CONTINENTAL GASTROPODS IN THE MATIENZO VALLEY

A paleo-ecological study of continental gastropods

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Introduction

An adult example of *Elona quimperiana,* in a cave in Matienzo

Snails, unlike other organisms, offer a number of advantages as a source of information about conditions in a Palaeolithic environment:

- Their shells, formed from calcium carbonate, are very resistant to degradation and are well preserved when included in very old strata.
- Their abundance in a wide range of different environments means that they are well represented in archaeological sediments.
- Then again, their identification, although complex for some genera, gives relatively exact results.
- Finally, it is a fundamental trait that certain species, or associations of species, develop exclusively on certain ecosystems and this is what makes them valuable ecological indicators.

Cepaea nemoralis midden

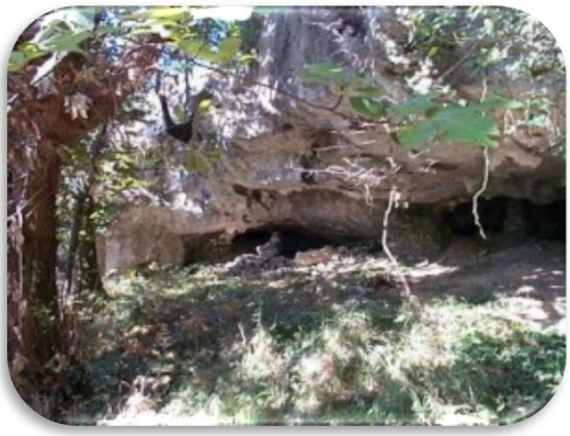
Continental gastropods include gastropods from both terrestrial and freshwater habitats. There are fifty terrestrial species and at least a dozen freshwater species living in Cantabria today. Our understanding of each is very different: while several studies of the former are available, as is work published in the Basque country, the same cannot be said for species that are associated with bodies of water, springs and underground streams.

Gastropods and Archaeology

Cepaea nemoralis hibernating in a limestone crack

Two types of archaeological work based on continental gastropods can be identified:

- Since some species of gastropods served as food for the groups of humans who formed the archaeological deposits, these carried a certain weight in the economy and it is possible to establish collection areas, times of year etc.

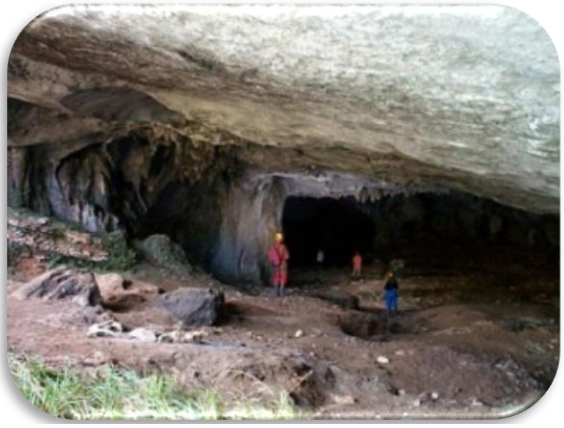


Rock shelter at Seldesuto with a shell midden made up of shells of *Cepaea nemoralis*

- Moreover, the often massive presence of terrestrial snail shells in the archaeological levels and their environmental specificity make more or less exact paleo- ecological interpretation possible.
- The first type of work, i.e. the study of edible species has been made in the traditional Cantabrian way, starting with the marine species and only at the end incorporating the terrestrial snail species, specifically *Cepaea nemoralis,* the only species of bromatological interest used here. It will be the second focus developed in this section.

The Project

The "Recent Prehistory of Matienzo" project was developed between 1994 and 2001, thanks to the collaboration between two groups: the British Matienzo Expedition (BME) and the Speleology and Underground Investigations Group Carballo Raba (GEIS C/R)



Entrance chamber of Cueva de Cofresnedo

Various archaeological interventions, financed and authorized by la Consejaría de Cultura del Gobierno de España, were carried out at different sites: Las Grajas, El Cubio Redondo, Cofresnedo, Cueva Roja, Covurruyo, Rascavieja and La Sima de Diente, all situated within the enclosed Matienzo depression.

Although in many cases work was limited to surface studies, with controls over the amount of archaeological material collected, in others archaeological excavations, of limited extent, were carried out, making it possible to obtain samples and materials.

