THE PLUMAGE OF THE PINE SISKIN

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OUR INTEREST in the plumage of the Pine Siskin *(Spinus pinus)* was first aroused in connection with banding, by certain peculiarities which our records of these birds showed. To review in detail their curious history at our station would be to wander too far from our subject. Suffice it to say that for three summers, in rapidly increasing numbers, they have abandoned the surrounding primeval forest for our small and remote clearing and grove of aspens. The attraction has always been some mineral food, relish, or medicament, natural or artificial. Ashes, deep blue clay from a cellar hole, salt, and newly-set Portland cement have all had their periods of favor.

Some idea of the numbers of the birds can be formed from the fact that last summer (1927) in a few midsummer weeks, with brief and intermittent periods of work, we banded 1214, with only 19 repeats. How many could have been caught but for the unlucky lapse of the band supply, it is hard to imagine. It is significant that these tastes are shared by other northern Fringillidae, though, to the limit of our experience, by no other group or species. Far more slowly the Crossbills, Redpolls and both Pine and Evening grosbeaks are finding the baits and feeding places of the Siskins, and are remaining in their neighborhood. An irritating fact, to the bird-bander, is that the spot now in favor is the upper and outer part of a very tall stone-and-cement chimney!

Since the habit seemed to be so restricted, it was natural to suppose that the long deprivations of the northern winter might explain the common taste among largely resident northern birds. Consequently we were surprised to find that almost ninety per cent of the siskins we trapped were, according to the usual descriptions, immature. Evidently, instead of restoring the jaded appetites of mature roisterers that had dined too long upon the abundance of the spruce, our wholesale condiments were being wasted upon mere fledglings, whose consuming effort of growth, scarcely completed, might have been expected to demand the substance and neglect the relish.

This naturally led to a sharp scrutiny of the accepted age-characters. Numerous inconsistencies at once arose, chief among them the frequent occurrence of both old white-tipped and new orange-tipped feathers in the same tract of molting wing coverts. We have not been able to pursue the history of the subject to its beginnings; but we find in the second edition of Coues' Key (1884): "Young birds have the markings diffuse, with a general buffy-brownish suffusion." Ridgway in his Birds of North and Middle America (part I, 1901) follows or agrees with this: Young "similar to adults, but wing-coverts tipped with buffy;" but he also adds "underparts often (but not always) tinged with sulphur yellow." Most recent manuals (Chapman, Taverner, Hoffmann) make no distinction between the immature and subsequent plumages; but F. M. Bailey (Handbook, 1916) says, "Young: upper parts mustard yellow tinged with brownish olive feathers streaked, except on belly; wing bands and patches brown." In the latter part of this description one wonders whether the word "brown" may not have been used to describe the wing-bars of very old skins, as it hardly applies to the bright orange-buff of the living bird.

The variable characters upon which any distinction in age would have to be founded are, in point of fact, (1) the dull white or bright orange-buff of the wing-

bars; (2) variation in the back from feathers with pale dusky centers and white margins to those with strong dusky, sometimes black, centers, and "mustard" margins; (3) presence or absence of yellow on the belly, varying from a warm, almost buffy, yellow, through the palest of lemon washes, to perfect dull whiteness; (4) the chest, and more rarely the flanks, may be warm buffy or even low red-orange, or any reduced degree of buff, both in area and intensity, down to plain white; and finally, (5) the belly is occasionally streaked longitudinally with strong dusky, more often lightly pencilled, and frequently immaculate. Care must be used to avoid confusing exposed dark bases with true streaking.

When the post-nuptial molt had been for some time in progress it occurred to us to attempt an analysis of the state of the plumage, both in regard to the above-mentioned variable characters and to the progress of the molt, of 100 birds, caught at random. We chose the following points for special observation and tabulation: For the molt, primaries, secondaries, tertials, tail, greater and middle coverts; for color, general color above and degree of yellow below. Unfortunately we did not at first realize the variability of the streaking and the buffy chest, but they were included later; and the total number of birds was raised to 150 to increase the amount of data on these special points. This accounts for the variable totals in the first table, and the number of "unobserved" symbols in the second, two-page table.

