J. Fac. Fish. Anim. Husb.
Hiroshima Univ. (1963), **5** (1): 1~49

Three Types of Native Swine in Taiwan and Their Descents[1)]

Jinshin YAMANE[2)]
Professor emeritus, Hiroshima University, Japan
and
John Y. K. CHEN[3)]
College of Agriculture, Chung-King University, Taichung, Taiwan, China.

(Plates 1–8; Text-figs. 1–7; Tables 1–7)

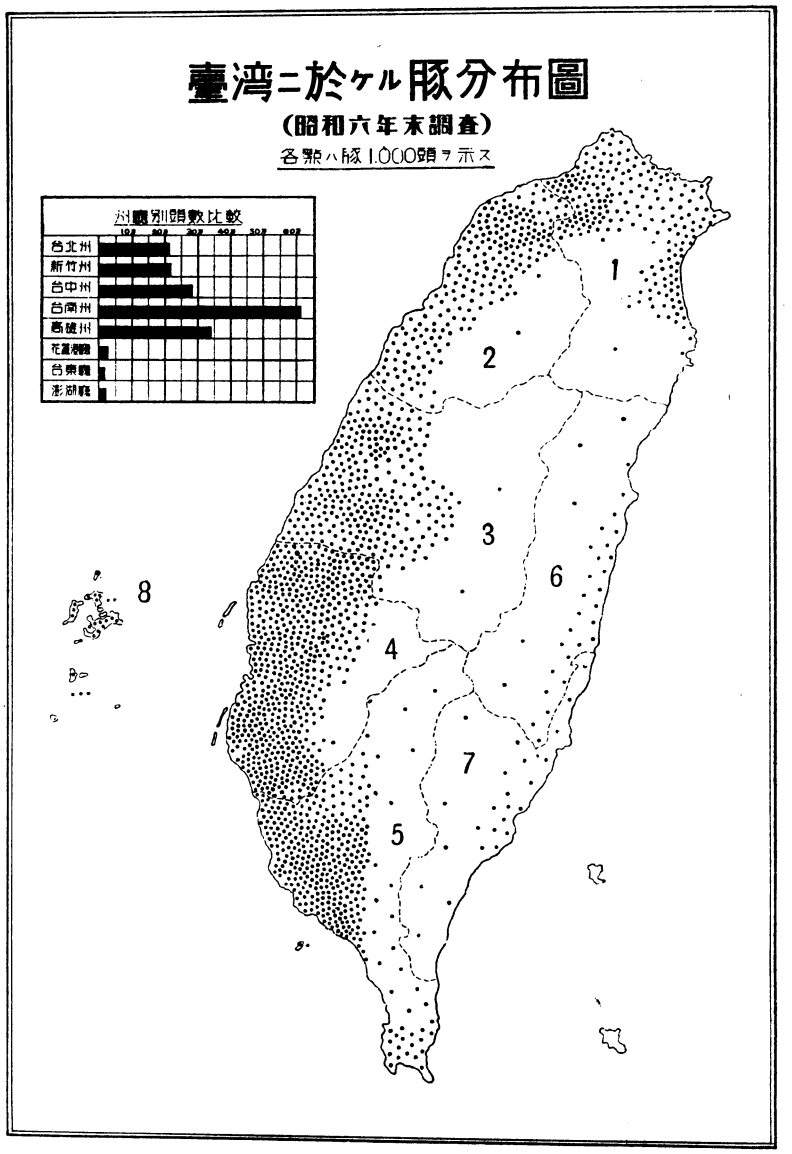
CONTENTS

INTRODUCTION

Swine husbandry plays a great role for the family life in Taiwan, formerly known as Formosa. Pork is indispensable for Taiwanese dishes, and raising pigs brings regardless of seasons a monetary income besides the rice harvest, not to say,

1) The substance of this paper was communicated to the Tenth Pacific Science Congress of the Pacific Science Association held at the University of Hawaii, Honolulu, Hawaii, 1961.
2) Formerly, Professor, Taihoku Imperial University, Taipei, Taiwan.
3) Professor of Chung-King University, formerly, Head, Animal Husbandry Section, Government Agricultural Experiment Station, Taipei, Taiwan.

that pig manure is the best of all available fertilizers in this island. Also, victim hogs should not lack on the altar of Taoism temples at the festival of villages. On these grounds it is the most important subsidiary work of Taiwan farmers to keep one hog or more at home all the year round. Prior to 1940 the population in Taiwan was 5,500,000 and the number of hogs raised there counted 1,800,000 of



Text-fig. 1. Hog population of Taiwan in 1931; each dot represents 1,000 head. The number in the map designates the administrative division during Japanese rule as follows: 1. Taihoku (Taipei); 2. Shinchiku (Hsinchu); 3. Taichu (Taichung); 4. Tainan (Tainan); 5. Takao (Kaohsiung); 6. Karenko (Hualien); 7. Taito (Taitung); 8. Hokoto (Pescadores Islands).

which about one million were yearly slaughtered for local consumption. This means that every 5.5 persons consumed one hog per year, showing a very high demand for meat and fat of the inhabitants of Taiwan comparing with other rice eating people in the Pacific Area. A dot map shown above reveals the dense population of the hog in the agricultural region of the island (Text-fig. 1).

Before 1916 when the Japan's Taiwan Government-General commenced the importation of the Berkshire breed for the development of the swine husbandry, the hogs raised throughout the island were exclusively native races which had quite different characteristics from the Western breeds in every point. While the number of native hogs was estimated at that time to be 330,000 heads, the introduction of the Berkshire blood caused a rapid disappearance of the pure native hogs. Nowadays only a few of them can be found in certain localities, being kept in pure lines either by some conservative farmers or by some Taiwanese aborigines in mountain regions. Owing to lower economical value of the native hogs compared with the Berkshire and its grades, even the surviving native hogs are now on the eve of extinction. It cannot be too much regretted that we should let these native hogs disappear from the earth forever without any scientific investigation, except a few fragmentary notes left by early Japanese veterinarians.

The objectives of this paper are firstly to record the types of native hogs in Taiwan which are now just before the extinction, and secondly to search for their descents which have been veiled quite in obscurity.

OLD AND MODERN TYPES OF NATIVE HOGS IN TAIWAN.

It was in 1908-1909 that the Taiwanese native hogs drew first Japanese veterinarians' attention. ONO (1913) attempted to make a classification of Taiwanese native hogs which has generally been used ever since. ONO's description may be summarized as follows:

1. Small-eared race.[1)]

This type is found in the middle and more southern parts of the island. Body size is very small with a long head; forehead, slightly arched; ears, small, either upright or declining to the side; face, not perceptively dished; neck, slender; back, slightly sunk; legs, long; coat color, solid black; temperament, very active.

2. Ao-Mao race.[2)]

It is found mainly in northern Taiwan and in a limited area of southern Taiwan. Head, long; forehead, flat with some longitudinal skin folds; medium-long ears, directed laterally or a little downwards; body, long with a slightly sinking back; coat, solid black.

3. Toyen race or Lung-Tan-Po race.[3)]

This type is found mainly in northern Taiwan. Head, short with a broad fore-

1) 小耳種 2) 澳卵種 3) 桃園種・竜潭坡種

head; ears, medium-long, drooping; neck, thick; back, broad and sinking; bones, thick but weak; hind legs, liable to direct forward. Skin folds are seen all over the body; the mountain-shaped wrinkles in the face are specially deep; coat, uniformly black.

4. Keelung race or Ting-Shuang-Chi race.[1)]

This race is raised in a limited area of northern Taiwan, especially in the suburb of the Keelung Harbor. Head, short; face, deeply dished; facial skin, transversally wrinkled; ears, very long and drooping which sometimes may be more than a foot; body, long; coat, black; temperament, mild.

According to ORITA (1922) there was another race which was called Mi-Nung Chung[2)] and of the same type with Toyen, only differing in their habitats.

The classification above described, however, had no genetical basis but merely based upon either the exteriors of animals or their habitats.

Since 1916, when the Berkshire breed was first introduced, native hogs have come to give an impression that they are entirely unprofitable animals, and a great part of hog population at present is consisting of the Berkshire and its grades. As a consequence, the Keelung or Ting-shuang-chi race has at present completely disappeared. Hence, nowadays only three types of native hogs are distinguishable, although a great number of intermingled forms are found throughout.

The distinct types remaining existent may be named Middle Black Masked Swine, Small Red Swine and Small Black Swine according to their exteriors. Of these three types, the Middle Black Masked Swine is medium in body size, with a medium height and long body as Asiatic breeds go; the coat color is solid black; skin folds on the face, neck and body are so unique that this type can readily be identified. The Small Black Swine is much smaller in body size than the Masked Swine; it has a smaller head, a compacter body and stronger extremities; coat color is uniformly black; skin folds are very little developed. The Small Red Swine is as small as the Small Black; the most peculiarity to this type is its coat color which is uniformly fawn or red or reddish brown. In many points, the Red Swine appears to occupy an intermediate position between the Middle Black and the Small Black as shown below.

Comparing this classification with that of ONO (1913) above cited, it appears that the Middle Black Masked Swine is identical with the Toyen race and the Small Black Swine is more or less similar to the Small-eared race. As regards the Small Red Swine, it is the type which has entirely escaped early Japanese veterinarian's notice probably because of the extremely out-lying area of its habitat.

THREE DISTINGUISHED TYPES OF NATIVE SWINE REMAINING EXISTENT IN TAIWAN.

I. Middle Black Masked Swine or Toyen Race (Pl. 1, Fig. 1; Pl. 5, Fig. 1–3).

1) 基隆種・頂双溪種　2) 瀰濃種

1) Habitat.

There were two breeding areas of this type: Toyen in Hsin-chu prefecture,[1] and Mi-nung in Kao-hsiung prefecture,[2] northwestern and southwestern part of the island, respectively. In early times the hogs of these two localities were thought to be different races and named "Toyen" and "Mino" by the Japanese, respectively. Certainly they showed some differences in body size, the concave of the face, the length of the ears etc., these being more remarkable in the former race than in the latter. However, in solid black coat color and peculiar wrinkle formation on the face and body, they coincide with one another so perfectly that ORITA (1922) grouped both the types into one and the same race originated from Kwantung province. Also, the long-eared Keelung or Ting-shuang-chi race now entirely disappeared from Taiwan seems to belong to the same race as the Toyen since both the types does not differ in masking of the head except in ear length. In short, the distribution of the Middle Black Masked Swine extended all over the western half of Taiwan, though some variation in external appearance was seen according to their habitats.

The following description of the Toyen race may serve as the type of predominating Taiwanese Masked Swine.

2) General Appearance.

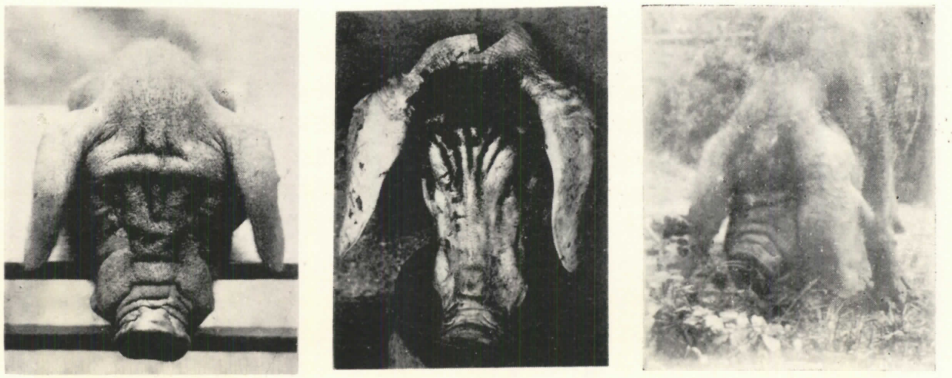
In size the Toyen can be ranked medium among Asiatic hog races; it is medium in height and has a long body. In dosal view the body shows a parallelogram in the proportion of approximately 5: 2. The coat color is solid black; skin folds on the face, neck and body sides are remarkably developed.

3) Characteristics.

The head is very short: the forehead and face are short and broad with a short nose; the face is strikingly dished with the eyes widely apart. Most characteristic to this type is the symmetrically furrowed skin on the face from which the name of "masked swine" was derived in early days. Generally, there are four longitudinal deep furrows in the face: two outer long and two inner short ones. There are also a semilunar or mountain-shaped furrow at the middle of the forehead and a deep transversal furrow over the eyes; the latter seems to embrace the outer longitudinal ones. On the nose three or four transversal furrows are formed. These furrows vary considerably in number as well as in form and depth according to sex, age and individuality. However, the entire physiognomy is quite different from that of the North China pig in which the head is elongated, less dished and less expressive in masked character (Text-fig. 2).

The drooping ears are thick and medium in size; the eyes are small, clear and light brown surrounded by so much fat that they are almost obscure in highly fatten condition. The muzzle is black and remarkably broad with large nostrils; the jowl is not full and firm. The neck is thin and medium in length with several vertical

1) 新竹州桃園庄 2) 高雄州瀰濃庄



Text-fig. 2. Head of Chinese Masked Swine.

Left: Taiwanese Masked Swine or Toyen race, specimen collected at Agricultural Experiment Station, Taipei.

Center: North China Masked Swine or Shantung pig, specimen collected at Tschintau.

