A MALFORMED EMBRYO OF *STENELLA COERULEOALBA*

TOSHIRO KAMIYA

Department of Anatomy, Faculty of Medicine, University of Tokyo, Tokyo

NOBUYUKI MIYAZAKI

Ocean Research Institute, University of Tokyo, Tokyo

At the present time, the dolphin drive fishery, mainly *Stenella coeruleoalba* on the east coast of Izu Peninsula is cooperatively operated at Kawana and Futo villages. At these two villages, the fishing season starts in early October and closes in January. The mean annual catch of *S. coeruleoalba* for both villages has been 5,157 individuals during the past 5 seasons (1969–'70 to 1973–'74).

In 1972, 21 schools of *S. coeruleoalba* were driven ashore at these two villages and 7,235 individuals were killed. In that season, we examined 2,299 individuals and 467 foetuses taken from 20 schools. On October 17 a school of 187 individuals was driven into the Futo Port. This was killed between the 17th and 19th of October. The composition of 115 individuals of the school is shown in Table 1. This table indicates that 60.5 percent of the females and 33.3 percent of the males in this school had attained sexual maturity, and the socionomic ratio was 0.28. In the course of field examination of those 115 individuals at Futo village, we collected 17 foetuses. One was a small malformed embryo. The mother of this embryo was 220 cm in body length and was estimated to be 8.5 years old. The age was determined by the number of opaque dentinal layers. The condition of the ovaries was not observed. Kasuya (1972) stated that females of *S. coeruleoalba* attain sexual maturity at 9 years at the length 212 cm, so that it seems that this mother was in her first or second pregnancy.

TABLE 1. SCHOOL COMPOSITION OF *STENELLA COERULEOALBA* CAUGHT ON OCTOBER 17, 1972.

Sex	Pregnant	Lactating	Resting	Mature	Immature	Total
Female	17 (22.4)	27 (35.5)	0	2 (2.6)	30 (39.5)	76
Male				13 (33.3)	26 (66.7)	39
Total						115

Figures in parenthesis indicate percentages.

The external characters observed in this embryo were the following: Body length (cranio-caudal): 9 mm; greatest breadth: 7 mm; body weight: 2.0 gr. In ventral view, the cephalic region appears to be almost normal (Fig. 1). The eye is easily identifiable and so is the maxillary area. In the dorsal half of the head there is a groove or depression that cannot be identified with certainty. The man-

dibular region is not clearly defined. The mandible is probably not developing. The upper limb bud is nearly normal on the left side (Fig. 2). On the right side, it is either not developing or in a state of abnormal formation (Fig. 4).

The abdominal region is not normal looking and, in particular, there is a string-like fold that can be the umbilical cord but it is not typical. The tail, as compared to that of a normal embryo, is too wide and placed with its tip in the oral region (Fig. 1).

In back view (Fig. 3), one can see the almost normal developing vertebrae and the segmentation. The curvature, from this aspect, is abnormally sideward. Comparing the two lateral views, one sees that, on the left side (Fig. 2), the appearance is almost normal (see above remark on mandible) but on the right side (Fig. 4), there is a mass of unidentifiable lumps of tissues.

Internal structures were observed in this embryo which was embedded in paraffin, sectioned longitudinally and serially 10 μ thick, and stained with hematoxylin and eosin for microscopical study. Also, we used an 11 mm long normal embryo of the same species for longitudinal serial sections to compare with the malformed embryo.

Fig. 5 shows an approximately sagittal section of the 11 mm normal embryo *S. coeruleoalba*. In this embryo, one clearly sees that the brain and spinal cord and all of the primordia of the cranial nerves are already present. Also, each visceral organ is quite well formed: primordial thymus, thyroid gland, lung, heart and liver with much blood, splenic primordium, gonad, primitive pancreas, mesonephros and metanephros respectively *etc.* are present.

One the contrary, in the malformed embryo which is covered with simple epithelium and the inner structure of which is mainly composed of mesenchyme cells, organ formation is extremely abnormal in comparison with the normal embryo. In the cephalic region, one cannot recognize any brain structure: there is only a non-differentiated nervous cell mass. In figure 6, the optic vesicle is cut near its center with the optic cup and the lens vesicle can be seen. The optic cup has inner and outer layers. The outer layer already presents the pigmented epithelium but the layer formation is irregular. In the thoracic and abdominal regions, we can mainly distinguish four kinds of tissue masses. Heart muscles, liver cells, neural tissue and segmental structures (Figs. 7, 8, 9). Bundle-like heart muscles with intercalated disks can be seen. The usual blood-cells accummulations were not observed. Nervous tissue is degenerated but spinal ganglion-like masses were identified and glia cells are abundant.

This case is one of the malformed embryos at an early developmental stage. A malformed embryo of *S. coeruleoalba* has been observed by Kawamura and Kashita (1971). That case was a double monster with body length of 16.8 and 17.2 mm respectively along a transverse axis. Rudimentary hind limbs in a mature individual were also reported by Ohsumi (1969) and the external development of normal embryos was described by Ogawa (1953). The normal cross-section of a 12 mm long embryo has been observed by Hosokawa (1955). Each of the above three embryos was from the same species.

