

Children and marmots: a pilot study in mountain primary schools

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In future years climate change will affect many areas of the planet, in particular delicate environments such as high elevation habitats at any latitude where most marmot species dwell. Thus all conservation efforts should be multiplied in the future and research aimed in understanding motivations of the public regard for species and/or habitat protection should be enhanced. In fact public opinion is an important part of the multiple layers involved in conservation issues that include many aspects: administrative and political, scientific, mass-media and educational (especially toward young generations).

In the present pilot study we present an investigation aiming at understanding both cognitive and affective relationships between children and alpine marmots and their habitat. Two primary schools located in a mountain area were chosen, 4 teachers and 28 children participated. According to the research-action paradigm we tested different integrated approaches. Results relating to children's informal knowledge investigated by means of semiotic field and drawing, expert encounter, and enhanced essay suggested they were context dependent, and elicited different responses in children. Informal knowledge about the fauna was much influenced by media: it is noticeable that many mammals from the African fauna but not from the local fauna were mentioned by children in their semiotic fields, nevertheless drawings and habitat descriptions showed a detailed knowledge of the marmot, suggesting an active naturalistic intelligence based on direct experience. Results are discussed also in term of the possibility of extending similar research-action techniques across different countries and cultures in order to understand the effect of the cultural environment as regards the marmot genus.

KEY WORDS: marmot genus, conservation, human-animal relationship, environmental education.

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INTRODUCTION

In future years, the increase of earth temperature, due to climate change, will affect many areas of the planet, in particular delicate environments such as high elevation habitats at any latitude. The Arctic is warming at almost twice the rate of the rest of the world, in many areas the mountains are warming faster than the lowlands, spring snow in Northern hemisphere is decreasing and major reductions in snow cover are projected for mid-latitudes by the end of the 21st century. The snow line is projected to rise in many mountain areas, and glacier retreat is a worldwide trend: Alps' glaciers in 2000 had half the mass of 1850, and disappearance of all glaciers in this area is foreseen in 2050 (MAGGI 2008). Although data related to the upward movement of the timberline and to vegetation change in high elevation meadows are still anecdotal and urgently need scientific confirmation, it is arguable that many, if not all, alpine ecosystems will be affected in the near future, with unpredictable decline in many marmot species. In a long term study in the Alps changes in first year birth rate were found (ALLAINÉ et al. oral communication at the VI Marmot Meeting, Cogne 2008), while drought due to lack of snow in the Tien Shan area was associated with a reduction of *Marmota menzbieri* populations (BYKOVA & ESIPOV 2008). Beyond climate change, human activities are affecting marmot populations throughout the boreal hemisphere: in high altitude meadows of Nepal, change of vegetation height, due to field desertion because of abandonment of traditional farming, decreased Himalayan marmot populations (NIKOL'SKII & ULAK 2007), while the crash of natural pastoral livestock correlates with the decline of the steppe marmot settlements in Ukraina (SAVCHENKO & RONKIN 2008, TOKARSKY et al. 2008). In Mongolian marmot species are endangered due to local hunting for meat and fur (TOWSEND & ZALHER 2007, KOLESNIKOV et al. 2008, TOWSEND 2008). In recent years, a very successful campaign was mounted in Canada in order to raise attention against the extinction of the North American most endangered marmot species, the Vancouver Island marmot (<http://www.islandnet.com/~marmot/>). Results were really outstanding, due to the approach adopted, dealing with multilevel instances: scientific, administrative, political, mass-media and, last but not least, public. And, due to the situation of many species in the marmot genus sketched above, it is arguable that, in the future,

more attention should be paid in devising the most successful conservation approach, and the one adapted to the different geopolitical environments in which many species of the marmots live. In fact, though human relationships with living creatures is ultimately shaped by our evolutionary past (BARKOW et al. 1992), it is also very much influenced by social attitudes, for instance marmots living in Buddhist countries are reported as not apparently being endangered (KHOLODNA 2008), because they are not hunted for meat as the people are vegetarians. In the Alps a change of attitudes toward marmots was witnessed by D. Lenti Boero, which are supported by documents and many reports collected from old mountaineers in the eighties, while working on a long term study on marmot ethology. Mountain dwellers at the age of 60 or more talked about snare hunting and eating marmots during winter in their youth: marmots were spotted during cattle pasturing, then excavated from burrows in the Autumn, kept in hibernation in cellars, and killed when needed. This practice aided human survival when no means for food conservation were available, but, together with dog hunting, took alpine marmots (*Marmota marmota* L.) into extinction in the South Western Alps (LENTI BOERO 1988). Actually marmots are not legally hunted in Italy (the only country in the Alps), and are peacefully recognised as part of the native wild fauna by local people, in particular children; toy cosy marmots are sold in many tourist resorts. This good situation might be the foundation for further in-depth testing of the social attitudes toward marmot species, in order to both theoretically explore human-animal relationships proposed by different authors (WILSON 1993, GARDNER 1999: 48-52, KHAN 2001), and to experiment on educational programs aimed to increase attention toward marmot species.

