A METHOD FOR DETERMINING AGE OF NESTLING HERONS IN JAPAN

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In 1956 a method was needed to determine the age of nestling ardeids for ecologic studies of Japanese encephalitis virus near Tokyo, Japan. An attempt was therefore made to correlate nestling size with age by measurement of the growth of selected anatomical structures in ardeids of known age. The birds chosen for study were the Black-crowned Night Heron (*Nycticorax nycticorax*), Plumed Egret (*Egretta intermedia*), and Little Egret (*Egretta garzetta*). The resulting data are presented here because they are primarily of ornithological interest.

Little information has been recorded in the literature concerning growth of ardeid nestlings, aside from the report of Adams (Condor, 57, 1955:55–60) who studied the skeletons of 41 adult Black-crowned Night Herons and found that male bones were slightly longer (less than 2 per cent) than those of females.

LOCATION AND METHODS OF STUDY

Observations were made at two large heronries within ten miles of Tokyo. One colony was at the Shinhama Imperial Duck Netting Grounds where the abundant ardeids in summer were Black-crowned Night Herons, Little Egrets, and Plumed Egrets. Nests were built in low bamboo (*Pleioblastus simoni*) and red pine (*Pinus densiflora*). At the other colony known as Sagiyama, Plumed Egrets, Black-crowned Night Herons, Little Egrets as well as Cattle Egrets (*Bubulcus ibis*) and Great Egrets (*Egretta alba*) nested in large *Zelkova japonica, Shiia siedoldii, Phyllostachys nigra,* and other trees in five farm yards.

At Shinhama in 1956, Black-crowned Night Herons, Little Egrets, and Plumed Egrets were marked on the day of hatching, banded when 10 days old, and measured repeatedly until they disappeared from the region of the nest. Bands were kindly supplied by the Japanese Game Management Bureau. Unfortunately every bird could not be measured every day since the observers' work periods were limited to five days a week and nestlings older than 10 days often climbed from the nest and hid at the approach of the field men. As a result, most nestlings were measured three or four times during the first two to three weeks of life.

Three anatomical parts were measured by means of calipers graded in millimeters: (1) upper mandible, from the forward corner of the eye (tear duct) to the tip of the beak, (2) tarsus, from the bend of the heel to the base of the phalanx, and (3) third primary wing feather, from the skin attachment to the tip. Initially the wing was measured from the base of the humerus to the tip of the third primary wing feather, but these measurements were soon stopped because the values obtained by different observers varied widely depending upon the position of the wing at the time of measurement.

At both Shinhama and Sagiyama in 1956, tarsal and third primary wing feather measurements were made of the three species mentioned previously. These were captured at weekly intervals for procurement of blood for Japanese encephalitis virus tests. When the measurements of a bird showed its age to be less than one week (by comparison with data from birds of known age), subsequent measurements were recorded and used to compile tables 1–3.

RESULTS

The growth curves for the tarsus, third primary wing feather, and mandible of Black-crowned Night Herons, Plumed Egrets, and Little Egrets during the first 24 to 26 days of life at the Shinhama heronry are shown in figures 1 to 3. It can be seen that at the time of hatching, the tarsus and mandible already had length and grew continu-

Table 1

Average Age of Black-crowned Night Herons Based on Length of Tarsus and Third Primary Wing Feather

Third primary wing feather length in mm.	Tarsal length in mm.	Number of birds per measurement combination	Average age in days
0	20	21	1
	25	6	3
	30	7	5
	35	11	7
	40	5	8
5	35	1	7
	40	9	7
	45	12	8
10	35	1	7
	40	2	8
	45	5	9
	50	13	9
15	50	5	9
	55	10	11
	60	2	11
20	50	2	13*
	55	8	10
	60	6	13
	65	3	13
25	55	2	10
	60	10	12
	65	10	14
30	60	5	13
	65	12	13
	70	6	15
35	65	11	14
	70	12	14
	75	6	15
40	65	9	14
	70	16	15
	75	12	16
50	65	6	14
	70	23	15
	75	23	16
	80	6	17
60	70	9	16
	75	18	16
	80	20	18
	85	8	21
70	75	16	17
	80	23	19
	85	11	19
	90	4	21
80	75	18	20
	80	17	21
	85	12	21
	90	2	22
90	75	3	22
	80	3	22
	85	9	23
	90	5	23
100	75	2	21
	80	16	22
	85	6	21
	90	8	24
	95	2	27
110	80	6	26
	85	10	24
	90	8	25
120	80	2	23
	85	3	26
	90	6	27
	95	4	28
130	85	2	28
	90	1	28
	95	1	29
140	85	2	30
	90	4	29
	95	2	32
150	85	2	31
	95	9	34
160	85	2	35
	95	1	40
170	85	1	35
180	85	1	42
	90	2	42
190	85	1	42

* Failures of the age to increase uniformly as the anatomical structures lengthen results from the use of small samples of birds and from variations in measurements among individual birds of the same age.

