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A New Species of Teal from the Pleistocene (Rancholabrean) of Wyoming

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The late Pleistocene fossil avifauna from Little Box Elder Cave, Converse County, Wyoming consists of 1,051 identifiable bones representing 84 taxa and 71 species (Emslie in press). These remains include 65 Anatidae bones identified as *Branta canadensis*, *Anas crecca*, *A. platyrhynchos*, *A. acuta*, *A. discors* or *A. cyanoptera*, *A. clypeata*, *Anas* spp., *Aythya collaris*, and *Mergus merganser*. In addition to these 65 bones is one Anatini carpometacarpus that differs in morphology and is considerably smaller than any other Recent or fossil teal from North America. This bone is described here as a new species.

Skeletal specimens of Recent species used for comparison include *Nettapus auritus* (1♂), *N. coromandelianus* (1♀), *Anas crecca* (24♂, 10♀, 13?), *A. querquedula* (2♂, 1♀), *A. discors* (14♂, 17♀, 1?), *A. cyanoptera* (5♂, 5♀), *A. hottentota* (3♂), *Aythya affinis* (1♂, 1♀), *Histrionicus histrionicus* (1♀), *Bucephala albeola* (1♂, 3♀), *Amazonetta brasiliensis* (1♂, 1♀), and *Oxyura jamaicensis* (2♂, 1♀). Specimens of North American teals examined are from a variety of geographic locations including Alaska, Montana, Utah, California, Arizona, Minnesota, and Florida to ensure that extremes in size and osteological characters were encountered. Fifteen

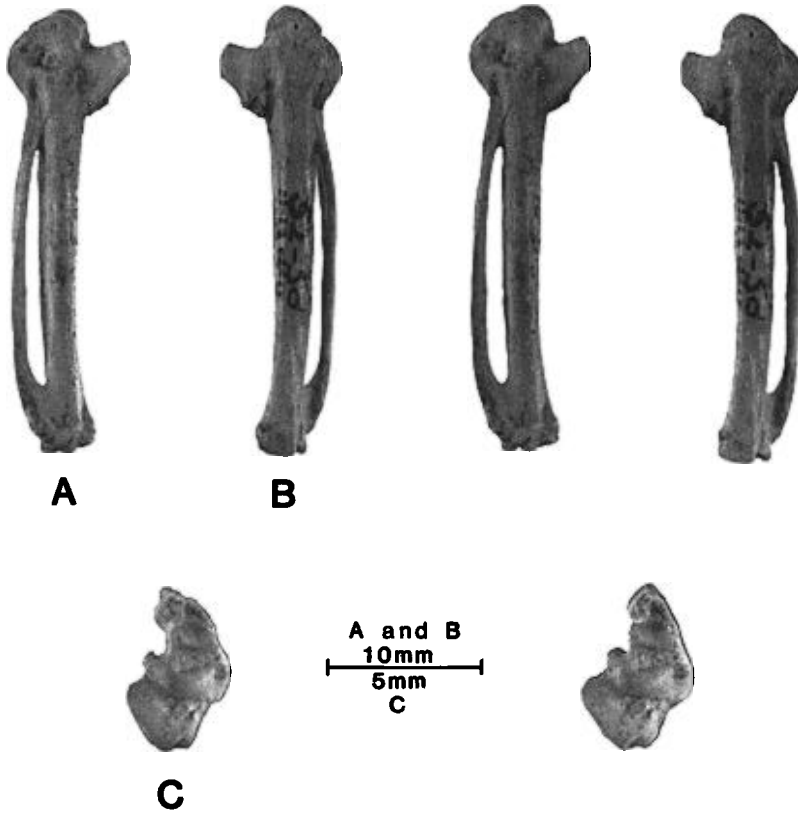


Fig. 1. Stereophotographs of the (A) internal view, (B) external view, and (C) distal end of the left carpometacarpus (UCM 49533) of *Anas schneideri* from Little Box Elder Cave, Wyoming. Views A and B are 2× and C is 4× natural size.

fossil carpometacarpi of *Anas crecca* were compared from the late Pleistocene localities of Little Box Elder Cave (3); Arredondo (2) and Itchetucknee River (1), Florida; Rancho La Brea (4), California; and Smith Creek Cave (5), Nevada (see Table 1).

