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Review

Checklist of sea turtles endohelminth in Neotropical region

M. R. WERNECK[1*], R. J. DA SILVA[2]

[1]BW Veterinary Consulting. Rua Ponciano Eugênio Duarte 203, Centro, Zip Code: 11680-000, Ubatuba, São Paulo State, Brazil, *E-mail: max@bwvet.com.br; [2]São Paulo State University (UNESP), Institute of Biosciences, Department of Parasitology, Laboratory of Wild Animals Parasitology, Botucatu, São Paulo State, Brazil

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Summary

This paper presents a list of parasites described in sea turtles from the Neotropical region. Through the review of literature the occurrence of 79 taxa of helminthes parasites were observed, mostly consisting of the Phylum Platyhelminthes with 76 species distributed in 14 families and 2 families of the Phylum Nematoda within 3 species. Regarding the parasite records, the most studied host was the green turtle (*Chelonia mydas*) followed by the hawksbill turtle (*Eretmochelys imbricata*), olive ridley turtle (*Lepidochelys olivacea*), loggerhead turtle (*Caretta caretta*) and leatherback turtle (*Dermochelys coriacea*). Overall helminths were reported in 12 countries and in the Caribbean Sea region. This checklist is the largest compilation of data on helminths found in sea turtles in the Neotropical region.
Keywords: checklist; helminths; marine turtles; parasites

Introduction

The Neotropical region corresponds to Central and South America, where five species of sea turtles are found: Green turtle (*Chelonia mydas* Linnaeus, 1758), loggerhead turtle (*Caretta caretta* Linnaeus, 1758), hawksbill turtle (*Eretmochelys imbricata* Linnaeus, 1766), Olive ridley turtle (*Lepidochelys olivacea* Eschscholtz, 1829) and leatherback turtle (*Dermochelys coriacea* Vandelli, 1761) (Lutz & Musick, 1996). The International Union for Conservation of Nature (IUCN, 2015) considers *C. caretta*, *C. mydas* and *L. olivacea* as endangered and both *D. coriacea* and *E. imbricata* as critically threatened.

Parasitological analyses of sea turtles have been conducted for many years and the results have contributed to a better understanding of the helminths of this group of hosts. Thus, the aim of this paper was to offer a comprehensive bibliographic review of the species of endohelminths found in sea turtles in the Neotropics.

Material and Methods

This checklist was developed using only scientific papers on endohelminths identified in sea turtles published between 1911 and 2016. Dissertations, theses and abstracts from conferences were not considered.

The data are presented in two forms: The first part of the paper presents a list of helminths (and synonyms) separated by family, genus and species and includes the infection site, location, infected host and author of the reference. The second part presents the hosts and a list of helminths reported in these hosts. For the classification, the taxonomic proposal presented by the World Register of Marine Species (WoRMS, 2015) was used.

Results

This checklist records the occurrence of 79 taxa of parasites. Se

venty six represent the phylum Platyhelminthes (one from the order Aspidogastrida, 11 from the order Diplostomida and 64 from the order Plagiorchiida) represented by 14 families. Three represent the phylum Nematoda, in which two families have been found in the sea turtles *C. mydas*, *C. caretta*, *E. imbricata*, *L. olivacea* and *D. coriacea*. Overall helminths are reported in 12 countries and three are reported for the region in which the present study took place (i.e. the Caribbean Sea).

Parasite-Host list

Phylum Platyhelminthes Gegenbaur, 1859
Class Trematoda Rudolphi, 1808
Subclass Aspidogastrea Faust & Tang, 1936
Order Aspidogastrida Skrjabin & Guschanskaja, 1962
Superfamily Apidogastroidea Poche, 1907
Family Aspidogastridae Poche, 1907
Lophotaspis vallei (Stossich, 1899)
Site of infection: Esophagus and stomach.
Host and distribution: *C. caretta* from Brazil (Araújo, 1941)

Subclass Digenea Carus, 1863
Order Plagiorchiida La Rue, 1957
Suborder Echinostomata Szidat, 1939
Super Family Echinostomatoidea Looss, 1902
Family Calycodidae Dollfus. 1929
Calycodes anthos (Braun, 1899) Looss, 1901.
Site of infection: Small and large intestine.
Host and distribution: *C. caretta* from Brazil (Werneck *et al.*. 2008a), *C. mydas* from Panamá (Caballero *et al.,*1955) and Brazil (Binoti *et al*., 2016); *D. coriacea* from Uruguay (Werneck *et al.,* 2012) and *L. olivacea* from México (Pérez-Ponce de Leon *et al.,* 1996).

Calycodes caborojoensis Fischthal e Acholonu, 1976
Site of infection: small intestine of *E imbricata* from Puerto Rico (Fischthal & Acholonu, 1976; Dyer *et al.,*1995a).

Familia Rhytidodidae Odhner, 1926
Rhytidodes gelatinosus (Rudolphi, 1819) Looss, 1901
Site of infection: Stomach and intestine.
Host and distribution: *C. caretta* from Brazil (Viana, 1924; Travassos *et al.,* 1969); *C. mydas* from Panamá (Caballero, 1954) and Brazil (Werneck & Silva, 2015) and *E. imbricata* from Puerto Rico (Fischthal & Acholonu, 1976; Dyer *et al.,* 1995a) and Cuba (Vigueras, 1955).

Rhytidodoides intestinalis Price, 1939
Site of infection: Gall bladder.
Host and distribution: *C. mydas* from Panamá (Caballero, 1954) and Costa Rica (Santoro *et al.,* 2006).

