THE EXPRESSIONS OF EMOTION IN THE PIGEONS. III. THE PASSENGER PIGEON (*ECTOPISTES MIGRATORIUS* LINN.).

BY WALLACE CRAIG.

INTRODUCTION.

IF the Passenger Pigeon is not yet extinct, it is highly important that there be published an account of its peculiar voice, for this may be of great assistance in re-discovering the birds. Thus, if you tell a boy to look for a bird of the same general appearance as the Mourning Dove but larger, he will be sure to mistake some large-appearing Mourning Dove for the Passenger Pigeon. But tell him to look for a pigeon that shrieks and chatters and clucks instead of cooing, and the boy will be less likely to make a mistake. The voice has this further advantage as a mark of identification, that it cannot be produced in a dead bird, and thus forms an incentive to keep the bird alive.

If the species is extinct, it is equally important to publish whatever is known of its voice, as a matter of permanent record. The Passenger Pigeon is well known to have been a unique species in one respect — its prodigious gregariousness. But the fact is that it was a marked bird in every respect. Ectopistes represents a line of evolution which has diverged widely, in habits at least, from the main paths of Columbine descent. Its voice was more distinctive than that of any other species in Professor Whitman's large collection of living pigeons from all parts of the world. This marked peculiarity of the species makes it infinitely regrettable if the whole race, through sheer wantonness, has been annihilated.

The accounts hitherto published of the voice and mating behavior of the Passenger Pigeon are meagre, largely incorrect, and totally inadequate for that detailed comparative study which scientific considerations demand. The best life-history, so far as concerns the mating behavior, is probably that of Bendire (quoted largely from Wm. Brewster), but even this, as is seen in the very manner of its composition, is fragmentary. Mershon has done a great

work in collecting scattered records of the species. But accounts of its voice and gestures are especially scarce. Wilson, for example, makes only this brief statement on the subject: "They have the same cooing notes common to domestic pigeons, but much less of their gesticulations." Even this last brief clause, however, is of value to countervail Audubon's florid description. Audubon has more to say than any other writer on the voice and gestures of the species, but his account is so full of errors that at the end of this paper (p. 423) I shall criticise it in detail. A criticism of the figures on Audubon's plate will follow the discussion of his text, and a criticism of other published figures will be found on pp. 411, 412.

The present study of the expressions of the Passenger Pigeon is also inadequate and, I fear, also incorrect in some details; all that can be said is, that I have made it as truthful and as adequate as I can. I saw this bird in a wild state only once to my knowledge, in Chicago in 1891,[1] as recorded by my late lamented friend Dr. Dunn (Dunn, 1895). My studies of the voice of the species were all made in Professor Whitman's aviary, chiefly in the year 1903, a year which was too late to see much of the vanishing birds, yet too early in my own study for me to have a good grasp of the problems. For Professor Whitman's aviary contained that summer no Passenger Pigeons in full breeding operation, but only a few unmated birds, one male mated with a female of his own species, one mated with a female Mourning Dove, and one mated with a female Ring-Dove, none of these mated birds carrying their breeding operations to completion. And as for a grasp of the problems, suffice it to say that science has not yet reached the point where it can well understand and record the language of any bird. My notes were not published when first taken, because they were felt to be so inadequate; now, after several years further study of doves, I can better understand the facts concerning the Passenger Pigeon, but I have forgotten many details. Hence, the following notes are put forth, not with the assurance that they adequately represent the repertory of this remarkable species, but only with regret that the meagre information now to be given is all we are likely to have on the subject.

[1] This occurrence of the species has been overlooked by Mershon in his list of occurrences.

A. THE FORMS OF EXPRESSION.

General Bearing. As I have said, the Passenger Pigeon had in every respect an individuality which marked it off from the other species of the family, an individuality which stood forth in walking, flying, and every other activity, and even when the bird stood silent and still on the perch. Professor Whitman says, in a published letter (Mershon, p. 199): "Of all the wild pigeons in the world the Passenger Pigeon is my favorite. No other pigeon combines so many fine qualities in form, color, strength and perfection of wing power." And chief Pokagon says (Mershon, p. 49): "It was proverbial with our fathers that if the Great Spirit in His wisdom could have created a more elegant bird in plumage, form, and movement, He never did." The bird was a majestic, muscular, trim body; it consisted of a splendid chest and wings, contrasting with rather short legs and small head, and tapering gradually into the long, slender tail. It was eminently a bird of flight; on the ground, it was rather awkward for a pigeon, its legs seeming too short and its massive shoulders too heavy. In regard to this, as in regard to all other points where practicable, I shall transcribe original notes verbatim.

"All important sounds given on perch or nest, they do nothing on ground but feed, female sometimes making angry noise when quarrelling over food, but I have not known male do even that."

