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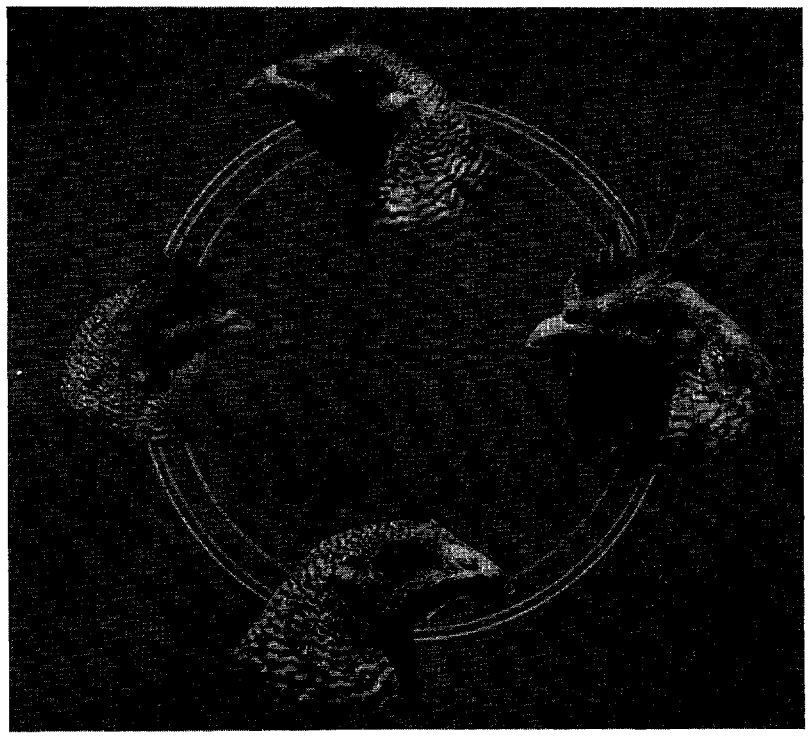
DEPARTMENT OF POULTRY HUSBANDRY



CULLING POULTRY[1]

LOYAL F. PAYNE AND HOWARD H. STEUP

This circular is divided into two parts: (I) Body Characters and Their Relation to Culling, (II) Head Characters and Their Relation to Culling. Part I is a revision of Circular 93, issued in 1922. It is devoted to the common culling practices which have been in general use for the past few years. Part II deals with the newer developments in culling as judged by head characteristics. The correct interpretations of these head characteristics will aid one in judging more accurately the merits of pullets before production starts and hens after production ceases

1. Contribution No. 45 from the Department of Poultry Husbandry.

PART I

BODY CHARACTERS AND THEIR RELATION TO CULLING

LOYAL F. PAYNE

The average farm flock of 100 unselected hens can be divided into three groups on the basis of egg production. The first group will consist of from 15 to 30 hens that are very poor layers. The second group, which will include the medium producers, will constitute, usually, more than one-half of the flock, and the third group will be composed of a small number of individuals that are relatively high producers. Studies of farm flocks in this section to determine the exact number that will fall in each group have not been made. Records of 40 miscellaneous mongrels trapnested at the Kansas Agricultural Experiment Station[2] give some information along this line. These records are as follows:

PRODUCTION FIRST YEAR	PER CENT OF FLOCK
0 to 60 eggs	20.0
61 to 124 eggs	67.5
125 and over	12.5
	100.0

Card[3] reports a similar grouping of 1,387 White Leghorns whose records are as follows:

PRODUCTION FIRST YEAR	PER CENT OF FLOCK
0 to 100 eggs	8.6
101 to 220 eggs	86.4
221 and over	5.0
	100.0

The mongrels represented in these figures were taken at random from a local receiving station, while the Leghorns were from carefully selected flocks that had been bred for egg production. Perhaps the most important point brought out by these studies is the high average production and very small per cent of unproductive hens in the carefully selected flock.

TRAPNESTING AND CULLING

The trapnest has made it possible to study the record of individual hens and to compare their records with certain character-

2. Lippincott, Wm. A. Improving mongrel farm flocks through selected standardbred cockerels. Kan. Agr. Expt. Sta. Bul. 223. 1920.

3. Card, L. E. A study of egg production in the White Leghorns. Storrs Agr. Expt. Sta. Bul. 91:39-90. Tables 31. Charts 5. 1917.

istics. The results have shown that low, medium, and high producers may be recognized by certain of these characteristics at some seasons of the year and sorted with a fair degree of accuracy. This sorting is referred to as culling. It should not be understood that culling is as accurate as trapnesting. A daily record of each hen is the only accurate means of determining individual egg production. But the equipment, inconvenience, and labor involved in trapnesting makes it an impractical method for the average farm flock. The trapnest is indispensable for all who pedigree their stock, or desire individual records.

CULLING DEFINED

Culling,[4] in the broad sense, as practiced by poultrymen, refers to the sorting of the desirable and undesirable hatching eggs, chicks, pullets, cockerels, hens, or breeding males. The greatest emphasis, however, has been placed on the sorting of hens, not only to eliminate the nonlayers but also to determine when and how long the remainder have been laying. No pretense of forecasting future production is made except in so far as it is correlated with past production. If a hen has been a good producer, it generally follows that she will be a good producer in the future if she maintains good health and is properly cared for. And *vice versa,* a poor hen is likely to continue so unless her poor record has been due to poor housing or poor feeding and these items of mismanagement are corrected.

PREREQUISITES FOR SUCCESSFUL CULLING

A general knowledge of culling that will enable one to select the nonproducing hen is readily obtained, but to become capable of intelligently judging the length of time a hen has been laying, the rate of her production, her vacation periods, etc., requires more study and considerable practice. The first requisite of successful culling is a normal flock, *i. e.,* one that has escaped serious disease epidemics, is physically "fit," and has received reasonably good care as to feeding, housing, and general management. The age of both hens and pullets should also be considered.

THE KIND OF POULTRY TO CULL

Culling should start with the eggs and never cease as long as chickens inhabit the farm. The crippled, wobbly, or weak chick should he destroved soon after hatching. Scrawny, unpromising

4. A glossary of terms and a culling chart will be found on pages 32 and 33, Part I of this circular.

individuals should be eaten or sold and only the fittest allowed to survive.

The demand for information on culling pullets is rapidly increasing, and poultrymen, farmers, and investigators are giving the subject more study and attention. It is obvious that it would be more profitable to eliminate the cull early in life, if that were possible, than to wait until later. The problem is one that will require and receive close study the next few years. Suffice it to say that a successful method of selecting high and low producing pullets before they start laying, beyond eliminating the obviously weak, has not been definitely worked out. Birds of low vigor which are crow-headed, or have long rangy bodies, as well as slow-maturing, off-type individuals, should be culled before the pullets begin to lay. It will be seen in Part II of this circular that progress is being made in judging pullets by head type.

Culling and selecting the breeding males is equally important, and will be treated later. Culling domestic poultry other than chickens has been given little attention, but there seems to be no good reason why ducks, geese, turkeys, and guineas may not be culled for present production, though perhaps less accurately, by much the same method employed in culling chickens.

WHEN TO CULL

Systematic culling, that is the handling and examining of every bird in the flock, should start about the middle of July and continue periodically about once a month until the middle of October. Generally speaking, systematic culling is not practical at other seasons of the year.

The principal object in summer culling (July and August) is to eliminate the slacker hens, while the object in September and October culling is to observe and select the best individuals to reserve as future breeders. Health, vigor, size, trueness to standard type and color, as well as heavy egg production, are points to consider in late fall culling. Some hens are able to stand the strain of high egg production and maintain good physical condition, while others "lay themselves out." The latter are of no use in the breeding pen and should be disposed of after finishing their laying season.

HOW TO CULL

The first thing the culler wants to know when examining a hen in July or August is whether or not she is laying. Hens which are laying at this season of the year are usually kept as the price of eggs

makes them profitable. If, upon later examination, they are found to be medium producers only, they can then be disposed of. The flock should be confined in the poultry house the day they are to be culled, or in the event there is no house available, they should be taken from the roosts and cooped the night before. In the former case a small coop (fig. 1) may be placed at the runway where it will

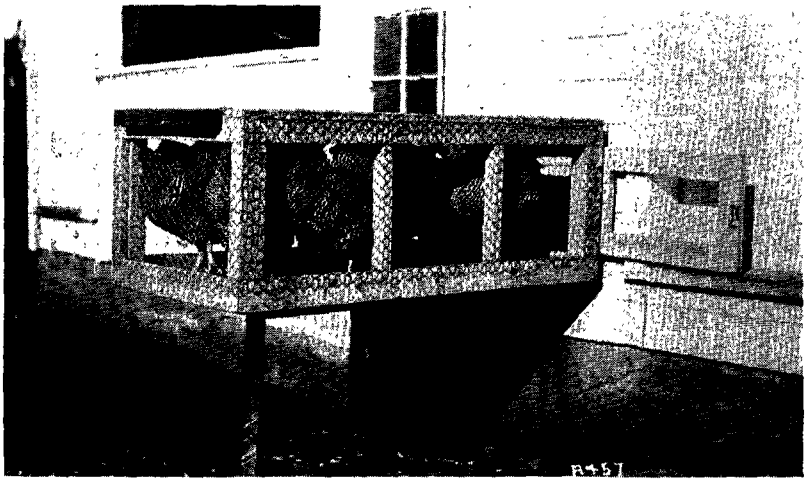


FIG. 1.—A convenient method of catching hens for culling.

FIG. 2.—A method that may be used in catching hens for culling if a house is not available.