Rhytidodoides similis Price, 1939
Site of infection: Gall bladder.
Host and distribution: *C. mydas* from Panamá (Caballero, 1954), Costa Rica (Santoro *et al.,* 2006) and Brazil (Werneck *et al.,* 2015a).

Suborder Hemiurata Markevitsch 1951
Superfamily Hemiuroidea Looss, 1899
Family Sclerodistomidae Odner, 1927
Prosorchis psenopsis Yamaguti, 1934
Site of infection: Stomach.
Host and distribution: *L. olivacea* from México (Pérez-Ponce de Leon *et al.,* 1996).

Suborder Pronocephalata Olson, Cribb, Tkach, Bray & Littlewood, 2003
Superfamily Paramphistomoidea Fischoeder, 1901
Family Cladorchiidae Fischoeder, 1901
Schizamphistomum erratum Blair, 1983
(Synonym: *Schizamphistomoides erratum* Blair, 1983)
Site of infection: Intestine.
Host and distribution: *C. mydas* from Costa Rica (Santoro *et al.,* 2006).

Schizamphistomoides spinulosum (Looss, 1901) Stunkard, 1925
Site of infection: Large intestine.
Host and distribution: *C. mydas* from Panamá (Caballero *et al.,* 1955).

Schizamphistomum scleroporum (Creplin, 1844) Looss, 1912
(Synonym: *Schizamphistomoides chelonei* Gupta 1961)
Site of infection: Stomach and intestine.
Host and distribution: *C. mydas* from Brazil (Werneck & Silva 2015), Costa Rica (Santoro *et al.,* 2006), Cuba (Groschaft *et al.,*1977) and Trinidade (The West Indies) (Gupta, 1961) and *E. imbricata* from Puerto Rico (Fischthal & Acholonu, 1976).

Schizamphistomum sp. Looss, 1912
Site of infection: Intestine.
Host and distribution: *C. mydas* from Brazil (Binoti *et al*., 2016) and Puerto Rico (Dyer *et al.,* 1995b).

Family Microscaphidiidae Looss, 1900
Angiodictyum anteroporum Chattopadhyaya, 1972 (Taxon inquirendum)
Site of infection: Large intestine.
Host and distribution: *E. imbricata* from Puerto Rico (Dyer *et al.,* 1995a).

Angiodictyum longum Blair, 1986
Site of infection: Small intestine.
Host and distribution: *C. mydas* from Brazil (Werneck & Silva 2015; Binoti *et al*., 2016).

Angiodictyum mooreae Dyer, Williams & Bunkley-Williams, 1995
Site of infection: Large intestine.
Host and distribution: *E. imbricata* from Puerto Rico (Dyer *et al.,* 1995c).

Angiodictyum parallelum (Looss, 1901) Looss, 1902
(Synonym: *Microscaphidium parallelum* Looss, 1901)
Site of infection: Small and large intestine.
Host and distribution:, *C. mydas* from Brazil (Werneck & Silva, 2015) and Puerto Rico (Dyer *et al.,* 1991) and *E. imbricata* from Puerto Rico (Dyer *et al.,* 1995c).

Deuterobaris chelonei Gupta, 1961.
Site of infection: Intestine.
Host and distribution: *C. mydas* from Trinidad (The West India) (Gupta, 1961).

Deuterobaris intestinalis Mehrotra, 1973
Site of infection: Intestine.
Host and distribution: *C. mydas* from Costa Rica (Santoro *et al.,* 2006).

Deuterobaris proteus (Brandes, 1891) Looss, 1900
Site of infection: Esophagus, stomach, small and large intestine.
Host and distribution: *C. mydas* from Brazil (Werneck & Silva, 2015) and Puerto Rico (Dyer *et al.,* 1991; Dyer *et al.,* 1995b).

Microscaphidium reticulare (Van Beneden, 1859) Looss, 1900
(Synonym: *Microscaphidium caballeroi* Groschaft, 1977, *Microscaphidium japonicum* Oguro, 1941 and *Monostomum reticulare* Van Beneden, 1859)
Site of infection: Small and large intestine.
Host and distribution: *C. mydas* from Brazil (Werneck & Silva, 2015), Costa Rica (Santoro *et al.,* 2006), Cuba (Groschaft *et al.,* 1977) and Puerto Rico (Dyer *et al.,* 1995b).

Microscaphidium warui Blair, 1986
Site of infection: Urinary bladder.
Host and distribution: *C. mydas* from Costa Rica (Santoro *et al.,* 2006).

Microscaphidium aberrans Looss, 1902
Site of infection: Intestine.
Host and distribution: *C. mydas* from Panamá (Caballero, 1954)

Neoctangium travassosi Ruiz, 1943
[Synonym: *Octangium travassosi* (Ruiz, 1943) Yamaguti, 1958, *Neoctangium trinidadi* Gupta 1962]
Site of infection: Stomach and small and large intestine.
Host and distribution: *E. imbricata* from Puerto Rico (Fischthal & Acholonu, 1976).
C. mydas from Brazil [Ruiz 1943 (see Muniz-Pereira *et al.,* 2009); Travassos *et al.,* 1969; Werneck & Silva, 2015; Binoti *et al*., 2016)], Caribbean Sea (Gupta, 1962) and Trinidad (The West Indies) (Gupta, 1961).