Table 2

Average Age of Plumed Egrets Based on Length of Tarsus and Third Primary Wing Feather

Third primary wing feather length in mm.	Tarsal length in mm.	Number of birds per measurement combination	Average age in days
0	20	17	2
	25	24	3
	30	12	5
	35	7	6
	40	11	8
	45	1	9
5	35	4	8
	40	6	8
	45	17	9
	50	6	10
	55	2	11
10	45	4	10
	50	7	11
	55	5	10*
15	50	2	11
	55	6	12
	60	7	13
20	50	2	12
	55	3	13
	60	11	14
	65	8	14
25	60	6	15
	65	3	16
	70	3	15
30	55	1	13
	60	2	14
	65	3	15
	70	5	15
35	60	1	15
	65	2	16
	70	9	17
	75	5	17
	80	2	17
40	70	3	17
	75	5	18
	80	5	19
50	70	1	17
	75	4	18
	80	11	19
	85	5	20
60	75	4	21
	80	1	20
	85	7	20
	90	2	22
70	80	2	22
	85	7	22
	90	4	23
80	85	5	23
	90	7	23
	95	3	23
90	85	3	28
	90	5	24
	95	2	26
	100	4	26
	110	1	27
100	95	4	28
	100	5	26
	105	2	26
110	95	3	29
	100	6	30
	105	6	28
120	90	1	29
	95	1	29
	100	4	30
	105	3	30
	110	5	31
130	95	2	31
	105	2	37
	110	2	33
	120	2	33
140	100	3	35
	105	4	34
	110	5	33
	115	6	35
	120	2	36
150	100	1	36
	105	2	40
	110	7	38
	115	8	39
	120	4	39
160	110	11	45
	115	7	45
	120	4	47
	130	1	55
170	110	3	49
	115	2	46
	120	3	49
	125	1	50
180	105	2	50
	110	3	53
	120	4	54
190	110	3	58
	120	2	55
	125	3	59
	130	2	59
200	110	2	64
	125	1	70
	130	3	60
210	120	2	60
220	115	1	70

* See footnote, table 1.

Table 3

Average Age of Little Egrets Based on Length of Tarsus and Third Primary Wing Feather

Third primary wing feather length in mm.	Tarsal length in mm.	Number of birds per measurement combination	Average age in days
0	30	2	6
	35	2	6
5	35	2	8
	40	2	10
10	45	4	10
15	45	4	10
	50	3	11
20	45	2	10
	50	1	12
	55	3	14
25	55	5	14
	60	4	15
	65	2	16
30	55	2	14
	60	1	15
	70	1	17
35	60	1	15
	65	2	17
40	65	5	17
	70	1	17
50	60	2	15
	65	3	17
	70	2	18
	75	1	18
	85	2	20
60	65	1	20
	70	1	20
	75	3	20
	80	4	22
	85	1	23
70	65	1	21
	70	1	21
	75	2	21
	80	8	22
	85	3	23
80	70	1	22
	75	1	22
	80	7	23
	85	4	24
90	80	5	23
	85	3	24
100	80	1	26
	85	4	27
	90	4	28
110	80	4	27
	85	3	28
	90	2	29
	95	2	29
120	80	2	28
	90	1	29
	95	7	32
	100	3	32
	105	1	32
	110	3	33
130	85	1	30
	90	3	31
	95	4	33
	100	1	33
	110	1	35
140	85	1	32
	100	1	34
	115	1	39
150	95	3	33
	100	1	34
	105	2	35
160	100	1	39*
	105	3	38
	110	2	40
170	105	1	40
	110	2	40
	115	3	42
180	100	2	35
	105	1	42
	120	1	50
190	95	1	51
	100	1	42
200	105	1	55
	115	1	50

* See footnote, table 1.

ously until full size was reached sometime after three weeks of age when the birds fledged. The tarsus of Black-crowned Night Herons grew slower than the tarsus of the other species; this result was expected, since the leg of the adult of the Black-crowned

