

Checking snails – pupils as snail watchers

Katharina Jaksch¹, Gabriele Baumgartner², Elisabeth Haring¹,
Helmut Sattmann³

¹Central Research Laboratories, Natural History Museum Vienna, Vienna, Austria

²GRg 13, Vienna, Austria

³Zoological Department, Natural History Museum Vienna, Vienna, Austria

katharina.jaksch@nhm-wien.ac.at

Introduction: The Craven Door Snail (*Clausilia dubia*) is a rock-dwelling clausiliid and known for its variable external appearance. Accordingly, different morphological forms and subspecies have been described, but the biological background of those supposed taxa is uncertain (Nordsieck, 2002; Jaksch, 2012). So far, only few data are available on the biology of this species (e.g., Nordsieck, 2005; Maltz and Sulikowska-Drozd, 2008) and only few data exist on close relatives (e.g., Maltz and Sulikowska-Drozd, 2012; Sulikowska-Drozd and Maltz, 2012; Szybiak et al., 2015). Therefore, all information on the life cycle of *C. dubia* is of high scientific interest. Furthermore, taxonomically relevant differences in size, shell shape, and ribbing might be genetically and/or environmentally linked. We hypothesise that if there is some environmental influence on shell traits, this might become apparent under altered conditions. To test this, we planned as the first experiment to rear and breed different morphological forms under the same laboratory conditions. Since for this experiment, plenty of snails have to be observed, pupils were involved as Citizen Scientists.

This project was started in 2014 in cooperation with secondary school students of the GRg 13 Wenzgasse, Vienna, and the Natural History Museum of Vienna (NHMW) (Figure 1). Besides conducting all the necessary work, the students also raised their own questions, made careful observations, and recorded important information. This included not only shell characters but also observations of reproduction biology like clutch size, hatching time, duration of development, and life span. After 2 years of rearing and breeding, first fundamental results on reproductive biology can be reported.

Methods: Subadult snails (estimated age: 4 months) were collected from different populations in the Schneeberg region (Lower Austria). Students of the 6th and 7th grade (12–13 years old) received ~200 door snails kept in small terrariums. The students were instructed regarding the conditions under which the animals should be kept by the scientists of the NHMW and by their biology teacher, who supervised the onsite procedures in the school. Regularly, several times per week, the boxes were cleaned, snails were fed (with lettuce and carrots), and any conspicuities were documented. Each time, all boxes were inspected for eggs and/or clutches. Eggs per clutch were counted,

protocolled, and transferred into separate breeding boxes. The time until hatching, the hatching itself, and finally the growing of the hatchlings were monitored, described, and documented by reports and images.

Results: Altogether 420 eggs were yielded from the generation caught in the wild. Of the F1 generation, 228 snails were successfully reared to adult stage. At the first glance, the offspring did not differ from parental snails in size, shell shape, and ribbing, but detailed measurements will be necessary to statistically test any differences. Besides the establishment of feasible settings for successful breeding of *C. dubia*, new data about the species' biology were gathered by the students: The eggs are partly calcified with visible calcium carbonate crystals on the surface (Figure 2). Size of egg clutches ranged from 2 to 8 eggs (average 3.8). Eggs were laid during the whole period of observance (September to September), and it takes 11–19 days until hatching. In all these parameters (size of clutches, seasonality, and duration until hatching), slight differences between populations/morphotypes were observed. Yet, due to the still small sample size, statistical significance has not been tested. Time from hatching until reaching adult stage (as determined by a certain size and form of the aperture) was 252 days on average. The parental generation of the studied snails reached an age up to 3 years.

Discussion: This was the first attempt to obtain data on door snail taxonomy and biology with substantial involvement of pupils, and this pilot study can be regarded as very successful. First results about basic biological data of *C. dubia* have been gathered by the students. It has to be underlined that information on the biology of this species was scarce. Maltz and Sulikowska-Drozd (2008) described the knowledge on life cycles of *C. dubia* as “unknown” in the field and “fragmentary” from laboratory observations. They reported that the species was oviparous and egg sizes were determined. According to our results, clutch sizes are relatively small compared with other clausiliid species. Incubation time until hatching is within the range of other clausiliids, but longer than in *C. pumila*. Development seems to be relatively slow compared with other species (Maltz and Sulikowska-Drozd, 2008). Welter-Schultes (2012) mentioned that epiphytic lichens and algae are the main food of *C. dubia*. This kind of nutrition was not available in our experiment, but it is noteworthy that we could successfully rear the animals with lettuce and carrots, which indicates that the food spectrum might be wider in nature.