Seven measurements on the carpometacarpus were used to compare specimens: total length, proximal depth through process of metacarpal I, least depth and breadth of metacarpal II, breadth of proximal (carpal) trochlea from the plane of the external surface to the internal surface of the trochlea, distal breadth from the plane of the metacarpal symphysis to the external surface of the tuberosity, and distal depth from the anterior surface of the facet for digit III to the posterior surface of the tuberosity. All measurements were taken with Vernier calipers to the nearest 0.1 mm.

DESCRIPTION

The carpometacarpus from Little Box Elder Cave is referable to the Subfamily Anatinae by characters

given by Woolfenden (1961: 25): the extensor attachment on the process of metacarpal I extends distally onto the distal edge of the process, and the upper surface of metacarpal II is rounded with no sharp edges. In addition, *Anas* can be distinguished from *Oxyura* and *Bucephala* by the distal metacarpal symphysis, which is larger and extends farther proximally in *Anas*.

Family ANATIDAE
Tribe ANATINI
***Anas schneideri*, new species**

Holotype.—Complete left carpometacarpus with distal end slightly damaged, University of Colorado Museum No. 49533. Collected by personnel from the University of Colorado Museum, Boulder, in July 1952 from late Pleistocene (Rancholabrean) deposits near the center of the cave at a depth of 308–359 cm (see Anderson 1968).

Measurements.—See Table 1.

Etymology.—The species is named in honor of Paul

TABLE 1. Measurements (mm) of the carpometacarpus of Recent and fossil teals.

	Total length	Proximal depth	Breadth proximal trochlea	Least depth metacarpal II	Least breadth metacarpal II	Distal breadth	Distal depth
Recent specimens							
<i>Anas crecca</i>							
n	47	43	47	43	43	47	43
Range	33.8-40.2	8.1-9.3	3.6-4.3	2.5-3.1	2.1-3.1	3.8-4.5	4.1-5.0
$\bar{x} \pm SD$	36.4 \pm 1.2	8.6 \pm 0.24	3.9 \pm 0.14	2.8 \pm 0.15	2.8 \pm 0.16	4.0 \pm 0.16	4.7 \pm 0.17
<i>A. discors</i>							
n	32	30	32	30	30	32	30
Range	34.6-40.2	8.0-9.6	3.6-4.3	2.5-3.3	2.6-3.2	3.7-4.5	4.5-5.2
$\bar{x} \pm SD$	38.0 \pm 1.29	8.8 \pm 0.32	3.9 \pm 0.15	2.8 \pm 0.17	2.9 \pm 0.16	4.1 \pm 0.17	4.8 \pm 0.19
<i>A. cyanoptera</i>							
n	10	8	10	8	8	10	8
Range	36.0-39.8	8.5-9.0	3.5-4.1	2.6-2.9	2.7-3.1	3.7-4.4	4.4-5.1
$\bar{x} \pm SD$	38.1 \pm 1.3	8.8 \pm 0.16	3.9 \pm 0.22	2.7 \pm 0.14	2.9 \pm 0.14	4.0 \pm 0.19	4.7 \pm 0.23
<i>A. hottentota</i>							
n	3	3	3	3	3	3	3
Range	31.6-32.7	7.4-7.7	3.5-3.6	2.2-2.3	2.3-2.5	3.5-3.7	4.1-4.3
$\bar{x} \pm SD$	32.2 \pm 0.55	7.6 \pm 0.17	3.6 \pm 0.05	2.3 \pm 0.05	2.4 \pm 0.1	3.6 \pm 0.1	4.2 \pm 0.11
Fossil specimens							
<i>A. bunkerii</i> ^a	35.0	—	4.3	—	—	3.6	—
<i>A. pullulans</i> ^b	—	8.3	3.6	—	—	—	—
<i>A. crecca</i> ^c							
n	11	13	13	13	13	13	12
Range	34.3-37.5	8.3-9.2	3.4-4.3	2.0-3.0	2.7-3.1	3.5-4.4	4.2-5.2
$\bar{x} \pm SD$	36.3 \pm 0.89	8.7 \pm 0.31	3.9 \pm 0.24	2.7 \pm 0.26	2.9 \pm 0.13	4.1 \pm 0.24	4.7 \pm 0.3
<i>A. schneideri</i>	29.3	8.1	3.5	2.3	2.3	3.8	4.3

^a Data from Wetmore (1944).

^b Data from Brodkorb (1961).

^c See text for description of specimens.

B. Schneider, an outstanding field biologist and ornithologist who died in an automobile accident in 1983 while completing field work in southern Nevada.

Paratypes.—Known only from type.

