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AGE OF LAUGHING GULL CHICKS INDICATED BY TARSAL LENGTH

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This paper investigates the possibility of predicting the age of a Laughing Gull *(Larus atricilla)* chick from measurements of its tarsus. Often bird banders and field ornithologists desire to know the age of a bird in the field for population and mortality studies or other reasons. I desired to know ages of chicks for two reasons: (1) to analyze banding results (Hailman, 1960), and (2) to assemble groups of wild chicks of a certain age in order to compare their behavior with that of hand-reared chicks of the same average age (in prep.).

Age Criteria

In Laughing Gulls, color pattern of plumage and color of soft parts do not change appreciably prior to flight, and the egg tooth disappears at varying rates, so that these characteristics cannot be used to determine early ages very accurately. Total body weight, which increases with age, depends partly upon how recently chicks have fed and seems to be too variable to be used in age determination in gull chicks (Goethe, 1955): furthermore, it is generally impracticable to carry an accurate balance or scale in the field. The problem requires a quantitative measurement that does not demand elaborate equipment. Tarsal length was tried because (1) it depends largely upon the length of the tarsometatarsus bone, which is rigid, and (2) it can be easily measured with a simple rule, without the use of calipers.

Chicks

The 18 chicks used in this study were hatched from the eggs in an incubator during June, 1960. The eggs were collected from a colony of over 1000 pairs, located on an island in Pamlico Sound, North Carolina. Tarsus measurements were taken about twice a day, the exact time being noted. The time of hatching is known to within 15 minutes on 10 birds and to within 2 hours on the remaining 8. As part of behavior experiments to be reported elsewhere, the chicks were raised in dark boxes and force-fed to satiation three or more times per day. It is impossible to assess the effects of hand-raising upon the growth rate of the chicks' tarsi. All appeared to be growing normally in all

respects. until a very hot humid day during which several died suddenly; abnormal growth or lack of nourishment did not seem to be the cause of death in any case. All birds lived beyond a week, and since this report covers only the first 120 hours of life, the possible effects of abnormal growth seem at a minimum. Nevertheless any aging scheme such as this should eventually be supplemented with measurements from individually-marked chicks in the field: I hope to pursue this in another breeding season.

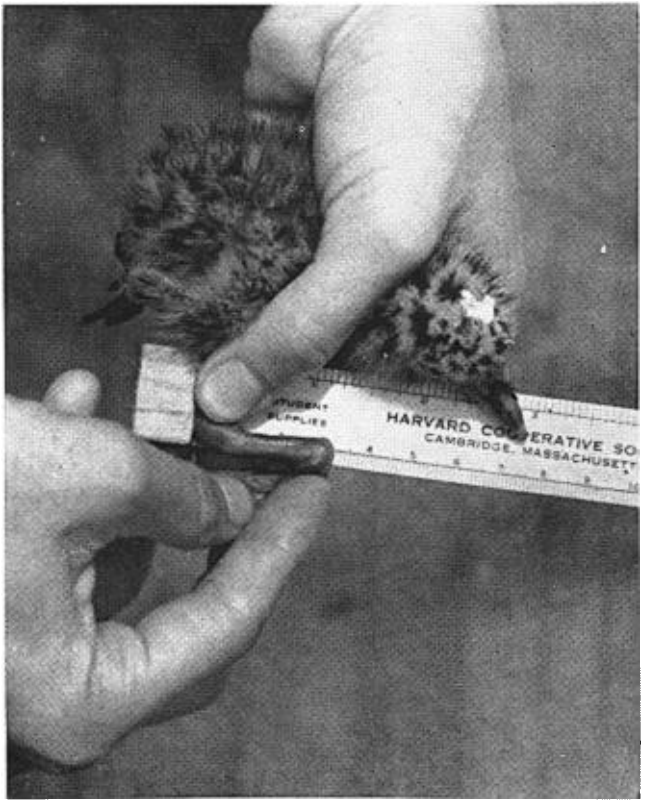

Figure 1. Measuring the right tarsus of a Laughing Gull chick (the spot on the bird's head is a dab of color paint used to mark chicks individually).

