

moderate functioning of the behaviour trait under discussion would have prevented this unusual invasion.

The foregoing appears to indicate that the Common Tern is not over-specialized, not even highly specialized and that its advantageously developed behaviour pattern although characterized by several strong traits, remains sufficiently pliable to successfully cope with unusual adversities of dangerous magnitude. Assuredly the evaluation of any behaviour pattern should be from the standpoint of its ability to maintain a species' population at a safe level regardless of any depletions which may occur. This, the Cape Cod group was able to do in its 1944 nesting by resorting to one potent behaviour trend and modifying all others in ways best suited to assist in its consummation. North Eastham, Cape Cod, Massachusetts.

NAMES OF AGE GROUPS OF YOUNG BIRDS

By HAROLD B. WOOD

A uniformity in the terminology of age groups of young birds has always been desirable. Several terms have long been used to denote the approximate ages of young birds, and have been so confusing and overlapping that some have been adopted where they clearly do not belong. These terms are nestling, fledgling, juvenile, immature and young. The word nestling dates back to 1399, juvenile was used by Bacon in 1625, and the fledgling bird was sung by Tennyson in 1830. These different age groups vary in length, respectively, from a few days, to some weeks, to several months, and to from one to three or more years, depending upon the species. This nomenclature of age groups has long concerned ornithologists, who can and should coordinate their ideas into the adoption of systematized definitions. These are essential but for two entirely different purposes, for ageing banded birds and for museum specimens. Whereas the bird bander must judge by the single specimen in hand, the preparator of bird skins has cranial or other anatomic characteristics and comparable plumage specimens to aid in his identifications. The appearance of the plumage, its stage of development and coloration are the principal factors upon which the judgment for classification must depend for banders. Other developmental characters include such items as the color of the iris or markings about the bill, but the bander may have difficulty in determining the condition of the fontanel. While for the collected specimen it may be desirable to note the stage of molting in transition, with banded birds it is only necessary to make a record as of a completed molt. The

bander needs brief abbreviations of the age terms, e.g.: "*nest.*," "*fl.*," "*juv.*," "*imm.*," or similar notations.

Although the banding of nestlings has been deemed undesirable as a widespread proposition, when banded for special studies or as of rare or rarely obtained birds, it should be recorded definitely that they are nestlings, because their hatch is known within a few days. Likewise, when birds recently out of the nest are banded, and are subjected to an excessive mortality rate from predators or other causes, their recordings should show a definite age group (fledgling) and not both these classes be merely recorded as "young."

The desirability of a uniformity in the use of these terms may be appreciated by referring to a few ambiguous expressions which have come recently to my attention. A popular magazine recently stated, "The parent birds brought live mice to the nest and fed the fledglings." Another described, "Fledgling Bluebirds buried under the nesting material." One author stated a fledgling is "from the time the bird is completely feathered until nearly full grown." Contrast that with the development of the Bald Eagle. A prominent bird bander recently described a "juvenile" as "a bird banded in the nest or caught after leaving"; and a young bird as "after the fall molt, hatched that year." A well-known author stated, "Juveniles can be divided into nestlings and fledglings, that is those taken in the nest and those taken out of the nest." Another admitted, "I have been troubled about our terminology," but he further declared, "In my banded birds I report 'Juv.' for birds banded in the nest, and 'imm.' for birds known or believed to be birds of the year." These usages are very misleading and not in accord with ornithological knowledge.

Also, other expressions by ornithologists showing confused ideas were: "One immature bird was captured two days after leaving the nest"; "grouse are called juvenile until the outer primaries develop as adults"; the term "nestling" being applied to the young after leaving the nest; a fledgling—"from the time the bird is completely feathered until nearly full grown"; "full grown juvenile"; "a female Swainson's Warbler was caring for two juvenile birds (about five days out of the nest)".

Dictionaries, so universally sought for correct definitions, attempt to give acceptable definitions of words, but are not always abreast of science, nor in mutual agreement. A nestling is described as "a young bird which has not abandoned the nest" (Webster), or "not old enough to leave the nest" (New English). John Walker's Dictionary of 1807 defined a nestling as "a bird taken out of the nest." A fledgling—a word actually meaning ready to fly—is accepted as a "young bird just fledged or feathered"; "equipped or ready to fly"; but only one dictionary, an edition of Webster's, gives the definition as "covered with

feathers or down." These are contradictory, as a downy altricial bird is not ready to fly and a downy precocial is ready to leave the nest. Zell's Encyclopedia of 1870 succinctly describes a fledgling as "qualified to leave the nest." Webster's quotes Dwight on juvenal plumage, "The plumage of a bird immediately succeeding the natal down"—which is the feathering of a fledgling. The word "juvenile" appears in John Walker's Dictionary of 1807 and quotes two pronunciations, with short and long "i", with personal preference for the latter.