In the present pilot study we present a research-action experience (LENTI BOERO 2004) that aimed to stimulate the relationship with marmots, both on a cognitive and emotional level, in primary school students, at increasing the awareness of the concept of biodiversity and at investigating psychological motivations involved in the conservation of wild species in young generations, the pivotal ones for future environmental conservation (LENTI BOERO 2004, 2007a, 2007b; BARBIERO 2006).

METHODS

This experience was conducted from February 2007 to June 2007 in Valle d'Aosta, Italy, at two mountain primary schools: Introd, 700 m a.s.l., and St George, 1100 m a.s.l., the latter is located at the edge of Gran Paradiso National Park, while the former is 10 km from it. Participants were four primary school teachers, who required the intervention of a marmot expert within a yearly program insisting in raising knowledge on the local wildlife, and 28 children (14 F; 14 M) aged 6 to 8. Focus of the intervention was on training teachers on specific topics of marmot behavioural ecology and on techniques suggested to arouse both emotional attachment and cognitive knowledge of the species in children (LENTI BOERO 2004). The project was articulated in six consecutive steps as follows:

- (1) In second and third week of February 2007, two encounters of a marmot expert (D. Lenti Boero) with teachers: in the first, teachers followed a two hour power-point presentation related to marmot behaviour and ecology, in the second they

followed a presentation related to psychological techniques useful in detecting children's informal knowledge and the base-line of cognitive and emotional pre-requisites toward the species (LENTI & PERUSSIA 1987, LENTI BOERO 2004, 2007b). The lines of psychological inquiry were also discussed with teachers.

- (2) In March, teachers of both schools conducted a first inquiry on marmot image and informal knowledge in naive children utilising the techniques of semiotic field and drawing (PERUSSIA 1979, LENTI & PERUSSIA 1987, LENTI BOERO 2004). Semiotic field consists of the teacher writing a stimulus word on the blackboard, and asking the children to write as many associated words (preferably substantives) as they can in the time span of two minutes. This is presented as a game: "*today we play with words*", the order of word presentation is obviously very important (LENTI BOERO 2004). Drawing is a classical tool of inquiry in environmental psychology (PERUSSIA 1979); children were asked to draw requested subjects with a black pencil on an A4 sheet; colors are generally avoided in order to obviate confounding in drawing content analysis (PERUSSIA 1979).
- (3) At the end of March, teachers gave a specific lesson on marmot behaviour and ecology aiming both at transferring the scientific knowledge acquired in step one and at arousing curiosity about the encounter with an expert.
- (4) At mid April, the expert (D. Lenti Boero) met with all children together in a big hall, in order to underlie the exceptionality of the event. In the first part of the meeting a video on marmot life was shown, in the second, the expert answered all possible questions about marmots posed by the children and took note of the questions.
- (5) At the end of April, teachers showed the photograph of a young marmot, and asked the children to write an essay describing the experienced feeling. This technique has the advantage to refer to the image of a real animal and not to a mere mental representation (enhanced essay).
- (6) A field trip was organized in June in order to directly observe marmots.

RESULTS

A total of 196 semiotic fields and 140 drawings were collected for content analysis, that was carried out on all of the children, due to the exiguity of subject number in this pilot study.

