

On the Intergeneric Hybrids between *Phasianus colchicus* ♂ × *Gallus domesticus* ♀

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(Tables 1-2, Text-fig. 1, Plates I-IV)*

INTRODUCTION

Numerous authors have reported results from work done on producing the hybrids between chickens and pheasants especially the Ringneck pheasants, *Phasianus colchicus* (SUCHTED, 1889; WHEELER, 1910; POLL, 1912; CUTLER, 1918; SEREBROWSKY, 1929; YAMASHINA, 1942; SHAKLEE & KNOX, 1954; ASMUNDSON & LORENZ, 1957; WATANABE et al., 1963). But the fertility of the hybrid eggs was very low and the majority of the reports are the works pertaining to the sex ratio and the cyto-genetics of the hybrids with the exception of a few reports. And thus, the reports with the characteristics of adult hybrids are so far very few.

In the present experiments, the Korean Ringneck pheasant male was mated naturally with chicken female produced by crossing Red-Hackled Shamo Bantam male with Single Comb White Leghorn female and have produced six hybrids. This paper reports in detail on the fertility, hatchability, incubation period, sex ratio, growth pattern and the characteristics of the adult hybrid birds obtained in the present experiments.

MATERIALS AND METHODS

The pheasant male used in the present experiments was a Ringneck pheasant; it was five years old and weighed 1,250g at the experimental time (Pl. I, Fig. 1). On the other hand, the fowl female used here was produced by crossing Red-Hackled Shamo Bantam¹⁾ male with Single Comb White Leghorn female; it was two years old and weighed 1,100g at that time. The fowl female has a pea comb similar to her male parent(Pl. I, Fig. 2). On April 25, 1963 the pheasant male described above was placed with the fowl female in breeding pen and these two birds mated naturally. From May 1 on, a regular laying occurred, producing 6 eggs until May 6 but no further laying occurred after the next day. On May 8, all the 6 eggs laid during the floor mating were hatched under the female hen and candling eggs were made at

1) In Japan, it is called the Small Bantam, or Chibi.

the 5th day of hatching under hen.

RESULTS OF EXPERIMENTS

1) Fertility and Hatchability

The record of fertility and hatchability of the eggs secured by floor matings between pheasant male and fowl female is presented in Table 1.

Table 1. Characteristics of the intergeneric hybrid produced by crossing the Korean Ringneck Pheasant male with the fowl female.

Nos. of bird	Incubation period	Sex	Plumage color	Remarks
No. 1	22	♂	Light brown	Average length of incubation period is 23.8 ± 1.6 days Sex ratio ♂:♀=4 : 2
No. 2	22	♂	Black	
No. 3	24	♂	Light brown	
No. 4	24	♀	Brown	
No. 5	25	♀	White	
No. 6	26	♂	Light brown	

Thus, all 6 eggs from the floor matings were fertile and these 6 eggs hatched all from May 30 to June 3, i. e. the average length of incubation period of the above hybrid eggs was 23.8 ± 1.6 days, ranging from 22 to 26 days. Therefore, both the fertility and hatchability are 100 percent. Such results as the present experiment are very rare in so far as ever practiced the experimental samples. These hybrids all but one which was killed in an accident being $5\frac{1}{2}$ months old, are now growing on with a great vitality.

2) Sex Ratio

Four of the six hybrids were males and the other two hybrids were females (Table 1). That is to say, the secondary sex ratio revealed 200 (♂♂4 : ♀♀2). Judging from the above results, it would appear that pheasant male mated to chicken female produce an excess of males.

