



Gastrointestinal helminth parasites of Loggerhead turtle *Caretta caretta* Linnaeus 1758 (Testudines, Cheloniidae) in Brazil

MAX RONDON WERNECK¹, CAMILA MARTOS THOMAZINI², EDUARDO SHIGUERU MORI²,
VERÔNICA THEREZA GONÇALVES², BERENICE MARIA GOMES
GALLO¹ & REINALDO JOSÉ DA SILVA²

¹✉ Fundação Pró-Tamar, Rua Antônio Athanasio da Silva n.º 273, Bairro Itagua, Ubatuba, São Paulo, Brazil 11680-000, Tel +55-12 3832-6202, Fax +55-12- 3832-7014

E-mail: max@tamar.org.br

² Departamento de Parasitologia, Instituto de Biociências, UNESP, Botucatu, São Paulo, Brazil, 18618-000, Tel. +55-14-38116239, Fax +55-14-38153744, e-mail: reinaldo@ibb.unesp.br

Abstract. Twelve juvenile specimens of *Caretta caretta* were examined and results showed five of them (41.7%) were parasitized by helminthes species, as: *Sulcascaris sulcata*, *Kathlania leptura*, *Orchidasma amphiorchis*, *Pyelosomum renicapite*, and *Calycodes anthos*.

Key words: Sea Turtles, nematodes, trematodes.

Resumo: Helmintos gastrointestinais parasitas de tartarugas cabeçudas *Caretta caretta* Linnaeus, 1758 (Testudines, Cheloniidae) no Brasil. Doze indivíduos juvenis de *Caretta caretta* foram estudados e cinco (41,7%) encontravam-se parasitados por helmintos das espécies *Sulcascaris sulcata*, *Kathlania leptura*, *Orchidasma amphiorchis*, *Pyelosomum renicapite* e *Calycodes anthos*.

Palavras-chave: Tartarugas marinhas, nematódeos, trematódeos.

Studies on the helminth fauna of sea turtles have been conducted in many countries. However, there are few reports on the occurrence of chelonian helminthes in Brazil and *Chelonia mydas* Linnaeus 1758 was the major studied species (Travassos *et al.* 1969, Vicente *et al.* 1993).

The aim of the present study is to report the gastrointestinal helminths of twelve specimens of *Caretta caretta* Linnaeus, 1758 donated to the TAMAR-ICMBio Project Marine Sea Turtle Rehabilitation Center (MTRC) during 2003 and 2007. Five *C. caretta* specimens were found dead by pelagic longline fishing commercial fleet workers and were frozen stored until sent to MTRC. The other seven specimens were collected on the North Coast of São Paulo State, Brazil.

The specimens were necropsied and their digestive tracts collected. Samples from the esophagus, stomach, small and large intestine were collected and then analyzed under stereomicroscope. The collected trematodes were fixed with AFA (Alcohol-Formalin-Acetic Acid) solution under

cover slip pressure and stained with carmine. The nematodes were fixed with hot (65°C) AFA solution and clarified with lactofenol. The voucher helminthes were deposited at the Helminthological Collection of the Instituto de Biociências (CHIBB) of the Universidade Estadual Paulista, Botucatu, São Paulo State, Brazil. Morphological and morphometrical analyses were performed using the Qwin Lite 3.1 computerized system (Leica, Germany). Prevalence, mean intensity of infection and abundance were calculated according to Bush *et al.* (1997).

Five (41.7%) *C. caretta* specimens (mean curvature carapace = 71,3 ± 21,5 cm) were parasitized by helminth. Trematodes were found in 4 (80%) animals while nematodes in 3 (60%). Two (40%) hosts presented concomitant infection by trematodes and nematodes.

Three digenetic trematode species, *Orchidasma amphiorchis* (Braun 1899) Looss, 1900, *Pyelosomum renicapite* (Leidy, 1856) Ruiz, 1946 and *Calycodes anthos* (Braun, 1899) Looss, 1901,

and two nematode species, *Sulcascaris sulcata* (Rudolphi, 1819) and *Kathlania leptura* (Rudolphi 1819) Travassos 1918, were identified.

Orchidasma amphiorchis was the most prevalent species, followed by *S. sulcata* and *K. leptura*. The latter presented the highest mean infection intensity. Mean abundance was highest in *O. amphiorchis* (Table I).