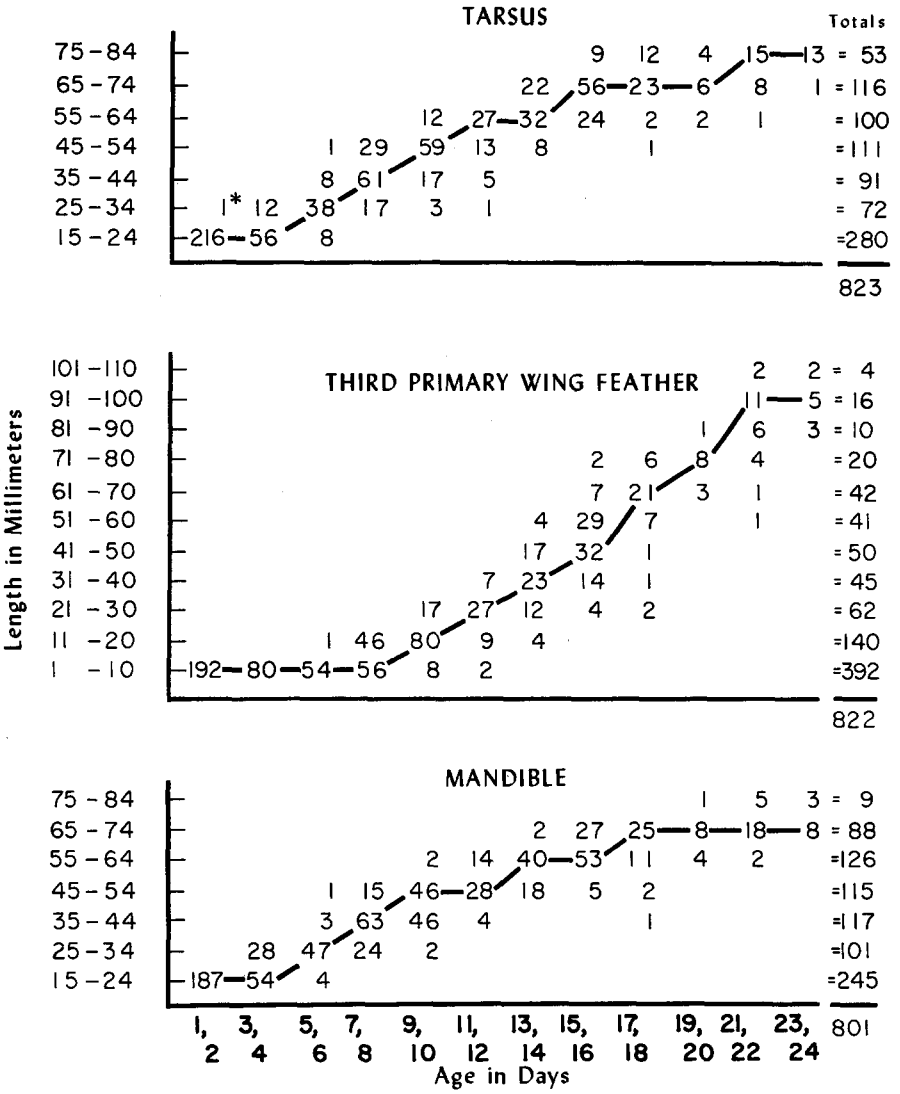

Fig. 1. Growth of the tarsus, third primary wing feather, and mandible in Black-crowned Night Herons (*Nycticorax nycticorax*) of known age. Asterisk indicates number of birds of known age with measurements indicated by the ordinate.

Night Heron is shorter and heavier than that of the egret. The mandibles of each species grew at about the same rates and reached the same lengths by the 24th day of life.

Growth of the third primary in each of the three species was very rapid, producing a steep curve (figs. 1–3). This feather continued to grow after the young fledged and after tarsal and mandibular growth stopped. The fact that the third primary did not begin visible growth until several days after hatching helped in determination of the

age of small herons and egrets. Black-crowned Night Herons without primary pin feathers were less than 5 to 6 days old, Plumed Egrets less than 9 to 10 days, and Little Egrets were less than 7 to 8 days of age. For more accurate age determination within the first week after hatching, the tarsal data were used.