In contrast to this lack of ease on the ground, is the ease and nobility of the Passenger Pigeon when flying and also when perched aloft. When sitting on a perch in the aviary the male often indulged in a grand wing exercise, an impressive display totally different from the fluttering exercise of the other species of pigeon.[1]

"August 1. Male often sits on perch or on ledge and flaps his wings for long time preparatory to flight, looking about him attentively as he does so. For a small part of the time, especially just at the beginning of each series, wings may be held up without being spread, and very slightly flapped; again, they may be fully spread and flapped with the fullest amplitude, the carpi coming within about $1\frac{1}{2}$ inch over the back. The

[1] I find that I made note of a similar wing exercise once in the Homing Pigeon, and once in the Rock Dove, *Columba livia.*

only reason this flapping does not lift the bird is that it is not rapid enough, also the bird seems to hold tightly to perch with its feet. As it is, the whole body, head and tail rise and fall with each stroke. He generally stands obliquely along the perch, so that one wing comes down on each side of perch, but even then it often happens that one wing hits the perch with very audible sound at every stroke."

This wing flapping seems to have been not merely an exercise but also a display, more or less connected with mating, for it was seen chiefly in the breeding season.

The nod of the Passenger Pigeon was utterly different from that of the Mourning Dove. The specific manner of nodding seemed an integral part of the bird's general bearing. The nod consisted of a movement of the head in a circle, back, up, forward, and down, as if the bird were trying to hook its bill over something. Often two or three such nods were given with no pauses between, following one another much more rapidly than in the Mourning Dove, because body and tail remained all the while stationary. Thus the nod, being performed by the head alone, fell in with the general mannerism of the species — the body generally executing strong and ample movements, the short and quick glances and nods being executed by the head alone.

To this general account of the bird's bearing, I may append the following scraps of notes, which, in case the species is really extinct, may prove of interest when our bird biographies become more complete than they are now.

"Ordinary walking pace of male, 12–13 steps in 5 seconds."

"In eating, female pecks at rate of about 12 pecks in 5 seconds on an average, and as head moves through considerable arc, its motion is very quick. The mumbling of each seed, also, is very quick."

"Especially active and noisy in early morning."

The general bearing of this species ought to be shown in the extant drawings of it, but this has been done with varying success. I have seen only five published plates representing the live Passenger Pigeon. Of these, the best to show the form and carriage of the species is the photograph of a young bird, by Professor Whitman (Mershon, facing p. 198). Fuertes's figure of the male (Mershon, frontispiece) is a life-like portrait of this bird in an attitude of alarm or anxious attention; the figure of the female in

this same plate is less representative. Wilson's figure (the one reproduced in Coues's 'Key'), though faulty in many particulars, gives one a general impression of strong, massive body, strong wings and shoulders, short legs and small head, all which is truly characteristic. The figures in Baird, Brewer, and Ridgway (Vol. III, p. 369) and in Audubon, as attempts to show the bearing and mannerism of the species, are quite worthless. (A detailed criticism of Audubon's plate is given on p. 425.)

Enmity. The male Ectopistes was a particularly quarrelsome bird, ever ready to threaten or strike with his wings (though perhaps not quite so ready with his beak), and to shout defiance in his loud strident voice. With such a quick temper, such a grand air, and such an unusual voice and method of attack, he generally put to flight a pigeon of any other species at the first onslaught. Nevertheless he was a coward at heart. In short, he was a splendid bluffer.

This is true of all pigeons to a greater or less degree. Most species of pigeon have two methods of fighting: the first, a hostile display or ceremony; the second, actual physical combat. Ceremonial fighting is the most frequent: the contestants make a great show and a great noise, talking and cooing, bowing and strutting, threatening with wings and beak, and generally deciding the quarrel by these means, the less determined party giving in without being hurt. When both sides are determined, however, they pass from this ceremonial fighting into a fierce physical struggle, in which there is no strutting, no ceremony, no crying out, but only the flutter and thud of fighting, and an explosive clapping of angry wings. The pigeon cannot kill his enemy at a blow, as the cock can, for he has no special weapons and his beak is soft, but he can worry his enemy grievously and in time perhaps worry him to death.

Now as to the Passenger Pigeon, he seemed, so far as I knew him, to have but one method of fighting, which was intermediate between the two described. He was an aggressive, violent threatener, but not a real fighter. He would even flee from a Geotrygon, a bird not half his size, as the following extract shows.

"July 25, 1903. A male Passenger Pigeon alighted on ground, was attacked by Geotrygon, chased for several jumps, and finally compelled

to fly up. Again, a Geotrygon flew down beside a male Passenger on a shelf, and drove him off the shelf simply by going at him with one wing up. A Geotrygon actually drove a male Passenger off his own nest."

The following incident in the life of a male Passenger Pigeon mated with a female Ring-Dove shows that the former was less brave than the latter in driving intruders away from the nest. (In pigeons generally the male is at least as brave as the female in this matter.)

