

GENERAL NOTES

Further notes on the Pinnated Bittern in Mexico and Central America.—Since the description of the Mexican form of the Pinnated Bittern, *Botaurus pinnatus caribaeus* (Dickerman, Wilson Bull., 73:333–335, 1961), 17 additional specimens have been collected in Mexico and Central America that substantiate the color characters used to describe *caribaeus* and add to our knowledge of the species' range. One of these from Costa Rica was previously reported by Slud (Bull. Amer. Mus. Nat. Hist., 128:43–44, 1964). Slud (p. 44) questioned the validity of the Mexican form *caribaeus*, but apparently misunderstood the characters of the latter race. Wing and tail length, stressed by Slud, were not utilized as characters, and the bill of the Costa Rican bird matches South American *pinnatus*, as it should. Slud's statement that his bird "approaches the description of *caribaeus* in general appearance" may be discounted, as he saw no specimens of that form. Actually, in coloration, the specimen is typical of the nominate race. Some of the 11 recent Mexican specimens are worn and faded; however, fresh-plumaged Mexican birds are definitely paler, less ochraceous than fresh-plumaged Central or South American specimens (see list of specimens examined below). This is most dramatic in the color of the auriculars, which are sandy buff in *caribaeus* in contrast to ochraceous buff in *pinnatus*. In series, ventrally, *caribaeus* is whiter, less buffy. The auriculars of the juvenile *caribaeus* from Tabasco (Dickerman, *ibid.*:334) are richer than are those of adults, and thus approximate the color of the auriculars in the nominate form. A second juvenile *caribaeus* beginning the first prebasic molt was taken 14 August near Lerdo de Tejada, Veracruz.

The exposed culmen of *caribaeus* averages slightly longer than the exposed culmen of *pinnatus*. The measurements are: seven female *caribaeus* 84–91 mean (87.4); nine female *pinnatus* 78–87 (82.9); ten male *caribaeus* 87–96 (91.9); thirteen male *pinnatus* 82–104 (89.5).

Additional Specimens Examined.—*Botaurus pinnatus caribaeus*: Veracruz: 2 mi. W. Tecolotla (3); 2 mi. E, 2 mi. S Tlacotalpan (2); Ingenio San Cristobal [= near Cosamaloapan] (1); Lerdo de Tejada (5). Tabasco: 14 mi. S. Villahermosa (1); Yucatan: 2 mi. S Progreso (1).

Botaurus pinnatus pinnatus: Costa Rica: Finca Taboga, Departamento de Guanacaste (1); Nicaragua: 11 mi. S San Carlos, Departamento de Río San Juan (1); El Salvador: Laguna Jocotal, Departamento de San Miguel (1).

The specimens from Yucatan and El Salvador are the first record of the species from those areas.

I wish to thank Dr. Thomas R. Howell, University of California, Los Angeles and Dr. George H. Lowery, Jr., Louisiana State University, for permission to examine recently taken specimens in those respective collections. Scientific collecting permits were provided by the Departamento de Conservacion de la Fauna Silvestre, Secretaria de Agricultura y Ganaderia of the Mexican Government.—ROBERT W. DICKERMAN, *Department of Microbiology, Cornell University Medical School, New York, New York, 18 May 1971.*

Chronology of hatching by laying sequence in Canada Geese.—Prince, et al. (Auk, 86:762–763, 1969) found a high correlation between the sequence of laying and the order of hatching in artificially incubated Mallard (*Anas platyrhynchos*) eggs. There is no evidence of this same correlation in the Canada Goose (*Branta canadensis*). During

TABLE I
CORRELATION OF LAYING, PIPPING, AND EMERGENCE SEQUENCE

| Comparison | Number of Eggs | Correlation Coefficient (r) | Percent Variation Explained (R) |
|-------------------------------|----------------|-----------------------------|---------------------------------|
| Laying Sequence vs. Pipping | 110 | 0.32** | 10 |
| Laying Sequence vs. Emergence | 109 | 0.20 | 4 |
| Pipping vs. Emergence | 80 | 0.69** | 47 |

(** $p \leq 0.01$)

a nesting study of Canada Geese conducted in the spring of 1971 on Marshy Point near Clarkleigh, Manitoba, Canada, we made observations on the order of pipping and order of emergence compared to the order of laying.

Nest searches were made during the egg-laying period in April. Nests containing one egg were visited every other day and each new egg marked with a soft-lead pencil. After the completion of the clutch, these nests were periodically revisited to check for destruction. Hatching time was predicted by using a 28-day incubation period (Brakhage, J. Wildl. Mgmt., 29:761, 1965).

We visited nests two days prior to the predicted hatching day and subsequent checks were conducted every 12 hours to determine hatching progress. When emergence was imminent, nests were inspected every four to six hours. Only those nests in which the exact pipping and emergence sequence was known, those which contained a minimum clutch of four eggs, and those in which at least 70 per cent of the original clutch hatched successfully were included in the analysis.