In regard to the molt, the tabulation of the individuals and tracts to show the facts most clearly, but without forcing the material to illustrate preconceived ideas of our own, was not easy. After much experimentation we decided to arrange the tracts from left to right horizontally in the order in which they begin to molt. This was ascertained by dividing the whole number into classes according to the number of tracts in process of molt at the time of examination, and observing in each group which new tract had been added. The results of this, or, of course, any other method, become somewhat uncertain when the least regular tracts are reached. As to the vertical order of individuals, all our evidence points to great regularity in the molt of the primaries, so that we decided to employ this tract as a kind of registering chronograph, conveniently attached to each living bird, and registering, through nine time-divisions (further divisible through the states of the immature feathers), the period since the molt had begun. An infinite number of individuals, placed in this order, should be equivalent to an equal number of observations of a perfectly average bird, and the general lines of movement in the single columns and across the whole sheet show, (1) the movement in each tract, (2) the sequence of tracts, and (3) the relations of the different tracts at any given stage of the molt. This belief in regard to the primaries, upon which a large part of our argument depends, was strongly substantiated by the great regularity in which the secondaries appeared when the tables were arranged in this way. It must be remembered that this method is used for purposes of comparison and has nothing to do with absolute time. Thus it is possible that the time-divisions may not be equal, that is, that the pace of the primaries may slow down as other tracts come in and demand their share of the vital reconstructive energy.

Most of the terms employed in the tables are self-evident, but perhaps a word of explanation may be needed in regard to the greater coverts, which are confusing and difficult to count. Their number is eleven. Most are unmistakable, each rooted directly upon the calamus of a secondary or tertial, but not corresponding with it in number, for the small outer covert which by position, color, form and imbrication unquestionably belongs to the tract, is rooted, not on the first secondary, but on the ninth primary or ninth primary covert, which latter is actually set between

the eighth and ninth primaries. Also the upper or proximal tertial carries two greater coverts upon or close to its insertion, of which the inner is shorter and weaker than the rest, in accord with its reduced functional importance in the work of flight. Thus the tract of the "greater secondary coverts" exceeds the secondaries and tertials themselves in number by two. It seems best to treat the tertials independently as such, rather than as secondaries, not only because their system of molt is perfectly regular and independent, but because, while rooted outside the elbow, they differ, with the occasional exception of the lower or distal, in not being attached to the ulna.

As a matter of fact it becomes possible, after some practice, to distinguish old feathers from new in most tracts by the depth and intensity of color, though the secondaries offer a common exception to this. In cases where the molt has not begun, or is completed, this sense, with the general condition of the plumage, color of the quills, etc., is of course sufficient for the necessary decision.

The symbols employed are as follows: 1, from the fall of the old feather to the bursting of the new sheath; 2, partially emergent from sheath; 3, still somewhat short; - (dash), completed new feather; . (dot), old feather; x, unobserved; ?, undecipherable; abs, absent; prs, present.

All enumerations, including the halves of the tail, are made starting from the outside. The main table (pp. 224-225), for economy of space contains only the eighty birds whose molt was incomplete. The remainder, whose molt was complete, and which were therefore only observed for color, are assembled in more condensed form in the smaller table which is presented here:

Character	No. Birds Observed	Present	Absent
"Mustard" above	68	66	2
Yellow below	68	67	1
Belly streaks	51	38	13
Buffy chest, etc.	53	39	14

The most important generalization to be drawn from these tables is that all the variable characters are regular or usual characteristics of *all* fresh plumages, and are in no way indicative of the bird's age. The orange wing-bars are regular, and regularly fade out to white, while the yellow underparts, buffy chest, and belly streaks are usual, and may fade out entirely or be persistent in varying degrees, doubtless according to their original strength. Belly streaks probably do not disappear by fading. The only other logical possibility would be that the pallid coloring was the result of the pre-nuptial, and the strong coloring of the post-nuptial, molt, which is so unlikely as to be negligible. The fact that in every molting specimen but two the molt was participated in by the remiges, and the fact that the two exceptions were cases of practically completed molt, with only a few middle coverts still short, militates against the probability of a partial autumn molt by the young of the season. A single interesting case occurred, in which an unquestionably new plumage, with orange wing-bars, was otherwise pallid throughout. It is regrettable that this was not realized before the bird was released and further notes made of the general condition. In no instance was a new wing-covert found to be white-tipped.

