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Animal Related Activities as Determinants of Species Knowledge

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Previous work has established a relationship between knowledge and environmental concern. Different factors may contribute to this knowledge and animal-related leisure activities may also contribute to this knowledge. 390 participants in Leipzig, Germany were interviewed to assess their animal-related leisure activities, their demographic status and their species knowledge. The questionnaire contained twelve common and indigenous animal species for measuring species knowledge, and demographic and animal-related questions. Significant positive relationships between animal species knowledge and age, educational level, the frequency of walking in nature, reading books/journals about animals, using the internet as a general source of information, frequency of zoo visits, watching animals, feeding birds at a bird feeder, visits to a natural history museum, and visits to game parks emerged. The study suggests that there is a positive relationship between different kinds of animal-related activities and species knowledge. Further, people using identification books scored significantly higher in knowledge but no differences could be found concerning the items "using the internet" and "asking friends" suggesting that the internet is not an optimal source for identification of unfamiliar species.

Keywords: Age Differences, Gender Differences, Animals, Biodiversity, Leisure Activity

INTRODUCTION

The decline in biodiversity due to human behavior is one of the most urgent issues of environmental concern (Millennium Ecosystem Assessment, 2005) and it has become one of the most important terms in environmental education (Gaston & Spicer, 2004). Conservation education spans from formal learning in schools (Randler & Bogner, 2008) to informal settings in adolescents (Bogner, 1998) and adults (Falk, 2005). Biodiversity, however, is a rather 'ill-defined', abstract and complex construct which is difficult teach either on the formal or informal level (van Weelie & Wals, 2002) because of its high complexity and interdependencies. Because complex and interdependent structures are difficult to teach, they have to be broken down into smaller and digestible entities (units). Usually, environmental conservationists, practitioners and teachers prefer the level or unit of the species as the taxonomic level on which to focus (van Weelie & Wals, 2002).

Environmental education specialists have recognized the value of species for capturing the imagination and directing public attention toward conservation of the natural environment (Barney, Mintzes & Yen, 2005). One aspect is the body size, the kind of intelligence and the social bonding of animals that make them attractive to humans (Schulz, 1985), as well as the phylogenetic relationship (Herzog & Burghardt, 1988). Therefore, discrete species are often in the focus of biodiversity and environmental concerns, e.g. in the discussion about the possible (re-)sightings of the Ivory-billed Woodpecker in the USA (Dalton, 2005) or in the acceptance of large carnivores (Røskraft, Händel, Bjerke & Kaltenborn, 2007). Apart from these flagship species (Barney et al., 2005; or see Bexell, Jarrett, Lan, Yan, Sandhaus, Zhihe, & Maple, 2007 for the case of Panda bears) the general popularity of wild animal species is known from many studies (Bjerke & Ostdahl, 2004; Czeck, Krausmann & Borkhataria, 1998). City-dwellers

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State of the literature

- Some studies present demographic variables that are linked with knowledge about animal species and with attitude towards species.
- Animal-related knowledge may further stem from leisure activities, such as more specialized activities like birdwatching or angling but also from common and widespread leisure activities such as walking in nature or visiting zoos and aquaria.

Contribution of this paper to the literature

- Animal related activities are correlated with species knowledge thus suggesting that participation in animal-related leisure activities has some kind of influence on knowledge.
- There were further demographic aspects correlating with animal-related knowledge.
- It further emphasizes the importance of informal learning for acquiring species knowledge.

were found to enjoy and appreciate wildlife in their day-to-day lives and most participants of surveys responded positively to wildlife-related questions (Ho, Sasidharan, Elmendorf, Willits, Graefe & Godbey, 2005; Randler, Höllwarth & Schaal, 2007).

Therefore, the relationship between animal-related knowledge and attitudes is an important aspect of human-wildlife-interaction and appreciation of wildlife. Several previous studies show that knowledge and positive attitude are significantly related with each other (Bogner & Wiseman, 2004; Lindemann-Matthies, 2005; Prokop, Kubiatko, & Fančovičová, 2008; but see Kaczensky, Blazic, & Gossow, 2004 for contradictory results). Species knowledge stems from different sources, such as formal learning in schools (e.g. Lindemann-Matthies, 2005; Randler & Bogner, 2006), and informal learning, e.g. in zoos, museums and aquaria (Falk, 2005; Randler, Höllwarth & Schaal, 2007). Also, animal-related activities are a source of animal species knowledge (Bjerke et al., 2001). Further, animal-related activities and knowledge differ with respect to demographic aspects, such as age, gender, income and educational level (Røskraft, Bjerke, Kaltenborn, Linnell & Andersen, 2003).

