I had expected to find the Calaveras Warbler and the Sierra Hermit Thrush (*Hylocichla guttata sequoiensis*) fairly numerous near Mohawk or Johnsville, but found none of the former and identified but one of the latter, which was the only one whose note was recognized as belonging to that species, its song leading to its capture for identification purposes.

San Francisco, January 22, 1919.

THE MARITAL TIE IN BIRDS

By LOYE HOLMES MILLER

IN THE CONDOR for October, 1918, Mr. F. C. Willard contributes a most stimulating article dealing with the question "Do birds mate for life?" In support of his affirmative contention he brings forward some observations resulting from his extended field work in southern Arizona.

His article is good and the facts recorded are unimpeachable. The interpretation of facts, however, introduces the human element into science, and hence offers a basis for divergence of honest opinion. It is not my desire to dispute Mr. Willard's conclusions but to offer, wholly in good faith, some remarks in support of the opposite side of the question, so that each reader may be his own judge, jury, and court of appeal.

I am free to say that I do not know whether or not birds mate for life, which statement is equivalent to admitting that I do not consider my own argument as conclusive. In all probability it often falls out that the same individuals come together in successive reproductive cycles, but such may be quite a fortuitous occurrence, due wholly to propinquity and not therefore proof of the truth of a more general conclusion. For some time it has been my own opinion that birds do not, as a rule, retain the same mates from one season to the next. At the risk of stepping from the realm of knowledge to that of speculation, I am offering in support of my position the following points, scarcely to be dignified by the name of evidence.

My first contention is that a bird's activities are almost wholly the result of instincts. These instincts are racial characters and are transmitted from generation to generation, no less truly, though perhaps more variably, than is color, size, or wing area. Only occasionally can even the layman contend that what we call intelligence enters in as a factor of behavior. Instinct bids a Hooded Oriole choose palm or yucca fiber as her nesting material, even though she place the structure in a gum tree or on a corn stalk, and failure of this instinct is almost as rare as is that failure in pigment formation which results in albinism.

My second contention is that instincts are dependent for their stimulus upon the physiological condition of the animal. Recent experiments on internal secretions have been performed by the transplantation of reproductive glands or by the infusion of tissue extracts directly into the blood stream. These experiments have some bearing upon our problem in that they go to prove that plumage differences between the sexes of poultry are directly controlled by the presence in the body of these germ cells, and that many instinctive acts are dependent, for their immediate stimulus, upon the activity of these glands. A

young capon in whose body the ovaries of a hen are grafted, will develop the feathering characteristic of the hen. The capon without the engrafted ovaries, will develop almost as the normal male. A normal female rabbit, treated by hypodermic injection with the extract of foetus in normal salt solution, will pluck the fur from her breast and build a nest as though expecting a litter of her own young, though none are developing. In these two cases a structural and a psychologic character, respectively, are influenced by a physiologic agent —a particular chemical substance. This substance is secreted and thrown into the blood stream by the germ cell or by the developing ovum, and constitutes one of those products, so important to the highly organized animal, which we term internal secretions.

The germ cells in birds, like those in most other wild animals, are seasonally active. As a result the reproductive gland may increase or diminish in size from ten to one hundred fold in regular cycles, which cycles are generally conformable to season. With the fluctuation in mass there will be a change in the amount and possibly in the nature of the internal secretion, hence the whole physiologic balance of the body will be seasonally affected. It is doubtless because of this ebb and flood of the physiologic tide that certain instincts, particularly those connected with the reproductive process, appear and disappear in orderly sequence each year.

It is maintained that the choosing of a mate is a purely instinctive act on the part of the wild bird. (It might often be discovered to be so among our august selves!) The choice is part of a great chain of events connected with the reproductive process as a whole; it is physiologic in its immediate origin, and therefore is of seasonal recurrence. During the dormant period of its reproductive cells, the bird is practically an asexual creature. Maleness and femaleness have disappeared entirely so far as interests, many activities, and often external appearance, are concerned. On the other hand, resumption of the germ cell activity initiates a new mating activity. The bird chooses a new mate.

So much for the theorist. What have we from the field observer? Among the forces that hold individuals together in the bird world, we may recognize at least three bonds, the parental tie, the marital tie, and the social tie. Of these three, which is of most importance as a bond of some duration? I contend that the parental tie is of greatest survival value to the race. We find it lacking in but few species, notably in cowbirds, in Old-World cuckoos, and in megapodes. But in these species the marital tie is also lacking as a persistent bond. The flocking tie alone, persisting in the cowbirds, results in a reprehensible Bohemian freedom and a Gypsy-like vagrancy of most unavian character.

Upon the duration of the parental tie, the whole care of the young and hence the safety of the race is hinged. It must outlast the period of the young's dependency, while the marital tie is not absolutely necessary beyond the momentary contact required for impregnation. We actually see the parental tie ruptured. The parent weans her young because of waning instinct, and further support is denied it. The parent and her offspring then become rivals, peaceful or otherwise. If such a fundamental tie be ruptured, why not also the less necessary marital bond? We find at least circumstantial evidence bearing upon the question.

