

## SHORT COMMUNICATION

## Helminth Parasites in Six Species of Shorebirds (Charadrii) from the Coast of Belize

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*Thirteen species of helminth parasites were recovered from six species of charadriid shorebirds (Aves: Charadriiformes) from Belize: the ruddy turnstone, *Arenaria interpres*, the snowy plover, *Charadrius alexandrinus*, the semipalmated plover, *C. semipalmatus*, the killdeer, *C. vociferus*, the white-rumped sandpiper, *Calidris fuscicollis*, and the black-bellied plover, *Pluvialis squatarola*. Cestode species were predominant (N = 8), followed by trematode species (N = 3) and acanthocephala (N = 2). The trematode, *Paramaritrempsis solielangi* infected four of the six species of hosts. The cestodes, *Nadejdolepis litoralis* and *N. paranitidulans* infected three and two host species respectively. Helminth parasite species were contagious (clumped) and not evenly distributed among hosts. Twelve of the 13 species were generalists. The one specialist *Microphallus kinsellae* was recovered from one *C. fuscicollis*. Three of the four types of feeding guilds were present and in approximately the same number. All but *M. kinsellae* have been reported from other species of hosts, mostly from Eurasia and North America.*

Key words: helminths - parasites - Aves - Charadriidae - shorebirds - ecology - Belize

Belize is a Central American country with its east coast bordering on the Gulf of Mexico. Thirty-two species of plovers (Charadriidae) and sandpipers (Scolopacidae) have been reported from Belize. Twenty-one are common to rare on the gray-white sand beaches adjacent to the ocean. The majority of the shorebirds utilizing the coastline of Belize are winter residents and nest in the Northern Hemisphere (Wood et al. 1986).

There are only two published reports of helminth parasites from shorebirds from Belize. Canaris and Deblock (2000) described *Microphallus kinsellae* Canaris and Deblock, 2000 from *Charadrius semipalmatus* Bonaparte, 1825 and *Paramaritrempsis solielangi* Canaris and Deblock, 2000 from *Arenaria interpres* Linnaeus, 1758. Deblock and Canaris (2000) gave some taxonomic considerations and additional descriptions of the cestodes *Nadejdolepis paranitidulans* (Golikova, 1959) from *Charadrius alexandrinus* Linnaeus, 1758, *N. arenariae* (Cabot, 1969) Deblock & Canaris, 2000 from *A. interpres* and *N. litoralis* (Webster, 1947) Rysavy, 1967 from

*Calidris fuscicollis* Vieillot, 1819. The purpose of this paper is to present information on helminth parasites recovered from six species of shorebirds from Belize.

Twelve ruddy turnstones, *A. interpres*, three snowy plovers, *C. alexandrinus*, two semipalmated plovers, *C. semipalmatus* and one each of the killdeer, *Charadrius vociferus* Linnaeus, 1758, white-rumped sandpiper, *C. fuscicollis*, and black-bellied plover, *Pluvialis squatarola* Linnaeus, 1758 were collected from the ocean beach approximately 8 km north and south of the village of Seine Bight, Belize from March 14 to 21, 1989. Gray-white sand beaches characterize the collecting site and the littoral zone is narrow and uniform because of minimal tidal change. Birds were shot with a shotgun and examined within 2 h. Hosts were examined by dividing the gastrointestinal tract into the following sections: oral cavity, oesophagus, proventriculus, ventriculus, small intestine, paired ceca, large intestine, and cloaca. All other internal organs and body cavity were also examined. Helminth parasites were fixed and preserved in alcohol-formalin-acetic acid (AFA), stained in Ehrlich's hematoxylin or Semichon's acetic carmine and mounted in Canada balsam. Voucher specimens of helminth parasites have been deposited in the collection of the Harold W Manter Laboratory (HWML) University of Nebraska, Lincoln, NE 68588-0514, HWML numbers 15778 to 15788.

