

## Studies on Five Specimens of Mammalian Double Monsters\*

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*With 14 Text-figures*

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The specimens of double monsters of mammals at my disposal are a pig, three kittens and a pup. With the exception of one kitten of anterior duplicity, these belong to a type of cephalothoracopagus.

Most of the specimens were in poor condition because of their long preservation before reaching my hands, and some of them, not being well fixed, were impossible for detailed study. My observations are confined mainly to the visceral organs, little or no attempt being made to study their skeletons or muscles.

Before going into the descriptions, I wish to express my sincere thanks to Professor T. KOMAI, who not only gave me a chance to study these rare specimens but who guided me throughout my investigations.

### **Cephalothoracopagus Monosymmetros**

Of the five specimens four belong to the cephalothoracopagus monosymmetros type of SCHWALBE (1907),\*\* having fused supra-umbilical regions and a single secondary face.

The four specimens show several marked common characteristics:

A. The twins are all females. This sex, according to SCHWALBE, is more frequently found among this type of monster.

B. The specimens are similar in that they have double tracheae and

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\*\* SCHWALBE, G. (1907). Die Morphologie der Missbildungen des Menschen und der Tiere. Doppelbildungen. Jena.

double lungs, a single œsophagus, and a compound stomach from which a single duodenum extends. The heart may be single or double.

C. All the thoracic organs, when double, are placed in dorso-ventral juxtaposition; the ventral organs are always more developed than the dorsal ones.

D. In three of the four specimens, the relative heights of the right and left kidneys are quite the reverse of those found in normal animals. This reversal always occurs in the left body of the twins.

*Specimen No. 1: Pig*  
(Figs. 1, 2, 3 and 4)

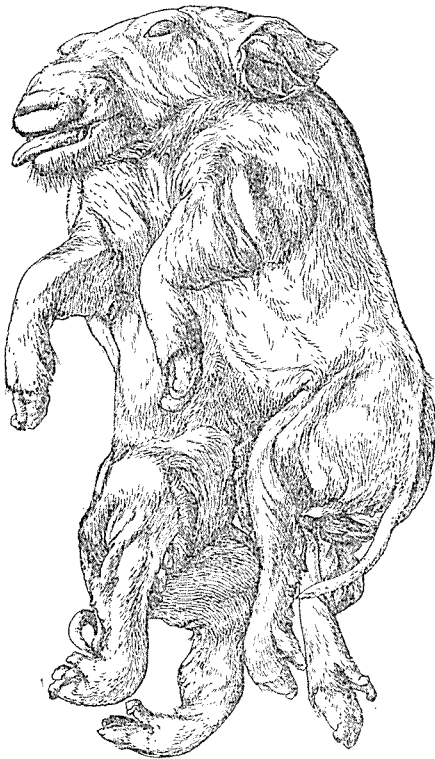


Fig. 1. Ventral view of the pig monster, Specimen No. 1.

The snout and mouth are large and unusually broad. There is a compound ear at the base of the skull which is formed by the fusion of the left ear of the right twin with the right ear of the left twin. The two forelegs on the ventral side of the monster are normal, the right being the right

*External appearance* (Figs. 1 and 2). The monster—found by Mr. SUZUKI at Kuraoka-mura, Miyagi Prefecture in July, 1933—has a single head and a compound trunk with two vertebral columns. The body gradually widens from the neck, as the internal duplicity begins from the larynx and progresses to the caudal parts. The complete separation takes place below the single umbilical cord. In the posterior thoracic region, the component bodies are twisted, thus making their ventral sides face each other. Below the bifurcation, the two separated bodies are normal.

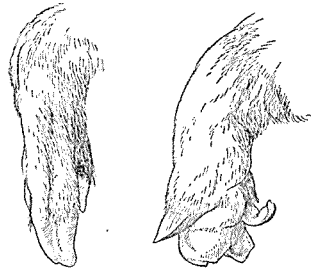


Fig. 2. Two abnormal forelegs on the dorsal side of the pig double monster (Specimen No. 1). Right figure is the left foreleg of right twin, left the right foreleg of left twin.

foreleg of the right twin and the left the left foreleg of the left twin. The two forelegs on the dorsal side are abnormal with imperfect paws, and lie very close to each other (Fig. 2).