Right: Keelung or Ting-shuang-chi race, picture presented by Mr. K. SADOWARA.

skin folds, giving a flabby appearance; it does not fit smoothly back into the shoulders. The shoulders are rough in quality; especially the old boar shows notable thickness and hardness of the skin of these parts, forming the so-called "shield". The back and loin are medium long and fairly broad in comparison with the other two types of the native hogs. The top-line is markedly concave, the deepest portion being situated at the fourth and fifth dorsal vertebrae. Such a sinking back is specially conspicuous in the brooding or too early mated sow whereas the newly born pig shows rather a straight top-line. The breast and chest are narrow; the ribs are not well sprung; the flanks are neither thick nor full; the whole features indicate a flat-sided conformation in comparison with the Berkshire. The barrel is so big and hanging so low that sometimes it almost touches the ground on which the hog stands. The hips are prominent and thinly covered with flesh. The rump is not thick, covered with wrinkled skin and exceedingly drooping. The hams are thinly fleshed with little roundness. The legs, both front and hind, are very short and thick but knees, hocks and pasterns are not strong enough to sustain the whole body weight. As the consequence, the hind legs are not carried straight down, but directed more or less forward; very often hocks are remarkably broken; the toes, too, are much spread and bent; the dewclaws, low down. This is specially the case with the pigs when they are raised on the concrete floor in the pen. The legs show also marked transversal skin folds. The tail is short, not curled but hanging, and furnished with little tuft at its tip. The skin is black or grey in color, very thick and deeply folded almost all over the body except the shoulders and hams. Hairs are black, remarkably short, rather soft and very thinly distributed. The bristles at the withers and back also are black, short and thin. Six pairs of well-developed teats are common. The temperament of the Toyen is very quiet and they are slow in movements.

At the twelfth month of age, sows weigh 85 *kg*, boars 100 *kg*, and barrows

140 *kg* on the average. The Toyen is the easiest feeder among Taiwanese native hogs. As a matter of fact, the race grew much in favor in the past when the Berkshire blood was not yet popularized, especially the barrow was highly appreciated as victim made on the altar. Since the largest possible live weight was demanded for the victim, fattening of pigs were flourished from old times among the pious farmers. In consequence, the Toyen underwent fairly strict artificial selection in respect to its fattening qualities (Text-fig. 3).

Text-fig. 3. A crossbred barrow between a Toyen sow and a Berkshire boar; the barrow was offered to the altar of a village of Hsinchu prefecture in 1932 after forcible fattening. At the age of 22 months, it gained 532 *kg* live weight and measured 180 *cm* in the length of top-line and 222 *cm* in the circumference of the chest (Original picture of J. YAMANE).

The Toyen belongs to the lard type, both outside and internal fat being rich in comparison with lean meat. The dressing percentage is 72.6 on the average.

Physical properties of body fat of the Toyen determined by the senior author in 1935 at the Agricultural Experiment Station, Taipei, are summarized as follows:

	Subcutaneous fat	Fat surrounding kidneys
Specific gravity at 20°C	0. 923–0. 925	0. 924–0. 928
Melting point	46. 0–48. 8	49. 5–50. 0
Solidifying point	28. 3–29. 0	31. 4–32. 2

The breeding qualities of the Toyen rank very high; it may be regarded as most prolific among the Taiwanese hogs. It breeds twice a year, producing 9 pigs

per litter on the average at normal feeding.[1] Litter size of 15 pigs is not at all uncommon although they are badly nursed; a litter of 23 pigs has been recorded.

During Japanese regime, and still now, the most attractive type of the hog to Taiwan farmers is the product of crossing of the Black Masked sow with the Berkshire boar, showing solid black coat color and non-wrinkled skins, and more early maturing qualities than the Masked Swine, and greater prolificacy than the Berkshire; such an improved type could be obtained through gradual selection of "back-crossed" offspring at the Agricultural Experiment Station, Taipei, and also by some eager pig-breeders.[2]

II. Small Red Swine (Pl. 1, Fig. 2; Pl. 6, Fig. 1, 2).

1) Habitat.

The distribution of the Small Red Swine is exceedingly limited to a certain area of the mountain region where the Taiwanese aborigines are settling down, namely, Wuh-sheh[3] in Taichung prefecture and some villages in Hualien prefecture;[4] hence, its number is very small. This is the reason why this type of native hogs remained unnoticed until about 1925. A boar and some sows had been bred at the Agricultural Experiment Station, Taipei, ever since, and subjected to observations; they were found to breed true.

2) General appearance.

In size, the Red Swine is smaller than the Toyen. The coat color varies from fawn to red or reddish brown. Wrinkle formation of the skin is not so conspicuous as Toyen.

3) Characteristics.

The head is fairly short; the forehead and face are slightly dished with a short nose; they are more or less masked though the skin furrows are not so deep as seen in Toyen. The upright or laterally directed ears are thick and short; the muzzle is of flesh color. The neck is short and thick. The body shows a flat-sided conformation though the shoulders, rumps and hams are moderately developed; the concave of the top-line of the sow is not so remarkable as in Toyen. The legs are short and strong; the tail is short and hanging. The skin is of flesh color and very thick; it shows on the neck and chest marked wrinkles, though not so conspicuous as in Toyen. Hairs are short and fawn or red or reddish brown. Most peculiar to the

1) On examining the breeding records at the Agricultural Experiment Station, Taipei, MAKITA (1943, p. 9.) reports the litter size of the Toyen to be 9.11 ± 0.36 in contrast to 6.80 ± 0.05 in the Berkshire.

2) There is a record of victim hog, Hsi-sheng Twen 犧牲豚, offered to the temple I-min Miaw 義民廟 at the village of Hsin-pu chuang fan-liao 新埔庄坊寮, Hsin-chu prefecture 新竹州, which gained 600 kg live weight (a semi-official report of the Bureau of Industries, Government-General, Taiwan, 1930).

3) 霧社

4) 花蓮港

boar are the heavy and thick bristles grown on the top-line running from the forehead to the middle part of the back; the bristles are red or brown on the basal and yellowish on the apical half.

The Red Swine is not so nervous as Small Black, but more active in temperament than Toyen. As regards the live weight twelve months old sows weigh 60 *kg* and boar 70 *kg* on the average. In feeding and pork qualities this hog does not differ notably from the Small Black; its great adaptability to the mountain region together with its special coat color seems to have caused the popularization of this type among the mountain tribes. The Small Red also breeds twice a year but the size of litter is very small, it commonly being 5 pigs. This is probably due to the inbreeding owing to the limited area where the Red Swine is kept.

III. Small Black Swine (Pl. 1, Fig. 3; Pl. 6, Fig. 3, 4)

1) Habitat.

This type of native hogs is mainly found in the southwestern part of the island, specially predominating in the less fertile mountain region of Taichung and Tainan prefecture.

2) General Appearance.

The Small Black is much smaller in body size than the Toyen, it has a long "unmasked" head, a compact body and strong extremities. Coat color is uniformly black; skin folds on the sides are very little developed and in the face almost none.

3) Characteristics.

The head is long and slender; its profile shows no concavity; it has smooth skin. The face is longer than the forehead and furnished with a strong snout. The ears are very small and mostly held erect but sometimes laterally. The neck is short and strong; the shoulders are strongly developed; the back is rather narrow and slightly sinking; the barrel does not hang so low as that of Toyen; the loins and hams are compactly formed; legs are rather long but very strong; the tail is medium long and not curled. The color of skin is more deep black than in Toyen. Unlikely to the latter, skin folds are seen only on the chest in a less degree. The hairs also are black and grown more densely than in Toyen. In the boar, the long and thick bristles grow on the top-line running from the poll to the middle part of the back.

The Small Black has a fiery temperament; it is very active in movement and less docile than the above two types.

One-year old sows weigh 50 *kg* and boars 60 *kg* on the average. The hogs of this type has fairly good feeding qualities; outdoors, they take the feeds for themselves in favor of their active temperament. Compared with the Toyen, the Small Black produces relatively much lean meat although it can hardly be regarded as pork type. It breeds also twice a year but it is not prolific, the size of litter being only 5 on the average. According to MAKITA (1944) the breeding record of the

Agricultural Experiment Station at Taipei has shown the mean of litter size to be 4.95 ± 0.346.[1] This may be attributed to the less fertility of the soil and the inbreeding in the small area where this type is raised.

CRANIOLOGICAL CHARACTERISTICS OF THREE TYPES OF TAIWANESE NATIVE SWINE.

For the craniometrical investigation, forty specimens of swine skulls were used, consisting of 6 Toyen hogs (4♀+2♂), 3 Small Black hogs (2♀+1♂), 3 Small Red hogs (1♀+2♂), 1 North-China hog from Shantung province (♂), 4 Taiwanese wild pigs (2♀+2♂), 2 Vittatus-swine (2♀), and 11 Berkshires (6♀+5♂). All these specimens were collected by the senior author and preserved at the Zootechnical Institute, formerly named The Taihoku Imperial University at Taipei, now renamed The National Taiwan University.

As regards the points of measurement, 18 dimensions were chosen from those adopted by NEHRING (1888/9), namely 5 lengths, 4 breadths and 2 heights of the cranium, 4 dimensions of the mandible, and 3 dimensions of the lacrimal bone. Terminology was used according to SISSON's "The Anatomy of the Domestic Animals", 3rd ed., 1948.

The explanation of dimensions of the skull subjected to the measurements are given below.

I. Points of Measurement for the Comparative Craniological Investigation.

1. Basal length: Linear distance from the under margin of the foramen magnum to the anterior end of the premaxilla.
2. Profile length: Linear distance from the middle point of the occipital ridge to the anterior end of the premaxilla.
3. Parieto-frontal length: Median length of the parietal and frontal bones in joining.
4. Nasal length: Greatest length of the nasal bone.
5. Occiputo-palatine length: Linear distance from the under margin of the foramen magnum to the incisura of the palatine bones.
6. Occipital breadth: Largest distance between the wings of the occipital bones.
7. Frontal breadth: Largest distance between both the supraorbital processes.
8. Cranial breadth: Greatest width of the cranium at the zygomatic arch.
9. Palatine breadth: Distance between the lingual surfaces of the third premolars (numerated from the molars).
10. Cranial height: Height of the whole skull including the mandible.
11. Occipital height: Height of the occipital bone from the under margin of the foramen magnum.
12. Mandibular length: Linear distance from the anterior end of the premaxilla

1) Referred from the "Hand-Book for Taiwan Farmers" (台湾農家便覧), 6th. ed. p. 1396. 1944.

to the posterior end of the condyle.

13. Length of the ramus: Linear distance from the anterior end of the premaxilla to the posterior end of the third under-molar.
14. Mandibular breadth: Largest distance at the condyle.
15. Length of the mandibular symphisis: Greatest length of the symphisis.
16. Height of the lacrimal bone at the orbital border: The same as the measure 20. in the Table 1 and 2 of NEHRING (1888/9).
17. Length of the under border of the lacrimal bone: The same as the measure 22. of NEHRING.
18. Length of the upper border of the lacrimal bone: The same as the measure 23. of NEHRING.

II. Craniological Differences among the Three Types of Taiwanese Native Swine.

In side-view of the swine skull including the mandible, its outline represents approximately a triangle which is formed by three median lines, i.e. parieto-nasal line, occiputo-mandibular line and underline of the mandible. This triangle, however, varies in form greatly according to the swine races (STAFFE 1922, p. 57). In the Taiwanese native hogs, too, there is a marked difference among the above described three types (Pl. 2, 3, 4).

The outline of the skull in side-view of the Toyen type shows a right-angled triangle, in which the occiputo-mandibular line meets the underline of mandible almost at a right angle. In the Small Black Swine, on the contrary, this angle is markedly obtuse, resulting naturally an acute angle between the parieto-nasal plane and the occipital plane. The Red Swine occupies in this respect an intermediate position between the Toyen and the Small Black, although it appears a little closer to the former than to the latter. The same relation is seen in the profile or parieto-nasal line, too; while the line is straight in the Small Black, it is markedly concave in the Toyen and intermediately concaved in the Red Swine. These cranial characteristics of the types can be shown more clearly by actual measurements.

Inspection of the basal lengths in Table 1 shows that, aside from the individual variation as well as sexual difference, there is a distinct difference in size of the skull among the three types i.e. in the order of Toyen, Red Swine and Small Black. By eliminating absolute size difference, viz., by computing every dimension in relative value reduced to each basal length = 100, several marked differences in dimensions can be found among the skulls of the three types.

On examining the relative values in Table 1, the most conspicuous fact is that the profile length is smallest in the Toyen and largest in the Small Black, whereas the Red Swine shows an intermediate length between the both. In comparing the parieto-frontal length with the nasal length, it reveals further, that this shortening of the profile length in Toyen and Red Swine is mainly caused by the reduction of the nasal length, while the parieto-frontal length seems to undergo little change. The relative occiputo-palatine length also suggests its little change.

Table 2 in which the ratios of nasal length to parieto-frontal are calculated,

Table 1. Relative values of skull dimensions reduced to its basal length (=100) in three types of Taiwanese native hogs.

Skulls / Dimensions	Types	Masked Swine or Toyen								Small Red				Small Black			
	No.	1	2	3	4	Aver-age	1	2	Aver-age	1	1	2	Aver-age	1	2	Aver-age	1
	Sex	♀	♀	♀	♀	♀	♂	♂	♂	♀	♂	♂	♂	♀	♀	♀	♂
	Age (Year)	2	3	3	3		$3\frac{1}{2}$	$3\frac{1}{2}$		$5\frac{1}{2}$	3	6	1	8	2		2
1. Basal length *mm*=100		208.0	249.0	260.0	242.0	239.8	289.0	300.0	294.5	242.0	266.0	282.0	274.0	237.0	208.0	222.5	231.0
2. Profile length %		105.8	101.6	102.3	106.6	104.3	103.8	111.3	107.5	107.4	104.9	111.7	108.3	105.9	114.4	110.1	110.8
3. Parieto-frontal length %		46.6	47.0	49.2	50.0	48.2	45.7	54.3	50.0	50.0	47.7	—	—	46.4	53.4	49.7	48.9
4. Nasal length %		47.1	41.8	42.3	44.2	43.7	43.3	49.0	46.1	47.5	48.1	—	—	54.4	52.9	53.6	52.4
5. Occiputo-palatine length %		20.6	19.3	21.2	19.8	20.3	20.1	20.7	20.5	17.8	17.7	17.7	17.7	18.1	20.7	19.3	19.0
6. Occipital breadth %		28.4	31.3	30.0	32.6	30.5	32.2	31.0	31.6	30.6	28.4	34.0	31.2	29.1	26.4	27.8	29.4
7. Frontal breadth %		44.2	44.2	45.0	47.5	45.2	48.4	45.7	47.5	44.6	41.7	48.2	44.9	43.0	38.5	40.6	38.5
8. Cranial breadth %		63.5	65.5	62.3	69.8	65.0	68.2	67.7	67.8	60.7	60.5	66.0	63.2	57.4	54.3	55.8	53.3
9. Palatine breadth %		20.2	21.3	21.2	22.7	21.2	21.1	20.7	20.9	19.8	19.2	21.3	20.2	—	17.3	17.5	18.2
10. Cranial height %		78.8	77.1	80.8	83.1	80.0	83.0	83.3	83.1	74.4	82.3	77.3	79.8	73.8	77.9	75.8	73.6
11. Occipital height %		43.8	41.0	42.3	41.3	42.0	44.6	43.3	43.9	41.7	42.5	45.4	43.9	41.4	39.4	40.4	39.4
12. Mandibular length %		96.6	96.8	93.8	105.8	98.5	99.0	106.3	102.6	92.6	93.2	108.2	100.5	95.4	90.0	92.7	88.7
13. Length of ramus %		58.9	64.3	64.2	73.3	65.0	62.3	69.0	65.6	62.0	66.9	73.4	70.5	62.5	—	62.5	56.3
14. Mandibular breadth %		57.7	57.4	56.9	62.8	58.7	61.3	60.3	60.7	54.1	51.1	59.6	55.5	55.3	51.0	53.1	50.7
15. Length of mandibular symphisis %		28.4	28.9	31.2	37.0	31.2	36.3	36.7	36.5	30.6	29.7	31.2	30.4	30.4	22.1	26.2	23.8

shows clearly the differences of the nasal length among the three types; it is shortest in Toyen, longest in Small Black, and Small Red lies between the other two.