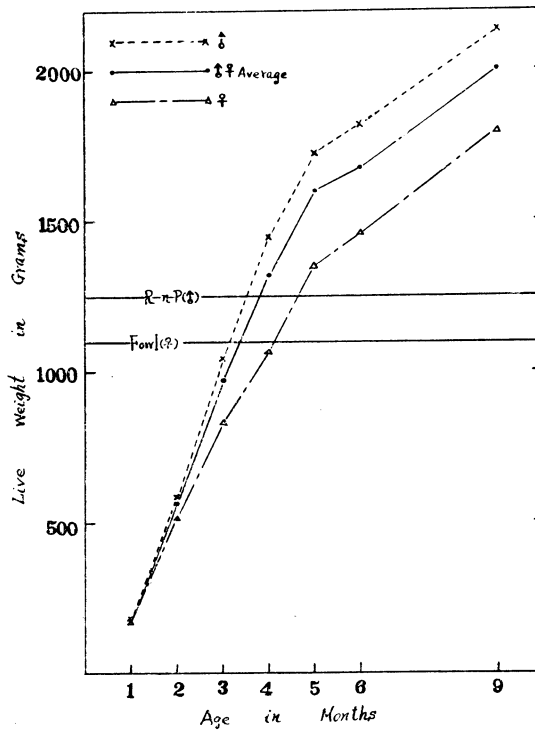
3) Growth of the Hybrids

The record of growth of the hybrids is presented in Table 2 and Text-figure 1. The average live weight of all hybrids attained to 1,320g at 4 months old, and 1,674g at 6 months old respectively. At 9 months old, it attained to 2,006g on the average, i.e. in male hybrids it attained to 2,140g on the average ranging from 2,080 to 2,200g, on the other hand, both the two birds in female hybrids attained to 1,800g severally.

Table 2. Live weight of the hybrids at 30-day intervals

Nos. of bird	Hatching date		Sex	Live weight, grams (Age, Months)						
				1	2	3	4	5	6	9
No. 1	May,	30	♂	180	640	1,170	1,630	1,850	1,880	2,200
No. 2*	May,	30	♂	210	600	1,010	1,320	1,600	—	—
No. 3	June,	1	♂	180	600	990	1,450	1,800	1,800	2,150
No. 4	June,	1	♀	170	480	780	970	1,300	1,430	1,800
No. 5	June,	2	♀	170	560	890	1,150	1,400	1,480	1,800
No. 6	June,	3	♂	170	520	1,020	1,400	1,650	1,780	2,080
Average weight of all				180	567	977	1,320	1,600	1,674	2,006
Average weight per male				185	590	1,048	1,450	1,725	1,820	2,140
Average weight per female				170	520	835	1,060	1,350	1,455	1,800

* Hybrid No. 2 was killed in an accident at 5½ months old.



Text-fig. 1. Growing curves of the hybrids

4) Plumage Color

The plumage color of each hybrid at hatching time varied considerably. Three of six hybrids are light brown and the rest is white, black and brown respectively. In

the hybrid of white plumage, the color of beak and shanks are whitish black and slate; in the hybrids of light brown plumage, the color of beak and shanks are both whitish grey; in the hybrid of brown plumage, that of beak and shanks are brown and whitish grey; and in the hybrid of black plumage, that of beak and shanks are black and slate-like black respectively. These plumage color have changed to some extent according to their growth, but the color of beak and shanks of the hybrids have not changed even when they became adult. The plumage color of each adult hybrid is shown in plate II, Fig. 5. When the hybrids became adult, the plumage color of white hybrid became whitish grey; that of the black hybrid became more black as a crow but the feather of its tail, back and abdominal region became somewhat brown as their male parent (Pl. III, Fig. 6). That of light brown hybrids became more and more clearer. That of the brown hybrid became a more darker brown.

5) General Appearance

The head of each hybrid at hatching time appeared to be smaller dorso-ventrally than that of chicks. When the hybrids became adult, the general shape of their heads and beaks are more like that of parent pheasant than that of parent chicken with the exception of its no tufts. On the other hands, the carriges of the body and the shapes of the shank of the young hybrids more resembled that of chicken than that of pheasant (Pl. II, Fig. 3).

6) Head Characteristics

The comb, wattles and earlobes of the chicken parent were absent in the hybrids of baby chick but strange to say, when they grew up and reached about 5 months old, all the hybrids made their appearance of a low rose comb (Pl. III, Fig. 7 & 8).