Octangium hyphalum Blair, 1987
Site of infection: Intestine.
Host and distribution: *C. mydas* from Costa Rica (Santoro *et al.,* 2006).

Octangium sagitta (Looss, 1899) Looss, 1902
[Synonym: *Microscapha sagitta* Looss, 1899, *Octangium hasta* Looss, 1902, *Octangium takanoi* Kobayashi, 1921 (see Blair, 1987)].
Site of infection: Stomach and small and large intestine.
Host and distribution: *C. mydas* from Puerto Rico (Dyer *et al.,* 1991) and *E. imbricata* from Puerto Rico (Fischthal & Acholonu, 1976; Dyer *et al.,* 1995c).

Polyangium linguatula (Looss, 1899)
[Synonym: *Microscaphidium linguatula* Looss, 1899, N*ephrobius colymbi* Poche, 1926, *Polyangium colymbi* (Poche, 1926), *Polyangium longiseminale* Chattopadhyaya, 1972 and *Polyangium miyajimai* Kobayashi, 1915].
Site of infection: Small and large intestine.
Host and distribution: *C. mydas* from Brazil (Teixeira de Freitas & Lent, 1938; Travassos *et al.,* 1969; Werneck & Silva, 2015; Binoti *et al.*, 2016), Costa Rica (Santoro *et al.,* 2006), Cuba (Groschaft *et al.,* 1977) and Puerto Rico (Dyer *et al.,* 1991; Dyer *et al.,* 1995c).

Superfamily Pronocephaloidea Looss, 1899
Family Pronocephalidae Looss, 1899
Adenogaster serialis Looss, 1901
Site of infection: Small and large intestine.
Host and distribution: *C. mydas* from Panamá (Caballero *et al.,* 1955) and Peru (Tantalean *et al.,* 1992); *E. imbricata* from Costa Rica (Santoro *et al.,* 2015) and Cuba (Vigueras, 1955) and *L. olivacea* from México (Pérez-Ponce de Leon *et al.,* 1996; Vivaldo *et al.,* 2006; Vivaldo *et al.,* 2009).

Charaxicephaloides polyorchis Groschaft & Tenora, 1978.
Site of infection: Stomach.
Host and distribution: *C. mydas* from Costa Rica (Santoro *et al.,* 2009a) and Cuba (Groschaft & Tenora, 1978; Groschaft *et al.,* 1977).

Charaxicephaloides sp. Groschaft & Tenora, 1978
Site of infection: Stomach.
Host and distribution: *C. mydas* from Costa Rica (Santoro *et al.,* 2006).

Charaxicephalus robustus Looss, 1901
Site of infection: Esophagus and stomach.
Host and distribution: *C. mydas* from Brazil (Binoti *et al*., 2016) and Costa Rica (Santoro *et al.,* 2006).

Cricocephalus americanus Vigueras, 1955
Site of infection: Stomach.
Host and distribution: *E. imbricata* from Cuba (Viegueras, 1955).

Cricocephalus albus (Kuhl & Van Hasselt, 1822)
(Synonym: *Cricocephalus delitescens* Looss, 1899 and *Cricocephalus koidzumii* Kobayashi, 1921).
Site of infection: Esophagus, stomach and small intestine.
Host and distribution: *C. mydas* from Brazil (Ruiz, 1946; Travassos *et al.,* 1969; Werneck & Silva, 2015; Binoti *et al*., 2016), Costa Rica (Santoro *et al.,* 2006), Panama (Caballero *et al.,* 1955) and Trinidade (The West Indies) (Gupta, 1961); *E. imbricata* from Costa Rica (Santoro *et al.,* 2015) and Puerto Rico (Fischthal & Acholonu, 1976).

Cricocephalus megastomum Looss, 1902
Site of infection: Esophagus, stomach and small intestine.
Host and distribution: *C. mydas* from Brazil (Werneck & Silva, 2015; Binoti *et al*., 2016), Costa Rica (Santoro *et al.,* 2006) and Cuba (Groschaft *et al.,* 1977); *E. imbricata* from Puerto Rico (Fischthal & Acholonu, 1976; Dyer *et al.,* 1995a).

Cricocephalus resectus Looss, 1902
Site of infection: Esophagus and stomach.
Host and distribution: *C. mydas* from Costa Rica (Santoro *et al.,* 2006).

Cricocephalus vitallani (Gupta, 1962)
(Synonym: *Neocricocephalus vitallani* Gupta, 1962)
Site of infection: Intestine.
Host and distribution: *C. mydas* from Caribbean Sea (Gupta, 1962).

Desmogonius desmogonius Stephens, 1911
Site of infection: Esophagus, stomach and intestine.
Host and distribution: *C. mydas* from "Caribbean waters" (Coil & Reid, 1965), Costa Rica. (Santoro *et al.,* 2006) and Jamaica (Stephens, 1911).

Diaschistorchis pandus (Braun, 1901) Johnstone, 1913
Site of infection: Stomach and small intestine.
Host and distribution: *C. mydas* from Brazil (Werneck & Silva, 2015); *E. imbricata* from Brazil (Werneck *et al.,* 2015b), Cuba (Vigueras, 1955) and Puerto Rico (Fischthal & Acholonu, 1976; Dyer *et al.,* 1995a).