Table 2. Ratios between the relative parieto-frontal length and the relative nasal length (derived from Table 1).

Relative Values	Toyen		Red Swine		Small Black	
	♀ Average	♂ Average	♀ No. 1	♂ No. 1	♀ Average	♂ No. 1
A. Prieto-frontal length	48.2	50.0	50.0	47.7	49.7	48.9
B. Nasal length	43.7	46.1	47.5	48.1	53.6	52.4
Ratio *B/A*	0.91	0.92	0.95	1.01	1.08	1.07

The cranial breadth or width at the zygomatic arch, is greater in the order of Toyen, Red Swine and Small Black. Also, the breadth of other parts of the cranium follows the same order. The cranial height as well as the occipital height is greater again in the order of Toyen, Red Swine and Small Black.

The relative lengths of the mandible are clearly greater in the order of Toyen, Red Swine and Small Black in every respect. This shows unequal longitudinal growth of cranial bones and mandible in Toyen and, though slightly, in Red Swine. On the contrary, the rami diverge more strongly in Toyen than in Red Swine and Small Black whereas no clear-cut difference between the latter two is perceivable.

As regards the form of the lacrimal bone, which was used by numerous authors for studying the origin of domestic swine races, it is hardly possible to get exact measures because of uneven surface of the bone, specially in Toyen. The results so far obtained, however, show that the lacrimal bone in all the three types is exceedingly high and short in comparison with those of North China hog (Shantung hog) and Berkshire, and more remarkably with those of the Asiatic wild swine, *S. vittatus* and *S. taivanus*. Among the three types under consideration the Toyen shows the smallest index (length of under border reduced to height at the orbit=1), whereas in the other two, the indices are almost indistinguishable (Table 3).

All the data above mentioned show, therefore, that as far as Taiwanese native hogs concern, the Toyen is decidedly brachycephalic and the Small Black, longicephalic, while the Red Swine occupies an intermediate position between the other two.

III. Craniological Comparison of the Three Types of Taiwanese Swine with Allied Domestic and Wild Swine.

The relationship of the three Taiwanese native hogs to the allied domestic and wild hogs were craniometrically investigated, although the specimens available for this purpose were not enough to eliminate the individual variation. As allied domestic hogs the Berkshire and the Shantung hog were here considered provided that these are the representatives of the European breeds related to Chinese hog and of

Table 3. Heights and lengths of the lacrimal bone of Taiwanese native hogs and allied swine races.

Sex & No.	Age (years)	*A.* Height at the Orbital Border in *mm*	*B.* Length of the Under Border in *mm*	*C.* Length of the Upper Border in *mm*	Index *B*/*A*
Toyen					
♀ 1	2	30	11	33	0.36
♀ 2	3	33	13	31	0.39
♀ 3	〃	33	15	31	0.45
♀ 4	〃	34	12	30	0.35
♂ 1	3½	38	13	35	0.34
♂ 2	〃	40	22	34	0.55
Red Swine					
♀ 1	5½	26	14	25	0.53
♂ 1	3	26	17	33	0.65
Small Black					
♀ 1	8	25	15	25	0.60
♂ 1	2	22	13	21	0.59
Berkshire					
♀ 3	7	23	19	41	0.82
♀ 5	2	22	17	35	0.77
♀ 6	*	23	19	37	0.82
♂ 3	6	24	27	48	1.12
Shantung hog					
♂	*	27	21	35	0.77
Sus vittatus					
♀ 1	*	24	25	40	1.04
Sus taivanus					
♀ 1	*	20	14	20	0.70
♀ 2	*	21	17	21	0.80
♂ 1	*	26	25	35	0.96
♂ 2	*	25	27	41	1.08

* Age is not available for these skull specimens but none of them is juvenile.

the North China race, respectively. Consideration of both the wild species, *Sus taivanus* and *Sus vittatus* was based upon the assumption that these might be more or less related to the Taiwanese hogs.

a. Toyen *versus* Berkshire.

In relative lengths the skull of the Toyen is a little greater than that of the Berkshire but both in breadths and heights smaller; the index of the lacrimal bone

Table 4. Relative values of skull dimensions reduced to its basal length (=100) in the Berkshire bred in Taiwan.

Dimensions \ Skulls	Type	Berkshire												
	No.	1	2	3	4	5	6	Average	1	2	3	4	5	Average
	Sex	♀	♀	♀	♀	♀	♀	♀	♂	♂	♂	♂	♂	♂
	Age (Year)	4	6	7	6	2	?		4	6	6	$4\frac{1}{2}$	$4\frac{1}{2}$	
1. Basal length mm=100		236.0	277.0	298.0	249.0	246.0	242.0	258.0	266.0	256.0	262.0	288.0	287.0	271.8
2. Profile length %		90.7	97.5	92.3	98.8	95.9	99.6	95.8	108.7	107.4	105.7	105.9	110.5	108.2
3. Parieto-frontal length %		40.7	45.5	35.9	42.9	43.1	46.3	42.3	50.0	51.6	50.8	51.0	64.1	53.6
4. Nasal length %		38.6	42.6	45.6	46.9	39.8	42.9	43.0	47.0	47.0	44.3	45.1	45.0	45.6
5. Occiputo-palatine length %		22.0	17.3	19.1	18.1	19.1	22.7	19.7	18.8	21.9	21.0	19.1	18.1	19.8
6. Occipital breadth %		39.4	30.3	32.9	32.5	32.9	31.8	33.5	30.8	32.0	32.8	31.6	34.8	32.6
7. Frontal breadth %		53.4	43.7	37.3	46.9	47.2	52.5	46.7	50.0	54.7	51.9	50.4	54.0	50.4
8. Cranial breadth %		78.8	63.2	59.7	67.1	69.9	73.6	68.8	72.2	77.7	76.3	73.3	76.0	75.0
9. Palatine breadth %		26.3	22.4	20.1	22.1	22.4	21.5	22.1	21.4	26.9	24.8	25.4	25.1	24.6
10. Cranial height %		101.7	80.5	80.5	81.1	84.2	90.9	86.6	93.2	103.5	94.3	93.1	97.9	96.4
11. Occipital height %		55.5	43.7	41.9	48.9	46.8	52.5	48.3	54.5	55.1	54.2	53.1	53.3	54.0
12. Mandibular length %		112.3	96.4	99.3	102.0	105.7	102.9	103.0	105.6	113.7	108.8	114.2	111.5	111.0
13. Length of ramus %		76.3	66.4	70.1	66.7	69.9	71.9	70.1	70.7	78.1	73.7	75.0	72.5	74.0
14. Mandibular breadth %		74.2	—	—	58.6	62.2	64.0	64.7	63.2	66.4	64.9	62.9	64.8	64.4
15. Length of mandibular symphisis %		38.1	33.6	30.9	30.1	30.1	35.9	33.1	36.8	43.7	42.0	40.6	42.9	41.4

Table 5. Relative values of skull dimensions reduced to its basal length (=100) Shantung hog, *Sus taivanus* and *Sus vittatus*.

Skulls / Dimensions	Types	Shantung hog	*Sus taivanus*						*Sus vittatus*		
	No.		1	2	Average	1	2	Average	1	2	Average
	Sex	♂	♀	♀	♀	♂	♂	♂	♀	♀	♀
	Age (Year)	*	*	*		*	*		*	*	
1. Basal length *mm*=100		290.0	208.0	209.0	208.5	278.0	274.0	276.0	278.0	287.0	282.5
2. Profile length %		113.4	115.4	115.3	115.3	113.0	113.9	113.4	118.7	117.8	118.3
3. Parieto-frontal length %		52.1	56.3	56.9	56.6	50.4	54.7	52.5	60.4	60.3	60.3
4. Nasal length %		49.7	51.1	52.2	51.6	55.0	53.7	54.3	51.1	51.6	51.3
5. Occiputo-palatine length %		17.6	17.3	18.2	17.7	15.8	15.7	15.8	15.8	15.7	15.7
6. Occipital breadth %		29.7	22.1	21.5	21.8	25.5	27.4	26.4	23.7	21.6	22.6
7. Frontal breadth %		43.1	35.1	35.4	35.2	34.5	35.4	34.9	34.7	32.1	33.4
8. Cranial breadth %		55.5	47.6	47.4	47.5	49.3	50.4	49.8	47.1	46.7	46.9
9. Palatine breadth %		18.6	13.0	13.9	13.4	13.3	14.6	13.9	12.4	12.5	12.5
10. Cranial height %		65.5	63.5	63.6	63.6	64.8	66.8	65.8	66.2	66.2	66.2
11. Occipital height %		40.0	35.6	35.9	35.7	39.6	37.2	38.4	42.0	34.2	38.1
12. Mandibular length %		93.1	84.1	86.6	85.3	88.9	88.3	88.6	87.4	89.2	88.0
13. Length of ramus %		55.5	—	—	—	58.6	59.5	59.0	59.4	56.8	58.1
14. Mandibular breadth %		48.3	43.3	43.1	43.2	43.2	44.5	43.8	39.9	39.4	39.6
15. Length of mandibular symphisis %		31.0	21.0	22.0	21.5	20.5	20.1	20.3	21.9	20.9	21.4

* Age is not available for these skull specimens but none of them is juvenile.

is almost one half of Berkshire's (Table 1, 3, 4). All the relative dimensions of the mandible in the former is decidedly smaller than in the latter, indicating less development of the under-jaw. Nevertheless, among the three types of Taiwanese native hogs the Toyen most resembles the Berkshire in skull form, so to speak, it is the most "cultured" type (Pl. 2, 3).

b. Toyen *versus* Shantung hog.

In relative lengths the skull of Toyen is smaller than that of Shantung hog except the occiputo-palatine length. This indicates the less degree of concavity of the profile in Shantung hog (Table 1, 3, 5; Pl. 3). The index of the lacrimal bone of Shantung hog surpasses exceedingly that of Toyen. All other relative dimensions here considered are smaller in Toyen than in Shantung hog.

c. Red Swine *versus* Shantung hog.

As a whole, Red Swine is more brachycephalic than Shantung hog, showing smaller lengths and greater breadths of the cranium in relative values and smaller index of lacrimal (Table 1, 3, 5; Pl. 2, 3).

d. Red Swine *versus* Sus taivanus.

Shortening and expansion of the skull of Red Swine is more prominent than in the previous case (Table 1, 3, 5; Pl. 2, 4).

e. Small Black *versus* Sus taivanus.

Generally speaking, in relative dimensions of the skull the Small Black most resembles the wild pig indigenous to Taiwan which has a straight profile. However, in the form of lacrimal bone a marked difference is seen, its index being much smaller in the former than in the latter (Table 1, 3, 5; Pl. 2, 4).

f. Sus taivanus *versus* Sus vittatus.

In comparing the sows' skulls of both the wild species, *S. taivanus* shows smaller value of absolute basal length than *S. vittatus*. From relative values of other dimensions as well as in the form of lacrimal bone, it may be said that *S. taivanus* is more brachycephalic than *S. vittatus*, though slightly (Table 5; Pl. 4). It follows therefore, that craniologically the Small Black more resembles *S. taivanus* than *S. vittatus*.

GENETICAL DATA OBTAINED FROM THE CROSSBREEDING BETWEEN TAIWANESE NATIVE SOWS AND BERKSHIRE BOARS.

As HILZHEIMER (1926, p. 213) has already pointed out, the reliability of the conclusion induced from the craniometric data is certainly limited. In this respect, the following genetical data obtained from the crossing of Taiwanese native sows with Berkshire boars seem to be of significant value. The crossbreeding was carried out at the Agricultural Experiment Station at Taipei from 1931 to 1938, although

the gene analysis was not the main object of it.

I. Coat Color.

The results of crossing of Toyen sows with Berkshire boars are summarized in Table 6.

Table 6. Inheritance of coat color in the crossing between Black Masked Swine (Toyen) and Berkshire.