"July 14, 1903. This morning I found a European Wood Pigeon (*Columba palumbus*) on the nest beside the female Ring-Dove, and a female Passenger in adjacent corner. The male Passenger came in and drove off the interloping female Passenger, then sat in corner quiet. Occasionally he threatened the Wood Pigeon with wings and voice, but dared not go at him. The female Ring-Dove threatened and finally pecked the Wood Pigeon, making him start and throw a wing up. Then the male Passenger flew at him and drove him off."

Had it not been for this comparative harmlessness, the Passenger Pigeons surely could never have nested so close together as they did — a hundred nests in one tree, as both Audubon and Wilson testify. Most pigeons are too aggressive to admit of such neighborliness.

Fear and Alarm. Probably the Passenger Pigeon did not differ greatly from other species in the expressions of fear and alarm, for these are the most uniform expressions throughout the Columbidæ. Chief Pokagon writes as follows (Mershon, p. 50): "While feeding, they always have guards on duty, to give alarm of danger. It is made by the watch-bird as it takes its flight, beating its wings together in quick succession, sounding like the rolling beat of a snare drum. Quick as thought each bird repeats the alarm with a thundering sound, as the flock struggles to rise, leading a stranger to think a young cyclone is then being born." This habit of flying up when the flapping of wings is heard, was taken advantage of by the pigeon-catchers in managing the flock, thus: (Brewster, 1889, quoted in Mershon, p. 75): "After a portion of the flock has descended to the bed, they are started up by 'raising' the stool bird [the stool bird then flapping its wings], and fly back to the perch." The communication of alarm by the sound of wings is seen clearly in all species of pigeon. The Passenger probably had

also an alarm-note resembling that of the other species, but of this I have no record.

The Charge. I believe, but am not certain, that the charge, as described for the Ring-Dove and Mourning Dove (Expressions in Pigeons, I, p. 42, and fig. 2; II, p. 400) is not represented in Ectopistes at all. This much is certain, that Ectopistes was more awkward on the ground than are most pigeons, and if it charged or strutted in any manner it did not indulge this habit so much as most pigeons do.

The Kah and the Coo in general. The cries of the Passenger Pigeon which seem to represent the kah and the coo of other species, are identified with those rather by the circumstances under which they are given than by the character of the cry itself, so far have they diverged from the usual type. Some of these cries, the homology of which is uncertain, had better be described under names invented for Ectopistes alone rather than under those names which apply to the Columbidæ in general. The terms used will be the following: 1. The copulation-note; 2. The keck (a name not used for the note of any other species); 3. Scolding, chattering, clucking (these names also peculiar to the species); 4. The vestigial coo or keeho; 5. The nest-call.

The Copulation-note. This note is essentially the same as in the Mourning Dove, and will be described in the course of the life-history (p. 421).

The Keck. This word is an imitation of the cry for which it stands. The first *k*, however, should be aspirated like the German *ch*, to represent the unmusical quality of the cry. The sound is loud, sometimes very loud, harsh, and rather high-pitched (*b* above the treble staff) so far as it can be said to have any pitch at all. It is generally given singly, but sometimes two or more in succession with but short pause between. It is quite unlike any sound I have heard from other species of pigeons. In its use it is, as it were, a loud shout, which commands attention and tends to overpower the bird at which it is directed. It is used both to overpower the female and to overpower an enemy. Hence it would seem to correspond to that expression of the Ring-Dove which I have named the kah-of-excitement (Expressions in Pigeons. I, p. 40). The keck resembles the kah-of-excitement also in that it is often followed immediately by other notes, such as the coo.

"Sometimes with each kheck wings are raised to full extent and flapped once. Often bird is a little oblique on perch so that one wing-tip strikes down in front of perch, the other behind; but sometimes bird is square and both wings come down in front.

"Have seen male give this wing-flap to female without a sound."

"One gave a loud keck and flap of wings at a Turtle-Dove who was bowing-and-cooing on a shelf two feet below him: the Turtle stopped his bowing-and-cooing.

"The Passenger did the same at a Wood Pigeon (*Columba palumbus*)."

