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LEAN-SEASON FAT IN A SOUTH AMERICAN POPULATION OF BLACK-NECKED STILTS

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Up to the present time, very little information is available concerning variations of weight and fat content in bird species residing permanently in tropical areas. Odum and Perkinson (1951) write: "Deposition of lipids and increase in weight in wild birds may occur seasonally during regular periods, especially (1) prior to migration in spring and fall and (2) in winter. The former deposition, or migratory fat, is lacking in non migratory birds, and the latter, or winter fat, is probably absent from birds wintering or residing permanently in the Tropics, although there are few data." Nevertheless, according to Ward (1964, 1965a, 1965b), Grant (1965, 1966), and Britton (1967), in the case of sedentary birds in tropical areas, we may expect some variations of weight and fat content in correlation with reproductive activities and availability of food. In order to investigate these variations, I collected specimens of the Black-necked Stilt (*Himantopus mexicanus*), a sedentary species of northeastern Venezuela.

LOCALITY AND METHODS

The specimens of Black-necked Stilt were shot near Cumaná (Laguna San Luis and El Peñón) and Chiguana, between January 1966 and April 1967. Cumaná, capital of the State of Sucre in northeastern Venezuela, is located at the mouth of the Gulf of Cariaco (10°25′42″ N and 64°11′36″ W). Chiguana on the other hand is about 60 km E of Cumaná, at the head of the Gulf of Cariaco (10°30′ N, 63°40′ W). A full description of the lagoons where the birds were taken is given by McNeil (1968, 1970).

As far as possible, groups of three or four individuals were collected at intervals of 10–15 days. However, this objective was not always attained because of the low number of birds in some periods of the year. Shooting hours varied between 07:00 and 10:00; these hours were maintained because of the possibility of diurnal variations in weight and fat content. Such variations have been reported by Helms (1963) in some species of Fringillidae.

In the laboratory, I used a modification of the lipid extraction method proposed by Odum (1960) and Odum et al (1961). McNeil and Carrera de Itriago (1968) describe their fat extraction method as follows: "The dry weight was obtained by drying the specimens in a hot air oven at 80°C for 2 days. After storage for 2 days in a cold petroleum ether bath (10 cc/g dry material), the specimens were removed and boiled for 30 min in a Soxlet apparatus containing petroleum ether. After a second 1-day drying period, the lean dry weight was obtained. Dry weight and lean dry weight were determined to 0.01 g. The difference between dry weight and lean dry weight gave the fat content; likewise the difference between fresh weight and dry weight gave the water content." In the case of Black-necked Stilts, because of the size of the species, the drying time was four days instead of two. For a more detailed description of this method, see McNeil (1968, 1969, 1970).

RESULTS AND DISCUSSION

The Black-necked Stilt (Recurvirostridae) is a very common sedentary species in northeastern Venezuela, especially in fresh and brackish water lagoons, in saltwater lagoons surrounded by mangrove forest, and also in flooded lowlands during the rainy season. According to my observations, the calendar of

