———, ———, **E. M. White, and R. F. Coombs.** 1975. Distribution of the avian hematozoa of North America. Canadian Journal of Zoology 53: 1762–1787.

Herman, C. M., J. O. Knisley, Jr., and E. L. Snyder. 1966. Subinoculation as a technique in the diagnosis of avian plasmodium. Avian Diseases 10: 541–547.

Johnson, R. J. 1994. American crows. Pages E-33–E-40 *in* S. E. Hygnstrom, R. M. Timm, and G. E. Larson, eds. Prevention and Control of Wildlife Damage. Cooperative Extension Division, University of Nebraska, Lincoln, Nebraska, U.S.A.

Love, G. J., S. A. Wilkin, and M. H. Goodwin, Jr. 1953. Incidence of blood parasites in birds collected in southwestern Georgia. Journal of Parasitology 39:52–57.

Robertson, W. B., and G. E. Woolfenden. 1992. Florida bird species: an annotated list. Florida Ornithological Society Special Publication 6. Gainesville, Florida, U.S.A. 260 pp.

Robinson, E. J., Jr. 1954a. Notes on the occurrence and biology of filarial nematodes in southwestern Georgia. Journal of Parasitology 40:138–147.

———. 1954b. Additional data on filarial worm infections in vertebrates of southwestern Georgia. Journal of Parasitology 40:690–691.

Scarvie, R., and G. W. Clark. 1971. The incidence of haematozoa in the common crow (*Corvus brachyrhynchos*) of western Washington. Journal of Protozoology 18(supplement):14.

Stabler, R. M., P. A. Holt, and N. J. Kitzmiller. 1966. *Trypanosoma avium* in the blood and bone marrow from 677 Colorado birds. Journal of Parasitology 52:1141–1144.

Stevenson, H. M., and B. H. Anderson. 1994. The Birdlife of Florida. University Press of Florida, Gainesville, Florida, U.S.A. 892 pp.

Woo, P. T. K., and C. M. Bartlett. 1982. *Trypanosoma ontarioensis* n.sp. and *T. paddae* from *Corvus brachyrhynchos brachyrhynchos* in Ontario, Canada, with notes on the biology of *T. ontarioensis* n.sp. Canadian Journal of Zoology 60: 2107–2115.

Comp. Parasitol.
69(1), 2002, pp. 96–99

Research Note

Endohelminths from the Little Blue Heron *Egretta caerulea* from the Texas Gulf Coast

NORMAN O. DRONEN[1] AND HSUAN-WIEN CHEN
Department of Wildlife and Fisheries Sciences, Texas A&M University, 2258 TAMU, College Station, Texas 77843-2258, U.S.A.

ABSTRACT: Fourteen species of endohelminths, including 1 acanthocephalan, 3 cestodes, 1 nematode, and 9 trematodes, were collected from 13 little blue herons *Egretta caerulea* from the area of Galveston, Texas, U.S.A. A mean of 4.3 (3–6) species of endohelminths per host was found. Five species (3 cestodes and 2 trematodes) represent new host records. Comparison of results from this study with a similar survey by Sepúlveda et al. (1996) from Florida, U.S.A., suggests some hypotheses concerning possible roles of composition and complexity of trophic structures of these 2 regions in establishment of their respective endohelminth communities in little blue herons.

KEY WORDS: acanthocephalans, cestodes, nematodes, trematodes, *Egretta caerulea*, little blue heron, endohelminth communities, trophic structure, Gulf of Mexico, Texas.

The little blue heron *Egretta caerulea* (Linnaeus, 1758) is a small wading bird commonly found associated with inland waterways and coastal areas of North America, Central America, the Caribbean, and tropical South America (Walters, 1980). Despite its ubiquity, there have been relatively few reports of endohelminth parasites from this heron (Stiles and Hassall, 1894; Vevers, 1923; Travassos, 1930; Polk, 1941; Vigueras, 1944; Caballero and Hildalgo, 1955; Coil, 1955; Cable et al., 1960; Schmidt and Nieland, 1971, 1973), and no survey has been published from the Texas Gulf coast, U.S.A. Sepúlveda et al. (1996) provided a survey of parasitic helminths from 35 little blue herons in Florida, U.S.A., in which they reported 24 species of helminths, including 2 acanthocephalans, 8 nematodes, 13 trematodes, and unidentified cestode proglottids. The current study was intended to supplement existing reports of endohelminths from the little blue heron by providing intensi-

[1] Corresponding author (e-mail: n-dronen@tamu.edu).

