

Initial considerations on the Würmian Tardiglacial malacological records at Dalmeri rockshelter (Grigno-Trento)

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ABSTRACT - The structure of the mollusc fauna of the Würmian Tardiglacial Alleröd coming from the Early Epigravettian stratigraphy, shows different occurrence of specimens per m², both during the periods of light or strong anthropization or inside the excavated area. These differences might be connected with human disturbance in the rockshelter. The land snails have been studied according their biogeography and some biological and ecological aspects. We can observe several colonizations during successive and short phases. The Mollusc assemblages suggest a woodland environment with a constant presence of broadleaf trees and conifers, which sometimes alternatively prevail. A period of aridity is present in Lev.14-14a.

Key words: Riparo Dalmeri; Würmian Tardiglacial; Mollusc assemblages; Colonisations; Palaeoenvironment

Parole chiave: Riparo Dalmeri; Tardiglaciale würmiano; Malacofauna; Colonizzazioni; Paleoambiente

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The malacological findings were collected during excavations carried out in 1991-1993 and regard the stratigraphic sequence known at that period, between Lev.3 and Lev.18 (370cm depth). To be more precise, they refer to the final phase of the Würm period, interstadial of Alleröd, dated Early Epigravettian Culture. General details regarding the orogeographic position, the aspects of the anthropic settlement of Dalmeri rockshelter as well as information on the surrounding area, are dealt with in other published works (DALMERI & LANZINGER, 1991,1992; BASSETTI & DALMERI, 1995; CASSOLI *et al.*, 1995). In particular, it should be noted that the levels mentioned refer to the stratigraphy in the DALMERI & LANZINGER works (1991). The frequency of Mollusca in the stratigraphy (Fig.1) is sporadic in the older levels; it is still low between Lev.14, 14a and 13 which show strong anthropization. There is a significant increase of species and specimens in Lev.12 and 11-12 where anthropization is lower. These are only general indications and are as yet incomplete in comparison to other cases that are well documented (GIROD, 1997) due to the fact that between Lev.11 and 3, the presence of Mollusca is not very frequent even though anthropization is weak or completely missing. Other factors such as the characteristics and the accumulation time of earth and rock materials in the stratigraphy must also be

considered. As for the different frequency within the excavation grids (spatial distribution), we can observe that the areas near the rock wall (# O) contained the highest density of Mollusca, amounting to 33 specimens per square metre, while the areas further away from the rock wall between 2.5 and 3.0m (# L) show a lower density, with 1.16 specimens per square metre. The site next to the rock wall is rich of accumulated and well preserved mollusc fauna. 24 species were identified and 755 specimen were found in all:

1. *Cochlostoma henricae* (Strobel)
2. *Abida secale* (Draparnaud)
3. *Discus rudersatus* (Férussac)
4. *Discus rotundatus* (Müller)
5. *Aegopis gemonensis* (Férussac)
6. *Aegopinella* cfr. *minor* (Stabile)
7. *Oxychilus* cfr. *draparnaudi* (Beck)
8. *Euconulus fulvus* (Müller)
9. *Cochlodina laminata* (Montagu)
10. *Charpentiera itala* (G.v. Martens)
11. *Charpentiera stenzii* (Rossmässler)
12. *Macrogastera lineolata* (Held)
13. *Macrogastera plicatula* (Draparnaud)
14. *Macrogastera asphaltina* (Rossmässler)
15. *Clausilia parvula* Férussac
16. *Clausilia dubia* Draparnaud

17. *Clausilia cruciata* Studer
18. *Clausilia pumila* Pfeiffer
19. *Neostyriaca corynodes* (Held)
20. *Trichia* cfr. *leucozona* (Pfeiffer)
21. *Helicodonta obvoluta* (Müller)
22. *Helicigona illyrica* (Stabile)
23. *Helicigona cingulata* (Studer)
24. *Causa holosericum* (Studer)

These species were studied in various ways: biogeography, ecological aspects, calcium-dependence, biological form, faunal association (Tab.1). It is often possible to confirm the opinions expressed by comparing the data obtained.