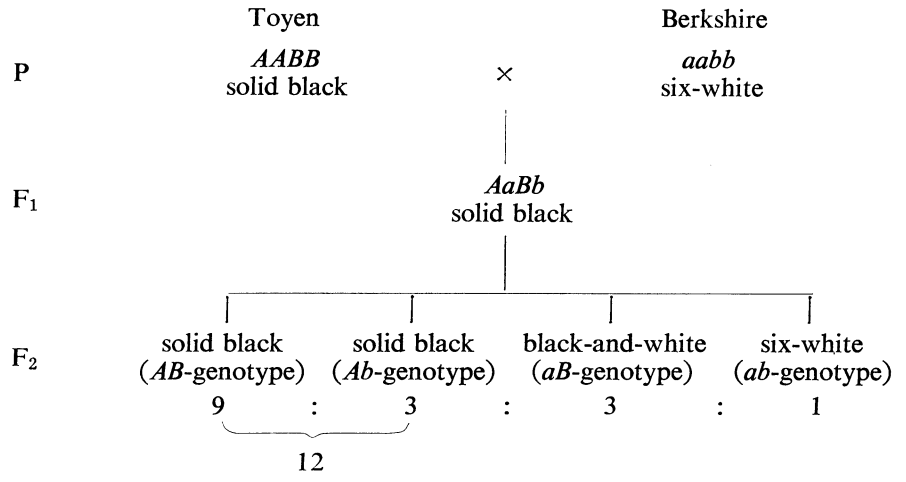
Mating	Combination of color	Number of litters	Number of pigs	Solid black	Black-and-white	Six-white
Toyen ♀ × Toyen ♂	black × black	21	160	160	—	—
Berkshire ♀ × Berkshire ♂	six-white × six-white	220	1,441	—	—	1,441
Toyen ♀ × Berkshire ♂ (=F_1)	black × six-white	5	50	50	—	—
F_2	black × black	5	49	37	11	1
F_1 ♀ × Berkshire ♂ (=FR_1)	black × six-white	5	64	31	16	17

As shown in the table, all the individuals of both the parent races are homozygous, the Toyen being solid black and the Berkshire, black with six-white points. In the F_1 all the individuals are solid black; this reveals solid black to be completely dominant over six-white. In the F_2 there occurred three kinds of coat color, solid black, black-and-white, and six-white. If an arbitrary classification of the black-and-white individuals into one group can be made, apart from the fact that the black-and-white varied considerably in the pigmented area of the skin, the ratios of three coat colors are 37 solid black, 11 black-and-white, and 1 six-white. This suggests a modified two-gene ratio as shown bellow:

	Solid black		Black-and-white		Six-white
Theoretical ratio	$\underbrace{9:3}_{12}$	:	3	:	1
Experimental number	37	:	11	:	1
Theoretical number	36	:	12	:	4

Further, in back-crossing with Berkshire, it resulted 31 solid black, 16 black-and-white, and 17 six-white; this accords with the theoretical ratio of 2 solid black: 1 black-and-white: 1 six-white.

From these data the tentative explanation will be as follows: *A* is the gene for producing solid black in Toyen and its recessive allele *a* is present in Berkshire showing six-white. Another color gene, *B* produces partially the black pigments in certain skin areas; *B* is present in Toyen and its allele *b* in Berkshire. Gene *A* is epistatic to gene *B*. Then the crossing Toyen × Berkshire should result according to the following scheme.



In back-crossing with Berkshire i.e. *AaBb* × *aabb*, it should produce:

solid black (*AB*-and *Ab*-genotype)		black-and-white (*aB*-genotype)		six-white (*ab*-genotype)
2	:	1	:	1

These findings are in full accordance with the results obtained by TOKUNAGA (1937) at The Agricultural Experiment Station of the South Manchuria Railway Company at Kungchuling, where an extensive breeding experiments had been conducted between the Manchuria black hog and the Berkshire. Certainly there must be more supplementary genes which modify the color pattern but the present data are too meager for further analysis of genes.

As regards the Red Swine, the number of pigs secured is likewise too small to attempt the gene analysis. However, as is clearly noticed in Table 7, red is recessive to black, because all the F_1 appeared in solid black and the mating of red *inter se* produced red only.

Table 7. Inheritance of coat color in the crossing between Red Swine and Berkshire.

Mating	Combination of color	Number of litters	Number of pigs	Solid black	Solid red
Red Swine ♀ × Red Swine ♂	red × red	6	32	0	32
Red Swine ♀ × Berkshire ♂	red × six-white	3	17	17	0
F_1 ♀ × Berkshire ♂ (Back-cross)	solid black × six-white	1	9	9	0
Back-cross ♀ × Red Swine ♂	solid black × red	1	2	0	2

Red race of hogs is not at all rare among Western breeds. Also, the results of crossing between Berkshire and some red breeds have already been reported. According to RICE (1934), the mating of Berkshire with Tammworth or Duroc Jersey

produces red with black spots. Present data, however, show that the F_1 between Berkshire and Taiwanese Red Swine are all red and the FR_1 are either solid black or solid red. This seems to indicate that the red color of Taiwanese Red Swine genotypically differs from that of the Western breeds in involving a dominant extension factor.

II. Masked Character.

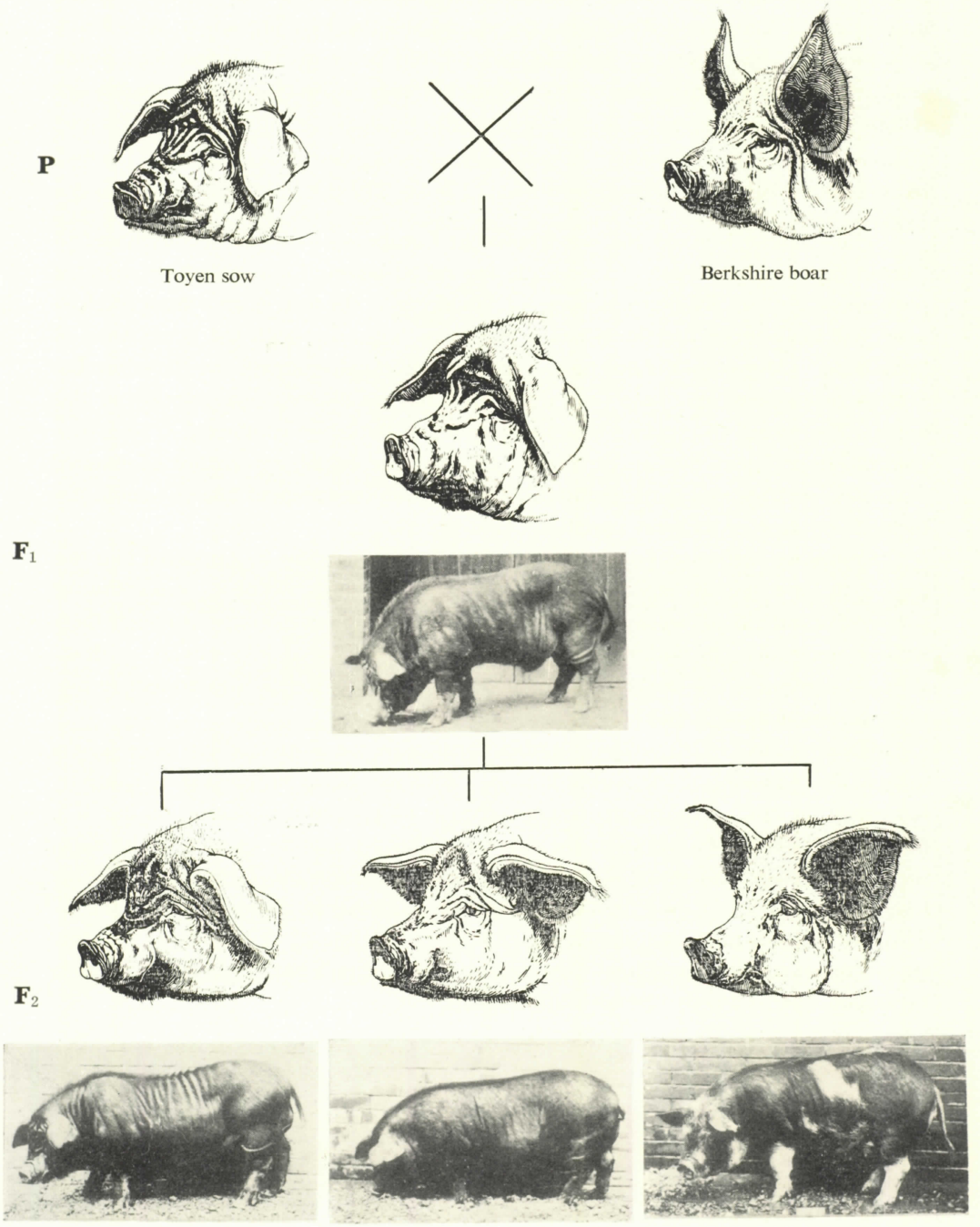
The Chinese Masked Pig was known to Europe with the erroneous name of "Japan pig" since the time of Linne. It was raised merely for show rather than for pork because of its peculiar character of "masking". In fact, such a masked character has never been met in Western breeds of hogs, although the occurrence of "pug-head" (Mopskopf) is not rare. As craniometrically shown, the Berkshire has a more pronounced pug-head than the Toyen but no masked face appears in this breed. The results of crossing between Toyen and Berkshire conducted at the Agricultural Experiment Station at Taipei indicated the hereditary nature of masked character, perhaps involving multiple allele, though its genetical analysis could not be made because of its great variation (Text-fig. 4).

Compared with the Toyen, the masked character in the F_1 appeared in a less degree in its extent as well as in the depth of skin folds. The F_2 consisting of twenty-five individuals were able to classify roughly into three groups although there were many gradations within the one group: six non-masked pigs similar to Berkshire, five prominently masked pigs similar to Toyen, and fourteen intermediate pigs more or less masked, similar to F_1.

HILZHEIMER (1926, p. 264) ascribes the occurrence of masked character to the inequal development of the skull and skin, the former being suppressed by captivity but the latter not. This inequality, however, is no postnatal phenomenon but of a hereditary nature deducing from the two facts, that no wrinkle appears in the Berkshire's head despite of more shortening of its skull than in the Toyen, and that the longicephalic North China pigs show more or less masked character (Text-fig. 2). Thus the masked character associated with the formation of skin folds on the sides should be taken for a hereditary character of Chinese pigs analogous to the wrinkle formation over the body of Old Merino sheep.

III. Blood Type.

YAMANE, OGURA and MAKITA (1938) have reported the possibility of application of haemolysin reaction for discriminating Toyen from Berkshire serologically. It was first found that no precipitin reaction applying sera of rabbit immunized with sera of both the breeds could show any difference between them, even by using the absorption test with heterologous serum; it is too rough to be used as interracial reaction. When, however, Toyen erythrocytes were injected intraperitoneously into Berkshire pigs, haemolysin was produced which acted clearly haemolytic against Toyen erythrocytes; the reaction appeared more distinctly by applying the absorp-



Text-fig. 4. Diagram showing the crossing experiments between Berkshire boars and Toyen sows conducted at Agricultural Experiment Station at Taipei, Taiwan, during 1931–1938.

tion test. On the contrary, in the reciprocal immunization carried out by injecting Berkshire erythrocytes into Toyen pigs no haemolysin production occurred.

The data obtained from the haemolysin reaction reveals that in erythrocyte of Toyen there must be a specific substance or antigen, say T, beside the substances, say B, commonly present in the erythrocytes of both the races. In contrast, erythrocyte of Berkshire contains no such substance specific to its own breed. The blood type of Toyen and Berkshire should then be TB and OB respectively, O designating the absence of T. Further experiments of cross-breeding between Toyen and Berkshire resulted as follows:

1. In F_1, 6 pigs obtained were TB-type.
2. In F_2, there occurred 20 TB and 10 OB or 2: 1.
3. In FR_1, the matings of F_1 to Berkshire resulted 34 TB and 22 OB or 1.5: 1, and matings of Berkshire to F_1, 2 TB and 2 OB or 1: 1.
4. In FR_2 or the mating of OB-type of F_1 *inter se*, all of 15 pigs obtained were of OB-type.
5. TB-erythrocytes both in F_1 and F_2 showed the same titer in absorbing haemolysin from anti-Toyen serum.

Considering that the ratio 2: 1 in F_2 may be a deviation of 3: 1 due to the small number of pigs secured, the above data show that it concerns with the monohybridism, the genotypes of Toyen and Berkshire being *TT* and *tt* respectively.

ZOOLOGICAL POSITION OF MASKED SWINE.

Since the publication of classical work of H. v. NATHUSIUS (1864), a great number of reports has appeared in literature discussing the descent of domestic swines of European as well as of Asiatic origin based upon the craniological method. Nowadays, it is a generalized concept postulated that European swine races have originated from the European wild swine, *Sus scrofa ferus* L., and the Asiatic swine races from Asiatic wild species, *Sus vittatus* MÜLLER & SCHLEGEL or its local varieties.[1] The vital distinction in morphology between the two wild swine and their domestic forms is in the skull characters. The Asiatic wild swine and its descendants show much shorter and higher skull than the European wild and domestic hogs.[2] In connection with this, special importance has been attached to the form of the lacrimal bone because this bone has been believed to remain unchanged under domestication, while the skull itself more or less undergoes change especially through the feeding habits.

As for the wild ancestor of the Asiatic swine races, NEHRING (1888/9, p. 29) has come to the conclusion, that despite of the occurrence of several *Sus*-species in Malayan Archipelago and adjacent territories, no other than the local varieties of

1) ADAMETZ (1926, p. 4) is of opinion that there was the third wild ancestor of domestic pigs, namely *Sus mediterraneus* from which the native breeds in South Spain and Italy developed.

2) SCHRÖTER (1922) found that the lacrimal bone of *S. vittatus* represents a juvenile form of the same bone of *S. scrofa ferus*, the former being stopped in the development at the stage of six months of the latter.

Vittatus-strain can be considered, and furthermore, that *S. leucomystax continentalis*, (a variety of *S. vittatus*), should be the radical form of the Chinese domestic swine.