Metacetabulum invaginatum Teixeira de Freitas & Lent 1938
Site of infection: Stomach and small intestine.
Host and distribution: *C. mydas* from Brazil (Teixeira de Freitas & Lent, 1938; Ruiz, 1946; Travassos *et al.,* 1969; Werneck & Silva, 2015; Binoti *et al*., 2016); *E. imbricata* from Porto Rico (Fischthal & Acholonu, 1976).

Pleurogonius americanus Caballero, Zerecero & Grocott, 1955
[Synonym: *Pyelosomum americanum* (Caballero, Zerecero & Grocott, 1955)]
Site of infection: Intestine.
Host and distribution: *C. mydas* from Panamá (Caballero *et al.,* 1955).

Pleurogonius laterouteus Fischthal & Acholonu, 1976
Site of infection: Large intestine.
Host and distribution: *E. imbricata* from Porto Rico (Fischthal & Acholonu, 1976).

Pleurogonius linearis Looss, 1901
[Synonym: *Pyelosomum lineare* (Looss, 1901)]
Site of infection: Small and large intestine.
Host and distribution: *C. mydas* from Brazil (Ruiz, 1946; Travassos *et al.,* 1969; Werneck & Silva, 2015; Binoti *et al*., 2016) and Costa Rica (Santoro *et al.,* 2006); *E. imbricata* from Costa Rica (Santoro *et al.,* 2015), México (Caballero & Zerecero, 1950) and Porto Rico (Fischthal & Acholonu, 1976).

Pleurogonius longiusculus Looss, 1901
[Synonym: *Pyelosomum longiusculum* (Looss, 1901)]
Site of infection: Esophagus, stomach, small and large intestine.
Host and distribution: *C. mydas* from Brazil (Ruiz, 1946; Travassos *et al.,* 1969; Werneck & Silva, 2015; Binoti *et al*., 2016), Costa Rica (Santoro *et al.,* 2006) and Panamá (Caballero, 1954; Caballero *et al.,* 1955).

Pleurogonius grocotti Caballero, 1954
Site of infection: Intestine.
Host and distribution: *C. mydas* from Panamá (Caballero, 1954).

Pleurogonius chelonii Mehra, 1939
(Synonym: *Pleurogonius mehrai* Ruiz, 1946).
Site of infection: Intestine.
Host and distribution: *C. mydas* from Trinidad (The West Indies) (Gupta, 1961).

Pleurogonius longibursatus Vigueras, 1955
[Synonym: *Pyelosomum longibursatum* (Vigueras, 1955)].
Site of infection: Intestine.
Host and distribution: *E. imbricata* from Cuba (Vigueras, 1955).

Pleurogonius puertoricensis Fischthal & Acholonu, 1976
Site of infection: Large intestine.
Host and distribution: *E. imbricata* from Puerto Rico (Fischthal & Acholonu, 1976).

Pleurogonius sindhii Mehra, 1939
[Synonym: *Pyelosomum sindhii* (Mehra, 1939)].
Site of infection: Intestine.
Host and distribution: *C. mydas* from Costa Rica (Santoro *et al.,* 2006) and Panamá (Caballero *et al.,* 1955).

Pleurogonius solidus Looss, 1901
[Synonym: *Pyelosomum solidum* (Looss, 1901); *Glyphicephalus solidus* Looss, 1901].
Site of infection: Intestine.
Host and distribution: *C. mydas* from Costa Rica (Santoro *et al.,* 2006) and *E. imbricata* from Cuba (Vigueras, 1955).

Pleurogonius tortugueroi Santoro, Greiner, Morales & Rodriguez-Ortíz, 2007.
Site of infection: Large intestine.
Host and distribution: *C. mydas* from Costa Rica (Santoro *et al.,* 2007).

Pleurogonius trigonocephalus (Rudolphi, 1809) Looss, 1901.
[Synonym: *Pyelosomum trigonocephalum* (Rudolphi, 1809), and *Monostoma trigonocephalum* Rudolphi, 1809].
Site of infection: Esophagus, stomach, small intestine, large intestine and liver.
Host and distribution: *C. mydas* from Brazil (Travassos *et al.,* 1969; Werneck & Silva, 2015); *E. imbricata* from Costa Rica (Santoro *et al.,* 2015), Cuba (Vigueras, 1955) and Puerto Rico (Fischthal & Acholonu, 1976).

Pleurogonius sp.
Site of infection: Intestine.
Host and distribution: *C. mydas* from British West Indies (Greiner *et al.,* 1980) and Costa Rica (Santoro *et al.,* 2006).

Pleurogonius lobatus (Looss, 1901)
(Synonym: *Glyphicephalus lobatus* Looss, 1901).
Site of infection: Stomach and small and large intestine.
Host and distribution: *C. mydas* from Brazil (Ruiz, 1946; Travassos *et al.,* 1969; Werneck & Silva, 2015; Binoti *et al*., 2016), Costa Rica (Santoro *et al.,* 2006), Panama (Caballero *et al.,* 1955), and Puerto Rico (Dyer *et al.,* 1991); *E. imbricata* from Costa Rica (Santoro *et al.,* 2015) and Puerto Rico (Fischthal & Acholonu, 1976); *L. olivacea* from México (Pérez-Ponce de Leon *et al.,* 1996).

Pleurogonius latus Fischthal & Acholonu 1976
(Synonym: *Glyphicephalus latus* Fischthal & Acholonu 1976).
Site of infection: Small intestine (occasionally stomach and large intestine).
Host and distribution: *E. imbricata* from Puerto Rico (Fischthal & Acholonu, 1976).