The specimen is covered entirely by whitish hairs. Both twins are females. The monster weighs about 375 gr., and is about 175 mm. long from the tip of nose to the base of the tails. The head and body lengths of the two are approximately equal.

*Digestive system and gland* (Fig. 3). A large liver lies a little to the right of the median line. It is divided vaguely into two lobes. Under the liver is a compound stomach (ST) which is formed by the fusion of the

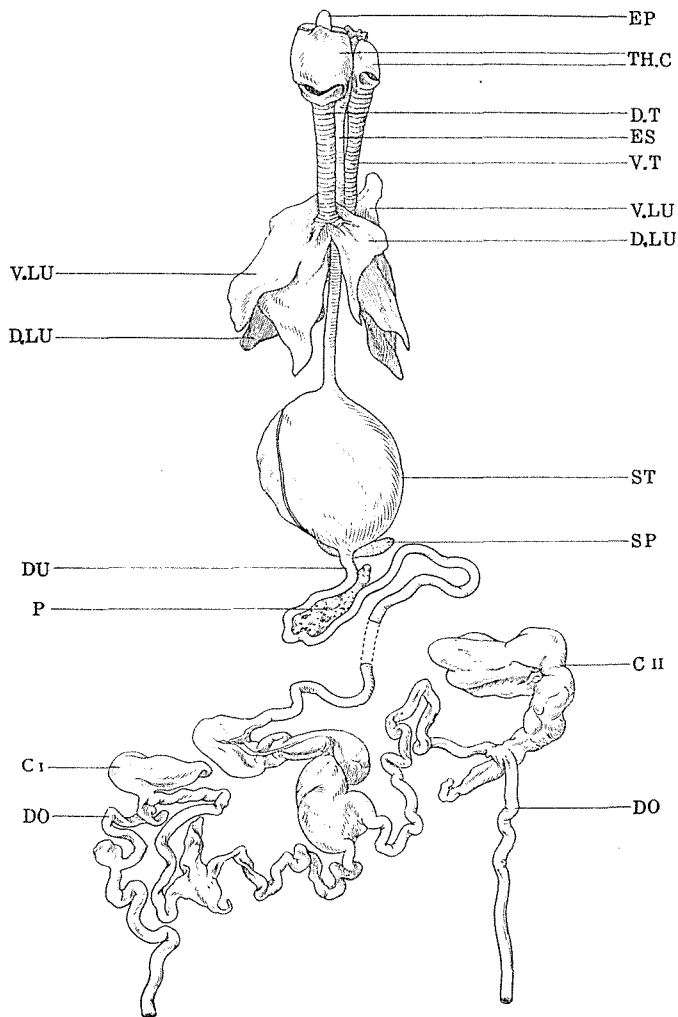


Fig. 3. The respiratory and alimentary organs of Specimen No. 1.

sides of the lesser curvature of the stomachs of the two bodies. The single œsophagus (ES) goes from a large common pharyngo-oral cavity to the stomach. The compound stomach opens into a single duodenum (DU) by a common pylorus. A spleen (SP) is located, in the ventral view, beneath the stomach. The pancreas (P) also is single and located in the normal position. The intestine, 57 mm. long, coils in the abdominal cavity, and is broadened considerably in the posterior portion before dividing into two branches. The cæcum of the right twin ( $C_I$ ) is much shorter than that of the left twin ( $C_{II}$ ).

*Respiratory system* (Fig. 3). The pharynx is double, each with its own epiglottis (EP). The larynges lie on the mid-dorso-ventral line. The ventral larynx is larger and well formed, but the dorsal one is considerably reduced in size. Two tracheae are situated on the dorsal and ventral sides of œsophagus; both bifurcate respectively into two bronchi before emptying into the lungs. The two sets of lungs (D. LU, V. LU), both much smaller than normal and having no more than two lobes each, are subequal in size.