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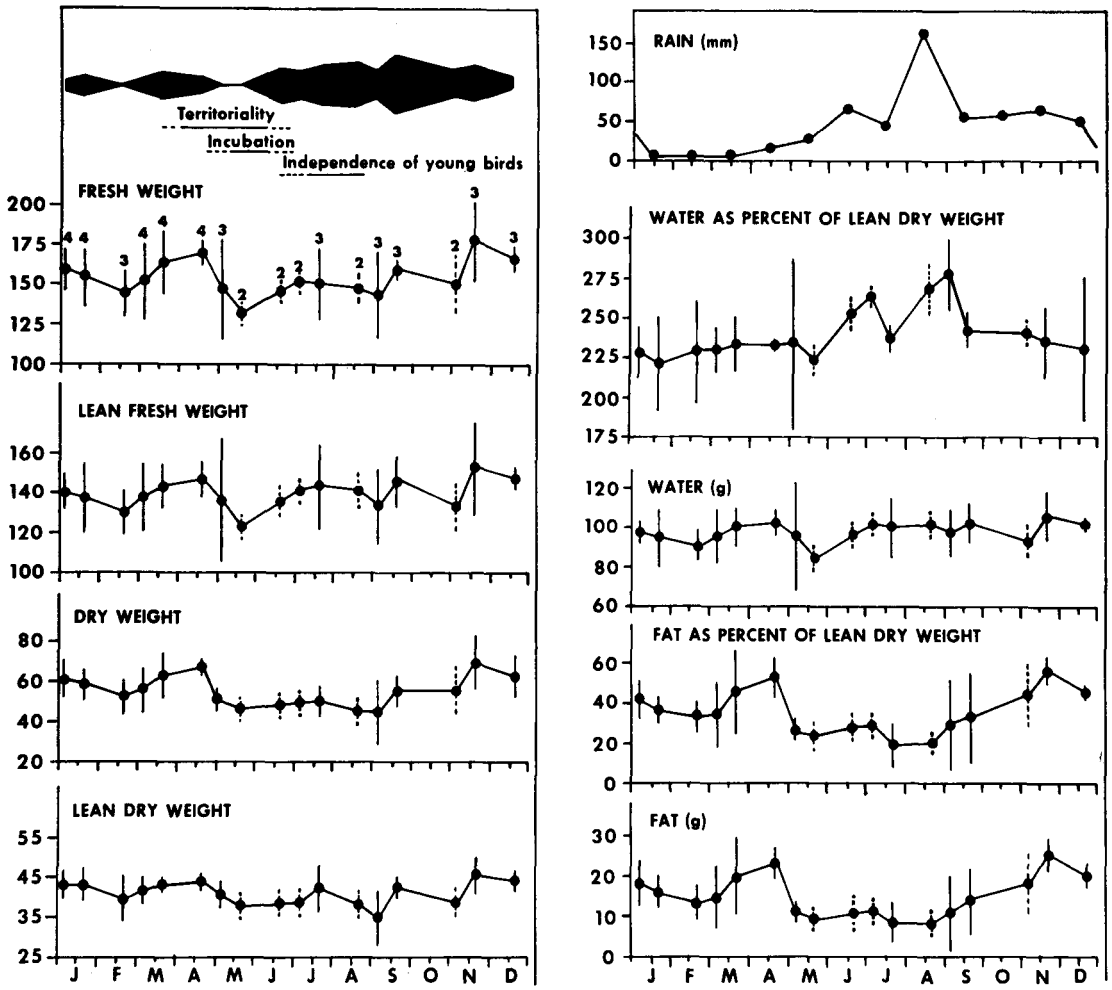

FIGURE 1. Seasonal changes in fresh weight, lean fresh weight, dry weight, lean dry weight, fat, and water content in relation to the molt period, the reproductive activities, and the rainy season for the Black-necked Stilt in northeastern Venezuela. (Circles represent the mean; solid vertical lines indicate the confidence limits for the mean where $t = t_{(.975;\ N-1)}$ when $N \geqslant 3$, while broken vertical lines show the range of values when $N = 2$. The polygon illustrates the duration and relative intensity of molt. Numerals indicate size of samples.)

activities for this species may be summarized as follows (fig. 1): (a) partial prenuptial molt involving the substitution of body feathers in March and April; (b) setting up and defense of the territory from the end of March to the end June; (c) laying and incubation from the end of April to the beginning of July; (d) independence of young birds beginning at the end of June; (e) full postnuptial molt from the end of June to January.

The presence of *Himantopus mexicanus* in a given lagoon varies seasonally, depending upon seasonal variations in the physical properties of the lagoon. Thus during the dry season, from January to April (fig. 1), this species is crowded in the lagoon complex of San Luis (periodically fed by surplus fresh-water from irrigation canals of cultivated fields) while it is missing or rare in El Peñón and Chiguana lagoons, which become drier with the arid season. During the breeding season, the Black-necked Stilt frequents, in addition to San Luis lagoon, part of El Peñón lagoon, also fed by freshwater from irrigation canals. The breeding season (setting up and defense of territories) starts in San Luis before that in El Peñón. As a matter of fact, favorable conditions for reproduction of *Himantopus mexicanus* appear in El Peñón only after the beginning of the rainy season, that is, at the end of April. The Black-necked Stilt is not common and apparently does not breed in the saltwater lagoons of Chiguana. But it breeds a few kilometres farther, in the lowlands flooded during the rainy season between Cariaco and Chiguana, and in the freshwater lagoon of Campoma, 5 km E of Chiguana. After the breeding season, from July onward, the abundance of Black-necked Stilts decreases both in San Luis and in El Peñón. This is the time when many young and adult birds disperse toward the flooded lowlands in the rainy season.

