

## Green-Winged Teal Ingest Epibenthic Meiofauna

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**ABSTRACT:** Several hundred green-winged teal (*Aves: Anatidae: Anas crecca*) were observed foraging along a mudflat devoid of seeds and only sparsely inhabited by macrobenthic infauna in southwestern Louisiana. Of eight teal collected in this habitat, four had ingested substantial numbers of meiofauna. Use of prey in this size range has not been reported for waterfowl. Meiofauna have been recognized only recently as important components of the food chain of marsh ecosystems.

### Introduction

Marshes of coastal Louisiana provide habitat for approximately 50% of the green-winged teal wintering in the United States (Rave and Baldassarre 1989). Green-winged teal, more than any other duck species, prefer feeding on mudflats, where they forage primarily for seeds and invertebrates (Bellrose 1980). Macroinvertebrates, such as insects and molluscs, commonly inhabit mudflats in coastal Louisiana (Daiber 1982) and make important contributions to the nutritional requirements of premigration waterfowl (Reinecke et al. 1988).

Macroinvertebrates are closely linked with higher trophic groups in the food chain. For instance, fish and birds regularly forage for shrimp and other crustacea, insect larvae, and annelid worms. However, information on direct interactions between meiofauna, invertebrates small enough to pass through a 0.5-mm sieve, and vertebrates is scarce in the literature (Bell and Woodin 1984; Coull and Bell 1979), and is limited to a few observations of fish ingesting meiofauna (e.g., Feller and Kaczynski 1975; Sibert et al. 1977). There are no reports in the literature of green-winged teal, or any other waterfowl, selectively feeding on meiofauna.

During a study of coastal marshes in Louisiana green-winged teal were observed feeding on mudflats. The purpose of this paper was to document observations of teal feeding on several taxa of meiofauna.

### Study Area and Methods

This study was done at Miller Lake, a 40-ha brackish marsh lake at the 30,756-ha Rockefeller State Wildlife Refuge (SWR) in southwestern Louisiana. (See Gaston and Nasci (1989) for habitat description.) Rockefeller SWR is closed to hunting,

and much of the marsh surrounding Miller Lake is impounded to stabilize water levels and improve waterfowl habitat. Miller Lake is influenced by lunar tides, and becomes a mudflat (i.e., brackish tidal flat) at low tide. Sediments may remain exposed for several days when north winds (i.e., wind-driven tides) drive water from the area. Miller Lake is bordered by deep *Spartina patens* marsh. The area is used by waterfowl throughout the year, and serves as a refuge and feeding area for large flocks of green-winged teal during the winter and early spring (Rave 1987).

Green-winged teal were collected with shotgun at Miller Lake on February 2, 1987 after their flock was observed feeding on a mudflat for 20 min. It was not possible to approach the feeding teal without causing them to take wing, so observations were made from vegetation near the mudflat and teal were collected as they passed overhead. Care was taken to collect teal from the group that was actively foraging near the mudflat shoreline. Esophagi and gizzards were removed immediately and preserved in 5% buffered formalin. Foods were rinsed of formalin in the laboratory the following day and transferred to 70% ethanol. Invertebrates that numbered over 1,000 were estimated to the nearest hundred. Invertebrates of the mudflat were collected with a 15 cm × 15 cm pole-mounted Ekman grab and two 1-l containers, preserved in 5% buffered formalin, later transferred to ethanol, and washed on a 0.25-mm sieve. Because an airboat was needed to get on the mudflat, invertebrates were not sampled until the day following teal collections.

### Results

Eight green-winged teal were collected from a flock of approximately 3,000. Several hundred of the flock were actively foraging along the water's edge of a broad mudflat at Miller Lake during a rising tide. Due to the gradual slope of the mudflat,

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TABLE 1. Esophagi contents of eight green-winged teal collected at Rockefeller State Wildlife Refuge (Cameron Parish, Louisiana). Taxa guide: O, Ostracoda; D, Decapoda; I, Insecta.