Although MAKINO (1952) found no chromosomal difference between the wild pigs, *S. scrofa ferus* and *S. vittatus leucomystax*, both showing 2n=40 in the number of chromosomes, LÜHNING (1914) could serologically distinguish the Chinese Masked Swine from the European wild pig by applying precipitin reaction. This shows clearly the Masked Swine to have no blood relation to the European wild pig. On the other hand, SASAKI and MORIBE (1930) found the Berkshire to be distinguishable from the Japanese wild pig, *S. vittatus leucomystax* by means of precipitin reaction combining with the absorption test. Neverthless in the experiments above referred (YAMANE et al. 1938), the precipitin reaction was unable to distinguish the Masked Swine or Toyen from the Berkshire. This is probably due to the fact that the early improvement of the Berkshire was done by the use of Chinese, Siamese, and Neapolitan blood (PLUMB 1906, p. 472). Taxonomically, Berkshire may be seen as a "hybrid" between *Sus scrofa* and *Sus vittatus*. It is natural, therefore, that precipitin reaction is hardly possible to distinguish the Berkshire from the Toyen of *Vittatus*-origin. Despite this close blood relationship of both the races, there is a marked difference between them in the chemical constituents of their blood cells, Toyen showing a special antigen which is determined by a gene *T*. This shows that the Toyen immunogenetically differs from the Berkshire though admixtured with *Vittatus*-blood. All these data appear to indicate that though in a limited degree the Masked Swine craniologically as well as serologically differs from *S. scrofa*, and that it is also immunogenetically distinguishable from the Berkshire, which is taxonomically to be seen as a "hybrid" between *S. scrofa* and *S. vittatus*.

DESCENTS OF TAIWANESE NATIVE SWINE.

I. Masked Swine or Toyen.

BARTLETT (1861) was probably the first who introduced the masked swine into literature with a figure of its masked head with long pendulent ears (Text-fig. 5). The peculiar external appearance of this pig was so impressive to Western people that GRAY (1862) gave the binominal nomenclature of *Sus pliciceps* to it, discriminating from the European common pig, *Sus scrofa*. It was bred as show animals in zoological gardens rather than as farm animals.

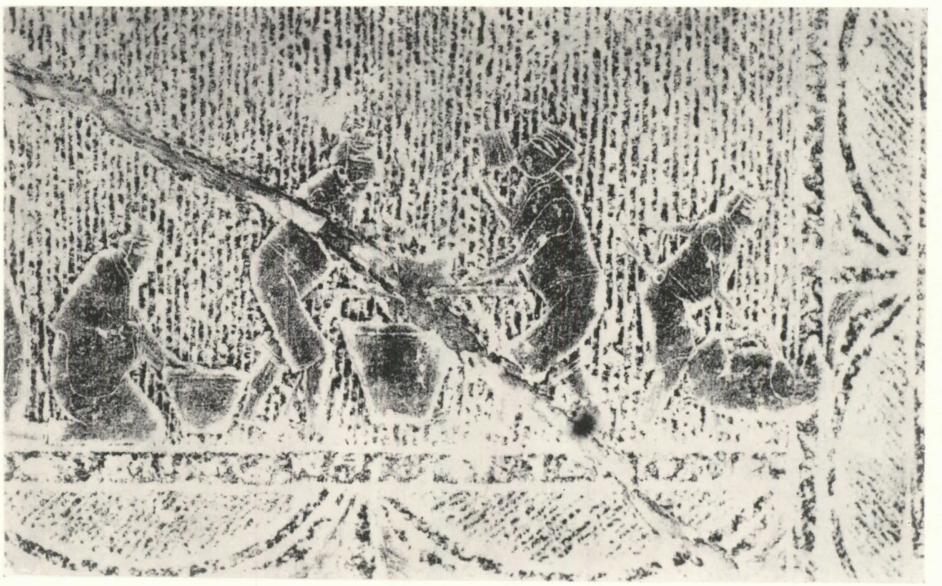
Properly speaking, the masked swine is a race of Chinese origin, although it has been known in Europe with the name of "Japanese masked pig". It was believed to have come from Japan (NATHUSIUS 1864) but it is by no means of Japanese origin because no swine husbandry had been known to the Japanese in those days when this pig was first introduced to Europe.

PHILLIPS, JOHNSON and MOYER (1945) divided Chinese swine roughly into two main classes, the North China and South China types; the approximate line dividing the two types was drawn across the southern part of the provinces of Kiansu, Anwei, Honan, Shensi and Kansu, though there is some intermingling of the types

Text-fig. 5. Woodcut of the "Japanese Masked Pig" illustrated by BARTLETT; reproduced from his paper in Proc. Zool. Soc., London, 1861, p. 263.

along it.

Both the pigs of North China and the Manchuria pigs introduced by the early settlers from North China can be taken for typical forms of the North China pigs. They seem not to have been much changed in a general appearance from ancient type which is seen in a stone sculpture of the Han Dynasty (202 B. C.–221 A. D.) from Shantung province, a relief of the scene slaughtering a pig in the kitchen, though it is not clear in every body points (Text-fig. 6).[1] The North China hog



Text-fig. 6. A rubbed copy of stone sculpture of the Han Dynasty representing a slaughtering scene of pig in kitchen (right side); this copy was obtained 1922 at Tsingtau. The whole feature of the pig resembles to-day's North China pig.

1) On the right of the relief, a butcher is keeping a pig upsidedown which indicates long pendent ears and hanging barrel. Compare this picture with Fig. 1, Pl. 7.

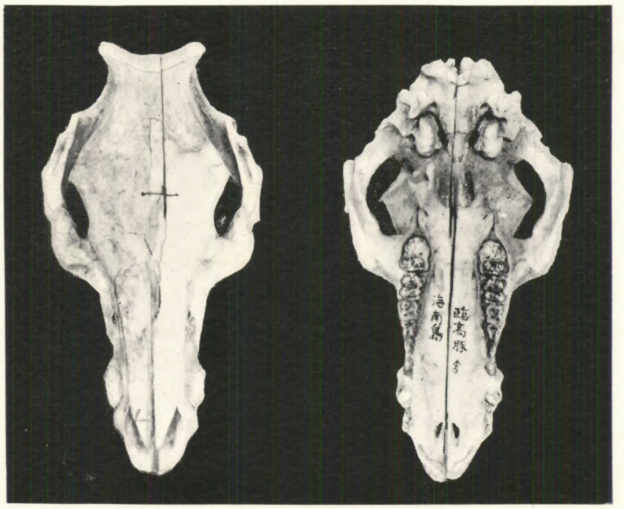
and its descendant, the Manchuria hog, have been classified by KOHMURA (1922) into three types: large, medium and small. They are all solid black, of flat-sided conformation with razor-back and hanging barrel; their head shows a straight forehead and nose covered with slightly furrowed skin; craniologically they belong to the longicephalic race (Text-fig. 2; Pl. 3, left; Pl. 7, 1).

In contrast to this, the craniological finding that the Taiwanese Masked Swine is decidedly brachycephalic in association with a strongly masked physiognomy, reveals that the race is less closely related to the North China pigs than to the South China pigs. There can be hardly a doubt that the Taiwanese Masked Swine represents a South China strain. More evidential is the fact that a small-type of black boar of Szechwan province illustrated in the referred monograph of PHILLIPS et al. (1945, Fig. 66) is almost identical with Toyen in its physiognomy.

Further, to mention is that the Masked Swine has been found in no other territories outside of South China. In Tonkin and Annam of Indochina under French rule, four autochthonous hog races were known, (YAMANE et al. 1942) viz., Tonkin or Delta race, Lang-Son race, Muong race and Annamite race, but none of these resemble Toyen in the profile as well as wrinkle formation of the facial skin (Pl. 8, Fig. 1–5). Also, in Hainan Island lying against the Luichow peninsula of Kwantung province, a native hog is found (YAMANE 1942; MAKITA 1943) but its head is not masked and more elongated than in the Toyen (Text-fig. 7). It has a characteristic coat color which is black in the head and the upper-half of the body, and white in the under-half (Pl. 7, Fig. 4, 5). Undoubtedly, the Hainan hog must have been bred from a strain of black-and-white Kwangtung hogs, the color pattern being fixed there as above. In the Philippines there had been a native hog named Jalajala which was crossbred with the Berkshire for establishing a new breed, Berkjala, at the College of Agriculture, Los Bagnos, Laguna (GONZALEZ 1932). Jalajala is said to be of Chinese origin; it was solid black but showed no masked head. The inhabitants of Ryukyu Islands lying east closely to Taiwan were keeping a small black hog race from time immemorial. The majority of it is at present improved with Berkshire blood. However, according to HAYASHIDA (1960), this native pig is kept still now on Amami-Oshima and Tokara Islands without being outbred; the pig is deep black, and it has a straight profile similar to the wild pig indigenous to the islands; its live weight averages 60–70 catties (36–42 kg), at most 100 catties (60 *kg*).

The first Chinese annals writing about Taiwan, "Fukien Tung-Chih" (General Geography of Fukien Province),[1] Vol. 64, No. 52, 1684, cites among the products of Taiwan eighteen beasts, to which cattle, goats and both the domestic and wild pigs[2] are included. This evidently shows that the domestic pigs had already been brought together with other farm animals about three centries ago or longer before that event. Though no description of external appearance of the pigs has been given in this annals, its writer might have minded the South China pig commonly found throughout, probably the same as reported by SWINHOE (1870, p. 643). The

1) 福建通志 2) 猪・山猪



Text-fig. 7. Skull of a Hainan barrow; it is certainly brachycephalic but not so extreme as the Masked Swine.

Taiwan Strait is so narrow that even in early days the shipment of pigs or other bigger farm animals, from Fukien and Kwantung to Taiwan, could be done by junk with greater ease, compared with the shipment for Hainan Island or the Philippines.

As for the hogs of South China, LEVINE (1920, p. 117) described that "They range in color from nearly white to black, or black with white points. In some localities the pig's ears are large and pendulant, while in others they are small and erect. Then again, these two types may be found in the same community". TENG (1925)[1] also divided South-Chinese pigs into the self black and the black-and-white strain. In the province of Kwantung, the black-and-white strain was predominating, whereas the black strain was found in a limited area skirted with Fukien.

Since the early settlers in Taiwan exclusively came from Kwantung and Fukien, the hogs imported by them must have been from these provinces, resulting a considerable variation in the body size, masked character, ear-length and other characteristics, according to the different native places of the settlers. There was, however, a common consciousness for pig selection among superstitious Taiwan farmers: preferring only the pigs of solid black coat color, because they traditionally rejected white or white-and-black color as an ill omen in every thing.[2]

Thus, the masked race represented by Toyen stood in the first rank among manifold strains imported from the opposite side of the Taiwan strait owing to its superior qualities, while the remaining strains were seen only as common village pigs. In fact, SWINHOE (1870, p. 643) reported that the Chinese colonists had introduced their black hollow-backed breed of Pigs from South China and one could

1) TEN CHIH-I 鄧植儀

2) Even the six white points of Berkshire was refused by Taiwan farmers at the beginning of importation of this breed. Among Manchurian farmers, the settlers from Shantung province, too, the same superstition had been prevailing throughout (TOKUNAGA 1937).

see only this type of swine among the villages of the plains. This type seems to have been the pigs devoid of masking, very common in South China and adjacent territories, probably the same type as that described and illustrated by H. v. NATHUSIUS (1864, p. 77) under the confusing name of *Sus indicus*.[1] These common pigs, however, are brachycephalic, showing more or less concave profile as seen in text-figures 33 and 34 given by the same author. Comparing the skulls of the masked swine with those of the non-masked swine, the author found only one difference between the both: the stronger development of the maxillary ridge over the upper canine teeth in the former. He concluded that there is no reason to believe both the races to be of different origin, and the both are dissimilar to the European wild pig in the same degree (NATHUSIUS 1864, p. 156). Further, through an extensive work with craniological materials from Malayan Archipelago and adjacent territories, NEHRING (1888/9, p. 29) has come to the conclusion that the continental form of *Sus leucomystax* is the wild ancestor of the Chinese domestic swine predominating throughout. As above mentioned, the formation of skin folds in the face is no postnatal phenomenon but of a hereditary character. It is reasonable to assume, therefore, that the Masked Swine should be a mutant of common smooth-skinned pigs which originated from the wild pig of South China known as *S. leucomystax continentalis* NEHRING or renamed by ALLEN (1940, p. 1123) *S. scrofa chirodonta* HEUDE. In short, the Taiwanese Masked Swine represented by Toyen race is the direct descendant of the Masked Swine of South China the distribution of which is extended far back to Szechwan province (PHILLIPS et al. 1945, p. 120); it can further be traced to the South China wild pig.

II. Red Swine.

The Taiwanese Red Swine, as above shown, is brachycephalic and more or less wrinkled on the sides though these characteristics are not so conspicuous as in the masked race. Despite of difference in coat color, there is ample evidence that both the races are craniologically in a close relation. PHILLIPS et al. (1945, p. 122) report that red or reddish brown pigs are frequently seen among the black strains, especially in the mountainous regions of Kweichow, Szechwan, Sikong, and similar regions to the north and south of this area. As regards the origin of Taiwanese Red Swine, however, the question arises whether or not it had been introduced by early Chinese settlers from their native homes. In this connection, of great interest is SWINHOE's observation (1870, p. 643) that follows:

> "Thus before the islanders had intercourse with the outer world they had a Pig of their own, which is still found among the tribes of the central mountains. These are curious animals, of a chestnut-red colour throughout; but I have occasionally seen examples patched with white. The young of this breed are also red, the skin and all the soft and horny parts being stained with more or less of prevailing colour. From the form of this Pig and the small

1) Despite of this nomenclature the author himself did not believe this type to be of Indian origin; he merely respected PALLAS's priority (H. v. NATHUSIUS 1864, p. 149). In reality, this "Indian" swine should be read as "non-masked Chinese" swine.

size and shape of its ear, I should think that it is doubtless derived from the wild stock of the island. The traditions of the natives confirm this impression; and the Pig was only domestic animal they were found to possess when the island first came under European observation."

Based upon the two facts, that the raising area of the Taiwanese Red Swine is rather shifted to the central mountains as Wuh-sheh,[1] Taichung prefecture, where no trade route with Continental China in so early days could be considered and that the red swine of South China are found far back in the mountainous regions of the continent, it is assumed that the Taiwanese Red Swine might be closely related to that "Pig" described by SWINHOE. Subsequent contact of the Chinese settlers with the islanders during the last two centries must have changed the external appearance of the settlers' pigs, especially coat color, by infusing a recessive red factor involved in the aborigines' pigs. The development of the bristles of agouti color from the crest to the back as well as a slight elongation of the skull in the Red Swine appear to be another characters caused by crossing of the pigs of both origin. An analogous case can be found in the work of STAFFE (1922, p. 83) who has concluded that the South-Siberia swine race, Irkutsk, is the product of crossing of the Manchuria pigs with *S. leucomystax sibiricus*.