7) Length of Tail Feather

The tail feathers in the hybrids began to appear from about 3 to 4 weeks old and its appearance became more clearly after one month old. The tail feathers in the adult hybrids of the present experiment were longer than that of the chicken, but were not so long as that of Ringneck pheasant male (it measures 48cm in length). The longest tail feather of male hybrids was 32cm and 28.8 ± 2.9 cm on the average of the four, ranging from 25 to 32cm (Pl. IV, Fig. 9). The longest tail feather of female hybrids was 25cm and 24.5 ± 0.2 cm on the average of the two, ranging from 24 to 25cm.

8) Spur

There are small spurs in male hybrids in the main, whereas no spurs in females. The spurs of the paternal pheasant are long and sharp with a relatively large base,

whereas that of male hybrids are short with a relatively round base (Pl. IV, Fig. 10). That of three male hybrids are located slightly to the rear of the inner-side of the shanks similarly to that of maternal chicken. One male hybrid had no spurs in his shanks, and bears the marks of spurs slightly as is the case in the shanks of female hybrids (Pl. IV, Fig. 11). The time in which the spurs of male hybrids began to appear was the same time in which their combs began to appear at about 5 months old.

9) Number of Scale

The number of scale in the left shank of the paternal Ringneck pheasant were 15 pieces and that of the maternal chicken were 13 pieces and that of the hybrids were 14 pieces on the average and were ranked intermediate between those of their parents above mentioned.

10) Male Genital Organs

Result from the dissection of the hybrid which was killed in an accident at about 5¹/₂ months old on Nov. 19, 1963 it revealed that the bird has very small testes (Pl. IV, Fig. 12). Those weighted only 0.16g in the left side and 0.13g in the right side respectively. On the other hand, the size of testis in the left side was 1.17 × 0.54cm, and that of the right side was 0.95 × 0.54cm. The weights and sizes of the adult Japanese Green pheasant testes which was dissected on the same time for reference were as follows: That is to say, the testis in both the left and right sides weighed 0.06g respectively and the size of testis in the left side was 0.93 × 0.41cm and that of right side was 0.78 × 0.45cm respectively.

DISCUSSION

Fertility and Hatchability

In crossing of pheasant on chicken or in the reciprocal crossing, it is known that matings between these birds occur very rarely in nature (KURODA, 1934), and also, that even in successful matings, the fertility and hatchability of the hybrid eggs are exceedingly low (GUYER, 1909; CUTLER, 1918; POLL, 1921; YAMASHINA, 1942). As the consequence, the characteristics of adult hybrids experimentally produced have been rarely described. The causal factor of this low fertility is not yet fully explained. Undoubtedly, the difference of chromosomes in number between the parent birds should not be left out of account. The data compiled by MAKINO's monograph (1956) show the chromosome number of the Japanese Green Pheasant to be 2n = 82 ♂, 81 ♀ whereas that of the domestic fowl is 2n = 78 ♂, 77 ♀; further in the hybrid from *Gallus gallus* × *Phasianus colchicus*, YAMASHINA (1943) has determined the resultant number of chromosomes as 2n = 80 ♂, 79 ♀. There is reason, therefore, to believe that low fertility and early embryonic mortality as well as

decrease in hatchability of "hybrid" eggs might be in part due to this chromosomal difference. Nevertheless, considering the fact that the in fertility in chicken pheasant matings, natural or artificial, is not absolutely sterile but conditionally fertile, there seems to be much room for promoting the fertility of "hybrid" eggs by improving the mating technique, on one hand, and by preparation of semen dilutor on the other hand. In the present experiment, both the fertility and hatchability are 100 percent respectively as previously described. Such results as the present experiment are very rare in so far as ever reported. As a matter of fact, the result of the present experiment indicates the possibility of mass production of these hybrid birds in the future.

Incubation Period

All six of the hybrids which pipped, did so on the average 23.8 ± 1.6 th day of incubation, ranging from 22 to 26 days. Previously SHAKLEE & KNOX (1954) and WATANABE et al. (1963) reported the incubation period of a chicken-pheasant hybrid as 26 days and 25 days respectively. Therefore, the results of the incubation period of the present experiment agree with that of the above investigators.