Semiotic field

Stimulus words were chosen on belief that some animals are much more familiar to Valle d'Aosta children than others; related habitats were chosen accordingly. Words were submitted in the following order: (1) *animals*, a more inclusive and generic word, was purposely included with the expectation that it might evoke a different semiotic field than specific animals, (2) *mountain*, (3) *cow*, a familiar animal due to both cultural traditions and economic vocation of the area, (4) *sea*, (5) *marmot*, our focal animal, (6) *dolphin*, an animal probably never seen directly within its natural environment, even if children from Valle d'Aosta have summer holidays at the sea, (7) *field*. A total of 1045 words were produced of which 457 'different' words were reported by more than one child. Thus, the children's output was com-

posed by idiosyncratic words — personal output of few — and words shared by many, the best indicators of collective representation. For this reason, we decided a cut off by adding all the words produced in semiotic fields (1542), and halving this number (771); then, we ordered the words by frequency of production (starting from the highest frequency) and subsequently added words until the sum was equal to half the total words produced. This equation falls in the frequency of five, the number of children we chose as cut-off (18%). The number of different words with frequency ≥ 5 was 98 (21%), and with frequency < 5 was 359 (79%). The ratio of shared vs shared plus idiosyncratic different words (Fig. 1) was 21% for animals, 33% for marmot, 20% for mountain, 18% for cow, 19% for field, 16% for dolphin, 23% for sea. It is noticeable that marmot had the highest proportion of shared vs idiosyncratic verbal output, suggestive of a strong collective representation, as might be expected in mountain dwellers.

Qualitative analysis of verbal output was performed only on shared words: “*animal*, *marmot*, *cow*, *dolphin*” evoked 440 words (Fig. 2). *Animal*, the most generic stimulus, evoked many African species certainly not directly known: elephants, cheetah, chimps and monkeys, giraffe, lion and zebra; domestic animals included dog, cat, horse and pig, but not cow, (notice that the stimulus word *animal* was presented first, and that, contrary to cows and hens, pigs and horses are seldom kept by Valle d’Aosta farmers); species classified as Alpine fauna included eagle, dormouse, owl (present in the area), and bear (not present in Western Alps); noticeably ibex, chamois and marmots were not considered. Habitat/ecology included grass/herbivore for both (generic) *animal*, and (specific) *cow* and *marmot*. Body and body parts included very detailed description for *marmot* (teeth, brown, tail, eyes, furry, nail, paws) and

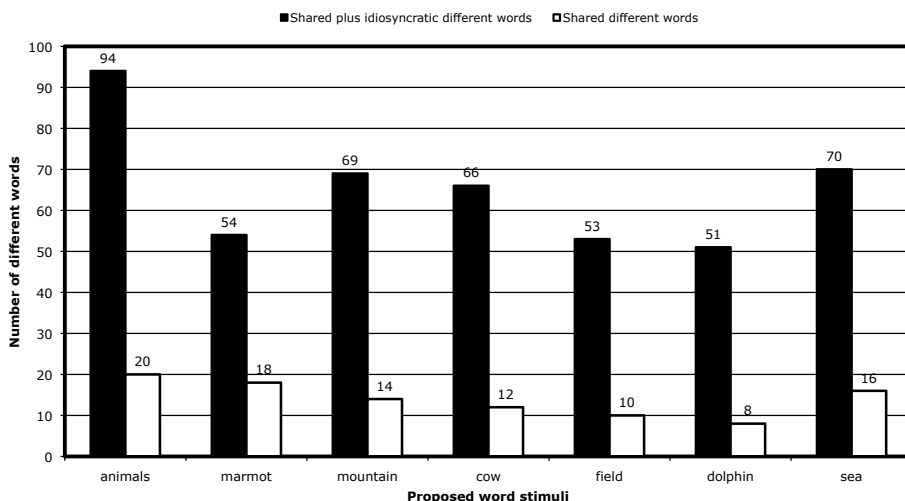


Fig. 1. — Semiotic field. Total number of different words (black) and words shared by at least 18% of 28 children from two mountain schools (white). Stimulus words are at the bottom.