Table 1. Prevalences and intensities of intestinal helminths from 13 little blue herons from Galveston, Texas, compared with data for 35 birds from southern Florida collected by Sepúlveda et al. (1996) (species of helminths found only in Florida are not listed).

Helminth*	USNPC no.	Prevalence (%)		Intensity			
				Mean		Range	
		F†	T‡	F	T	F	T
Acanthocephala							
Southwellina sp. (3)	90986	6	15	2	2	—	—
Cestoda							
Cyclustera capito (Rudolphi, 1819)§ (3)	90987	—	23	—	2	—	—
Dendrouterina ardeae (Rausch, 1955)§ (3)	90988	—	31	—	4	—	2–5
Dendrouterina papillifera (Fuhrmann, 1908)§ (3)	90989	—	38	—	4	—	1–11
Nematoda							
Tetrameres sp. (2)	90990	35	46	9	13	1–42	10–17
Trematoda							
Ascocotyle sp. (3, 4)	90991	—	23	—	19	—	18–21
Apharyngostrigea multiovata (Perez-Viqueras, 1944) (3)	90992	24	31	4	8	2–9	2–12
Apharyngostrigea simplex (Johnson, 1904) (4)	90993	6	23	1	13	—	7–17
Clinostomum complanatum (Rudolphi, 1814) (1)	90994	26	38	2	13	1–2	3–7
Diplostomum ardeae Dubois, 1969§ (3)	90995	—	23	—	5	—	3–6
Echinochasmus donaldsoni Beaver, 1941 (3)	90996	31	46	456	51	9–1,770	20–99
Phagiocola longa (Ransom 1920)§ (3, 4)	90997	—	23	—	17	—	7–23
Phagicola nana (Ransom, 1920) (3, 4)	90998	31	38	49	60	22–90	25–195
Posthodiplostomum macrocotyle Dubois, 1937 (3, 4)	90999	8	23	20	191	2-503	28–310

† F = Sepúlveda et al. (1996) from southern Florida.
‡ T = current study from Texas.
§ New host record.
* Numbers in parentheses indicate location in host birds from Texas: (1) oral cavity, (2) stomach, (3) small intestine, and (4) large intestine.

ties of infections and prevalences of helminths from this host along the Texas Gulf coast. We compare the current study from the Texas Gulf coast with the survey of Sepúlveda et al. (1996) from Florida. Intensity and prevalence follow the definitions given by Margolis et al. (1982).

Thirteen adult little blue herons were collected (U.S. Fish and Wildlife permit SCCL 691681 and Texas Parks and Wildlife permit SPR 0890272) from the intercoastal canal in the Galveston area of Texas (6 between December 1977 and November 1978, by shotgun; 4 in August 1992, salvaged specimens; and 3 in August 1995, salvaged specimens) and examined for parasitic helminths. Acanthocephalans, cestodes, and trematodes were relaxed in saline, fixed in alcohol-formalin-acetic acid (AFA), stained with Semichon's carmine, and mounted in Kleermount® or Canada balsam. Nematodes were fixed in warm 70% ethanol and stored in glycerin. A comparison of prevalences and intensities of helminths recovered in this study with those found by Sepúlveda et al. (1996) from Florida is given in Table 1. Representative specimens were deposited in the U.S. National Parasite Collection, Beltsville, Maryland (USNPC 90986–90999).

At least 3 of 14 species of endohelminths were found in all birds examined in Texas (100%). Infected birds each harbored a mean of 4.3 (3–6) helminth taxa. One acanthocephalan (*Southwellina* sp.), 3 cestodes (*Cyclustera capito, Dendrouterina ardeae,* and *Dendrouterina papillifera*), 1 nematode (*Tetrameres* sp.), and 9 trematodes (*Apharyngostrigea multiovata, Apharyngostrigea simplex, Ascocotyle* sp., *Clinostomum complanatum, Diplostomum ardeae, Echinochasmus donaldsoni, Phagicola longa, Phagicola nana,* and *Posthodiplostomum macrocotyle*) were found in Texas. The most prevalent species were *E. donaldsoni* (46%) and *Tetrameres* sp. (46%), followed by *C. complanatum* (38%), *D. papillifera*

(38%), *P. nana* (38%), *A. multiovata* (31%), and *Dendrouterina ardeae* (31%). Prevalences of all other helminth species ranged from 15% to 23%. Although all birds were collected in marine/estuarine habitats, the majority of species found in the current study were those that would likely have freshwater-based life cycles, with *P. longa*, *P. nana*, and possibly *Ascocotyle* sp. being probable saltwater species.