Pleurogonius stenobursatum (Fischthal & Acholonu, 1976) Blair, 2005
[Synonym: *Pyelosomum stenobursatum* (Fischthal & Acholonu, 1976) Pérez ponce de León & Brooks, 1995, and *Epibathra stenobursata* Fischthal & Acholonu 1976].
Site of infection: Large intestine.
Host and distribution: *E. imbricata* from Puerto Rico (Fischthal & Acholonu, 1976).

Pronocephalus obliquus Looss, 1899
(Synonym: *Pronocephalus mehrai* Chattopadhyaya, 1972).
Site of infection: Esophagus, stomach, small intestine, large intestine and liver.
Host and distribution: *C. mydas* from Brazil (Travassos *et al.,* 1969; Werneck & Silva, 2015; Binoti *et al*., 2016) and Costa Rica (Santoro *et al.,* 2006); *E. imbricata* from Brazil (Werneck *et al.,* 2015b).

Pronocephalus trigonocephalus Looss, 1899
Site of infection: Esophagus, stomach and intestine.
Host and distribution: *C. caretta* from Brazil (Viana, 1924); *C. mydas* from Brazil (Ruiz, 1946; Travassos *et al.,* 1969; Binoti *et al.,* 2016) and Panama (Caballero *et al.,* 1955).

Pyelosomum cochlear Looss, 1899
Site of infection: Urinary bladder.
Host and distribution: *C. mydas* from Brazil (Werneck & Silva, 2015; Binoti *et al*., 2016), Costa Rica (Santoro *et al.,* 2006), Panamá (Caballero, 1954) and Puerto Rico (Dyer *et al.,* 1995b; Dyer *et al.,* 1991); *L. olivacea* from Brazil (Werneck *et al.,* 2015c).

Pyelosomum crassum (Looss, 1901) Ruiz, 1946
(Synonym: *Glyphicephalus crassa* Looss, 1901).
Site of infection: Small and large intestine.
Host and distribution: *C. mydas* from Brazil (Ruiz, 1946; Travassos *et al.,* 1969; Werneck & Silva, 2015), and *E. imbricata* from Costa Rica (Santoro *et al.,* 2015).

Pyelosomum posterorchis Oguro, 1936
Site of infection: Small intestine.
Host and distribution: *C. mydas* from Panama (Caballero *et al.,* 1955); *E. imbricata* from Costa Rica (Santoro *et al.,* 2015) and Puerto Rico (Fischthal & Acholonu, 1976).

Pyelosomum renicapite (Leidy, 1856)
[Synonym: *Astrorchis renicapite* (Leidy, 1856), *Monostomum nephrocephalum* Diesing, 1858, *Monostomum sphargidis* MacCallum, 1921 and *Pyelosomum longicaecum* Luhman, 1935]

Site of infection: Small and large intestine.
Host and distribution: *C. caretta* from Brazil (Werneck *et al.,* 2008a); *D. coriacea* from Brazil and Uruguay (Werneck *et al.,* 2012) and Puerto Rico (Dyer *et al.,* 1995b); *L. olivacea* from México (Pérez-Ponce de Leon *et al.,* 1996).

Rameshwarotrema uterocrescens Rao, 1975
Site of infection: Esophagus, stomach, small and large intestine.
Host and distribution: *C. mydas* from Brazil (Werneck & Silva, 2015) and Costa Rica (Santoro *et al.,* 2006); *E. imbricata* from Puerto Rico (Dyer *et al.,* 1995a).

Ruicephalus minutus (Ruiz, 1946) Skrjabin, 1955
(Synonym: *Pronocephalus minutus* Ruiz, 1946)
Site of infection: Stomach and small intestine.
Host and distribution: *C. mydas* from Brazil (Ruiz, 1946; Travassos *et al.,* 1969; Werneck & Silva, 2015; Binoti *et al.*, 2016).

Suborder Xiphidiata Olson Cribb, Tkach, Bray & Littlewood, 2003
Superfamily Gorgoderoidea Looss, 1901
Family Gorgoderidae Looss, 1899
Subfamily Anaporrhutinae Looss, 1901
Plesiochorus cymbiformis (Rudolphi, 1819) Looss, 1901
[Synonym: *Phyllodistomum cymbiforme* (Rudolphi, 1819; *Plesiochorus cymbiformis elongatus* Pigulevsky, 1953]
Site of infection: Urinary bladder and small intestine.
Host and distribution: *C. mydas* from Brazil (Binoti *et al*., 2016) and Panamá (Caballero, 1954); *E. imbricata* from Puerto Rico (Fischthal & Acholonu, 1976); *L. olivacea* from Costa Rica (Santoro & Morales, 2007).

Superfamily Microphalloidea Ward, 1901
Family Pachypsolidae Yamaguti, 1958
Pachypsolus irroratus (Rudolphi, 1819) Looss, 1902
[Synonym: *Pachypsolus branchus* Barker, 1922, *Pachypsolus lunatus* Looss, 1901, *Pachypsolus puertoricensis* Fischthal e Acholonu 1976 and *Pachypsolus ovalis* Linton, 1910)].
Site of infection: Stomach and intestine.
Host and distribution: *C. mydas* from Panamá (Caballero *et al.,* 1955); *E. imbricata* from Porto Rico (Fischthal & Acholonu, 1976); *L. olivacea* from México (Pérez-Ponce de Leon *et al.,* 1996) and Costa Rica (Santoro & Morales, 2007).

