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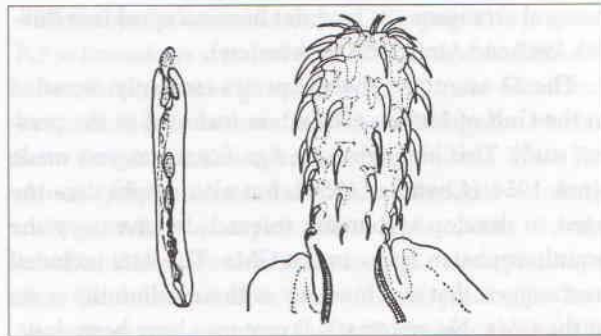
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Acanthocephala of the Gulf of Mexico

Guillermo Salgado-Maldonado and Omar M. Amin

Acanthocephalans (phylum Acanthocephala Rudolphi, 1814) are parasitic worms with bilateral symmetry, are dioecious, and lack a digestive apparatus and gas-exchange organs. This group's characteristic organ is a proboscis armed with hooks that allows it to fix to its host's intestinal wall. Adults are "little more than a bag of reproductive organs with a spiny holdfast at one end . . ." (Schmidt and Roberts, 1977). Excellent morphological descriptions of the group are available, as are general biological accounts (Hyman 1951, Van Cleave 1953, Petrochenko 1956, Yamaguti 1963, Bullock 1969, Golvan 1969, Crompton 1970, Schmidt and Roberts 1977, Miller and Dunagan 1985, Schmidt 1985, Kennedy 1993, Nickol 1995, Amin 1998). Adults parasitize the intestines of vertebrates, while the larvae invariably parasitize arthropods: insects (Coleoptera, Orthoptera) for those with terrestrial life cycles; and crustaceans (Amphipoda, Copepoda, Isopoda, Ostracoda) for those with aquatic life cycles. The structure of this arthropod (intermediate host) to vertebrate (definitive host) life cycle pattern can be complicated by a third, paratenic, host that serves as an ecological bridge needed to infect vertebrates that do not habitually ingest arthropods. Ichthyophagous birds, for example, acquire acanthocephalans by ingesting fish (paratenic hosts) that have already been infected by ingesting crustaceans. The acanthocephalan life cycle lacks free life stages.

Damage caused by acanthocephalans in their hosts includes intestinal perforations and ulcers produced by the proboscis's mechanical effect (Kennedy 1985,



Acanthocephala. After Pratt 1916.

Williams and Jones 1994, Nickol 1995, and references therein). They can also produce behavioral changes in hosts that facilitate predation (Holmes and Bethel 1972, Bethel and Holmes 1973, Nickol 1985, Moore 2002, and references therein).

In the early 1950s, only 7 acanthocephalan species from 4 parasite families parasitizing 11 fish species from 4 sites in the Gulf of Mexico had been reported (Chandler 1954). After analyzing the data available at that time (Linton 1907, 1909, Chandler 1935), Chandler concluded that acanthocephalans were not as abundant a faunistic component in the Gulf of Mexico as in more northerly latitudes of North America. He predicted that sampling in the shallow bays and beaches of the Gulf coast, "where small crustaceans abound," would add new records for the region, but that acanthocephalans would not be abundant in oceanic or reef fish. The acanthocephalan fauna of the Gulf of Mexico has not been revised since Chandler's 1954

study, although 4 studies have contributed partial data or data from adjacent areas. Bullock (1957b, 1960) reported new data and compiled data published up to that time to establish a record of 8 acanthocephalan species in fish on the Texas (U.S.A.) coast and 5 on the Florida (U.S.A.) coast. Salgado-Maldonado (1982) listed 83 acanthocephalan parasites of crustaceans, fish, amphibians, reptiles, and aquatic birds, including records for Florida, Texas, and other states in the United States that border on Mexico, as well as acanthocephalans from Central America and the Caribbean. Amin (1998) recorded 43 acanthocephalan species from 20 genera as parasites in vertebrates from marine and estuarine environments along the Atlantic coast of the United States between Maine, New York, and Texas, including data from the Gulf of Mexico.