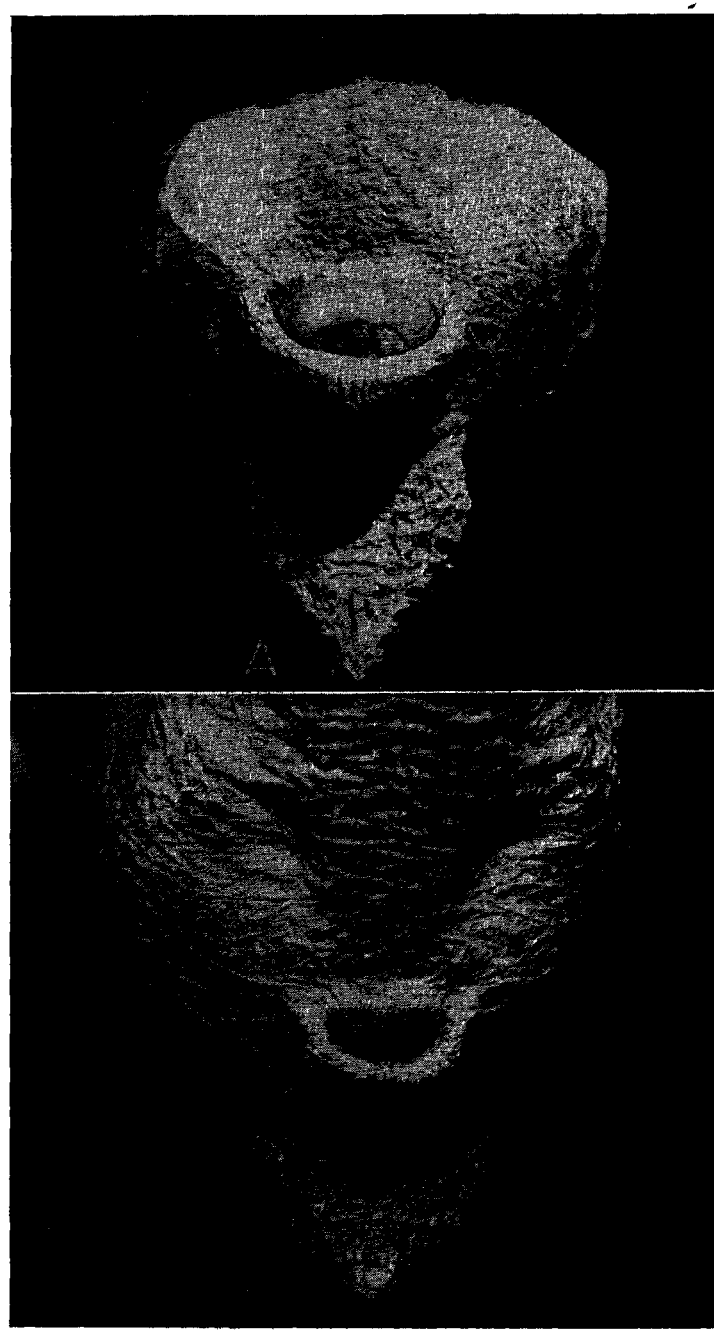


FIG. 3.—The vent and abdomen of a laying hen (A) and of a nonlaying hen (B).

soon be filled. The door is then closed and the birds removed through an opening in the top with a minimum of disturbance. If a suitable house is not available, the coop can be used by the side of a fence with a portable frame as illustrated in figur 2. It is necessary to handle every bird and consider all of the characters to be discussed, before passing judgment.

FIG. 4.—Illustration showing the width between the pubic bones of a laying hen (A) and of a nonlaying hen (B).

The culler should be able to determine three things: Present production, persistence of production, and intensity or rate of production. A detailed discussion of each follows.

JUDGING PRESENT PRODUCTION

Present production may be determined by examining the vent, pubic bones, comb, wattles, and earlobes.

Vent.—The vent of a laying hen is large, moist, and dilated, and tends to become oblong in shape. The lower edge appears flat and extends almost straight across, and the upper edge blends evenly into

the surrounding tissue which has a smooth, loose, pliable appearance. (Fig. 3, A.) Contrasted with this is the small, contracted, dry vent of the cull or nonlaying hen. The corners are drawn in giving the vent a round appearance with thin, prominent edges. The region around the vent is puckered, rough, and hard. (Fig. 3, B.)

Pubic Bones.—The pubic bones of a laying hen are wide apart, usually the width of two or more fingers, compared with the close-fitting bones of the nonproducer which are no farther apart than the width of one or two fingers. This measurement is illustrated in figure 4.

Comb, Wattles, and Earlobes.—An increased circulation of blood in the comb, wattles, and earlobes accompanies the development and functioning of the egg organs. They assume the large, full, glossy appearance characteristic of the laying hen. These characteristics are most noticeable when the pullet comes into the height of her production. As the laying season advances the appendages of the head lose their gloss and prominence. Near the close of the production period, though still retaining their red color, they appear limp or wilted and reduced in size.

The comb of a hen that has quit laying is small, contracted, dry, and usually covered with a white scale or dandruff. It is cool to the touch indicating only a slight circulation and a dormant condition of the egg organs. The wattles and earlobes react in a similar manner, but being less prominent they are not so noticeable. The comb is one of the best external characters to indicate nonproduction in hens as they are observed in the pen or yard. (Fig. 19, B.)

PERSISTENCE IN LAYING

As the culling season progresses, not only the culls should be separated from the layers, but the layers should be graded and classified as well. In early September the low producers that were passed in July and August because they were laying a few eggs should be disposed of. The early spring pullets are coming into production by this time and a part of the houses that have been occupied by the hens are needed for their accommodation.

Color.—Persistence in laying is determined largely by color and molting. The yellow pigment or color (xanthophyll) observed in the skin, beak, and shank of a pullet or hen is the same as that which causes the yellow color found in the yolk of the egg. When a hen is not laying, this color is stored up in the body tissue and is readily seen in the vent, eyelids, earlobes (if white), beak, and

shank. But when laying begins, all the pigment of the feed is required for the eggs and hence its course is diverted from the exterior body tissue to the fat globules of the egg yolk. If this visible pigment is not continually renewed it fades, leaving the various parts white, or as commonly expressed, bleached.

The disappearance of yellow pigment from the shanks of laying hens was reported in the ***Cultivator and Country Gentleman*** as

FIG. 5.—The head of a high producer. The arch of the upper mandible is the last section of the beak to fade.

early as 1879. However, experimental data showing a correlation between yellow pigment and egg production did not appear until about 1914.

When a yellow-skinned pullet begins to lay the color first fades from the vent, disappearing in a few days. The eyering or the edges of the eyelids bleach a little slower than the vent. The earlobes of white lobed varieties, are next to lose their creamy color followed by the lower and upper mandibles of the beak. The color leaves the corners of the mouth or base of the beak first, gradually fading toward the tips, disappearing from the arch of the upper mandible last. (Fig. 5.) From 4 to 8 weeks production or the laying of 25 to

50 eggs will usually eliminate all color from the beak. The shanks are the last to lose their color, fading first in front and retaining longest the color just below the feather line at the rear of the hock joint. Normally, 2 to 5 months' laying is necessary to completely bleach the shanks.

When a hen stops laying the yellow color reappears in each of the above regions in the same order in which it disappeared, that is, in the vent, eyelids, lobes (if white), beak, and shanks, returning, however, much faster than it disappeared.

Pigmentation observations should always be made in daylight, artificial light being unsatisfactory. The order of the most common breeds according to the rapidity with which the pigment fades is as follows: Leghorns, Wyandottes, Plymouth Rocks, and Rhode Island Reds. The dependence to be put on the pigmentation test seems to be greater in the case of the Leghorn than with the heavier breeds. June, July, and August observations seem to be more reliable than April and May pigment studies.

Color changes are perhaps affected by more conditions than any other set of characteristics. For example, the feed, range, size, and age of birds, thickness of skin, management, vitality, and amount, of color normally carried in different strains, influence fading and should be considered in culling. Many of the white varieties that have been bred for exhibition purposes show very little yellow pigment whether laying or not. The amount of pigment originally carried in a strain of hens can be determined in a measure after they have been laying sometime, by observing the amount of pigment carried in the shanks of related males, preferably brothers.

When culling white-skinned birds such as the Orpingtons, Sussex, and Dorkings, or the dark-shanked breeds such as the Langshans or Andalusians, no attention can be given to color changes. Birds of these breeds are judged by the molt and by other factors discussed below.

Molting.—Persistence of production is measured also by the condition of the plumage during the summer and fall. As long as the hen lays regularly she usually retains her old feathers, but, if for any reason other than sickness or broodiness she stops laying, the feathers begin to drop, she is then said to be molting. The order in which the feathers fall is first from the neck, then the back, wings, and body. The neck molt is rather common at any season of the year even in good layers, but if the molt progresses to the back, the primary feathers of the wing generally molt also. This

stage is seldom reached unless the hens have entirely ceased laying. In other words, the cessation of laying is likely to bring on a general molt. Soon after the old feathers are dropped, new ones grow in to take their place. Leghorns and other breeds of their class seldom lay while the new feathers are growing, but individuals are

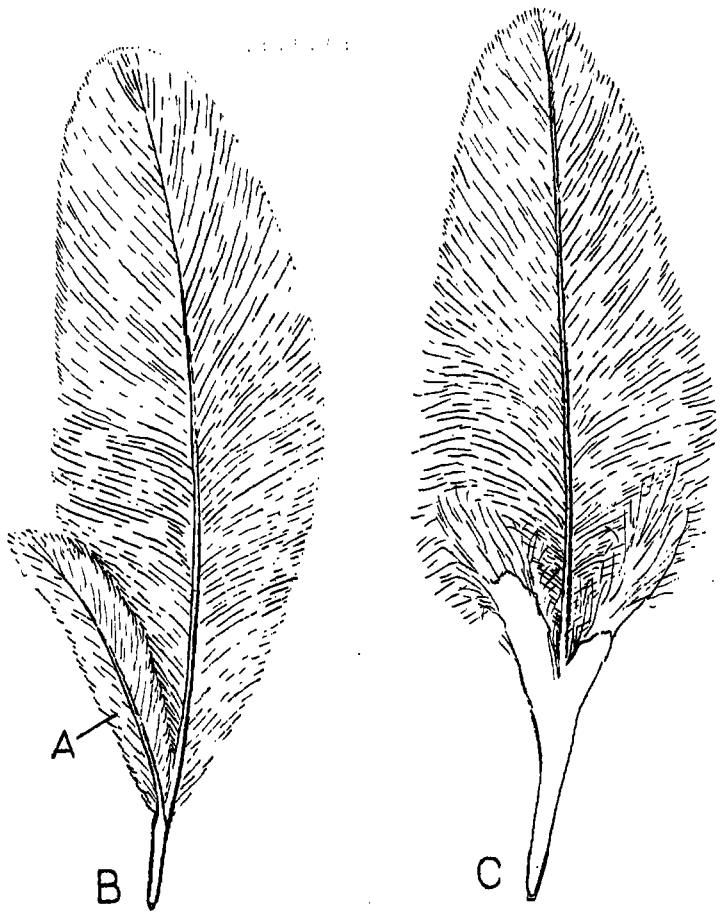


FIG. 6.—An old feather (B) with its accessory plume (A) and a new feather (C) as seen in a molting hen. Note the large quill and absence of accessory plume in the new feather.

occasionally found among the general-purpose breeds, as Plymouth Rocks, Rhode Island Reds, Wyandottes, Orpingtons, etc., which will lay while the new feathers are growing. A molting condition can be determined easily by examining the base of the feather. The web appears new and glossy, the quill is large, full, soft, and pink, and the accessory plume is not visible. (Fig. 6.)