Superfamily Plagiorchioidea Lühe, 1901
Family Brachycoeliidae Looss, 1899
Cymatocarpus solearis (Braun, 1899) Braun, 1901
(probably Synonym: *Cymatocarpus undulatus* Looss, 1899)
Site of infection: Esophagus, stomach and small intestine.
Host and distribution: *C. mydas* from Brazil (Werneck & Silva, 2015) and Mexico (Caballero, 1959); *E. imbricata* from Brazil (Werneck *et al.,* 2015b)

Family Plagiorchiidae Lühe, 1901
Enodiotrema megachondrus (Looss, 1899) Looss, 1901
Site of infection: Small intestine.
Host and distribution: *C. mydas* from Brazil (Werneck *et al.*, 2016a); *E. imbricata* from Cuba (Groschaft *et al.,* 1977); *L. olivacea* from Costa Rica (Santoro & Morales, 2007) and México (Pérez-Ponce de Leon *et al.,* 1996; Vivaldo *et al.,* 2006).

Enodiotrema reductum Looss, 1901
Site of infection: Small intestine.
Host and distribution: *C. mydas* from Panamá (Caballero, 1954); *E. imbricata* from Costa Rica (Santoro *et al.,* 2015) and Puerto Rico (Fischthal & Acholonu, 1976; Dyer *et al.,* 1995a).

Family Styphlotrematidae Baer, 1924
Styphlotrema solitaria (Looss, 1899) Odhner, 1911
Site of infection: Esophagus, stomach and small intestine.
Host and distribution: *E. imbricata* from Brazil (Werneck & Silva, 2012), Cuba (Groschaft *et al.,* 1977) and Puerto Rico (Fischthal & Acholonu, 1976).

Family Telorchiidae Looss, 1899
Orchidasma amphiorchis (Braun, 1899)
Site of infection: Stomach and small intestine.
Host and distribution: *C. caretta* from Argentina (Boero & Led, 1974) and Brazil (Werneck *et al.,* 2008a); *C. mydas* from Brazil (Teixeira de Freitas & Lent, 1938; Travassos *et al.,* 1969; Binoti *et al*., 2016), México (Caballero & Zerecero, 1950; Caballero, 1962); Panama (Caballero *et al.,* 1955), and Peru (Tantalean *et al*., 1992); *E. imbricata* from Puerto Rico (Fischthal & Acholonu, 1976); *L. olivacea* from México (Pérez- Ponce de Leon *et al.,* 1996).

Order Diplostomida Olson, Cribb, Tkach, Bray & Littlewood, 2003
Suborder Diplostomata Olson, Cribb, Tkach, Bray & Littlewood, 2003
Superfamily Schistosomatoidea Stiles & Hassall, 1898

Family Spirorchiidae Stunkard, 1921
Amphiorchis amphiorchis Price, 1934
Site of infection: Blood vessels of large intestine.
Host and distribution: *E. imbricata* from Puerto Rico (Fischthal & Acholonu, 1976).

Amphiorchis caborojoensis Fischthal & Acholonu, 1976
Site of infection: Blood vessels of lung, liver, small intestine, body wash and heart.
Host and distribution: *E. imbricata* from Puerto Rico (Dyer *et al.,* 1995a; Fischthal & Acholonu, 1976) and Brazil (Werneck *et al.,* 2008b; Dutra *et al.,* 2012; Werneck *et al.,* 2015b).

Amphiorchis indicus Mehrotra, 1973
Site of infection: Esophagus, stomach, small intestine, large intestine and liver.
Host and distribution: *C. mydas* from Brazil (Werneck & Silva, 2013; Werneck & Silva, 2015).

Amphiorchis solus (Simha & Chattopadhyaya, 1970) Platt, 2002
(Synonym: *Squaroacetabulum solus* Simha & Chattopadhyaya, 1970)
Site of infection: Intestine and heart.
Host and distribution: *C. mydas* from Brazil (Werneck *et al.,* 2011; Werneck & Medeiros, 2016) and Costa Rica (Santoro *et al.,* 2006).

Carettacola stunkardi (Martin & Bamberger, 1952)
[Synonym: *Haemoxenicon stunkardi* Martin & Bamberger, 1951,*Carettacola chelonenecon* (Martin & Bamberger, 1952), and *Haemoxenicon chelonenecon* Martin & Bamberger, 1952)].
Site of infection: Blood vessels of urinary bladder, heart, body wash and liver.
Host and distribution: *C. mydas* from Brazil (Werneck *et al.,* 2013) and Panamá (Caballero *et al*., 1955); *E. imbricata* from Brazil (Werneck *et al*., 2008b; Werneck *et al*., 2015b) and Costa Rica (Santoro *et al*., 2015).

Hapalotrema postorchis Rao, 1976
Site of infection: Great vessels and heart.
Host and distribution: *C. mydas* from Brazil (Werneck *et al*., 2015d) and Costa Rica (Santoro *et al*., 2006); E. *imbricata* from Brazil (Werneck *et al*., 2014).

Hapalotrema synorchis Luhman, 1935
Site of infection: Heart.
Host and distribution: *E. imbricata* from Puerto Rico (Fischthal & Acholonu, 1976).

