Embryonic Development of *Tribolodon* sp. (Ukekuchi-ugui)

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The rare, undescribed cyprinid fish *Tribolodon* sp. (Ukekuchi-ugui) has been classified as vulnerable to extinction in the "Red Data Book".¹⁾ Since the initial citation of *Tribolodon* sp. by Nakamura,²⁾ little has been published concerning its ecology or life history with the exception of several papers³⁻⁶⁾ illustrating its morphology and distribution. This study describes the embryonic development of *Tribolodon* sp.

Three sexually mature fish (one female, 46.1 cm SL, 1.50 kg BW; two males, 43.3, 45.8 cm SL, 1.25, 1.45 kg BW, respectively) were collected by cast net from the artificial rapids of the Omono River, a tributary of the Mogami River, Kawanishi, Yamagata Pref., 37°54'24"N, 140°2'2"E, on 28 April, 1994. Collection site water temperature was 10.0°C. The eggs and sperm were stripped out and inseminated utilizing the dry method. The fertilized eggs adhered to the egg-collector and were incubated at 11.7°C W.T. in circulating well water. The embryonic development was observed from fertilization to larvae emergence. Development was recorded through sketches made of live and fixed (5% formalin or Bouin's solution) eggs.

The unfertilized and fertilized eggs diameters measured 2.00–2.20 mm (mean 2.09) and 2.20–2.50 mm (mean 2.36), respectively. The fertilized eggs, spherical, light yellow-green with a transparent egg membrane, exhibited a strong adhesiveness. The egg dimensions and adhesive qualities are similar to those recorded for *T. brandti*³⁾ (Sakai, unpublished).

The following temporal description is referenced back to the point of insemination: Observed blastodisk (1.5 h) (Fig. 1A); first cleavage initiated (3 h) and completed (4 hr) (Fig. 1B); second cell division completed (5 h) (Fig. 1C); eight cell stage (6 h) (Fig. 1D); 16 cell stage (6.5–7 h) (Fig. 1E); 32 cell stage (8–9 h) (Fig. 1F); morula stage (11.5–12.5 h) (Fig. 1G); early gastrula stage (22 h) (Fig. 1H). During the gastrula stage at 53 h, the blastoderm covered approximately 70% of the yolk (Fig. 1I). The blastopore closed completely and the embryonic body appeared after 72 h (Fig. 1J). A pair of otic vesicles and myomeres appeared and the embryonic body enveloped 80% of the yolk (77 h) (Fig. 1K). Increased numbers of myomeres became apparent (82 h) (Fig. 1L). Detachment of the tail tip from the comma-shaped yolk and the presence of Kupffer's vesicle along with a wriggling motion were observed (102 h) (Fig. 1M) and just prior to hatching (140 h) (Fig. 1N). Emergence from the eggs was observed 144 to

192 h after insemination. Six hatched larva ranged from 5.8 to 8.2 mm (mean 6.7) were yellowish, tadpole-shaped with no melanophores (Fig. 1O).

The observed embryonic development and larvae of *Tribolodon* sp. were similar to those described in *T. hakonensis*,^{3,7)} *T. brandti*^{3,8)} and *T. ezoe*.³⁾ The similarities in embryonic development and larvae would suggest that the larvae of *Tribolodon* sp. occupy similar habitats, interstices of river gravel for several days prior to swimming up,^{3,9)} similar to the other members of this genus.

Reported incubating durations were 120 h at 17–21°C^{3,9)} and 80 h at 15–20°C⁷⁾ in *T. hakonensis*, 120 h at 11–17°C³⁾ and 67 h at 17–21°C⁸⁾ in *T. brandti*, and 90 h at 16–20°C³⁾ in *T. ezoe*. *Tribolodon* sp. required 144–192 h for incubation. The extended incubation period is due in part to the low incubating temperature (11.7°C) utilized in this study.

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Fig. 1. Embryonic development of *Tribolodon* sp. (Ukekuchi-ugui) from the Mogami River, Yamagata Pref.

A) blastodisk stage, 1.5 h after insemination; B) 2-cell stage, 4 h; C) 4-cell stage, 5 h; D) 8-cell stage, 6 h; E) 16-cell stage, 6.5–7 h; F) 32-cell stage, 8–9 h; G) morula stage, 11.5–12.5 h; H) early gastrula stage, 22 h; I) gastrula stage, 53 h; J) close of blastopore and formation of embryonic body, 72 h; K) formation of otic vesicles, 77 h; L) myomeres increased in number, 82 h; M) tail tip detached from yolk, 102 h; N) just prior to hatching, 140 hr; O) hatched larva, 6.7 mm, 144 h.

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