A significant simple correlation coefficient was found between the pipping sequence and the emergence of the goslings and between laying sequence and pipping sequence. No significant correlation was found between laying sequence and emergence (Table 1).

Prince (op. cit.) found that 80 per cent of the variation in hatching sequence was explained by laying sequence; only four per cent of the variation in gosling emergence was explained by laying sequence. The results of the two studies suggest possible species differences and/or possible differences between natural and artificial incubation environments.

The average time required for a gosling to emerge once an egg was pipped was about 24 hours, agreeing with Collias and Jahn (Auk, 76:494, 1959), Brakhage (op. cit.:762), and MacInnes (J. Wildl. Mgmt., 26:251, 1962). The elapsed time between pipping and emergence (range of 15-30 hrs.) was less than the 8 to 36 hour range reported by Kossack (Amer. Midland Naturalist, 43:645, 1950).

If the last egg hatched between daylight and early afternoon, the female left the nest with the brood the following morning. However, if the last egg hatched in the late afternoon or during the night, the female remained on the nest with the brood the following day and did not lead them away until the morning of the second day. The only variation in this behavior occurred when three females were frightened by us and the dry goslings followed. The gander was never observed brooding dry goslings off of the nest while the female was still incubating the remainder of the clutch as reported by Kossack (ibid.).

The hatchability of the eggs was 89 per cent; well within the normal range found for Canada Geese (Brakhage, op. cit.:767). One dead gosling was found in a nest after

brood departure, and there were no desertions. The air temperature during the 15 day period that the hatching checks were made averaged 48.2°F and ranged from a minimum of 26° to a maximum of 70°. No precipitation fell during the hatching period and we believe the study had no measurable effect on nesting success, hatching, or gosling mortality.

This is a contribution of the Massachusetts Cooperative Wildlife Research Unit (supported by the U.S. Bureau of Sport Fisheries and Wildlife, the Massachusetts Division of Fisheries and Game, the University of Massachusetts, and the Wildlife Management Institute), the Massachusetts Agricultural Experiment Station and the Delta Waterfowl Research Station. Thanks are due the owners of East Meadows Ranch for facilities provided.—JAMES A. COOPER AND JON R. HICKIN, *Department of Forestry and Wildlife Management, University of Massachusetts, Amherst, Massachusetts 01002, 6 July 1971.*

Spring migration of Swainson's Hawk and Turkey Vulture through Veracruz, Mexico.—At 15:40 hours, 22 March 1970, on Highway 180, 9 km west of Cardel, Veracruz we observed a massive migration of Swainson's Hawks (*Buteo swainsoni*) and Turkey Vultures (*Cathartes aura*) heading generally north-northwest. The hawks, apparently all in typical adult plumage, were in loosely formed flocks of 75 to 200 birds flying approximately 50 to 300 m above the ground. In 30 minutes we conservatively estimated that 1,600 hawks passed overhead.

An approximately equal number of Turkey Vultures were migrating at the same time; they tended to segregate into homogeneous flocks traveling at lower altitudes and wheeling and turning more than did the Swainson's Hawks. At 16:10 we continued south toward Veracruz and observed flocks of migrating birds along the coastal plain to 28 km south of Tamarindo. The weather was warm and overcast.

On 23 March, another overcast day, we encountered along the same route hundreds of migrating birds 14 km south of Tamarindo. Again the Swainson's Hawks tended to be higher than the vultures, although the vultures outnumbered the hawks. As soon as we started up the mountains west of Tamarindo into heavy clouds, we no longer saw migrating flocks.

On 26 March which was mainly overcast with a few short breaks of sunlight and a strong wind off the Gulf of Mexico, we encountered migrating birds on Highway 180 12 km north of Vega de Alatorre at about noon. From there to Tecoluitla we observed thousands of vultures. Often they were just above the tops of the palms and other trees bordering the Gulf, but we saw none over the water itself. Hawks were few, although about 27 were over Puente Nautla at 12:13. The stratification of species was still evident. Our northernmost observation was 32 km south of Poza Rica at 15:00.

The spectacular migration of both species through Central America has been noted by many authors. In Veracruz Swainson's Hawk migrations have been reported by Loetscher (*Auk*, 72:14-54, 1955) near Las Vigas and Jalapa. Sutton and Pettingill (*Auk*, 59:1-34, 1942) witnessed migrating Swainson's Hawks near Gomez Farias, Tamaulipas, in April. Turkey Vulture spring migration in Veracruz was reported by Wetmore (*Proc. U. S. Natl. Mus.*, 93:215-340, 1943) and Bussjaeger et al. (*Condor*, 69:425-426, 1967). Heretofore the extensive occurrence of both species migrating together this far north has not been reported. Monroe (*Ornithol. Monogr.* No. 7:1-458, 1968) reported the two species together in Honduras. Dickey and van Rossem (*Field Mus. Nat. Hist., Zool. Ser.* No. 23:1-609, 1938) noted migrating flocks of Turkey Vultures and Swainson's Hawks in El Salvador in the fall. They stated that hawks and