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Extraordinary Size and Survival of American Black Duck, *Anas rubripes*, Broods

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Two female American Black Ducks (*Anas rubripes*) were initially observed during June 1982 with 20 Class Ib or 18-22 Class Ia-b ducklings in two wetlands in Hancock County, Cherryfield, Maine. Fifteen of 20 ducklings (75%) in one brood and 16 of 18-22 ducklings (72-89%) in the other brood survived to fledge. These large broods probably resulted from post-hatch brood amalgamation.

Key Words: American Black Duck, *Anas rubripes*, brood size, duckling survival, post-hatch brood amalgamation, Maine.

Exceptionally large broods of North American dabbling ducks (*Anas* spp.) that exceed average clutch size (8-10 eggs, Zammuto 1986) occur when females (1) lay extraordinarily large clutches, (2) lay eggs in nests of conspecifics ("pre-hatch brood amalgamation" (Pre-HBA), or brood parasitism; Eadie et al. 1988), or (3) hatch their own clutches and acquire the brood of another female ("post-hatch brood amalgamation" (Post-HBA); Eadie et al. 1988). Pre-HBA, which can be either inter- or intra-specific, and post-HBA occur infrequently in the Anatini; only 3 of 9 species of Anatini were reported by Eadie et al. (1988) for either type. Tufts (1986) in Nova Scotia reported brood amalgamation for three American Black Duck broods when he released orphaned ducklings near females with broods. Herein, we report two records of probable post-HBA resulting in two extremely large broods of wild American Black Ducks in Maine.

Study Area and Methods

We observed the two broods in two Beaver (*Castor canadensis*) flowages (Snake Flowage, 44º37'N, 68º06'; BFA Flowage, 44º 39'N, 68º07'W) that were 20 km northwest of Cherryfield, Maine, in township T10 SD, a forested area that has negligible acid-neutralizing capacity and low nutrients in wetlands (Norton 1980). We obtained morphometric and water chemistry characteristics of wetlands by methods of McAuley and Longcore (1988). We mapped and classified (Cowardin et al. 1979) both wetlands, and we sampled invertebrates in one (Snake Flowage), as part of related fieldwork (J. R. Longcore, unpublished data). All observations of broods followed the survey protocol of Longcore and Ringelman (1980). Morning visits on wetlands began 0.5 hour before sunrise and lasted two hours; the 2-h evening visit ended ≥0.5 hour after sunset. Broods were always sought on both wetlands simultaneously, and observers scanned wetlands with binoculars (7×50) and spotting scopes (20-60×) from elevated (4-5 m high) platforms. We backdated brood age (Gollop and Marshall 1954*) to determine approximate dates that first eggs were laid.

Results

During 3 June – 12 July 1982. we observed two American Black Duck broods that were twice (20 and 18-22 ducklings) the size of average broods. Each brood was seen three times. Both broods were seen on the same wetland on the same day (8 June) by DGM. Both broods were observed on 12 July during the even-

Table 1. Characteristics of the two brood-rearing wetlands with the large American Black Duck broods in Cherryfield, Maine, 1982.

Variable	Snake Flowage	BFA Flowage
Wetland System, Class	Palustrine, Forested Wetland	Palustrine, Forested Wetland
Basin area (ha)	4.9	4.5
Surface water area (ha)	4.9	3.4
% Submergents	10	78
% Emergents	28	22
% Flooded timber	41	78
pH (in situ)	5.51	6.13
Alkalinity (μeq L^{-1})	58.8	83.0
Conductivity (μS cm^{-1})	24.0	23.0
Calcium (μeq L^{-1})	59.4	77.5
Phosphorus (ug L^{-1})	70	170
Color (Hazen units)	170	150

ing visit, each by a different observer on a different wetland, thereby corroborating that two different broods existed as first identified by plumage characteristics (Gollop and Marshall 1954*). The brood of 20 declined to 15 (75% survival) and the brood of 18-22 declined to 16 (73 or 89% survival) at Class III size near fledging. The features of the two wetlands are described by the variables in Table 1. We sampled invertebrates in Snake Flowage, which contained the highest ($P < 0.0001$) number of aquatic Insecta per sample (mean = 257) compared with nine other wetlands sampled in the area (J. R. Longcore, unpublished data).