The most accepted current phylum classification is that of Amin (1982, 1985b, 1987a). This system is based on the Meyer-Van Cleave schemes and includes proposals from Golvan and Bullock. Petrochenko's and Yamaguti's taxonomical arrangements have not been accepted (see Bullock 1969 and Amin 1998 for a review).

The 33 acanthocephalan species currently recorded in the Gulf of Mexico (GMx) are included in the present study. This highlights the significant progress made since 1954 (Chandler 1954), but also emphasizes the need to develop systematic research to inventory the acanthocephalan fauna in the GMx. The data included here suggest that a rich variety of these helminths exists in the GMx. No systematic inventories have been done, however, and published research is scarce. During an early period (reviewed 50 years ago), researchers in the United States (i.e., Chandler, Bullock, Cable, Van Cleave, and Schmidt) actively studied the group. Currently, only Amin and Nickol study acanthocephalan taxonomy in the United States, although Muzzall and Richardson have also reported on the group. In Mexico, Salgado-Maldonado studied acanthocephalan taxonomy beginning in the 1970s, and Monks has done research more recently.

Sampling coverage is far from complete. Only a few fish species have been examined for acanthocephalans: only 67 of the 1541 fish species in the GMx (McEachran, this volume) have records for these parasites. The acanthocephalan parasites of crustaceans, ichthyophagous birds, and marine mammals have only been studied occasionally (see references herein).

Available data on the GMx acanthocephalan fauna suggest it may be rich. The 33 known species listed here are distributed in 21 genera and 7 families; 16 are found in fish, 16 in birds, and one in marine mammals. Eight

species in this total (5 from fish and 3 from birds) have been recorded only in the GMx, and 3 other species in fish and one in birds have been recorded only in the GMx and Caribbean. Ten of the listed Gulf species found in fish and another 9 found in birds are also known from the Northwest Atlantic to Brazil, or found worldwide. Marine acanthocephalans reported for the Caribbean and West Indies only, whose hosts can be found in the GMx, include 14 species; 10 of these species are from fishes, that is, *Acanthocephaloides spinicaudatus* (Cable and Quick, 1954); *Acanthogyrus (Acanthosentis) acanthuri* (Cable and Quick, 1954); *Dollfusentis longispinus* (Cable and Linderth, 1963); *Gorgorhynchoides elongatus* Cable and Linderth, 1963; *Gorgorhynchus cablei* Golvan, 1969; *Gorgorhynchus xiphias* Hogans and Bratney, 1982; *Koronacantha pectinaria* (Van Cleave, 1940); *Pomphorhynchus rocci* Cordonnier and Ward, 1967; *Pseudocavisoma chromitidis* (Cable and Quick, 1954); and *Rhadinorhynchus pristis* (Rudolphi, 1802). Three of these species are from birds and one from a marine mammal, i.e., *Arhythmorhynchus longicolle* Villot, 1875; *Plagiorhynchus (Plagiorhynchus) charadrii* (Yamaguti, 1939); *Polymorphus (Polymorphus) trochus* Van Cleave, 1945; and *Bolbosoma capitatum* (Linstow, 1880). Those species probably will be found in the GMx; however, none of these inferred records are included in present analyses.

Based on the preceding, the known data suggest that the GMx acanthocephalan fauna constitute a single entity with that of the Caribbean and West Indies. It also differs from that of the Northeast Atlantic, because these areas share only 8 species (see Amin 1992). The presence of a component consisting of widely distributed acanthocephalan species in the GMx fauna is to be expected, given their association with fish and bird hosts with broad geographic distributions. Salgado-Maldonado et al. (2005) and Salgado-Maldonado (2006) have argued that a geographic area's parasite fauna is related to the host community composition in that area because parasites are generally closely linked to their host families.

