RELATIVE GROWTH OF THE SHANK (TARSOMETATARSUS) IN DOMESTIC DUCKS*

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Although preliminary in nature this communication contains two facts which should be of interest to students of growth. First, the tarsometatarsus of the common domestic duck reaches its maximum length at a very early age. Second, during its period of growth, length of this part of the leg appears to increase at a slower rate than that of the body as a whole. The latter finding differs from that observed in domestic fowl and turkeys.

Relation between age and growth. General body growth of ducks differs from that of chickens and turkeys (Milby and Henderson 1937) in being much more rapid in the first four to five weeks after hatching. Many investigators have reported that at the time of a major feather molt (thirteen to fourteen weeks of age) growth is depressed for a period of four to six weeks.

The ducks observed for the present report were weighed and measured at hatching and weekly thereafter through the sixteenth week. As shown in the table maximum shank length was attained by six to nine weeks after hatching in females and by nine to eleven weeks in males. Means from weekly shank lengths after these ages were identical with those recorded in the table. Should this early cessation of longitudinal shank growth be a characteristic of all waterfowl except waders, adult size may be predicted from shank length of young as early as ten or eleven weeks after hatching.

TABLE I.

Relation between shank length and body weight in ducks.

	MAXIMUM SHANK		Corresponding body weight	Mature body weight
	Length	Age attained		
	mm	*weeks*	*gms.*	*gms.*
Females:	70	6	1102	2449
	68	9	1628	2359
	69	7	1334	2359
Males:	74	9	1810	2767
	77	11	2313	2812
	75	10	1955	2767
	80	9	1996	3130

Relative shank growth. The relative growth of the shank (y) compared with that of the body (x) as a whole may be expressed by the formula $y=bx^a$ (Huxley and Teisser 1936) in which a is a constant and b is the value of y when $x=1$. Assuming that, during growth, weight of bone (W) bears a constant relation to bone length (L) as expressed by $W=CL^3$, isometry or relatively equivalent growth would give an a value of .333. For the domestic fowl (for references see Lerner 1939) and the domestic turkey (unpublished), positive allometry or relatively more rapid longitudinal shank growth is indicated.

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To estimate the growth constant a for ducks a least-squares method (Feldstein and Hersh 1935) was used. From visual tests on a log-log plot of the data, it seemed desirable to use only those records obtained for hatching, the first four weeks in females, and the first five weeks in males. Thus thirteen comparisons were available for females and twenty-four comparisons for males. From these the estimated growth constant a was found to be .2979 for females and .2991 for males. The shank, therefore, appears to exhibit negative allometry during growth. Inclusion of any shank-weight comparisons at later ages consistently lowered the a values, indicating that shank length is probably approaching its upper asymptote in growth after four weeks in females and five weeks in males. It is interesting to note that this corresponds very closely to a marked reduction of growth rate of body observed by Milby and Henderson (1937) when they plotted logarithms of weight against units of time.

Mature proportions. From the foregoing information it is evident that the actual equilibrium constant for adult proportions must differ from the relative growth constant derived above. Records from seven mature females were available for the purpose of estimating a, the actual equilibrium constant, for adult proportions. This estimate is .153. Should this be the true equilibrium constant for ducks, larger ducks would be expected to have proportionally a shorter shank than smaller ducks belonging to the same allometric tribe (Lumer 1940).

LITERATURE CITED

Feldstein, M. J. and A. H. Hersh. 1935. The calculation of relative growth constants. Am. Naturalist 69:610-613.

Huxley, J. S. and G. Teissier. 1936. Terminology of relative growth. Nature 137:780-781.

Lerner, I. M. 1939. Allometric studies of poultry. Proc. World's Poult. Congr. 7:85-88.

Lumer, H. 1940. Evolutionary allometry in the skeleton of the domesticated dog. Am. Naturalist 74:439-467.