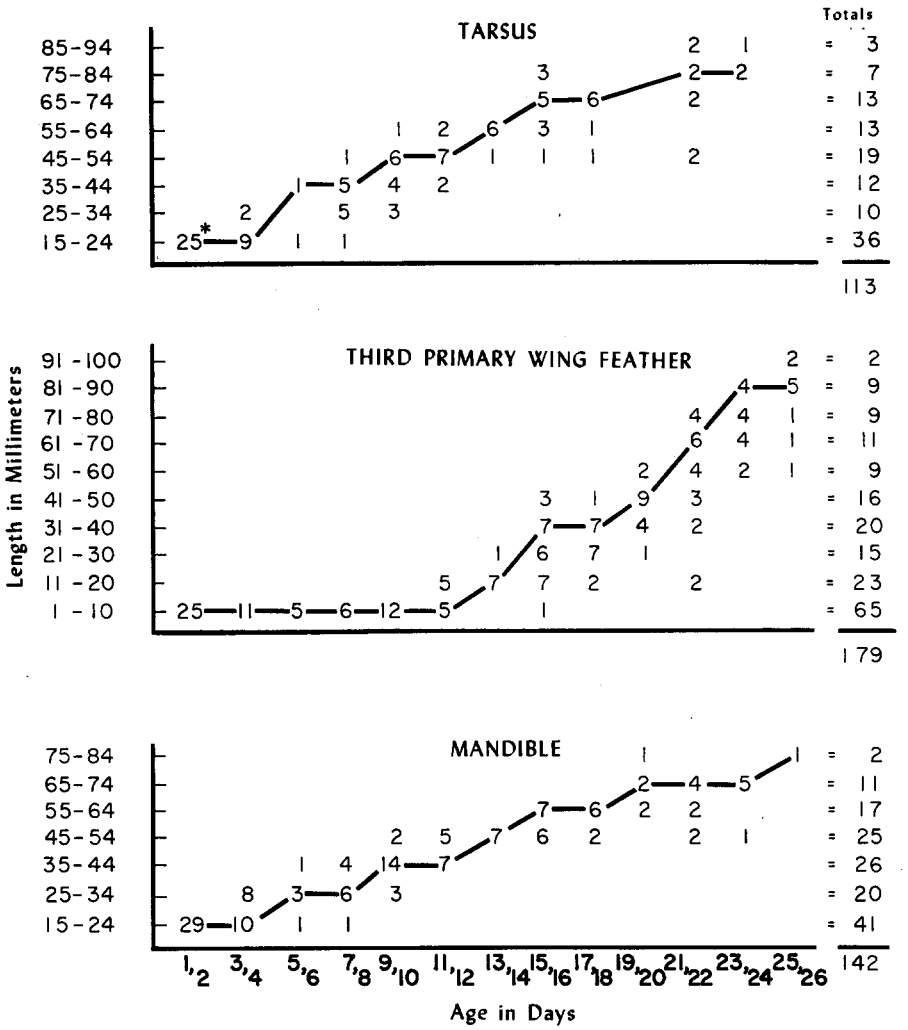

Fig. 2. Growth of the tarsus, third primary wing feather, and mandible in Plumed Egrets (*Egretta intermedia*) of known age. Asterisk indicates number of birds of known age with measurements indicated by the ordinate.

"Yard sticks" for ageing of the three species are presented in tables 1–3. These tables give the average age of birds based upon tarsal and third primary lengths and serve as compact sources of information for ageing ardeids in the field. Considering the variations in growth of individual birds and the inherent inaccuracies of measurements, discrepancies in the tabulated data were expected and indeed are present. Nevertheless, these tables provide a basis for ageing of juvenal birds of the three ardeids quickly.

DISCUSSION

Structural differences among individual birds of the same age made it difficult to establish a precise means for ageing nestling ardeids. Competition among siblings for food undoubtedly affected their growth and may account for structural differences and for some of the variations in results among birds of the same age. In addition the