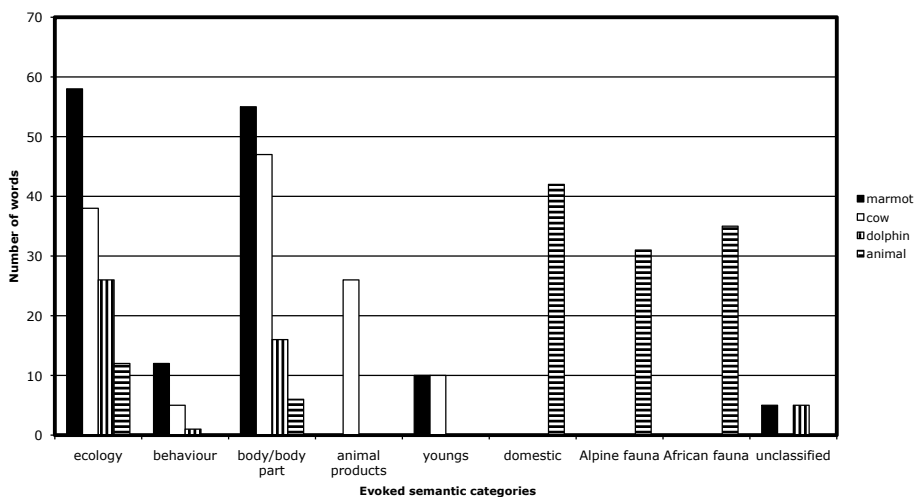


Fig. 2. — Word categories produced upon animal related word stimuli. Classification of semi-otic field animal related verbal output reaching the threshold of 18% of 28 children from primary schools in Aosta Valley.

cow (teats, spots, hoofs, horns, tail), to be considered that two of the traditional Valle d'Aosta cow breeds are spotted (*valdostana pezzata rossa*, *valdostana pezzata nera*), but only fins for *dolphin* and fur for *animal*. Behaviour included hibernation and whistling for *marmot*, grazing for *cow*, and jumping for *dolphin*, animal products included meat and milk for *cow*.

Table 1 shows the results of the qualitative analysis for the word stimuli relating to habitats. Words related to environmental cues or characteristics were 93 for *mountain*, 75 for *sea*, and 43 for *field*. This stimulus seemed to have a double valence, arousing many words related to sports and human activities (38), whereas mountain and sea aroused only 5 and 1 words, respectively. *Deer*, *ibex*, *chamois* and a more generic *birds* were the (really present) animals related to *mountain*, and elicited 30 quotations, no animal was related to *field*, while 81 animals were associated with *sea*.

Drawing

Proposed subjects for drawing were: *Aosta* (town of 40,000 inhabitants), a well known dwelling place, but where children did not live; *sea*, a known, but not very familiar habitat; *wood* and *mountain* well-known, frequented and very familiar habitats of children, the first not being a marmot habitat. We also added *marmot*, with the aim of better understanding children's representation. As for the semiotic field, all drawings were analysed for content; that is, number and typology of depicted subjects (Fig. 3). As in the semiotic field, different items were shared and idiosyncratic. We took the same threshold of 18% of children sharing the same representation. Ratio of shared vs

Table 1.

Results for three stimulus words related to habitats shared by at least 18% of children. Words were classified as follows: animals (bold & italic), environmental cues (bold), sport, human activities and artefacts (italics).

Mountain	No. of quotations	Field	No. of quotations	Sea	No. of quotations
trees	22	grass	15	<i>fishes</i>	28
snow	20	<i>foot-ball</i>	14	rocks	20
high	13	corn	10	seaweeds	16
rocks	10	<i>soccer</i>	8	<i>starfish</i>	11
<i>ibex</i>	9	grassland	7	sand	10
<i>chamois</i>	8	<i>farmer</i>	6	water	9
<i>deer</i>	7	land	6	<i>sea-horse</i>	9
ice/glacier	6	flowers	5	waves	9
steep	6	<i>goal</i>	5	<i>whale</i>	8
<i>birds</i>	6	<i>tennis</i>	5	<i>boats</i>	8
avalanche	6			<i>crabs</i>	8
<i>houses</i>	5			<i>seal</i>	7
flowers	5			beach	6
peak	5			<i>dolphins</i>	5
				<i>jellyfish</i>	5
				salt/salted	5
animals					
environment					
<i>sport and human activities</i>					

shared plus idiosyncratic different items was 26% for *Aosta*, 42% for *sea*, 21% for *mountain*, 36% for *wood*. Apparently, *mountain*, the most familiar habitat, had the most idiosyncratic representation. How children depicted marmots, our focal animal, was obviously of particular interest. We collected 28 drawings relating to *marmot*, in one of them, no marmot was apparent, but only a burrow, in another one, only the face of a marmot was evident (Fig. 4). Sixteen children represented marmots inside their ecological contexts (Fig. 5), and 10 represented only a single marmot on the white sheet (Fig. 6). Those examples indicate that marmot representations were highly variable in details of the ecological context and in physical characteristics. Similarly to the semi-otic field, body and body parts were present. Semiotic field for *marmot* elicited 63 words related to habitat (both biotic and abiotic), while those items in drawings were only 42 (burrow, grass, tree, sun, slope, birds, insects, snakes, stars, moon, butterflies); however, only 16 children depicted marmots in their