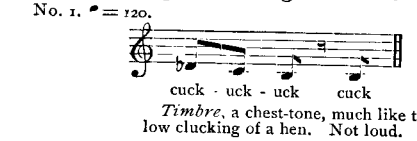
Scolding, Chattering, Clucking. These words are chosen to represent the wide variations of this most characteristic and frequent utterance of the Passenger Pigeon. Similar descriptive words have been used by all who have attempted to treat the voice of this species. Thus Audubon says (Orn. Biog., I, pp. 325, 326): "The common notes resemble the monosyllables *kee-kee-kee-kee.*" Other writers, quoted by Mershon, speak of the sounds as "chattering" (pp. 51 and 166, 167), "twittering" (p. 84), "chirping" (p. 85), "*Tete! Tete! Tete!*" (p. 138), and finally the "crowing call of the wild pigeon" (p. 157). Wm. Brewster (quoted in Bendire, p. 134) says: "They make a sound resembling the croaking of wood-frogs." A vivid idea of the sound may be gained from the following account by H. T. Blodgett (in Mershon, p. 120): "During the spring and also the fall visit, flocks searching for feeding ground could be called down from flight and induced to light on trees near where the call was sounded. The call was one in imitation of the pigeon's own call, given either as a peculiar throat sound (liable to make the throat sore if too often repeated) or with a silk band between two blocks of wood....held between the lips and teeth and blown like a blade of grass between the thumbs. By biting or pressing with the teeth....the tension upon the silk band would be increased, raising the tone of the call or relaxing for a lower note. Cleverly used, it was very successful in calling pigeons feeding in small flocks to alight."

This cry is used in a great diversity of circumstances, it is directed both toward the mate and toward enemies, and in varying situations the utterance varies to an extreme degree. In expressing high excitement it becomes loud and high-pitched, and in the excitement of fighting especially it becomes very rapid. In a gentle mood, it subsides into a soft, low-pitched adagio. Hence,

although the tone is never musical the cry is highly expressive, just as the tones of voice in speaking and shouting are expressive. This utterance is probably analogous to the ordinary *kah* of the Ring-Dove, which, you will remember, has no analogue at all in the Mourning Dove.

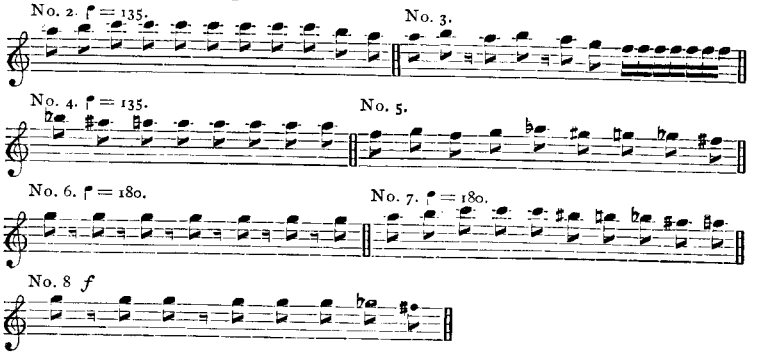
The following notations (Nos. 1–20) of the scolding, chattering and clucking of the Passenger Pigeon, I made as accurately as I could by ear, in Professor Whitman's aviary.

Alighting on a perch among a lot of other birds.

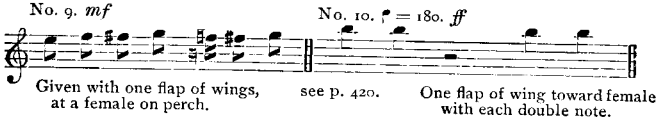


Timbre, a chest-tone, much like the low clucking of a hen. Not loud.

Fighting, Quarreling.



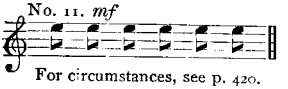
Masterfully, toward female.



Given with one flap of wings, at a female on perch.

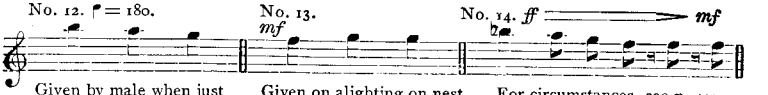
see p. 420.

One flap of wing toward female with each double note.



For circumstances, see p. 420.

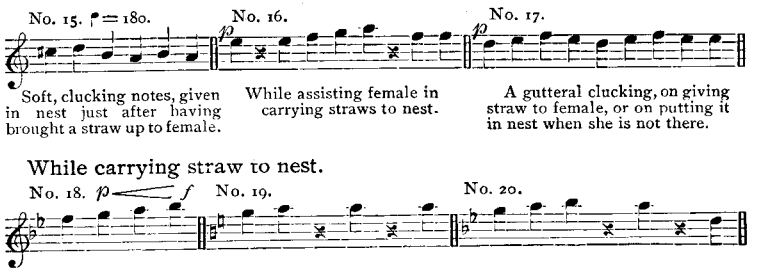
Gently, toward mate.



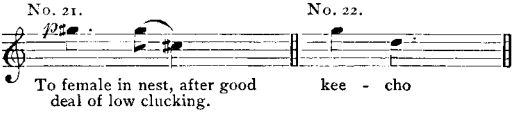
Given by male when just about to tickle female's head.

Given on alighting on nest when female there.

For circumstances, see p. 420.



