridleys from Mexico (Pérez-Ponce de León *et al.*, 1996).
Measurements: (N = 3) Body 5.1 ± 0.5 (4.5 – 5.7) mm by 1.1 ± 0.0 (1 – 1.2) mm; oral sucker 200 ± 43.3 (150 – 225) by 242 ± 14.4 (225 – 250); pharynx 83 ± 14.4 (75 – 100) by 108 ± 28.8 (75 – 125); ventral sucker 242 ± 14.4 (225 – 250) by 242 ± 14.4 (225 – 250); right testis 458 ± 38.2 (425 – 500) by 450 ± 25 (425 – 475); left testis 508 ± 14.4 (500 – 525) by 450 ± 43.3 (400 – 475); ovary 250 ± 25 (225 – 275) by 267 ± 14.4 (250 – 275); vitelline follicles (from 8 to 12 in number on each side) (N = 10) 127 ± 14.2 (100 – 150) by 102 ± 7.9 (100 – 125); eggs (N = 10) 36 ± 3.4 (32 – 39) by 14 ± 2.1 (13 – 19).

Family: Pachypsolidae Yamaguti, 1958
3. *Pachypsolus irroratus* (Rudolphi, 1819) Looss, 1902
Host: *Lepidochelys olivacea,* adult female (CCL 68 cm).
Locality and collection date: Ostional National Wildlife Refuge (10˚00´00"N, 86˚45´50"W), on the Nicoya peninsula, north Pacific coast of Costa Rica; on October 2, 2004.
Site of infection: stomach.
Prevalence and intensity of infection: 1 of 3 hosts infected (33.3 %) with 1 specimen.
Voucher specimen deposited: HWML 48251.
Remarks: A single specimen from the stomach of the adult female was identified as *P. irroratus*. Blair and Limpus (1982) recognized only 2 valid species in *Pachypsolus*: *P. irroratus* from the sea turtles and *P. sclerops* Travassos, 1922 from the crocodilians of South America. According to Blair and Limpus (1982), *P. irroratus* has been found in loggerhead, hawksbill, and green turtles in Australia, France, New Guinea, northwest Atlantic coast of Africa and Florida, Mexico, Panama, Puerto Rico, and Red Sea. Additionally *P. irroratus* has been reported in loggerheads from Italy (Manfredi *et al.*, 1996) and Spain (Aznar *et al.*, 1998) and in olive ridleys from Mexico (Pérez-Ponce de León *et al.*, 1996).
Measurements: (N = 1) Body 7.2 mm by 2.3 mm; oral sucker 693 by 1,071; ventral sucker 945 by 819; pharynx 500 by 575; right testis 693 by 441; left testis 693 by 504; ovary 315 by 252; eggs (N = 5) 71 ± 0.0 by 19 ± 0.0.

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