Figure 1 shows the seasonal variations of the physiological pre- and postreproductive state of 51 specimens. Before egg-laying, at the end of the prenuptial molt and at the time of pair formation and setting-up of territories, *Himantopus mexicanus* gains both in weight (fresh and dry weights) and fat content: the mean fat index as per cent of lean dry weight is

52.2. Such a prereproductive fat deposition has been observed in a South American race of Wilson's Plover, *Charadrius wilsonia cinnamominus* (McNeil 1968) and in birds of Tres Marías Islands off the coast of México (Grant 1965, 1966). At the time of incubation, fresh and dry weights diminish, owing to a decrease of the fat index (mean value of fat as per cent of lean dry weight = 22.5 and 24.8). This corresponds to an increase of energetic requirements for the breeding birds during a period when reproductive activities reduce feeding time.

On the other hand, by the end of November and of the rainy season (fig. 1), Black-necked Stilts undergo a second increase of their fat content (mean fat index = 53 per cent). This phenomenon may have an adaptive significance in the sense that it may allow the birds to cope with the dry period which begins in January as far as it concerns the saltwater lagoons and the lowlands, the latter previously flooded by rains. In fact, the data indicate that the fat content subsequently decreases until the end of February. Moreover, most of the Black-necked Stilts aggregate in San Luis lagoon during the dry period. Dryness greatly affects this species, which feeds on organisms living in relatively deep water (10–15 cm).

Such fat deposition appearing just before the dry period is a phenomenon apparently very similar to "winter fat" described by Odum and Perkinson (1951) for birds overwintering in cold or temperate environments. On the other hand, Ward (1964, 1965a, 1965b) observed that *Quelea quelea* (Ploceidae) in Nigeria deposits fat at the beginning of the season when food is normally scarce or difficult to obtain. Likewise, Britton, in his study of *Merops nubicoides* (Meropidae) in Rhodesia, wrote in 1967: "Birds were heavier in November (rainy season) than in September (dry season). It is suggested that this weight change is a response to improved food supplies." Ward (1964) proposed the expression "lean-season fat" to replace the term "winter fat," previously used by Odum and Perkinson in 1951.

As Newton (1969) has recently emphasized, "it is reasonable to assume that the capacity for winter fattening has been evolved in response to the energy demands of long cold nights, or to buffer the effects of temporary food shortage in the daytime." Winter fattening in the Bullfinch (*Pyrrhula pyrrhula*) wintering in England (Newton 1969) and daily fattening in the Yellow-vented Bulbul (*Pycnonotus goiavier*) living in Singapore (lat. 1°N.) (Ward 1969) have both been interpreted as overnight fat. "The only difference between the fattening of the temperate-zone Bullfinch and the tropical Yellow-vented Bulbul is that the amount of fat needed overnight varies seasonally in the finch, but remains constant in the bulbul" (Ward 1969). Incidentally, Ward (personal communication) now believes the above-mentioned fattening in *Quelea quelea* to be nothing else than overnight fat. However, the seasonal changes in day length and overnight temperature (seasonal changes in mean air temperature range about 1.9°C in Cumaná and 2.3°C in Chiguana) do not seem sufficient to explain the seasonal changes in the lipid reserves of *Himantopus mexicanus* in northeastern Venezuela. The fattening observed in the Black-necked Stilt at the end of the rainy season undoubtedly serves as an overnight reserve, but also appears to serve to buffer the effects of temporary food shortage in the daytime.