A temporary colonization of Lev.17 regards *Discus ruderatus*, followed by further phase of colonization in Lev.16 and 15 of species including the "mountain" *Clausilia dubia* and *Clausilia cruciata*. A tundra woodland environment can be hypothesized with a *Betula*, *Rhodoreto-Vaccinetum* and *Mugeto-Rhodoretum* habitat and with a very cold climate. Species that live in a woodland environment such as *Cochlodina laminata*, *Charpentieria itala*, *Charpentieria stenzii*, *Macrogastra lineolata*, *Helicodonta obvoluta* are also present. This means that around 11260 ± 100 BP the mollusc fauna included many elements and that the chorologic categories, including Holarctic, European, Central European, Central-Eastern European, Central-Southern European, Alpine-Apennine and Eastern Alpine species, confirms the central position of the Sette Comuni Plateau in the Prealpine Italian complex. This area was an ideal habitat for species already present in the surrounding regions after the Würm III (FORCART, 1966). A third phase of colonization follows in Lev.14 and 14a with *Cochlostoma henricae*, *Abida secale*, *Macrogastra asphaltina*, *Clausilia parvula*, *Neostyriaca corynodes*, *Helicigona cingulata*; as well as *Discus rotundatus* and *Oxychilus* cfr. *draparnaudi*, Europeo-Mediterranean species and the Alpine-Carpathian *Causa holosericum*. In Lev.12 and 11-12 *Aegopinella* cfr. *minor*, *Euconulus fulvus*, *Clausilia pumila*, *Trichia* cfr. *leucozona* can be added to these totalling 21 species that are simultaneously present. The environment appears to have evolved considerably and presents a variety of microniches and microenvironments ideal for many species. This ideal situation was not founded in the higher stratigraphic levels (from Lev.11 to 3) even though in Lev.9-10 and 9 the presence of *Aegopis*

gemonensis and *Helicigona illyrica* confirms a last phase of colonization.

In mollusc habitat, the stony-soils and the stony/broken-up soils species are present and confirm the rocky and crumbly nature of the substrata. The strictly open - country species are not found in the stratigraphy; hypothetical influences and connections with the Marcèsina grassland plains overlooking the Dalmeri rockshelter (MARTELLO, 1992) can be therefore be excluded. A strip of more or less dense woodlands between Marcèsina and the Dalmeri rockshelter area probably acted as a barrier to the open-country mollusca.

We can also note that in the mollusc assemblage structure, the woodland association is predominant with the exception of Lev.10, 6 and 5 where the stony-soils species are more abundant. In particular, various woodland species are not found in these levels: *Discus rotundatus*, *Oxychilus* cf. *draparnaudi*, *Cochlodina laminata*, *Trichia* cf. *leucozona*. It would seem that here the woodlands thinned out leaving more open spaces and glades.

A more thorough analysis of the woodland complex, based on the presence of species connected to plants with deciduous leaves and to leaf-litter areas, evidenciated that this type of vegetation prevailed from Lev.15 to 10. From Lev. 9 to 5 there is an abundance of *Causa holosericum* sometimes together with *Discus ruderatus*, more associated with conifer wood. Simultaneously, certain species of broadleaf tree assemblage are less abundant or disappear: *Charpentieria itala*, *Macrogastra lineolata*, *Macrogastra plicatula*, *Clausilia cruciata*. Therefore the evaluation resulting from increment of *C. holosericum* is confirmed by the decline of species living in the broad-leaf trees environment.

The analysis of the faunal associations always lead to mixed woodland environments with deciduous broadleaf trees (or shrubs with deciduous leaves) and conifers (Fig.2), with alternate phase in which one or the other prevail and other periods in which the woodlands probably thinned out.

A relatively dry period of the environment in Lev.14 and 14a is underlined by the brief presence of thermophile species: *Cochlostoma henricae* and *Abida secale* and by the simultaneous appearance of *Discus rotundatus* and *Oxychilus* cf. *draparnaudi* in the Dalmeri rockshelter. The two last species probably found there ideal environment inside the more humid cavity (GIUSTI & MANTOVANI, 1979).