The vestigial Coo, or the "Keeho." The notes which have just been described, were, as said, the most frequent and the most characteristic utterances of the Passenger Pigeon. But not uncommonly when the bird is kecking and clucking he lapses into a weak, somewhat musical strain sounding like *keeho* or some such dissyllable. This is no doubt a vestigial coo. It resembles the coo in sound, and also in the circumstances under which it is uttered, for it is given *after* the more unmusical notes, both in dealing with an enemy and in wooing the female. I call it vestigial, a mere remnant of a coo, for several reasons: its sound is feeble and lacking expression; in function it seems unimportant, coming usually after or among the stronger, more expressive utterances; finally, the manner of its utterance gives the impression that it is somewhat less voluntary, less under the bird's control, than are some other notes of this species or the coos of other species. One sees in this probably an adaptation to life in a community so populous and hence so noisy that cooing could hardly be heard and the pigeon which could best win a female or warn off an interloper would be the pigeon with the merely loudest voice. In this ultra-gregarious species, the soft note, the coo, has degenerated; whereas the hard cry, the kah, has been developed and intensified into the loud sounds of kecking, clucking, chattering and scolding. The following notations (Nos. 21–26) illustrate the vestigial coo.



No. 23.

Before giving this, gave keck several times, each time raising wings and closing again suddenly. Once gave a flap of wings forwards.

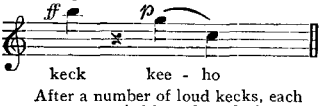
No. 24.

Also given after a few kecks (even if the kecks are at an intruding bird.)

On another occasion, given alone, not preceded by kecks.

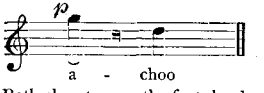
On one occasion, given near nest, after driving other pigeons away.

No. 25.



After a number of loud kecks, each accompanied by a flap of wings.

No. 26. ♩ = 180.



Both clear tones; the first, hard like squeak of violin; the second softer, a head-tone. The slight intermediate ch is toneless.

Altogether, quite musical.

The Nest-call. The nest-call, of which I have only one carefully recorded observation, resembles that of the Ring-Dove and Mourning Dove in the general use to which it is put and in the movements which form part of the expression. The sound is totally unlike that heard from Ring-Dove and Mourning Dove, but bears a general resemblance to the nest-call cooing of the Japanese Turtle (*Turtur orientalis* Lath.) and the European Turtle (*Turtur turtur*), which Professor Whitman believed to be the nearest living representatives of the ancestral type of the whole group.

No. 27.

Timbre very much burred — more so than any other note of this species. A great mixture of high and low tones. Only moderately loud, and half musical.

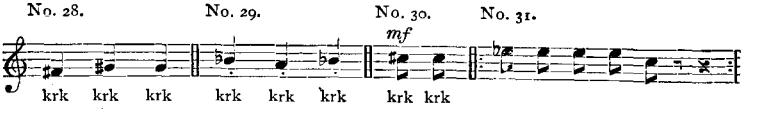
Series consists at the least of about 8 notes, and at the most of a large number. If a long series, it falls a little in pitch, about a semitone. Series always ends with a *keeho*.

Bird stood in nest, with tail up and head down, though not so much tilted as some other species. He was never at rest, always in slight nervous motion.

In much the same position, bird gives a series of *keeho* without the nest-call burred note. With the first note of *keeho* head is raised a good deal above the back, and lowered with second note.

The Voice of the Female. All that has been stated thus far regarding the voice of the Passenger Pigeon, refers to the male

only.[1] In this species, as in all other pigeons, the female is comparatively a very quiet bird. The following few notes (notations Nos, 28–31) are all I have on the voice of the female.



No. 28, not loud, a clucking sound. Given on alighting on perch among Band-tailed Pigeons who drove her off.

No. 29, similar to the preceding. Given in striking at a dove and driving it off perch.

No. 30, an almost toneless croak. Uttered at a male whom she wished to drive off. Once heard a male give a very similar note toward a female.

No. 31, an almost toneless croaking sound, like the rolling of an *r* in one's throat. Uttered at another bird in quarrelling over food. Repeated several times. Another day I heard the same utterance given under the same conditions, but 6 notes instead of 5, and a considerable resonant tone with the hoarseness, being *mf*.

Once I heard a female give, at the end of a series of clucks, in the nest, a feeble counterpart of the male's keeho.

B. THE EXPRESSIONAL LIFE-HISTORY.

The life-histories of all pigeons are very much alike; that of the Passenger Pigeon is in general, and even in most of its details, a counterpart of the life-history of the Ring-Dove or the Mourning Dove, as described in the two preceding papers of this series. However, there are many details in the life of Ectopistes which are not found in any other pigeon, and if we had known the species more fully we should probably have found many peculiarities of habit which are now not known at all. I am by no means able to give a complete life-history of the species, but I shall give all my observations on the uses of the various cries and gestures in the mating and general social life of the species.

