Longevity in salamandrid newts – a rule, not an exception? Verified cases of Japanese Fire-bellied Newts (Cynops pyrrhogaster) reaching a lifespan of more than 40 years

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Longevity in salamandrid newts – a rule, not an exception? Verified cases of Japanese Fire-bellied Newts (*Cynops pyrrhogaster*) reaching a lifespan of more than 40 years

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Abstract: We report on verified cases of longevity in the Japanese Fire-bellied Newt *Cynops pyrrhogaster*. Two individuals obtained as adults in 1978 died in July 2008 and November 2017, resulting in an individual minimum lifespan of 33 and 42 years, respectively, possibly even longer. Another four individuals of *C. pyrrhogaster* were received in 1975 and living now for more than 47 years, with two individuals received as adults likely having reached a lifespan of 50 years already. Another adult male *C. pyrrhogaster* was obtained in 1991 and died in 2022 at an accordingly estimated age of >34 years. Previously reported lifespans for *C. pyrrhogaster* in human care were 20-25 years, with only a single report of 40 years. However, other species of *Cynops* and *Hypselotriton* are also apparently long-lived, such as *H. cyanurus chuxiongensis* (25 years), *H. orientalis* (32 years), and *C. ensicauda* (43 years). With these documented cases, the lifespan of Fire-bellied Newts is exceeded only by few other species of Caudata, such as *Andrias japonicus* (70 years), *Cryptobranchus alleganiensis*, *Salamandra salamandra* (>50 years), and *Proteus anguis* (100 years). Our report thus indicates that decades-long lifespans in salamandrid newts, viz. substantial longevity, might be rather common and could be considered a rule, not an exception.

Keywords: Amphibia - Caudata - Salamandridae - *Cynops* - husbandry - maximum age.

INTRODUCTION

Asian Fire-bellied Newts of the genus *Cynops* Tschudi, 1838 were imported to Europe and North America at least since the 1950s (Axelrod, 1958) for the pet trade and anecdotal reports mention them as having been present in almost every small pet shop at certain periods. Among the ten species currently recognized (Frost, 2022), the Japanese *Cynops pyrrhogaster* (Boie, 1826) apparently was most prevalent in the commercial trade of these newts when it started. As a result, thousands of these newts were kept in small aquaria by teenagers and adults in Europe and North America – and many of them for long time. Various internet reports by keepers indicate that *Cynops* species may reach a remarkable individual age. However, most reports are anecdotal in character only and hard to prove. In the following, we report three verified cases of longevity of *C. pyrrhogaster*.

MATERIALS AND METHODS

The age records reported herein are both based on our own findings and that of colleagues. Identification was based on photographs and morphological diagnostic characters (details given in the results). Measurements were taken with a digital calliper in preserved specimens and a measuring rule in living individuals and rounded to the nearest 1.0 mm. Deceased individuals were deposited in the following zoological collections: Hessisches Landesmuseum Darmstadt (HLMD) and the Museum of Comparative Zoology, Harvard (MCZ).

RESULTS

The first case: In the year 1978, as a teenager at the age of 15, palaeontologist Gottfried Klappert, purchased two

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adult Fire-bellied Newts in a small pet shop at Kelkheim (Taunus), a small city west of Frankfurt, Germany. These two individuals were kept in a small paludarium and mainly fed with earthworms (Lumbricidae) at his home with one dying in July 2008 and the other on 2 November 2017. Both individuals were preserved and donated to the zoological collection of the Hessisches Landesmuseum Darmstadt.

Both specimens are adult females in a rather poor state of preservation (Fig. 1A), as they were not found promptly following their deaths in the paludarium. The smaller individual which died in 2008 (HLMD-RA-3213) has a snout-vent length of 48 mm and a total length of 89 mm, the larger and older individual (HLMD-RA-3212) has 55 mm snout-vent length and 101 mm total length. Despite the poor state of preservation, both specimens were identified as *C. pyrrhogaster* based on the following morphological characters: rugose dorsal skin, elevated vertebral ridge, and prominent, elongated parotoid glands, which distinguish them from *H.. orientalis*.

Considering that both individuals were fully adult when bought in the pet shop in 1978 and maturity in *C. pyrrhogaster* normally is reached after 3 years from hatching (Franzen & Franzen, 2005; Sparreboom, 2014), the individual lifespan of the two specimens considered is at least 33 and 42 years, respectively, possibly even longer.

The second case: Four individuals of *C. pyrrhogaster*, two adult females of unknown age and two male juveniles, were received in 1975 by one of the authors (H. Janssen) and have been kept alive to the present day. These individuals have thus lived more than 47 years, with the two individuals received as adults likely having already reached a lifespan of 50 years. While the females stopped laying eggs many years ago, the males are still showing reproductive behaviour (Fig. 1B). Current total length of the two males is 108 and 111 mm, respectively, that of the two females is 139 and 169 mm, respectively[1].

The third case: One author (M. Gage) received an apparently wild-caught adult male *C. pyrrhogaster* from a Massachusetts (U.S.A.) pet store in 1991 that died in human care on 6 February 2022 (specimen donated to the Museum of Comparative Zoology, Harvard; MCZ:Herp:A-153484; Fig. 1C), at an accordingly estimated age of >34 years with 59 mm snout-vent length and 101 mm total length.