It remains here, however, another question to be solved: where the aborigines' red swine had come from. CAMPBELL describes in his work, "Formosa under the Dutch" (1903, p. 254), the account of the visit of John STRUYS to Formosa in 1650 as follows: "The wild-goats and swine are often very dangerous to unarmed travellers at night, although these animals are occasionally tamed by the people, ... Every woman has a pig which follows her about everywhere." The "Taiwan Fu-Chih" (Geography of Taiwan Province), 1694,[2] had simply cited the presence of domestic pigs without any description, but in its revised edition, Vol. 18 (1747), the writer of the gazetteer, added newly "Fan-Chu" (aborigines' pig)[3] with yellow hairs suggesting sandy coat color of the wild pig.

From these historical documents, it may be deduced that the Taiwanese aborigines had been keeping the pigs of sandy color or tamed wild pigs indigenous to the island, *Sus taivanus* SWINHOE,[4] before their contact with Chinese settlers.

In swine, it has been known that the red of coat color behaves as recessive or hypostatic to the black and wild color, although the genes involved seem to be manifold (HETZER 1946). The crossing experiments of the Red Swine with the solid black Taiwanese Masked Swine has shown also recessiveness of red. Then, the coat color of the Red Swine may be attributed to the recessive mutant of the aborigines' pigs.

III. Small Black Swine.

The distinction of the Small Black Swine from the other two native races and the common South China pigs is in the shape of skull. It is remarkably longicephalic and straight in the profile view; it resembles strikingly the Taiwanese wild pig,

1) 台中州霧社 2) 台湾府誌 3) 番猪 4) SWINHOE (1870, p. 641).

S. taivanus in the skull form (cf. Pl. 2 & 4). However, the Small Black differs from the latter species in "culturing" which manifests in shortness of lacrimal bones with the index of 0.59–0.60 against 0.70–1.08 of the wild pig (Table 3).

The effects of nutrition and management upon the skull form of the swine have often been reported by many authors; it is believed that even in the short-headed breeds malnourishmant and free ranging cause the elongation of the skull. It is however unlikely that the environmental factors are so highly effective that the skull can develop only along its long axis to the degree in the wild pig. Be the matter as it may, as far as the skulls here presented concern, such external influences cannot be taken in consideration, because they were all secured at the Agricultural Experiment Station, Taipei, where the Small Black had been bred since 1928 and raised at the same condition as Berkshire, Toyen and Red Swine. All of them were fed mainly with the ration of sweet potatoes and potato veins with the concentrates as soybean cakes, and rice bran, each animal being raised separately in a pen that passes into a small ground, floored with concrete. Hence, there is ample reason to believe that the Small Black is no reverted form of the brachycephalic Chinese swine, but it must have originated from the wild swine abundantly found in Taiwan still to-day, all the more because this type mainly occurs in the regions of the central mountains.

The relationship of the Small Black Swine to the wild pig may be shown from another angle. Although the thoracic and lumbar vertebrae in the domestic swine are commonly considered to be fourteen or fifteen and six or seven in number, respectively (SISSON 1948), there appears to be some difference present according to the swine races and the wild or domestic form as DARWIN (1905, p. 91) has quoted. On examining the skeleton materials collected at the Agricultural Experiment Station, Taipei, the following numbers were obtained:

Number of thoracic and lumbar vertebrae of native and wild pigs in Taiwan.

	Toyen		Red Swine		Small Black	Sus taivanus
	♀	♂	♀	♂	♀	♀
Thoracic vertebrae	14(2)	13(2)	15(1)	14(1)	14(1)	14(1)
Lumbar vertebrae	—	6(1)	6(1)	—	5(1)	5(1)
Total	—	19	21	—	19	19

Remarks: Number in parenthesis denotes number of specimen examined.

The data in the table, though fragmentary, seem to indicate that:

1. In the Taiwanese native swine, the thoracic and lumbar vertebrae fluctuate in number, probably according to the type.

2. However, these numbers in Small Black Swine and *S. taivanus* are coincident, showing fourteen and five in number, respectively; both the vertebrae appear to deviate from those of Toyen and Red Swine.

3. This suggests that the Small Black is more a direct descendant of the Taiwanese wild pig than the Red Swine.

The Taiwanese aborigines, though properly hunting or fishing tribes, were good pig-raisers keeping the wild but tame-natured pig in captivity as seen in the historical documents above referred. They have the words of their own for the domestic pigs discriminating from the wild pigs as shown below: an indication of their intimate relationship to the domestic pig long before the Chinese colonization. Most of the words are corruptions of the Indonesian proto-form "babui".

Vocabulary for the wild and domestic pigs of Taiwanese aborigines.[1)]

Tribes	Wild pig	Domestic pig	Pig pen
Ami	vavui no para	vavui	pi-vavuyan
Atayal	bijoak qanehəyun	bijoak	libo na bijoak
Bunun	wanisi	vavo	
Kanakanabu	vavulu	tutui	
Mantaulan	vavoe	hau'uku	
Paiwan	vavui	qatsang, didi	
Tsou	fuzu	feyo'u	

It is well known that, in early times, the occasional domestication of wild pigs was a common custom among natives though it has rarely developed to build up domestic races. The native swine of Soemba Island, one of the Lesser Sunda Islands, Indonesia, may represent one of such rare cases. According to MERKENS (1930), the Soemba swine is very similar to *S. vittatus* in the head form, showing a long or medium long, straight profile; it has erect short ears. The coat color is self black but exceptionally black and white. Young pigs show wild striping until the sixth or seventh month after birth; in the sow the thick skin tends to form wrinkles.

In this connection, it is unreasonable to assume that the Taiwanese Small Black Swine is a pure domesticated type of *S. taivanus*, since in this race no wild striping appears at the postnatal stage.

When the aborigines came in contact with the Chinese settlers keeping pigs from South China, it is but natural that the crossing of the pigs of the both origins might have happened to a greater and less degree, specially in those early days when the outdoor keeping of pigs was usage among the inhabitants.

All things considered, the Taiwanese Small Black is neither direct descendant of common South China pigs nor of Taiwanese wild swine, but it is very likely to be the product of crossing of both the strains, though the wild strain is predominated.

SUMMARY.

1. In Taiwan before 1940, there were three distinguished types of native

1) The authors are greatly indebted to Dr. E. ASAI, formerly professor of Philology, Taihoku Imperial University, for compiling this vocabulary.

swine which may be named Middle Black Masked Swine or Toyen, Small Red Swine and Small Black Swine according to their exteriors.

2. Of the three types, the Masked Swine is craniologically brachycephalic and the Small Black is longicephalic while the Red Swine occupies an intermediate position.

3. Masking or wrinkle formation of the skin on the forehead and nose as well as on the sides of the body, is a hereditary character which seems to have appeared by mutation among the smooth-skinned South China pigs presumably originated from South China wild pigs, *Sus scrofa chirodonta* HEUDE.

4. The Taiwanese Masked Swine is the direct descendant of the same race from Kwantung and Fukien provinces, which was introduced by early Chinese settlers.

5. The wild pig indigenous to Taiwan, *Sus taivanus* SWINHOE, took part in forming the native domestic swine; there are reasons to believe that the Red Swine and the Small Black race are more or less related to the wild pig, the radical form being South Chinese pig in the former and the wild pig in the latter.

6. At the time of Dutch occupation the mountain tribes of Taiwan had kept the wild pigs under domestication which had been turned to red strain by recessive mutation. Through the contact of the natives with the Chinese colonists, it is but natural that occasional matings occurred among the native and imported pigs; thus, the Red Swine and Small Black are the results of the amalgamation of both the blood of domestic and wild stocks. From the osteological standpoint of view, the Small Black is more a direct descendant of the wild pig.

7. Since 1916 when the Japanese Taiwan Government made its breeding plan for promoting the performance of these native hogs, the Berkshire breed was introduced on a large scale. As the result of the extensive crossbreeding the protoform of native races are now on the verge of extinction.

8. In connection with the descents of the Taiwanese native swine, other swine races of Continental China as well as of adjacent territories have been taken in consideration.

REFERENCES.

ADAMETZ, L.: Lehrbuch der Allgemeinen Tierzucht. Wien, 1926.

ALLEN, G. M.: The Mammals of China and Mongolia. Natural History of Central Asia, Vol. XI, Part 2: (Genus Sus Linnaeus), 1940.

BARTLETT, A. D.: Remarks on the Japanese masked pig. Proc. Zool. Soc., London, 1861.

CAMPBELL, W.: Formosa under the Dutch. London, 1903.

DARWIN, C.: The Variation of Animals and Plants under Domestication. Vol. 1. London, 1905.

GONZALEZ, B. M.: The animal improvement program of the College of Agriculture. Philip. Agriculturist, Vol. 21. 1932.

HAYASHIDA, S.: Studies on wild boar and dog found at shell-mounds in the Amami-Oshima Archipelago. Jour Anthropol. Soc. Nippon, Vol. 68, No. 725. 1960. (in Japanese with English summary)

HETZER, H. O.: Inheritance of coat color in swine. V. J. Hered., Vol. 37. 1946.

HILZHEIMER, M.: Natürliche Rassengeschichte der Haussäugetiere. Leipzig, 1926.

KOHMURA, T.: Appearances of Manchuria native hogs and its distribution. J. South Manchuria

Soc. Vet. Zootech. No. 4, 1922. (in Japanese)

LEVINE, C. O.: Swine, sheep and goat in the Orient. Jour. Hered. Vol. 9. 1920.

LÜHNING, A.: Versuche einer Diagnostik von Schweinerassen mit Hilfe der biologischen Eiweissdifferenzierungs-Methode. Landw. Jahrb., Bd. 47. 1914.

MAKINO, S.: A contribution to the study of the chromosomes in some Asiatic mammals. Cytologia. Vol. 16, No. 4. 1952.

MAKITA, T.: Studies on Hainan Pigs. Bull. Taiwan Government-General Agr. Expt. St. No. 219. 1943. (in Japanese)

MERKENS, J.: Bijdrage tot de kenntnis van het Soembavarken. Ned. -Indische Bladen voor Diergeneeskunde. Deel. XLII, Afl. 6. 1930.

NATHUSIUS, H. v.: Vorstudien zur Geschichte und Zucht der Haustiere, zunächst am Schweineschädel. Berlin, 1864.

NEHRING, A.: Über *Sus celebensis* und Verwandte. Abh. u. Ber. d. K. Zool. u. Anthr. -Ethn. Mus. zu Dresden. Nr. 2. 1888/9.

ONO, S.: Experimental results of pig raising. Special Report No. 7, Taiwan Government Experiment Station, Taipei, 1913. (in Japanese)

ORITA, T.: On Toyen Pigs. Taiwan Nojiho (Taiwan Farmers' Bulletin). Vol. XVI, No. 12. 1922. (in Japanese)

PHILLIPS, R. W., R. G. JOHNSON, & R. T. MOYER: The Livestock of China. Department of State Publication 2249, Far Eastern Series 9. Washington, 1945.

PLUMB, C. S.: Types and Breeds of Farm Animals. Ohio State University, 1906.

RICE, V. A.: Breeding and Improvement of Farm Animals. 1934.

SASAKI, K. & K. MORIBE: On the serological distinction of the wild boar and the domestic pig. Annot. Zool. Jap. 12. 1930.

SCHRÖTER, H.: Das Verhältnis der europäischen zu den asiatischen Wildschweinen auf Grund der postembryonalen Schädelentwicklung der europäischen Wildschweine. Zool. Jahrb., Bd. 46. Abt. f. Systematik. 1922.

SISSON, A.: The Anatomy of the Domestic Animals. 3rd Ed. Philadelphia, 1948.

STAFFE, A.: Über den Schädel und das Haarkleid von *Sus leucomystax sibiricus*, einer neuen südsibirischen Wildschweinform. Arb. d. Lehrk. f. Tierz. a. d. Hochsch. f. Bodenkultur, Wien. Bd. 1. 1922.

SWINHOE, R.: Catalogue of the Mammals of China (South of the River Yantsze) and of the Island of Formosa. Proc. Zool. Soc., London, 1870.