Discussion

At Moosehorn National Wildlife Refuge, Maine, and at Lake Dalhousie, Nova Scotia (J. R. Longcore, unpublished data), we have observed Class III American Black Duck broods of 10 ducklings, which are near mean clutch size. The two large broods, however, were twice the clutch size (mean ±1 SD) of American Black Ducks in Maine (10.4 ±1.3), in Vermont (9.6 ±1.8; Coulter and Miller 1968), in Maryland (9.1 ±1.8; Stotts and Davis 1960), or in Quebec (9.2 ± 1.7; Reed 1970). Other studies of American Black Ducks have reported large clutches but rarely as large as the broods we observed. Reed (1970) reported sizes of mostly first clutches during 12-25 April, as 13, 14, 15, and 17 eggs in Quebec. Both Coulter and Miller (1968) and Stotts and Davis (1960) reported clutch sizes of 14 or 15 eggs, and Krementz et al. (1991) reported that in 1982 American Black Ducks nesting on islands in Chesapeake Bay averaged 10.2 ± 3.0 eggs per clutch, ranging from 7-20 eggs, but it was unknown whether large clutches were from one female.

For our two wetlands adequate food seemed available for females to lay large clutches because the highest mean number of invertebrates per sweep net sample was from Snake Flowage among 10 wetlands sampled (J. R. Longcore, unpublished data). By backdating clutches we determined that these females, if they laid the entire clutch, would have initiated egg laying about 7 and 14 April, similar to early egg dates of 1-10 April for Maine and Vermont (Coulter and Miller 1968). Although ducks may adjust clutch size to environmental conditions (Skutch 1967), if these two females had laid 20 to 22 eggs per clutch, mass of the clutch would have been 1248 – 1373 g (62.4 g/egg × 20 or 22 eggs), which would have equaled or exceeded mass of a female and been >2 times the average mass of a usual clutch (mean = 580.3 g, Arnold 1988). Therefore, it is possible that each female produced the entire clutch for these large broods, but it seems improbable.

The possibility of intra-specific pre-HBA (hatch brood amalgamation) is supported by Stotts and Davis (1960) who reported two instances of American Black Duck females laying eggs in the nest of another female. They (Stotts and Davis 1960: 145) also commented that "Eleven others [clutches] may have been the result of similar parasitism (a total prevalence of 1.8 percent)." An example of inter-specific pre-HBA also was recorded by Stotts and Davis (1960) who documented that an American Black Duck female began laying in a Mallard (*Anas platyrhynchos*) nest that contained five eggs. The Mallard laid four more eggs before deserting, but the American Black Duck laid 11 eggs to equal a 20-egg mixed clutch. Also, they reported that two American Black Duck females nested within 46 cm of each other on an offshore duck blind in Chesapeake Bay, Maryland; one female gradually incorporated the other's clutch into her own and incubated all eggs (Stotts and Davis 1960: 142). Large clutches associated with ducks nesting on islands, however, may be related to high nest density (i.e., 25.2 – 35.7 nests/ha on Bodkin Island, Chesapeake Bay, Krementz et al. 1991); but is uncommon elsewhere (e.g., 0.06 – 0.12 nest/ha in Maine bogs (Coulter and Miller 1968: 35). Because nest sites are not limiting in Maine or across the breeding range, nesting females are widely dispersed, except on islands (Coulter and Miller 1968), nests are well hidden (Bent 1923), and females are secretive when returning to nests in twilight hours (J. R. Longcore, unpublished data), it seems improbable that our large broods resulted from intra-specific pre-HBA (Beauchamp 1997). The third explanation for the large broods is intra-specific post-HBA. For this scenario, two additional clutches of 10-12 eggs must have hatched at the same time and ducklings in those broods were then acquired by the females that we observed. We know that two other American Black Duck broods (i.e., of five and 10 ducklings) used Snake Flowage at the same time as the large broods. To account for this scenario of post-HBA, six American Black Duck broods of similar age must have been associated with these two wetlands. Concentration of broods on high quality

wetlands is common (Longcore et al. 1998); indeed these two wetlands also supported one Green-winged Teal (*Anas crecca*), three Wood Duck (*Aix sponsa*), and four Hooded Merganser (*Lophodytes cucullatus*) broods. For the 20-duckling brood, JRL recorded on 24 June that some ducklings appeared to be in different age Classes (i.e, IIb and IIc), which suggests post-HBA; however, the duckling brood of 18-22 appeared as all the same age to DGM. The two brood-rearing females were large, extremely attentive, and especially adept in eliciting rapid responses from ducklings by uttering a few low calls. Although females are capable of laying large clutches and the remote possibility of nest parasitism (pre-HBA) exists, we conclude that the most plausible explanation for these two large broods was intra-specific post-HBA.

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