Differences in particular species composition, numbers of species of helminths present, and prevalences and intensities of helminth species found in comparing the current study with that of Sepúlveda et al. (1996) from Florida may be, at least in part, due to the smaller sample size of our study. Despite this difference, several observations suggest some hypotheses concerning the possible roles of the composition and complexity of the trophic structures of these 2 regions in establishment of their respective endohelminth communities. 1) In contrast to the survey of Sepúlveda et al. (1996), where 24 helminth taxa were found, only 14 species were found in the current study. The higher species richness of endohelminths found by Sepúlveda et al. (1996) could have been, in part, a factor of the more diverse ecosystem trophic structures present in Florida, which may have provided additional potential intermediate host species and thus increased the transmission of endohelminths to this definitive host. 2) The presence of the same 8 species of endohelminths in both Florida and Texas (1 acanthocephalan, *Southwellina* sp.; 1 nematode, *Tetrameres* sp.; and 6 trematodes, *A. multiovata, A. simplex, C. complanatum, E. donaldsoni, P. nana,* and *P. macrocotyle*) indicates that food chains that include the intermediate hosts necessary for completion of life cycles for these species were present in the trophic structures of both regions. 3) It is interesting to note that whereas the Florida study reported a large number of nematode species (7) and a small number of cestodes (unidentified proglottids), the Texas study found only 1 species of nematode and 3 species of cestodes. Five species (3 cestodes, *C. capito, Dendrouterina ardeae,* and *D. papillifera*; and 2 trematodes, *Diplostomum ardeae,* and *P. longa*) were found only in Texas and represent new host records, whereas 15 species (1 acanthocephalan, *Neoechinorhynchus* sp.; 8 nematodes, *Acuaria* sp., *Chandleronema* sp., *Contracaecum* spp., *Eustrongylides ignotus* Jaegerskiold, 1909, *Capillaria mergi* Madsen, 1945, *Syncuaria* sp., and *Tetrameres* sp.; and 6 trematodes, *Ascocotyle gemina* Font, Overstreet, and Heard, 1984, *Microphallus turgidus* (Leigh, 1958), *Phagicola diminuta* Stunkard and Haviland, 1924, *Pholeter anterouterus* Fischthal and Nasir, 1974, *Prosthogonimus ovatus* (Rudolphi, 1803), and *Ribeiroia ondatrae* (Price, 1931)) were found only in the Florida study. These observations suggest that some food chains may have been present in the Texas ecosystems sampled that were not present in the Florida ecosystems, and vice versa, thus providing for transmission of those species found only in one region. The absence of saltwater species, such as *Ascocotyle gemina, Contracaecum* spp., *Microphallus turgidus,* and *Phagicola diminuta* from Texas may be due to preferential feeding of little blue herons in fresh water, as indicated by the low number of saltwater species in these birds. 4) Although Florida birds had almost twice as many species of endohelminths as did Texas birds, the overall prevalence (100% in Texas compared with 94% in Florida) and mean number of taxa present (4.3 compared with 2.6) were greater in Texas. In addition, with the exception of intensities of *E. donaldsoni* (456 in Florida compared with 51 in Texas), endohelminth species reported in both of these studies generally had higher prevalences and intensities in Texas. *Echinochasmus donaldsoni* is a species that generally establishes high densities of metacercariae in a broad spectrum of second intermediate hosts, which may account for the higher intensities observed in Florida (Beaver, 1941). These observations suggest that having fewer food chains available and/or higher densities of intermediate hosts supporting these selected endohelminth species may have forced little blue herons in Texas to feed more frequently on a low number of species that served as intermediate hosts, thus concentrating fewer species of endohelminths in birds and resulting in the higher prevalences and intensities seen in Texas. The unidentified cestode proglottids found in the Florida study may represent at least 1 of the 3 species found in Texas. Specimens of *Ascocotyle* sp. were immature and could not be identified to species, but these specimens had longer ceca and a different pattern of the vitellaria compared with *Ascocotyle* sp. reported by Sepúlveda et al. (1996). *Southwellina* sp. and *Tetrameres* sp. could not be identified to species because of the poor quality of our specimens.