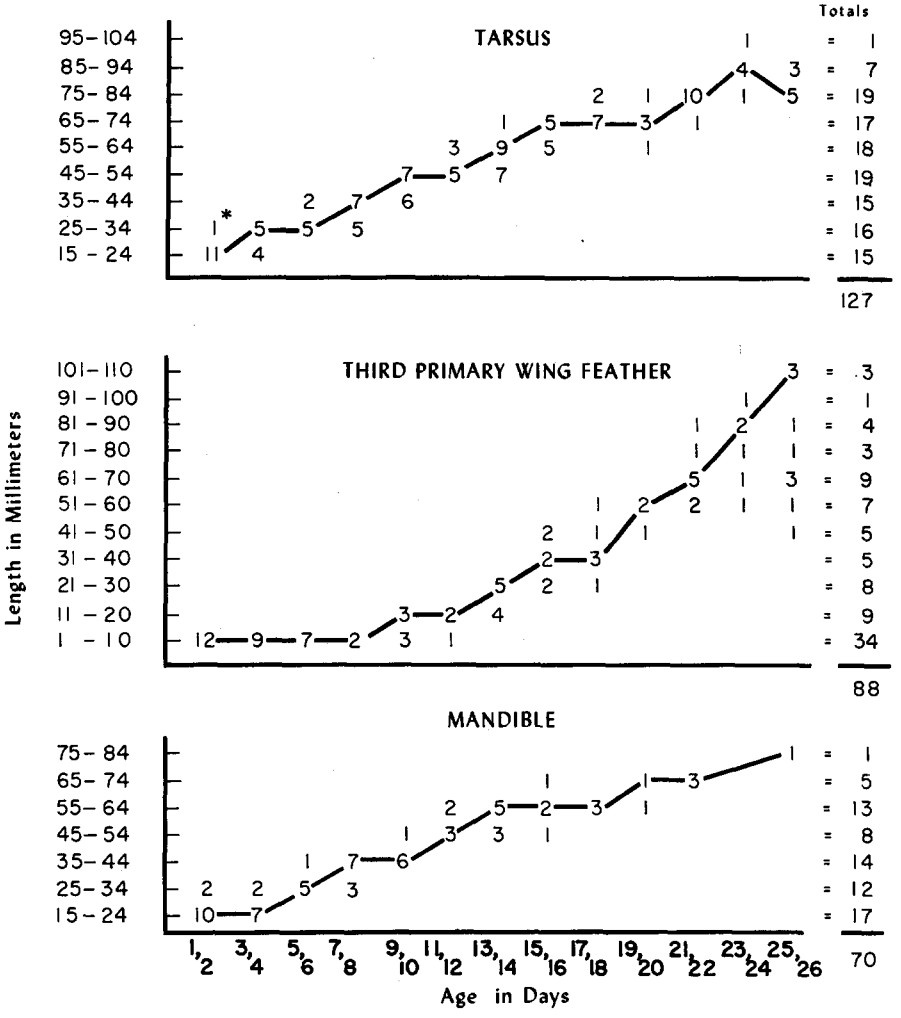

Fig. 3. Growth of the tarsus, third primary wing feather, and mandible in Little Egrets (*Egretta garzetta*) of known age. Asterisk indicates number of birds of known age with measurements indicated by the ordinate.

somatic growth of young ardeids was influenced by various environmental and physiologic stimuli. Ardeids are primitive enough or flexible enough in their growth responses to permit wide variations in growth rate and yet sustain survival of young. Black-crowned Night Herons were especially hardy and lived even under adverse nestling competition. For example, when birds which hatched late and were half the size of their

siblings were deserted by the parents after the rest of the family had fledged, they often moved to another nest.

Yet despite factors such as these that affected the growth of individual ardeid nestlings, it was possible to obtain data that permitted more accurate ageing of ardeids by measurements of the lengths of selected anatomical structures than by gross observations of over-all body size and development. The tables and figures presented herein provide a standard method for ageing ardeid nestlings that can be used by persons untrained in ornithology and that will not vary from year to year with changes in personnel. These attributes of a method for ageing ardeids were important and necessary for its use in ecologic studies of Japanese encephalitis virus, requiring as they do repeated yearly field observations by changing personnel.

SUMMARY

During the summer of 1956, the lengths of the tarsus, third primary wing feather, and upper mandible of nestling Black-crowned Night Herons, Plumed Egrets, and Little Egrets at the Shinhama heronry near Tokyo, Japan, were correlated with age during the first 24 to 26 days after hatching (that is, until the birds fledged and could not be captured). Over 3000 measurements of these birds were made at the Shinhama and Sagiyama heronries near Tokyo during the summers of 1953, 1956, and 1957. It was found that birds without measurable third primary wing feathers were less than a week old and that the tarsal and mandibular lengths were useful in determining their age more precisely. At ages between 7 and 24 to 26 days, the length of the third primary wing feather proved most valuable for ageing ardeids. Tables and figures are presented for quick and easy field use in ageing nestling Black-crowned Night Herons, Plumed Egrets, and Little Egrets from measurements of tarsal and third primary wing feather lengths.

United States Army Medical Research Unit, Institute for Medical Research, Kuala Lumpur, Malaya, June 20, 1958.