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Influence of a Field Trip on the Attitude of Schoolchildren toward Unpopular Organisms: An Experience with Snakes

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Abstract.—**The general public prefers to support conservation projects that focus on a few, easily "loveable" species; consequently most of biodiversity is neglected. It is essential to redress such bias and to educate children about the value of a wide diversity of organisms, including those labeled by social bias as less appealing. Because snakes are among the most disliked animals, they are suitable candidates for such endeavor. We evaluated the impact of a single field trip on the attitudes of more than 500 schoolchildren. The participants were involved in snake catching and were allowed to manipulate nonvenomous snakes. The organizers limited their intervention to providing natural history information and carefully avoided saying that snakes should be protected. We used pre- and post-field trip questionnaires to gauge the feelings of the children. Although pre-surveys suggested that many schoolchildren like snakes a priori, their attitudes improved following field experience: almost all children declared then that they liked snakes and expressed a strong willingness to protect them. Such change was associated with an increase of the frequency in the responses of the terms linked with affectivity (e.g., "snakes are cute"...). Snake handling was the favorite activity, and physical contact with animals appears to be a crucial element to improve schoolchildren's attitude for an unpopular organism. Our results support the promotion of field trips that include physical contact with wildlife over the current trend in the educational systems that promote virtual approaches.**

Research and conservation programs are characterized by a strong disequilibrium toward several animal taxa (Balmford et al., 1996; Bonnet et al., 2002; Clark and May, 2002; Seddon et al., 2005; Trimble and Van Aarde, 2010). The high popularity of few animals (e.g., polar bear, whale) is used intensively by the media to raise conservation awareness, usually confined to exotic species living in remote locations (Clucas et al., 2008). Charismatic animals, almost exclusively represented by mammals and birds, receive disproportionally more attention and funding for conservation than other taxonomic groups. This bias might be the consequence of the general support of people for the protection of aesthetics, large or humanlike species (Ward et al., 1998; Gunnthorsdottir, 2001; Tisdell et al., 2006; Maresova and Frynta, 2007; Martín-López et al., 2007). Less popular organisms, including almost all invertebrates and many vertebrates, remain relatively unknown for most adults and children. Awareness and interest for animals are limited to a few exotic species and pets; and a very small proportion of the general public is actually able to recognize more than a handful of local wild animal species (Kellert, 1985; Lock, 1997; Balmford et al., 2002; Lindemann-Matthies, 2005; Lindemann-Matthies, 2006). This biological illiteracy is worrying for conservation because it precludes the possibility to develop initiatives and participation of the citizen for conservation of the local environment and local species (Lindemann-Matthies, 2002; Ehrlich and Pringle, 2008).

One of the efficient ways to redress such bias is to upgrade the biological and environmental education of children (Feinsinger, 1987; Kellert, 1996; Ehrlich and Pringle, 2008). One aim of biodiversity education is notably to extend the appreciation toward loveable species to a wider range of organisms; and schools play a key role in that objective (Kellert, 1993, 1996; Lindemann-Matthies and Bose, 2008). Greater progress is expected using the most detested animals. It is indeed useless to reinforce the popular rating of already iconic species simply because there is only little possibility for further improvement; by contrast, there are ample opportunities to redress the deleterious bias against detested, hence neglected, species (Ballouard et al., 2011).

Because direct and concrete experiences improve the learning process, children must be immersed in the outdoor environment to encourage all aspects of their relationships with wildlife (Wilson, 1996; Ballantyne and Packer, 2002; Ballantyne et al., 2005; Lindemann-Matthies, 2005; Prokop et al., 2007). Field trips are unanimously considered as the most efficient way to promote positive attitudes by acting both on cognitive knowledge and affective development (Knapp and Barrie, 2001; Kellert, 2002; Rickinson et al., 2004). Physical experiences, wildlife handling, and sensory engagement with natural environments are essential (Orion and Hofstein, 1994; Wilson, 1996; Ballantyne and Packer, 2002; Lindemann-Matthies, 2005; Prokop et al., 2007; Prokop and Tunnicliffe, 2010). Despite the widely acknowledged educational value of field trips, in practice, bringing schoolchildren into the field is a neglected activity (Prokop et al., 2007). Hands-on experience with living organisms has declined massively over time at school (Wilson, 1996; Lock, 1997; Barker et al., 2002; Pinou et al., 2009). Little time is allocated to educate children to biodiversity during school time, and it is almost exclusively done using virtual information (Barker et al., 2002; Ballouard, 2005).

