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A case of suspected paedomorphosis in a captive Asian lentic salamander *Hynobius leechii*

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Paedomorphosis is a condition in which juvenile characteristics are retained into adulthood. It may take two forms, neoteny where the juvenile form remains even in adulthood due to the delayed development of somatic cells, or progenesis where the growth rate is fast and the development of gonads is accelerated, leading to early adulthood (Wakahara, 1996; Box & Glover, 2010). In some amphibians, including salamanders, paedomorphosis occurs depending on environmental conditions including population density, water level, competitors, habitat changes, genetics, water temperature, mutations, stress, and hormones (Sasaki, 1924; Tompkins, 1978; Moriya, 1980; Semlitsch, 1987; Voss & Shaffer, 1997 Whiteman et al., 2012; Bendik et al., 2013; Johnson & Voss, 2013).

We report here a case of suspected paedomorphosis in the Wosan salamander *Hynobius leechii*. On 15 March 2022, under local government collection permit (approval number: Goheung 2022-1, Uiryeong 2022-1), we collected ten male specimens from Jukjeon-ri, Yongdeok-myeon, Uiryeong-gun (35° 21’17’’N, 128° 16’35’’E, 79 m a.s.l.) and on 16 March 2022 ten females from Bongnae-myeon, Goheung-gun (34° 27’27’’N, 127° 28’31’’E, 34 m a.s.l.). On 16 March 2022, to induce reproduction, one male (snout-vent length, SVL 58.9 mm, tail length, TL 47.6 mm) and one female (SVL 58.4 mm, TL 49.1 mm) were placed in a vivarium (L 320 × W 180 × H 200 mm) at Ewha Womans University. The water depth in the vivarium was kept at about 10 cm so that any scattered eggs would not dry. Spawning was confirmed the next day (17 March) and on 23 March a total of 52 larvae hatched from the eggs. The hatchlings were kept in the vivarium within which sponge filters (SF2822, Amazon, China) were installed for aeration. The temperature in the rearing space was kept at approximately 15 °C. Twice weekly, the young salamanders were fed with frozen mosquito larvae (BBVSR0001, Hyangsan, South Korea) with multivitamins (PT-1861, Hagen, USA). This study was approved by the Institutional Review Board (IRB) affiliated with Ewha Womans University (EWHA IACUC 23009t). We followed the ARRIVE guideline for salamander breeding and management (Percie du Sert et al., 2020).

By 30 May, 38 salamanders had metamorphosed and left the water except for one. Thereafter, the remaining individual in the water were fed thrice weekly. The growth rate of this specimen is shown in Figure 1. At approximately 23 months after hatching (15 January 2024), external gills were still present and thin fins were visible (Fig. 2). However, the sex of the individual still could not be determined.

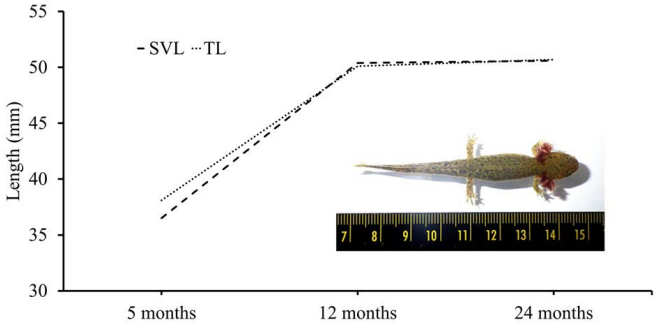

Figure 1. Changing body (SVL) and tail length (TL) in a potentially paedomorphic *Hynobius leechii* reared in captivity (August 2022 to February 2024). The salamander was 5 months old when the photo was taken.

Figure 2. The external appearance of a suspected paedomorphic *Hynobius leechii* 23 months after birth in captivity, the photo was taken on 15 January 2024

Paedomorphosis in salamanders is common in North America, but very rare in Asia (Sasaki, 1924; Okamiya et al., 2021). In addition, this is the first case of suspected paedomorphosis in an individual born and reared in captivity. Salamanders in the genus *Hynobius* usually become adults 3 to 5 years after hatching (Ento & Matsui, 2002; Kusano et al., 2006). However, it took only about 12 months from hatching for a paedomorph-like individual to become adult-sized. Denöl et al. (2005) suggested that neotenic individuals have a size similar to that of adults when they reach adult age, while progenetic individuals reach adult size long before they reach adult age. We suspect the current case to be one of progenesis, i.e. based on early growth, but it is difficult to confirm this because we do not know whether the specimen is yet capable of reproduction.

It remains unknown why this individual is paedomorphy-like. All the larvae were fed in the same way and were kept in the same environmental conditions. In previous studies, approximately equal proportions of metamorphosis and paedomorphosis were identified among offspring from paedomorphic *Ambystoma mexicanum* (Tompkins, 1978; Voss & Shaffer, 1997). In the current case, neither parent was paedomorphic, which reduces the likelihood that this case is related to intergenerational genetics. Sasaki (1924) who discovered the first case of paedomorphosis in the *Hynobius* salamander, associated it with low-temperature conditions (0–10°C) that lasted for a long period together with a rich food supply. In our study, the temperature was kept constant at a room temperature of about 15 °C, so low-temperature conditions may also be excluded as a cause.

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