long energetic pursuit flights involving many drakes. The Blue-winged Teal and Shoveler do not generally engage in these spectacular attempted rape flights and this may be related to defense of small, discrete territories and the strong residency patterns in these species (McKinney 1975, Seymour 1974).

The performance of courtship displays by unpaired males in observations 1 and 2 suggests that formation of a pair bond was their main objective. These unpaired males were observed to be mobile, moving from pair to pair in the same manner as described for unmated Gadwall drakes (Dwyer 1974). Rape by unpaired males has not been documented in any *Anas* species and, in the Blue-winged Teal, attempts would likely be thwarted by mate defense by the paired male. Attempts to mount the female (e.g. incident 4) appeared to be socially facilitated (Weidmann 1956) and perhaps unpaired drakes could be successful in instances where they greatly outnumber the paired male. However, our observations suggest that mounting attempts by unpaired males were always unsuccessful.

In the Blue-winged Teal, rape attempts by paired males may occur at any time during the breeding season and are not necessarily associated with weakening pair bonds as suggested by McKinney (1965). Rape chasing could benefit paired males in two ways: (1) stolen copulations may result in fertilization of some eggs (McKinney 1975), and (2) intruding pairs are removed from the territory.

Paired males defend their females by attacking those males which are attempting to mount the female, as has been documented in the Mallard (Weidmann 1956) and Gadwall (Dwyer 1974). In all cases, females tried to escape from harassing drakes through flight and/or diving and females never appeared to solicit copulation from harassing drakes.

Acknowledgments.—We thank Scott Derrickson, Frank McKinney, and Rodger Titman for reviewing this manuscript and contributing useful ideas. These observations were made while all of us were being supported by the North American Wildlife Foundation through the Delta Waterfowl Research Station, Manitoba, Canada. Robert Bailey was also supported by a scholarship from the National Research Council of Canada.

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Received 7 May 1976, accepted 10 December 1976.

A Device for Measuring Egg Volumes

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McNicholl (1973, Auk 90: 915) pointed out the difficulties of obtaining data on bird egg volumes under field conditions. The various shapes of eggs, even of a given species, make it difficult to derive a formula that will give volume from simple measurements of length and breadth, even for all the eggs in a single clutch (Preston 1974, Auk 91: 134). The simple direct method of immersing the egg in a graduated cylinder

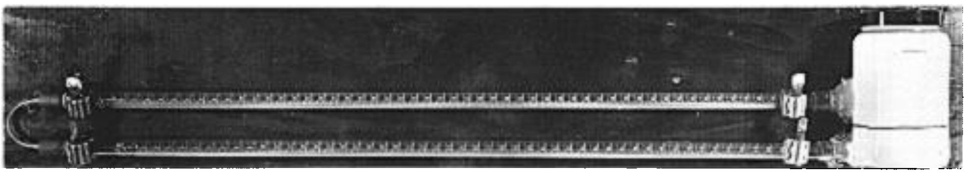

Fig. 1. The egg volumeter.

filled with water and reading the difference is not very accurate for single eggs because if the cylinder is large enough to introduce the egg, the graduations cannot be read with much precision.

We reasoned that if a device could be built that would permit introducing the egg and then reading the difference in a more constricted cylinder, the method of direct water displacement could be made accurate enough to be useful.

Our device is a plastic reservoir to which are cemented two graduated buret tubes of 50-cc capacity each. The burets can be read to 0.1 ml. The reservoir has a wide-mouthed opening on the side for the introduction of eggs (Fig. 1). The assembly is attached to a wooden board to make it easier to handle.

To use this device, which we call an "egg volumeter," the burets are positioned vertically and all bubbles are coaxed out of the reservoir into the burets. The volume levels on both burets are read. If the volumeter is held correctly, the readings will be identical as the burets are connected at the top by a small rubber tube. The device is then laid horizontally so that the burets fill with water and one can unscrew the cap without loss of water. The egg is introduced without splashing. A small loop of twisted wire is useful for lowering the egg carefully and for retrieving it later. After replacing the screw cap (its original position can be duplicated by lining up indicator marks), the burets are returned to the vertical position and again bubbles are coaxed out of the reservoir. The burets are read again and the difference between these readings and the initial ones corresponds to the egg volume.

We checked the accuracy of the volumeter by measuring the volume of spheres and blocks of known dimensions. The device was found to be accurate within 2% on a series of six objects. A comparison of volumes of 12 chicken eggs measured by the volumeter with those obtained by weighing the eggs in air and

TABLE 1. Egg dimensions of several species of Florida birds[a]

	N	Length (mm)	Width (mm)	Volume (ml)	k[b]
Cattle Egret[c] (*Bubulcus ibis*)	19	45.44 ±2.35	32.47 ±1.08	24.07 ±2.58	.501 ±.0089
Great Egret[c] (*Casmerodius albus*)	21	56.32 ±2.09	40.41 ±1.30	46.86 ±4.00	.508 ±.0074
Snowy Egret[c] (*Egretta thula*)	23	42.73 ±1.26	31.72 ± .87	21.91 ±1.23	.510 ±.0056
Louisiana Heron[c] (*Hydranassa tricolor*)	21	45.00 ±1.62	32.52 ±.844	24.00 ±1.42	.504 ±.0072
White Ibis[d] (*Eudocimus albus*)	19	58.18 ±2.37	38.82 ±1.18	44.71 ±3.93	.509 ±.0083
Laughing Gull[e] (*Larus atricilla*)	30	51.77 ±2.53	38.09 ±1.42	37.24 ±4.02	.495 ±.0116
Gull-billed Tern[f] (*Gelochelidon nilotica*)	24	45.90 ±1.41	32.84 ± .85	24.74 ±1.66	.499 ±.012
Least Tern[f] (*Sterna albifrons*)	25	31.30 ±1.02	22.78 ± .71	8.12 ± .58	.499 ±.012
Royal Tern[f] (*Sterna maxima*)	20	63.11 ±1.60	44.83 ±1.04	63.09 ±3.56	.497 ±.006
Black Skimmer[f] (*Rynchops niger*)	28	44.88 ±2.01	32.43 ±1.14	23.60 ±1.82	.500 ±.011