It must be noted that the water content (water as per cent of the lean dry weight) significantly increased from July to September (fig. 1), at a time of high molt intensity, involving the postnuptial or postreproductive replacement of wing and body feathers. It thus appears that this relative increase of water content corresponds to the keratin synthesis involved in the formation of new feathers, and undoubtedly to the blood volume increase during molt.

SUMMARY

A resident bird species of northeastern Venezuela, the Black-necked Stilt (*Himantopus mexicanus*) deposits an amount of prereproductive fat which disappears during reproductive activities. It also deposits postreproductive fat apparently in preparation for the dry season, when food may be relatively scarce for this species.

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PREDATION BY A WHITE-TAILED HAWK AND A HARRIS HAWK ON A WILD TURKEY POULT

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On 6 May 1970, I observed a White-tailed Hawk (*Buteo albicaudatus*) and a Harris Hawk (*Parabuteo unicinctus*) attack and kill a six-day-old wild Turkey poult (*Meleagris gallopavo intermedia*). The incident occurred at 11:35 CDT on King Ranch, Inc., Kleberg County, Texas.

The events prior to and after the incident are as follows. While observing a Turkey hen with poults, I noticed a White-tailed Hawk diving for the ground. It spread its wings and extended its feet just before landing on the Turkey poult. Two or three seconds after the White-tailed Hawk hit the poult, a Harris Hawk also landed on the poult. The hawks were facing each other on the ground with their feet grasping the young bird. The Turkey hen left her hiding place, some 25 m away, and flew directly toward the two hawks. As she approached, the hawks released the poult and took to the air with the Turkey hen in close pursuit. After chasing the hawks for some 20 m and flying to a height of approximately 45 m, at one time almost straight up, the hen glided to the ground and promptly returned to her previous hiding place.

I believe this incident is of scientific interest for the following reasons: (1) it increases our knowledge of the White-tailed Hawk, a relatively unstudied species; (2) it illustrates an instance of direct competition between two species of raptors; and (3) it adds to the knowledge of predation on very young wild Turkeys.

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THREE ADDITIONAL SPECIMENS OF THE EARED POOR-WILL FROM THE STATE OF GUERRERO, MÉXICO

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The Eared Poor-will, *Otophanes mcleodii*, is one of the neotropical caprimulgids that remains poorly known. Miller (Condor 50:224, 1948) described a new subspecies *O. m. rayi* from two specimens collected by W. W. Brown near Chilpancingo, Guerrero. A considerable contribution to the life history and ecology of the Eared Poor-will resulted from the fieldwork of Schaldach and Phillips (Auk 78:567, 1961) in Jalisco and Colima. Finally, Phillips (Anales Inst. Biol. Mex. 33 (1962):331, 1963) concluded that *O. mcleodii* should be regarded as monotypic and that the genus *Otophanes* should be merged into *Nyctiphrynus*. Nothing has been published on this species since these three contributions.

Because this caprimulgid remains relatively scarce in collections, I wish to report three additional specimens from Guerrero.

One bird, a reddish male, was collected 3 July 1954 by Keith L. Dixon after the poor-will was flushed from the floor of the forest 2.5 mi. S of Almolonga (17° 38′ N, 99° 18′ W) at an elevation of approximately 5600 ft. This area is scrub oak forest on a limestone outcropping (J. R. Dixon, pers. comm.). The bird was already in a late stage of molt; only primaries 9 and 10 and one pair of rectries (pair 2) were old. The testes measured 1.5 mm. The specimen is no. 6121 in the Texas Cooperative Wildlife Collection, Texas A&M University.

Two additional specimens have been collected in the vicinity of Aqua del Obispo (17° 19′ N, 99° 28′ W). A grayish male, testes not enlarged, was collected on 22 August 1963, apparently fully molted. The second bird, a reddish female with ovary not enlarged, was collected on 14 July 1970. This latter bird had the tail still in molt and all primaries renewed or in growth except for the outer two; these outer primaries were not badly frayed, however. These two specimens are deposited in the collection of Allan R. Phillips.

I wish to thank A. R. Phillips for his constructive suggestions and for his generosity in allowing me to include the two specimens in his possession.

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