Snakes are suitable candidates to evaluate the effect of practical field experience on schoolchildren for several reasons. First, snakes are among the most disliked animals; they trigger very strong levels of fear and destructive behaviors (Morris and Morris, 1965; Shalev and Ben-Mordehai, 1996; Gomez et al., 2004; Christoffel, 2007; Prokop et al., 2009). This situation provides a valuable opportunity for a significant positive attitude change (Kaplan, 1997). Second, any project based on wild snake education is particularly challenging given the expected strong reluctance of teachers, parents, authorities, etc., to approve it (Gomez et al., 2004); therefore, any success will open the doors for many other less challenging projects. Third,

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snakes are difficult to observe; overcoming such complication will show that technical aspects should not always be considered as insurmountable. Children can easily manipulate nonvenomous snakes; indeed, these animals are particularly robust, and by selecting appropriate species, there is almost no risk for both handled specimen and handlers. Finally, snake populations are facing a worldwide decline (Reading et al., 2010), but negative attitudes against potentially dangerous animals represent a major obstacle to set up specific conservation plans (Seshadri, 1984; Burghardt et al., 2009; Prokop and Fančovičová, 2010).

The aim of the current study was to examine the influence of a field experience based on snake population monitoring on the feelings of schoolchildren. We also aimed to evaluate the intensity of the expected difficulties associated with such activity: complaints by parents, negative reports, etc. Because, in most cases school field trips will be limited to a single opportunity, we evaluated the impact of a one-day field experience. For that 472 schoolchildren (aged from 6–11 yr old) physically participated in a project called "Life in the shrubs," an additional 48 children served as a control group (total number of children involved in the study 520). This project was set up to bring children in the field especially to discover snakes in their local natural environment and through physical participation to population monitoring, including snake searching, captures, identification, measurements, marking, and releasing, thereby justifying ample handling opportunities. We addressed the following questions: (1) Does a single field experience with snakes improve schoolchildren attitudes? (2) What was the favorite activity experienced by the children? (3) What types of technical and administrative complications were generated by a project based on animals that generally garner public dislike?

Materials and Methods

The current study was organized through comparison of two main activities, either performed within classrooms or outdoor: (1) surveys of attitudes of schoolchildren attitudes before and after a field trip; and (2) field trips with schoolchildren.

Surveys of Schoolchildren Attitudes.—Thirty-one classes (520 schoolchildren) from urban and rural areas were selected to participate. Schools situated in the vicinity of the field sites (see below) were contacted randomly. We used written questionnaires to assess the attitudes of schoolchildren. The questionnaire was developed under the supervision of a committee (including teachers specialized in schoolchildren psychology). During preliminary tests, we checked the capacity of the children to understand and respond to questions about nature (unpubl. data). Identical questionnaires were administered before and after the field trip. Several questions were added to the post-field trip questionnaire, however, to assess the preferred activities in the field.

The questionnaire contained 47 closed and open questions and aimed to assess general issues (age, sex. . . of participant) in addition to snake-specific topics. We were notably interested by the following issues: (1) General feelings: we asked the children if they liked or disliked snakes. If they were afraid of snakes we asked them to briefly explain why. (2) Willingness to protect snakes: we asked the children if they considered it is important to protect snakes. In addition, among a list of 10 animals encompassing a broad range of popularity and taxonomy (i.e., bear, beetle, dolphin, eagle, frog, panda, snake, spider, toucan, and turtle) children were asked to choose and rank three animals that must be protected. (3) To examine the possible influence of previous experience with snakes, we asked the children if they had ever seen or handled a snake. (4) Preferred activities: after their field trip, children were asked to rank in order of preference eight activities (scored from 1 to 8) that revolved around the field trip (e.g., snake catching, observing other animals. . .).