Measuring the Tarsus

The measuring technique was perfected only after actually measuring tarsi of several other chicks raised slightly earlier than the birds in this study. Only the right tarsus is measured, always in the same position, as shown in figure 1. Hold the chick in the left hand so that its right leg is up and extended toward the right hand. Place a small plastic rule, fitted with a wooden stop at the zero end, under the right leg and hold the chick's tibiotarsus ("tibia") firmly against the stop with the left forefinger. With the right forefinger and thumb, grasp the webbed right foot, and bend the leg at the tarsal ("heel") joint, so that the tarsometatarsus lies parallel to the edge of the rule. This can be done

with considerable exactness, because the anterior edge of the tarsometatarsus is almost straight and this can be aligned parallel to the edge of the ruler. With the tarsometatarsus in this position, bend the joint at the foot, so that the anterior edge of the foot is parallel to the measurement marking on the rule; this is the measured length of the "tarsus."

Following this procedure, I was able to get consistent values in several independent measurements of the same birds within an hour's time; no repeat measurement was more than 0.5 mm. from the original measurement, when read to 0.5 mm. Later, with more experience, I read measurement to + and — increments from the basic 0.5 mm. reading, but my reading error at this later time was not established, although I believe it was reduced.

Figure 2. 138 measurements of tarsal length at various ages since hatching from 18 hand-reared Laughing Gull chicks.

Tarsal Length Versus Age

Figure 2 shows all the data (138 measurements) from the 18 chicks. Growth curves often follow an "S" shape, being primarily logarithmic in the early part. The beginning of a logarithmic curve might well be fitted to Figure 2, although the data might also be summarized by a line of regression. No matter what the underlying variables are, it is evident that the increase in length of tarsus with time is not a precise indicator of early age because of the variability in the data. If the graph is taken as an adequate sample to judge range of measurements at a given age, it is readily apparent that individual chicks must be at least four days apart in age to be readily separated, although the general increasing trend is great enough to separate average age groups from very large samples of chicks.

Totaling the data of 18 individual chicks is, of course, misleading, in that there are only 18 sets of independent data, not 138 independent observations. When the individual data are graphed separately for each chick, one gets, in general, curves parallel to one another and to the

curve of figure 2. This indicates that the growth is similar in all birds, and the variation in the graph of figure 2 is due primarily to constant size differences between individuals.

DISCUSSION

From these results it seems unlikely that tarsal measurement by itself is a useful indicator of age during the first five days of life. The curve could be extended, and as it appears to be accelerating in an exponential fashion, differences between age groups might become larger. Even within the first week there is no overlap in tarsus length between the 1-24 and the 96-102 hour periods, although this difference may be due to the paucity of observations in the higher age category. Regression lines (linear or curvilinear) and confidence limits might be fitted to this data; however, the measurements come from hand-reared birds from a certain geographic locality and therefore the data would not be universally applicable, so that the results of the arduous computations required hardly justify the effort.

Since the variation in the data seems to arise principally from consistent size differences between individuals, it might be possible to calculate from several measurements the best fit of an individual's measurements on the curve and then extrapolate its age. However, this method presupposes knowing or closely approximating the underlying equation of the data, and furthermore requires several measurements over a period of days to insure accuracy. This suggestion would be unacceptable in light of the requirements for an aging method stated at the outset.

Despite the limitations, this method is obviously useful in gross age estimates, and with proper investigation, could be adapted to other species. It seems likely that tarsal measurement, coupled with one or more *independent* aging criteria (that do not depend on size), will prove the most satisfactory.

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SUMMARY

The tarsi of hand-reared Laughing Gull *(Larus atricilla)* chicks were measured twice daily for the first five days after chicks hatched. Figure 1 shows the measuring technique, and figure 2 shows the combined data of 18 individuals. Variability prevents accurate determination of early age from tarsal length in individuals, but several modifications of the method are discussed. This method may easily be adapted to other species.

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