cerning head-scratching. This behavior was achieved by balancing on the tarsal stump and extending the right wing until it touched the perch. With practice the bird held this posture easily and was able to scratch the head with the claws of the left foot. Most passerines are over-wing scratchers but in this case the bird scratched from under the left wing, presumably in adaptation to its injury.

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A HYBRID AMERICAN AVOCET × BLACK-NECKED STILT

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To my knowledge, there has not been previously reported an interspecific hybrid, wild or captive, from parents in the family Recurvirostridae. It was with interest, therefore, that I learned about a living "Avostilt" in the San Francisco, California, Zoo. The following note describes that bird, which I saw on 10 and 17 July and 20 August 1974.

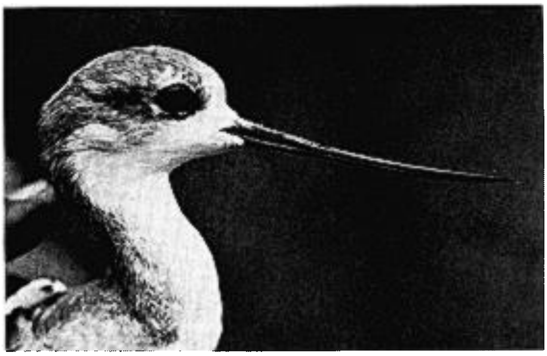

FIGURE 1. American Avocet × Black-necked Stilt, San Francisco Zoo, 17 July 1974.

Records at the San Francsico Zoo are incomplete, but zoo officials recall the bird to have been hatched during May 1971, the result of the pairing of a male American Avocet (*Recurvirostra americana*) and a female Black-necked Stilt (*Himantopus mexicanus*). According to zoo records, these two species were the only recurvirostrids held in captivity for at least five years previous. Morphological evidence supports the presumed parentage. The geographic origins of the parent birds were not recorded, but zoo officials state that most, if not all, stilts and avocets in captivity at the zoo came from the wild in central California.

The hybrid resembles a winter-plumaged avocet, but the bill is noticeably shorter and straighter (see fig. 1), and the gray of the neck is restricted to the dorsal side, in the pattern of the black of a Black-necked Stilt. The eye of the hybrid appears larger than that of an avocet, and the brown color is intermediate between the black iris of an adult avocet and the brown iris of an adult stilt. The feet are semipalmate, and intermediate between those of the parent species (see fig. 2). The sex of the hybrid is unknown, but zoo officials believe it to be a male, based upon an "attempted mating" with a female stilt in 1973.

On 17 July the bird was netted, the culmen and tarsus were measured, and the bird was weighed (280 g) and photographed. Culmens and tarsi were measured on museum specimens of stilts and avocets from localities in central California. Comparisons of these data, shown in table 1, show that the hybrid is intermediate between the parent species.

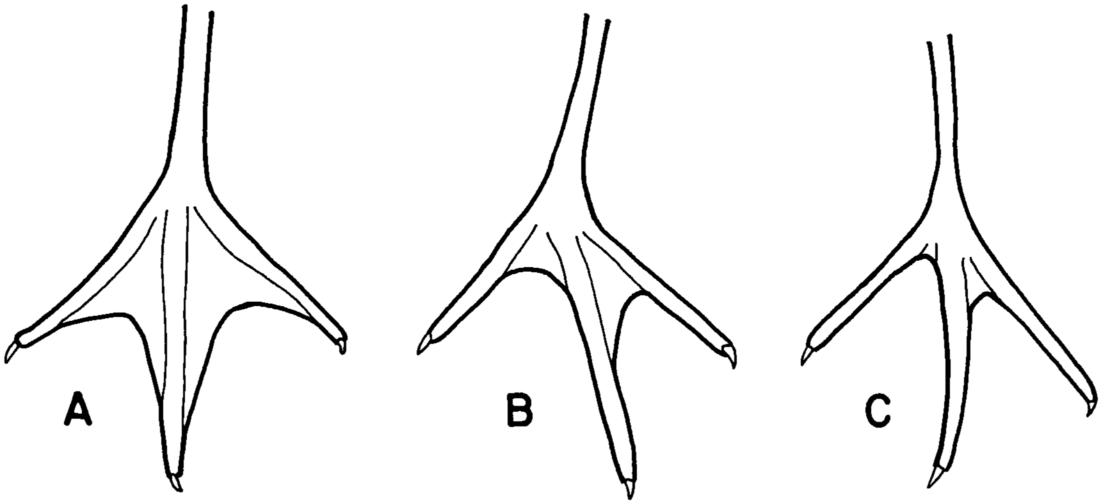

FIGURE 2. Degree of webbing in the feet of A. American Avocet, B. hybrid, C. Black-necked Stilt. Drawn to same size.