Sex Ratio

The results of sex ratio in which pheasant males were mated to chicken females are reported previously by GUYER (1909), CUTLER (1918), POLL (1921), TAIBEL (1932), SANDNES & LANDAUER (1938), SHAKLEE & KNOX (1954) and ASMUNDSON & LORENZ (1957). A summary of the results of these investigators reveals 47 male and 15 female offspring (unknown 13). The percentages of males among the hybrids in the present experiment are summarized in Table 1; i. e. in a total of six hybrids secured from this cross there were 66.7 percent males ($\text{♂♂}:\text{♀♀}=4:2$), and the results of the present experiment seems to agree with that of the above described investigators. Thus, there is an undoubted excess of males among the offspring of crosses between pheasant ♂♂ and chicken ♀♀ , and so agreeing with the HALDANE rule (1922).

Growth of the Hybrids

The growth of the hybrids in the present experiment is very fast (Table 2 and Text-fig. 1). At 4 months old, the average live weight of all hybrids is already superior to that of their both parents. At 5 months old, even in the average live weight of female hybrids, not to mention that of all hybrids and male hybrids, it is superior to that of their both parents. At 6 months old, the average live weight of all hybrids attained to 1,674g and at 9 months old it attained to 2,006g on the average, in male hybrids it attained to 2,140g on the average, ranging from 2,080g to 2,200g, on the other hand, both the two birds in the female hybrids attained to 1,800g respectively. Therefore, the average live weight of all hybrids is 1.8 times

heavier than that of their maternal parent and is 1.6 times heavier than that of their paternal parent. Thus, the phenomena of heterosis is observed clearly among them. Such phenomenon was also observed in the growth of the Mule-ducks which are intergeneric hybrids between the Muscovy drake and the Common ducks previously reported by WATANABE (1961).

Characteristics of Hybrid Birds

The plumage color of each adult hybrid varied considerably, i. e. they are white, light brown, brown and black as shown in Plate II, Fig. 4 and 5. The general shape of the heads and beaks of the adult hybrids more resembled that of parent pheasant than that of parent chicken. The baby hybrid birds lacked the furnishing on their head such as the comb, wattles and earlobes of the chicken and the tufts of the pheasant. When they grew up and reached about 5 months old, all the hybrids made their appearance of a low rose comb as shown in Plate III, Fig. 7 & 8. WHEELER (1910) previously reported that the comb of a pheasant-chicken hybrid was very low, having somewhat the appearance of a rose comb, but without the spike. The tail feathers in the adult hybrid birds were longer than that of parent chicken female, but were not so long as that of parent Ringneck pheasant male. The shape of tail feather in female hybrids much resembled that of paternal Ringneck pheasant but the length of it was fairly shorter than that of the parent pheasant.

Spur

The spurs of male hybrids in the present experiment are short with a relatively small round base. The spurs of three male hybrids are located slightly to the rear of the inner-side of the shanks similarly to that of parent chicken. The length of spurs was 0.8cm on the average, ranging from 0.7 to 0.9cm in the case of all but one male hybrid. One of the four male hybrids had no spurs in his shanks and bears the marks of spurs slightly as in the shanks of female hybrids. The female hybrids bear only the marks of spurs in their shanks. The spurs in male hybrids began to appear on about 5 months old and this is the same time in which their combs began to appear in their heads.

Scale in the Shanks

YAMASHINA (1942) previously reported that the number of scale in the shanks of the Ringneck pheasant was from 15 to 16 pieces and that of the Red-Hackled Shamo was from 14 to 16 pieces and also that of the hybrid of the above two birds was from 15 to 17 pieces, and thus there was no great difference among them. The number of scale in the same portion of the hybrids produced in the present experiment were 14 pieces on the average. That of the paternal Ringneck pheasant were 15 pieces and that of the maternal chicken were 13 pieces. Therefore, the number of scale in the shanks of the hybrids was ranked intermediate between those of their

parents.

Male Genital Organs

It is well known that the wild birds generally decline their spermatogenic function in a non-breeding season. SHAKLEE & KNOX (1954) previously reported that the pheasant-chicken hybrid males had not mated or were incapable of producing viable sperm. They also stated that the results of dissection of the male adult hybrids revealed small testes which weighed only 0.25g in the case of each bird, whereas the testes of a Silver Cornish male approximately the same age weighed 26.2g.