Diagnosis.—The specimen compares most closely with *Anas crecca* in all characters except: (1) at least 13% smaller total length, (2) shaft of metacarpal II and III relatively more robust, (3) shaft of metacarpal II bends towards tuberosity of metacarpal II farther proximally on shaft, (4) internal ventral edge of carpal trochlea generally higher and more steeply curved, and (5) tendinal groove shallower and less distinct.

DISCUSSION

Anas schneideri is distinctly smaller than any other living or fossil teal from North America (Table 1). Table 1 indicates that Recent and Pleistocene *A. crecca*, the smallest North American teal, are at least 13% longer than *A. schneideri*. Further comparisons of size can be made using the methodology of Martin and

Mengel (1980). These authors estimate the variability in size of fossil geese using data from Recent, closely related species. Figure 2 illustrates the mean \pm 2 SD of the total length of carpometacarpi of Recent and Pleistocene teals and of *A. schneideri*. The predicted variability in *A. schneideri* is estimated by assuming that the holotype represents the mean and by using the SD of Recent *A. crecca*. These comparisons indicate that the probability of obtaining a carpometacarpus of *A. crecca* within the predicted range of *A. schneideri* is still <0.001 .

The only living teal that approaches the size of *A. schneideri* is *A. hottentota* of Africa. Bones of this teal, however, are similar to other living teals and lack the characters described above for *A. schneideri*. Carpometacarpi of immature teals also were examined and found to be porous and less dense than bones of adults and to have an unfused metacarpal III. The specimen of *A. schneideri* is completely ossified and lacks these characteristics, indicating it is from a fully developed individual. That the specimen may represent a pathology, perhaps caused by poor development in a specimen of *A. crecca*, is discounted by

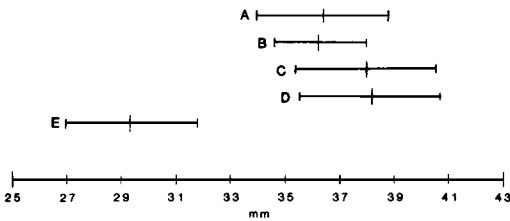


Fig. 2. The mean (vertical line at midpoint of each horizontal graph) \pm 2 SD of the total length of carpometacarpus of (A) *Anas crecca*, Recent ($n = 47$), (B) *A. crecca*, Pleistocene ($n = 11$), (C) *A. discors*, Recent ($n = 32$), (D) *A. cyanoptera*, Recent ($n = 10$), and (E) *A. schneideri*. The length of the holotype of *A. schneideri* was used as the assumed mean, and the SD of *A. crecca*.

the relative proportions of the bone that are correct, especially at the distal end (Fig. 1), and the lack of any pathological growths on the bone.

Wetmore (1944) described a new species of teal, *Anas bunkerii*, from the early Blancan of Kansas. The holotype, a right carpometacarpus, is similar to living teals in length and characters but differs in being more robust, and it is larger than *A. schneideri* (see Table 1). McCoy (1963) described *Anas itchtucknee* from the Pleistocene of Florida. The holotype, a left coracoid, is similar in characters to *A. discors* and is much larger in size than *A. crecca*. Moreover, Campbell (1980) questions the validity of this species. Other fossil teals from North America are from Tertiary deposits. These include *Anas integra* from the middle Hemingfordian of South Dakota (Miller 1944), *A. pullulans* from the middle to late Clarendonian of Oregon (Brodkorb 1961), *A. greeni* from the late Clarendonian of South Dakota (Brodkorb 1964), and *A. ogallalae* from the middle to late Clarendonian of Kansas (Brodkorb 1962). *Anas pullulans* is known from the proximal end of a left carpometacarpus that approaches the size of *A. schneideri* (Table 1) except for the proximal breadth of metacarpal II, which is 3.3 mm in *A. pullulans* (Brodkorb 1961) and 2.9 mm in *A. schneideri*. The metacarpal I also is lower, relatively and absolutely, in *A. pullulans* than in *A. schneideri*. *Anas ogallalae*, known from a distal humerus, is only slightly smaller than *A. crecca* (Brodkorb 1962), and *A. greeni*, known also from a distal humerus, is larger than *A. ogallalae* and approaches the size of *A. crecca* (Brodkorb 1964). As *A. schneideri* differs in size, characters, and temporal position from these specimens, it can be recognized as a new, small species of teal.