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The following statistical procedures were used: variance to mean ratio test ( $S^2/X$  with  $\chi^2$  goodness-of-fit test) for dispersion (uniform, random, contagious) for each species of parasite whose prevalence and abundance was appropriate and Shannon's index for diversity (Pielou's  $J'$  in which a  $J'$  value was calculated for each host and these values were summed and a total mean value for  $J'$  was derived (the closer the  $J'$  value to 1.00, the more evenly the helminths were distributed among the hosts). Host specialists and generalists were categorized using the following criteria; specialists – those helminth species that either have the bulk of reproducing adults found only in a single host species or have been reported from a single host species, and generalists – found or reported from several host species, including hosts from other regions (Bush 1990, Canaris & Kinsella 1998). Parasite guilds were investigated using the following classification used by Bush (1990): (1) T = trematode guild-mucosal, feed by engulfing gut tissue and by absorbing nutrients across the body surface; (2) L = luminal absorbers-large cestodes and all acanthocephalans, attached to the mucosa but bodies are luminal, feed strictly by absorbing materials across the body surface; (3) M = mucosal absorbers-small cestodes intimately associated with the mucosa; (4) N = nematode guild-mucosal, feed strictly by engulfing gut tissue or contents.

A total of 13 species of helminths was recovered from six species of hosts. Three of the helminth species were recently described; *Wardium canarisi* Deblock & Kinsella, 2000 from the black turnstone *Arenaria melanocephala* Vigors, 1828 from Alaska (Kinsella & Deblock 2000) and *Paramaritremopsis solielangi* Canaris & Deblock, 2000 and *Microphallus kinsellae* Canaris & Deblock, 2000 from this study (Canaris & Deblock 2000) (Table). Species of cestodes were predominant (N = 8) followed by trematode species (N = 3) and acanthocephala (N = 2). Four species of helminths infected more than one species of host. The trematode *P. solielangi* infected four of the six, the cestodes *N. litoralis* and *N. paranitidulans* three and two respectively and the acanthocephalan *A. longicolle* two (Table). All species of helminth that could be tested were contagious (clumped) and not evenly distributed among hosts. Twelve of the 13 species of helminths were generalists. The one specialist, *M. kinsellae*, was recovered from one of two *C. semipalmatus*. The three guilds present in the helminth pool from the six species of hosts were almost the same in number: T = 6, L = 7, M = 7 (Table). The pool of helminths infecting the six species of charadriids, except for *M. kinsellae* and *P. solielangi* have been reported

from birds from other geographic localities, mostly from Eurasia and North America (Table).

Trematode species are usually dominant in marine habitats, and cestodes in freshwater environments (Bush 1990, Canaris & Kinsella 1998). In this study, and two done on Bristol Bay, Alaska by Schmidt and Neiland (1968) and Canaris and Kinsella (2000), cestode species were dominant, 62%, 79% and 72% respectively. The uniform gray-white sand beaches of Belize with minimum littoral zone and absence of rocky areas may, in part, account for an absence of proper intermediate molluscan hosts for trematodes. The absence of the nematode guild may be due to small sample size but its absence has been evident in other studies on shorebirds from Alaska (Canaris & Kinsella 2000), Canada (Goater & Bush 1988, Edwards & Bush 1989) and in some species of shorebirds in North and South America reviewed by Anderson et al. (1996).

As in our study, except for several cestode species from the American avocet, *Recurvirostra americana* Gmelin, 1789 (Garcia & Canaris 1987, Hinojos et al. 1993) and black-necked stilt, *Himantopus mexicanus* Müller, 1776 (Hinojos & Canaris 1988) that are uniform in distribution, helminths are usually contagious (clumped), and not very evenly distributed among hosts (Secord & Canaris 1993, Canaris & Kinsella 1998). With our increased knowledge about helminth parasites in shorebirds it has become evident that generalists are much more common than specialists. The one specialist in this study *M. kinsellae* may be a generalist when more species of shorebirds are examined.