Since our knowledge of the molt in general is so incomplete, it would perhaps be a pity to close without a resumé of the other facts which these tables offer us,

Date		Number	Right or left	Primaries	Proximal Middle Distal tertials	Greater coverts	Tail	Middle coverts	Secondaries	Mustard above	Yellow below	Belly streaks	Buffy chest, etc.
				123456789		1234567891011	123456	12345678	123456				
Aug.	28	1	R	12	...	. . . . .	.....	.....	.....	abs	abs	x	x
			L	1	...	. . . . .	.....	.....	.....				
Aug.	29	2	R	.....	.1.	. . . . .	.....	.....	.....	abs	prs	abs	x
			L	.....	.1.	. . . . .	.....	.....	.....				
Aug.	27	3	R	133	.1.	....111. . .	.....	.....	.....	abs	abs	x	x
			L	133	.1.	....111. . .	.....	.....	.....				
Aug.	31	4	R	.....13_	31.	111111111 . .	...111	.....	.....	abs	abs	abs	prs
			L	.....13_	31.	.11111112 1 .	...111	.....	.....				
Aug.	28	5	R	133	.2.	. . . . .	.....	.....	.....	abs	abs	abs	x
			L	.....1__	.2.	. . . . .	.....	.....	.....				
Aug.	29	6	R	.....1__	.2.	. . . . .	....1.	.....	.....	abs	abs	abs	prs
			L	.....1__	.2.	. . . . .	...11.	.....	.....				
Sep.	2	7	R	.....2__	.3.	. . . . .	.....	1	.....	abs	abs	abs	abs
			L	.....2__	.3.	. . . . .	.....	.....	.....				
Aug.	31	8	R	.....3__	...	. . . . .	.....	.....	.....	abs	abs	abs	prs
			L	.....3__	...	. . . . .	.....	.....	.....				
Aug.	28	9	R	.....3__	...	. . . . .	.....	.....	.....	abs	abs	abs	x
			L	....13__	...	. . . . .	.....	.....	.....				
Aug.	28	10	R	....3___	.2.	1222222___ _	.....	.....	.....	abs	abs	x	x
			L	....23__	.2.	2222222___ _	.....	.....	.....				
Sep.	2	11	R	....133__	.2.	222222221 2 2	111111	.....	.....	abs	abs	prs	abs
			L	....133__	12.	222222221 2 2	...111	.....	.....				
Aug.	27	12	R	....133__	2_.	_____ _ 1	112221	...1....	.....	abs	abs	x	x
			L	....133__	1_1	_____ _ 1	112221	.....	.....				
Aug.	28	13	R	....13___	...	111111___ _ _	...111	.....	.....	abs	abs	abs	x
			L	....13___	1__	11111___ _ _	...111	.....	.....				
Aug.	27	14	R	....3____	-..	______22. . .	.....	.....	.....	abs	abs	x	x
			L	....3____	-..	______21. . .	.....	.....	.....				
Aug.	28	15	R	...133___	__1	_____ _ _	.11222	.....	.....	abs	prs	x	x
			L	...133___	__1	_____ _ _	.11222	.....	.....				
Aug.	29	16	R	...13____	___	_____ _ _	..1111	.....	.....	abs	abs	abs	x
			L	...13____	___	_____ _ _	..1111	.....	.....				
Aug.	29	17	R	...13____	__.	_____ _ _	...333	.....	.....	prs	abs	abs	prs
			L	...13____	__.	_____ _ _	111333	.....	.....				
Aug.	29	18	R	...13____	__2	_1122____ _ ?	.123_3	11111...	.....	abs	abs	abs	x
			L	...13____	__2	1_____ _ _	.123_3	...11...	1.....				
Sep.	7	19	R	...13____	__3	_____ _ _	?	.....	1.....	abs	abs	abs	prs
			L	...13____	?	_____ _ _	?	.....	.....				
