

**AESTIVATION SURVIVAL IN SOME TURKISH *ALBINARIA* SPECIES
(GASTROPODA PULMONATA: CLAUSILIIDAE)**

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Overleving van uitdroging door enkele Turkse *Albinaria* soorten

Albinaria caerulea calcarea, *A. lerosiensis* en *A. anatolica* blijken onder kunstmatige omstandigheden een periode van minstens 9 tot 13 maanden zonder water te kunnen overleven. Dit is aanzienlijk langer dan de 4 tot 5 maanden lange droogteperiode gedurende de zomer in hun natuurlijke omgeving.

The Mediterranean climate of southwestern and southern Turkey is characterized by a hot and dry period lasting from about May to October. For example, in Kusadasi on the western coast, the average monthly total rain, 34 mm in April and 24 mm in May, goes down to 5 mm in June, and then to 1 mm in each of the months July and August. The average goes up to 15 mm in September and then to 56 mm in October (Göney, 1975). This is followed by a much rainier period lasting until April of the following year. More or less the same pattern is observed at other places along the southwestern and southern coasts. The land snails that inhabit these places spend about five months of the year in aestivation. Many species aestivate under the

rocks or buried in soil, where they obtain protection from the direct heat of the sun. But, some, including many species of *Albinaria* (Pulmonata: Clausiliidae), aestivate on exposed surfaces of rocks, sometimes fully in the sun.

How long can the snails adapted to the dry Mediterranean summers survive in dormancy under natural conditions? To offer a partial answer to this question, I report the aestivation survival of five individuals of *Albinaria* for up to about 13 months partly indoors in an artificial environment. Although this was not a planned, controlled experiment, the following conditions applied to all of the specimens. The specimens

were stored in plastic bags at room temperature and humidity away from sunlight either in the dark or exposed to intermittent artificial lighting. During the year the temperature of the room where the snails were kept varied between about 17-24 °C. In the spring and the summer, the humidity was maintained around 50% using a dehumidifier, while during the rest of the year it naturally fell below 50%. To rehydrate a snail I sprayed its shell with water and then partially covered it with water in a small dish.

The accounts of the specimens are as follows.

Albinaria caerulea calcarea (Boettger 1878): I collected several specimens on 3 August 2000 at a location near Kusadasi (Örstan, 2001). On 4 July 2001, while examining the lot for the first time, I found one adult shell whose aperture was partially covered with dried slime. I wetted the shell and about five hours later the snail had started crawling. This specimen had probably become dormant sometime in May 2000 and remained so for about 13 months. Before I killed it, the snail remained active for 44 days and fed on the algae covering a small rock.

Albinaria lerosiensis (Pfeiffer 1841): I collected two lots of this species on 4 August 2000 at two stations located northwest of Kusadasi (Örstan, 2001). On 8 July 2001, in one of the lots I found one adult that had lost the bottom and the columellar walls of its aperture. The clausilial plate was slightly raised and the remaining cavity of the aperture was filled with dried foam-like slime. I suspected that the snail was alive and put the shell in water. Six hours later the snail had started crawling. Before I killed it, this snail remained active for 40 days, fed on the algae on a rock and partially repaired its aperture. I was able to revive two more snails from the second lot. These three snails had also survived in aestivation for about 13 months.

Albinaria anatolica (Roth 1839): Francisco Welter-Schultes collected several specimens of this species on 21 September 1998 at a location between the towns of Kas and Demre in southern Turkey (Neubert et al., 2000). On 4 March 1999, I revived one adult snail after at least a nine-month aestivation (assuming that the snail

had not been broken its dormancy in September 1998). This snail remained alive for several months.

The total time these snails survived without getting liquid water from the outside, up to 13 months, was considerably longer than the usual four to five months a year that they endure. That they had not been injured by their unusually long aestivation was indicated by their ability to quickly revive and to carry on normal activities, such as feeding and shell repair, for many days. We could consider these snails' aestivation mechanism to be an over-adaptation in the sense that it enables them to survive for a period much longer than an average dry summer. This is possible probably because the aestivating snails metabolize at a very low rate (Schmidt-Nielsen et al., 1971; Withers et al., 1997), and consequently, their metabolic reserves can last a long time. In the long run, this over-adaptation must be an indispensable safety mechanism, because, without it, one unusually long dry period lasting, for example, seven months would kill all the snails.

Literature

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