As compared with the above results the size of the testes of a hybrid produced in the present experiment which was killed in an accident on Nov. 20th 1963, i. e. killed at 179 days old after hatching was $1.17 \times 0.54\text{cm}$ in the left and $0.95 \times 0.54\text{cm}$ in the right side, and thus, the weight of the testes weighed only 0.16g in the left and 0.13g in the right side respectively.

SUMMARY

The Korean Ringneck pheasant male was mated naturally with chicken female produced by crossing Red-Hackled Shamo Bantam male with Single Comb White Leghorn female.

1. All 6 eggs from natural matings were fertile and these 6 eggs hatched all and the average length of incubation period of the hybrid eggs was 23.8 ± 1.6 days, ranging from 22 to 26 days. Thus, both the fertility and hatchability were 100 percent.
2. The behavior and general appearance were more pheasant-like than chicken-like.
3. At 6 months old, the average live weight of all the hybrids attained to 1,672g and were more superior to that of their parents, thus the phenomena of heterosis were observed among them.
4. The plumage color of each adult hybrid varied considerably, i. e. they were white, light brown, brown and black.
5. The beak and shank color of each adult hybrid also varied considerably, i. e. they were whitish-grey, slate and slate-like black.
6. The tail feather length of the hybrids were intermediate between the parent species.
7. The hybrids had none of the wattles and earlobes of the chicken parent and of the tufts of the pheasant parent but when they grew up and reached 5 months old, all the hybrids made their appearance of a low rose comb.
8. Four of the six hybrids were males and the other two hybrids were females and the secondary sex ratio revealed 200 ($\text{♂} \text{♂} 4 : \text{♀} \text{♀} 2$).
9. The spurs of the hybrids were intermediate between the parent species in shape, size and location.
10. Average number of scale in the shanks of the hybrids were 14 pieces and this was ranked intermediate between those of their parent species.
11. No characteristics of sexual activity was observed.

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コーライキジ雄とニワトリ雌の属間雑種について

渡 辺 守 之・芦 田 宏 一

属間雑種の作出を目的としてコーライキジ雄をニワトリ雌(小しゃも雄を白レグ雌に交配して得たF₁)に交配して6羽のF₁を得ることに成功した。その雑種卵の受精率、ふ化率及び雛の発育過程における種々の変化について観察した結果は次の如く要約される。

1. 自然交配により得られた雑種卵6個は全部受精卵で、ふ化日数は22~26日、平均23.8±1.6日で6個が全部ふ化した。
2. 雑種の雛の一般外貌及び行動はニワトリよりもむしろキジに類似した。

3. 6カ月令で雑種の平均生体重は1,672gに達し、その両親鳥の体重の何れをも凌駕し所謂heterosisの現象が認められた。
4. 羽装の色は可成り違いがあり、白、薄茶、濃茶及び黒が現われた。
5. 嘴及び脚の色も亦可成りの違いがあり、灰白色、石盤色及び石盤色様の黒となった。
6. 雑種の尾羽長はその両親鳥の間であった。
7. 雑種はニワトリの特徴である肉髯や耳朶もなければ又キジの特徴である耳房も無い。しかし約5カ月令に達する頃より全雑種に低いバラ冠が現われて来た。
8. 雑種の性比は雄：雌＝4：2で Haldane rule に一致する。
9. 雑種の蹠爪は形、大きさ、及び位置については両親鳥の蹠爪の夫々の間であった。
10. 雑種の脚の鱗片数は平均14でその両親鳥の間であった。
11. 雑種の性機能の特質は観察出来なかった。

EXPLANATION OF PLATES I-IV

Plate I

Fig. 1. Ringneck pheasant male; about 5 years old.

Fig. 2. A chicken female crossed with the above Ringneck pheasant male; about 2 years old.