Orchidasma amphiorchis has been reported in *C. mydas* in Mexico (Caballero 1962) and Brazil (Travassos *et al.* 1969). Yamaguti (1971) reported the occurrence of this helminth in *C. mydas*, *Eretmochelys imbricata* Linnaeus 1758, and *C. caretta* in Florida, the Gulf of Mexico; Oaxaca, Japan and Brazil. Infection by *O. amphiorchis* has also been observed in *C. caretta* in Australia (Blair & Limpus 1982), Italy (Manfredi *et al.* 1998), and the Mediterranean Sea (Badillo 2007).

Mohan (1970) found *P. renicapite* infecting a specimen of *Dermochelys coriacea* Vandelli, 1761 in the Indian Ocean. This parasite was later reported in the same species in Canada (Threlfall 1979), France (Almor *et al.* 1989), Porto Rico (Dyer *et al.* 1995), and Italy (Manfredi *et al.* 1996).

Aznar *et al.* (1998) reported the occurrence of *C. anthos* parasitizing *C. caretta* in the western Mediterranean, while Manfredi *et al.* (1998) observed a prevalence of 14.3% for this parasite in the same species in Italy. Its occurrence was also observed in *C. mydas* in Panama (Caballero *et al.* 1955) and *D. coriacea* in Canada (Threlfall 1979).

The only trematode species reported in *C. caretta* in Brazil is *Rhytidodes gelatinosus* (Rudolphi, 1819) Looss, 1901 (Travassos *et al.* 1969). The present study is the first report on the occurrence of *O. amphiorchis*, *P. renicapite* and *C. anthos* parasitizing this chelonian species in

Brazil and contributes to the knowledge of geographical distribution of trematode parasites of sea turtle.

Sulcascaris sulcata has been extensively reviewed by Sprent (1977), who demonstrated that this nematode species has only been reported in *C. caretta* and *C. mydas* from the Mediterranean Sea and Western Pacific populations. Subsequent studies have demonstrated the occurrence of the parasite in *C. caretta* in Australia (Lester *et al.* 1980, Berry & Cannon 1981) and Uruguay (Lent & Freitas 1948). In Brazil, however, it has only been observed in *C. mydas* (Freitas & Lent 1946, Vicente *et al.* 1993).

Kathlania leptura was originally described by Rudolphi (1819) from a specimen of *C. mydas*. Reported hosts and distribution pattern for this nematode are: *C. mydas* in Sri Lanka, Mauritania, and Brazil (Lane 1914, Travassos 1918); *C. caretta* in Sri Lanka, Brazil, Egypt, Western Australia, the Mediterranean and Ossabaw Island, Georgia, U.S.A. (Baylis 1923, Inglis 1957, Sey 1977, Lester *et al.* 1980, Khalil 1998, Bursey *et al.* 2006, Badillo 2007); and *Lepidochelys olivacea* Eschscholtz, 1829 in Zanzibar (Brooks & Frazier 1980). However, contradictory data concerning the occurrence of this parasite in *C. caretta* can be found in the literature. While Bursey *et al.* (2006) cited this chelonian as host for *K. leptura*, a revision on nematode parasites found in reptiles in Brazil (Vicente *et al.* 1993) reported only *C. mydas* as host for this nematode. The present study confirms the occurrence of *K. leptura* in *C. caretta*, as previously cited by Bursey *et al.* (2006).

Few studies on the gastrointestinal helminth community of *C. caretta* have been reported and all were conducted with sea turtles from the Mediterranean Sea (Manfredi *et al.* 1998, Aznar *et al.* 1998, Badillo 2007). Prevalence (P), mean

Table I. Prevalence, mean abundance and intensity of infection in Loggerhead Turtle, *Caretta caretta* (Testudines, Cheloniidae), from Ubatuba, State of São Paulo, Brazil.

Species	Collection number (CHIBB)	Total number of parasites	Number of infected hosts	Prevalence (%)	Mean abundance	Intensity of infection		Infection site
						Mean	Range	
Trematoda								
<i>Orchidasma amphiorchis</i>	1383, 1387, 2531, 2598, 2599	650	4	33.3	54.16 ± 35.82	162.5 ± 90.61	1 – 335	SI
<i>Pyelosomum renicapite</i>	1384	12	1	8.3	1	12	-	LI
<i>Calycodes anthos</i>	2530	1	1	8.3	0.08	1	-	LI
Nematoda								
<i>Sulcascaris sulcata</i>	1385, 1386, 2597	33	2	16.6	2,75 ± 1.94	16.5 ± 1.5	15 – 18	ES, SI
<i>Kathlania leptura</i>	1388, 2600	457	2	16.6	38.0 ± 33.7	228.5 ± 177.5	51 – 406	LI

