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Histological Observations of Siamese Twins in Coho Salmon, *Oncorhynchus kisutch*

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The occurrence of Siamese twins which are fused or conjoined and united in part has been reported in several fish species including cichlids (Huang et al., 1987), Salmonidae spp. (Robert, 1989; Bruno, 1990) and guppy (Takahashi, 1973).

The two coho salmon, *Oncorhynchus kisutch* Siamese twins, larvae connected to the same yolk sac in an otherwise normal fashion, were found in a batch of 1,806 fertilized eggs from farmed brood-fish. These Siamese twins survived for at least three weeks after yolk sac absorption (to time of examination) while the others were dead, in common with other fish species (Godolla, 1968; Bruno, 1990), as the yolk sac is absorbed. In Siamese twins examined, the yolk sac was completely absorbed and two fries were fused from their posterior part of lower jaw to anterior part of the anus. Externally a mouth, gill arches, eyes, pectoral fins and other fins of each fry were present (Fig. 1). The benthic behavior and mode of carangiform swimming of Siamese twins were noted and only the posterior portion of body is capable of wide flexure.

To confirm occurrence and sexes of conjoined Siamese twins, the coho salmon was studied histologically. For the histological observation of the internal organs, a whole body of Siamese twins was fixed in Bouin's fluid, embedded in paraffin, serially cut at 6~8 μ m in thickness and stained with hematoxyline and eosin-phloxine B solution. Histological examination revealed that the twin fry was fused in the direction of the abdominal cavity. The kidney, stomach, gut, liver and anus, however, were separately present in each twin fry (Figs. 1, 2 and 3). Particularly, sex of the twin fry were identical as ovary (Figs. 4 and 5).

Previously Hanson (1985) has described the occurrence

of separate, normal twins in the sea lamprey, *Petromyzon marinus*, however, it was assumed that in the present case the twins fry arose from a single yolk and formed fused, normal twins. In the present study, malformations such as twinning may be caused by the over-ripeness of the egg already reported by Witschi (1952) or may due to genetic variation and environmental variations suggested by Moore and Persaud (1993).

References

- Bruno, D. W. 1990. Occurrence of a conjoined twin among farmed Atlantic salmon, *Salmo salar* L. J. Fish Biol., 37, 501~502.
- Godolla, P. H. 1968. Fortpflanzungsfahige siamesische zwillinge bei *Poecilia reticulata*. Monatsschrift fuer Ornithologie und Vivarienkunde Ausgabe B., Aquar. Terrar., 15, 407~409.
- Hanson, L. H. 1985. Observation of twinning in the sea lamprey (*Petromyzon marinus*) in the laboratory. J. Great Lakes Res., 11, 549~551.
- Huang, C. M., H. T. Cheng, S. L. Chang, N. H. Chao and I. C. Lioa. 1987. Siamese twins in tilapia. J. Fish Biol., 31, 441~442.
- Moore, K. L. and T. V. N. Persaud. 1993. The developing human. 5th ed., W. B. Saunders, pp. 153~162.
- Robert, R. J. 1989. Fish Pathology, 2nd ed., London, Bailliere Tindall, pp. 153~169.
- Takahashi, H. 1973. Histological observations on Siamese twins of the guppy, *Poecilia reticulata*. Bull. Fac. Fish. Hokkaido Univ., 24, 69~75.
- Witschi, E. 1952. Over-ripeness of the eggs as a cause of twinning and teratogenesis: a review. Cancer Res., 12, 763~786.