Special attention was paid to the shells of terrestrial gastropods, the subject of this work.

The Matienzo Valley

Matienzo is a polje, situated in the eastern half of the Cantabrian mountains, and formed in pure, reef limestones.
The eco systems found today in this small area are only echoes of those which developed during the first Holocene. But the progressive abandonment of the economic farming methods of the last two centuries is today permitting their slow, and somewhat random, return on the hillsides and summits.

The Vega valley, the western arm of the Matienzo depression

Beeches cover part of the Seldesuto hillsides along with Holm oak matorral which replaced the oak woods after the medieval deforestations.

Nowadays the valley bottom is covered with hay meadows, but there are interesting combinations of mixed woodland on the flanges of the slopes. Also the watercourses that run through the three arms of the polje are flanked by narrow lines of gallery woods.

The slopes of El Naso with the entrance, among others, of la Cueva de Diente

The hillsides appear to be largely bare. The shallower slopes are covered in pasture, although there are many stretches of bare limestone. The species typical of holm oak matorral appear in different combinations in some sectors.

A study of the Matienzo countryside, published in 2003 as the environmental introduction to the report of the results of the project, the *Recent Prehistory of Matienzo*, is available in pdf format here.

Paleo-ecological studies of gastropods in Matienzo

1. Cubio Redondo (cave 793)

View from within Cueva Redondo in Matienzo

- This is the first Cantabrian cave in which continental gastropods were studied.
- Shells from the deposit of *Cepaea nemoralis*, which had been eaten, were studied. The radiometric dating from the deposit indicates that it was formed during a few millennia of the Mesolithic.
- This is a small cave situated halfway up a limestone hillside. It was used by a small group of hunter gatherers who consumed goats, roe deer, red deer, wild boar and chamois there, which they hunted in the immediate vicinity. They also collected and consumed hazelnuts, acorns and snails.

- The study of samples of *Cepaea nemoralis* revealed the existence of two populations:

    a) One group which appear to be mainly adults of two years of age with an average diameter of around 25mm

    b) A significant sample of sub-adults of 18mm diameter that were born in the spring of the year in which they were collected.

	Media	Desviación	N
Diámetro máximo			
Población total	24.17	3.46	482
Adulto	25.49	1.86	397
Subadulto	17.97	2.27	85
Diámetro mínimo			
Población total	20.57	2.72	482
Adulto	21.53	1.65	397
Subadulto	16.09	2.20	85
Longitud			
Población total	14.69	1.87	482
Adulto	15.30	1.17	397
Subadulto	11.87	1.94	85

Parameters for the adult and sub-adult *Capaea nemoralis* population (maximum and minimum length and diameter) from Cubío Redondo.

This double population shows that the cave was occupied in the autumn, around September and October. Also this would be the best time for their collection as it coincides with the first rains.
The shells of other species were also studied in this deposit. The study was carried out by M.T.Aparicio of the C.S.I.C. (Aparicio 2001)

An important number of species, up to then not cited in any other deposit in the region, were seen, reflecting, among other things, the existence of a significant tree cover in the environs of the deposit. It can be seen that a good number of species, today linked to the holm oak, must, in their times, have lived in the oak woods which occupied the hillsides and valley bottom.

2. Cofresnedo. Matienzo.

The mouth of Cueva Cofresnedo, from the exterior.

This is a large cavity which occupies a central position in the valley. Its magnificent, large entrance chamber provides the ideal conditions for habitation, which explains why it has been used since the earliest Palaeolithic phase, probably without interruption, until the middle ages. Besides habitation (Lower, Middle and Upper Palaeolithic, Mesolithic and Bronze Age), it was also used for rituals during the Iron Age and the Middle Ages, and a deposit containing mid and late Bronze Age burials has been found in its internal passages

In Cofresnedo, the appearance of gastropods in the Mousterian levels (circa 45,000 years bp) and Aurignacian levels (circa 22,000 bp) stands out, but these are only shell fragments of species which are poor indicators.

Analysis of this site demonstrates the diminution in the richness of current species towards the interior of the cave.

A reduction of 54% in the number of species and of 85% in the number of individuals was observed in a sample taken from the entrance chamber and another 15m from the cave mouth. Interesting associations of troglophilic species (*Oxychilus, Cryptazeca, etc.)* have been found in interior positions in this deposit.