The wooing of the Passenger Pigeon is very different from that of most other species. There is no bowing as in the Turtles, Ring-Doves, etc., no strutting as in the Domestic Pigeon, and I doubt whether the charge was practised as in the Ring-Doves and Mourn-

[1] Except musical score No. 1, which I suspect may have been recorded from a female.

ing Dove. The male Passenger Pigeon, when displaying near the female, used the *keck*, often accompanied by a single sweep of the wings, also the loud chattering notes and the soft *keeho*, and sometimes the grand wing exercise (p. 410).

"Once when male was caressing female [on a day of copulation] and she flew away from him to next perch, he looked at her, fighting attitude, and gave call No. 10 (p. 416), flapping his wings at her."

When close beside the female, the male Ectopistes had a way all his own of sidling up to her on the perch, pressing hard upon her, sometimes putting his neck over her neck, "hugging" her, as Professor Whitman expressed it.

"July 18. Male presses over on perch against female, gives *keck* twice without raising wings, then preens inside wing [a sign of eros]."

"July 31, 1903. A male is following a female about. Whenever he alights beside her he presses close to her, head held as high as possible and directed toward her. She moves off each time and he sidles along and presses her again and again. This very characteristic of the Passenger Pigeon."

Cry No. 11 (p. 416) was "given to mate, after several kecks and light, swift taps with the wings. The performance looked like fighting, but it was not. The birds sharply and roughly preened each other."

Cry No. 14 (p. 416). "Male alights beside female [on a day of copulation], presses so close as to make her move several steps along the perch, and as he does so gives cry No. 14."

When the female becomes amorous, instead of edging away from the male when he sidles up to her, she reciprocates in the "hugging," pressing upon the male in somewhat the same manner that he presses upon her. These peculiarities make it far more difficult for the breeder to cross the Passenger Pigeon with other species than it is to cross many of these other species *inter se*. Thus, one of Professor Whitman's attempts to mate a female Passenger Pigeon with a male homer (*Columba livia* var.) failed because when the female had been played up to until she was amorous she began to reciprocate by sidling up to the male, wanting to press him and hug him, he took this for just so much pugnacity every time, and edged off, with the result that they never mated. In general the Passenger Pigeons are very rough in their caressing. When a male Passenger is mated with a female Ring-Dove, instead

of preening her feathers gently as the male Ring-Dove usually does, he preens her so roughly that she is frightened and edges off from him.

The act of billing, which occurs in all pigeons before copulation, is in Ectopistes reduced to a mere form. In the Ring-Dove, the male opens his mouth, the female puts her bill into it, then follows a pumping movement in which the male seems to be actually feeding the female; then the pair leisurely disconnect, mumble their mouths as if they had a sweet taste in them, and soon bill again in the same careful manner. But in the Passenger the bills are quickly clasped, shaken for a fraction of a second, and as quickly separated; the performance is precisely like a brief, quick handshake. It is probable that there is no passing of food from one mouth to the other. This perfunctory mode of billing, again, causes some difficulty in crossing the species: for example, if a male Passenger is mated with a female Ring-Dove, when they are leading one another up to the point of copulation, the male bills in his abbreviated fashion and immediately wishes to mount, but the female is not yet ready, she is trying again to bill.

With regard to the manner of copulation, I made the following note on July 24, 1903.

"Each time they copulate, female stands up very straight when male mounts; this compels him to flap his wings for long time, scrambling up near her neck, till she becomes tired [?] and sinks down, then he copulates."

I cannot say whether this procedure is invariably followed, but if so it is peculiar to the species and in keeping with their generally rough manner of wooing. This scrambling of the male on the back of the female is probably a stimulus which serves the same function as the protracted billing in other species.

With regard to the *copulation-note,*

(July 24, 1903.) "After copulation, male takes a position somewhat like that of fear (fighting), head drawn in and feathers puffed out, and clucks in a soft toneless voice  . Female clucks in somewhat similar way, raises wings and strikes male with them two or three times.

"After copulation this evening (7:20 P. M., dusk) both stand up straight and tickle each other's heads with nervous rapidity for several seconds."

In all this, the only act at all peculiar to the species is that of the female striking the male with her wings.

Choosing a nesting-site, carrying twigs and straws to it, and building the nest, are done, as in other pigeons, by male and female in coöperation, with a good deal of ceremony — caressing, cooing, etc. The following contains the gist of my notes on the subject.

"Female sits in nest and builds it, while male fetches straws to her. He leaves nest and hunts for straws silently, but having found the straw he gives a few kecks on starting, and a few whenever he perches on the way, or when he arrives at nest." Another note reads: "When flying up with a straw he gives a series of notes rising to high pitch and intensity. No. 18 [p. 417] is typical." But in this case he may have been unusually excited, for the pair were in a state of indecision as to which of two nests to use.) On giving straw to female, or putting it in nest when she is not there, he makes a guttural clucking (No. 17, p. 417).

