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

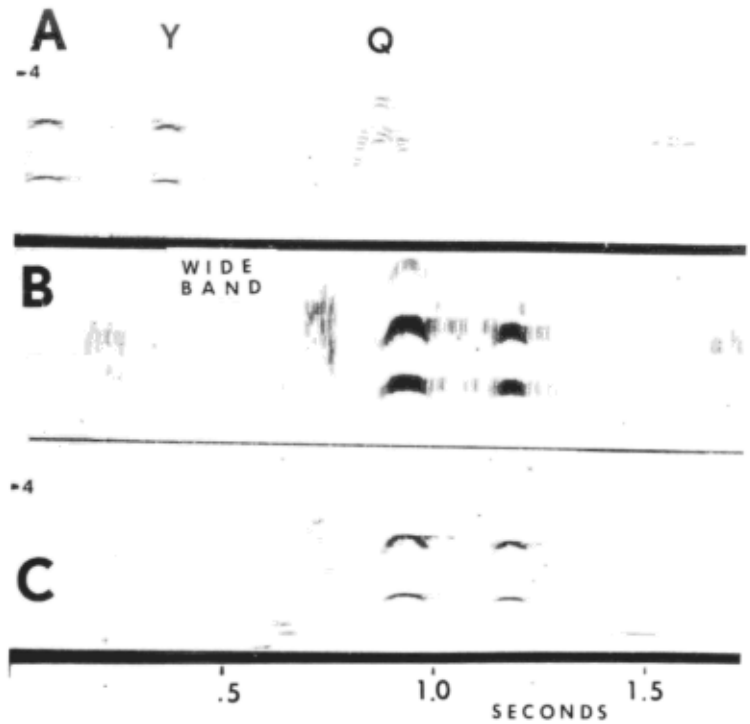

Fig. 1A, Y = yelp of female and Q = quack of male (narrow band). 1B, quack note (wide band) showing combined amplitude and frequency modulation. 1C, additional yelp notes from the Venezuelan female, virtually identical to yelp notes of Mexican captive male. These recordings were made 70 km southeast of Upata, Bolivar, Venezuela.

male flew to that tree, again landing below her, and the calling resumed. The male began moving upward in that tree, and when he was within about 5 m, the female flew off again, this time out of our sight over a small hill. It was now quite light, and through a 20× telescope we could watch the male preening. He remained silent for about 5 min, and then flew over the hill in the direction taken by the female. Although we had clearly disturbed the female from her original roosting perch, it did not appear that we influenced their behavior during their subsequent maneuvering in trees about 75–150 m from us. The habitat was originally dense lowland humid evergreen forest (altitude about 200 m), from which many of the large trees had been selectively cut. Several plots had been cleared for planting by slash-and-burn techniques, and it was in one of these abandoned areas surrounded by forest that we were able to study the eagles.

In flight the birds struck us as cumbersome; their short direct flights with rapidly beating wings gave no indication of the speed that the Harpy is said to attain when hunting. In October 1974 at the Oklahoma City Zoo, Gochfeld watched a similar interaction of a pair of Harpy Eagles. The male gave "quack" notes and the female "yelp" notes in alternation for periods of several minutes. The female accompanied each call by a slight outward flick of the wing. Further studies of this pair are planned (J. Snelling, pers. comm.). This captive pair was nesting. Their behavior supports our impression that the pair we saw was engaged in courtship or pair-bond maintenance behavior.

We recorded the vocalizations of the wild pair and compared them with recordings obtained from a captive pair at the Zoological Park directed by Sr. Miguel Alvarez del Toro in Tuxtla Gutierrez, Chiapas, Mexico, on 12 August 1966. This captive pair was initially silent, but the male began screaming (Fig. 2) when some children approached his cage. Some screams were preceded by single yelping notes. These calls may have reflected annoyance, but the birds did not seem to react to the visitors in any other manner. The female of this captive pair uttered occasional soft notes (Fig. 2C). Vocalizations were recorded on a Uher 4000L recorder at 19 cm/sec (7.5 ips.) and were analyzed on a Kay 6061 B sonagraph using both narrow- and wide-band filters.

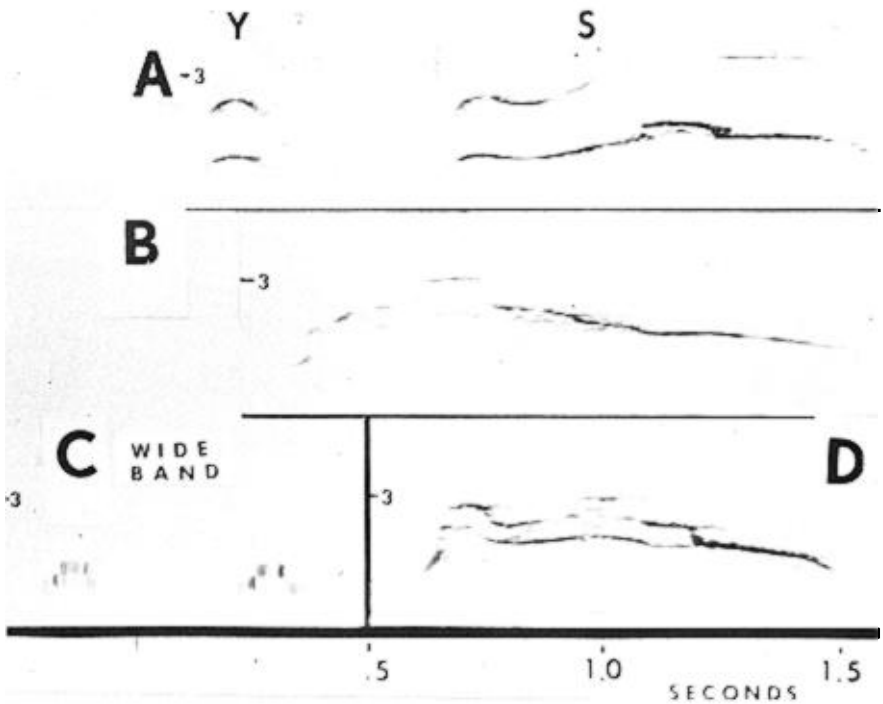

Fig. 2A, Y = yelp and S = scream of captive male Harpy Eagle. 1B and 1D, variations of the scream, note preceded by yelp. 1C, soft call notes (wide band) of captive female. Recordings made at zoo in Tuxtla Gutierrez, Chiapas, Mexico.

Figure 1 shows a sequence of yelps and quacks given by the wild female and male respectively. These calls were alternated, but not with fixed intervals. There was no time when only one bird was calling. Figure 1B shows frequency modulation in the quacking note. Figure 1C shows a yelping note which is virtually identical to the yelping note of the captive male (Fig. 2A). Screams from the captive bird are presented in Fig. 2 showing calls with and without a preceding yelp, and showing variation both in duration and structure of the scream, which approximates a pure whistle. The context of vocalizations in this species and in large raptors in general is poorly known.

We are grateful to Paul Schwartz and William Phelps for hospitality and information. J. P. O'Neill and J. Snelling provided information on Harpy Eagles in eastern Peru and in the Oklahoma zoo. Dean Amadon, Eugene Eisenmann, and Edwin O. Willis made useful criticisms of the manuscript.

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