3. Sima del Diente. Matienzo

The climb to Sima del Diente.

The Sima del Diente deposit accumulated at the bottom of a small shaft, carved into the base of a wide overhang, near the top of one of the hills which surround the Matienzo depression.

The remains of 16 species of terrestrial gastropod were located in sediment samples, making the sample numerically very significant. (1663 shells) The series was studied by D^{ra} Teresa Aparicio. The majority are animals that live in the shaft itself - *Cryptazeca vasconica* and *Oxychilus sp, Elona quimperiana* - and other species which would have lived in the outer shelter.

In this deposit, as in others, it is attested that *Cryptophalus asperses*, the present day edible snail, only appears in the most recent layers, which suggests that this species arrived on the Cantabrian coast within historical times.

A view of the overhang from which Sima del Diente open, during the excavation

What is most interesting about the study of the gastropods in this deposit is that the ratio between endogenous and exogenous species in the different levels allows us to establish the rate at which the layers formed, taking into account that rate of decline of snails in the first group remains stable. The sediment which makes up the levels with the greater archaeological content comes from the disturbance of a deposit situated in the outer shelter. It is this which provides the greatest number of species from the exterior.

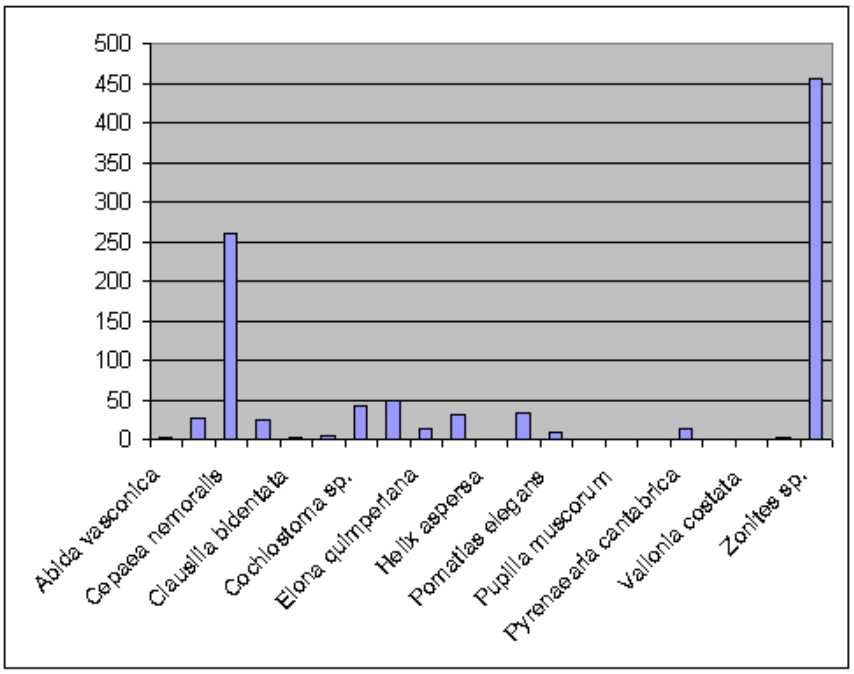
The species of gastropods identified in Matienzo

Oestophorella buvinieri from the Cofresnedo series

The results of three samples from archaeological sediments in Matienzo are available. The material obtained from the excavation in Cubío Redondo in Matienzo was studied by T. Aparicio, attached to the Museum of Natural Sciences, Madrid (C.S.I.C.), which published the results in 2001 (Aparicio 2001). We would like to thank this researcher for her help with the project. This same author also analyzed the series recovered from the Sima del Diente, publishing the results in 2003. (Aparicio 2003) The short series recovered in the excavation in Cofresnedo was also published (Ruiz Cobo and Smith 2003). Finally we include the sampling taken by H. Raven in various locations in the valley, which he has kindly given.