Sep.	2	20	R	...13____	__.	_____ _ _	...222	.....	1.....	abs	abs	abs	prs
			L	...13____	__2	_____ _ _	...222	.....?	.....				
Sep.	2	21	R	...12____	__.	_____ _ _	?	..11111.	2.....	abs	abs	abs	prs
			L	...13____	__1	_____ _ _	?	.1112...	2.....				
Aug.	27	22	R	...22____	__3	_____ _ 2	23____	11211_11	1.....	abs	abs	x	x
			L	...22____	__3	_____ _ 2	23____	11111111	1.....				
Aug.	27	23	R	...33____	.1.	111111___ _ _	?	.....	.....	abs	x	x	x
			L	....2)___	1_.	..1_____ _ _	?	11.....	.....				
Sep.	2	24	R	...2_____	__3	_____ _ _	111111	111111_1	3.....	prs	abs	abs	prs
			L	...2_____	__3	_____ _ 2	111111	11111111	3.....				
Aug.	31	25	R	...2_____	__1	_____ _ _	.1____	.....	.....	prs	abs	abs	prs
			L	...2_____	__1	_____ _ _	.1____	..1111..	1.....				
Aug.	30	26	R	...2_____	___	_____ _ _	11____	_1111..?	2.....	abs	abs	abs	prs
			L	...2_____	___	_____ _ _	11____	11111.1.	21....				
Aug.	29	27	R	...3_____	___	_____ _ _	.23___	.....	3.....	prs	abs	abs	abs
			L	...3_____	___	_____ _ _	.23___	.....	3.....				
Aug.	31	28	R	...3_____	__2	_____ _ _	23____	12221...	3.....	prs	abs	abs	prs
			L	...3_____	__2	_____ _ _	23____	2222.111	3.....				
Sep.	5	29	R	...3_____	___	_____ _ _	..2222	..2222..	3.....	prs	abs	abs	prs
			L	...3_____	___	_____ _ 2	112222	.....	3.....				
Sep.	2	30	R	...3_____	___	_____ _ _	2_____	.2.1111.	3.....	prs	prs	abs	prs
			L	..13_____	___	_____ _ _	2_____	1111..11	3.....				
Aug.	30	31	R	..12_____	___	_____ _ _	____32	1111.11.	_1....	prs	abs	abs	prs
			L	..12_____	___	_____ _ _	_____	.1_11.11	_1....				
Sep.	5	32	R	..13_____	__2	_____ _ _	12233_	...?....	3?....	abs	prs	abs	abs
			L	..13_____	__2	_____ _ _	12233_	.....	3?....				
Aug.	29	33	R	..13_____	__2	_____ _ _	133333	1111111.	2.....	abs	abs	abs	x
			L	..13_____	__1	_____ _ _	133333	111111..	2.....				
Sep.	1	34	R	..13_____	__3	_____ _ _	13____	12221112	2.....	prs	abs	abs	prs
			L	..13_____	___	_____ _ _	13____	12221112	2.....				
Aug.	29	35	R	..13_____	__3	_____ _ _	22____	22222221	_3....	abs	abs	abs	x
			L	..13_____	__3	_____ _ _	2_____	22222221	32....				
Aug.	31	36	R	..13_____	___	_____ _ _	13____	_____1	31....	prs	abs	abs	prs
			L	..13_____	__3	_____ _ _	13____	_____11	31....				
Sep.	2	37	R	..13_____	__3	_____ _ _	13____	1_____1	31....	prs	abs	abs	prs
			L	..13_____	___	_____ _ _	13____	11____13	31....				
Sep.	1	38	R	..13_____	__2	_____ _ _	1_____	2_____2	3.....	abs	abs	abs	prs
			L	..13_____	__3	_____ _ _	3_____	2_____2	31....				
Aug.	27	39	R	..13_____	___	_____ _ _	23____	_____222	31....	abs	abs	x	x
			L	..13_____	___	_____ _ _	23____	_____222	31....				
Sep.	1	40	R	..13_____	___	_____ _ _	123___	2_____	_2....	abs	abs	abs	prs
			L	..13_____	___	_____ _ _	123___	22_____	31....				