Little Box Elder Cave has a diverse mammalian and avian fauna. Extinct taxa that have been identified from this locality include *Arctodus simus*, *Martes nobilis*, *Panthera leo atrox*, *Equus conversidens*, *Camelops cf. hesternus*, *Hemiauchenia* sp., and *Neophrontops americanus* (Anderson 1968, 1974; Kurtén and Anderson 1974; Emslie in press). These taxa are typical of late Pleistocene (Rancholabrean) faunas of western North

America. No carbon-14 dates are available from this site.

Bones of teals are common in Rancholabrean localities, probably as a result of raptors roosting and/or nesting near the site (e.g. Howard 1952). Although other Pleistocene teal remains from Little Box Elder Cave, Bell Cave, and Little Canyon Creek Cave, Wyoming; Smith Creek Cave, Nevada; American Falls and Moonshiner Cave, Idaho; and Rancho La Brea, California, were examined, no other bones of *A. schneideri* were found.

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NOTE ADDED IN PROOF

Recently, several complete elements of a probable new species of small duck have been identified from the Love Site, a late Clarendonian fossil locality in Alachua County, Florida (J. Becker pers. comm.). The carpometacarpus of this duck is smaller in length and more slender than, but not referable to, *A. schneideri*. This new species from an avifauna dated at 9 m.y. old, currently under study by J. Becker, indicates that a niche for a very small duck has existed in North America since the late Miocene.

Do Female Red-winged Blackbirds Limit Harem Size? I. A Removal Experiment

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Intrasexual aggression as a part of the reproductive strategy of female birds has been neglected until quite recently. Female-female aggression has been observed in several species of birds [Red-winged Blackbirds (*Agelaius phoeniceus*), Nero 1956, LaPrade and Graves 1982, Yasukawa and Searcy 1982; Brown-headed Cowbirds (*Molothrus ater*), Kevin Teather in prep.; Mountain Bluebirds (*Sialia currucoides*), Power and Doner 1980; Eastern Bluebirds (*Sialia sialis*), Gowaty 1981; Tree Swallows (*Tachycineta bicolor*), Lef-felaar and Robertson in press; Tetraonidae, Scott 1942, Wiley 1973, Robel and Ballard 1974, Hannon 1983, 1984]. However, few studies have directly addressed the function and efficacy of female-female aggression.

LaPrade and Graves (1982) observed increased aggression by female Red-winged Blackbirds toward conspecific female models as the breeding season progressed and interpreted this in terms of parental investment theory (Trivers 1972, Dawkins and Carlisle 1976). They suggested that the females increased the level of defense of their offspring as the cost of replacing them increased. Yasukawa and Searcy (1982) presented evidence that female Red-wings attempted to monopolize male parental care by preventing additional females from joining the harem. Hurly and Robertson (1984) demonstrated that female Red-winged Blackbirds behaved territorially and suggested that this aggressive behavior was effective in deterring further recruitment into harems.

Here we present the results of a female removal experiment testing the effectiveness of female-female aggression in limiting harem size. We predicted that new female Red-winged Blackbirds would settle when aggressive resident females were removed, and that new nest initiations would occur more frequently in male territories where harem size was maintained at an artificially reduced level than in similar

control territories. Support for our predictions would suggest that female-female aggression is an important factor limiting harem size.

This study was conducted at the Queen's University Biological Station north of Kingston, Ontario. The study site was Barb's Marsh, a 2-ha marsh dominated by willow (*Salix* spp.) and cattail (*Typha* spp.).

The front half of the marsh was searched for nests 3 times weekly from early May to the end of July 1981. Nests were marked by placing a numbered piece of flagging tape on vegetation approximately 1 m from the nest. Thirteen territories of males were mapped during the first three weeks of May. A random-number generator was used to select 7 experimental territories, leaving the remaining 6 as controls. Female removals occurred between 1800 and 2100 on 23 and 25 May and 6, 9, and 18 June 1981. On each of these days all females that could be associated with nests in the experimental territories were shot using a 12-gauge shotgun. Nests of incubating females were left as a test to ensure that the eggs were unattended on subsequent nest checks. If a removed female had nestlings, they were removed and killed in ether.

We attempted to remove all females nesting in the experimental territories. Some individuals (4) were very secretive and could not be shot without great disturbance of other females or some degree of uncertainty of identity; consequently, they were not removed. None of these females could have been responsible for new nest initiations. In general, an active nest was taken as an indication of a female on a male's territory. In two instances females that could not be associated with active nests were removed. These females vocalized and refused to leave the males' territories, so it was assumed that they either possessed nests that had not been found or were in the process of building nests. After the beginning of the remov-