
Timing of skull ossification in the kinglets

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It was, I believe, in 1975 that we were returning homewards after the EBBA annual meeting in Wheeling, West Virginia, and stopped for a tour of the Powdermill Nature Reserve in Westmoreland County, Pennsylvania. Like most banders, I was fascinated with the banding operation being done there by Robert Leberman. When I particularly admired his set-up for "skulling", which permitted optimum conditions of light and magnification, he kindly gave me a copy of his paper, "Pattern and timing of skull pneumatization in the Ruby-crowned Kinglet."

Later, when studying Leberman's paper, I noted that — although it dealt specifically with Ruby-crowned Kinglets (*Regulus calendula*) — he indicated that Golden-crowned Kinglets (*Regulus trapa*) could perhaps be skulled into November. Since this appeared contrary to the Bird Banding Laboratory's information indicating that it was unsafe to age either species of kinglets by skulling after 1 October, I thought it might be interesting to check back into banding records for our Kiptopeke, Virginia banding station. In his study, Leberman — when skulling his kinglets for age — divided them into six classes, ranging from about 20% to 98% ossified. Our Kiptopeke records, on the other hand, indicated only HY (for partially ossified) or U (completely ossified) for our kinglets.

When we examined our records for 1973 and 1974, it became apparent that at the end of October the Ruby-crowns were almost all completely ossified, while by far the majority of the Golden-crowns were only partially ossified. When I reported this to Leberman, he suggested that — since we apparently had a greater sample of Golden-crowns at Kiptopeke — perhaps we could make it a Kiptopeke project to determine when it was no longer safe to use skulling in ageing Golden-crowns. This seemed a good idea, but it did present some problems.

Our Kiptopeke station usually operates from Labor Day weekend to the end of October, with different banders in charge of each week. This meant that our project would require the cooperation of whichever bander happened to be in charge on those days when we had a kinglet flight. When I broached the subject in the fall of 1975, each

bander readily agreed to skull the kinglets by class of ossification.

At the close of our 1975 season I compiled the skulling information on all kinglets we had banded. I noted that, for those birds which one other bander and I had skulled, the results followed Leberman's study exactly. However, I also noted that some of our other banders were not seeing what I saw and consistently had opposite results, while still others "just didn't have the time on flight days"! From this I concluded that the only practical way to conduct this study was to have one person do all the skulling, and I requested each bander to let me skull all the kinglets. I did this for the years 1975, 1976, and 1978. In 1977 we banded only 22 Golden-crowns, and few of them arrived on the days I was there.

When compiling my data, I found that I had two types, compelling me to use two different approaches in analyzing it. In attempting to determine at what point it is not longer safe to use skulling as a technique for age determination in Golden-crowns, I have included data on Ruby-crowns as a means of comparison.

My first approach utilizes data based only upon HY (partially ossified) and U (completely ossified) birds. The sample size is 827 Ruby-crowns and 381 Golden-crowns (see Tables 1 and 2). Graphs show the percentage of the daily sample which are HY birds. Referring to Figure 1, for Ruby-crowns, it is apparent that by the first week in October the number of HY birds was dropping below 90%, and by the end of the third week nearly all were completely ossified. Looking at Figure 2, for Golden-crowns, the picture is very different; the date of 27 October appears significant since, as a large sample, it should be comparatively free of bias and indicates 81% HY.

I wish that I had data carrying through November, for this percentage most certainly would start dropping at some point in the month. Also, Kiptopeke records indicate that most wintering species (Yellow-rumped [Myrtle] Warblers, for example) have a higher ratio of adult to immature than do strictly transient species. Thus, it is probably not unreasonable to presume that almost all of the 19% U birds of 27 October are adult.

Table 1. Ruby-crowned Kinglets (sample: 827)

Date	% HY	HY	U	Date	% HY	HY	U
22 Sep	100	1		04 Oct	57	39	29
27 Sep	100	1		05 Oct	77	33	10
28 Sep	75	3		06 Oct	38	8	13
29 Sep	100	9		07 Oct	31	18	39
30 Sep	100	1		08 Oct	60	3	2
01 Oct	0		1	09 Oct	42	22	30
02 Oct	75	3	1	10 Oct	38	19	30
03 Oct	89	219	26	11 Oct	45	11	13

Date	% HY	HY	U
12 Oct	100	2	
14 Oct	67	2	1
15 Oct	23	15	52
16 Oct	50	5	5
17 Oct	14	3	18
18 Oct	14	6	36
19 Oct	16	1	5
20 Oct	6	1	15

Date	% HY	HY	U
21 Oct	23	4	13
24 Oct	25	1	3
25 Oct	50	1	1
27 Oct	3	2	57
02 Nov	0		2

Table 2. Golden-crowned Kinglets (sample: 381)