"July 18. Female, in nest with male, gives sound like *kŭ-ss, kŭ-ss, kŭ-ss, kŭ-ss,* in which the first note of each pair is a low cluck, and the second a high squeak."

Ruthven Deane (1896, p. 235), quoting the owner of some captive birds, says: "The females remained on the shelf, and at a given signal which they only uttered for this purpose, the males would select a twig or straw . . . .and fly up to the nest." No doubt the birds do stimulate one another to work, but there is no such definite "signal."

The Passenger Pigeon, like other species, shows intense jealousy throughout the period of wooing and nest-building, quarrelling with any outsider who comes near mate or nest. After the egg is laid, jealousy in regard to the mate ceases, but the jealousy which guards the nest of course continues. Hence, in the old densely populated breeding grounds the noise of quarelling must have been frightful. Brewster, in speaking of the old colonies, says (quoted by Bendire, p. 134): "Pigeons are very noisy when building . . . . Their combined clamor can be heard four or five miles away when the atmospheric conditions are favorable." This condition would seem sufficient to explain the peculiar voice of the species — the emphasizing of loud, piercing tones, and the comparative disuse of the soft notes.

The number of eggs laid by Ectopistes has been the subject of much controversy. Professor Whitman assured me that the female of this species lays only one egg. Morris Gibbs is undoubtedly

correct when he says that each female lays but one egg, and that when two eggs or two young are found in the same nest, the two came from different females. In any species of pigeon it might happen that two females should lay in the same nest, but in the Passenger Pigeon this occurrence seems to have been unusually frequent, which is one of several facts going to show an unusual degree of neighborliness in this species.

Another line of evidence going to show an unusual degree of neighborliness in the breeding of this species, is that of the feeding of orphans. Chief Pokagon says (Mershon, pp. 52, 53): "It has been well established that these birds look after and take care of all orphan squabs whose parents have been killed or are missing." E. T. Martin says (Mershon, pp. 102): "In proof of the pigeons feeding squab indiscriminately [this word is surely an exaggeration], I may mention the fact that one of the men in my employ this year . . . .in one afternoon shot and killed six hen pigeons that came to feed the one squab in the same nest." And Chief Pokagon again (Mershon, p. 206): "I have seen as many as a dozen young ones assemble about a male, and, with drooping wings, utter the plaintive begging notes to be fed, and never saw them misused at such times by either gender." It is true of the domestic pigeon, for example, that a parent may occasionally, if importuned, feed a young one not his own, but it is also true that a young one may be pecked and driven off if it begs from strangers. Hence, if the above-quoted observations on the Passenger Pigeon are correct, they indicate a solicitude for orphans which is probably unique among pigeons.

At the end of the breeding season, the Passenger Pigeon, like other pigeons, becomes a comparatively quiet bird. Beginning early in August, one notices that the birds are not only less amorous but also less quarrelsome: the kecking and scolding and the grand wing exercise become less frequent, less prolonged, and less intense; the *keeho* seems to disappear altogether for a time. But early in the following year, possibly even in January, the flock re-attains its maximum vociferation.

As was said before (p. 409), I purpose now to criticise Audubon's account of the expressions of this bird. Audubon did a great work, a work of foremost value in the history of American orni-

thology. He was a pioneer — but pioneer work is necessarily rough and imperfect, and some of it must of course be superseded. It would be a mistake, especially in the case of an extinct species, to let incorrect statements stand, no matter how deeply we may venerate their author. I shall quote all that Audubon says (Ornithological Biography, I, pp. 319–326) upon the expressions and mating habits of the species, and shall correct it where known to be wrong. He begins by describing a certain mode of nuptial flight, said to be very similar to such flight in the domestic pigeon; unfortunately, the birds in Professor Whitman's aviary could never be allowed outside and hence had no opportunity to display such flight. After describing the nesting-places, Audubon then proceeds: "At this period the note of the pigeon is a soft *coo-coo-coo-coo*, much shorter than that of the domestic species. [This probably refers to what I have called the *keeho* or vestigial coo.] The common notes resemble the monosyllables *kee-kee-kee-kee*, the first being the loudest, the others gradually diminishing in power. [Not always so inflected. Corresponds to the "scolding," etc., in the present paper.] The male assumes a pompous demeanor and follows the female whether on the ground or on the branches, with spread tail and drooping wings, which it rubs against the part over which it is moving. [?] The body is elevated, the throat swells [? probably this is assumed by analogy from other pigeons], the eyes sparkle.... Like the domestic pigeon and other species, they caress each other by billing, in which action, the bill of the one is introduced transversely [wrong] into that of the other, and both parties alternately [wrong. In no species of pigeon does the female feed the male.] disgorge the contents of their crop by repeated efforts. [Probably there is no disgorging, even by the male, in this species.] These preliminary affairs are soon settled, and the pigeons commence their nests in general peace and harmony. [On the contrary, there must have been ceaseless quarrelling.].... The eggs are two in number. [Undoubtedly wrong.]....During incubation, the male supplies the female with food. [Not true.].... It is a remarkable fact, that each brood generally consists of a male and a female. [Impossible, since there is only one egg.]" The last statement is manifestly carried over from the domestic pigeon, and even of this species it is not so true as is generally supposed,