At the close of the breeding season, a thousand Linnets assemble in a weed patch, there to feed from time to time during the fall and winter. The flock

is an impartial mixture of sexes and of generations, in which the social tie dominates the other two, if these other two exist at all at the time. Are they really present? Will the flock coagulate in the spring and give out the same marital combinations that existed during the previous breeding season? Is not parent just as liable to mate with its own offspring as with a member of its own generation?

Consider the case of our non-social birds, such as the Shrikes and the Mockingbird. The asexual winter bird sees only a competitor in every other one of his own species who invades the particular territory which he has preëmpted as his own. These birds are, with us here in the south, more or less localized as to individuals; hence it doubtless often happens that, through propinquity, the same combination of individuals may recur in successive years. But does this involve a marital constance? I doubt it.

Take again in the case of the migratory species. There is a separate migration of the sexes in many of them. By the end of August most of the male Hooded Orioles have gone from the neighborhood of Los Angeles. There are still plenty of females and young of the year. The same might be said of the Black-headed Grosbeak and of a number of other species. The "men folk" have gone off on a regular stag party (or Elk's excursion) to the tropics. Will their "women folk" follow after with the children and hunt up their neglectful lords? May they not even winter in separate intra-tropical states, spending the asexual part of their yearly cycle wholly unconscious of each other's being? On the return migration, the same separate movement may be observed. The vagrancy impulse seems to attack the males first and they push northward in great pioneer armies of males. I have seen a flock of male grosbeaks flying like a flock of blackbirds and entirely unleavened by feminine presence. They were just arriving from the south. Did their last season's wives follow later and claim, each, her recalcitrant spouse?

Then there are cases of abject desertion on the part of the male. Such is true of the Anna Hummingbird. I have found many nests of this species, in various stages of progress of the nest or of its content, but never yet have I seen the marital tie survive the early stages of nest building. The female completes the nest, incubates the eggs, and rears the young without assistance from the male. Mrs. Hummingbird is the original golf widow, with a husband somewhere at the club, but she is not sure where (nor probably does she care).

Perhaps we should not offer here as evidence the great variety of courting antics in which birds indulge, from the classic flight of the retiring woodcock to the dancing tournaments of the grouse. Are they merely for stimulus and not for selection of the mate? If birds mated for life would we see these courting activities so commonly? They would be needed only by the young and by the bereaved.

The theorist, however, feels it proper to ask the question: Are there not biologic reasons why a seasonal readjustment of the marital relation would prove advantageous to the race? If a protracted effort is required each season before a mate is obtained, the less virile bird will go unmated. Would not the result average better for the maintainance of tone in the race? Whatever else may be claimed for the principle of sexual selection, it seems to be more or less vital to racial vigor. Seasonal recurrence of the selective process would then be classed as a sort of protective adaptation in a class of animals showing abundant specialization in other respects.

The writer has often met in the layman's mind, a tendency to read into the behavior of lower animals the impulses of the human brain. Further still, some would impose upon the lower animal the restrictions of the Mosaic Law. In case the human law have no foundation in biologic law, is there any reason why it should be imposed upon the lower animal? On the other hand, let us examine some of the laws of human ethics and see if they are merely different ways of stating laws of nature. I have already used in the preceding pages of this now too long article the words "reprehensible", "recalcitrant", and "vagrant", but is it proper to do so? I maintain that the ethics which demands that the marital tie shall last "till death do us part" should not be imposed in those words upon the bird but that the same law, recast in terms of biology, is applicable to, and is observed by, a multitude of bird species. Let that law read thus: "The male and female shall coöperate during the period of the young's dependency upon parental care." Will it not work out for humans in the majority of cases, almost as well as does the ritual?

Take two biologic humans, uninfluenced by the artificial conditions of our later civilization. They establish the marital tie at the age of twenty years. The first offspring is born within the year and becomes independent at the age of eighteen or twenty. In the meantime there have appeared, at intervals of two years, other offspring to the number of ten. Is this an exaggeration for the biologic human family? By the time the last young is independent, the parents have lived in active coöperation for the period of forty years, and have reached the age of sixty. They had best not attempt any readjustment at that age, even though they have no grandchildren on their hands. The ethical law is really a biologic law and we didn't know it.

Apply the same restriction to the bird and you have a coöperative period not extending, as a rule, beyond the spring and summer of each single year, and sometimes for even less time than that. There is no biologic demand for a greater prolongation of the marital tie. Certainly there is nothing in the birds' code of ethics. Why hold to a human lettering of the law?

State Normal School, Los Angeles, California, February 1, 1919.

THE SUMMER BIRDS OF HAZELTON, BRITISH COLUMBIA*

By P. A. TAVERNER

WITH ONE PHOTO

HAZELTON, BRITISH COLUMBIA, is at the head of the Skeena River, at the forks where the stream is formed by the junction of the Bulkley and Babine rivers. It is the most northern point reached by the Grand Trunk Pacific Railroad, hence, with the exception of points on the new Hudson Bay Railroad, it is the most northern station reached by any of the main railway systems in America. In latitude 55° 20′, it is on line with the mouth of James Bay and slightly north of Hamilton Inlet on the Labrador coast. Situated as it is, at the head of navigation on the Skeena River, the supply route

*Published by permission of the Geological Survey, Ottawa, Canada.