Date	%HY	HY	U	Date	% HY	HY	U
03 Oct	100	7		10 Oct	91	20	2
05 Oct	100	6		11 Oct	100	9	
06 Oct	100	3		12 Oct	0		2
07 Oct	94	15	1	15 Oct	67	25	13
08 Oct	88	22	3	16 Oct	60	3	2
09 Oct	95	21	1	17 Oct	65	27	17

Date	% HY	HY	U
18 Oct	73	8	3
19 Oct	75	3	1
20 Oct	38	3	5
21 Oct	75	3	1
24 Oct	33	1	2
25 Oct	100	1	

Date	% HY	HY	U
26 Oct	100	1	
27 Oct	81	116	26
02 Nov	70	5	2
03 Nov	100	1	

Table 3. Ruby-crowned Kinglets (sample: 357)

Date	Percent Ossification					
	20%	40%	60%	75%	90%	100%
03 Oct	—	—	—	1	—	—
04 Oct	—	5	13	14	6	29
05 Oct	—	1	2	5	1	4
06 Oct	—	—	2	2	2	10
07 Oct	—	—	2	10	5	39
09 Oct	—	—	—	—	—	1
10 Oct	—	—	—	14	4	29
15 Oct	—	1	2	—	—	16
16 Oct	—	—	—	1	—	4
17 Oct	—	—	1	—	—	3
18 Oct	—	—	4	2	—	27
20 Oct	—	—	—	1	—	14
21 Oct	—	—	2	1	—	12
24 Oct	—	—	—	1	—	3
25 Oct	—	—	—	1	—	1
27 Oct	—	—	—	—	2	57

Table 4. Golden-crowned Kinglets (sample: 204)

Date	Percent Ossification					
	20%	40%	60%	75%	90%	100%
05 Oct	1	2	—	—	—	—
06 Oct	—	—	—	1	—	—
07 Oct	3	11	—	—	—	1
10 Oct	—	7	9	3	—	2
15 Oct	—	1	—	—	—	—
17 Oct	—	—	—	1	—	—
18 Oct	—	4	1	1	—	2
20 Oct	—	1	—	—	2	3
21 Oct	—	1	—	—	—	2
24 Oct	—	—	1	—	—	—
25 Oct	—	—	—	—	1	—
26 Oct	—	—	1	—	—	—
27 Oct	5	64	25	18	4	26

My second approach in analyzing the data is based upon degree of ossification similar to Leberman's study. Sample size is 357 Ruby-crowns and 204 Golden-crowns (see Tables 3 and 4). In an attempt to lessen bias, I have selected from my data sheets only those dates which represent flight days. Figures 3 and 4 show the percentage of sample for each degree of ossification. It is apparent that a much higher percentage of the samples have less ossification in the Golden-crowns than in the Ruby-crowns; by 27 October, 95% of the Ruby-crowns were completely ossified, while only 19% of the Golden-crowns were.

In the final analysis, I must acknowledge certain built-in biases. I will probably never be able to obtain sufficient data through all of November to determine when most, if not all, of the Golden-crowns become completely ossified. Also, my visits to Kiptopeke do not always coincide with those of the kinglets, thereby affecting sample size and perhaps reliability. However, in spite of these biases, I would conclude that complete ossification occurs at a later date for Golden-crowns than for Ruby-crowns, and that it seems safe to use skulling as a technique for ageing Golden-crowns at least until 1 November.

I wish to express sincere appreciation to Robert Leberman for much helpful advice in the preparation of this paper. 🐾

Literature cited

Leberman, R.C. 1970. Pattern and timing of skull pneumatization in the Ruby-crowned Kinglet. *Bird-Banding* 41:1210124.

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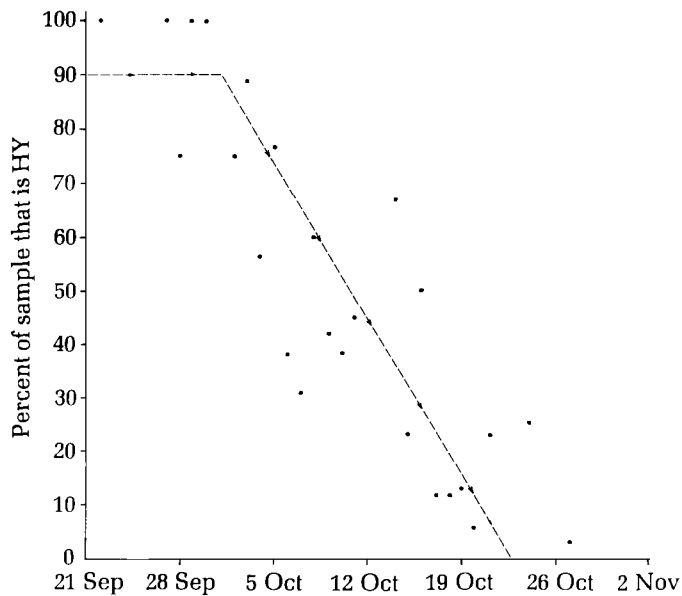


Fig. 1. Ruby-crowned Kinglets (sample—827)