TAIWAN GOVERNMENT AGRICULTURAL STATION: Hand-Book for Taiwan Farmers. 6th ed. Taipei, 1944. (in Japanese)

TENG, CHIH-I: Report of General Survey of Agriculture in Kwantung Province. Animal Industry. 1925. (in Chinese)

TOKUNAGA, M.: On the inheritance of coat color in the crossbreeding between the Manchurian pig and the Berkshire. Res. Bull. Agr. Expt. St., South Manchuria Railway Co., Kungchuling, 1937. (in Japanese)

YAMANE, J., K. OGURA & T. MAKITA: Immunogenetische Studien bei den Rassenbastarden von taiwanischem Maskenschwein und Berkshire. Jap. Jour. Genet., Vol. XIV, No. 5. 1938. (in Japanese with German summary)

YAMANE, J.: Report of Survey of Animal Husbandry in Hainan Island. Taiwan Governm.-Gen. Publ. Taipei, 1942. (in Japanese)

YAMANE, J., S. SHIBATA *et al.*: Report of Japanese Mission of Economic Survey to French Indochina, Section: Animal Husbandry. Japanese Ministry of Foreign Affairs. 1942. (in Japanese, unpublished)

台湾土産豚の三型とその起源について

山根甚信・陳耀錕

過去3世紀にわたり，台湾島住民の生活と切り離し難い関係をもっていた家豚は，時代の進運に伴い他品種との交配が行われ，固有の体型を失いつつあり，台湾土産豚は今や地上から姿を消す寸前にあるといっても過言ではない。

本報告は東洋古来の家畜の起源攻究の一環として，台湾土産豚の形態と起源について記載且考察したものである。

次にその結論のみを要約する。

1. 1940年以前の台湾においては，島民によって古くから畜養されていた豚は外貌上明かに3種類あった。すなわち，中型黒色畸面豚（一名桃園種），小型赤色豚および小型黒色豚がそれである。

2. 3型の中，畸面豚は頭骨学的に見て，明かに短頭型に属し，小型黒色種は長頭型であり，赤色豚は両者の中間に位する。

3. 畸面豚の前頭部と鼻部および体側に出現する皮膚の褶襞は一種の遺伝形質であって，華南産家豚の無褶襞のものから突然変異によって生じたものと推定される。この華南豚は恐らく華南産野猪 *Sus scrofa chirodonta* Heude の畜化されたものであろう。

4. 中国大陸のうち，華南以外の地域並びに印度支那，ヒリッピン等東南アジアにも，畸面豚を見ないから，この豚の原産地は華南の何れかの地方と考えられるが，台湾畸面豚に関する限り，広東，福建の両省からの移住者の携行したものの直系後裔であることは疑いない。

5. これに反して，赤色豚と小型黒色豚は輸入された華南豚の直系子孫ではなく，多かれ少かれ台湾産野猪 *Sus taivanus* Swinhoe と血縁関係をもっている。すなわち，赤色豚の原型は華南豚系であるが台湾野猪の混血によって赤毛色となり，小型黒色種は原型が台湾野猪であり，黒色化したものと思われる。

6. 台湾の高山族はオランダ人占拠以前既に野猪を畜化飼養していたが，それは突然変異による赤色豚であったことは，史実によって推定される。渡来した漢民族が高山族と接触するに及び，輸入された華南豚と台湾野猪又はその畜化型とが雑交することは自然の勢である。骨格学から見ると小型黒色豚は赤色豚よりも一層野猪に近縁であると推論される。

7. 1916年以降，台湾総督府は土産豚の改良に着手し，バークシャー種豚を輸入して土産豚との間に雑種繁殖を行った。その結果，能力増進の反面，土産豚の形質は逐次消失し，固有の体形をもつ生豚を見ることがすこぶる困難となった。

8. 台湾豚起源の追究に関連して華南，華北並びにその周域の家豚をも討議の参考資料とした。

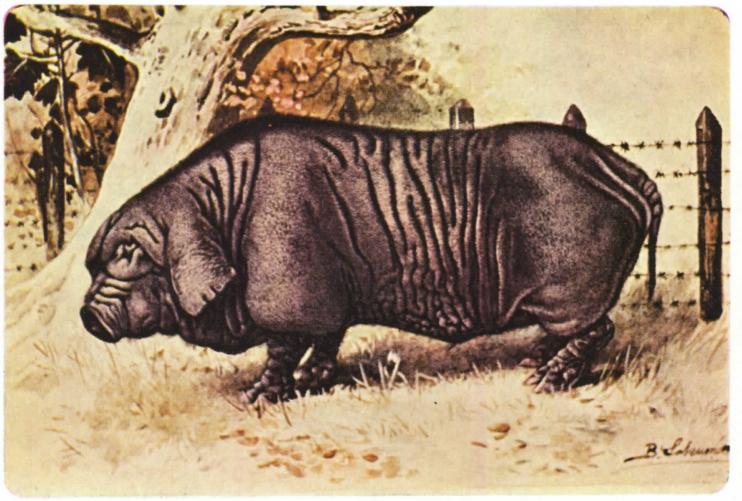
Plate 1.

Three distinct types of native swine remaining existent in Taiwan. Drawn by B. SAKUMA from life at the Agricultural Experiment Station, Taipei. The body size of the pigs in the three pictures is not in a correct proportion one another.

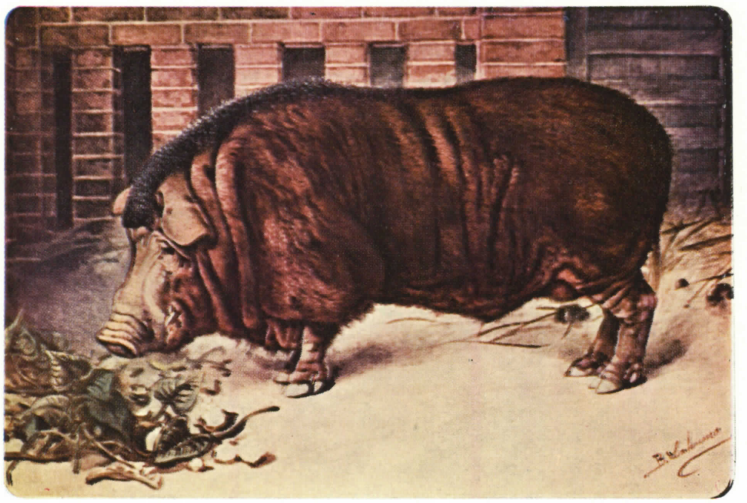
Fig. 1. The Middle Black Masked Swine (Toyen race), boar.

Fig. 2. The Red Swine, boar.

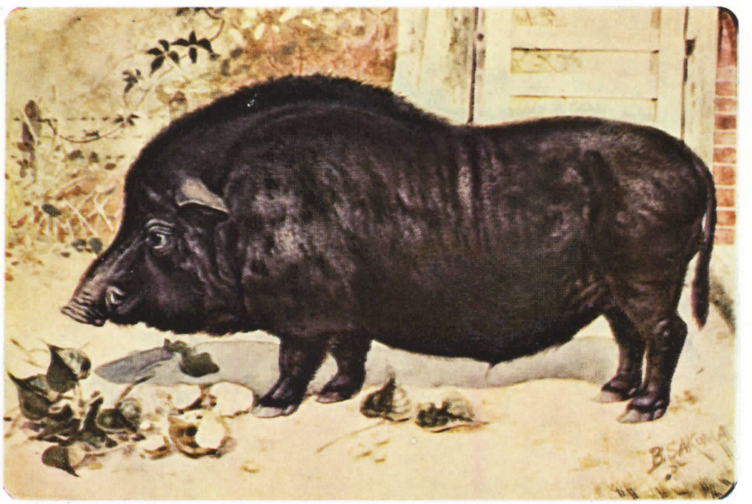
Fig. 3. The Small Black Swine, boar.



1



2



3

Plate 2.

Skulls of three types of Taiwanese native swine, bred at the Agricultural Experiment Station, Taipei.

Left: Middle Black Masked Swine (Toyen race), sow.

Center: Small Red Swine, sow.

Right: Small Black Swine, sow.

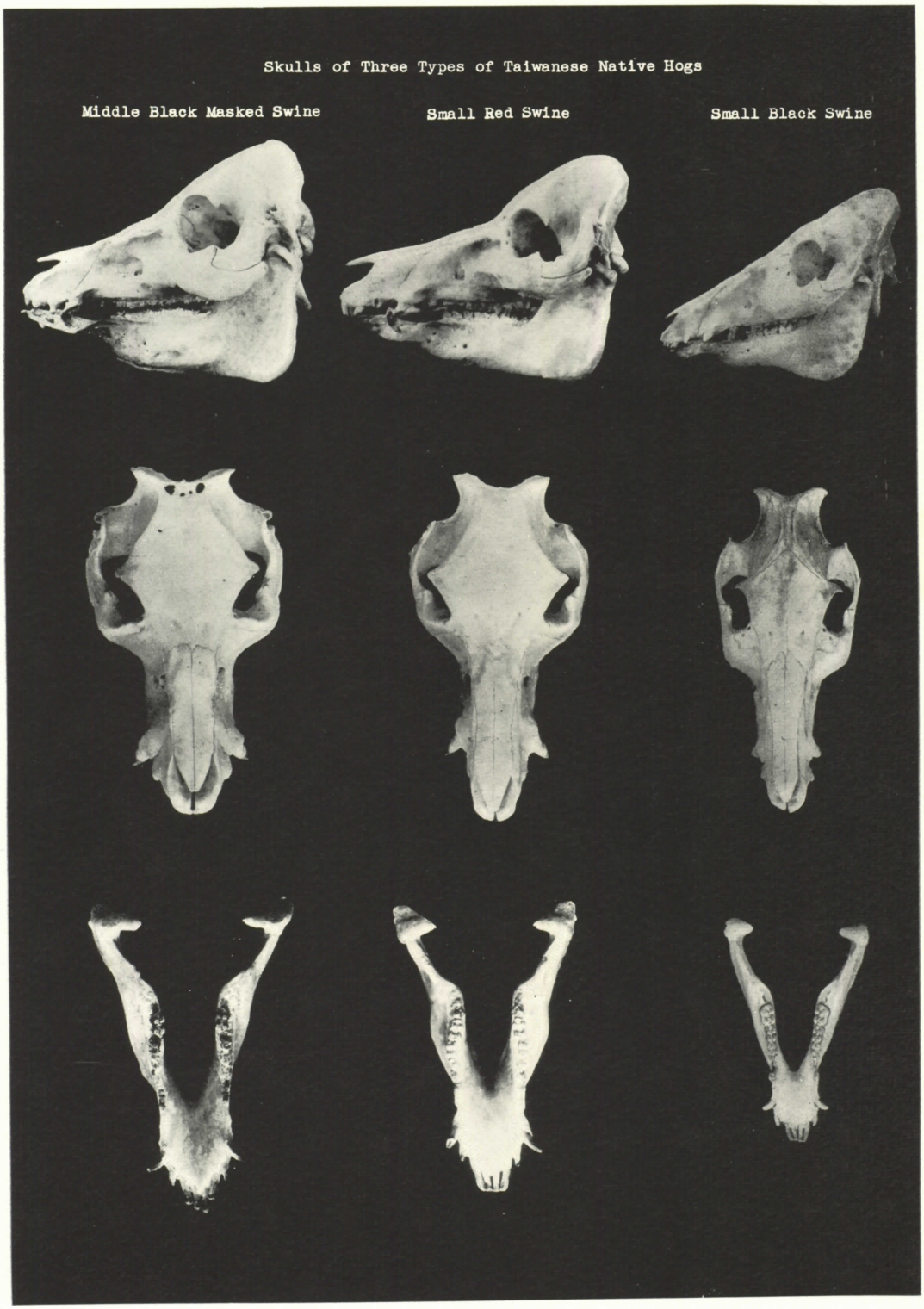

Skulls of Three Types of Taiwanese Native Hogs
Middle Black Masked Swine
Small Red Swine
Small Black Swine

Plate 3.

Skulls of allied swine races.

Left: Shantung hog, collected in Tsingtao, barrow.

Right: Berkshire, sow, bred at the Agricultural Experiment Station, Taipei.

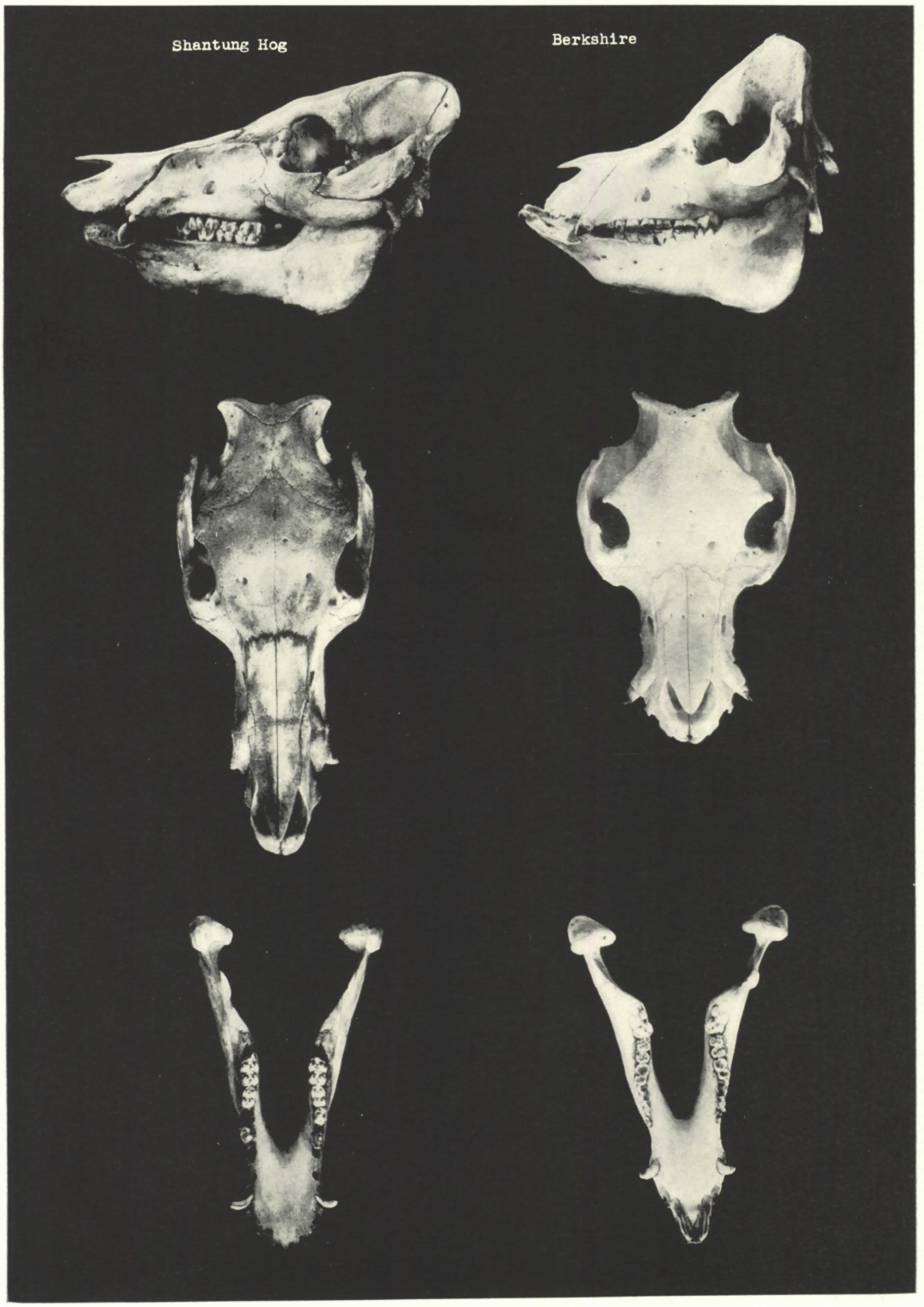

Shantung Hog
Berkshire

Plate 4.

Skulls of Asiatic wild boars.