The establishment of endohelminth communities in little blue herons is undoubtedly a complex process in which age of birds, seasonal availability of food, diet shift of birds, extent of the areas sampled, and other factors may have contributed to some of the differences between our study and that of Sepúlveda et al. (1996). The possible role of trophic structure suggested above may provide some potential hypotheses that could be tested in future studies.

We are indebted to Dr. Keith Arnold, Department of Wildlife and Fisheries Sciences, Texas A&M University, for providing endohelminths; to the Texas Parks and Wildlife Department, whose cooperation made this study possible; and to Dr. Eric P. Hoberg and Dr. J. Ralph Lichtenfels for access to endohelminth specimens in the U.S. National Parasite Collection. We also thank Dr. Merrill Sweet, Department of Biology, Texas A&M University, for his suggestions in the preparation of this manuscript. This study was funded by the Schubot Exotic Bird Research Center, The Texas Veterinary Medical Center, Texas A&M University.

Literature Cited

Beaver, P. C. 1941. The life history of *Echinochasmus donaldsoni* n. sp., a trematode (Echinostomatidae) from the pied-billed grebe. Journal of Parasitology 27:347–355.

Caballero, E., and C. E. Hildalgo. 1955. Helmintos de la República de Panamá. XVI. Descripción de dos especies de trematodos digeneos de *Florida caerulea* (L.). Revista de la Sociedad Mexicana de Historia Natural 16:29–34.

Cable, R. M., R. S. Connor, and J. W. Balling. 1960. Digenetic trematodes of Puerto Rican shore birds. Scientific Survey of Puerto Rico and the Virgin Islands 17:187–255.

Coil, W. H. 1955. Notes on the genus *Maritrema* Nicoll, 1907 (Trematoda: Microphallidae) with the description of two new species. Journal of Parasitology 41:533–537.

Margolis, L., G. W. Esch, J. C. Holmes, A. M. Kuris, and G. A. Shad. 1982. The use of ecological terms (report of an ad hoc committee of the American Society of Parasitologists). Journal of Parasitology 68:131–133.

Polk, S. J. 1941. *Dilepis hilli*, a new dilepid cestode from a little blue heron. The Wasmann Collector 4:131–134.

Schmidt, G. D., and K. A. Nieland. 1971. Helminth fauna of Nicaragua. IV. *Sacciuterina mathevossiani* sp. nov. (Dilepididae), and other cestodes of birds. Parasitology 62:145–149.

———, and———. 1973. Helminth fauna of Nicaragua. V. *Cardiofilaria stepheni* sp. n. (Onchocercidae) and other nematodes of birds. Proceedings of the Helminthological Society of Washington 40:285–288.

Sepúlveda, M. S., M. G. Spalding, J. M. Kinsella, and D. J. Forrester. 1996. Parasitic helminths of the little blue heron, *Egretta caerulea*, in southern Florida. Journal of the Helminthological Society of Washington 63:136–140.

Stiles, C. W., and A. Hassall. 1894. A preliminary catalogue of the parasites contained in the collection of the U.S. Bureau of Animal Industry, U.S. Army Medical Museum, Biological Department of the University of Pennsylvania (Coll. Leidy) and Coll. Stiles and Coll. Hassall. Veterinary Magazine 1:331–354.

Travassos, L. 1930. Revisão do gênero *Ascocotyle* Looss. 1899 (Trematoda: Heterophyidae). Memórias do Instituto Oswaldo Cruz 23:61–97.

Vevers, G. M. 1923. Some new and little known helminths from British Guiana. Journal of Helminthology 1:35–45.

Vigueras, I. P. 1944. Trematodos de la super-familia Strigeoidea: descripción de un género y siete especies nuevas. Universidad de la Habana 52/54: 295–314.

Walters, M. 1980. The Complete Birds of the World, Illustrated Edition. T. F. H. Publications, Inc., Neptune, New Jersey. 367 pp.