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				123456789		1234567891011	123456	12345678	123456				
Sep.	2	41	R	..13_____	___	_____ _ _	3_____	1222.....	31....	prs	abs	abs	prs
			L	..13_____	___	_____ _ _	3_____	.1111.11	31....				
Sep.	2	42	R	..13_____	___	_____ _ _	_____	111__111	3.....	prs	abs	abs	prs
			L	..13_____	___	_____ _ _	_____	.11_1_.1	3.....				
Aug.	30	43	R	..23_____	___	_____ _ _	3_____	____2111	_1....	prs	abs	abs	prs
			L	..23_____	___	_____ _ _	3_____	__221111	32....				
Sep.	2	44	R	..23_____	___	_____ _ _	3_____	_____2_1	3.....	prs	abs	abs	prs
			L	..23_____	___	_____ _ _	3_____	_____2_2	3.....				
Sep.	3	45	R	..1_____	___	_____ _ 1	_____	1111.11.	_1....	prs	abs	abs	prs
			L	..1_____	___	_____ _ 1	_____	.1...._1_	_1....				
Aug.	27	46	R	..2_____	___	_____ _ _	23____	.....	_3....	prs	prs	x	x
			L	..2_____	___	_____ _ _	23____	.....	_3....				
Aug.	30	47	R	..2_____	__3	_____ _ 2	33____	_____2	_31...	prs	abs	abs	prs
			L	..2_____	__3	_____ _ 2	33____	_____2	_31...				
Aug.	27	48	R	..2_____	___	_____ _ _	_____	___11__1	2.....	abs	abs	x	x
			L	..2_____	___	_____ _ _	3_____	1____1_1	2.....				
Aug.	28	49	R	..3_____	___	_____ _ _	_____	_____	_____	prs	abs	abs	x
			L	..3_____	___	_____ _ _	_____	_____	_____				
Aug.	27	50	R	..2_____	___	_____ _ _	3_____	_____	_2....	prs	abs	x	x
			L	.2_____	___	_____ _ _	3_____	2_____.22	2.....				
Sep.	1	51	R	.13_____	___	_____ _ _	3_____	._____1.	_3....	abs	prs	abs	prs
			L	..3_____	___	_____ _ _	3_____	1_____...	_1....				
Aug.	31	52	R	.13_____	__3	_____ _ _	3_____	_____	_21...	prs	abs	prs	prs
			L	.13_____	__3	_____ _ 2	3_____	_____2	_31...				
Sep.	1	53	R	.13_____	222	_____ _ _	3_____	22_____2	?3....	prs	abs	abs	prs
			L	.13_____	___	_____ _ _	3_____	222___22	?3....				
Aug.	29	54	R	.13_____	__3	_____ _ _	3_____	._____1__	_3....	prs	abs	abs	x
			L	.13_____	___	_____ _ _	3_____	_____	_3....				
Sep.	7	55	R	.13_____	___	_____ _ 3	33____	_____	32....	prs	prs	abs	abs
			L	.13_____	___	_____ _ _	33____	11111111	32....				
Aug.	27	56	R	.13_____	___	_____ _ _	23____	22___22_	_21...	abs	abs	x	x
			L	.13_____	___	_____ _ _	23____	____3222	_21...				
Aug.	30	57	R	.13_____	___	_____ _ _	3_____	_____1_	_31...	prs	abs	prs	prs
			L	.13_____	___	_____ _ _	3_____	___1._11	_31...				
Aug.	27	58	R	.13_____	___	_____ _ _	3_____	_____1	_31...	abs	abs	x	x
			L	.13_____	___	_____ _ _	3_____	_____1_1	_31...				
Sep.	5	59	R	.13_____	___	_____ 1 _	_____	1_____.	_3....	prs	abs	abs	prs
			L	.13_____	___	_____ _ _	_____	_____	_3....				