From the foregoing it is obvious that the later a hen molts in the fall the longer has been her laying season, and hence the greater is likely to be her production. This means that the early molting hens have taken vacation periods and are probably low

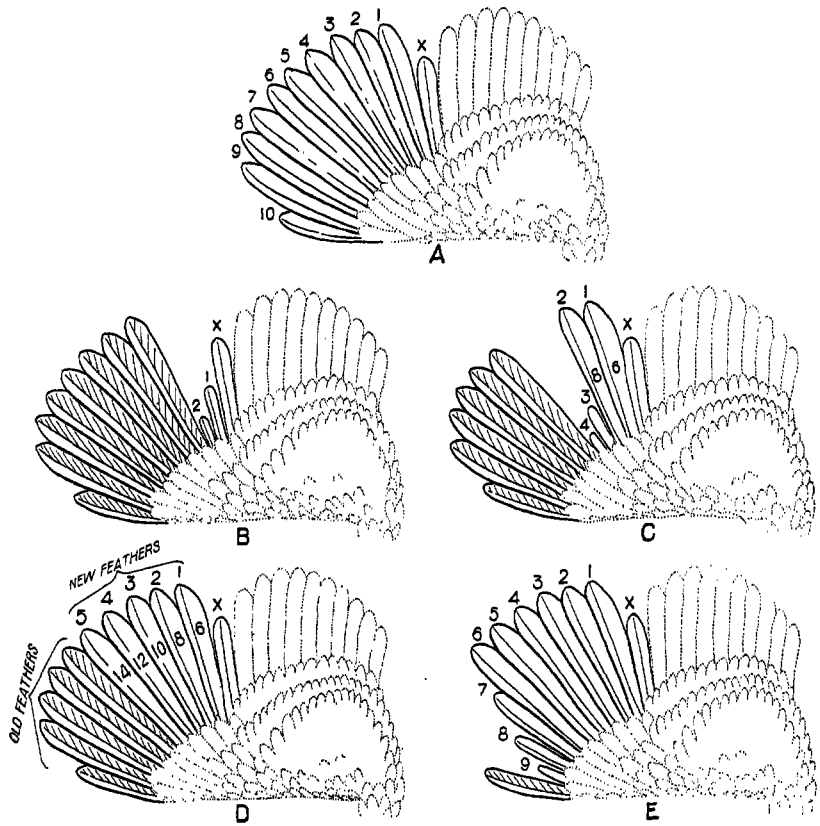


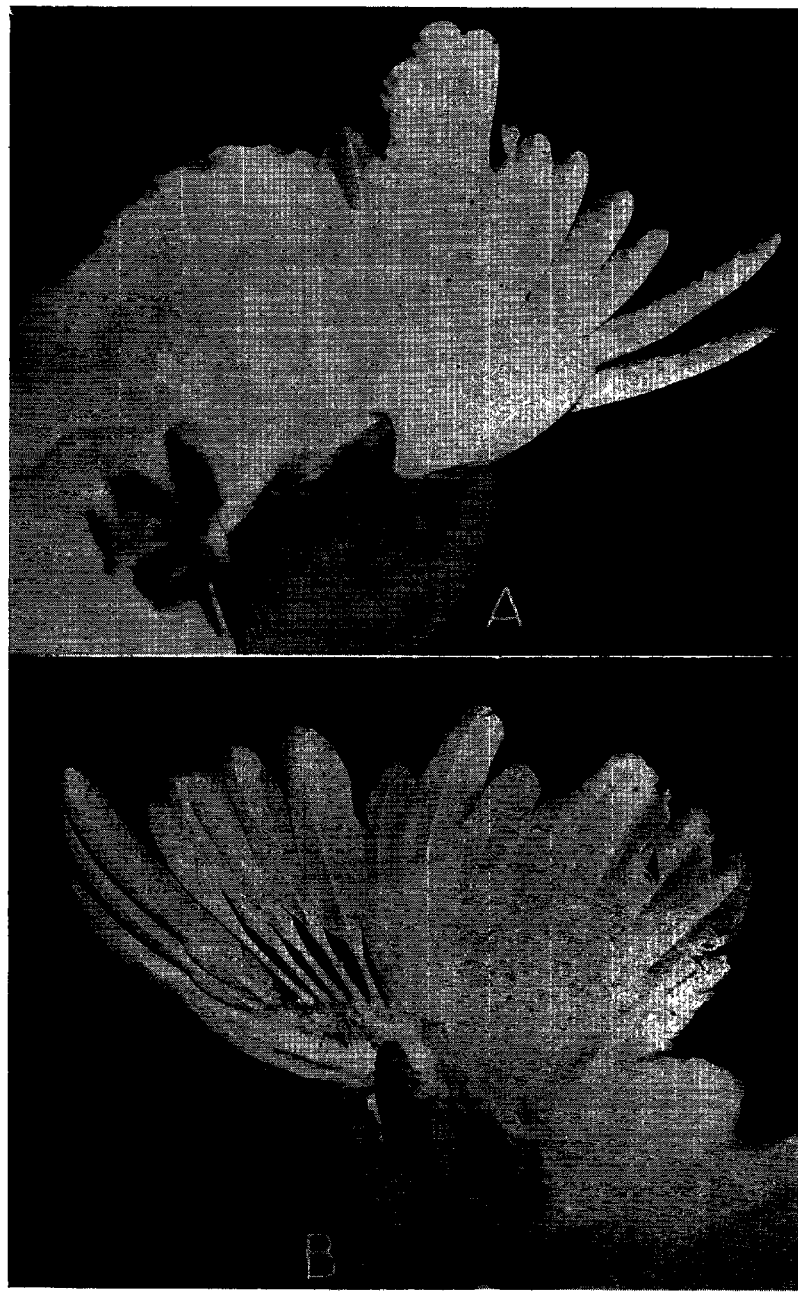
FIG. 7.—(A) A normal wing showing the primary feathers, Nos. 1 to 10. They are separated from the secondary feathers (in dotted outline) by a short axial feather, X. (B) The beginning of a wing molt. Nos. 1 and 2 are new feathers growing in. (C) An eight-week molt. Nos. 3 and 4 are not counted until fully grown. (D) An instance (abnormal) in which five feathers only were molted. (E) A wing completing a normal molt.

producers. The new plumage of the early molting hen is easily recognized by its clean, bright color, with every feather perfect in shape, while the plumage of the heavy laying hen that has not molted is rough, soiled, dry, and worn threadbare. The tail and wing feathers, as well as those about the back, head, and neck, are frequently ragged, worn, and broken.

There was a time before the advent of culling that farmers sold their ragged and faded birds because of their unsightly appearance and kept the slick-coated, yellow-legged individuals because of their attractiveness. But that time is past and the practice now is reversed.

Wing Molt.—When a general molt, as opposed to a partial molt, starts, that fact is registered in the primaries of the wing and the length of time a hen has been molting can be calculated by the number and length of the new feathers in the primary. The primary feather next to the axial feather (fig. 7, A-1) drops when the body

FIG. 8.—A molting wing showing four new feathers starting next to the axial feather.



Courtesy of Connecticut Agricultural College Extension Service.

FIG. 9.—(A) A wing with three mature feathers followed by five growing out at the same time. The first three were shed during an early broody period. (B) A wing with five new feathers showing four weeks' growth, counted as one feather. After the feathers reach maturity it is difficult to tell whether they grew out together or singly, except by the hardness of quill and general conditions of body molt.

molt starts and six weeks on the average is required for it to grow to full length. Feather 2 is dropped about 2 weeks later and so on with each subsequent feather until the 10 primaries have been renewed. In calculating the time elapsed since a molt started, 6 weeks should be allowed for the first full-grown feather and 2 weeks more for each additional mature new feather. For example, D, in figure 7, shows five mature new feathers which indicates that the molt had been in progress 14 weeks. Figure 8 shows the early stages of a wing molt as represented by four new wing feathers. This hen was a high producer and had been molting 3 weeks. Such a molt though faster than normal for a low-producing hen is not unusual for a high producer.

The new primary feathers make about two-thirds of their growth the first 3 weeks and one-third the last 3 weeks. That is, if the feathers when mature are 6 inches in length, they will grow about 4 inches the first 3 weeks and 2 inches the last 3 weeks. The application of this growth rate is made in determining the beginning of a molt before any of the new primaries attain full length. (Fig. 7, B.)

The new primary feathers when mature may be identified by their clear, bright appearance, with the web slightly wider and less pointed. The base of the shaft on the under side of the wing shows less of the clear horny quill than is seen in the old feathers. The molt is usually at the same stage in both wings. The above description holds very well for the early, slow-molting, poor-producing hen, but is not so reliable for the high-producing late molters. The principal difference comes in the rapidity with which good hens molt. Instead of dropping the primary feathers separately, they frequently drop, two, three, four, or even five at a time. (Fig. 9.)

When two or more new feathers grow in together they are counted as one in calculating time. This works very well until the feathers reach full length when it is impossible to judge whether they have come in one at a time or all together. Such a wing with four new feathers might indicate 6, 8, or 12 weeks molt, that is, the feathers may have come in individually, in pairs, or all together. In such cases the length of new feathers over the body, hardness of quill, and the number and position of the additional new wing feathers may throw some light on the situation. Heavy producers frequently shed nearly all of their feathers at once. These grow in again quite rapidly, requiring usually 5 to 8 weeks to become full grown, after which time the hens are again ready to lay. Such quick molters do not always renew all of the primary feathers but retain some of

them a second year. The low producers usually molt very slowly, requiring several months to renew their coat of feathers. It is frequently assumed that these early-molting culls, not having to grow feathers in the late fall, occupy their time producing winter eggs, but careful study and close observations have failed to prove this assumption.

RATE OF PRODUCTION.

Rate or intensity of production and persistence in production are characteristic of the best layers. Hens may be laying and show no

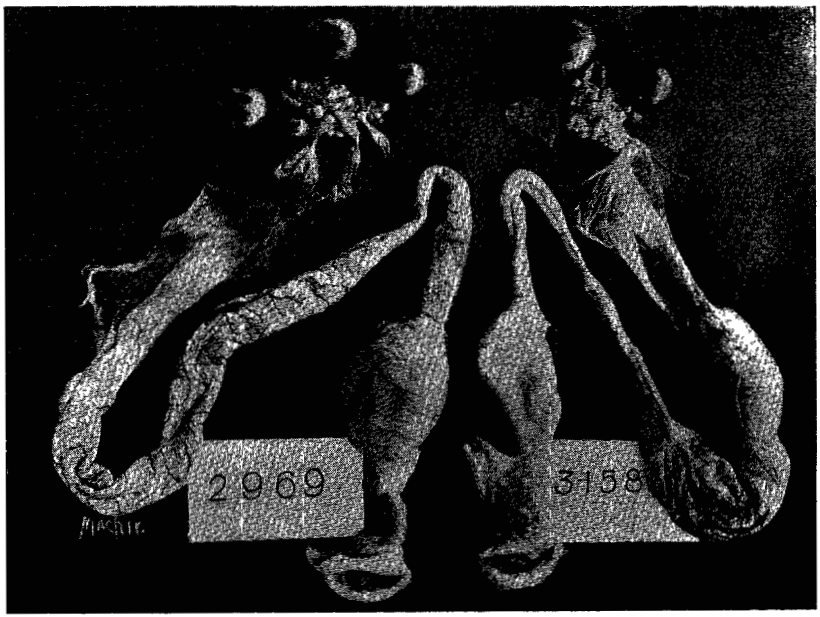


FIG. 10.—The egg organs of two hens showing high (2969) and low (3158) rate of production as indicated by the size and number of yolks in each ovary.

signs of molting but have a low rate of production, *i. e.*, 2 to 3 eggs per week. In order to make a good record a hen must produce at a high rate, *i. e.*, 5 to 6 eggs weekly, as well as for a long period. (Figs. 10 and 11.)

It is from the high-rate producers that breeders should be selected. Fortunately, persistent layers usually have a high rate of production as well. The intensity or rate of production is judged largely by the body capacity, condition of the abdomen, and quality of the skin.