In the updated checklist of acanthocephalan species recorded in the GMx that is included here, the major taxa, orders, classes, and families appear in phylogenetic order (Amin 1985b) while the genera and species are shown in alphabetical order. Fish host names follow the denomination used in FishBase (Froese and Pauly 2006). Acanthocephalan species are included that parasitize fish, birds (mostly ichthyophagous birds), and marine mammals found naturally in marine, coastal, estuarine, and tidal wetland waters. The marine mammal species of the

GMx were defined according to Würsig, Jefferson, and Schmidly (2000). Amin (1998) listed the acanthocephalan species in fish, birds, and mammals recorded along the eastern coast of the United States. Some of the species he discussed are mainly distributed along the North Atlantic coast in the United States and Canada but have not been recorded in the GMx and thus have not been included here (see Amin 1998 for a complete review of these species). The table does not include species that parasitize freshwater fish: *Acanthocephalus dirus* (Van Cleave, 1931); *Hexaglandula mutabilis* (Rudolphi, 1819) (cystacanths); *Leptorhynchoides thecatus* (Linton, 1891); *Pomphorhynchus bulbocolli* Linkins in Van Cleave, 1919; *Pomphorhynchus rocci* Cordonnier and Ward, 1967; *Neoechinorhynchus cylindratus* (Van Cleave, 1919); and *Neoechinorhynchus golvani* Salgado-Maldonado, 1978. This was done even though they have also been recorded in mainly freshwater fish taken from salt or estuarine environments of the GMx (Petrochenko 1956, Yamaguti 1963, Samuel, Nickol, and Meyes 1976, Huffman and Nickol 1978, Overstreet 1978, Salgado-Maldonado 1978a, Amin 1985a, 1987b, 1988, 1998, Sepúlveda et al. 1994, Fiorillo and Font 1996, 1999, Salgado-Maldonado and Kennedy 1997, Salgado-Maldonado et al. 1997, Vidal-Martínez et al. 2001, Páez-Rodríguez et al. 2002, Montoya-Mendoza, Chávez-López, and Franco-López 2004, Montoya-Mendoza et al. 2004). In addition, the different *Neoechinorhynchus* species parasitizing freshwater turtles in Florida have not been included, even though some of these records could be from saltwater environments (see Nickol and Ernst 1987, Foster et al. 1998, Barger, Thatcher, and Nickol 2004, Barger 2005). The overall geographic range of each species was taken from the primary literature and is defined broadly. All the records in the table are from the primary literature; in other words, all the identifications were made by experts in acanthocephalan taxonomy.

Abbreviations

Abbreviations pertaining to the tabular species checklist are as follows: **Fishes:** Aba = *Acanthurus bahianus*; Aco = *Acanthurus coeruleus*; Afe = *Ariopsis felis*; Ane = *Ameiurus nebulosus marmoratus*; Apr = *Archosargus probatocephalus*; Aro = *Anguilla rostrata*; Avi = *Anisotremus virginicus*; Avu = *Albula vulpes*; Bch = *Bairdiella chrysoura*; Bma = *Bagre marinus*; Boc = *Bothus ocellatus*; Bso = *Bathygobius soporator*; Cag = *Cathorops aguadulce*; Car = *Cynoscion arenarius*; Ccr = *Caranx crysos*; Chi = *Caranx hippos*;