Learedius learedi Price, 1934
Site of infection: Esophagus, stomach, small and large intestine, liver, gall bladder, heart, lung, body wash, kidney.
Host and distribution: *C. mydas* from Bermuda (Rand & Wiles, 1985), Brazil (Werneck *et al.,* 2006; Werneck & Silva, 2015; Binoti *et al*., 2016), British West Indies (Greiner *et al.,* 1980), Costa Rica (Santoro *et al.,* 2006), Panama (Caballero *et al.,* 1955), Puerto Rico (Dyer *et al.,* 1991), México (Cordeiro-Tapia *et al.,* 2004; Inohuye-Rivera *et al.,* 2004); *E. imbricata* from Puerto Rico (Dyer *et al.,* 1995a).

Learedius orientalis Mehra, 1939
Site of infection: Heart.
Host and distribution: *C. mydas* from Puerto Rico (Dyer et al., 1995a); *E. imbricata* from Puerto Rico (Fischthal & Acholonu, 1976).

Monticellius indicum Mehra, 1939
Site of infection: Heart.
Host and distribution: *C. mydas* from Brazil (Werneck *et al.,* 2008c; Werneck & Silva, 2015 and Costa Rica (Santoro *et al.,* 2006; Santoro *et al.,* 2009b); *E. imbricata* from Brazil (Werneck *et al.,* 2015e).

Neospirorchis schistosomatoides Price 1934
Site of infection: Heart chambers and Aorta.
Host and distribution: *C. mydas* from Bermuda (Rand & Wiles, 1985) and Brazil (Werneck *et al.,* 2016b).

Neospirorchis sp.
Site of infection: Small intestine, liver, heart, lung, body wash.
Host and distribution: *C. mydas* from Brazil (Werneck & Silva, 2015).

Phylum Nematoda Rudolphi, 1808
Class Chromadorea Inglis, 1983
Subclass Chromadoria Adamson, 1987
Order Rhabditida Chitwood, 1933
Suborder Spirurina Railliet & Henry, 1915
Infraorder Ascaridomorpha De Ley & Blaxter 2002
Superfamily Ascaridoidea Baird, 1853
Family Anisakidae Skrjabin e Karokhin, 1945
Sulcascaris sulcata (Rudolphi, 1819)
Site of infection: Esophagus, stomach and small intestine.
Host and distribution: *C. caretta* from Brazil (Werneck *et al.,* 2008a) and Uruguay (Lent & Teixeira de Freitas, 1948); *C. mydas* from Brazil (Teixeira de Freitas & Lent, 1946).

***Anisakis* larvae**
Site of infection: Body wash.
Host and distribution: *E. imbricata* from (Werneck *et al.,* 2015b).

Superfamily Cosmocercoidea Travassos, 1935
Family Kathlaniidae Travassos, 1918
Kathlania leptura (Rudolphi, 1819)
Site of infection: Small and large intestine.
Host and distribution: *C. caretta* from Brazil (Werneck *et al.,* 2008a); *C. mydas* from Brazil (Travassos, 1918).

Tonaudia freitasi Vicente & Santos, 1968.
Site of infection: Stomach.
Host and distribution: *C. mydas* from Brazil (Vicente & Santos, 1968).

Nematode larvae
Site of infection: Esophagus, stomach, small and large intestine, liver.
Host and distribution: *C. mydas* from Brazil (Werneck & Silva, 2015).

Host-Parasite list

Chelonia mydas

Digeneans
Family Calycodidae

- *Calycodes anthos*
-

Family Rhytidodidae

- *Rhytidodes gelatinosus*
- *Rhytidodoides intestinalis*
- *Rhytidodoides similis*

Family Cladorchiidae
Schizamphistomum erratum
Schizamphistomum scleroporum
Schizamphistomoides spinulosum

Family Microscaphidiidae

- *Angiodictyum longum*
- *Angiodictyum parallelum*
- *Deuterobaris chelonei*
- *Deuterobaris intestinalis*
- *Deuterobaris proteus*
- *Microscaphidium aberrans*
- *Microscaphidium reticulare*
- *Microscaphidium warui*
- *Neoctangium travassosi*
- *Octangium hyphalum*
- *Octangium sagitta*
- *Polyangium linguatula*

Family Pronocephalidae

- *Adenogaster serialis*
- *Charaxicephaloides polyorchis*
- *Charaxicephalus robustus*
- *Cricocephalus albus*
- *Cricocephalus megastomum*
- *Cricocephalus resectus*
- *Cricocephalus vitallani*
- *Desmogonius desmogonius*
- *Diaschistorchis pandus*
- *Metacetabulum invaginatum*
- *Pleurogonius americanus*
- *Pleurogonius chelonii*
- *Pleurogonius grocotti*
- *Pleurogonius linearis*
- *Pleurogonius longiusculus*
- *Pleurogonius sindhii*
- *Pleurogonius solidus*
- *Pleurogonius tortugueroi*
- *Pleurogonius trigonocephalus*
- *Pleurogonius lobatus*
- *Pronocephalus obliquus*
- *Pronocephalus trigonocephalus*
- *Pyelosomum cochlear*
- *Pyelosomum crassum*
- *Pyelosomum posterorchis*
- *Rameshwarotrema uterocrescens*
- *Ruicephalus minutus*

Family Gorgoderidae

- *Plesiochorus cymbiformis*

Family Pachypsolidae

- *Pachypsolus irroratus*

Family Brachycoeliidae

- *Cymatocarpus solearis*

Family Plagiorchiidae

- *Enodiotrema reductum*

Family Telorchiidae

- *Orchidasma amphiorchis*

Family Spirorchiidae

- *Amphiorchis indicus*
- *Amphiorchis solus*
- *Carettacola stunkardi*
- *Hapalotrema postorchis*
- *Learedius learedi*
- *Learedius orientalis*
- *Monticellius indicum*
- *Neospirorchis schistosomatoides*