*Circulatory system* (Fig. 4). There are two hearts, very unequal in size, located back to back within the thorax in a separate pericardium. The ventral heart (V. H) is much larger than the dorsal and apparently the predominant heart. The former lies a little to the left of the median line and its shape and structure are normal. A large common ascending aorta arises from the left ventricle. It bifurcates immediately into two aortae (R. AO, L. AO) which run respectively along the vertebral columns of the twin to the respective tails. Two common carotid arteries (C. C. A) originate proximal to the bifurcation. The pulmonary aorta (P. A.), which arises from the right ventricle of the ventral heart, is replaced by the dorsal aorta of the right twin after giving off the pulmonary arteries to the ventral lung. That is, the ascending aorta and the pulmonary aorta become confluent at the place of bifurcation of the ascending aorta. The right aorta gives off two subclavian (S. A), a celiac (C. A), and two renal arteries, and, at the lumbar region, two iliac (I. A) and two umbilical (U. A) arteries. The umbilical arteries arise abnormally from the right iliac arteries. From the aorta of the left twin, two subclavian (S. A), a celiac (C. A), two renal, two iliac and two umbilical arteries branch in the normal manner.

A common jugular (C. J. V) and three subclavian veins (S. V) are gathered to become a precaval vein which enters the right auricle of the ventral heart. Two postcaval veins of the twins and the common hepatic vein are also brought together to the right auricle.

The dorsal heart (D. H) is very small, only providing, beside a special vessel (A) which communicates with the dorsal aorta of the right twin, its own pre- and postcaval veins (PR. V, PO. V) and pulmonary aorta which runs to the dorsal lung. At any rate, the circulation of the dorsal heart is in a vestigial state.

The genito-urinary system is double, and each entity is normal.

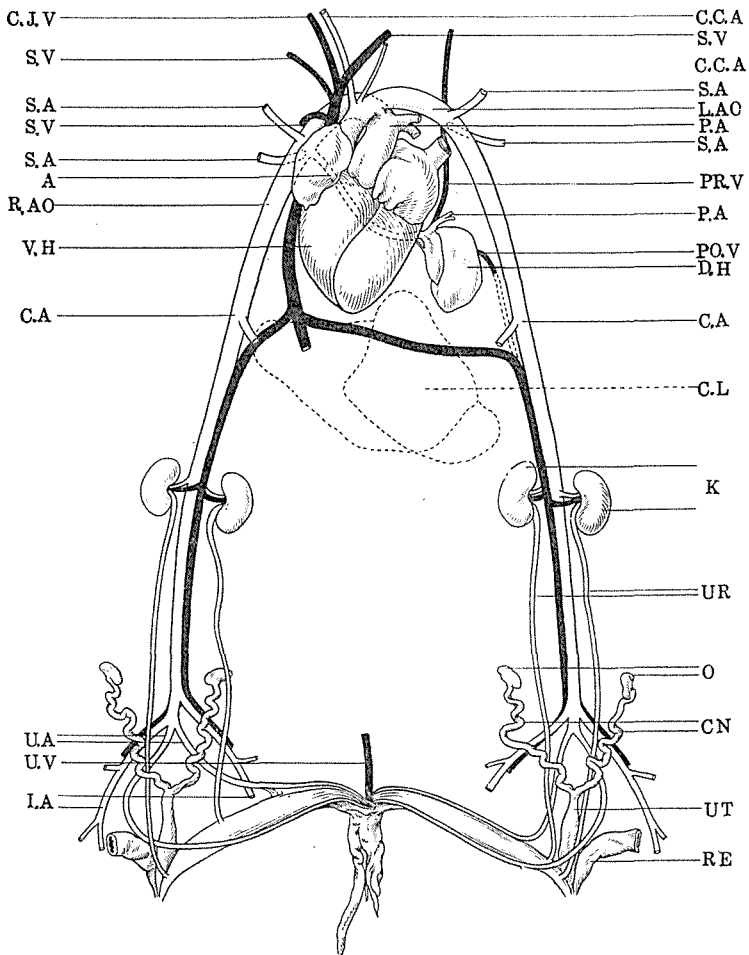


Fig. 4. The circulatory and urogenital organs of Specimen No. 1.