Left: *Sus taivanus*, sow, collected in Taichung prefecture.

Right: *Sus vittatus*, sow, collected in Johor, Malay.

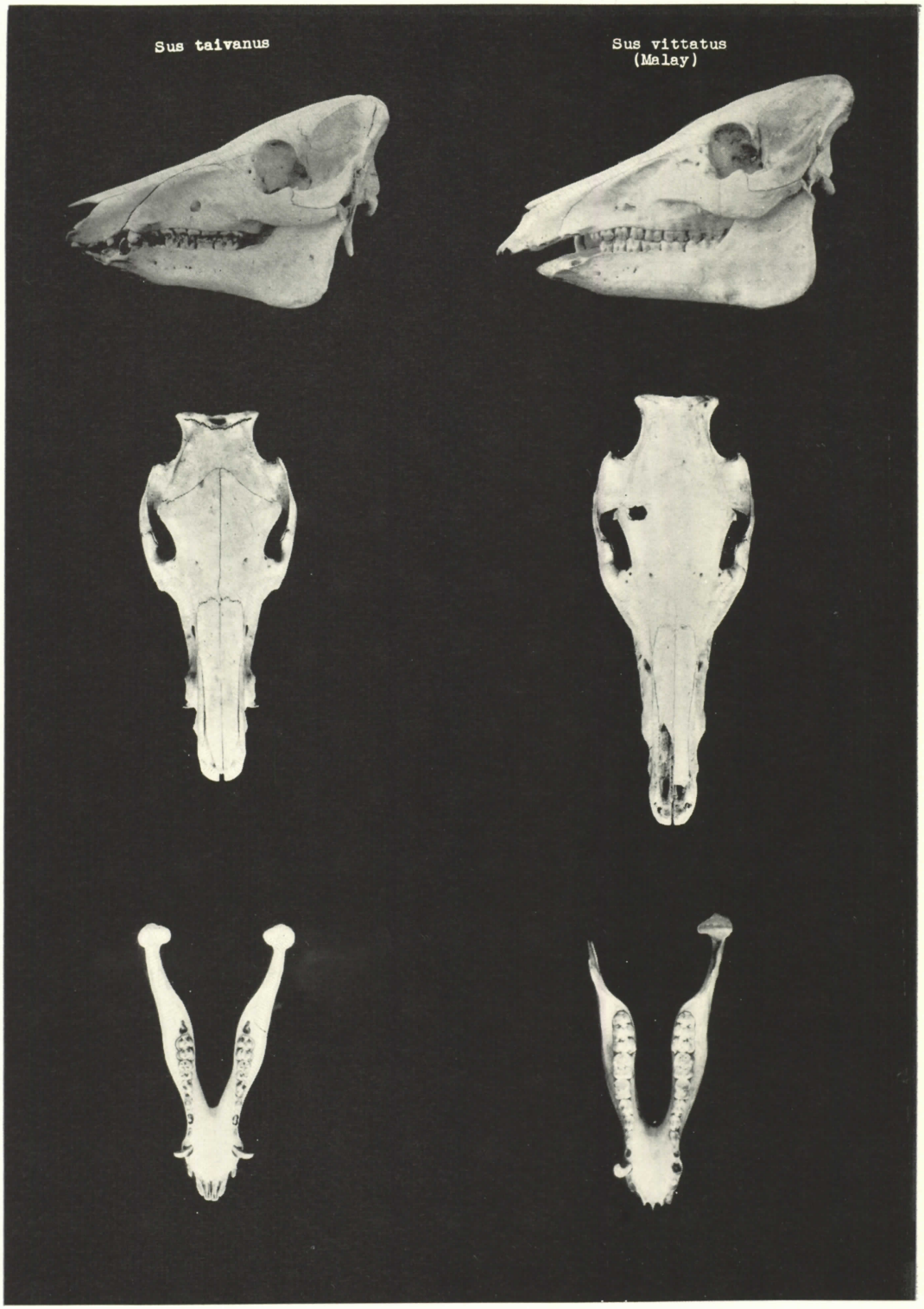

Sus taivanus
Sus vittatus
(Malay)

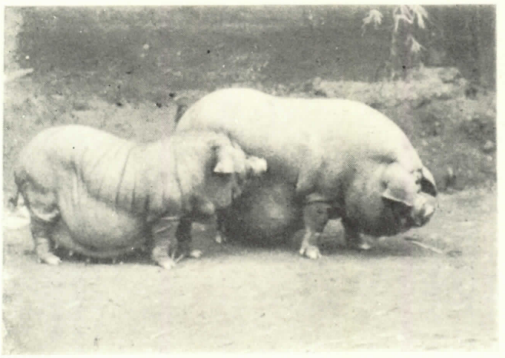
Plate 5.

Taiwanese Masked Swine or Toyen.

Fig. 1. Pigs in fattening condition.

Fig. 2. Three sows.

Fig. 3. A boar.



1

2

3

Plate 6.

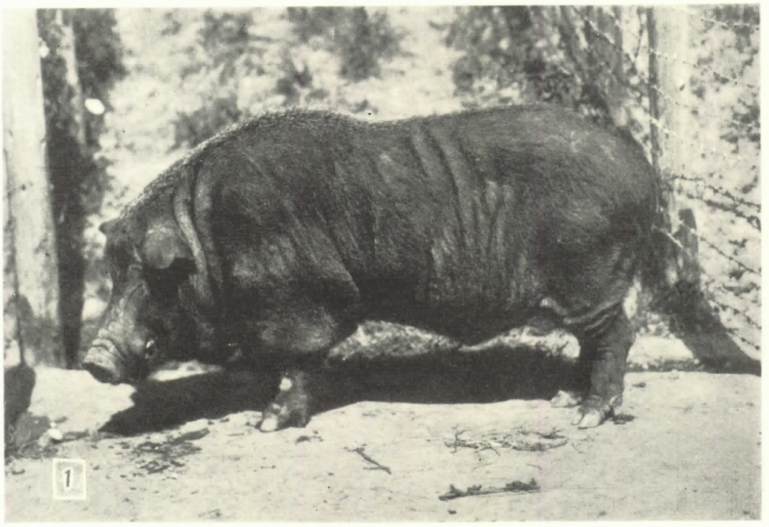
Taiwanese Native Swine.

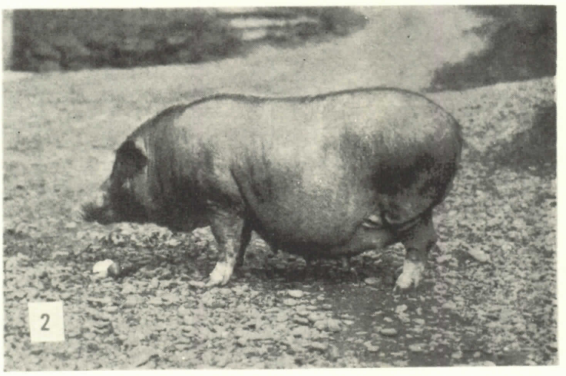
Fig. 1. A Red Swine, boar.

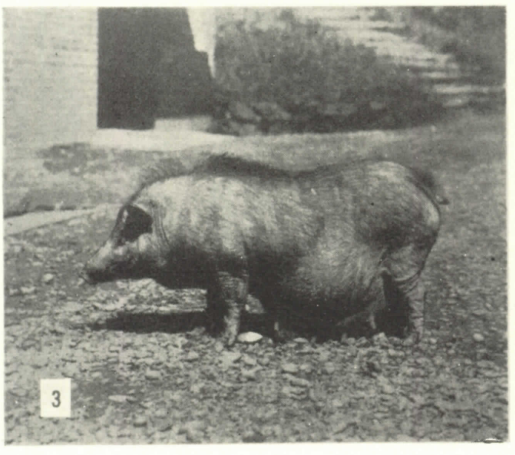
Fig. 2. A Red Swine, sow.

Fig. 3. A Small Black Swine, sow.

Fig. 4. The same, boar.


1


2


3

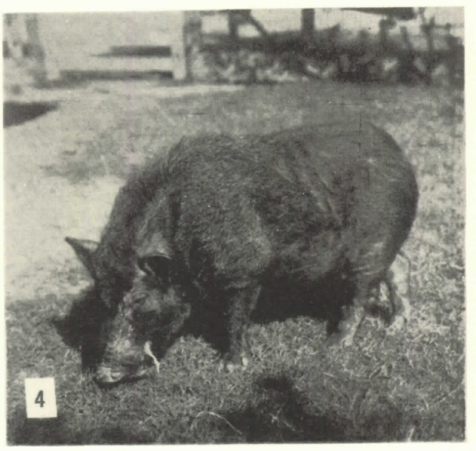

4

Plate 7.

Chinese pigs.

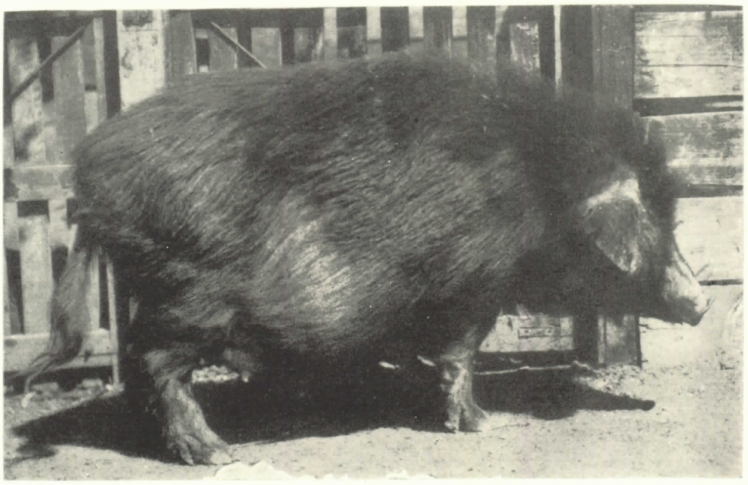
Fig. 1. A Manchuria sow.

Fig. 2. A Kwantung sow with pigs.

Fig. 3. A Kwantung boar.

Fig. 4. A Hainan sow.

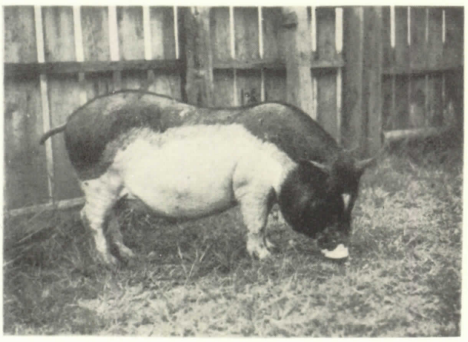
Fig. 5. A Hainan boar.



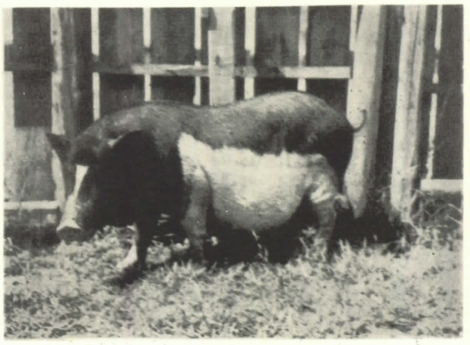
1

2

3



4



5

Plate 8.

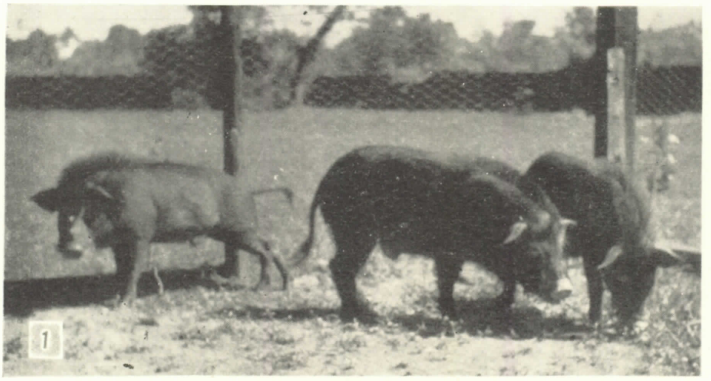
Native Swine of Indochina.

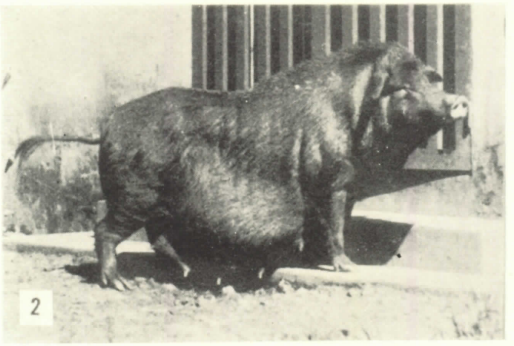
Fig. 1. Boars of Lang-Son race.

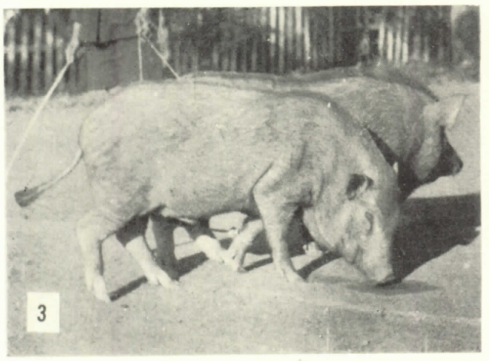
Fig. 2. A sow of the same.

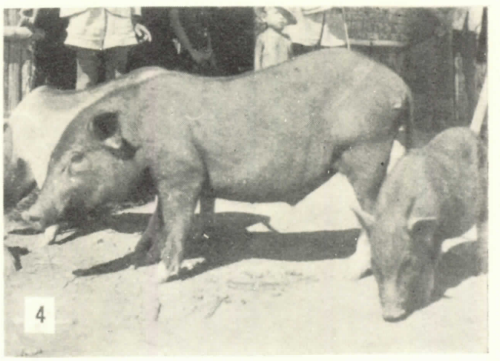
Fig. 3. & 4. Annamite race.

Fig. 5. Tonkin or Delta race.


1


2


3


4


5