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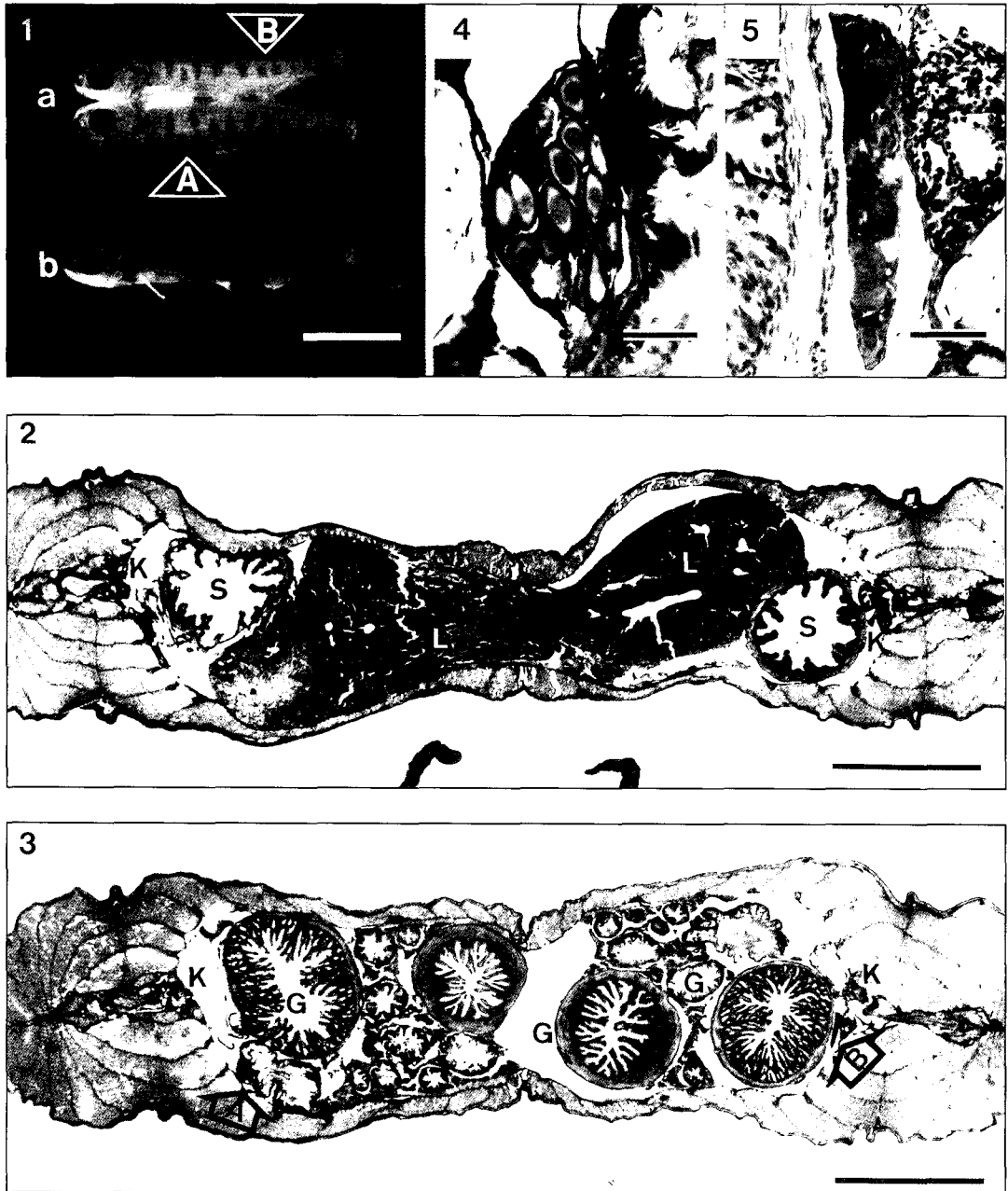


Fig. 1. Lateral views of Siamese twins (a) and normal (b) of coho salmon, *Oncorhynchus kisutch*. Arrowheads A and B indicate cross sectioned positions in Fig. 2 (A)1 and Fig. 3 (B), respectively. Bar=2.5 cm.
 Fig. 2. Cross section of Siamese twins at position arrowhead A in Fig. 3. Bar=1 mm. Abbreviation: K (kidney); S (stomach); L (liver).
 Fig. 3. Cross section of Siamese twins at position arrowhead B in Fig. 3. Note the identical ovary of Siamese twins (arrow A and B). Bar=1 mm. Abbreviation: K (kidney); G (gut).
 Fig. 4. Photomicrograph of the ovary in Siamese twins magnified arrowhead A in Fig. 3. Bar=0.5 mm.
 Fig. 5. Photomicrograph of the ovary in Siamese twins magnified arrowhead B in Fig. 3. Bar=0.5 mm.