[a] Mean values ± SD.
[b] $V = kLW^2$ This empirically derived function is useful for calculating the volume of an egg from length and width alone (Preston 1974, Auk 91: 132).
[c] Near Vero Beach, 13 April 1977, one egg from each clutch.
[d] Near Ft. Pierce, 13 April 1977, one egg from each clutch.
[e] St. Petersburg, 30 April 1977, ten clutches of three.
[f] Near Jacksonville, July 1976, some complete clutches, some single eggs.

again in water (Evans 1969, Auk 86: 560) yielded differences of from −1.0% to +0.8% (SD = 0.5%). The volumeter also proved to be precise within ±0.5% in a series of two eggs measured five times each.

We used the volumeter to gather data on egg volumes of 10 species of Florida birds. These measures are given in Table 1.

The first device we constructed was designed to measure eggs in the 20–70-ml range; therefore we designed it with two burets, each of 50-ml capacity. The small amount of water lost in introducing the egg (some always clings to the loop, for example) was acceptable in eggs of 20-ml volume or more, because it was a small percentage of the total volume of the egg, but on smaller eggs this constant error was too great to tolerate. We built a device with one buret of 50-ml capacity, but it was no more accurate than the two-buret model. We then built a smaller volumeter with two burets, each of 10-ml capacity, which could be read to .025 ml. This device was accurate within ±2% on eggs of about 8-ml volume if used carefully. It remains to be seen if this method can be refined enough to be useful on small eggs (5 ml or less).

The major source of error in the use of the device was loss of water when removing the lid of the reservoir through splashing and droplets clinging to the edge of the mouth. Great care must be exercised in this part of the procedure to avoid spillage. The smaller the diameter of the reservoir the less spillage is likely to occur, as the water level will be farther from the top in a smaller reservoir.

Care should be taken to keep the device clean. Dirt and excrement, often introduced on the eggs, cause water to cling to the sides of the burets rather than sheeting down into the reservoir as it should. The machine should be washed out after each day of use. We used the cleaning rod for a .410 gauge shotgun to swab out the bore of the burets. Ample time should be allowed for the water to drain down into the reservoir before reading, particularly with the smaller burets. Cracked or pipped eggs should not be measured.

Each egg should be measured twice and the two values averaged. If the difference between the two is more than 2%, a third measurement should be taken and averaged in. If there is a wide discrepancy between any two measurements, the volumeter should be checked carefully for leaks or other malfunctions and further measurements taken to determine the source of the error.

We have used the volumeter to obtain measures of egg volumes of 10 species in Florida (Table 1).— *Received 19 January 1976, accepted 17 September 1976.*

Observations on behavior and vocalizations of a pair of wild Harpy Eagles.—The Harpy Eagle (*Harpia harpyja*), usually considered the most powerful of the world's raptors (Brown and Amadon 1968: 62), ranges from southern Mexico to northern Argentina but is nowhere common. It is most often encountered in the Guyanan region where Haverschmidt (1968) mentioned seeing them fairly regularly in disturbed forest about 100 km south of Paramaribo. Snyder (1966) reported it distributed throughout Guyana where Fowler and Cope (1964) studied two nests and learned of several others. Little field information is available on this species. Bond (1927), Overington (1937), and O'Neill (in litt.) provide information on nests, eggs, and young, while Fowler and Cope (1964) have contributed the bulk of what is known of the species in the wild. Brown and Amadon (1968) mention some behavior of paired Harpy Eagles in captivity but we have found no reference to the behavior of wild pairs.

Shortly after dawn on 7 May 1970 along a road 70 km southeast of Upata, southeastern Bolivar, Venezuela, we found two Harpy Eagles perched on trees where they had probably roosted for the night. We stopped our car, and after a minute the larger of the two birds, the presumed female, which had been perched about 10 m up in a *Cecropia* tree, flew to a large tree about 75 m away. The smaller bird, presumably the male, sat less than 25 m from us, about 15 m up on a dead snag, and devoted more attention to its apparent mate than to us. The two had been perched about 30 m apart. Both appeared to be in fully adult plumage with grey head and dark breast band. The male occasionally elevated the elongated crown feathers, momentarily assuming an "eared" look.

Both eagles were initially silent. The male then flew to a tree closer to the female and commenced uttering a soft duck-like quacking, similar to that which Fowler and Cope (1964) heard from a female Harpy attending a juvenile at the nest. The female responded by giving a yelping note (see Fig. 1), and the smaller bird then flew to the same tree and landed about 10 m below her. The two continued calling in alternation. We could not, however, positively determine that only one bird was quacking and only one yelping. No other vocalizations were heard from these birds.

The male began to move upward in the tree by a series of small jumps and short flights. As he approached, the female flew to the top of another tall tree. The two birds ceased calling briefly, but the calling resumed when the male flew to that tree, landing about 20 m below the female. He again progressed upward towards her, whereupon she flew to another tree about 100 m off, but still in view. After several silent minutes, the