*Specimen No. 2: Kitten*

(Figs. 5 and 6)

The specimen was originally a property of the Zoological Institute in the Department of Agriculture, Hokkaido Imperial University.

*External appearance* (Figs. 5 and 6). The monster has a coat of spotted brown. It has a weight of about 34 gr., and both right and left members are about 95 mm. long. If compared to a normal kitten of the same age which is usually 125 mm. in length, its dimensions are considerably reduced. The twins are both females.

The cranial aspect of the head is normal. The separation begins at the region of the shoulder girdle and at the mouth. The upper lip and

roof of the oral cavity are separated by a fleshy and hairy septum. It looks as if the upper lip had subsided medially into the oral cavity. The lower lip is imperfectly bifurcated; the splitting runs to the throat. The tongue is divided into two (R. T, L. T) approximately at its center, but the basal half of the tongue remains normal and is attached to the hyoid bone in the usual manner.

The two forelegs on the ventral side of the monster are quite normal, one being the right foreleg of the right kitten and the other the left foreleg of the left kitten. A dorsal compound foreleg (Fig. 6) has two scapulae fused by their suprascapular fossae, a compound humerus, a compound radius with two normal ulnae, and a partially doubled manus. A longitudinal groove is present on the integument that covers this compound leg.

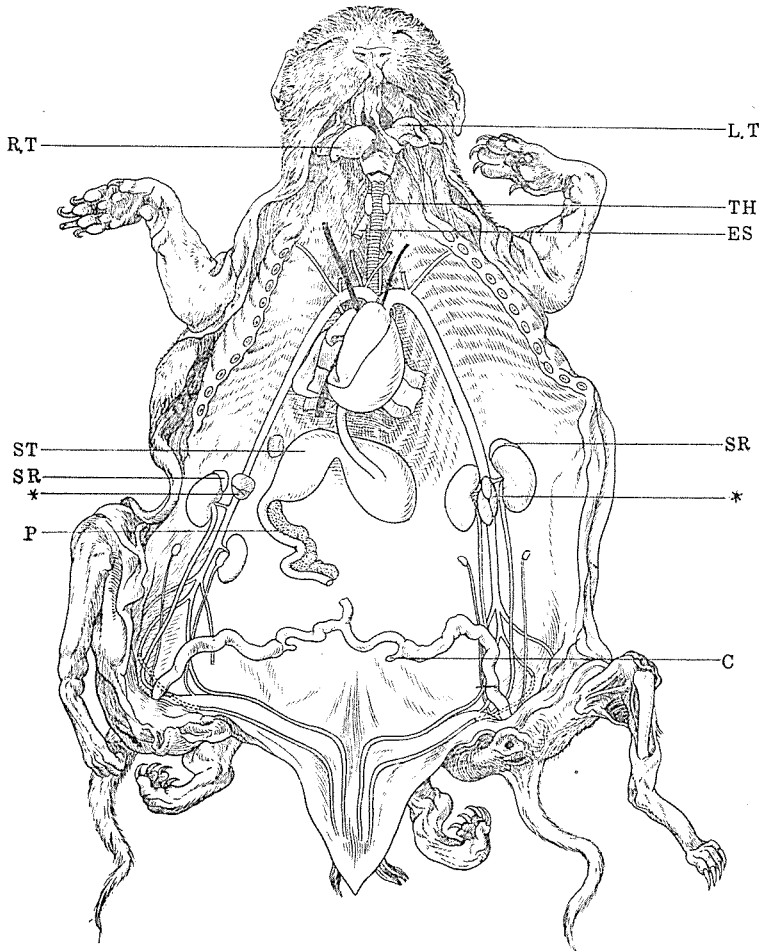


Fig. 5. Internal organs of the kitten monster, Specimen No. 2.