Legend: ES – esophagus, SI – small intestine, LI – large intestine.

abundance (MA) and intensity of infection (II) were highly variable in these studies. The ecological data reported by Aznar *et al.* (1998) (P=46; MA=8.7; II=9) and Badillo (2007) (P=45.9; MA=9.65; II=20.95) for *C. anthos* were higher than that observed in the present study. A higher ecological data were similarly observed for *S. sulcata* by Manfredi *et al.* (1998) (P=71.4; MA=17.8). On the other hand, for *O. amphiorchis*, the data found by Manfredi *et al.* (1998) (P=21.4; MA=3.1), Badillo (2007) (P=2.3; MA=0.02; II=1) was lower than that were here reported. This was also observed for *K. leptura* by Badillo (2007) (P=2.3; MA=0.02; II=1)

These data suggest that the interaction host-parasite is a complex relationship which involves many variables, including environmental, ontogenetic, feeding habit, ethological and geographical factors. Furthermore, the present study was performed with a smaller sample than other studies

References

- Almor, P., Raga, J. A., Abril, E., Balbuena, J. A. & Duguay, R. 1989. Parasitisme de la tortue luth, *Dermochelys coriacea* (Linnaeus, 1766) dans les eaux europeennes par *Pyelosomum renicapite* (Leidy, 1856). **Vie Milieu**, 39: 57-59.
- Aznar, F. J., Badillo, F. J., & Raga J. A. 1998. Gastrointestinal helminths of loggerhead turtles (*Caretta caretta*) from the western Mediterranean: constraints on community structure. **Journal of Parasitology**, 84: 474-479.
- Badillo, F. J. 2007 Epizoítos y parásitos de la tortuga boba (*Caretta caretta*) en el Mediterráneo Occidental. **Phd Thesis**. Universitat de València, Valencia, Espanha, 262 p.
- Baylis, H. A. 1923. Report on a collection of parasitic nematodes, mainly from Egypt. Part. I. Ascaridae and Heterakidae. **Physiology**, 15: 1-13.
- Berry, G. N. & Cannon, L. R. G. 1981. The life history of *Sulcascaaris sulcata* (Nematoda: Ascaridoidea), a parasite of marine mollusks and Turtles. **Internation Journal for Parasitology**, 11: 43-54.
- Blair, D. & Limpus, C. J. 1982. Some digeneas (Platyhelminthes) parasitic in the Loggerhead Turtle, *Caretta caretta* (L.), in Australia. **Australian Journal of Zoology**, 30: 653-680.
- Brooks, D. R. & Frazier, J. 1980. New host and locality for *Kathlania leptura* (Rudolphi) (Nematoda: Oxyurata: Kathlanidae). **Proceedings of the Helminthological Society of Washington**, 47(2): 267-268.
- (Manfredi *et al.* 1998, Aznar *et al.* 1998, Badillo 2007). However, this sampling includes all *C. caretta* specimens found dead in the region of Ubatuba between 2003 and 2007 the data presented contribute to the knowledge on marine chelonian helminth fauna and their geographical distribution.

Acknowledgments

Projeto TAMAR is affiliated with ICMBio, co-managed by the Fundação Pró-TAMAR, and officially sponsored by PETROBRAS. We would like to thank the Fundação de Amparo à Pesquisa do Estado de São Paulo - FAPESP (Proc. 07/59504-7) for financial support. The authors wish to express their thanks to Paula Baldassin, Cecília Baptistotte and Ricardo Nouailhetas Simon for critical reading and suggestions to improve the manuscript, and Bruno de Barros Giffoni (TAMAR-ICMBio), ITAFISH fishing enterprise and the crew of the Oceano Brasil boat.