The questionnaires were administered to 29 experimental classes (472 children participated in the field experience) and to two control classes (48 children did not participate in the field experience). The first questionnaire was administered to the children at least one month before the field trip and the second questionnaire two weeks after the field trip. During the same period, the two questionnaires were administered to the control classes.

Field Trips.—The project was arranged through the collaboration between one ecology research laboratory (Centre d'Etudes Biologiques de Chizé, CNRS) and the main French governmental forest management organization (Office National des Forêts, ONF). Over the past decades, snake populations (*Hierophis* [=*Coluber*] *viridiflavus*, *Zamenis* [=*Elaphe*] *longissima*, *Natrix natrix*, and *Vipera aspis*) have been monitored in the forest of Chizé (CF) (Western Central France, 79 district), especially in the associated 2,600-ha biological reserve (Naulleau and Bonnet, 1995; Bonnet and Naulleau, 1996; Bonnet et al., 1999; Lelièvre et al., 2010). A network of concrete slabs (~900; 1.20 m/0.80 m size) was set up to increase snake catchability (several thousand snakes have been marked). In 2006, a similar, albeit smaller, field study was set up in the l'Arche de la Nature (ADLN) site, in a 450-ha forest managed in the vicinity of Le Mans (North Western France, 72 district). Four snake species occur in this second field site (*Coronella austriaca*, *Natrix natrix*, *Elaphe longissima*, and *Vipera aspis*); and snakes are monitored using a network of 115 concrete slabs (several hundreds of snakes marked). In both sites, the network of concrete slabs provided an opportunity to catch snakes with limited searching effort.

In spring 2008, 2009, and 2010, 23 one-day field trips were organized with different schools (1.2 classes per field trip on average). Twenty-six classes visited the CF site, and three visited the ADLN site. Teachers and their classes (typically 20 to 30 schoolchildren) discovered native snakes in their natural environment and were educated with regard to the scientific activities associated with population monitoring. Field trips were standardized: The classes arrived in the morning, and the activity started almost immediately with snake searching. Using heavy-duty gloves, each child lifted at least one slab under the supervision of the organizers; approximately 150 slabs were examined per trip, representing two to three hours of searching. In the event of a snake discovery, the organizer captured the snake(s) by hand. Children were invited to handle the snake for several minutes, and the specimen was then put in a cotton bag until measurements could be obtained. Snake species and sex and identity (when the individuals were already marked) were recorded. In an opportunistic way, other animals were captured and carefully handled notably amphibians, spiders (e.g., *Pisaura mirabilis* is common), insects (many beetles), but others were simply observed (birds, mammals, lizards. . .) because of the logistical difficulties involved in capturing and manipulating them. All the snakes collected (from one to more than 10) were brought to the lunch site.

After lunch (one hour on average), the schoolchildren had the opportunity to observe the snakes in more detail. Each

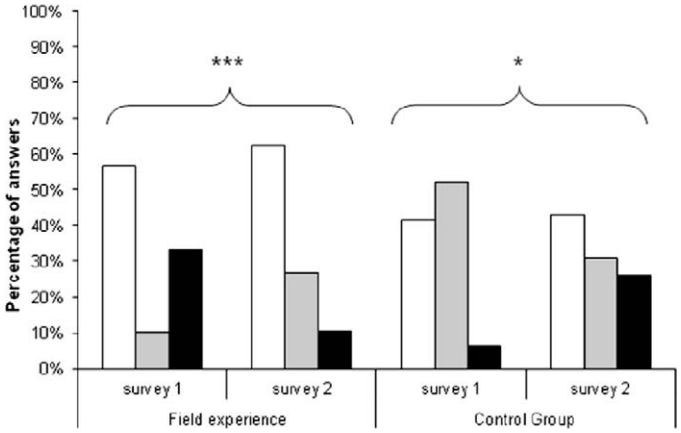

FIG. 1. Percentage of children who claimed to have no fear of snakes (white bars,) have fear (black bars), or were indecisive (grey bars), at pre-survey and post-survey. Respondents were children with field experience ($N = 472$) and children without field experience (control group, $N = 48$). *** = $P < 0.0001$; * = $P < 0.05$.