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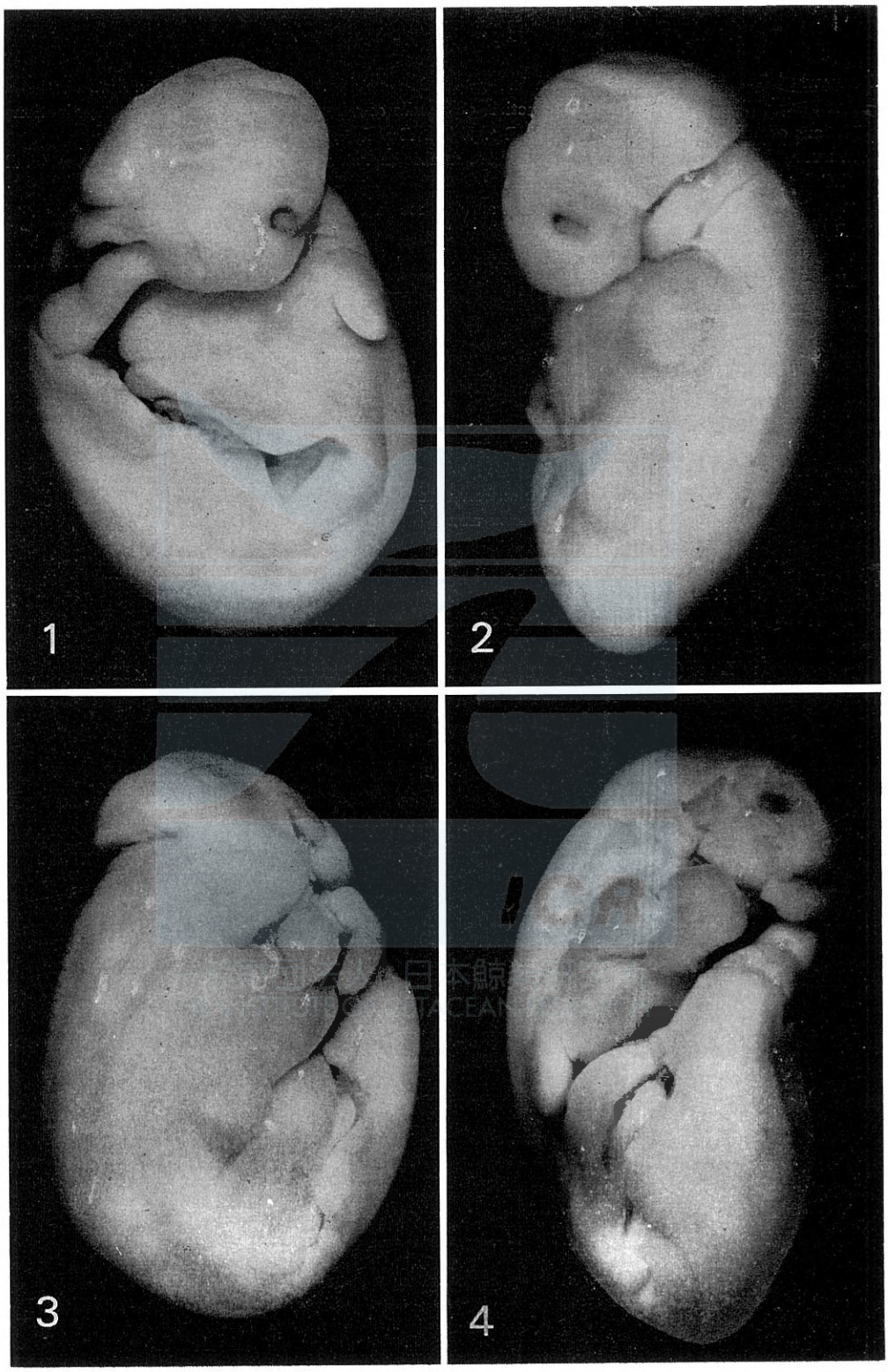
EXPLANATION OF FIGURES

Figs. 1–4. External form of malformed embryo of *S. coeruleoalba*. (ca. ×10.5).
1: Ventral view 2: Lateral view of the left side 3: Dorsal view
4: Lateral view of the right side

Fig. 5. Longitudinal median section of the 11 mm normal embryo of *S. coeruleoalba* (ca. ×10).