Aug.	28	60	R	.13_____	__2	_____ _ _	3_____	_____	_31...	prs	abs	x	x
			L	.13_____	___	_____ _ _	3_____	_____	_31...				
Aug.	31	61	R	.1_____	___	_____ _ 2	3_____	111	31....	prs	prs	prs	abs
			L	.1_____	___	_____ _ _	_____	1____111	31....				
Aug.	29	62	R	.1_____	___	_____ _ _	_____	_____	_2....	prs	prs	abs	x
			L	.1_____	___	_____ _ _	_____	_____	_2....				
Aug.	27	63	R	.3_____	___	_____ _ _	_____	_____	_32...	prs	abs	x	x
			L	.33_____	___	_____ _ _	_____	_____	_32...				
Aug.	31	64	R	.3_____	___	_____ _ _	_____	_____	_31...	prs	prs	abs	prs
			L	.3_____	___	_____ _ _	_____	_____	_31...				
Sep.	2	65	R	123_____	__3	_____ _ 2	3_____	_____	_1....	abs	abs	abs	prs
			L	113_____	__3	_____ _ _	3_____	_____2__	_1....				
Sep.	2	66	R	133_____	___	_____ _ _	3_____	2_____22	31...	prs	abs	abs	prs
			L	123_____	___	_____ _ _	_____	1_____2	3?21..				
Sep.	2	67	R	123_____	___	_____ _ _	_____	_____111	_32...	prs	abs	abs	prs
			L	123_____	___	_____ _ _	_____	_____11	_32...				
Aug.	28	68	R	123_____	___	_____ _ _	_____	_____	_321..	prs	abs	abs	x
			L	123_____	___	_____ _ _	_____	_____	_321..				
Sep.	2	69	R	133_____	___	_____ _ _	_____	._____	_32...	prs	prs	abs	prs
			L	133_____	___	_____ _ _	_____	._____2__	_32...				
Sep.	7	70	R	133_____	___	_____ _ _	3_____	_____	__31__	prs	abs	abs	prs
			L	133_____	___	_____ _ _	3_____	_____	__31..				
Sep.	7	71	R	133_____	___	_____ _ _	3_____	_____	__31..	prs	abs	abs	prs
			L	133_____	___	_____ _ _	3_____	_____	__31..				
Sep.	1	72	R	13_____	___	_____ _ _	_____	_____	__33?.	prs	abs	abs	prs
			L	333_____	___	_____ _ _	_____	_____	__321.				
Sep.	7	73	R	13_____	___	_____1_ 1	_____	1___1.1?	__3...	prs	abs	prs	prs
			L	13_____	___	_____ _ 3	_____	1___222.	__3...				
Sep.	2	74	R	13_____	__3	_____ _ _	3_____	_____	_11...	prs	abs	abs	prs
			L	13_____	__3	_____ _ _	3_____	_____	_11...				
Sep.	7	75	R	13_____	___	_____ _ _	_____	_____	_32...	prs	abs	abs	prs
			L	13_____	___	_____ _ _	_____	_____	_32...				
Aug.	28	76	R	13_____	___	_____ _ _	_____	_____	__31..	abs	abs	x	x
			L	13_____	___	_____ _ _	_____	_____	__31..				
Sep.	7	77	R	33_____	___	_____ _ _	_____	_____	__31..	prs	abs	abs	prs
			L	33_____	___	_____ _ _	_____	_____	__31..				
Aug.	27	78	R	2_____	___	_____ _ _	_____	_____	21....	prs	abs	x	x
			L	2_____	___	_____ _ _	_____	_____	21....				
Aug.	28	79	R	_____	___	_____ _ _	_____	__111111	_____	prs	abs	prs	x
			L	_____	___	_____ _ _	_____	__11_111	_____				
Sep.	2	80	R	_____	___	_____ _ _	_____	__1__1__	_____	prs	abs	abs	prs
			L	_____	___	_____ _ _	_____	_____1__	_____				