The greater affinity of helminth species in shorebirds to North America and Eurasia in our study was also reported in a study done on shorebirds in Bristol Bay, Alaska (Canaris & Kinsella 2000). According to Paulson (1993) all but one species of Eurasian shorebird that breeds in Siberia north of Sakhalin and east of 140°E have been recorded in North America. The reasonably close proximity of the nesting and pre-migratory areas between Siberia and Alaska lends itself to exchange and eventual spread of parasites especially because the majority of the helminths are generalists. More studies have been done on helminth parasites of shorebirds in Eurasia and North America compared to other geographic regions and this has some influence on analysis of these relationships at this time.

Helminth parasite abundance, species richness, variety of species, and the presence of three of the four feeding guilds indicate that the helminth pool in charadriid shore birds is well represented on the coast of Belize. We assume that additional studies

TABLE  
Helminth parasites of six species of shorebirds (Charadrii) from Belize

Host	Parasite and guild	Number infected	Mean abundance	Range	Total	Other localities <sup>a</sup>
Ruddy turnstone <i>Arenaria interpres</i> (N = 12)						
	<i>Wardium canarisi</i> Deblock and Kinsella, 2000 M	12	71.2	1-365	854	2
	<i>Nadejdolepis arenariae</i> Cabot, 1969 M	9	29.4	0-207	353	10
	<i>Anomotaenia multifilamenta</i> Bondarenko and Kontrimavichus, 1980 L	4	12.7	0-83	152	2, 13
	<i>Acanthocirrus retrostris</i> Belapolskaja, 1953	3	52.6	0-567	631	1, 7, 8, 9, 13
	<i>Paramaritrempsis solielangi</i> Canaris and Deblock, 2000	3	18.8	0-150	226	-
	<i>Levinseniella carteretensis</i> Coil and Heard, 1966	3	6.3	0-38	75	12
	<i>Arhythmorhynchus longicolle</i> Villot, 1875	4	4.9	0-38	59	3, 5, 8
Snowy plover <i>Charadrius alexandrinus</i> (N = 3)						
	<i>Nadejdolepis litoralis</i> (Webster, 1947)	3	84.0	39-124	252	6, 13, 15
	<i>Nadejdolepis paranitidulans</i> (Golikova, 1959)	2	109.5	35-184	219	13
	<i>Paramaritrempsis solielangi</i>	3	15.0	9-25	45	-
Semipalmated plover <i>Charadrius semipalmatus</i> (N = 2)						
	<i>Nadejdolepis litoralis</i>	1	0.5	-	1	6, 13, 15
	<i>Progynotaenia americana</i> Webster, 1951	2	1.5	1-2	3	12
	<i>Paramaritrempsis solielangi</i>	1	66.0	0-132	132	-
	<i>Microphallus kinsellae</i> Deblock and Canaris, 2000	1	22.0	0-44	44	-
	<i>Plagiorhynchus charadrii</i> (Yamaguti, 1939)	2	46.0	2- 90	92	4, 11, 14
White-rumped sandpiper <i>Calidris fuscicollis</i> (N = 1)						
	<i>Nadejdolepis litoralis</i>	1	-	-	258	6, 13, 15
	<i>Nadejdolepis paranitidulans</i>	1	-	-	112	13
	<i>Arhythmorhynchus longicolle</i>	1	-	-	1	3, 5, 8
Black-bellied plover <i>Pluvialis squatarola</i> (N = 1)						
	<i>Proterogynotaenia texanum</i> Huey, 1985	1	-	-	541	12
	<i>Paramaritrempsis solielangi</i>	1	-	-	3,028	-
Killdeer <i>Charadrius vociferus</i> (N = 1)		0	-	-	-	

a: 1: Africa; 2: Alaska; 3: Arctic; 4: Australia; 5: British Is.; 6: Cuba; 7: England; 8: Europe; 9: Greenland; 10: Ireland; 11: Japan; 12: North America; 13: Russia; 14: Tasmania; 15: U.S.A. (Texas)

of helminth communities of shorebirds from Belize will reveal new species particularly among the short-lived adult stages such as the microphallid trematodes. We also expect additional commonality of species of helminths among species of hosts in Belize an adjacent regions because of host movement, migration, and sharing of habitat.

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