It has been stated by one authority that the ovary and oviduct of a hen in full production is about 20 times as large as the same organs of a nonproductive hen. (Fig. 12.) Accompanying this difference is

an increased appetite and an enlargement of the digestive organs. These changes require more space in the body cavity, which is provided in part by a lowering of the floor or keel. The lateral or sternal processes are also forced downward and outward.

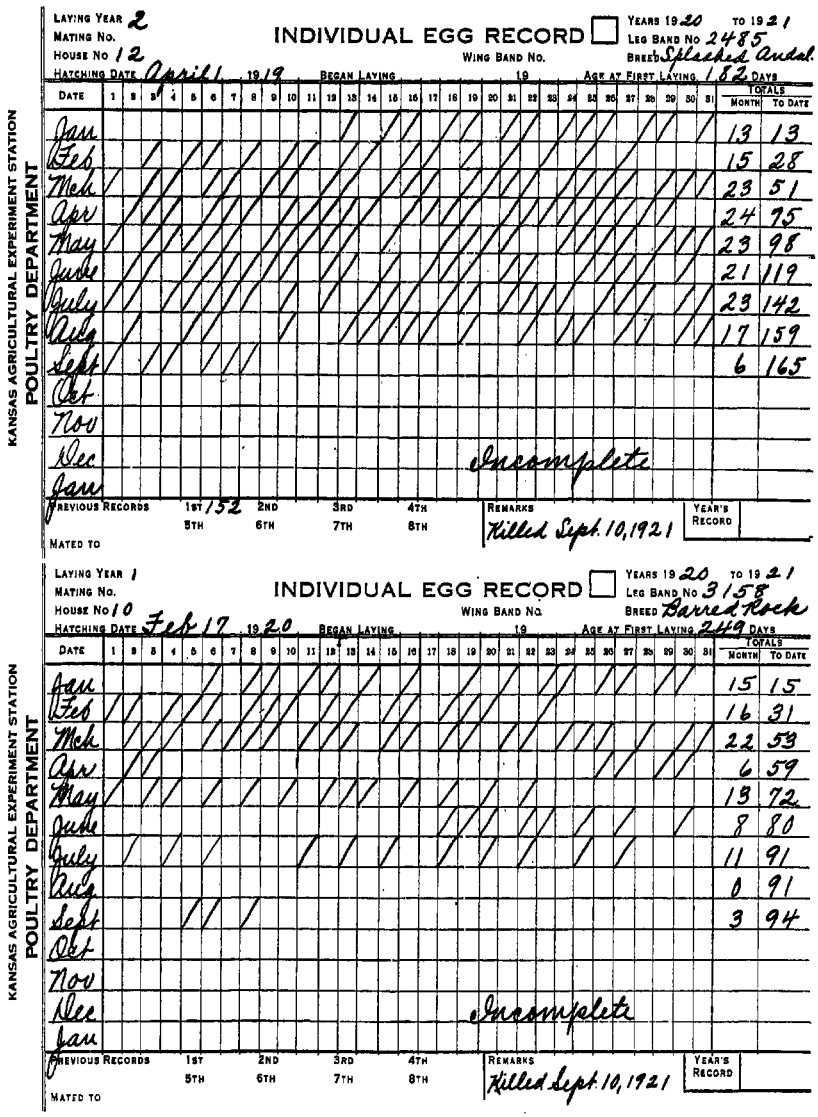


FIG. 11.—Individual egg records illustrating high and low intensity or rate of production as indicated by the number of eggs laid without skipping a day as well as by the monthly production. The egg organs of 3158 are shown in figure 10. The organs of 2485 were not in condition to photograph when she was killed.

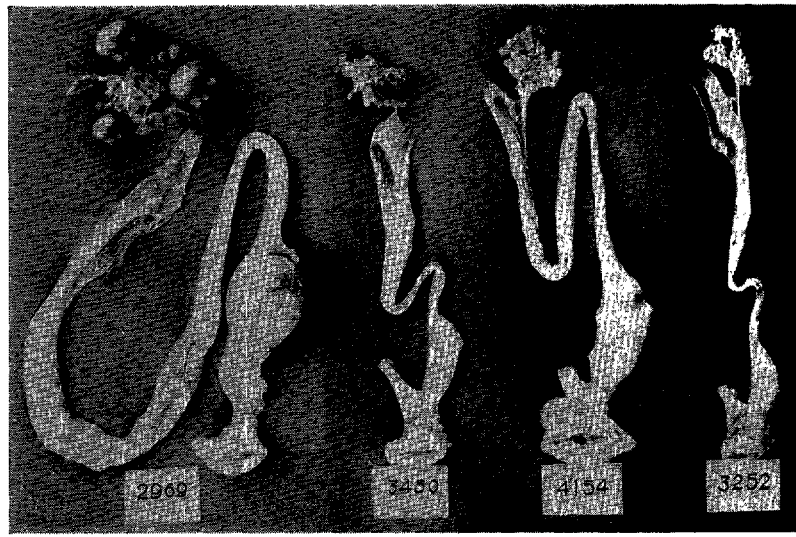


FIG. 12.—Egg organs of a heavy producer (2969); a cull hen (3450) that had stopped laying 3 weeks; a broody hen (4154); and a hen (3252) that was once a good producer but had not laid for 3 months.

FIG. 13.—Capacity of abdomen of a cull (A) and a good layer (B).

FIG. 14.—Illustrations showing method of determining relation of keel to back. In the high producer (A) the finger tips of the lower hand point downward. In the nonproducer (B) the finger tips of the lower hand point toward the tail. The first year's production records of these hens are: (A), 187 eggs; (B), 97 eggs.

Capacity to produce eggs is shown by the depth or distance from the front of the keel to the center of the back, the space between the end of the keel and the pubic bones, the width and length of the back, and by the width and length of the keel. These dimensions are more or less fixed in the adult bird except that the end of the keel moves up or down. The downward tendency is somewhat regulated

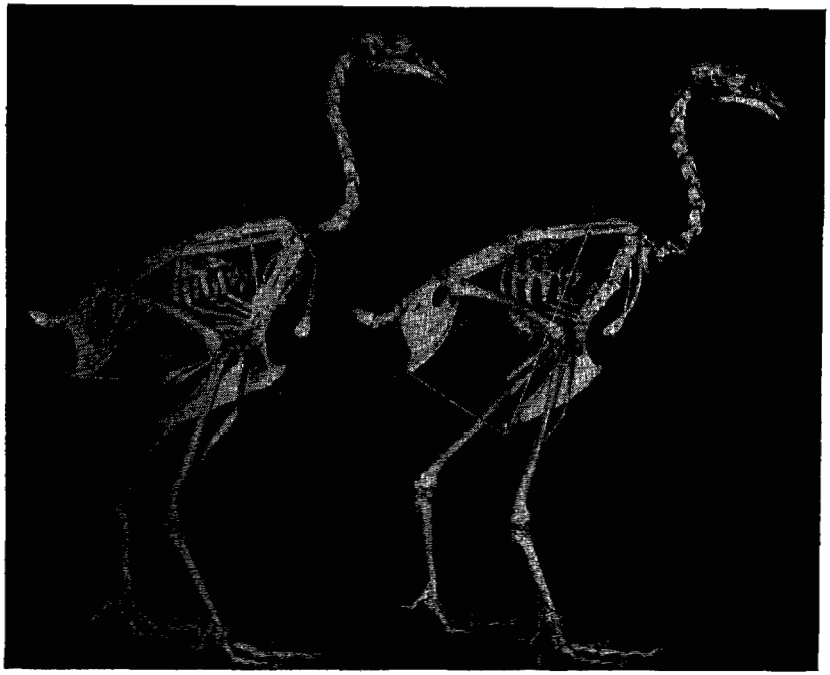


FIG. 15.—Skeletons of the cull (left) and the high producer (right) shown in figure 14. When judging body type of *good* hens that are *not* laying emphasis is placed on the size of the triangle, E-F-G. The triangle emphasized in judging hens in *full* production, is A-B-C. When a hen stops laying, the point C moves toward B so that the distance B-C varies with egg production, while the points E and F remain the same whether the hen is laying or not; hence the value of the points E and F in judging type. H shows the lateral processes.

by the demand for more internal space which usually indicates a greater intensity in laying. A depth of 4 to 5 fingers from the end of the keel to the pubic bones is associated with good rate of production, while a depth of 2 or 3 fingers indicates fair to poor production. (Fig. 13.)

The position of the keel relative to the back can be determined by facing the bird and running one hand down the top line and the other along the bottom line as in figure 14. The finger tips usually

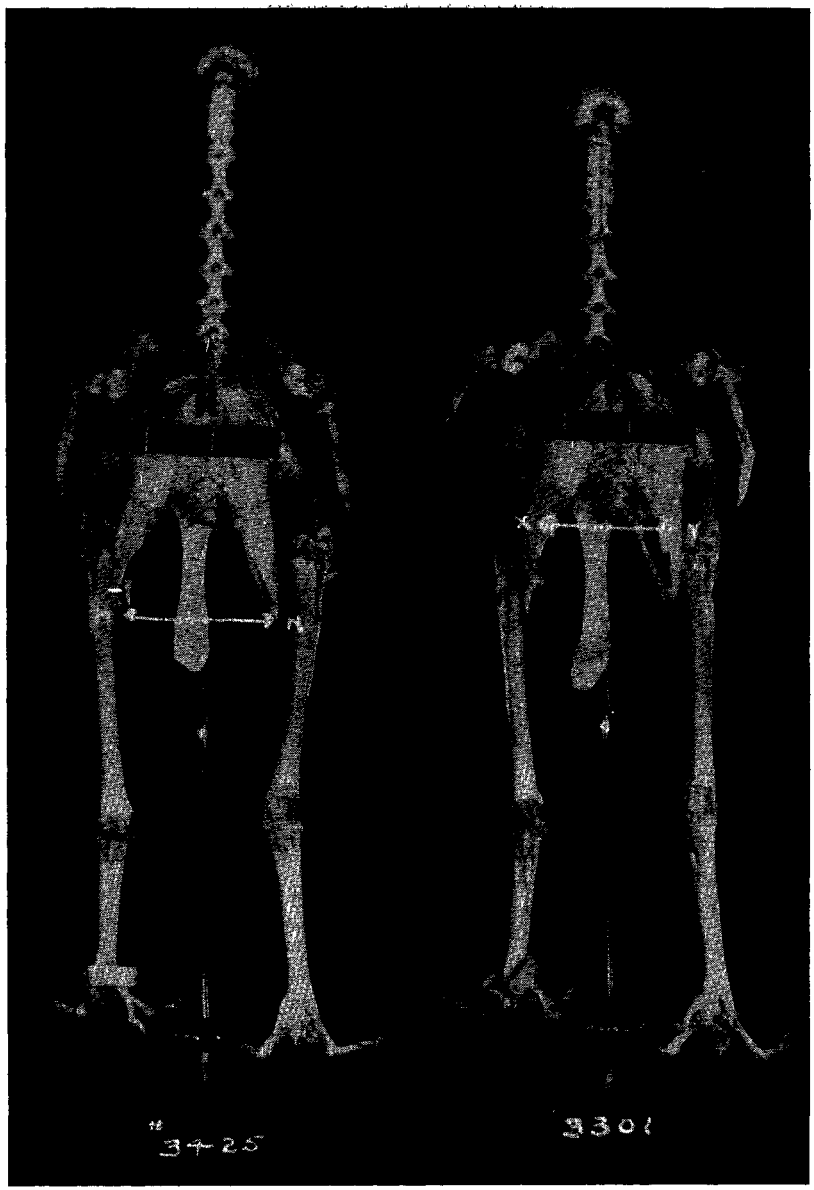


FIG. 16.—Skeletons of the cull (left) and the high producer (right) shown in figure 14. The tips of the pubic bones and the distance between them are shown by M-N. The width of rump is illustrated by X-Y. Note that 3301 is wider across the back than 3425.

point downward in laying hens of high intensity. This test is applicable to laying hens only. Other measurements must be resorted to when judging hens that are not in a laying condition.