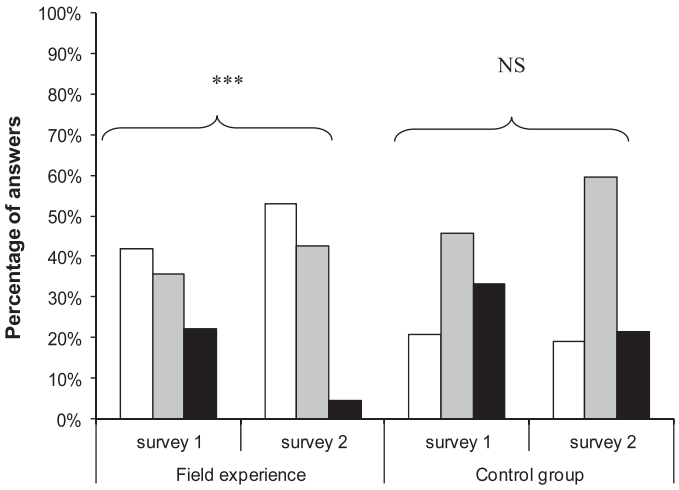

FIG. 2. Percentage of children who claimed to like snakes (white bars), dislike snakes (black bars), or were indecisive (grey bars), at pre-survey and post-survey. Respondents were children with field experience ($N = 472$) and children without field experience (control group, $N = 48$). *** = $P < 0.0001$; NS = $P > 0.05$.

individual was re-identified (species, sex), measured (head, length), weighed, palpated, and marked permanently (and named by the children) in case of first capture. Children had then ample opportunity to (re-) manipulate and photograph the snakes. Then each snake was released by children under the slab of capture. During the 23 field trips organized, at least one snake was captured; most of the snakes were found under the slabs and a few basking in the sun. However, to ensure that the children would see and manipulate living snakes, we also brought individuals caught nearby (from the same population, but from under slabs other than those surveyed with the children) one to three days before. Such supplementary snakes were used when only one or two snakes were captured by the children, to show at least two species and two sexes. Consequently all children manipulated at least *H. viridiflavus*. and *E. longissima*. On several occasions, schoolchildren had the opportunity to discover the *V. aspis*, but they were not allowed to capture and handle them although they touched the vipers while the snakes were handled by the organizers with the head of the snake placed in a plastic tube for safety reasons.

The organizers' carefully avoided influencing the willingness of the children to protect snakes for ecological reasons, for instance by stating that snakes deserve protection, or that they are important elements in the trophic web. The explanations provided to the children were strictly limited to natural history.

Analyses.—Closed questions (e.g., "Do you like snakes?") generated simple answers ("Yes," "No," or "It depends"). Open questions (e.g., "Why do you like snakes?") generated complex answers. Consequently, we scrutinized and classified such complex responses into height categories to perform the analyses. (1) Affective: children clearly introduced an affective factor in their written response. For instance using the terms: "because they are cute" or "nice." (2) Physical aspect: words related to color, size, or feeling during handling (e.g., temperature, odor...) constituted the response. (3) Behavior: snake behavior (basking in the sun, darting away...) were the criteria retained. (4) Dangerousness: this category was established on the use of terms such as "They are venomous," "Dangerous," "They can bite...." (5) Fear: terms such as "I'm afraid," or "I panic" were retained in this category. (6) Naturalistic and utilitarist: children employed terms related to the importance of the snakes for science or ecosystems; for instance, "They are predators," "they are useful...." (7) Others: this category includes answers not easily classified (e.g., "they are unique"; "they are alive"...). (8) No response or "I don't know."

In this study, we analyzed a subset of the most relevant questions and responses to gauge the influence of a field trip of schoolchildren's attitudes in relation to the conservation issues, notably fear, or willingness to protect. Although not presented, comprehensive (fastidious) analyses did not produce any results that contradicted our conclusions or irrational outcomes. Analyses of contingency tables were performed with Statistica 7.1.