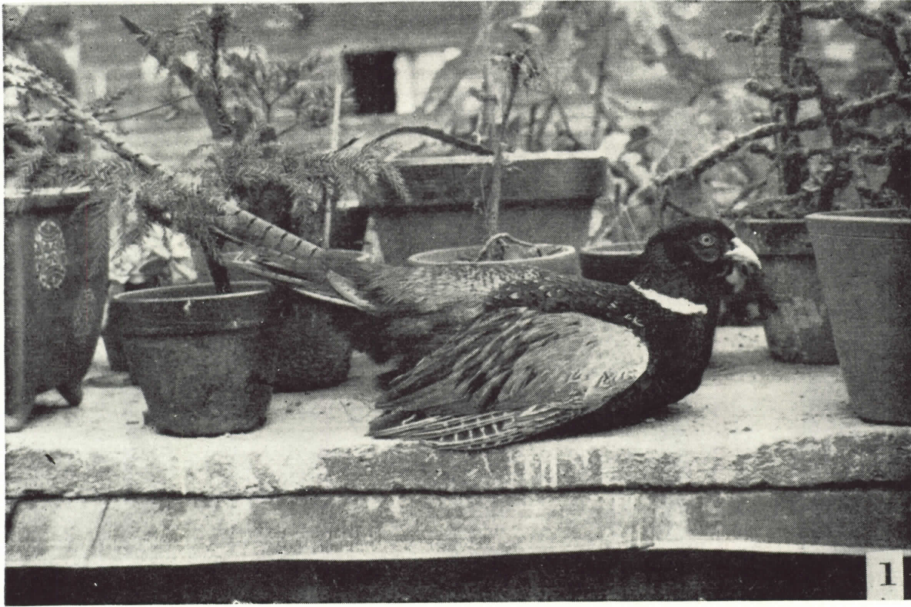


Plate II

- Fig. 3. Six pheasant-chicken hybrids at thirty-six days old.
- Fig. 4. Six pheasant-chicken hybrids at one hundred and ten days old.
- Fig. 5. Six pheasant-chicken hybrids at one hundred and fifty-seven days old. In this time the length of tail feathers of hybrid birds attained to *25cm* on the average and all the hybrids made their appearance of a low rose comb. In male birds, their spurs also began to appear on about the same time.

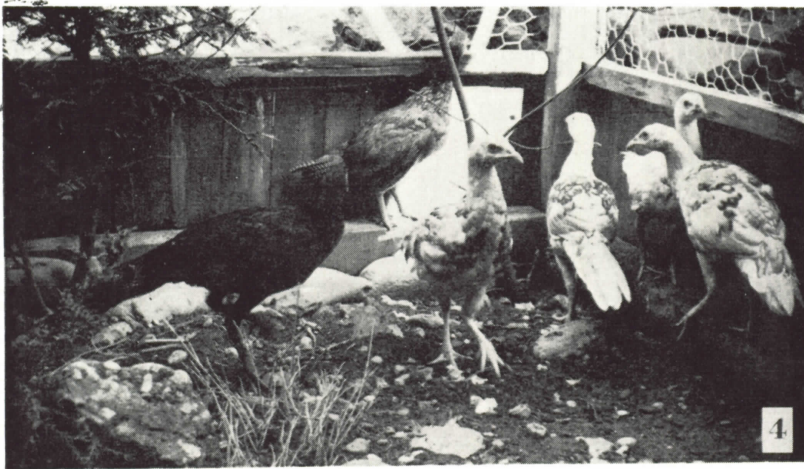
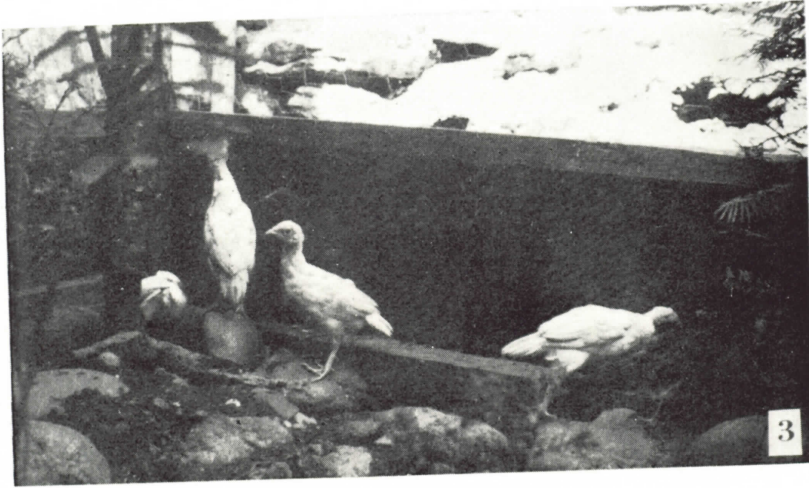