SUMMARY - The malacological records concern the Early Epigravettian stratigraphy (Würmian Tardiglacial, Alleröd) of Dalmeri rockshelter, situated on the Asiago Plateau (Trento). We observe a quick colonization by *Discus ruderratus*, shade-loving species of easy adventitions and element of Alpine environments, first appearing in the oldest layers. A second stage of recolonization includes *Clausilia dubia* and *Clausilia cruciata*, together with *Charpentieria itala*, *Charpentieria stenzii*, *Cochlodina laminata*, *Macrogastra lineolata* and *Helicodonta obvoluta*. This contingent of deciduous-broadleaf woodland assemblage was followed by a third quick arrival of other species: *Oxychilus* cf. *draparnaudi*, *Macrogastra asphaltina*, *Neostyriaca corynodes*, *Clausilia parvula*, *Helicigona cingulata*, *Causa holosericum*. In Lev. 14-14a the presence of *Cochlostoma henricae* and *Abida secale* indicates a partial aridity. At 11260±100 BP the biotope seems well evolved, rich in microniches and a variety of microenvironments allowing the presence of many land snails. It is a woodland environment, including broadleaf and conifer trees and showing some transitory changes: the broadleaf trees prevail from Lev.15 to Lev.10 and in Lev.3. The presence of conifers is more important from Lev.9 to Lev.5. The anthropization of the rockshelter might be a cause of disturbance for the Mollusca, both in time and in different points of the excavated area. Those nearer the rockwall supplied more abundant records.

RIASSUNTO - Si studia la struttura della malacofauna del Tardiglaciale würmiano di Alleröd proveniente dalla stratigrafia epigravettiana. Sono state evidenziate diverse densità di individui al m² sia nella stratigrafia che tra differenti punti dell'area di scavo; differenze temporali e spaziali in parte attribuibili al disturbo antropico. I Molluschi terrestri vengono esaminati sotto gli aspetti della geonemia e delle categorie corologiche, valenza ecologica, calcio dipendenza, forma biologica. Si notano fasi successive di colonizzazione del Riparo Dalmeri e con l'analisi delle associazioni faunistiche si individua un ambiente ove è sempre presente un bosco misto con piante a foglie decidue e con conifere; si hanno fasi alterne in cui prevale un tipo o l'altro di vegetazione. Vi è evidenza di un periodo di relativa aridità nei Liv.14-14a.

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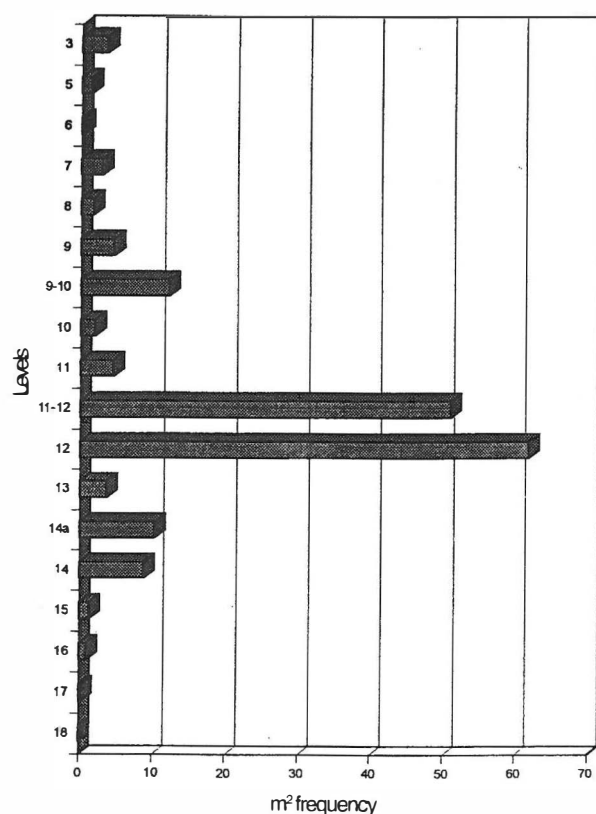