Jonathan Dwight, writing of Passerine birds, separated them by age according to plumage development and subsequent molts. The stages of plumage development he termed the natal, juvenal, first winter, first nuptial, second or adult winter, and second or adult nuptial. He wrote, "Unfortunately we have no other available guide except plumage to determine whether a bird is one, two or more years old," which is quite true, and most useful to know when studying a series of bird skins. His classifications did not take into account anything of the life ability of the young bird to manage its own affairs—a most critical period. Dwight believed the term "juvenal" should apply to the first plumage, that of the fledgling; thus the juvenal plumage covers the fledgling and the juvenile, and includes the spotted breasts which later become a clear color. Dwight further wrote: "In some species the plumage following the juvenal may be indistinguishable from that of the adult, in others the adult dress may be assumed just before the first breeding season, and still others not until after this season." Since adult means sexually competent, there is no way for a bander to determine if these adult appearing birds are adult unless they are sexually active.

Because ornithologists should select or approve definite terms of nomenclature, letters with suggestive definitions, different from those accompanying this article, were addressed to several leading ornithologists, and their replies may be quoted.

John W. Aldrich was quite in agreement with the definitions as submitted. Herbert Friedmann thought them adequate. Arthur A. Allen worded them differently. Ernst Mayr wrote: "Questions of terminology are always thorny, particularly when of one field are transferred to another. In your case, the terminology for the various plumages was originally given to plumage stages of bird skins. For these workers the plumage alone is the decisive factor and it makes no difference whether or not the young bird has left the nest. Further complication is that your terminology applies only to altricial birds and furthermore only to those which do not have a complete fall molt." The definitions he referred to are not those given in this article. Lawrence E. Hicks said he used precisely the same definitions as given except for "young"—"which I have arbitrarily defined as offspring

in natal year up to January first, or in their first year as long as distinguishable from adults. In the southern hemisphere the arbitrary date would be different—so your one year is probably better than any.”

Alden H. Miller states that birds of the year “would be classed either as juvenile or immature according to whether they had undergone the post-juvinal molt.” Also, “The term immature is correctly used even for a bird that has a plumage indistinguishable from an adult if it shows other definite signs of youth, specifically in the skull region where ossification may be incomplete.” This osteologic point cannot be determined by bird banders, hence the plumage alone must be the differential limit, as according to Dwight. James L. Peters further elucidates, “I find it unsatisfactory to age birds in New England on cranial characters much after December first. By that time the fontanelles in the skulls of the birds of the year are completely ossified, as in the adults, and I doubt if in banding purposes it would be possible to make any age determinations.” Frederick C. Lincoln wrote: “To me the terms fledgling and nestling are synonymous with juvenile, and I never use them except in that sense. In other words, I use the term juvenile (abbreviated *juv.*) for any young bird from the time it is hatched until it is definitely on its own, when it becomes an immature (*im.*). This status it retains as long as it shows by its plumage that it is not an adult (abbreviated *ad.*). In my opinion these three terms all involve very definite periods in the life of a bird, and generally there is no difficulty in applying them.” W. E. Clyde Todd, in labeling specimens, uses the word juvenile to include the first three classes, but agrees that “some distinction might very well be drawn.”

John T. Zimmer reached the conclusion that he does not believe that the application of so many common English names can be restricted to particular stages in a young bird's existence. He stated juvenile, immature and young are distinctly overlapping in their meanings. Dr. Zimmer wrote: “I think a better system would be one based on plumages which are matters of age and development, regardless of whether the bird is precocious or not. In this country Dwight's terms are quite adequate, and most people use them.” Frank M. Chapman wrote: “I should turn first to Dwight's *Molts and Plumages* and possibly amend them as required, rather than develop a new nomenclature.” The sole purpose of this paper is to clarify the nomenclature already set up, not to propose a new one.

FLEDGLING PERIOD—This expression is confusing and used variously. As the hatching period terminates with the appearance of the hatch, so the fledgling period might be stated to end with the development of the fledged bird, and would therefore represent the life span of the nestling. Stresemann used the term as that time spent in the nest. R. E. and W. M. Moreau stated: “It is misleading to take as a rule the

day the young bird leaves the nest as the end of the fledgling period; it is preferable to take, as far as possible, the date on which the bird can raise itself in the air by its wings." Many birds would not fit into that category. B. H. Ryves suggests the fledgling period be defined as "the period during which the young remain in the nest, which they finally abandon under natural conditions, in varying stages of general development." Alden H. Miller uses the expression to include only the life of the fledgling, out of the nest, as does Dr. Friedmann. This use seems much more logical and makes this period analogous to the childhood period.

NESTLING—Alexander F. Skutch correctly terms the nestling as the bird "between hatching and its departure from the nest." Witherby describes the period as "from hatching to the growth of the teleoptiles," the down or feathers which succeed the neossoptiles. Arthur A. Allen suggested, "A young bird in the nest, not fully feathered and with apteria still prominent," which is inclusive of many species. Since some birds are hatched with no down and others are completely covered with it after leaving the nest, the definition in Funk & Wagnall's 1941 College Standard Dictionary is all inclusive: "A bird too young to leave the nest."