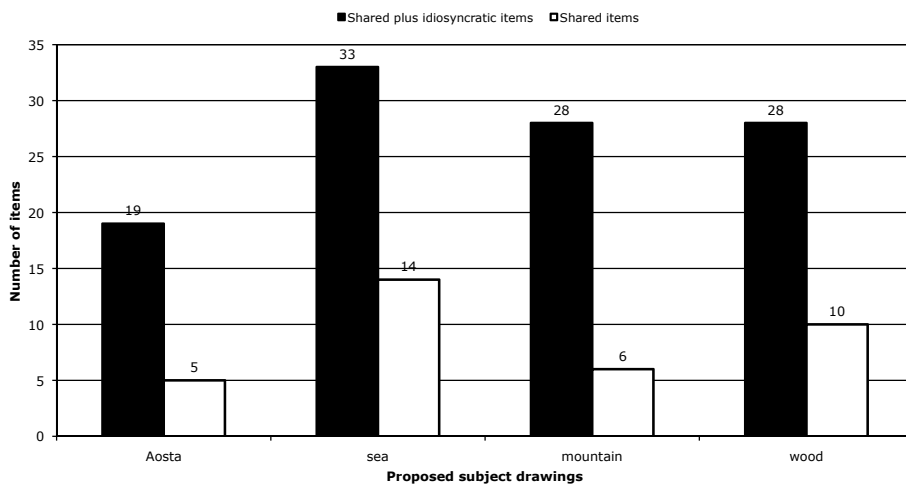


Fig. 3. — Drawing. Total number of different items and items shared by at least 18% of 28 children from two mountain schools. Requested subjects for drawing are at bottom legend.

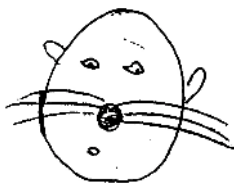


Fig. 4. — Marmot drawings. Face of a marmot, drawn by a 6 years old girl. The original pencil drawing was scanned by means of Canoscan scanner, and filtered by means of Adobe Photoshop CS2.

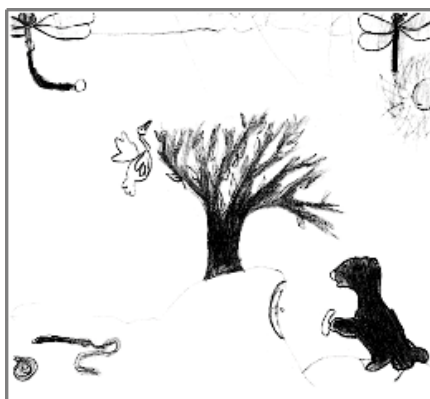


Fig. 5. — Marmot drawings. Marmot within a natural context depicted by a 8 year old boy. Notice the burrow under the tree. The original pencil drawing was scanned by means of Canoscan scanner, and filtered by means of Adobe Photoshop CS2.

ecological context. Interestingly, *mountain* was drawn before *marmot* and our rodent was never represented, even if 41 animals: squirrel, adder, birds, ibex, cow, bull, fish, and a generic animal were depicted.

Encounter with the expert

The encounter was very well prepared by teachers, the view of a VHS cassette relating to marmot life proved to be very useful, in fact a video can show many aspects of marmot life that would need months to be witnessed in the wild; this underscore the importance of producing high level educational media. After that a discussion started, children were well prepared by teachers and amazingly attentive, very polite, raising their hands before any question, the discussion lasted for slightly more than 2 hr. Focal and most frequent questions related to the expert's personal experience, in particular relating to direct contact with a wild animal generally very shy and secretive. Other questions related to anatomical features (as also testified by semiotic field and drawing). Some children referred to their own experience in marmot encounters.

Enhanced essay

As regards the *enhanced essay* only 14 essays were produced, because only teacher of Introd school could pursue this activity. Essays were carefully read but no content analysis was performed: in typical essays "naïve biology" descriptions were abundant, but no sentences referred to any emotion felt toward marmots, the opposite of what happened during expert encounters. We speculated that the specific scholar setting of writing an essay might be poor in eliciting emotional arousal toward knowledge. The following are a few



Fig. 6. — Marmot without context portrayed by a 7 year old girl. Notice the standing position and anatomical details of the muzzle. The original pencil drawing was scanned by means of Canoscan scanner, and filtered by means of Adobe Photoshop CS2.

of the most recurrent kinds of sentences: "*Marmots eat: grass, daisies, ... Her enemies are: the eagle, the owl, the salad (?)*. *Marmot bath in the river, in small lakes. Marmot bears 10 young, thus she is a mammal. ... Marmot has a small tail, drinks a lot of water*".