RESULTS

Influence of the Field Trip on the Attitude of Schoolchildren about Snakes.—Although many (86.1%, $N = 472$) schoolchildren declared to have already observed a snake (e.g., in a zoo, pet shop...) at the onset of our surveys, the majority (52.9%) had

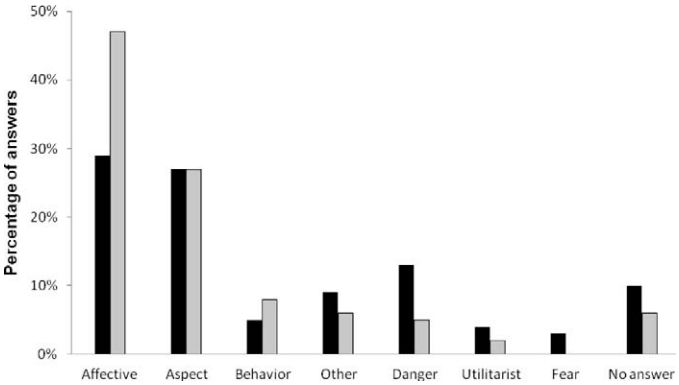

FIG. 3. Categorization of reasons for liking snakes from children who claimed to like snakes before (black bars) and after the experience (grey bars). Response of children were classified according to 8 different categories: (1) Affective (responses with an affective factor); (2) Physical aspect (responses with words related to color, size, or feeling); (3) Behavior (responses about snake behavior); (4) Dangerousness (responses about snake dangerousness); (5) Fear (responses with terms such as "I'm afraid," or "I panic."); (6) Naturalistic and utilitarist (responses with terms related to the importance of the snakes for science or ecosystems); (7) Others (responses not easily classified); (8) No response or "I don't know."

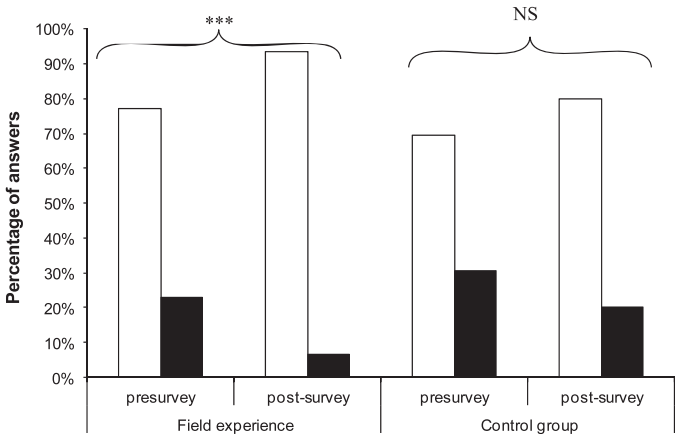

FIG. 4. Percentage of children who declared that snakes should be protected (white bars) or not (black bars) during pre-survey and post-survey. Respondents were children with field experience ($N = 472$) and children without field experience (control group, $N = 48$). *** = $P < 0.0001$; NS = $P > 0.05$.

never handled one. During the field trip, all the children participated actively. Almost all children wanted to, and actually did, manipulate the snakes captured during the field trip (or 1–2 days before). Thus, the proportion of children that handled snakes rose to 96.9% ($\chi^2 = 284.25$, df = 1 $P < 0.0001$). A small number of children ($N = 15$) remained afraid and refused to handle the snakes. However, all the participants were interested in the snakes and carefully observed them; none of the children manifested any obvious sign of ophidiophobia.

We found a difference in the proportion of children that declared they were afraid of snakes before and after the field trip ($\chi^2 = 88.37$, df = 2, $P < 0.0001$). Such proportion decreased markedly, from 33.2% to 10.6%, whereas the number of indecisive children increased from 10.3% to 26.8% (Fig. 1). We observed also a significant change in the control group, however, with the number of children that declared they were more afraid (from 6.2% to 26.2%; ($\chi^2 = 8.10$, df = 2, $P = 0.02$).