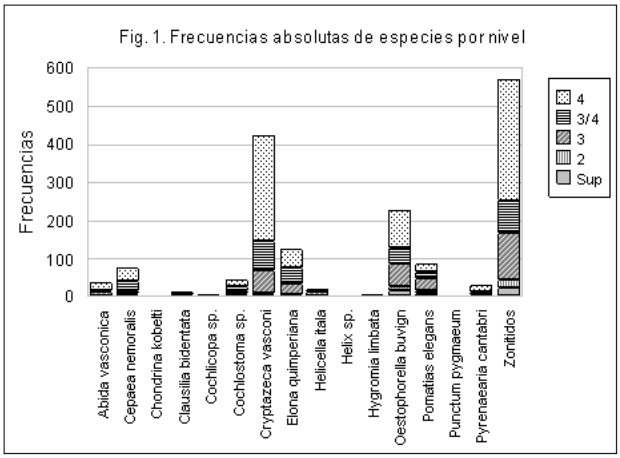
A list of the species which made up each sample follows:

Especie	Frecuencia
Abida vasconica	2
Azeca goodalli	27
Cepaea nemoralis	261
Chondrina kobelti	25
Clausilia bidentata	3
Cochlicopa lubrica	4
Cochlostoma sp.	42
Discus rotundatus	49
Elona quimperiana	14
Helicella itala	32
Helix aspersa	1
Oestophorella buvinieri	33
Pomatias elegans	9
Punctum pygmaeum	1
Pupilla muscorum	1
Pyramidula rupestris	1
Pyrenaearia cantabrica	14
Truncatellina cylindrica	1
Vallonia costata	1
Vitrea contracta	2
Zonites sp.	455
Total	**978**



Absolute frequencies of the gastropods from Cubío Redondo (Aparicio 2001)

Especie / Nivel	Sup	2	3	03/04	4	Total
Abida vasconica	2	1	8	6	21	38
Cepaea nemoralis	4	4	7	26	34	75
Chondrina kobelti	-	-	2	-	1	3
Clausilia bidentata	4	-	1	1	6	12
Cochlicopa sp.	3	-	2	-	1	3
Cochlostoma sp.	6	1	9	10	17	43
Cryptazeca vasconica	4	5	60	76	278	423
Elona quimperiana	5	-	29	42	49	125
Helicella itala	1	1	9	-	9	20
Helix sp.	1	-	-	-	-	1
Hygromia limbata	1	-	3	-	2	6
Oestophorella buvignieri	15	10	59	43	101	228
Pomatias elegans	10	6	30	17	22	85
Punctum pygmaeum	-	-	1	-	-	1
Pyrenaearia cantabrica	2	-	4	7	17	30
Zonitidos	22	21	123	86	318	570
Total	**876**	**314**	**347**	**49**	**80**	77



Frequencies of gastropods from the Sima del Diente, by levels.

Samples taken from the cave of Cofresnedo (Ruiz Cobo and Smith 2003)

Unlike previous samples, obtained from archaeological excavations and dated to more or less early periods of the Holocene, the Cofresnedo samples are made up of present day or sub-present day shells, collected during the excavation. The series recovered from the excavation were meagre and made up of widespread species of no great interest.

Cofresnedo. The exterior sample.

Especie	F.A.
Obscurella bicostulata	20
Pomatias elegans	36
Azeca goodalii	1
Abida biguerrensis	2
Clausilia biplicata	9
Eucunulus fulvus	1
Vitrea contracta	2
Zonites inmaduros	21
Retinella incerta	3
Elona quimperiana	1
Oxychilus sp	11
Oestophorella buvinieri	11
Helicella itala	1
Cepaea nemoralis	2
Total	**124**

Description: the sample was taken from the first surface layer, a humic level made up of leaf litter and loose soil, at the base of, and protected by the overhang of the cave for 2 to 5 metres in. The substrata is Aptian limestone and the vegetation is mixed woodland with hazel, holm oak, arbutus etc.

Vegetation: mixed woodland

Type of sample: Sediment with a weight of 308 grams of clean sediment

Cofresnedo. Interior sample

Especie	F.A.
Obscurella bicostulata	2
Pomatias elegans	1
Cryptazeca vasconica	2
Zonites inmaduros	18
Elona quimperiana	7
Oxychilus sp.	2
Cepaea nemoralis	1
Total	**33**

Description: the sample was taken from the top layer of soil in the interior part of the entrance chamber within the reach of natural light. The floor is composed of pebbles and loose earth

Vegetation: lichens, mosses and ferns

Type of sample: sediment, total, 2 litres with a weight of 310 grams of clean sediment.