Nematodes
FamilyAnisakidae

- *Sulcascaris sulcata*

Family Kathlaniidae

- *Kathlania leptura.*
- *Tonaudia freitasi*

Eretmochelys imbricata

Digeneans
Family Calycodidae
- *Calycodes caborojoensis*

Familia Rhytidodidae
- *Rhytidodes gelatinosus*

Family Cladorchiidae
- *Schizamphistomum scleroporum*

Family Microscaphidiidae
- *Angiodictyum anteroporum*
- *Angiodictyum mooreae*
- *Angiodictyum parallelum*
- *Neoctangium travassosi*
- *Octangium sagitta*

Family Pronocephalidae
- *Adenogaster serialis*
- *Cricocephalus albus*
- *Cricocephalus americanus*
- *Cricocephalus megastomum*
- *Diaschistorchis pandus*
- *Metacetabulum invaginatum*
- *Pleurogonius laterouteus*
- *Pleurogonius latus*
- *Pleurogonius linearis*
- *Pleurogonius lobatus*
- *Pleurogonius longibursatus*
- *Pleurogonius puertoricensis*
- *Pleurogonius solidus*
- *Pleurogonius trigonocephalus*
- *Pleurogonius stenobursatum*
- *Pronocephalus obliquus*
- *Pyelosomum crassum*
- *Pyelosomum posterorchis*
- *Rameshwarotrema uterocrescens*

Family Gorgoderidae
- *Plesiochorus cymbiformis*

Family Pachypsolidae
- *Pachypsolus irroratus*

Family Brachycoeliidae
- *Cymatocarpus solearis*

Family Plagiorchiidae
- *Enodiotrema megachondrus*
- *Enodiotrema reductum*

Family Styphlotrematidae
- *Styphlotrema solitaria*

Family Telorchiidae
- *Orchidasma amphiorchis*

Family Spirorchiidae
- *Amphiorchis amphiorchis*
- *Amphiorchis caborojoensis*
- *Carettacola stunkardi*
- *Hapalotrema postorchis*
- *Hapalotrema synorchis*
- *Learedius learedi*
- *Learedius orientalis*
- *Monticellius indicum*

Nematodes
FamilyAnisakidae
- Anisakis larvae

Lepidochelys olivacea

Digeneans
Family Calycodidae
- *Calycodes anthos*

Family Sclerodistomidae
- *Prosorchis psenopsis*

Family Pronocephalidae
- *Adenogaster serialis*
- *Pleurogoius lobatus*
- *Pyelosomum cochlear*
- *Pyelosomum renicapite*

Family Gongoderidae
- *Plesiochorus cymbiformis*

Family Pachypsolidae
- *Pachypsolus irroratus*

Family Plagiorchiidae
- *Enodiotrema megachondrus*

Family Telorchiidae
- *Orchidasma amphiorchis*

Caretta caretta

Aspidogastrids
Family Aspidogastridae
- *Lophotaspis vallei*

Digeneans
Family Calycodidae
- *Calycodes anthos*

Familia Rhytidodidae
- *Rhytidodes gelatinosus*

Family Pronocephalidae
- *Pronocephalus trigonocephalus*
- *Pyelosomum renicapite*

Family Telorchiidae
- *Orchidasma amphiorchis*

Nematodes
FamilyAnisakidae
- *Sulcascaris sulcata*

Family Kathlaniidae
- *Kathlania leptura*

Dermochelys coriacea

Digeneans
Family Calycodidae
- *Calycodes anthos*

Family Pronocephalidae
- *Pyelosomum renicapite*

Discussion

This checklist demonstrates the occurrence of 79 taxa of helminthes parasites. Seventy six represent the phylum Platyhelminthes (one from the order Aspidogastrida, 11 from the order Diplostomida and 64 from the order Plagiorchiida) represented by 14 families. Three represent the phylum Nematoda,
Five species of sea turtles (*C. mydas*, *C. caretta*, *E. imbricata*, *L. olivacea* and *D. coriacea*) had records of helminths in the Neotropical region. The host with the largest number of records of parasites was *C. mydas* (records of only the genus were excluded from the calculation), representing 62 parasite species, followed by *E. imbricata* (42 species), *L. olivacea* (10 species), *C. caretta* (8 species) and *D. coriacea* (2 species). Overall helminths are reported in 12 countries and three are reported for the region in which the present study took place (i.e. the Caribbean Sea).
Among the countries in which helminths are reported, Brazil, Costa Rica and Panamá have the largest number of records for *C. mydas*. *Lepidochelys olivacea* is the best studied sea turtle from Mexico, with eight records of parasite species. Porto Rico stands out for the large number of parasite species reported in *E. imbricata*, such as *C. caborojoensis*, *A. anteroporum*, *A. mooreae*, *P. laterouterus*, *P. puertoricensis*, *P. latus*, *P. sternobursatum*, *A. amphiorchis* and *H. synorchis,* which are only found in this country in this region.
Dermochelys coriacea had the fewest reports of parasites from the region with only *C. anthos* and *P. renicapite*) being detected. This species of turtle has been studied the least of all marine turtles regarding its parasites around the world (see Werneck et al., 2012). This paper presents the largest compilation of data on helminth parasites in sea turtles in the Neotropical region published to date.

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