- Bush, A. O., Lafferty, K. D., Lotz, J. M. & Shostak, A. W. 1997. Parasitology meets ecology on its own terms: Margolis *et al.* revisited. **Journal of Parasitology**, 83: 575-583
- Burse, C.R., Richardson, K. E., Richardson, D. J. 2006. First North American records of *Katlania leptura* and *Tonaudia tonaudia* (Nematoda: Kathlanidae), parasites of marine turtles. **Comparative Parasitology**, 73(1): 134-135.
- Caballero, E. C. 1962. Trematodos de las tortugas de Mexico, X. Presencia de *Orchidasma amphiorchis* (Braun, 1899) Los, 1900 en una tortuga marina, *Chelone mydas* de las costas del estado de Tamaulipas, Mexico. **Anales del Instituto de Biología / Universidad Nacional Autonoma de Mexico**, 28: 47-55.
- Caballero, E. Y. C., Zerecero, M. C. D. & Grocott, R. G. 1955. Helminths de la Republica de Panama. XV trematodos de *Chelone mydas* (L.), Tortuga marina comestible de Oceano pacifico del Norte. 2º parte. **Anales del Instituto de Biología / Universidad Nacional Autonoma de Mexico**, 26: 149-190
- Dyer, W. G., Williams, E. H. & Bunkley-Williams, L. 1995. Digenea of the green turtle (*Chelonia mydas*) and the Leatherback turtle (*Dermochelys coriacea*) from Puerto Rico. **Caribbean Journal of Science**, 31: 269-273.
- Freitas, J. F. T. & Lent, H. 1946. "Porrocaecum sulcatum" (Rudolphi, 1819). **Revista Brasileira de Biologia**, 6: 235-238.
- Inglis, W. G. 1957. A revision of the nematodes

- genera *Kathlania* and *Tonaudia*. **Annals and Magazine of Natural History**, 10: 789-800.
- Khalil, A. I. 1998. Redescription of nematode *Kathlania leptura* (Rudolphi, 1819) Travassos, 1918 (Ascarideida, Kathlaniidae). **Journal of Egyptian German Society of Zoology**, 26: 147-157.
- Lane, C. 1914. Suckered round-worms from India and Ceylon. **Indian Journal of Medical Research**, 2: 655-669.
- Lent, H. & Freitas, J. F. T. 1948. Uma coleção de nematódeos, parasitos de vertebrados do Museu de História natural de Montevideú. **Memórias do Instituto Oswaldo Cruz**, 46: 1- 71.
- Lester, R. J. G., Blair, D., Heald, D. 1980. Nematodes from scallops and turtles from Shark Bay, Western Australia. **Australian Journal of Marine and Freshwater Research**, 31: 713-717.
- Manfredi, M. T., Piccolo, G., Prato, F. & Loria, G. R. 1996. Parasites in Italian sea turtles. I. The leatherback turtle *Dermochelys coriacea* (Linnaeus, 1766). **Parassitologia**, 38: 581-583.
- Manfredi, M. T., Piccolo G. & Meotti C. 1998. Parasites of Italian sea turtles. II. Loggerhead turtles (*Caretta caretta* [Linnaeus, 1758]). **Parassitologia**, 40: 305-308.
- Mohan, R. S. L. 1970. Occurrence of the digenetic trematode *Astorchis renicapite* (Leidy) (family: Pronocephalidae) in the Leathery Turtle *Dermochelys coriacea* (Linné) from the Indian Ocean. **Journal of the Bombay Natural History Society**, 68: 489-490.
- Rudolphi, C. A. 1819. **Entozoorum synopsis cui accedunt mantissa duplex et indices locupletissimi**. Berolini, Rücker. 811p.
- Sey, O. 1977. Examination of helminth parasites of marine turtles caught along the Egyptian coast. **Acta Zoologica Academiae Scientiarum Hungaricae**, 23: 387-394.
- Sprent, J. F. A. 1977. Ascaridoid nematodes of amphibians and reptiles: *Sulcasaris*. **Journal of Helminthology**, 51:379-387.
- Threlfall, W. 1979. Three species of Digenea from the atlantic leatherback turtle (*Dermochelys coriacea*). **Canadian Journal of Zoology**, 57: 1825-1829.
- Travassos, L. 1918. Informações sobre a família Kathlanidae, n.nom. **Revista da Sociedade Brasileira de Ciências**, 2: 83-88.
- Travassos, L., Freitas, J. F. T. & Kohn, A. 1969. Trematódeos do Brasil. **Memórias do Instituto Oswaldo Cruz**, 67: 1-886.
- Vicente, J. J., Rodrigues, H. O., Gomes D. C. & Pinto R. M. 1993. Nematóides do Brasil. III. Nematóides de répteis. **Revista Brasileira de Zoologia**, 10: 19-168.
- Yamaguti, S. 1971. **Synopsis of Digenetic Trematodes of Vertebrates**. Keigaku Publishing Co., Tokyo, 1074 p.

Received December 2007

Accepted September 2008

Published online November 2008