This pilot study provided us with some key data on reproduction, although it has to be considered that the laboratory conditions surely deviate to a certain degree from natural ones. At first appearance, the results did not show any environmental influence on shell characters, but this question has to be evaluated in upcoming experiments analysing more snails and using also individuals of the F2 generation. Also, observations on egg and clutch sizes as well as hatching behaviour will be statistically analysed when more data are available. In addition, food preferences will be tested in further experiments.

Conclusion: The success of this study was due to the strong commitment of the pupils. This was demonstrated in a joint public presentation of the young scientists together with the researchers of the NHMW and documented in a survey article of the supervisors of the project (Jaksch and Baumgartner, 2015). A great benefit was the particular experience of the biology teacher in breeding of snails. Recently, we have adapted the methodological approach according to our experience gained in this pilot study. We plan to extend the experiments including more students and snails. In addition to the ongoing breeding experiment, snail pairs will be handed out to students who will monitor them at home. In general, all observations will be documented in more detail.

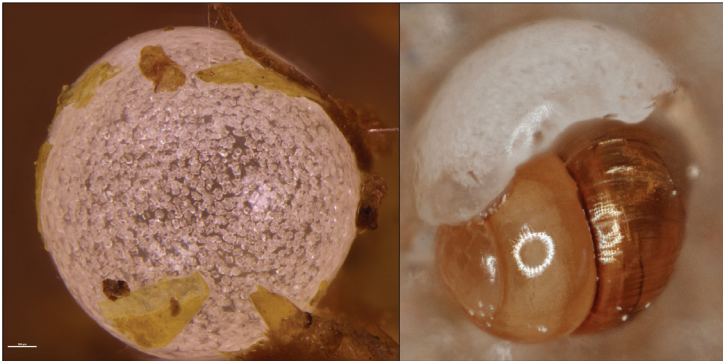


FIGURE 1: *Clausia dubia* egg and hatchling; photos: O. Macek / K. Jaksch



FIGURE 2: Pupils of GRg Wenzgasse involved in the snail study; photo: G. Baumgartner

Keywords: rearing, reproduction biology, shell characters, citizen scientist data, *Clausilia dubia*

Acknowledgements

We are grateful to all pupils involved in this project for their commitment and to the director of the GRg 13, Andreas Paseka, for his backing. We also thank Julia Schindelar and Oliver Macek for preparing and arranging facilities for snail keeping.

REFERENCES

- Jaksch, K. (2012). Phylogeographie und Unterartklassifikation von *Clausilia dubia* Draparnaud, 1805 im östlichen Österreich (Gastropoda: Pulmonata: Clausiliidae). Diploma thesis, University Vienna, Vienna.
- Jaksch, K., and Baumgartner, G. (2015). *Citizen Scientists – Schülerinnen und Schüler werden zu Schneckenforschern. Das Naturhistorische*. Vienna: Universum Magazin, 8–9.
- Maltz, T. K., and Sulikowska-Drozd, A. (2008). Life cycles of clausiliids of Poland – knowns and unknowns. *Ann. Zool.* 58, 857–880. doi: 10.3161/000345408X396783 PMID:NOPMID
- Maltz, T. K., and Sulikowska-Drozd, A. (2012). Life history of *Alinda biplicata* (Montagu, 1803) (Gastropoda: Pulmonata: Clausiliidae) based on five-year laboratory observations. *Ann. Zool.* 62, 789–807. doi: 10.3161/000345412X659803 PMID:NOPMID
- Nordsieck, H. (2002). The subspecies classification of *Clausilia dubia* DRAPARNAUD (Gastropoda: Stylommatophora: Clausiliidae), a critical revision. *Mitt. Dtsch. Malakozool. Ges.* 68, 37–44. doi: NODOI PMID:NOPMID
- Nordsieck, H. (2005). Mating biology of Clausiliidae. *Mitt. Dtsch. Malakozool. Ges.* 73/74, 29–34. doi: NODOI PMID:NOPMID
- Sulikowska-Drozd, A., and Maltz, T. K. (2012). Reproduction of *Balea (Pseudalinda) stabilis* (L. PFEIFFER, 1847) (Gastropoda: Pulmonata: Clausiliidae) kept under laboratory conditions. *Folia Malacol.* 20, 73–79. doi: 10.2478/v10125-012-0007-1 PMID:NOPMID
- Szybiak, K., Gabala, E., and Leśniewska, M. (2015). Reproduction and shell growth in two clausillids with different reproductive strategies. *Biologia* 70, 2015. doi: 10.1515/biolog-2015-0076 PMID:NOPMID
- Welter-Schultes, F. (2012). *European Non-Marine Molluscs: A Guide for Species Identification*. Göttingen: Planet Poster Edition.