The proportion of children who declared that they like snakes increased from 41.9% to 53.0% ($\chi^2 = 64.05$, df = 2, $P < 0.0001$); whereas no change was detected in the control group ($\chi^2 = 1.98$, df = 2, $P = 0.371$; Fig. 2). The proportion of children who declared to dislike snakes decreased from 22.3% to 4.4%, with no change in the control group.

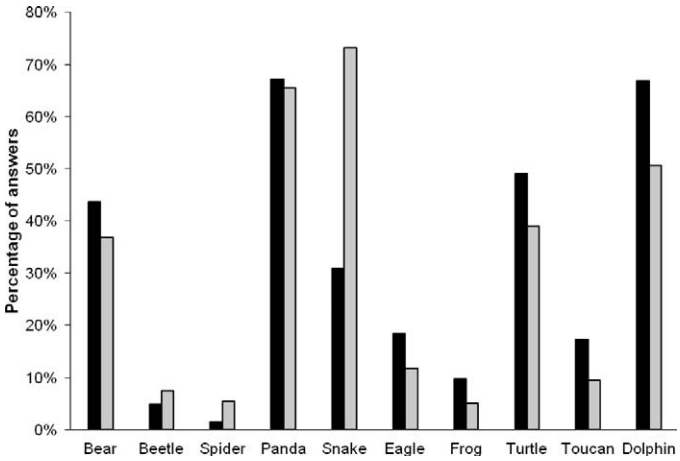

FIG. 5. Percentage of animals chosen by the schoolchildren to be protected before (black bars, $N = 206$) experience, and after (grey bars, $N = 442$).

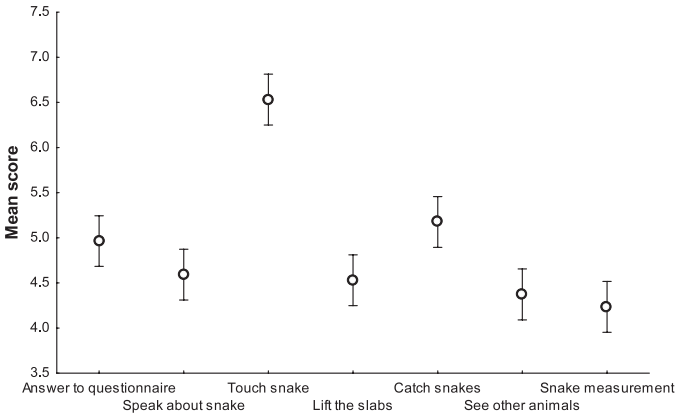

FIG. 6. Mean score of the activities that were declared to be preferred by the schoolchildren after the experience.

Focusing on the responses of those children who declared to like snakes both before and after the field experience, and hence who apparently exhibited a stable attitude, we nonetheless observed a significant change in the explanations they provided: the proportion of responses referring to affective factors increased from 29.1% to 47.0% ($\chi^2 = 17.92$, df = 7, $P = 0.01$; Fig. 3).

Willingness to Protect the Snakes.—Following the field trip, the number of children declaring that is it important to protect snakes increased from 77% to 94% ($\chi^2 = 43.61$, df = 1, $P < 0.0001$), with no change in the control group ($\chi^2 = 1.22$, df = 1, $P = 0.269$; Fig. 4).

Among the three animals chosen by the schoolchildren to be prioritized for protected, bear, panda, dolphin, and turtle were more often selected by the children during the first survey (Fig. 5), by a large margin. After the field trip, such proportion was significantly modified, snakes were more often selected after (73%) than before (31%) the field trip ($\chi^2 = 105.50$, df = 2, $P < 0.0001$), and they even surpassed most popular animals (e.g., panda 65%, dolphin 51%).

Preferred Activities.—Among the eight activities proposed during the field trip (Fig. 6), snake handling was largely the favorite (Mann Whitney ANOVA, $U = 29.621$, $P < 0.001$; $N = 193$).