TABLE 1. Measurements in millimeters of museum specimens and hybrid.

		N	Culmen Mean (± S.D.)	Culmen Range	Tarsus Mean (± S.D.)	Tarsus Range
American Avocet	♂	10	95.69 (±3.54)	90.1–100.8	94.95 (±3.99)	89.6–104.0
	♀	10	88.90 (±2.66)	82.5– 92.1	87.66 (±3.95)	82.6– 93.5
hybrid			83.6		95.9	
Black-necked Stilt	♂	10	67.27 (±1.87)	64.6– 70.3	111.79 (±2.38)	107.1–116.3
	♀	10	64.49 (±2.33)	60.6– 68.0	98.75 (±6.10)	91.3–108.7

Short (Auk 86:84–105, 1969) said "Artificially induced hybridization proves only the existence of considerable genetic similarity and compatibility." The existence of this hybrid shows great genetic similarity between *Himantopus* and *Recurvirostra*, and supports their placement together in the family Recurvirostridae.

I extend thanks to Joseph Morlan and Malcolm Raff for assistance in observing and photographing this bird, to Ned K. Johnson for permission to measure specimens in his care at the Museum of Vertebrate Zoology, to J. Robert McMorris, Zoologist, and Herman Edwards, Keeper, of the San Francisco Zoo for their courtesy and help, and to Ralph J. Raitt for critically reading this manuscript.

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AREA-VOLUME RELATIONSHIP FOR A BIRD'S EGG

J. B. TATUM

The surface area A of an egg is slightly more difficult to determine, either by measurement or by calculation, than the volume V. Various methods of determining the volume have been described by Barth (1953), Preston (1974), Paganelli et al. (1974) and Tatum (1975). Recent investigations to determine the area have therefore concentrated on finding a relation between the area and the volume, so that if the latter is known the former could be quickly found. In particular, both Paganelli et al. (1974) and Shott and Preston (1975) have pointed out that there is a general relationship of the form

$$A = kV^{\frac{2}{3}}$$

between A and V for any closed surface, the constant k being determined solely by the shape of the surface and independent of its size. The value of k is least for a sphere, when k takes the value $\sqrt[3]{36\pi} = 4.836$. Both groups have therefore directed their efforts to the determination of k for different shapes of eggs.

Paganelli et al. determined k by actual measurement of A and V for a variety of birds' eggs of different shapes and sizes, and found empirically that for most eggs k is near to 4.951. Shott and Preston, on the other hand, developed a theoretical expression for the value of k for prolate spheroids. With $p = b/a$, where a and b are respectively the semi major and semi minor axes of the spheroid, their expression was equivalent to

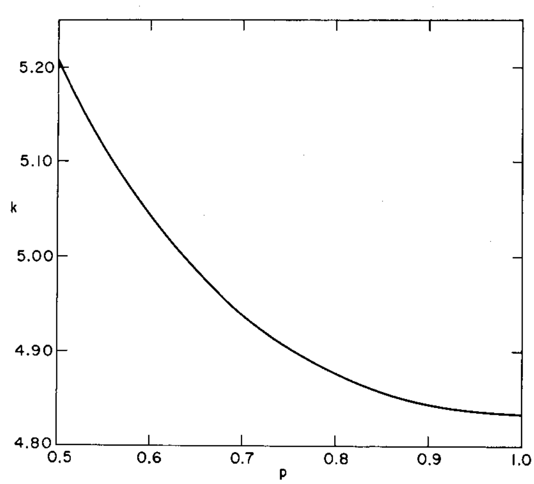

FIGURE 1. The constant k as a function of p for prolate spheroids calculated from the formula of Shott and Preston.

$$k = \left(\frac{9\pi}{2p}\right)^{\frac{1}{3}}\left(p + \frac{\cos^{-1} p}{\sqrt{1-p^2}}\right).$$

This function is illustrated in figure 1. Shott and Preston stated that most eggs have p near to 0.7, and indeed the empirical value of $k = 4.951$ found by Paganelli et al. corresponds to a spheroid with $p = 0.6861$.

Real eggs, however, are not prolate spheroids, which are symmetric objects. Preston (1953) proposed that the shape of many eggs could be fairly faithfully represented by the equations