

pairs of measurements, five differed by as much as 3.5 mm, 10 by 3 mm, and 38 by 2.5 mm.

Discrepancies between the measurements by two observers of the same object may arise from three sources: errors by one observer, errors by the other, and variations in the object. If the contributions of the three sources are independent (i.e., uncorrelated with each other), statistical theory indicates that they should contribute additively to the variance of the difference.

In this study the only important variation in the object is likely to be the difference between right and left wings. Baird and Howard, who measured right and left wings respectively, double-checked measurements that differed by more than 1 mm, and found that in the original sample of 424 birds there were only 21 (5 percent) whose wings actually differed by more than 1 mm (9 by 1.5 mm, 11 by 2 mm, 1 by 3 mm). These differences would have made only a small contribution (less than 25 percent) to the variances involving Howard in Table 1. Otherwise these variances result from individual differences in measurement of the same wings.

Table 1 indicates no consistent differences between observers in their contributions to the variances, suggesting that each made errors of similar magnitude. However, the fact that the lowest and the two highest variances in Table 1 involve the same observer suggests that the assumption of independence is not correct: there may, for example, be consistent differences between the observers in the way they treat bent or frayed wing-tips.

We conclude:

(1) that different observers can measure mean wing-chords in a large sample within about 0.4 mm. (0.6 percent), without special care to standardize techniques (other than instruction to measure wing-chords without flattening);

(2) that errors by individual observers have a root mean square value of 0.6-0.7 mm, so that errors of 2.0 mm (3 percent) are not exceptional;

(3) that measurements of the same bird by different observers may differ by as much as 3.5 mm (5 percent). However, the variance introduced by individual observers is only a small fraction (about 5 percent) of the total variance of each sample. We recommend that wing-lengths which may be significant in identification should be measured twice (the same wing), preferably by different observers.

This study should be repeated on live birds under field conditions.—I. C. T. Nisbet, J. Baird and D. V. Howard, Massachusetts Audubon Society,* Lincoln, Massachusetts 01773; K. S. Anderson, Manomet Bird Observatory, Manomet, Massachusetts 02345. *Contribution No. 81 from the Hatheway School of Conservation Education.

Spotted Eggs in a Local Population of Starlings.—In June 1968, during the course of a study of nestling behavior in hole-nesting birds, I received a clutch of 4 eggs of the European Starling (*Sturnus vulgaris*) that had distinct but very fine reddish-brown spots on the normal light blue ground color. These eggs had been taken from a martin house on the east side of Lawrence, Douglas Co., Kansas. From the stage of embryonic development the eggs appeared to have been incubated 4-5 days. This clutch was not saved.

Subsequently, I examined the oological collections of several major museums and found no other spotted eggs of the European Starling.

On 26 June 1969, I removed a set of 3 spotted Starling eggs from a martin house on the west edge of Lawrence, approximately 3 miles from the location of the first nest. These eggs were fresh and have been preserved in the oological collection of the University of Kansas (# 1753). In 1968 and 1969 I examined 4 additional Starling clutches in Lawrence which were all normally colored.

During the spring and early summer of 1970 I examined 13 Starling clutches in Lawrence; 5 of these clutches were spotted. Only one of the spotted clutches was found in a nest box known to have previously contained spotted eggs. Two young known to have hatched from spotted eggs were banded (F. and W. S. # 602-92819 and # 602-92820).

It appears that this is a rather localized phenomenon that may be of relatively recent origin in the Lawrence population. Amadon (1943) indicates that spotted eggs are common in the family Sturnidae, though the genus *Sturnus* characteristically has unspotted eggs. To my knowledge there is no North American record

of spotted eggs for the European Starling, though Jourdain (1938: 41) states (concerning European populations): "Eggs with very fine red spots also recorded." Of several hundred Starling clutches examined by Kessel (1957) in New York, Collins and De Vos (1966) in Ontario, and Royall (1966) in Arizona, no spotted eggs are mentioned, though Kessel cites Witherby *et al.* (1943) as saying they occur. Bent (1950: 191) found "no record of any spotted eggs." Olmstead (1954) examined 8 clutches of Starling eggs in Douglas County, Kansas, in the period 1951-1954, but made no mention of spotted eggs. A. S. Gaunt (K. U. nest record file; pers. comm.) examined 7 clutches of Starling eggs in Lawrence in 1961 but found no spotted eggs.

