A terrestrial viviparous salamander into water: notes on the unusual larval aquatic development in *Salamandra lanzai*

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SALAMANDRA lanzai (Amphibia, Salamandridae) is a montane species present in a limited area of SW Cottian Alps, in Italian and French territories (Andreone et al. 1999; Andreone & Sindaco, 1999; Miaud et al., 2001). This salamander lives at comparatively high altitudes (from 1200 to about 2800 m), and shows several adaptive characters to the montane environment. Among these adaptations are the black colouration and aplacentar viviparity (Wake, 1993; Blackburn, 1994): after a long pregnancy period (at least three years according to our unpublished data) the

Figure 1. Aquatic larva of *Salamandra lanzai* born in captivity and reared in water until metamorphosis.

females give birth to a few fully developed salamanders already adapted to the terrestrial life. In this aspect *S. lanzai* is similar to *S. atra* and to *Mertensiella luschani* (Özeti, 1979; Griffiths, 1996). Other species belonging to the genus *Salamandra* (e.g., *S. salamandra*, *S. corsica*, *S. algira*) give usually birth to aquatic larvae, although in some high altitude populations (e.g. those belonging to the subspecies *S. s. bernardezi*, and possibly to *S. corsica*) it is not uncommon that there is a tendency towards 'terrestrial viviparity' with the parturition of terrestrial juveniles. On the other hand, according to current knowledge, free aquatic larvae of *S. lanzai* and *S. atra* (as well as *Mertensiella luschani*) have never been observed in nature, and thus we argue that the parturition of terrestrial salamanders is the 'norm' for these species.

We here report the case of an induced aquatic larval development in captivity: during a study of the species' fecundity we kept for some days in a terrarium some pregnant females captured in Germanasca Valley (NW Italy, Turin Province, altitude 1550 m; co-ordinates not given for conservation reasons). One of the females (captured on 3rd June 2001) gave birth prematurely to two young on 8th June. They still had very developed external gills: in the attempt to save them from death they were put into water (in a small aquarium). They immediately turned out to swim and carried out an aquatic life, being in this very similar to larvae of *S. salamandra*. Besides the external developed gills (which were anyhow laminar), they also showed several other larval characters, such a laterally flattened tail, labial lobes, and thin-translucent skin (Fig. 1). The two larvae were fed with *Chironomus* larvae and small earthworms, and metamorphosed on 25th June, becoming terrestrial after an aquatic permanence of 17 days. Two more salamanders were deposited by the same female on 12th June, but they died just after parturition, due to the fact that they were not immediately detected in the terrarium. This is the first report of aquatic development of *S. lanzai* larvae, and stresses therefore the evolutionary and adaptive meaning of terrestrial viviparity. This is confirmed by a similar case of 'captive-induced' aquatic larvae for another viviparous and montane *Salamandra* species (*S. atra*) (Sauer, 2001) In both these cases we interpret the aquatic life and larval development as a consequence of premature birth due to captivity, and we argue that this phenomenon is unusual and unlikely to occur in the natural environment.

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