FLEDGLING—"A bird which has left the nest but is still dependent on its parents," suggests Mrs. Margaret M. Nice. This is a better definition than the etymology of the word compasses. All dictionaries describe the bird as "fully feathered," but Webster's Students' Dictionary includes "downy"—which would include precocial birds, as quail, rails and others. Alden H. Miller, evidently writing of atricial birds, defined the fledgling as "fully feathered young bird which is under the care of its parents, and is either out of the nest or is ready and able to leave the nest." Herbert Friedmann would restrict the term fledgling to "birds already out of the nest but still cared for by the parents." It is difficult to decide when the fledgling stage is passed, or when a parent bird stops feeding its young. I have seen young Killdeer exactly the size and appearance of adults being fed parentally. Dwight used the words "juvenile plumage" as developing after the post-natal molt, which would be the plumage of the fledgling continued into the juvenile bird. The succinct expression in Zell's Encyclopedia, 1870, is developmentally correct: "Qualified to leave the nest."

"The word 'chick,'" wrote Mr. Lincoln, "I think can be rather generally applied to the downy young of precocial birds, although it is rarely if ever used for ducklings. Nevertheless, for all of these I think that the term juvenile is preferable."

JUVENILE—H. F. Witherby states a juvenile is "a bird in its first covering of true feathers, which usually immediately succeeds the down of nestlings." Dwight classes the juvenile as between the post-

natal molt (of down) and the post-juvinal molt, doubtless meaning the completion of each. "The juvenal plumage [is] acquired by a complete post-natal molt." Mr. Lincoln grossly applies the term to all young birds from hatching to weaning, for the entire time they require the care of their parents. Mr. Todd labels specimens as "juv" to include all birds up to the post-juvinal molt, but agrees that some distinction might be drawn. When these birds are in the process of the post-juvinal molt, Mr. Peters sometimes designates them as "juv-imm." Mrs. Nice wrote: "Some warblers might not be juvenile at all, as they acquire full plumage while still dependent—at least that was my experience in Massachusetts." The title used by Dwight of post-juvinal molt definitely terminates the juvenile age group.

IMMATURE—The period of the immature bird begins with the completion of the post-juvinal molt and terminates with the acquisition of full adult plumage. Dr. Miller separates the juveniles from the immatures by the post-juvinal molt. Mr. Todd restricts the use of the term "immature" to individuals which have assumed the first winter plumage, at least as long as they retain an incompletely ossified skull.

YOUNG—The broad distinction classes birds as either young or adult, but since some species require a matter of years to attain full adult plumage it is advisable to confine the use of the term "young" to those birds of the first year, preferably to those not completing the first fall, or post-juvinal molt. Arthur A. Allen says the term "young is so indefinite it ought to be avoided in banding so far as possible," but as a definition of any bird less than a year old it would be satisfactory. Dr. Friedmann stated, "the term young could be used as an inclusive term under which nestling, fledgling, juvenile and immature represent four distinct stages. I would suggest that observations of birds be written up as free as possible of the use of the word young." When used, he writes, it would give the impression that the writer was without definite information as to the bird in question.

In view of the various expressed opinions cited, and other study, the following definitions of age groups of young birds, to include the altricial and precocious birds, are herewith submitted:—

NESTLING—A young bird within and not ready to leave the nest.

FLEDGLING—Normally ready or physically able to leave the nest and survive, and still being cared for by its parents.

JUVENILE—A young bird out of the nest and able to take care of itself, but which has not completed the post-juvinal molt.

IMMATURE—A bird after completing the post-juvinal molt, but has not acquired the complete adult plumage.

YOUNG—A generalized term applied to the bird less than one year old, when a more definite determination of age cannot be made.

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A METHOD OF DETERMINING THE AGE OF LIVE
PASSERINE BIRDS

By ALDEN H. MILLER

Frequently, in utilizing passerine birds for experimentation or in following their history in banding studies, it is important to know the age of individuals. In the majority of species differential plumage characteristics of first-year and adult birds are not distinct enough to afford dependable criteria. Even where appreciable differences do exist, adequate analysis of them may not have been made, or it may be infeasible for the worker accurately to evaluate them at his field station. Another method helpful in some species has recently been put into practice with fully satisfactory results. It utilizes in the live bird the condition of the skull, a criterion well known to experienced preparators of bird skins.

The skull of a passerine bird when it leaves the nest is made up of a single layer of bone in the area overlying the brain; at least, the covering appears single when viewed macroscopically. Later the brain case becomes double-layered, the outer layer being separated from the inner layer by an air space across which extend numerous small columns of bone. It is not necessary to section the bone to determine the condition. Externally the skull of the immature bird appears uniform and pinkish in live or freshly-killed specimens. The skull of the adult is whitish, due to the air space, and also it is finely speckled as a result of the dense white bony columns between the layers.

As is well known, the double condition is attained progressively and, in some species, more rapidly than in others. In some non-oscine families, as the Furnariidae, I think doubling may never be complete; and some specialized types, like the crossbills, have aberrant structure.