The relative position of the bones so important when judging for egg production is illustrated in figures 15 and 16. The width between the pubic bones is shown by M-N, the capacity of the abdomen by B-C, and the depth of the body by E-F. As these dimensions increase the capacity for egg production increases.

FIG. 17.—Illustrations showing relation of condition of abdomen to egg production. (A) Abdominal capacity of cull, 1; high-rate producer, 2; and low-rate producer, 3. (B) Relative thickness of fat of high-rate producer, 1; and low-rate producer, 2. These birds correspond to Nos. 2 and 3, respectively, in (A).

Abdomen.—The abdomen of a high-rate hen is not only full and expanded, but is also soft and pliable. Capacity alone seems to mean little. A hen with a hard, rubbery, unyielding abdomen, caused by the accumulation of thick layers of fat should not be mistaken for a good layer even though the abdomen measurement indicates good capacity. (Fig. 17.) This does not mean that a fat hen cannot be a good producer, but that usually she is not unless the fat is soft and pliable. The size of abdomen is not the same for all

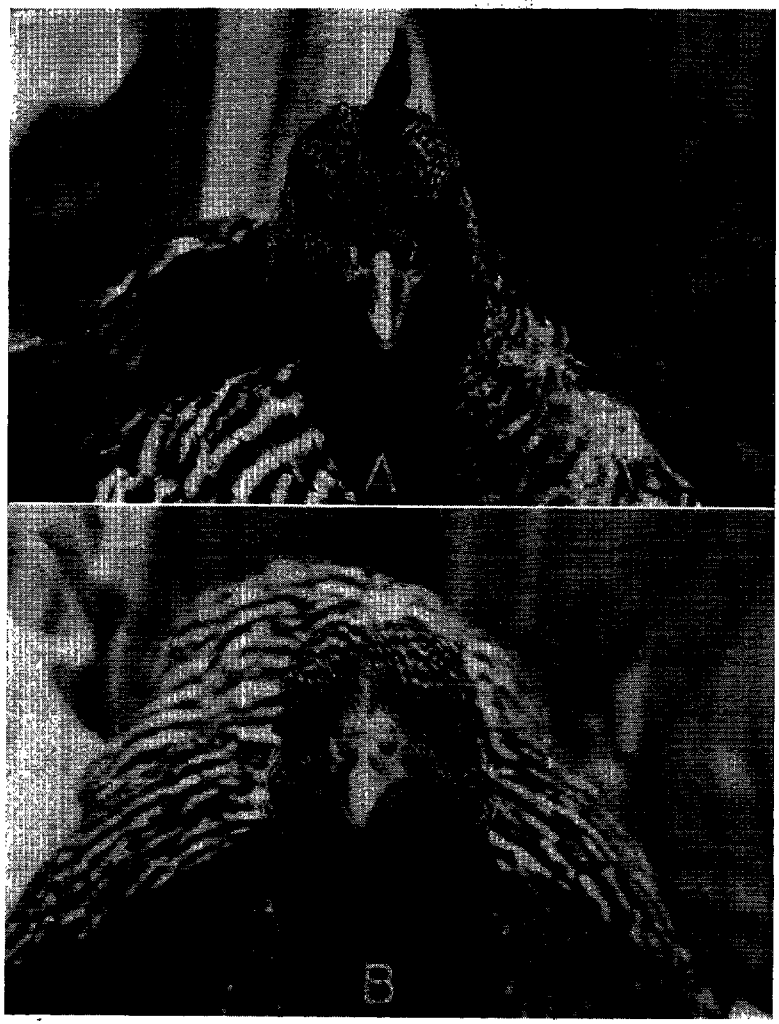


FIG. 18.—Head of high producer (A) and of low producer (B). Note the prominent bright eyes, large comb, and lean, clean-cut face in (A) and the dull eyes, small comb, and full face in (B).

breeds or individuals within a breed but is influenced by the size of the hen and the length of the keel. Short-keeled birds have an advantage in measured abdominal capacity over birds with long keels unless due allowance is made for the length of the keel. In general the long-keeled birds are preferred.

The examination of 354 Leghorns, Reds, and Plymouth Rocks at

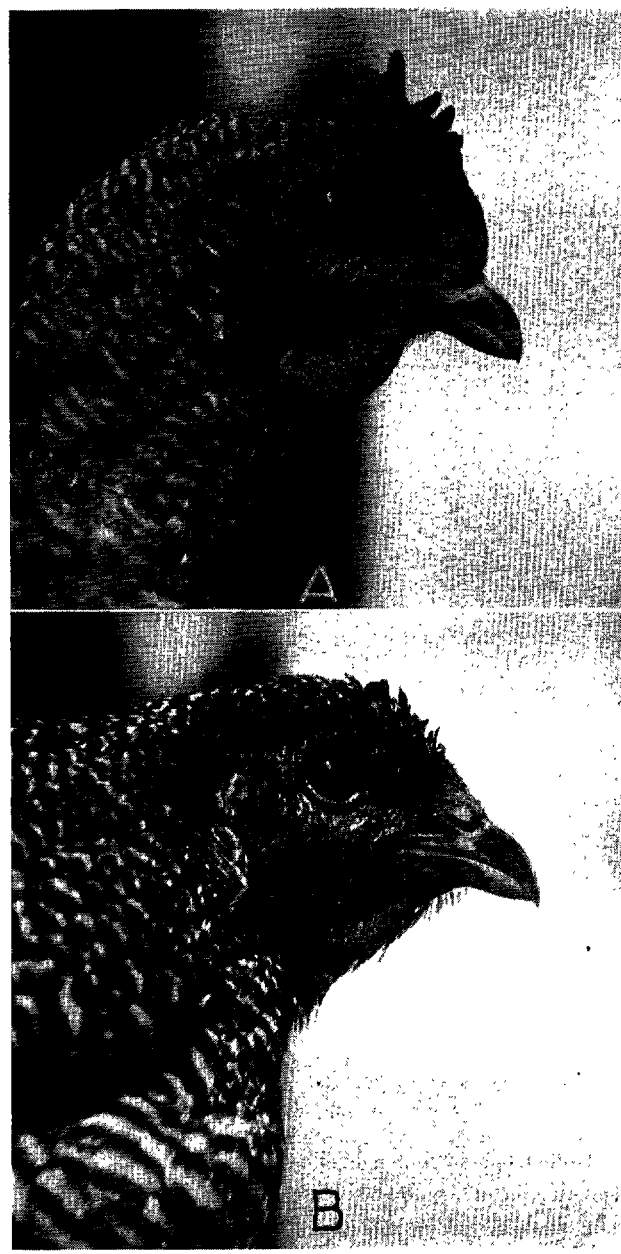


FIG. 19.—Head of high producer (A) and of a low producer (B). Note the well-developed comb, wattles, and earlobes, the full eye, and the short and well-curved beak of (A) and the beefy head, prominent eyering, and sunken eye of (B).

the Agricultural Experiment Station showed no correlation between keels with downward pointed tips as (C) in high producer (fig. 15) and date of hatch, age at first egg, intensity of winter production, or size of egg laid.

The length of the keel can be determined by placing the hand along the keel as in figure 14; also by noting whether the hand, when placed on the abdomen as in figure 13 extends straight down, as will

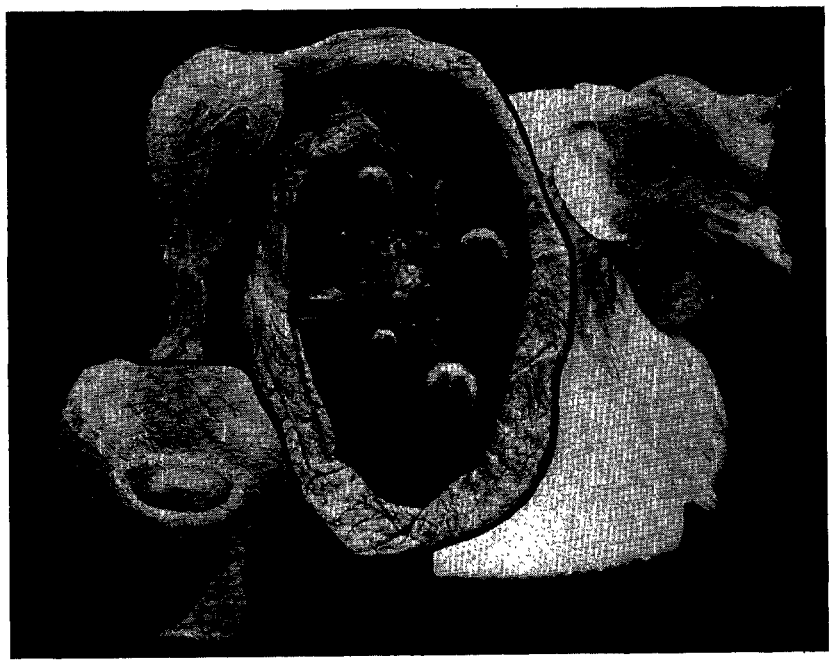


FIG. 20.—A head of good quality, a vent indicating present production, and egg organs indicating high rate of production.

be the case with a long keel, or slopes forward to touch the end of a short keel.

The pubic bones are usually thin and pliable in high-producing hens and covered with thick, hard fat in those of low production.

Quality.—Hens of high intensity possess quality as shown by a soft, thin, silky skin. This is best determined by feeling the skin on the body under the wing with the thumb and finger, or by holding the bird with head down and moving the thumb and finger up each side of the breast over the lateral processes. Slow producers are likely to have a skin that is thick, dry, and frequently covered with

a scale. A lean, clean-cut face with prominent, clear eyes, and an absence of wrinkled skin about the head is a mark of good quality as in figure 18, A.

In heavy producers the shanks are usually flat with creases down the sides and with scales of fine texture. Poor layers usually show a beefy head, full face, heavy eyelids and eyebrows, and round shanks covered with rather coarse scales. (Fig. 19.) The thin face, char-

FIG. 21.—Reproductive organs of a broody hen showing the rapid absorption of immature egg yolks. For comparison with functioning egg organs, see figure 12.

acteristic of high-producing hens, should not be confused with the sunken face of hens of low vitality. The difference is readily distinguished by the spark in the eye, the color and prominence of comb and wattles, and general alertness and activity. A head that shows good quality, a vent showing present production, and egg organs indicative of a high production rate are shown in figure 20.