but is an old, old belief, dating back at least to Aristotle. Thus, when we examine Audubon's account of the expressions of the Passenger Pigeon, we find that it came largely by reasoning by analogy from the domestic pigeon and from the author's charming but somewhat unscientific imagination; so much so as to cast a shadow of doubt over other statements which we cannot now verify.

For the sake of our knowledge of this species, Audubon's figures, just as his text, need to be criticised. The plate (Birds of America, Vol. I, pl. lxii, portrays a male and a female Passenger Pigeon in the act of billing, the female sitting on a separate perch, so high above the male that they can just reach one another. But in truth the birds when billing are always side by side; whenever they wish to bill, they sit side by side and caress one another first. The artist evidently intended to represent a female passing food to the male. But this never happens; if any food is passed at all it is from male to female. Coupled with this is the fact that the begging attitude in which Audubon has drawn the male, belongs to the female only among pigeons (and not even to her, I think, in the Passenger). Nor should the tail of the male be spread. As to the bills, the drawing is correct in that it shows the bill of the female inserted into that of the male, but wrong in showing the female's bill inserted "transversely," as the text has it. The fact is, that as the two birds sit side by side in billing, their heads are both in normal position, the upper mandible being uppermost. Thus we see that, however great the value of this plate in other respects, its value as a record of the attitudes and habits of the species, is very little. (Mention of other published figures was made on p. 411).

A word as to the care of Passenger Pigeons, in case we may be so fortunate as to find some still living. Professor Whitman kept his in the same pen with other species, supplied with the pigeon staples of mixed seed, grit, oyster shells, salt, and plenty of green food such as lettuce. After he had had his flock many years, he discovered that they would greedily devour earthworms, and when abundantly supplied with this delicacy the birds improved so much in health and vigor that Professor Whitman thought if only he had known of this diet early enough he might have saved his stock from dying away.

SUMMARY OF PECULIARITIES OF THE SPECIES.

It has been shown in this paper that the Passenger Pigeon was as peculiar in voice and gesture and social life as it was in its habits of flocking and migrating. Even its attitude and movements when standing on a perch, were highly characteristic of the species, seeming to be correlated with its high adaptability for flight. It was comparatively awkward on the ground, and hence was less given to strutting and charging than are other pigeons. On the other hand, it indulged in a grand wing exercise all its own.[1] Its voice was loud and strident, the hard notes being predominant and the musical notes somewhat degenerated, this being probably the result of its living and breeding in colonies so populous that only the loudest sounds could be heard. It was a bluffer in fight, quarrelling much, but having neither much power to hurt the enemy nor much bravery in withstanding his attacks. It suffered intruding pigeons to approach its nest as few other species would do. Its manner of courting was distinctive, characterized by much physical contact and roughness; the gentle ceremony of billing was reduced to a brief, quick contact. All these peculiarities seem to hang together, making a consistent character. And all seem connected, directly or indirectly, with the extreme gregariousness, the breeding in vast colonies.

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[1] But see note added to p. 410.

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OTHER EARLY RECORDS OF THE PASSENGER PIGEON.

BY ALBERT HAZEN WRIGHT.

(*Concluded from page 366.*)

Pennsylvania, New Jersey and Delaware.

In 1634, Capt. Thomas Yong, in his 'Voyage to Virginia and Delaware Bay and River,' found[1] "infinite number of wild pidgeons" in the latter region. Some fifty years later (1683), 'A Letter from William Penn,' etc., in speaking "Of the fowl of the land," gives[2] "pigeons" as "in abundance." The same year, February 10, 1683, another letter from Pennsylvania by Thomas Paskel observes that[3] "There are here very great quantities of birds and one hardly thinks it worth while to shoot at ring pigeons. . . ." 'A Collection of Various Pieces concerning Pennsylvania,' printed in 1684, finds[4] "The woods are supplied with a quantity of wild birds, as . . . .pigeons, ..."

[1] Mass. Hist. Soc. Coll., Fourth Series, IX, 1871, p. 130.
[2] Proud, Robert. The History of Pennsylvania, etc., Vol. I, 1797, p. 250.
[3] Penn. Mag. of Hist. and Biog., Vol. VI, p. 326.
[4] *Ibid.*, p. 313.