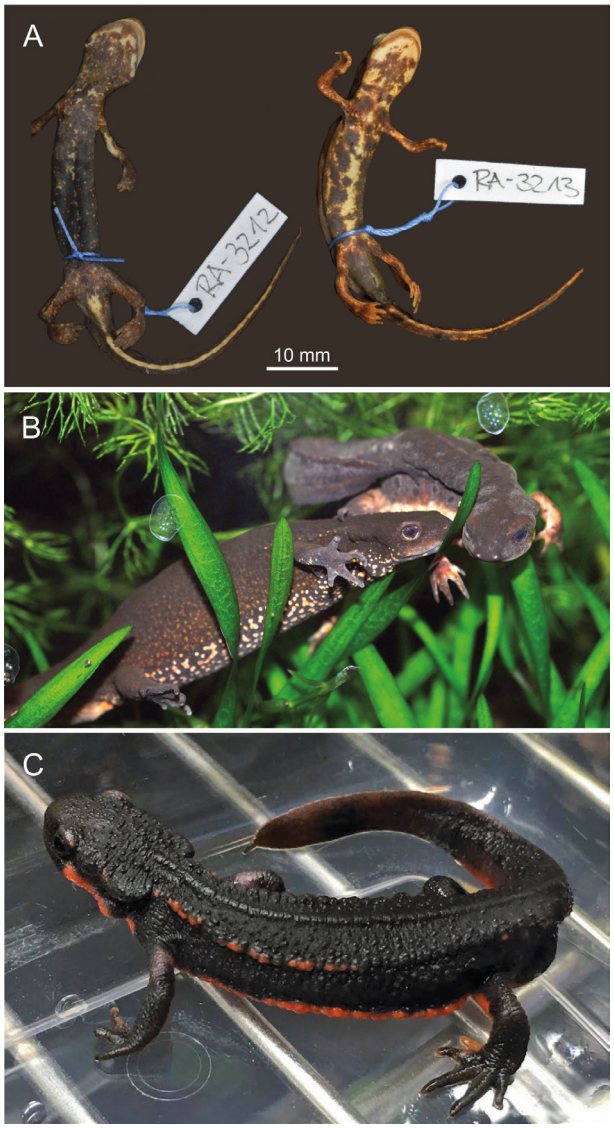

Fig. 1. Individuals of long-lived *Cynops pyrrhogaster*. (A) Preserved female specimens HLMD-RA-3212 and HLMD-RA-3213 in ventral views, having reached a lifespan of at least 42 and 33 years, respectively. (B) Two individuals (still alive) kept by H. Janssen which reached a lifespan of at least 47 years already. (C) Male MCZ:Herp:A-153484 in life, having reached a lifespan of at least 34 years.

DISCUSSION

While age records of 20-25 years are not exceptional for *Cynops pyrrhogaster* (Sparreboom, 2014) and even historical literature reports refer to 25 years under human care for the species (Wolterstorff, 1928; Senning, 1940), there are only few documented cases of Fire-bellied Newts exceeding an individual age of 40 years (Bogaerts, 2013). Skeletochronological studies estimated the maximum age of wild-caught female *C. pyrrhogaster* to be 16 years (Marunochi *et al*., 2000).

With our documented cases of more than 47 years of age, the lifespan of *C. pyrrhogaster* is exceeded only by few

[1] Note added in proof: While this article was in press, one of the male *C. pyrrhogaster* reported on in the second case, received in 1975, had died on 13 January 2023 after 47 years of keeping. This individual will be deposited in the HLMD collection (HLMD-RA-3237).

other species of Caudata (see summary by Warburg, 2007). Among them: *Andrias japonicus* (Temminck, 1836) reaching 70 years (Schneider, 1932), or more than 60 years in human care (Nickerson, 2003), *Cryptobranchus alleganiensis* (Sonnini de Manoncourt & Latreille, 1801) reaching 55 years in human care (Nigrelli, 1954), and the record holder *Proteus anguis* with 100 years in human care (Aljancic, 1993). The freeze-tolerant *Salamandrella keyserlingii* Dybowski, 1870 represents a special case of longevity, with a thawed individual reported to have emerged alive from permafrost soil after 90 ± 15 years (Aubert, 2002).

Within the family Salamandridae, the maximum documented lifespan of *C. pyrrhogaster* is only equalled by *Salamandra salamandra* (Linnaeus, 1758), kept for more than 50 years (Böhme, 1979). However, other species of *Cynops* and *Hypselotriton* (formerly also in *Cynops*; see Dubois & Raffaëlli, 2009) are also apparently long-lived. *Hypselotriton cyanurus chuxiongensis* (Fei & Ye, 1983) lived in human care for 25 years (Ke Jiang, Chengdu Institute of Biology, pers. comm.), *H. orientalis* (David, 1873) (1 male, 8 females) has been kept alive for 32 years by one author (H. Janssen), and *C. ensicauda* (Hallowell, 1861) for 43 years by another keeper (Sergé Bogaerts, The Netherlands, pers. comm.). Longevity has further been documented in the genus *Tylototriton*, with *T. ziegleri* Nishikawa, Matsui & Nguyen, 2013 having reached an estimated age of at least 23-28 years (Ziegler *et al*., 2018).

Our report indicates that decades-long lifespans in salamandrid newts, viz. substantial longevity, might be rather common and could be considered a rule, not an exception.

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