Disposition and Temperament.—A good layer has a friendly disposition, is tame, and does not get much excited when handled. She is alert, active, and always busy, among the last to take the

roost at night and first off in the morning. Her appetite is always good as shown by her full crop at night and her worn toenails. The low producer is shy, stands around preening her feathers much of the time, squawks loudly when caught, and displays little tendency to hustle for feed. She goes to roost early with little in her crop and

FIG. 22.—The contracted abdomen and contracted deeply-wrinkled vent of a hen 9 days after going broody.

is among the last off the roost in the morning. She does not work or lay and hence has little appetite.

Broody Hens.—The general purpose and meat breeds are inclined to broodiness through the spring and summer. It has been found that, on the average, hens lose 14 to 16 days' production each time they go broody, even when they are "broken up" as soon as possible.

The number of times Rhode Island Red hens go broody per year was found by Goodale[5] of Massachusetts to average 5.39. The length of time from the first broody day to the day production began was on the average 16.3 days.

When a hen goes broody her reproductive organs are reduced in

FIG. 23.—The head of a broody hen (figs. 21 and 22) showing prominent eyebrows, wrinkled face, and masculine features. This hen had been broody on two previous occasions prior to September 1; her production until then was 151 eggs.

size very rapidly. (Fig. 21.) Her appetite becomes less, and there is a tendency for the vent and the whole abdominal region to contract. As the vent does not usually take on color immediately, several days follow each broody period when it is hard to classify such birds. They usually show evidence of good past production, but the abdomen is of medium size and handling condition, vent fairly large but dry, surrounded with deep, prominent wrinkles. (Fig. 22.)

5. Goodale, H. D., Sanborn, Ruby, and White, Donald. Broodiness in domestic fowl. Mass. Agr. Expt. Sta. Bul. 199:93-116. 1920.

Heavy, overhanging eyebrows, and, a lack of luster throughout the head, comb, and wattles are further indications of broodiness. (Fig. 23.) Broody hens are not necessarily culls and should not be disposed of when found, unless it is known that they are habitual offenders. This point can be determined and the whole matter of judging broody hens greatly simplified by placing a celluloid spiral legband on each hen every time she is found broody.

EGG TYPE

Most of the foregoing discussion has concerned hens when they are or ought to be laying. The question naturally arises, what about the good hen during her period of rest, or while she is in the molt? Is there any way of determining whether she has been a good, medium, or poor producer as judged by her appearance and handling qualities alone? Or in other words, is there an egg type? It would be peculiar if there were not differences in body type and conformation correlated with egg production.

The egg type as now understood consists of a deep body as measured from the front of the keel to the center of the back; deep, gradually tapering flat sides, wedge shape; a long, straight back carrying its width to the base of the tail; good width throughout the pelvic region; and a wide, full breast. The emphasis is placed on the individual possessing adequate capacity in all sections to properly accommodate all the vital organs and reproductive system under the strain of heavy egg production. The body of an off type individual is shallow from back to breast with a prominent spring of ribs giving a more rounded body. There is much yet to be learned about type, and one should be cautious in depending upon it until further knowledge is obtained. So far as known, type can be applied to any breed, age (after maturity), or sex. The discussion of head characteristics under Part II contributes further to this subject.

EXCEPTIONS

The foregoing discussion is general and should apply to the majority of normal flocks and individuals. But there is a great variation in the way flocks are handled. They may or may not be graded according to age. Some receive good care and attention while others are neglected. Some are on free range, others are confined. Some are fed rations containing much yellow pigment, as green feed and yellow corn, while others are fed rations containing

very little. Exceptions will be found in flocks which receive grain alone without tankage, meatscraps, or milk in some form. Irregular feeding or under feeding will bring on an untimely molt and this possibility should be considered in culling.

Broodiness is a disturbing factor that must be studied carefully. Infestations of red mites or internal parasites, as well as disease outbreaks, cause irregularities that interfere with accurate culling. Abnormalities among individuals caused by ovarian troubles, such as deposit of eggs in the body cavity and the development of masculine characters in hens, are occasionally encountered. Artificial illumination, when misused, will throw the birds into a winter or spring molt which is no fault of the hens, but is the result of mismanagement. Hens used in hatching and brooding chicks will show color late in the season. They should be marked so that they can be identified. These and other conditions make it necessary for the individual culler to know the flock. The better the flock is known, the more successful will be the work of culling and grading.

In culling on the basis of present production, one should be able to place correctly 95 to 100 per cent of the birds after some experience. But in placing birds in order according to their rank in annual egg production, based on their indications of past production, one cannot expect to get more than 70 to 75 per cent of them in the right order.

HOW LONG SHOULD HENS BE KEPT

Good hens may be kept at a profit two or three years for market eggs, and for breeding purposes even longer. Hens on the average give their greatest egg production the first or pullet year and diminish 15 to 20 per cent each succeeding year. The following figures give 3 years' records at the Kansas Agricultural Experiment Station for a number of White Leghorns, Rhode Island Reds, and Barred Plymouth Rocks:

	Rocks and Reds		Leghorns	
Year	Average production	Per cent	Average production	Per cent
1.....	170	100	198	100
2.....	140	82	151	76
3.....	104	61	120	61

Most of the second and third year's production is obtained during the spring and summer when eggs are cheap, therefore the net receipts from older hens will decrease faster relatively than egg production. The age of individual birds can easily be determined

if the web between the toes is slit each spring when the chicks hatch, a different one of the sixteen possible combinations being used each year.

SELECTING THE BREEDING MALE

The first requirement in a good breeding cock or cockerel is vigor. It is identified in the yard by an alert, active, and commanding disposition. Upon close examination it will be seen that a vigorous male has a short, well-curved beak, broad, deep head, full face, with a prominent clear, bright eye and a deep red color in the comb, face, and wattles. The neck is short, arched, and blends well into the shoulders. The legs, of medium length, are set squarely under the body and the knees are straight and wide apart. Pronounced masculine characters should dominate all sections of the bird, even to the bright sheen on the plumage.

Second only in importance to vigor is type. In addition to the general discussion of types, other points emphasized for the male birds include a prominent breast, breadth across the shoulders, and great depth from center of back to center of keel. Well-bred cocks, unlike hens, are usually narrow between the pubic bones and show but little capacity in the abdomen. This apparently is due to the shape of the keel of the male which is inclined upward at the tip. Fundamentally it is due to the fact that the reproductive organs of the male need far less space than those of an actively laying hen.

In selecting a breeding male one should not be too quick to choose the precocious cockerel, that is, the first to show the red comb and to crow and take command of the flock. Such a bird will often show high fertility in hatching eggs and other good breeding characteristics, but is likely to be fine-boned and undersized for the breed. The continuous use of early-maturing males may have a tendency to reduce the size of the offspring and eventually affect the size of the egg. The small size of the male cannot be readily overcome by the size of the females with which he is mated, for it is well known that the highest-producing hens are often a half pound or more below the standard weight for the breed.

The above points are external and are valuable only as such. The prepotency of an individual or his power to transmit character is an internal and intangible quality that can be accurately measured by the progeny test only. Just as the trapnest is the only accurate measure of egg production, so the performance of his daughters is the only accurate measure of the breeding powers of

the male so far as egg production is concerned. This test consists of mating a male with a number of females and keeping records of the eggs laid by the daughters. Progeny tests can be run with a number of cockerels one season and their values as breeders indicated for the second season by the winter production of their daughters. A number of experiments have shown that pullets with a high winter production as a rule give a good yearly production. Aside from the progeny test one who is not using pedigreed birds must resort to vigor and type in selecting the male for the breeding pen.

GLOSSARY OF TERMS

Abdomen: That part of the body below the vent covered with fluff or down feathers.

Axial Feather: The short feather in the middle of the wing that separates the primaries from the secondaries.

Beak: The horny projecting mouth parts of chickens and turkeys, including an upper and a lower mandible.

Broody: The condition of a hen inclined to set.

Cock: Male chicken over 1 year of age.

Cockerel: Male chicken under 1 year of age.

Cull: To select; to separate the desirable from the undesirable.

Capacity: The cubical content of the body case, commonly estimated in culling by the distance from pubic bones to the end of the keel.

Eyering: The edges of the eyelids.

Earlobe: Fleshy, unfeathered growth under the ear.

Fingers: The tips of the fingers just back of the first joint are used for measuring in culling. Four fingers of the average man's hand measure about 3 inches in width.

Hen: Female chicken over 1 year of age, but used in this circular for any bird that has started to lay.

Intensity: Rate of egg production measured by the number of eggs laid per week or per month.

Keel: The breast bone of a bird.

Persistence: The length of time a hen lays without long interruptions.

Lateral or Sternal Processes: Long, narrow, boney processes attached each side of the keel.

Molt: The process of changing old feathers for new.

Pullet: A female chicken under 1 year of age.

Pigment: The yellow color found in the skin, shanks, and beak of certain breeds and varieties.

Primaries: The long outermost flight feathers visible when the wing is extended. They number ten as a rule but nine or eleven are exceptions sometimes found.

Pubic Bones: The long, slender, flat bones terminating each side of the vent.

Precocious: Early maturing. Further developed than is normal at a given time.

Secondaries: The large wing feathers adjacent to the body visible when the wing is folded or extended. They are usually ten in number.

Vent: Common opening of the alimentary and genito-urinary systems.

CULLING CHART

JUDGING FOR PRESENT PRODUCTION

CHARACTER	LAYING HEN	NONLAYING HEN
Vent	Large, dilated, oblong, moist	Small, contracted, round, dry
Pubic Bones	Flexible, and wide apart	Rigid, close together
Comb	Large, red, full, glossy	Small, pale, scaly
Wattles and Lobes	Prominent, soft, smooth	Inconspicuous, rough, and dry

JUDGING PAST PRODUCTION

	LONG LAYING PERIOD	SHORT LAYING PERIOD
Vent	Bluish white	Flesh colored
Eyelids	Thin and edges white	Thick, yellow tinted
Eye	Prominent, keen, sparkling	Listless, sunken
Earlobes	Enamel white	Yellow tinted
Beak	Pearly white	Yellow tinted
Face	Clean cut, sunken	Full, well fleshed, yellowish
Shanks	White, flat, thin, creased	Yellow, round, smooth
Plumage	Worn, soiled, lifeless, close-feathered	Signs of molting, loose-feathered

JUDGING RATE OF PRODUCTION

	HIGH RATE	LOW RATE
Keel	Slopes downward	Slopes upward
Pubic Bones	Tips thin, point straight out	Tips thick, curved in
Capacity	Four to five fingers	Two fingers
Abdomen	Soft, pliable, dilated	Fatty, hard, contracted
Rump	Broad, width carried back	Narrow, cramped
Lateral Processes	Prominent, pointed outward	Hard to find, pointed inward
Skin	Soft, thin, loose, silky	Thick, dry, underlaid with fat

PART II

HEAD CHARACTERS AND THEIR RELATION TO CULLING

HOWARD H. STEUP

POSSIBILITIES IN HEAD-TYPE CHARACTERS

There are two systems of improving the laying ability of the modern hen. One employs the use of the trapnest and the other uses certain physical characteristics. The more accurate of these is the trapnest system, but even this method has room for improvement. There are occasional mechanical mistakes made in trapnesting and there always will be hens that lay on the floor. Both of these tend to keep trapnest records slightly under 100 per cent accurate, but it is not these few minor discrepancies that seem to be holding this trapnest method back. The main problems are to lessen the present high cost and to obtain an accurate means of predetermining the value of male birds.