DISCUSSION

Although several studies have shown the positive impact of outdoor learning to increase appreciation, concern, and knowledge about biological diversity and for conservation purposes, none involved young children catching and handling unpopular organisms in the field (Bogner, 1998; Zoldosova and Prokop, 2006). Although for many adults (hence parents), encountering snakes can be a traumatic experience that usually triggers destructive behaviors (Seshadri, 1984); the expected difficulties with teachers, schools, and parents never occurred despite the dimensions of our experiment in terms of sample size (more than 450 children, 2 sites), duration (3 yr), and species involved (e.g., venomous aspic vipers). We had no accident in the field; we received zero parent complaints; and most of the teachers were ready to renew the experience with other classes. Thus, the first important lesson of our study is that we often imagine excessive difficulties to organize field trips. Outdoor experiences based on practical manipulations (e.g., handling animals) should be encouraged and organized more intensively.

Our results also show that, although snakes indeed are feared or hated by most adults, this does not necessarily apply to children. Even the survey before the field trip revealed

moderate negative attitudes of children toward snakes. More important however, a substantial proportion of children did not like the snakes and were afraid at the beginning of our study; thus ample space for progress was available. Thanks to the field trip, almost all the children had the opportunity to discover, capture, and handle native snake species in their natural habitats. Although we have investigated few aspects of the children's attitudes, our results show, at least in the short term (months), that the field experience with snakes strongly improved children's attitudes toward snakes. Indeed, because we focused on one of the most disliked animals and because fear attitude and likeability have the most important impact on behavioral attention and willingness to protect (Kellert, 2002; Christoffel, 2007; Knight, 2008), such improvement provides a strong support about the efficacy of field education in conservation perspectives (Zint et al., 2002; Lindemann-Matthies, 2006; Prokop et al., 2007). After the field trip almost all children wanted to protect snakes. Children even ranked the snake at the level of the iconic animals such as panda and dolphin.

After only one day of field experience, the improvement of the children's attitude was spectacular. This contrasts with other studies that evaluated the efficacy of snake education programs based in a verbal approach: the progression in terms of positive attitudes were relatively modest and not persistent on the short term (Morgan and Gramann, 1989; Gomez et al., 2004). We believe that the efficacy of our approach is essentially attributable to the value of the field trip, notably the emotion generated by snake-searching and above all by the physical contact between children and animals; talks (e.g., about the importance of species in the ecosystem) are far less able to generate emotions. In support of the assumption that the improvement of attitude was generated through the activation of an affective relationship between children and snake, we observed that children not only preferred snake handling activity but also that the proportion of responses containing affective factor increased markedly after the field trip. Thus, our study conforms to the growing evidence that it is more important to feel rather than to know to develop concern and appreciative attitude toward animals (Iozzi, 1989; Kellert, 1996; Wilson, 1996). To learn, children have to be engaged in real experiences rather that receive ecological lessons in a classroom (Dettmann-Easler and Pease, 1999; Lindemann-Matthies, 2002). In general, so little time is engaged in biodiversity education (Barker et al., 2002; Brewer, 2002; Kellert, 2002; Randler, 2008) that it is essential to adopt the most efficient way that will favor long-term concern and awareness of children toward organisms. Field experiences have the potential to trigger the powerful affective channel of children (Chawla, 1999). Handling a warm and "cute" snake is likely the experience the children will probably not forget, but they likely will not retain the name of the species.

Unfortunately, such practical approach of the environmental education is neglected. Educational systems promote the use of virtual and intellectual information means heavily (Barker et al., 2002; Brewer, 2002; Wells and Lewis, 2006; Louv, 2008; Randler, 2008). Direct and emotional experiences of local natural areas are replaced with virtual ones (Levi and Kocher, 1999; Pyle, 2002). Outdoor education is, however, the only way to (re)connect children with the local environment (Dillon et al., 2006; Lindemann-Matthies, 2006). Our study also suggests that the overreliance on a few flagship animals on the grounds that they will offer an otherwise unhoped-for protection to the rest of wildlife is not justified. Even snakes can easily become popular, at least for young children (Feldhamer et al., 2002). All children may develop concern and awareness toward any kind of animal, but conservationists and educators should play a more balanced role, and they should bring the children into the field to discover all forms of life, not only the usual icons.

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