Taxa	Teal No. =	Numbers of Organisms <sup>a</sup>							
		1	2	3	4	5	6	7	8
<i>Cyprideis salebrosa</i> —O	3,900	1,000	27	1	0	0	0	0	0
<i>C. gelica</i> —O	1,100	400	0	0	0	0	0	0	0
<i>Candona verretensis</i> —O	7	0	0	0	0	0	0	0	0
Ostracoda (unid.)	10	8	0	0	0	0	0	0	0
Harpacticoid copepoda	5,000	3,400	71	24	0	0	0	0	0
Nematoda	2,200	2,300	55	11	0	0	0	0	0
<i>Pinnixa</i> sp.—D	1	0	0	0	0	0	0	0	0
Chironomidae—I	0	0	0	0	0	0	0	0	11
Odonata—I	0	0	0	0	0	0	0	0	1

<sup>a</sup> When counts exceeded 1,000 organisms estimates were made to the nearest 100.

a thin lens of tidal water less than 1 cm deep encroached on the mudflat and allowed some teal to forage along a 200-m muddy shoreline. Esophagi of two of the eight teal collected were filled with meiofauna: mostly ostracodes, harpacticoid copepods, and free-living nematodes (Table 1). Esophagi of two additional teal contained lower numbers of the same meiofaunal taxa. The remaining four teal apparently had not fed, because their esophagi were empty, except one that had ingested some insect larvae and pupae. Gizzards of all eight teal contained seeds of marsh vegetation and small amounts of the same invertebrates found in the esophagi.

Containers of water dipped from the site contained fewer than 10 harpacticoids l<sup>-1</sup> and no ostracodes or nematodes. Sediment collected from the feeding area was inhabited by moderately dense populations of polychaetous annelids and bivalve molluscs, but few ostracodes, copepods, or nematodes, and no seeds (Table 2).

### Discussion

Feeding behavior of the teal and ecology of the meiofauna suggest that the teal were feeding on

meiofauna concentrated in the water just above the sediment surface. These meiofaunal taxa generally live on or near the sediment surface, and occasionally concentrate in great abundance. Apparently the concentrations of meiofauna were not present when sediment and dip samples were taken, which was the day after teal were collected.

Feeding on meiofauna may be common in teal, even though it has not been reported previously. Meiofauna are small, and without magnification they may be indistinguishable from detritus and sediments. It is possible that previous studies of teal failed to detect or record presence of meiofauna.

Meiofauna may be important to teal, but probably do not comprise a major dietary component of most other waterfowl. Teal regularly feed on mudflats (Bellrose 1980; Rave and Baldassarre 1989), especially during late winter when other foods are depleted, and they have fine spacing of their lamellae that allows ingestion of small invertebrates (Armstrong and Nudds 1985). Although meiofauna commonly inhabit muddy substrates of tidal marshes (Daiber 1982), they may be too small to be selected by most waterfowl species. Northern shovelers (*Anas clypeata*) also feed on mudflats in coastal Louisiana; however, gut contents of six shovelers that I collected in intermediate marshes of Rockefeller SWR contained some macrofauna, but no meiofauna.

Less than two decades ago it was suggested that meiofauna were ingested solely by meiofaunal predators, and that little energy transfer occurred to higher trophic levels (McIntyre and Murison 1973; Giere 1975). Most ecologists now recognize that interactions between meiofauna and macrofauna are fairly common (Bell and Woodin 1984; Dye and Lasiak 1986), but direct interactions between meiofauna and most vertebrates are rare. This report of teal ingesting meiofauna is the first published record of vertebrates, other than fish, selectively feeding on meiofauna.

TABLE 2. Dominant invertebrate taxa of a brackish tidal flat on Rockefeller State Wildlife Refuge, Cameron Parish, Louisiana. Taxa guide: P, Polychaeta; OL, Oligochaeta; M, Mollusca; I, Insecta.

Taxa	Number of Organisms per Sample Plot <sup>a</sup>
Nematoda	50
Ostracoda (unid.)	122
<i>Mediomastus californiensis</i> —P	91
Naididae—OL	46
Tellinidae—M	73
Copepoda	32
<i>Capitella capitata</i> —P	20
<i>Streblospio benedicti</i> —P	18
Chironomidae (larvae)—I	13

<sup>a</sup> Sample plot = 15 cm × 15 cm quadrat, n = 2.

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