Field excursion

The excursion was planned for the end of the scholastic year; during this "happening" children waited anxiously. They should have explored by means of olfaction, hearing, and sight the marmots' habitat, and, possibly, marmots. Unfortunately this was not possible: due to bad weather and heavy rain we could only have a short field experience, where only some burrows were examined. In Italian school excursions are programmed for a specific day many weeks in advance, due to necessity to ask permission of parents, and to organise transportation. In fact, only St George school had marmot colonies nearby; Introd school was not far from colonies, but children had to be transported in any case.

DISCUSSION

Human attitudes towards wild animals, plants, and landscapes, should be taken into account in any conservation project, or protection campaign. Motivations of local people to be involved, or at least accept, protection of some species or habitat are complex and multidimensional, but must be taken into account to be successful in conservation (SUTHERLAND 1998, CAMINO et al. 2005), and in future years we will need the highest possible agreement from populations, in order to protect marmots as well as other mountain species and habitats. There is a general agreement that young generations are the most flexible to acquire positive attitudes toward living beings, and it is also well known that children can be strong agents for protection in their own households (LENTI & PERUSSIA 1987, LENTI BOERO 2007b and this study). In this pilot study we wanted to test and further explore previous results acquired with similar techniques in university students (LENTI BOERO & MARANGONI 1994, LENTI BOERO 2007c, LENTI BOERO et al. 2008). Our protocol started from the inquiry about the attitudes and emotions of 'naïve' children toward our focal animal (*marmot*) and its environment (*mountain*) and differences from other animals and environments, in order to test their informal knowledge; that is, that acquired in situations different from schools (peers, direct experience, media, family, etc.). Then teachers proceeded towards providing more formal information about marmots. Results relating to informal knowledge, expert encounter, and enhanced essay suggest that those different psychological and educational approaches are context dependent, and might elicit different responses in children. As in a previous Italian study conducted with children living near a regional park (Parco del Ticino), influence from the media such as TV, magazines, books, appeared to be very strong in shap-

ing mental representation of habitats evoked by words (LENTI & PERUSSIA 1987). In fact familiar habitats had less representative words than unfamiliar ones. Children indifferently utilised different knowledge sources, both formal and informal (LENTI BOERO 2007b), and seemed able to utilise indirect knowledge when direct was lacking. This might explain why African and sea fauna were quoted so frequently and animals typical of Alpine area such as ibex and chamois were not often considered. However, a VHS movie on marmot life was a very useful tool during the encounter with the expert, in order to focus children's attention.

The educational outcome of this experience was discussed with teachers, who testified to the great enthusiasm of children in their participation and in their learning both with "the head and the heart" the many life history details of marmots, and their curiosity. Their hope, as well as ours, was that at least some trace of this experience might last in their adult future, and told us of the many times children at home complain with their parents about their bad "ecological" behaviour.

Animal direct encounters are the most emotion arousing, and the one most expected by children of our study (LENTI & PERUSSIA 1989; LENTI BOERO 2004, 2007b, 2007c; LENTI BOERO et al. 2008), but unfortunately, this was the most critic phase of our project due to difficulties to be ascribed to bad weather, but also to our undervaluation of timing schedules in schools, that are very strict even in primary ones. For the future, we should devise a more agile way to get school children in direct contact with nature, and plan it in advance, perhaps involving families and parents, or taking advantage of the great fondness for summer excursions by local people. It must be noted that, in mountain areas not many mammals can be observed easily during the day, and that marmots are a wonderful exception in that they occupy territories that can be spotted in advance, so specific observation areas can be prepared for children, and possibly tourists (LENTI BOERO et al. 2008) to let them freely observe marmots.

After this pilot study our future plans are: (1) to consolidate this experience with other mountain school in the Aosta Valley and to devise simple but reliable census techniques to be adopted in mountain schools surroundings (the "field" part of our pilot experience was the one less satisfying, but in the future, must be the focal one); (2) to find partners from other areas in order to cross-culturally compare different attitudes toward the species of the genus; (3) to experience the possibility of enhancing tourist interest and knowledge about marmots.

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