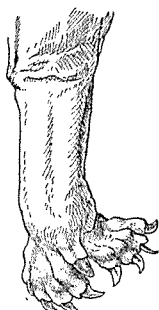


Fig. 6. Dorsal compound foreleg of Specimen No. 2.

This appendage is composed of the left foreleg of the right twin and the right foreleg of the left twin.

*Digestive system and glands* (Fig. 5). The oesophagus (ES), lying between the dorsal and ventral tracheae, is single, and normal. The stomach (ST) is compound, but it differs in the mode of duplication from that of the Specimen No. 1 as is seen in Fig. 5. The small intestine is fused to the lower one-third of the ileum, only becoming double below that point. The doubled part of the alimentary tract is normal.

The liver is single but very complex in structure as it is vaguely divided into right and left halves which in turn are subdivided into four and five lobes respectively. These lobes, however, are very indistinct.

*Circulatory system* (Fig. 5). The single heart is located in the ventral thoracic wall. The right auricle receives two superior caval veins and a big postcaval vein. The left ventricle gives origin to an aorta which immediately bifurcates into a right and a left aorta. From the former branch issue two common carotid and two subclavian arteries. Four hypogastric arteries leave the umbilical ring—one from each of the four internal iliac arteries. The intercostal, celiac, renal and lumbar arteries are all distributed normally from the descending aortae of the twins.

It is interesting to note that in this case the two aortae are, at the same time, also working as pulmonary arteries. Dissection of the heart shows that the right and left ventricles are imperfectly separated.

*Respiratory system.* The larynx is single with a normal structure but it is a little larger than that of a normal kitten. The trachea begins as single but immediately separates into two. Two subequal lungs are placed on the median line dorsal to the heart. These lungs are divided into several lobes by irregular fissures.

*Urogenital system* (Fig. 5). The location of the kidneys of the right twin is normal while that of the left twin is reversed—the left kidney lies more cephalad, and the renal artery and vein show a corresponding difference. The suprarenals (SR) are present only for the right kidney of the right twin and for the left kidney of the left twin. The structure and position of the ovaries, Fallopian tubes, and the uteri seem quite normal. There are unidentified fat-like substances (\*) between the kidneys of the twins.

### *Specimen No. 3: Kitten*

(Figs. 7, 8 and 9)

The specimen was a property of the Kagoshima High School.

*External appearance* (Figs. 7 and 8). The specimen weighs about 19 gr. and the length of both bodies is about 75 mm.

In this monster the separation takes place more anteriorly than in the

case of the Specimen No. 2. This is indicated by the state of the cranium and the presence of four perfect forelegs. The left parietal bone (L. PAR) of the cranium is noticeably larger than the right (R. PAR), while the size of the left frontal (F) bone is reduced in comparison to that of the right one, thus a crooked skull is formed. The interparietal bone (I) is remarkably displaced on the left side.

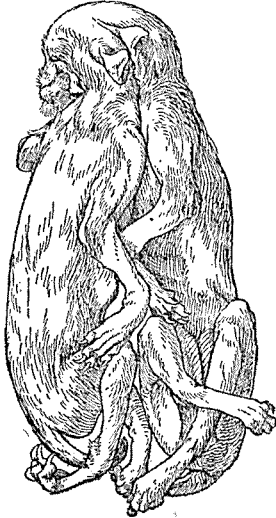


Fig. 7. Dorsal view of the kitten monster, Specimen No. 3.

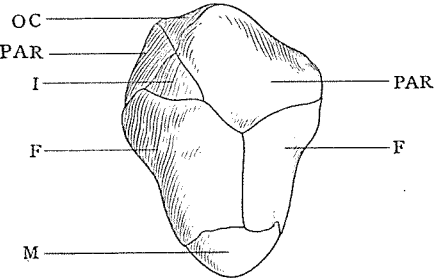
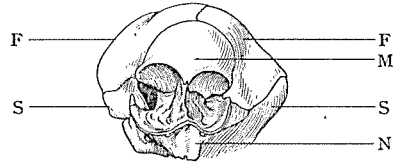


Fig. 8. Cranial and frontal views of the skull of Specimen No. 3.