Cla = *Caranx latus*; Cme = *Cathorops melanopus*; Cmu = *Chromis multilineata*; Coh = *Coryphaena hippurus*; Cpa = *Centropomus parallelus*; Cre = *Cynoscion regalis*; Cun = *Cetropomus undecimalis*; Cva = *Cyprinodon variegatus*; Dam = *Dasyatis americana*; Das = *Dasyatis say*; Dau = *Diapterus auratus*; Dma = *Dormitator maculatus*; Drh = *Diapterus rhombeus*; Dsa = *Dasyatis sabina*; Emo = *Epinephelus morio*; Epl = *Eugerres plumieri*; Fgr = *Fundulus grandis*; Fma = *Fundulus majalis*; Fsi = *Fundulus similis*; Gaf = *Gambusia affinis*; Gci = *Gerres cinereus*; Hbi = *Halichoeres bivittatus*; Hme = *Haemulon melanurum*; Jfl = *Jordanella floridae*; Kse = *Kyphosus sectator*; Lgr = *Lutjanus griseus*; Ljo = *Lutjanus jocu*; Lnu = *Labrisomus nuchipinnis*; Lpa = *Lucania parva*; Lrh = *Lagodon rhomboides*; Lsy = *Lutjanus synagris*; Lxa = *Leiostomus xanthurus*; Mam = *Menticirrhus americanus*; Mbe = *Menidia beryllina*; Mce = *Mugil cephalus*; Mcu = *Mugil curema*; Mli = *Menticirrhus littoralis*; Mma = *Mulloidichthys martinicus*; Msa = *Morone saxatilis*; Mun = *Micropogonias undulatus*; Mve = *Mycteroperca venenosa*; Och = *Orthopristis chrysoptera*; Pcr = *Pomadasys crocro*; Pde = *Paralichthys dentatus*; Ple = *Paralichthys lethostigma*; Poc = *Polydactylus octonemus*; Rca = *Rachycentron canadum*; Sma = *Strongylura marina*; Ser = *Seriola* sp.; Tca = *Trachinotus carolinus*; Tfa = *Trachinotus falcatus*. **Aves:** Aal = *Ardea alba*; Aan = *Anhinga anhinga*; Afu = *Anas fulvigula maculosa*; Ahe = *Ardea herodias*; Ain = *Arenaria interpres*; Apl = *Anas platyrhynchos*; Cal = *Calidris alba*; Cfu = *Calidris fuscicollis*; Cse = *Charadrius semipalmatus*; Cwi = *Charadrius wilsonia*; Eal = *Eudocimus albus*; Eca = *Egretta caerulea*; Fam = *Fulica americana*; Gch = *Gallinula chloropus*; Gim = *Gavia immer*; Hle = *Haliaeetus leucocephalus*; Nvi = *Nyctanassa violacea*; Pau = *Phalacrocorax auritus floridanus*; Pbr = *Phalacrocorax brasilianus*; Paj = *Platalea ajaja*; Peo = *Pelecanus occidentalis carolinensis*; Per = *Pelecanus erythrorhynchus*; Rlo = *Rallus longirostris*. **Crustacea:** Cla = *Corophium lacustre*^{CA}; Dme = *Discapseudes mexicanus*^{CT}; Esp = *Emerita* sp.^{CD}; Gbo = *Grandidierella bonnieroides*^{CA}; Hsp = *Haustorius* sp.^{CA}; Lsp = *Lepidactylus* sp.^{CA}; Pcl = *Procambarus clarkii*^{CD}; Ura = *Uca rapax*^{CD}; Usp = *Uca spinicarpa*^{CD}. **Marine Mammals:** Mde = *Mesoplodon densirostris*. **Other abbreviations:** InRe = Inferred Record. Host species abbreviations without any superscript belong to fishes; ^B = birds; ^{CI} = isopod, ^{CA} = amphipod, ^{CD} = decapod or ^{CT} = tanaidacea crustacean intermediate host; ^L = only larval stages of the acanthocephalan collected from these hosts, no status of host, that is, paratenic, accidental, postcyclic, was given in original literature; ^M = marine mammals; ^P = paratenic host. In the GMx Range column,

the abbreviations refer to the sector of the Gulf for each record (e.g., sw = southwestern, ne = northeastern).

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Taxonomic summary for Acanthocephala of the Gulf of Mexico.

Component host subgroups	Total GMx species	Number of GMx-only species	Number of GMx + Caribbean species	Number of GMx + northwestern Atlantic species	No. of GMx + widely distributed species
Fishes	16	5	3	5	3
Birds	16*	3	1	4	5
Marine mammals	1	-	-	-	1
Total	33	8	4	9	9

* Insufficient data about 3 of these species to preclude knowledge of their exact situation.

Checklist of Acanthocephala from the Gulf of Mexico.