Plate III

- Fig. 6. A stuffed specimen of the hybrid No. 2 which was killed in an accident at 179 days old after hatching.
- Fig. 7. The low rose comb in hybrid No. 6; a front view.
- Fig. 8. The same as Fig. 7; side view.

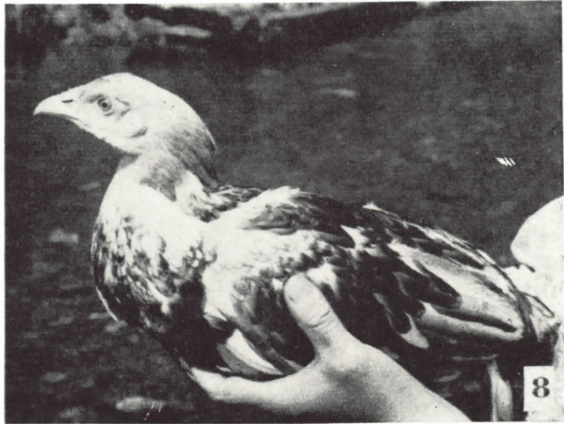
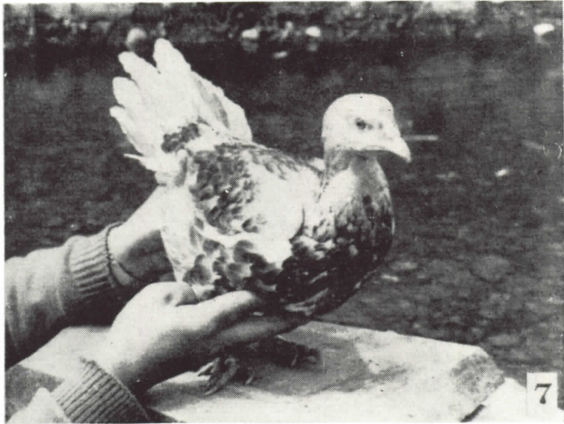
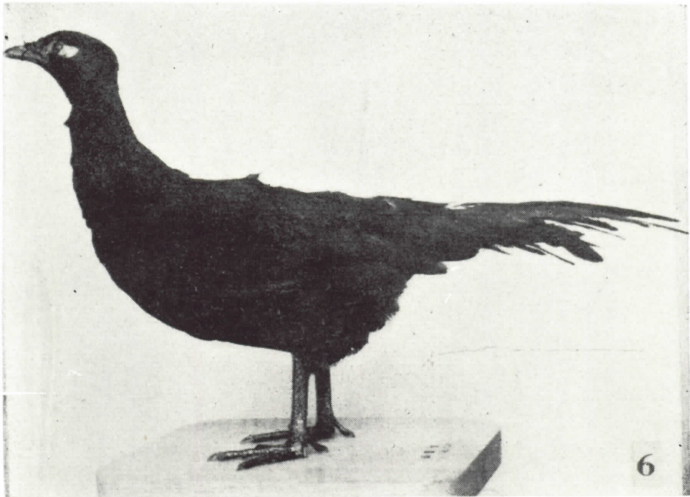


Plate IV

Fig. 9. The tail feather of male hybrid No. 1; it measures 32cm in length.

Fig. 10. The spurs and scales of male hybrid No. 1.

Fig. 11. The spur of male hybrid No. 2; this hybrid bird bear the marks of spurs in his shanks.

Fig. 12. The testes of the male hybrid No. 2.