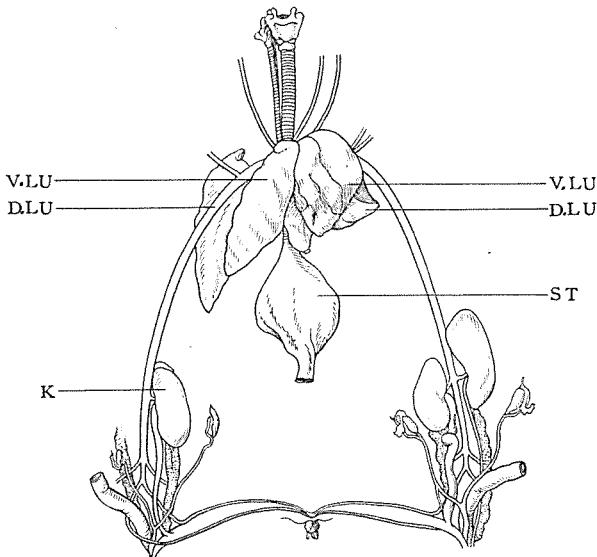


Fig. 9. Internal organs of the kitten monster, Specimen No. 3.

#### *Internal anatomy*

(Fig. 9). The alimentary canal begins with a single oesophagus which is apparently of normal size and structure. The oesophagus continues with a compound stomach (ST) like that of the Specimen No. I. The duodenum is single. Any further trace of the alimentary canal and accessory glands is impossible to determine as the specimen is very poor.



There are two perfect sets of respiratory systems and two unequal-sized hearts. The ventral heart, from which two aortae are given off, lies on the left of the median line and is apparently the predominating heart. The right aorta has offshoots of the two common carotids, a subclavian and a pulmonary artery, but the left aorta only has a common carotid and two subclavian arteries.

The right twin has only one kidney (K) which is situated on the left side of the body. The left twin has two kidneys; their relative heights are reversed. The female genital organs are complete in both bodies.

*Specimen No. 4: Pup*  
(Figs. 10, 11 and 12)

The specimen was sent to us by Mr. WATANABE of Heian-nando, Korea. The specimen is labelled as follows: Female pup born of normal four year old parents. The four other pups in the same litter were all normal. The parturition of the mother dog was considerably difficult.



Fig. 10. The pup monster, Specimen No. 4.

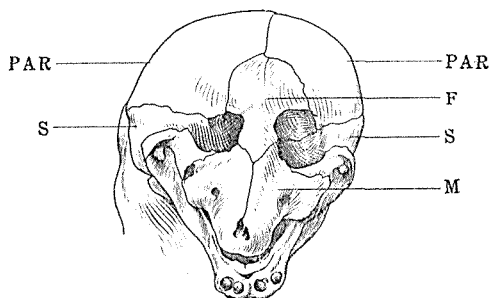


Fig. 11. Frontal view of the skull of Specimen No. 4.

*External appearance* (Figs. 11 and 12). The specimen weighs 98 gr., and the length of both twins is nearly 130 mm; the specimen is greatly shrunk because of its long preservation in formalin.

The mode of duplicity of this monster is almost like that of the Specimen No. 3. The internal constitution, however, is not quite the same. The pup monster has four perfect forelegs and a markedly ill-shaped cranium. The parietal bones (PAR) are abnormally expanded and the frontal bones (F) are greatly reduced in size. The nasal bones are almost shapeless.

*Internal anatomy* (Fig. 12). The oesophagus (ES) is single, the stomach (ST) compound, and the duodenum single. There are two livers but the dorsal one is larger than the ventral one. The bile-duct from each gall-bladder is joined by the pancreatic duct of the same side before its entrance into the duodenal wall. The dorsal liver (D.L) is divided into

