

A Note on the Reproductive Ecology of the Torrent Catfish, *Liobagrus reini* (Siluriformes: Amblycipitidae)

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Torrent catfishes of the genus *Liobagrus* inhabit mainly upper streams in China, Korea and Japan (Nelson, 1984; Son, 1987). Their reproductive ecology has been reported by some authors, e.g., Uchida (1933, 1939) on spawning season, and embryonic and larval development, and Son (1987) on spawning season and sexual dimorphism, both in Korean species. Uchida (1933, 1939) reported that at spawning sites of *L. andersoni* and *L. mediadiposalis*, under boulders, a female parent was observed with an egg mass. His description suggests that the females only of these species exhibit parental care, such being rather rare in siluriforms (Breder and Rosen, 1966; Blumer, 1982). In the absence of further studies confirming (or otherwise) a female care-taking role in *Liobagrus*, more recent literature relies upon the early descriptions by Uchida (e.g., Miyadi et al., 1976; Kuwamura, 1987).

Liobagrus reini Hilgendorf, an endemic species in Japan, is distributed mainly in the middle to upper reaches of rivers from the middle of Honshu to Kyushu (Nakamura, 1963). The reproductive ecology of the species is little known, except for egg characters and the spawning season (from May to June) (Nakamura, 1963; Miyadi et al., 1976). This paper reports some aspects of the reproductive ecology of the species and suggests male parental care.

Materials and Methods

Sample collections and egg observations of *Liobagrus reini* were undertaken in the Tagiri River, a tributary of the Inabe River, Shimohira to Ageki, Hokusei-cho, Mie Prefecture, 35°10'N, 136°31'E, in June 1989 and May 1990, and the Kawaura River, a tributary of the Nagara River, Ibuka-cho, Mino-kamo City, Gifu Prefecture, 35°30'N, 137°01'E, in April and June 1990. The study sites of the two rivers were Bb-type (Kani, 1971), patchily dotted with many boulders on the pebbly river beds.

At the Tagiri River study site, spawning sites of *L. reini* were located by manually turning over the boulders. The eggs and accompanying fish, when possible, were collected and preserved in 10% formalin. Sex of the captured fish was confirmed by direct observation of the gonads, whereas that of fish which were not captured, was determined visually from the shape of the cheek and head muscle which is sexually dimorphic (Son, 1987; Mori and Nagoshi, 1989).

Since the density of *L. reini* in the Tagiri River was low, female specimens required for ovarian egg counts were collected in the Kawaura River. Standard lengths (SL) of the specimens preserved in 10% formalin were measured, and number of ovarian eggs carried by the largest-size mode counted.

Specimens examined were registered as follows: Tagiri R., NSMT (National Science Museum, Tokyo)-P 36039, a male (89.5 mm SL) and eggs, May 28, 1990; Kawaura R., NSMT-P 36040, a female (68 mm SL), June 4, 1990; NSMT-P 36041, 8 females (64.2–86.3 mm SL) (out of 19 specimens), April 24–27, 1990.

Results and Discussion

Observations on spawning sites and sex of the fish accompanying eggs.—Four spawning sites of *Liobagrus reini* were located in the Tagiri River (Table 1),

Table 1. Spawning sites of *Liobagrus reini* found in the Tagiri River

No.	Date	Number of eggs	Sex of accompanying fish	Size of boulder (cm) ¹	Water depth (cm)	Water temp. (°C)
1	June 7, 1989	ca. 150–250 ²	male ³	45 × 32	25	22
2	July 7, 1989	—	male ³	—	—	—
3	July 7, 1989	—	male ³	—	—	—
4	May 28, 1990	182	male ⁴	69 × 46	31	19

¹ Longest × shortest axes; ² estimated by partial sampling; ³ visually determined under water; ⁴ 89.5 mm SL (NSMT-P 36039; Fig. 1). Velocity of water current at the surface was less than 30 cm/sec in all cases.

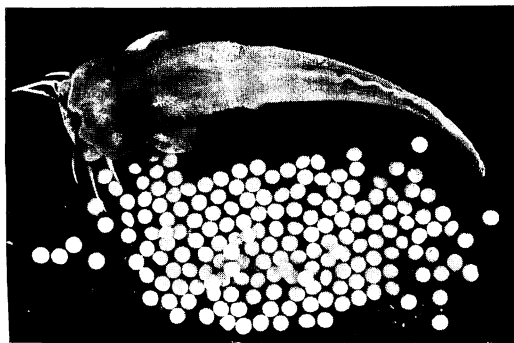


Fig. 1. Eggs and the male parent of *Liobagrus reini* (89.5 mm SL) collected from the Tagiri River, May 28, 1990 (NSMT-P 36039). Eggs originally adhered to one another before fixation.

each egg mass weakly adhering to the underside of a boulder. The eggs were yellow and covered with a transparent membrane, as described for congeneric Korean species by Uchida (1933, 1939). The diameters of the egg and egg membrane in the case (4) in Table 1 were $3.9\text{ mm} \pm 0.1$ (3.6–4.1) [mean \pm SD (range)] and 4.1 ± 0.1 (4.0–4.2), $n=30$, respectively, in 10% formalin preservation. All eggs were at the gastrula stage.

In all four cases, the egg mass of *L. reini* was accompanied by a male fish, exhibiting the secondary sexual character (Fig. 1). It is considered that the males at the spawning site were most likely guarding the eggs.

Number of ovarian eggs.—The nine females (64.2–86.3 mm SL) obtained from the Kawaura River had well developed ovaries, apparently close to maturity and spawning. The ovarian eggs clearly represented two or more size groups; e.g., in a female, 76.0 mm SL (NSMT-P 36041-2), larger egg size (mm) mean \pm SD (range, n) = 3.3 ± 0.1 (3.1–3.6, 24) and smaller, 0.7 ± 0.3 (0.2–1.4, 43). It is suggested that the eggs belonging to the largest size mode would be spawned in the current season, the mean number of such eggs being 95.6 ± 13.7 (71–107, 9). There was no significant correlation between standard length of the fish and number of ovarian eggs ($r=0.180$, $p>0.5$).

One male was found guarding 182 eggs in the Tagiri River (Table 1). Estimated from the fecundity of Kawaura River females, such eggs might have been deposited by 2 or 3 females, although the fecundity of Tagiri River specimens was not examined for confirmation of this.

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アカザ (ナマズ目: アカザ科) の繁殖生態に関する知見

渡辺勝敏

三重県田切川(員弁川水系)において5月下旬から7月初旬にかけて巨礫下で観察されたアカザの卵塊は、全4例とも性的二型の現われた雄1個体と共に見つかり、雄親による卵保護が示唆された。卵径(卵膜を除く)は3.6–4.1 mmであった。1990年

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5月28日に採集された1例では、標準体長 89.5 mm の雄が 182 粒の卵に伴っていた。岐阜県川浦川（長良川水系）産の標本 (64.2–86.3 mm SL) の孕卵数は 70–100 粒であった。雄が複数雌の卵を保護する可能性が示唆された。

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