Fig. 1 - Frequency of Mollusca in the stratigraphy

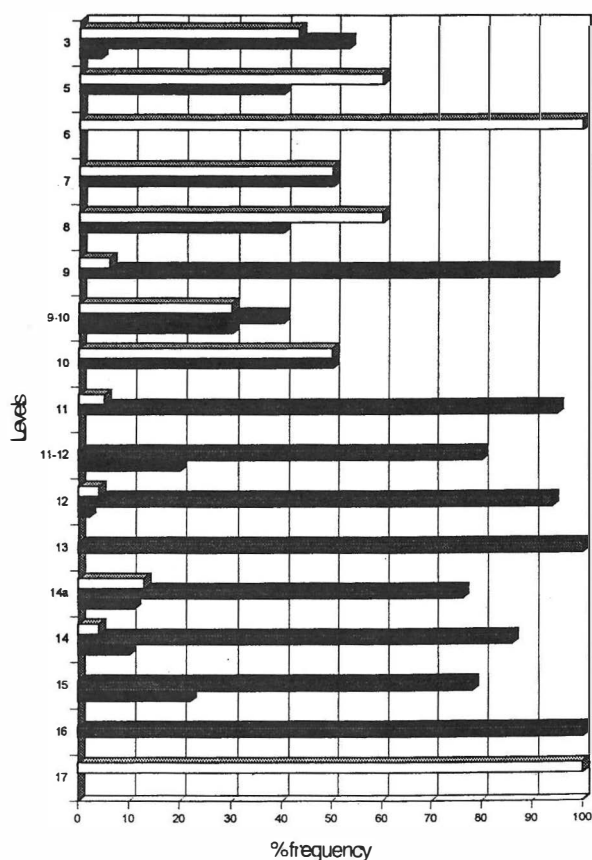


Fig. 2 - Frequency of various components of the woodland association in the stratigraphy: in white: forms connected with conifer woods; in grey: forms connected with broadleaf-deciduous trees; in black: woodland in general

SPECIES	DIFUSION	ECOLOGICAL ASPECT	CALCIUM-DEPENDENCE	BIOLOGICAL FORM	FAUNAL ASSOCIATION
<i>Cochlostoma henricae</i>	Al E	B	C	K	RP
<i>Abida secale</i>	Eu	B	C	K	LB PE
<i>Discus rudersatus</i>	OI	M	I	K	FC
<i>Discus rotundatus</i>	Eu M	B	I	K	FL
<i>Aegopis gemonensis</i>	Al E	B	I	K	F PE
<i>Aegopinella cfr. minor</i>	Eu CS	B	I	H	LB PE
<i>Oxichylus cfr. draparnaudi</i>	Eu M	B	I	H	F PE
<i>Euconulus fulvus</i>	OI	B	I	H	FL
<i>Cochlodina laminata</i>	Eu	B	I	K	F
<i>Charpentieria itala</i>	Al Ap	B	C	K	FL RP
<i>Charpentieria stenzii</i>	Al E	B	C	K	RP
<i>Macrogastra lineolata</i>	Eu C	M	I	K	FL PE
<i>Macrogastra plicatula</i>	Eu CE	B	I	K	FL
<i>Macrogastra asphaltina</i>	Al E	B	I	K	FL RP
<i>Clausilia parvula</i>	Eu CE	B	C	K	PE
<i>Clausilia dubia</i>	Eu CE	B	C	K	PE
<i>Clausilia cruciata</i>	Eu B	M	I	K	FL PE
<i>Clausilia pumila</i>	Eu E	B	I	K	FL
<i>Neostyriaca corynodes</i>	Al	M	C	K	PE
<i>Trichia cfr. leucozone</i>	Al E	B	I	K	PE
<i>Helicodonta obvolvata</i>	Eu CS	B	I	K	FL
<i>Helicigona illyrica</i>	Al E Di	B	I	K	PE
<i>Helicigona cingulate</i>	Al Ap	B	C	CM	RP
<i>Causa holosericum</i>	Al Ca	M	I	K	FC

Tab. 1 - systematic list and information regarding biogeography, ecological aspects, calcium-dependence, biological form and faunal association of every species: Diffusion: Al) Alpine; AlAp) Alpine-Apennine; AlCa) Alpine-Carpathian; AlE) East Alpine; AlEDi) Alpine Eastern-Dinaric; Eu) European; EuB) Euroboreoalpine; EuC) Central European; EuCE) Central-East European; EuCS) Central-South European; EuE) Eastern European; EuM) Euromediterranean; OI) Holarctic
 Ecological aspect: B) very wide; M) mountain
 Calcium-dependence: C) calcicole; I) indifferent
 Biological form: H) *hyaliconchae*; K) *keratoconchae*; CM) *chaliconchae mesoxerofile*
 Faunal association: F) woodland; FC) conifers; FL) broad-leaf trees; LB) broken-up soils; PE) stony-soils; RP) rupestral