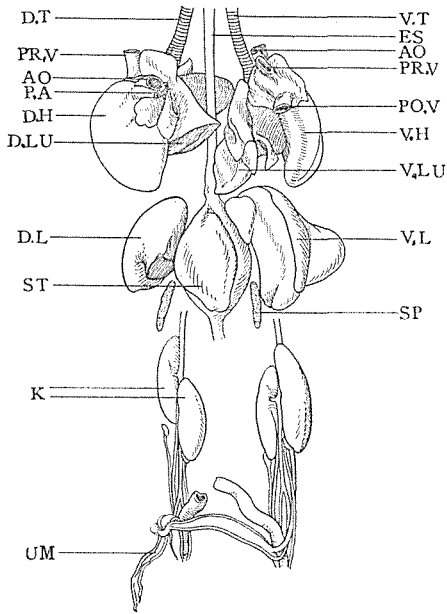


Fig. 12. The internal organs of the pup monster, Specimen No. 4. Oblique lateral view.

four lobes while the ventral liver (V. L) has two lobes. The sets of larynges, tracheae and lungs lie on the median line. The heart is also double (D. H, V. H). The urino-genital system of both members is normal except for the location of the right and left kidneys (K) of the left twin—the left being more anteriorly situated than the right.

**Duplicitas  
Anterior—Opodymus**

*Specimen No. 5: Kitten*  
(Figs. 13 and 14)

The monster was born in the city of Kagoshima in 1904 and was kept in the Kagoshima First normal School. Its weight is 41 gr., the length of the right member is 92 mm., while the left member is 77 mm. long.



Fig. 13. The opodymous kitten. Specimen No. 5.

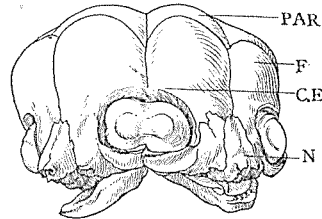
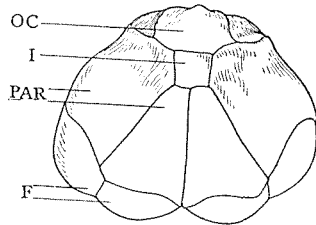


Fig. 14. Cranial and frontal views of the skull of Specimen No. 5.

*External appearance* (Figs. 13 and 14). The head and body of the monster is incompletely doubled, the right one being more developed than the left. A compound eye (C. E) is situated at the middle of the compound face.

This eye is formed by the fusion of the right eye of the left head and the left eye of the right head.

*Internal anatomy.* All visceral organs appear normal both in construction and location. The coronary arteries rise from the common heart in a normal manner and pursue a normal course. From the arch of the aorta extends a short innominate artery which is divided into two common carotid arteries and the right subclavian arteries. A detailed description of the peripheral distribution of these branches can not be given, owing to the poor condition of the specimen.

#### Abbreviation used in Figures

A.,	aorta of dorsal heart	OC.,	occipital bone
C.E.,	compound eye	P.,	pancreas
C.I.,	1st cecum	PAR.,	parietal bone
C.II.,	2nd cecum	P.A.,	pulmonary artery
C.C.A.,	common carotid artery	PO.V.,	postcaval vein
C.J.V.,	common jugular artery	PR.TV.,	precaval vein
C.L.,	common liver	R.T.,	right trachea
CN.,	cornu	RE.,	rectum
D.H.,	dorsal heart	S.,	squamosal
D.L.,	dorsal liver	S.A.,	subclavian artery
D.LU.,	dorsal lung	S.V.,	subclavian vein
D.T.,	dorsal trachea	SP.,	spleen
DO.,	descending colon	ST.,	stomach
DU.,	duodenum	SR.,	suprarenal body
EP.,	epiglottis	TH.,	thymus gland
ES.,	oesophagus	TH.C.,	thyroid cartilage
F.,	frontal bone	U.A.,	umbilical artery
I.,	interparietal bone	U.V.,	umbilical vein
I.A.,	iliac artery	UM.,	umbilical cord
K.,	kidney	UR.,	ureter
L.AO.,	left aorta	UT.,	uterus
L.T.,	left trachea	V.H.,	ventral heart
M.,	maxillary bone	V.L.,	ventral liver
N.,	nasal bone	V.LU.,	ventral lung
O.,	ovary	V.T.,	ventral trachea