Figs. 6–9. Histological structure of malformed embryo of *S. coeruleoalba*.
6: Optic vesicle, L=lens (ca. ×300) 7: Heart muscles (ca. ×500)
8: Liver (ca. ×500) 9: Segmental structure (ca. ×120)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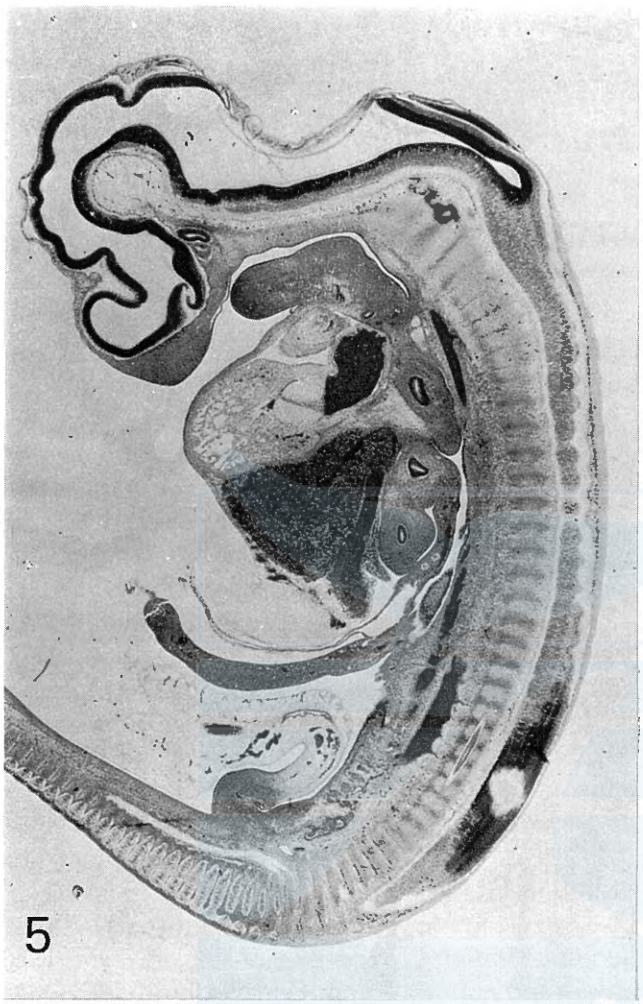
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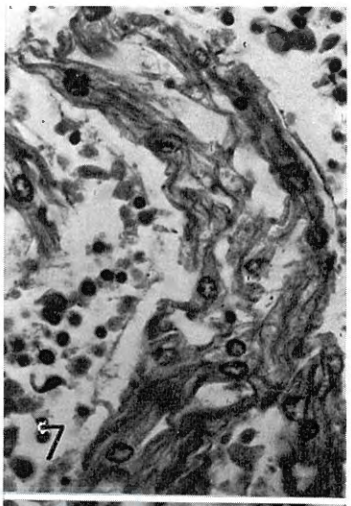
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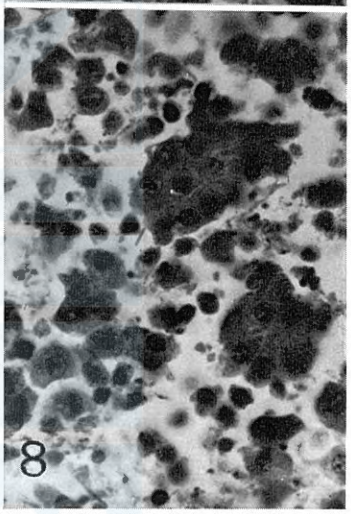
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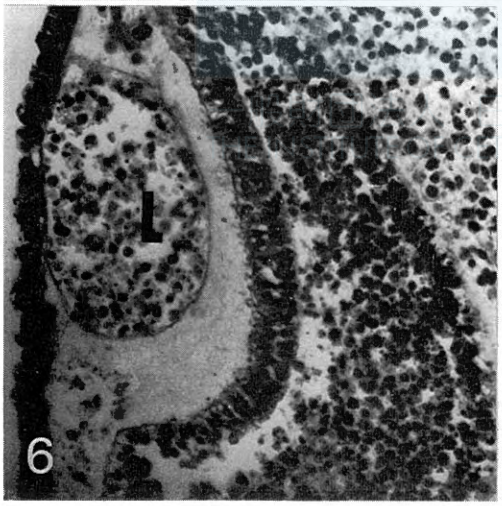
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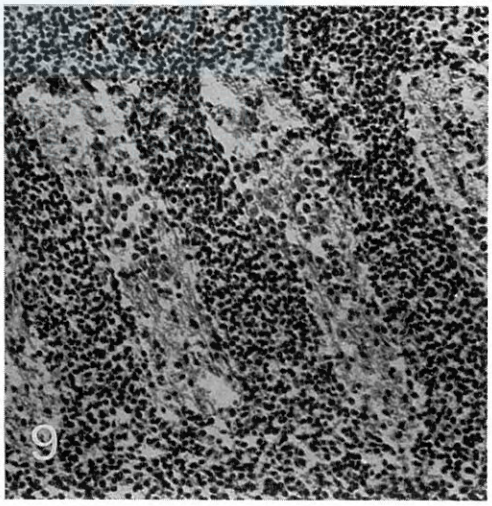
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