Taxon	Overall geographic range	GMx range	Host(s)	References/Endnotes
Class: Palaeacanthocephala				
Order: Echinorhynchida				
Family: Cavisomidae				
<i>Caballerorhynchus lamothei</i> Salgado-Maldonado, 1977	Coastal waters and tidal wetlands sw GMx	sw	Dau	111 ¹
		sw	Bcr, Bma, Cag, Cpa, Dau, Drh, Epl, Lrh, Mun	103
		sw	Bcr, Cpa, Cun, Dau, Drh, Epl, Lrh, Mun, Dme ^{CT}	57 ²
<i>Filisoma fidum</i> Van Cleave & Manter, 1947	Known only from Dry Tortugas Florida	se	Kse	152
Family: Illiosentidae				
<i>Dollfusentis bravoae</i> Salgado-Maldonado, 1976	Recorded only from sw GMx	sw	Pcr	110
<i>Dollfusentis chandleri</i> Golvan, 1969	Woods Hole, Massachusetts to Brazil	nw	Lxa, Mun, Poc	9, 35, 41, 80, 100, 139, 144
		nw	Mun	136
		nw	Car, Lxa, Mun, Och	24
		ne	Och	72
		se	Hme	110
		ne	Apr, Bch, Dsa, Lxa, Mun, Och, Col ^{CA} , Gbo ^{CA}	22
		nw	Lsp ^{CA}	22
		ne	Mun	102
		sw	Epl, Mun, Lrh	103
<i>Dollfusentis ctenorhynchus</i> (Cable & Linderoth, 1963)	Caribbean Sea: West Indies to Florida	ne	Mma	35
				30, 94
<i>Illiosentis heteracanthus</i> (Cable & Linderoth, 1963)	Caribbean Sea: West Indies to Florida	ne	Boc, Bso, Gci, Lnu	30, 35
			Avu	10 (see 88)

(continued)

Checklist of Acanthocephala from the Gulf of Mexico. (continued)

Taxon	Overall geographic range	GMx range	Host(s)	References/ Endnotes
<i>Tegorhynchus furcatus</i> (Van Cleave & Lincicome, 1939)	Western Atlantic: Massachusetts to Caribbean Sea and GMx	nw	Mam	9, 24, 40, 151
		nw	Mli, Poc	24 ³
		ne	Lsp ^{CA} , Mam	102
		ne	Dam, Das, Dsa, Fsi, Hsp ^{CA} , Lsp ^{CA}	22
		ne	Tca	9
nw	Mam, Poc	9		
Family: Pomphorhynchidae				
<i>Pomphorhynchus lucyi</i> Williams & Rogers, 1984	Northern Florida and southern Alabama	ne	Aro, Sma	159 ⁴
Family: Rhadinorhynchidae				
Subfamily: Gorgorhynchinae				
<i>Gorgorhynchoides bullocki</i> Cable & Mafarachisi, 1970	Known only from GMx	ne	Chi	36
		se	Cl, Epl, Gci, Lgr	114
		sw	Chi	114
		ne	Bch	9
<i>Gorgorhynchus clavatus</i> Van Cleave, 1940	Caribbean Sea: West Indies to GMx	se	Emo	35, 92, 123 ⁵
<i>Gorgorhynchus medius</i> (Linton, 1908)	Western Atlantic: Bermuda Islands to Florida and GMx	nw	Afe	40, 144 ⁶
		ne	Och	9
		nw	Afe, Mve	41 ⁷
sw	Afe	103		
Subfamily: Serrasentinae				
<i>Serrasentis sagittifer</i> (Linton, 1889)	Arabian Gulf, Western Atlantic: New Jersey, North Carolina, Brazil, GMx	ne	Tfa	1, 12, 24, 85, 141, 144, 155 ⁸
		nw	Afe ^P	24
		ne	Lsy ^P , Mun ^P , Rca	102
		sw	Unidentified marine fish	113
		ne	Bch, Cre, Pde	9
		sw	Mun	103
Order: Polymorphida				
Family Plagiorhynchidae				
<i>Plagiorhynchus</i> (<i>Plagiorhynchus</i>) <i>crassicolle</i> (Villot, 1875)	Europe and Cuba	se	Cwi ^B	50, 162
		ne	Hle ^B	109
<i>Plagiorhynchus</i> sp.				
Family: Polymorphidae				
<i>Andracantha grvida</i> (Alegret, 1941)	Known only from GMx	se	Pau ^B	126
		ne	Gim ^B	77
		ne	Pau ^B , Peo ^B	126
		nw	Pau ^B , Pbr ^B	58
		ne	Rlo ^B	98, 162
<i>Arhythmorhynchus frassoni</i> (Molin, 1858)	Europe and GMx	ne	Ura ^{CD}	99
		ne	Aal ^B	134, 143
<i>Arhythmorhynchus pumilirostris</i> Van Cleave, 1916	Western Atlantic: Washington D.C. to GMx	ne	Aal ^B	134, 143
<i>Arhythmorhynchus uncinatus</i> (Kaiser, 1893)	Known only from GMx	ne	Apr	25