Present-day breeders use males from high-producing hens and good pedigree backing, but only a certain per cent of these prove themselves to be prepotent for transmitting high production to their daughters. To tell the good breeding male from the poor is at present a task requiring both patience and expense, for the male must be mated and his daughters must mature and be put under trapnest before any decision can be reached. When the results are known, it is not uncommon to find that some of the proved sires have "gone by" and are incapable of fertilizing eggs. Besides this, there is the expense of testing many males which requires much equipment and labor for the small number that prove themselves.

The same is true for hens. The reports of egg-laying contests usually stress the few exceptional birds, but along with these are also the poor hens that were not worthy of the time and trouble placed upon them. What is thus true at contests in a small way is true on an enormous scale when all trapnested hens are considered.

This inefficiency exists primarily because the poultryman has never had any reliable means of telling performance in advance and has had to resort to this trial and error method. Head-type characters may offer a way out that will effect a great saving if they can be applied in a practical way.

There is no reason why a large per cent of the poor individuals should not be eliminated before testing. After one becomes familiar with certain head characters, it may be possible to tell by physical examination the majority of both males and females worthy of testing.

Since the trapnest is not practical for the large number of average poultrymen, head-type characters will probably be of most value to the poultry industry when included in the physical character type of culling. Present-day culling methods include observations on pigment bleaching, quality or freedom from fat, molting, body conformation, temperament, and a little on head characters. As these are used to-day, they apply in the main to past production. Thus the poor hen has to be boarded and given a chance before present culling practice weeds her from the flock. This unproductive test period consumes some of the profits of the good hen and the efficiency of the flock is lowered. How much better it would be to recognize the poor individuals, whether male or female, and discard them early in life.

PHYSICAL CHANGES FOLLOW CESSATION OF PRODUCTION

If one should analyze the group of physical characters now used in culling practice, he would find that they apply to the result and not the cause. Hens do not lay because they bleach. The pigment fades because of the laying. Hens do not quit laying because they are fat. They become fat because of nonproduction. There is a lot of evidence that body type may be influenced by production rather than being its cause. The spread of the pubic bones depends upon laying or nonlaying as well as does the depth from pubic bones to keel. The lateral processes swell outward with laying and point inward in periods of nonproduction. Even some of the early head-type characters first included in culling programs are not constant. Temperament, which was so closely linked with Foreman's first classification of head types, is especially fluctuating. This fluctuation was recently very well demonstrated by Lady Mary, the Barred Rock hen with such a wonderful egg record. When she was displayed at the Third World's Poultry Congress at Ottawa (Canada), she was just recuperating from an injury. Gone was the snap and fire from her eye and her usual active and alert expression had dimmed. If temperament alone were considered, it would have been impossible to recognize her as the same Lady Mary that ap-

peared at the Chicago Coliseum Poultry Show immediately following her record year.

What was true of Lady Mary in this exceptional case is true of most hens after they have finished a year of heavy production and are recuperating. Therefore, the present culling system is not only weak in that it locks the door after the feed has been eaten, but also in that it is incapable of efficient use at all times.

THE STUDY OF PHYSICAL CHANGES

Realizing that both trapnesting and culling practices could be benefited by additional knowledge of physical characters, a study was started some years ago to determine this additional information. The logical way to attack the problem was at the cause and not backwards from effect. Head type presented itself as an interesting problem and poultry investigators were beginning to believe the head region indicated degrees of ability in production. Correlation studies were made upon various recognized head characters only to prove that no apparent relation existed. These failures to obtain significant correlations on these then accepted head characters soon convinced the writer that such things as temperament, brightness of eye, quality of head appendages, etc., were helpful in certain individual cases, but were too fluctuating with the seasons of year and period of egg production to be year-around criterion.

The first difference in a permanent head character to be discovered was position of eye. Since then more permanent characters have been observed and studied until the characters listed herein finally evolved.

The main thing to remember is that these characters deal with the skull conformation, which is the same irrespective of season or period of production. If predictions of breeding and laying ability are to be worked out, they will come from unchanging characters that act as a cause, rather than from the characters that are changed periodically and are affected by production itself.

HISTORY OF HEAD-TYPE CHARACTERS

It is well for students of head characters to become familiar with the many phases through which these characters have evolved. Each step listed herein has advanced the knowledge of culling and is worthy of consideration. Some are more important than others, but they all belong together as a background for present-day head classifications.

In checking over past culling practices it appears that the year

1922 was the beginning of attention to head type. Previous to this date, with the exception of the little accepted Hogan theory of male head prepotency, one can find only the descriptions of combs and wattles as they varied in production from nonproducing periods. Almost every one is familiar with the bright, red, full comb and wattles of the hen that is laying, and the limpid, pale, shriveled condition of these same appendages when the bird is out of production. These signs are valuable to the poultryman and probably have caused many a nonlayer to be killed for eating, whereas without their notice a laying hen might have ended in the pot. In fact most poultrymen have associated red combs and wattles with egg production for so long that this knowledge often works against them when they first start to study head types. Many students of head type have gone sadly awry because they were blinded to more important points by a red comb. Comb and wattles should be used only in determining present production—that is whether or not the bird is laying at the time of handling. To use them for more than this purpose is to court much trouble in reading head characters.

FOREMAN'S SIX CLASSES

Foreman, to whom undoubtedly belongs the credit for first emphasizing head type, divided head types into six classes.[6] The first of these, crowhead, was more or less known at the time of his first publication. He associated, however, the long skull, shallow face, and sunken eye of the crowhead with slow maturity and slow feathering. He further intimated that crowheaded individuals might possess enough laying temperament to lay as many as 140 eggs a year. To make his classification more complete he said that laying temperament combines such factors as "character, refinement, intelligence, and enterprise supported by a powerful digestive apparatus."

His second type was known as "overly refined." Such a head lacked the determined expression and more substantial conformation that is found on the refined group. The head was supposed to be trim, bright, and intelligent, but lacked stamina and ruggedness. Nowhere, however, did he clearly define what one might look for in the way of this rugged stamina.

His third group included the extremely good hens and was known as the "refined" type. The eye was alert and intelligent. The skull was moderately narrow, but entirely free from heaviness directly over the eye. The jaw was narrow and the skin showed no tend-

6. Foreman, E. C. Every step in culling and breeding. 63 pp., 66 illus. Modern Poultry Breeder, Battle Creek, Mich. (Ref., p. 22.)

encies toward fat. The neck was included with this head type and was supposed to fit on neatly without any tendency toward heaviness.

His fourth type was the "beefy head" with heavy prominent skulls, protruding eyebrows, sunken eyes, thick jaws and heavy neck attachments. It further included a wrinkled face and a sluggish temperament.

His fifth type included the masculine heads so common as a result of certain injuries to the ovary. Large comb and wattles, spur development, masculine voice, and general male characters predominated his descriptions. He called this type the incomplete hermaphrodite.

His sixth type was known as "lacking in character." This head was coarse and expressionless and usually abnormal in shape. A dull, listless temperament was usually associated with it.

RICE'S SEVEN CLASSES

Foreman's work on head types was continued by Rice and his staff colleagues of Cornell University. In 1925 Rice described the good head type as follows:

> The head should be well proportioned and distinctly feminine, and the eyes well set and prominent. The feathers of the head should lie close, rather than stand outward or upward.
>
> The head should be wider at the top of the skull than at the bottom, but not so wide as to overhang the eyes. When the head is viewed from the front, or rear, the eyes should be seen standing out from the face.
>
> The head, from top to bottom, on a line drawn through the eyes, should be fairly deep; and a line drawn at right angles from this line to the beak should not show the head so long proportionately as to give the bird a crowheaded appearance.
>
> The face should be clean and free from feathers; the eyelids should be large and slightly oval. The eye should have a fearless, determined expression. As an indication of temperament, the eye is important.

In 1927 head types were classified on Cornell stencil 5842 as follows: (1) Rugged refined. (2) Refined, (3) Overly refined. (4) Crowhead. (5) Unrefined. (6) Phlegmatic. (7) Masculine.

They evidently found that one class for good producers was not sufficient and so distinguished between the extremely good as "rugged refined" and the good as "refined." The beefy type of Foreman was changed to a more descriptive type called "unrefined"; the "lacking character" group was changed to "phlegmatic"; and the "incomplete hermaphrodite" was designated as "masculine."

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7. Rice, James E., and Botsford, Harold E. Practical poultry management. 506 pages. 307 illustrations. Reference, page 13. John Wiley and Sons, Inc., New York. 1925.

In addition to the above classes, the Cornell system uses the expressed mentality of the bird. This is divided into three sections; namely, expression, disposition, and intelligence.

In further describing the head of a good individual the Cornell system states as follows: "The head should be clean cut. It should be of medium length and depth, wide and flat, the width increasing uniformly from attachment of beak to a point directly behind the eye. The eyes should be large, bright, and prominent. A smooth and lean condition of the skin covering the face is desirable. The head should be neatly attached to the neck, avoiding all tendency toward throatiness. Common defects to be avoided are thick prominent jaws, narrow skulls, heavily wrinkled or shallow faces, small or sunken eyes, overhanging eyebrows, or combs with extremely narrow serrations."

In the report of the proceedings of the Third World's Poultry Congress, Professor Rice is quoted as follows: "The first and most important single character in judging is the head. It is the bird's periscope—the lighthouse. It is the central power house. It is the dynamo that drives all the machinery of the body. It reflects the condition and value of all other sections of the body. It is the center of the nervous system. It is the bird's radio station. It is both a sending and a receiving set. We use it first because it shows most in hens as in humans."

Thus in the space of a few short years, head type has risen from insignificance to the consideration as most important of all characters. The various descriptions listed in this short historical sketch are all important. Regardless of how many ways and by how many persons good head type is described, the heavy producing hen will always have the same head. Any differences in descriptions are due to faulty observations, to a study of exceptional individuals instead of the large majority, or to different descriptions of the same characters due to various viewpoints.

FOUR HEAD-TYPE CHARACTERS

The writer has classified head characters into four definite groups. This classification depends entirely upon form and shape and thus is constant. These may be altered and changed in the young chick by malnutrition and mismanagement, but once they are established in the boney framework of the skull, they are fixed. This permanency is not affected by seasonal factors and seems to work as well on hens out of production as those in full production. When once

these characters are recognized, it may be possible to distinguish these differences even in young chick heads, which gives promise of enabling their application much earlier than present-culling methods are now applied.