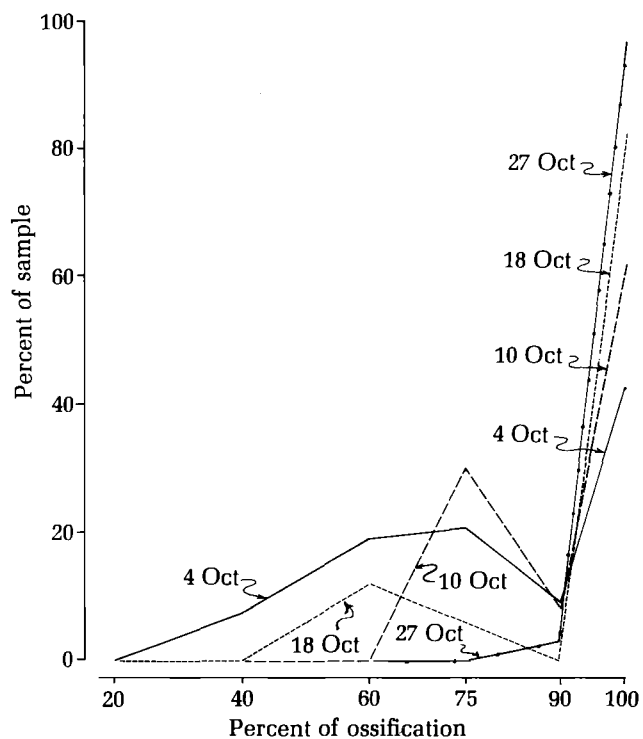


Fig. 3. Ruby-crowned Kinglets (sample—357)

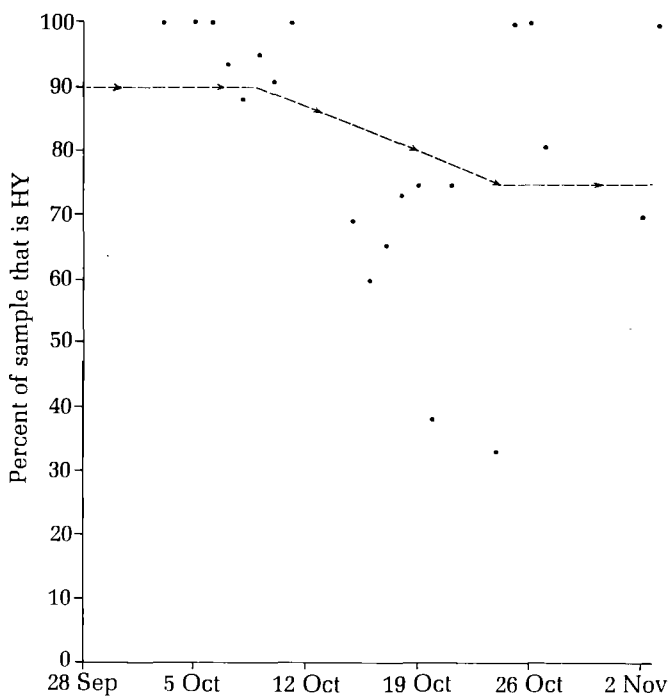


Fig. 2. Golden-crowned Kinglets (sample—381)

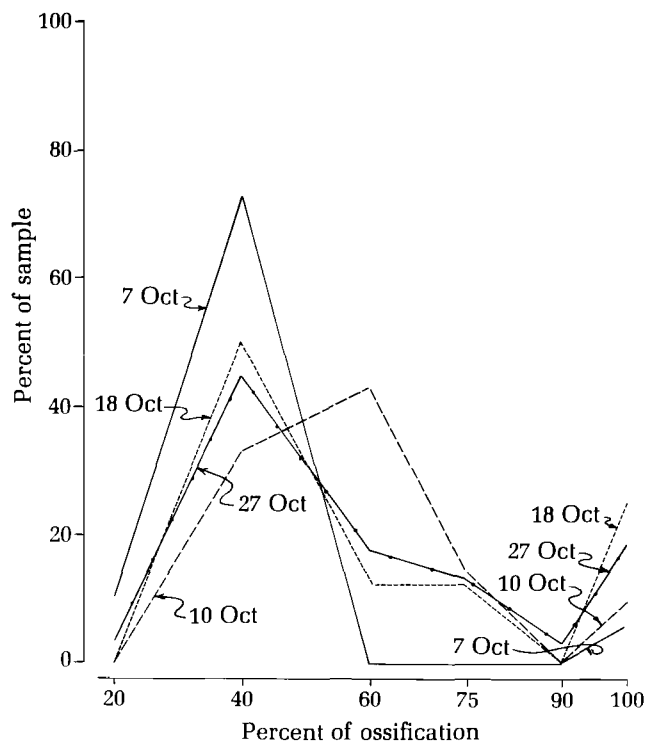


Fig. 4. Golden-crowned Kinglets (sample—204)