Checklist of Acanthocephala from the Gulf of Mexico. (continued)

Taxon	Overall geographic range	GMx range	Host(s)	References/ Endnotes
<i>Bolbosoma vasculosum</i> (Rudolphi, 1819)	Mediterranean region, northeast Atlantic, tropical Atlantic, West Indies, the Caribbean Sea, and GMx	ne	Mde ^M	33, 46, 59, 86, 107, 163
<i>Corynosoma</i> sp.	Eastern Texas coast	nw	Afu ^B	124
<i>Hexaglandula corynosoma</i> (Travassos, 1915)	West Indies into GMx	ne	Nvi ^B , Ura ^{CD} , Usp ^{CD}	34, 99 (see 8)
<i>Polymorphus (Polymorphus) acutis</i> Van Cleave & Starrett, 1940	Bering Sea to GMx	nw	Afu ^B	124, 142
<i>Polymorphus (Polymorphus) brevis</i> (Van Cleave, 1916)	Widely distributed in inland and coastal areas from Baltimore, Maryland, Minnesota, Illinois, and New Hampshire; to central Mexico and the Yucatán Peninsula	ne	Paj ^B	8, 9, 115, 131, 132, 148 ⁹
		ne	Aal ^B	134
		nw	Ahe ^B	9
		ne	Gim ^B	77
		ne	Hle ^B	78, 109
		ne	Per ^B	79
<i>Polymorphus (Polymorphus) obtusus</i> Van Cleave, 1918	Canada, western Atlantic: New York to GMx	ne	Aan ^B , Ahe ^B	8, 9, 106, 140, 145, 146 ¹⁰
<i>Polymorphus (Profilicollis) kenti</i> Van Cleave, 1947	Canada, California to GMx	ne	Esp ^{CD}	9, 67
<i>Polymorphus (Profilicollis) altmani</i> (Perry, 1942)	Northwest Atlantic, California, GMx, also reported from North Carolina	nw	Cal ^B	9, 99, 156
<i>Southwellina dimorpha</i> Schmidt, 1973	Known only from GMx	ne	Eal ^B , Pcl ^{CD}	32, 125
<i>Southwellina hispida</i> (Van Cleave, 1925)	Western Atlantic: New Jersey, Hawaii, USSR, Europe, India, Galápagos Islands	ne	Peo ^B	19, 20, 48, 51, 54, 62, 85, 130, 147
		ne	Paj ^B	132
		ne	Peo ^B , Pau ^B , Mbe ^{B,P}	9
		ne	Gim ^B	77
		nw	Ple	41
		nw	Fgr ^P	24
		sw	Bch	103 ¹¹
<i>Southwellina</i> sp.		ne	Eca ^B	133
		nw		55
Class: Eoacanthocephala				
Order: Neoechinorhynchida				
Family: Neoechinorhynchidae				
Subfamily: Atactorhynchinae				
<i>Atactorhynchus verecundus</i> Chandler, 1935	New York to GMx	nw	Cva	24 ¹² , 26, 41 ¹³
		ne	Cva	25, 102, 157, 158
<i>Floridosentis mugilis</i> (Machado, 1951)	From GMx to Brazil, Argentina, West Indies; Pacific Ocean: México from Baja California to Colima	ne	Mce	21, 34, 44, 74, 84, 101, 119, 138, 154 ¹⁴
		nw	Mce	24
		ne	Mce	25, 72
		ne	McU	157, 158
		sw	McU	103 ¹⁵

