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Author(s)	齋藤, 三郎
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A NOTE ON THE TWIN LARVA OF THE SALAMANDER

BY

SABURO SAITO

(With Plate I)

エゾサンショウウチの双頭畸形の一例

齋藤三郎

Among Amphibia twins of anadidymous type, in which the anterior part of the body is doubled are very rare. So far, BORN (1881), LOYER (1897), SPEMANN (1919) and LEBEDINSKY (1923) have noted and described the double-headed monster of the frog larva. In Urodela four cases in *Salamandra maculosa* were described by PORIZER (1926) and two cases in *Diemyctylus pyrrhogaster* by OYAMA (1927).

Recently a case of such monstrosity was noted by chance while examining thousands of eggs of native salamander, *Hynobius lichenatus* BOUL.. The attention of the writer was attracted to the above case and a close watch was kept on its development. A study of the internal structure was made microscopically.

At the time of discovery the larva still in the egg sac and was at the stage in which a few pair of mesoblastic somites were developed. The anterior part of the body was composed of two equally developed medullary canals in which three parts of the brain were already visible, the bifurcation going as deep as the hind brain. On the 20th day of the observation the external gills were found to be well developed on the outer sides of the body, while the one which was common to both heads was abnormally small. In the two following days a pair of eyes appeared on each head. By this time the difference

in development between the larva under observation and that of the normal control larva was not noticeable. Thereafter, the monster evidently grew inactive and the development almost stopped so at last it was killed by being put into the conserving solution of Bouin. That was on the 26th day of the observation. At the time of killing the only movement of the larva to be noticed was simply a slight bending of the body, sometimes to the left, sometimes to the right, while the normal larva at the same stage was swimming around actively outside of the egg sac.

The external view

The larva measures 0.97 cm. in length, and 19 pairs of mesoblastic somites are visible externally on the dorsal side. The anterior half of the body is bifurcated into two heads which diverge at an angle of 30° . The heads are equal in size and in development; hence a pair of eyes, a pair of nostrils and a mouth opening on each head are observed. Two pairs of external gills develop on the outer side of the body while one abnormal gill is found common to the two heads. There is a pair of minute projections of the fore-extremity which is beginning to appear. The body end is short and thick, bending a little to the left. As may be seen in Fig. 2 the opening of the cloaca is also abnormally large.

The normal larva as the control, on the other hand, measures 1.63 cm. in length; therefore it is $1\frac{1}{2}$ times as large as the monster. Besides three pairs of exceedingly well developed external gill, the balancers are also remarkable.

The internal structure

The brain in each head is of normal structure and the spinal cord from each brain comes together at about the third gill-cleft and fuse into a single cord in the tail (Figs. 3, 4, 5, 6 and 8). The eyes and auditory capsules develop normally on the outer side of each head while they are retarded in development on the inner side where the two heads come in contact with each other. Thus the two eyes are seen fused at the lens and a pair of exceedingly small auditory capsules are seen on the inner sides of the heads (Figs. 3, 4). The olfactory pit, however, is normal on each head.

The chorda dorsalis of each head meets for the first time at the region above the anus (Fig. 8). Though it could be seen that the mouth cavity opens separately in each head (Fig. 4), internally the fore-gut which comes between the two chordas, is of double structure at first and then becomes single behind the region of the third gill-cleft (Figs. 5, 6). The mesoblastic somite develop from behind the ear normally. It was remarkable to see a pair of somites between two chordas, assuming an order symmetrical to those of the outer sides (Figs. 5, 6). However, the somites of the inner sides unite posteriorly and soon disappear at the point of conjunction of the chordas (Figs. 7, 8), consequently, in the tail only the somites of the outer side are visible.

As to the pronephros and its ducts, they are normal in position as well as in development (Figs. 7, 8).

The circulatory system of the larva also shows the doubling except the heart which is normal in structure possessing a ventricle and an atrium. The right head has a perfect system of blood vessels and there is an aorta, a pair of branchial vessels and a pair of carotid vessels in it. The left head, on the contrary, lacks the right branchial vessel and the right carotid vessel while on the left hand they exist normally. Here the aorta is found normal under the chorda.

In conclusion it is worth while to remark that even on the head the duplicity of the organ is shown more clearly in the dorsal part of the body than in the ventral. The organs in the tail, however, are single in structure as in the normal larva. Anyhow the embryo above explained is defect in development as well as in the construction of the organs.

Zoological Institute,
Hokkaido Imperial University,
Sapporo, Japan

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EXPLANATION OF PLATE I

- Fig. 1. Dorsal view of the monster. ×5.
E. eye. eg. external gill. fe. fore-extremity. ms. mesoblastic somite.
- Fig. 2. Ventral view of the monster. ×5.
a. anus. M. mouth. n. nostrile.
- Fig. 3. Transverse section through the two eyes of inner sides. ×20.
cb. carotid vessel. ec. optic cup. egb. branchial blood vessel. el. lens of eye. fb. fore-brain. n. olfactory pit. pl. pigment layer.
- Fig. 4. Transverse section through the metencephalon. ×20.
ch. chorda dorsalis. hb. hind brain. ie. auditory capsule.
- Fig. 5. Transverse section through the 2nd gill-cleft. ×20.
ao. aorta. fg. fore-gut. ms. mesoblastic somite. sc. spinal cord.
- Fig. 6. Transverse section through the 3rd gill-cleft. ×20.
gc. 3rd gill-cleft. other abbreviations as before.
- Fig. 7. Transverse section through the middle part of mid-gut. ×20.
pd. pronephric duct. other abbreviations as before.
- Fig. 8. Transverse section through the hind part of mid-gut. ×20.
The abbreviations as before.

摘 要

自然界に於ける兩棲類の双頭畸形は稀である。特に有尾類の此の種の畸形の報告は比較的少ない。一九二六年四月偶然エゾサンショウウヲの双頭畸形の幼児を得たので、二十六日間飼育し、其の發育状態及び内部構造を明にし得た。全體長0.97cm.、十九對の中胚葉節を認め、其の前半身は體の正中線により左右に分割され、頸部は完全に二叉をなし、尾部は左方に屈曲す。内部構造は尾部を除き、背面の半身は諸器關全く二重性を現はし、腹面の半身は全く正常な單一構造をなす。