It seems likely that egg-spotting in birds is genetically controlled (Romanoff and Romanoff, 1949; Pitman, 1964). The fact that all Starlings in North America putatively are descended from an original stock of about 100 individuals (Bent, 1950: 183) provides a basis for speculation. If egg-spotting is inherited as a simple recessive trait and there was a single gene for spotting in the original stock, then the frequency of the gene would have been 1/200. Proceeding from this, the probability of homozygosity in subsequent populations would be $(1/200)^2$ or 1/40000. Since the phenotypic expression of the homozygous condition (i.e., spotted eggs) can occur only in females, the probability of finding a clutch of spotted eggs would then be 1/80000. This minimum probability is sufficient to demonstrate that spotted eggs could be a trait derived from the old world parent populations and that it has just previously not been observed. Unfortunately, I have found no information regarding either the geographic location of spotted eggs in European populations or the geographic origin of the inocula from which the North American populations stem.

The occurrence of 7 spotted clutches among 19 examined suggests that the frequency of spotted eggs in the local population is high (f. .37). Such a frequency implies that the local population is to some degree isolated — a condition which at first may seem unlikely since the species had been able to extend its range the width of a continent in less than a century and, from banding returns, is known to be somewhat migratory. Migratory birds, however, can still occur in reproductively isolated populations if individuals return to the same area year after year to breed and if mate selection occurs after the return to the breeding area. Such appears to be the case among Starlings (Kessel, 1957). The invasion of North America by Starlings is considered to have been largely accomplished through dispersal of the young (Thomas, 1934; Kessel, 1953); thus, the degree of reproductive isolation of a Starling population may largely be a function of the dispersal of the young.

Dispersal distances of young Starlings in Europe have been found to be less than 1 1/2 km., and more than 50% of the young move less than 1/2 km. (von Haartman, 1949: 105). While little direct evidence has been presented to indicate dispersal distances of young Starlings in North America, indirect evidence may be found in the banding returns summarized by Fankhauser (1968): of 3810 recoveries of Starlings banded from 1920 to 1962 during the period 15 April to 30 November, 3389 (89 %) were recovered in the state or province where they were banded. This leaves only 11 % to be accounted for by long distance migration or long distance dispersal. These data show that: 1) Starlings are not as migratory as other North American "blackbirds" (Fankhauser, *op. cit.*); 2) dispersal distances of the young are probably short. Thus, while there is gene flow between populations, presumably the rate of flow is slow. In the present instance, this isolation by time may have enabled the genotype for spotted eggs to reach the high frequency found in the Kansas population.

ACKNOWLEDGEMENTS

I gratefully acknowledge support from the Kansas Biological Survey in the form of a research assistantship for the years 1968-1970. I also thank R. F. Johnston, J. D. Robins, and S. A. Rohwer for their assistance in examining Starling clutches and for critically reading the manuscript.

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An African Recovery of a North American Common Tern.—On June 28, 1969, about 200 Common Terns (*Sterna hirundo*) were banded as juveniles in a nesting colony on West Inlet Island, near Moriches Inlet, East Moriches, Long Island, New York, latitude 40° 46' N, longitude 72° 46' W. On December 16, 1969, the individual bearing band number 1083-72358 was taken by hand aboard a trawler between Fresco and Tabou west of the city of Abidjan, Ivory Coast, Africa. The location is in the Gulf of Guinea at latitude 4° 30' N, longitude 6° 20' W.

This is apparently the first transatlantic recovery of a North American banded Common Tern since a supposed earlier record was later corrected (Lincoln, *Migration of Birds*, U. S. Dept. of the Interior, Fish and Wildlife Service, Circular 16, p. 38, 1950). Details beyond those supplied by the Banding Office were requested from the finder, Mr. Andre Intes of the Centre de Recherches Oceanographique in Abidjan. He replied that a reward is given to individuals bringing in bird bands, that local fishermen amuse themselves by attempting to capture terns that alight on their boats and that from 12 to 20 tern bands, all previously from Europe, are obtained annually. All bands are on deposit at the research center. This tern was brought in during the absence of Mr. Intes and died within a few hours. The skin was not preserved.

Although there seems to be no doubt concerning the authenticity of the recovery, the possibility that the specimen was an Arctic Tern (*S. paradisaea*), which species had been recovered several times in Africa should be considered. However this possibility is rejected for the following reasons: 1. The Arctic Tern has never been known to breed south of Nantucket and Martha's Vineyard,