Cuvío Redondo (Cueva 793), 2.5 km W of Matienzo			
Abida bigerrensis	1	bare limestone rock, alive	
Cepaea nemoralis	e	inside cave (Holocene fossil, displaced)	
Cepaea nemoralis	ma	limestone rock, between grass, alive	
Chondrina kobelti	v	bare limestone rock, alive	
Clausilia bidentata	v	bare limestone rock, alive	
Cryptomphalus aspersus	v	limestone rock, under stones, alive	
Elona quimperiana	e	limestone rock, under stones and between grass, dead	
Euomphalia brigantina	me	limestone rock, under stones, dead	
Helicella itala	ma	limestone rock, between grass, alive	
Hygromia limbata	v	limestone rock, under stones, alive	
Obscurella bicostulatum	v	limestone rock, under stones and between grass, alive	
Obscurella hidalgoi	ma	bare limestone rock, alive	
Obscurella obscurum	1	limestone rock, between grass, alive	
Oxychilus spec	e	limestone rock, under stones, dead	
Perforatella incarnata	1	limestone rock, under stones, dead	
Plentusia vendia	1	limestone rock, under stones, dead	
Pomatias elegans	ma	limestone rock, under stones and between grass, alive	
Retinella incerta	me	limestone rock, under stones and between grass, alive	
Trichia hispida	1	limestone rock, under stones, dead	
Cueva del Arenal, 3.5 km SW of Matienzo			
Arion ater	v	limestone rock, between grass, alive	
Elona quimperiana	me	limestone rock, forest next to cave, dead	
Hygromia limbata	v	limestone rock, forest next to cave, alive	
Obscurella bicostulatum	e	bare limestone rock, alive	
Obscurella oscitans	v	bare limestone rock, alive	
Pomatias elegans	ma	limestone rock, forest next to cave, alive	
Retinella incerta	me	limestone rock, forest next to cave, dead	
Cueva Molino, 1 km W of Matienzo			
Clausia bidentata	2	bare limestone rock, alive; 11-12 whorls	
Macrogastra rolphii	1	limestone rock, between herbs; dead	
Obscurella bicostulatum v	v	bare limestone rock, alive	
Pomatias elegans	v	limestone rock, herbs, alive	
Radix ovata	1	in rivulet flowing into cave, fresh	
Aegopinella nitidula	2	in mud near entrance - dead	late Holocene
Cepaea nemoralis	v	limestone rock, herbs, alive; in mud near entrance – dead, late	Holocene
Euomphalia brigantina	me	in mud near entrance - dead	late Holocene
Helicella itala	1	in mud near entrance - dead	late Holocene
Obscurella bicostulatum	v	in mud near entrance - dead	late Holocene
Oxychilus spec	1	in mud near entrance - dead	late Holocene
Pomatias elegans	v	in mud near entrance - dead	late Holocene

E=2-3, me=4-10, V =11-100, ma= >100 specimens

Samples of molluscs studied by Han Raven in the Matienzo area

References

Aparicio, Mª T., 2001: Malacofauna terrestre del yacimiento de Cubío Redondo (Matienzo, Cantabria). *Munibe 53: 61-66. San Sebastían*

Aparicio, Mª T., 2003: Malacofauna del yacimiento de la sima del Diente (Matienzo, Ruesga). Sautuola IX: 89-95. Santander.

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Environments represented in the context of the archaeological studies

The greater part of the species identified in the archaeological sites in Matienzo can be assigned to a number of specific ecological environments, and although, in many cases, these biotopes overlap in the countryside and the species appear in a number of them, they can be more frequent in one than another.
For the purpose of this work the variability has been limited to:

- Parietal- Karstic
- Troglobitic
- Humic
- Edaphic

A characteristic Parietal- Karstic habitat

These environments can be found under the cover of, or associated with mixed woodland of beech, oaks or other groupings.

The species marked (*) have been identified by H. Raven in samples from various locations in Matienzo which he studied. We would like to express our gratitude for his collaboration in our project.

1. Parietal-karstic environments

Parietal-karstic environments exist on the walls outside the mouths of big caves in sunlit areas, overhangs, limestone ledges and clints. At times they are high in humidity, with a covering of rupicola type vegetation. These species are herbivorous genera, feeding on lichens.