FLATNESS OF SKULL FROM SIDE TO SIDE

The first character is the flatness of the top of the skull from side to side. The good laying hen has a flat head which makes the eye set well up toward the comb. The top lines of a good hen's head is

FIG. 24.—(A) The head of a high producer, 281 eggs in one year. (B) The head of a low producer, 106 eggs in one year. Note the flatness over the eye of the good hen (1, A) and the plump or round condition over the eye of the poor hen (1, B).

like the flat roof found on many buildings, and immediately beneath this level top line is found the eye. In some cases the flatness is carried out wide enough over the eyes so as to give the skull an overhanging effect.

This side-to-side flatness can be told by noticing the distance from the top of the eye to the bottom of the comb. (Fig. 24, A.) The shorter this distance the flatter the top of the skull and the better the individual is likely to be as an egg producer. On some hens the feathers are smooth on top of the head and lie close to the skull line. On other hens the feathers stand upright. Therefore, it is quite essential that the exact skull line be determined before ascertaining this distance from top of eye to bottom of comb. For keenest

observation of this point, it is well to press the feathers down tightly against the top of the head or else moisten the feathers so that they stay down.

The top skull line of a poor hen slopes or rounds from side to side. This sidewise slope starts at the bottom of the comb and rounds or slants downward to the top of the eye, which is set lower down in the head than in the good hen. (Fig. 24, B.)

There are times when this one character of side-to-side flatness will prove fairly accurate in culling by itself. and again there are

FIG. 25.—An example of a wide, flat skull (2) carried well forward (3). Record, 274 eggs in one year.

individual hens that will not conform exactly to this character. No definite correlation can be obtained on this character, nor on the other three of this system. Therefore it is unwise to use any one by itself as the influence of the other three may greatly alter the general effect. However, of the four characters here considered, this first one is probably the most important.

It has been suggested that side flatness may be closely related to rate of production, but this never has been proved by correlation tables.

CARRY FORWARD OF SKULL WIDTH

The second character is the carry forward of the skull width. The width of the head itself is not so important as is the way the width is carried forward toward the nostril. Many skull-width measurements have been taken without finding any definite co-

relation existing, except a positive relation between size of bird and skull width. However, there is a general tendency for a good hen (Fig. 25) to carry her skull width well up to the nostril and the poor hen to lose this width much farther back. On most hens the skull width is lost immediately in front of the eye. Therefore this carry forward of skull width is usually associated with a forward position of the eye. Good layers have the eye setting well toward the nostril under the front half of the comb. Poor layers have the eye more in the back of the head under the rear half of the comb

FIG. 26.—The distance from base of comb to top of wattles (4) should be about the same as the distance from front of earlobe to the end of the beak (5) in well-balanced heads as in (A). In crow-headed birds, the length of head is greater than the depth as in (B). These dimensions do not change in adult birds and apply whether the hens are laying or not.

and sometimes entirely behind it. On some good layers, the eye is not so far forward in the head as might be expected, but then it will be observed that the skull width does not stop at the front, of the eye but carries well forward beyond this usual stopping point. The strength of this character also can be observed by looking down on the head from in front of the hen. The more width toward the beak, the better. This forward carriage of skull width may be closely linked with persistence of production. Hens that are very strong in this character are continuous layers. Those that are weak on forward width are not able to lay without rest periods. These rest periods appear as winter pauses, broody spells, or vacation periods of molting toward the end of the laying year.

This, second character is as important as the first where one is dealing with production of over 200 eggs. The first character will

be used more on average flocks where extremely good hens are the exception and carry forward of skull width is hard to find. Those who apply these head characters on extremely good birds will find much use for the second character. It is extremely pronounced on the 300-egg individuals, and is usually the deciding factor when dealing with birds from such high-record breeding.

HEAD BALANCE

The third character is the balance of the head. This balance refers to the relation of the depth of the head to its length. Good layers usually have nearly as much distance from the base of the comb to the top of the wattle as they do from the front of the ear-

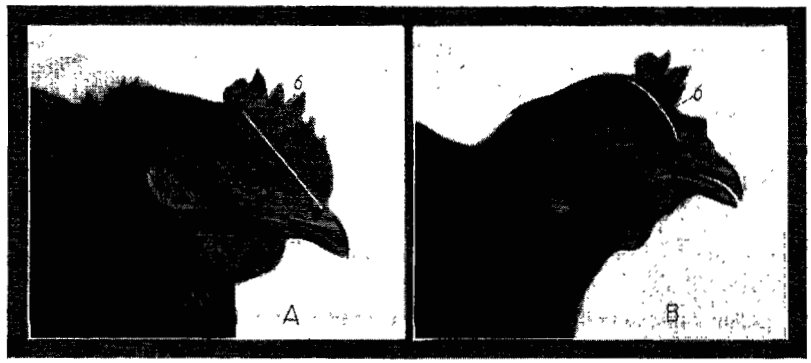

FIG. 27.—(A) A high-producing hen. Note the level-headedness, a desirable characteristic. The line from nostril to the top of head where comb is attached should be straight (6, A) and not curved (6, B).

lobe to the tip of the beak. (Fig. 26, A.) Poor layers sometimes have a long, narrow head which means that the comb to wattle distance is considerably less than the earlobe to tip of beak distance. (Fig. 26, B.) Long, narrow heads usually have a long beak attachment whereas the good, balanced head usually carries a short, strong beak.

The long, narrow head is associated with physical weakness for it is nothing more than the crow-headed condition that poultrymen have avoided for years. This type of head can be easily obtained by certain malnutrition practices. All birds in the later stages of rickets show decidedly crow heads.

Important as this character is in head type classification, it is well to use it always with caution. There are many good-laying hens whose head type is at first not so impressive because of an

unbalanced condition. These heads are not long and narrow enough to be called crow heads, but still lack quite a bit of the perfect balance herein described. Such individuals, however, are so extremely good for the other three head characters that it is not hard to recognize them for the good hens that they are. Of the four head characters, the balance of head or character three, is probably the least important.

LEVELNESS OF SKULL FROM FRONT TO REAR

The fourth character is the levelness of the top of the skull from front to rear. The good layer has a top headline that is nearly level from the nostril to the back of the comb attachment. (Fig. 27, A.) The poor layer has a top headline that rounds or slopes both in front of and behind the eye. (Fig. 27, B.) The extremely poor hen has this two-way slope to such a marked degree that her head takes on a gable-roof effect. This slope can be observed by actual visualization or by noticing the distance between the bottom of the comb and both the front and rear of the eye. Good hens with heads nearly level in this respect have very little difference between these distances. The eye appears to be set in the head parallel to the skull top line. On poor producers the front of the eye is much nearer to the bottom of the comb than is the back of the eye. The sloping of the skull line makes the eye appear to be set in the head at an angle to the top skull line or a cross-eyed effect.

This character is associated with beefy and sluggish individuals and is the most important in observing the extremely poor layer. It is of further use in that it often helps in distinguishing close differences on birds of medium production.

DISCUSSION OF THE FOUR HEAD-TYPE CHARACTERS

A careful study of these descriptions and illustrations should give a thorough understanding of head-type characters as the writer sees them. It should be remembered always that all four of these characters should be considered together and not too much dependence placed upon any one. Extremely good hens will usually express all four of these characters in their head types, although they sometimes may have only three present in perfection while the fourth may be more or less weak. Extremely poor layers will have a decided absence of these four good characters. The two extremes are usually easy to note. Difficulty is sometimes encountered in being able to separate small differences among medium-producing hens. Here two good and two poor characters may be combined while at other times all four characters may be neither good nor bad.

There are exceptions to this classification. Usually these appear as hens laying better than their head characters would indicate. It is extremely rare to find a good-headed hen with a poor egg record, unless some outside factor such as sickness, injury, improper feeding, or floor laying has disturbed normal results.

There are other head characters than these four that are sometimes helpful in head-type culling. These have been mentioned in the history of head characters but are seldom used because of their variability and the confusion resulting from dealing with too many factors. When one is able to read correctly the four characters herein listed, there is little need to look further for additional help unless an absolutely perfect, exception-free system is desired. In other words, the correct application of these four simple head characters will be sufficiently efficient for all practical purposes.

PREDICTING PRODUCTION

There is no question but that the head characters herein described will become useful in the general practices of culling for past production. Sufficient observations on enough different strains, varieties, and breeds of hens have been made to be assured that these head characters are a useful addition to present culling knowledge. The debatable part of head culling is whether or not it will prove out as a practical means of predicting future production.

Reliable evidence for or against this is quite hard to obtain, as it necessitates many predictions on a large number of pullets of different breeds, varieties, and strains. Until such evidence is available, it is safe to say that head characters give promise of predicting future production.

HEAD CHARACTERS IN RELATION TO MALE SELECTION AND INHERITANCE

One of the most beneficial results of this head-type examination will be the selection of male birds, if these four characters prove a reliable basis for such selection. It is only logical to conclude that if certain definite head characters are associated with good production in females, these same characters are desirable in male birds.

Within certain limits like begets like. A male bird with a poor head type can hardly be expected to produce daughters with good head characters, whereas a male with a good-production head should transmit these good qualities to his daughters. The theory is plausible enough. To prove it is quite a task since tested or proved males are comparatively scarce.

FIG. 28.—Flat, level heads which carry forward and are well balanced apply to males as well as females. The head illustrated in (A) is the more desirable than in (B).

FIG. 29.—(A) A strong breeding head. (B) A highly inbred and weak head.

In choosing the male birds whose headware shown in figures 28 and 29, it was possible to recognize and classify correctly the breeding powers of each one before any knowledge or record of their performance was produced.

It will be a difficult task to accumulate mass evidence on this point as tested male birds are not nearly so numerous as trapnested hens. In addition to this, the male has no way of expressing his egg-production abilities except with the help of females in the breeding

FIG. 30.—(A) The head of a high-producing hen belonging to Mr. Ralph Upham. Record, 303 eggs in one year. Note the prominent "carry forward" of the top headline. This characteristic is plainly visible in the head of her seven weeks' old son (B).

pens. In bringing in this female side, the breeder has added additional factors that may either help or hinder the possibilities of the male.

HEAD CHARACTERS IN YOUNG STOCK

The poultry industry is rapidly progressing toward greater efficiency. In this march of progress all new systems that will effect a saving are eagerly absorbed into the management routine. The sooner the poultryman can recognize unprofitable birds the sooner he can dispose of them and thus eliminate considerable waste. If male birds are kept until they become staggy before they are recognized as poor individuals and sold, their market price is so lowered that they are worth little if any more than they would have brought as broilers. The poultry man thus loses most of the expense of care

and feed after the broiler age. Usually pullets culled in the fall have to be sold on a market glutted with fryers and they also seldom bring more than they would have as broilers. Therefore, if these poor individuals could be recognized at the broiler age a great saving would result.

In the face of this economic situation, the question naturally arises whether or not head type characters can be used at broiler age. This question is hard to answer. Differences in head characters of baby chicks have been observed but these differences have not been followed through to maturity. Does head type change on normal growing chicks or not? It does change on chicks given mistreatment. As the chick grows the skull grows and before this boney structure is fixed, there are always chances of changing.

At broiler age, it is still easier to recognize differences in head type. Figure 30 is presented here to illustrate how clearly certain head types stand out at broiler age. The young male in this illustration is highly inbred with the blood line of a 300-egg hen.

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