(continued)

Checklist of Acanthocephala from the Gulf of Mexico. (continued)

Taxon	Overall geographic range	GMx range	Host(s)	References/ Endnotes
Subfamily: Neoechinorhynchinae				
<i>Neoechinorhynchus doryphorus</i> Van Cleave & Bangham, 1949	Known only from GMx; however, similar forms from some Arabian Gulf fishes were recorded	ne	Fma ¹ , Jfl	12, 150
<i>Octospiniferoides chandleri</i> Bullock, 1957	Recorded also from freshwater habitats of the Yucatán Peninsula and Veracruz, Mexico	ne nw	Lpa ¹ Fgr	25 23 ¹⁶
		ne	Gaf	27, 28

¹ *Caballerorhynchus lamothai* had been recorded also from freshwater fishes of Tabasco and the Papaloapan drainage basin at Veracruz, Mexico (Salgado-Maldonado 2006).

² The tanaidacean reported by Escobar-Briones, Álvarez, and Salgado-Maldonado (1999) as *Discapseudes holthuisi* was later described as a new species, *Discapseudes mexicanus* Guñu, 2006, based on additional specimens from the same locality in the southwestern GMx.

³ Only 3 immature worms were recovered from 31 threadfin, *Polydactylus octonemus*. Therefore, this record might constitute an accidental infection. This genus of acanthocephalans appears to be restricted to members of the genus *Menticirrhus* and closely related genera (Bullock 1957b).

⁴ This species was described from 14 mostly freshwater species of fish from northern Florida and southern Alabama (Williams and Rogers 1984, see also Kráľová-Hromadová et al. 2003).

⁵ First recorded from *Lutjanus jocu* from Jamaica (Cable and Linderoth 1963).

⁶ Also reported from freshwater fish *Ameiurus nebulosus marmoratus* from Florida (Bangham 1940).

⁷ Encapsulated immature specimens were reported among the viscera of a number of spiny rayed fishes (Chandler 1935).

⁸ Definitive hosts for *Serrasentis sagittifer* is a species of fish more common in the deeper water of the Gulf or one that comes inshore during the warmer months (Bullock 1957b). A long list of paratenic hosts from the Atlantic North America that could be inside GMx was provided by Amin (1998).

⁹ Several freshwater fish species have been recorded as paratenic hosts from Florida (ne) (Amin 1992, 1998) and the Yucatán Peninsula (se, sw) (Vidal-Martínez et al. 2001).

¹⁰ Parasitizes various aquatic birds, including *Anas platyrhynchos*, *Ardea herodias*, *Erismatura jamaicensis*, *Mergus merganser*, *Phoenicopterus ruber*, in coastal states from Florida to New York (see Van Cleave 1924).

¹¹ Also in freshwater cichlid fishes from se GMx (see Van Cleave and Lincicime 1939).

¹² Acanthocephalans are not host-specific but generalist species; however, *Atactorhynchus verecundus* appears to be very host specific to *Cyprinodon variegatus* (see Amin 1998).

¹³ The intermediate host of this species is the copepod *Cletocamptus deitersi* (see Dill 1975).

¹⁴ *Floridosentis mugilis* had been recorded also from freshwater fishes in coastal waters of southern GMx (Salgado-Maldonado et al. 2005, Vidal-Martínez et al. 2001).

¹⁵ Also infecting freshwater cichlid fishes from se GMx (Salgado-Maldonado et al. 2005, Vidal-Martínez et al. 2001).

¹⁶ *Octospiniferoides chandleri* is regarded as a marine species; however, recent records from southern Mexico (see Salgado-Maldonado 2006) suggest this could be a rare species but in freshwater fishes. The original description (Bullock 1957a) was based on only 2 immature females recovered from one of 3 Gulf killifish, *Fundulus grandis*, from Texas. Later, Bullock (1957b) stated that no other specimens of this parasite were obtained from 100 other *F. grandis*, and over 600 additional cyprinodontid fishes representing 5 species were likewise negative for this parasite.