Characteristic species of parietal-karstic habitats found in Matienzo:

- *Obscurella hidalgoi*
- *Obscurella bicostulata*
- *Obscurella obscurum*
- *Obscurella oscitans*
- *Chondrina kobelti*
- *Abida Bigerrensis*
- *Piramidula rupestris*
- *Clausilia bidentata*

This last is most common at the bases of holm oak trunks.

Example of *Chondrina kobelti* on the outer wall of a clint

Obscurella hidalgoi on the limestone wall of an overhang

2. The first stretches of the interior of karstic cavities

Elona quimperiana on the wall of a cave

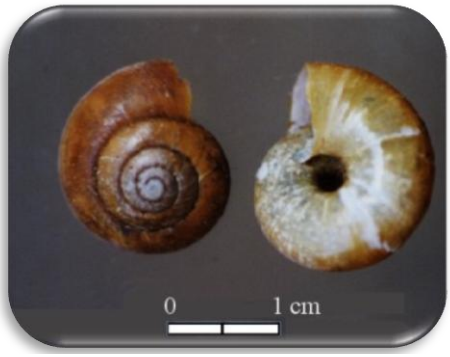
There are troglophilic species which pass part or all of their life cycle in these environments. Generally they are detrivores or feed on carrion, taking advantage of whatever type of organic material finds its way into the first galleries and entrance chambers of caves. Completely troglodite species don't usually appear in archaeological samples, given that their shells are very delicate, they are small in size and their populations are in general smaller, occupying, as they do, the interiors of caves.

Troglophilic species identified in Matienzo:

- *Elona quimperiana*
- *Cryptazeca vasconica*
- *Oxychilus sp.*

Populations of *Zoospeum suarezi* have been identified in cave 2741 in the Matienzo valley, as in the nearby areas of Miera and Rasines. Some of the shells present characteristics similar to *Z. schaufussi,* though they are somewhat smaller.

3. Humus living/Forest species



Retinella incerta from the entrance chamber of Cofresnedo

An important group of species lives in the humus and among the leaf litter and detritus which accumulates on the surface under rock shelters and in the outer parts of cave mouths. These detrivores and carrion feeding species demonstrate the existence of a layer of fairly dense layer of humus when the archaeological level was formed. In this group, partly overlapped by the previous group and also in contact with the next one, the following can be included:

- *Pomatias elegans*
- *Oesteophora buvinieri*
- *Oestophorella silvae*
- *Discus rotundatus*
- *Pomatias elegans*
- *Aegopinella nitens*
- *Lauria cylindracea*
- *Pupilla muscorum*
- *Cochlicopa lubrica*
- *Retinella incerta*

4. Soil habitat

Some species live buried in the A horizon of the soil. In some cases they are blind and very small and they also occupy the interstitial niche. This environment overlaps the previous one and, as the characteristics are not exclusive, movement occurs between them. In general, due to the size of these shells, they only appear in samples obtained by flotation of the sediment recovered in archaeological excavations.

Ceciliodes acicula

- *Acicula fusca*
- *Azeca goodalii*
- *Carychium tridentatum*
- *Cryptazeca kobelti*
- *Cryptazeca vasconica*
- *Euconulus fulvus*
- *Vallonia costata*
- *Vallonia pulchela*
- *Vitrea crystalina*
- *Ceciliodes acicula*

Although this last species has not been recovered in the Matienzo sites it is common today in the humus and has been located in other archaeological deposits in nearby areas.

5. Other environments. Widespread species

Of course, species appear in the archaeological series which come from the matorral or the bases of trees, which have arrived there along with firewood or carried in as food by groups of humans or other animals, or with sediment that has been dragged in. The following can be included in this group:

Cepaea nemoralis sharing a bramble leaf *(Rubus ulmifolius)* with an immature *Hygromia limbata*

A pair of *Cryptomphalus asperses* on the same bramble.

- *Cepaea nemoralis*
- *Cryptomphalus aspersus*
- *Cochlicella acuta*
- *Helicella itala*
- *Clausilia bidentata*
- *Perfotarella incarnata (*)*
- *Euomphalia brigantina (*)*
- *Plentusia vendia (*)*
- *Hygromia limbata*