though they are perhaps neither novel nor striking. First, therefore, to review the sequences of molt within particular tracts:

1. Primaries, as usual falling from the inside outward, without exception and with the most perfect bilateral synchronism, that is, equality of the two sides at all stages. In all eighty cases no corresponding pair varies significantly in growth.

2. Secondaries, equally regular in sequence from the outside, and with the same perfect synchronism of sides.

3. Tertials, invariably in sequence of middle, upper, lower (or middle, proximal, distal), with a curiously regular delay after the fall of the middle feather. In nos. 5, 6, 7, 10, 11, and 14, for instance, the middle feather has completely or nearly renewed itself before either of the others has fallen. The bilateral time-correspondence is scarcely less perfect here.

4. Tail: The three inner pairs fall and are replaced simultaneously, often accompanied by the next pair, which, however, shows a decided tendency to follow in a sequence which is regular in the case of the ensuing outer pairs. Elaborate measurements of great numbers of molting skins might reveal some further evidence of sequence among the central rectrices, but we got no hint of it. The only suggestions of the sort (nos. 18 and 32) are contradictory. No. 24 shows a case of the whole tail falling simultaneously. The bilateral synchronism is perfect.

5. Greater coverts: A tantalizing tract, continually suggesting some order, but never giving us the right to describe it. It furnishes one point of contrast with the middle coverts, in that the molt seems always to start *from a given point or center.* In no case do we find the condition common in the middle coverts, of commencement and progress from two points at once. To be sure, the whole tract may fall at once, or nearly at once, as in nos. 4 and 11. Yet one cannot but feel that the contrast between the two tracts is a real and permanent one, though it may be giving too free a rein to fancy to suggest without more evidence that the greater coverts are in a state of transition, passing towards or away from a condition of greater regularity, or recalling, perhaps, an ancestral condition of simultaneous molt. One of the most startling facts in these tables is the speed with which the greater coverts are replaced, as may be noticed between numbers 9 and 15. The whole process evidently takes place, in the great majority of cases, while the primaries are molting from one to two feathers. This is in notably sharp contrast with the middle coverts, although the latter are still more prone to simultaneous molt. Molt commencing in the middle is far more rare than from either end. Indeed, in the two cases where the movement seems to have begun centrally, the briefest period might have sufficed to change the appearance of the situation by the fall of the remaining outer feathers on one side. It is probable that our few early cases give a somewhat unjustly irregular impression, in the light of the fact that such a large number of more advanced individuals are terminating the molt of this tract at the proximal end. The correspondence of the sides is evident, though subject to variation.

6. Middle coverts: All traces of order disappear. Thus the molt of these tracts would seem to conform to the law that regularity of molt exists in direct ratio to the active utility in flight of the pteryla in question, and that molt by single feathers, the two sides moving *pari passu,* is restricted to indispensable tracts.

Granting the dependability of the primaries as time-indicators, the sequence of the ensuing tracts seems to be fairly regular, in the order represented horizontally in the larger table, but is not without definite exception. Thus such scattered inconsequentialities as those shown among the middle coverts of nos. 7 and 12 are

likely to be the results of accidental losses; but no. 4 shows unquestionable early molting in both greater coverts and tail, while nos. 27, 32 and 46 show even more striking cases of delay on the part of the middle coverts. In sharp contrast to the fairly definite order of commencement of the minor tracts is their scattered irregularity in terminating their molts. The middle coverts, most irresponsible and insubordinate of pterylae, even straggle, in one or two cases, beyond the completion of the secondaries, which, very regular but very late and slow, mark the usual and ordinary closing of this, at least external, renewal of youth.

Indianpoint Lake, Barkerville, B. C., Canada, December 20, 1927