One central aspect of environmental and animal-related knowledge is placed within the concept of informal learning (see overview in Falk, 2005), and this kind of learning might contribute to knowledge about animals. All zoos, museums and aquaria define themselves as some kind of educational institutions and settings for informal learning especially with regard to conservation issues (Dierking, Burtnyk, Buchner & Falk, 2002; Falk & Adelman, 2003). Studies in zoos or museums have focused on adults or family visitors and the variables which have been measured included affect attitude, knowledge and observable behaviors (for review, see Dierking et al., 2002). Within this conceptual framework, another interesting aspect are leisure activities that may also contribute to animal species knowledge. Leisure activities or recreation specialization, such as angling and birdwatching, contribute to knowledge about the respective group of animals (Kellert & Westervelt, 1983; Hvenegaard, 2002). Apart from the work based on specialized fields of leisure activities, more common leisure activities such as bird feeding or visiting natural history museums and their relationship to species knowledge were in the focus of this study.

There are already some studies that look at attitudes and knowledge. For example, Bjerke and Ostdahl (2004) surveyed residents' attitudes toward common urban animals and their participation in animal-oriented activities. A positive attitude was expressed towards small birds, squirrels, butterflies, hedgehogs, ducks, geese and dogs, and negative attitudes were expressed towards bats, snails, invertebrate species, mice and rats. Further, a negative relationship existed between age and preference scores for animals and a positive correlation was found between educational level and preference scores (Bjerke & Ostdahl, 2004). Research in attitudes towards large carnivores also revealed an age effect: older people are more negative towards these species (bears, wolves, etc., Røskraft, Händel, Bjerke & Kaltenborn, 2007) but this is not always the case (see Arrindell, 2000; Davey, 1994; Kaltenborn, Bjerke, & Nyahongo, 2006).

Educational level also was a significant predictor of attitude. For example, people with the highest educational level express high positive attitudes towards large carnivores and invertebrates (Kellert, 1993; Røskraft et al., 2007). In contrast, Brooks, Warren, Nelms and Tarrant (1999) found no significant correlations between education level and attitude or knowledge scores in a survey on visitors of areas with restored bobcats (*Lynx rufus*).

Concerning gender, women value wild animals higher than men, while men were more knowledgeable and less fearful of wildlife (Kellert & Berry, 1987; but see: Tucker & Bond, 1997; Røskraft et al., 2007). In the study of Czech, Devers and Krausman (2001), women ascribed greater preservation value to non-primate species and express stronger support for the Endangered Species Act (ESA).

Concerning knowledge Gilbert (1982) states that most people were unable to name individual wildlife species. In another study, respondents demonstrate low knowledge but favorable attitudes regarding wildlife species protection (Tarrant, Bright & Cordell, 1997). In pupils, bird species knowledge is low and Evans, Dixon and Heslop (2007) suggest that this knowledge is not

acquired by outdoor activities but rather by watching television and other media. However, Bjerke et al. (2001) revealed a high level of outdoor animal-related activities in adolescents, and Randler, Höllwarth and Schaal (2007) found a positive relationship between the number of park visits and knowledge of the respective species. Taken together, these studies suggest that there is a relationship between different animal-related activities and species knowledge in addition to demographic aspects.

The research goal of the present study was i) to relate animal-related leisure activities and demographic characteristics to knowledge about animal species in a broad sample of adult residents in an unselected urban German population, and ii) to assess which materials people use for identification and its impact on species knowledge.

METHODS

The questionnaire instrument

390 participants (149 men, 241 women) were interviewed via an on-site questionnaire in parks and in the city of Leipzig. The interviews were evenly distributed across different days, different times of days and seasons to avoid bias. The questionnaire took approx. 10 minutes to complete. Closed and open-ended questions were used. Face-to-face interviewing took place between 9th June and 5th November 2007 between 8:00 and 20:00 hours. The female interviewer was dressed casually and conducted interviews with a consistent appearance and techniques (Dick & Hendee, 1986). Each interview started with an introduction and brief explanation (learn more about animal related activities of the general public) and then to the questions (Dick & Hendee, 1986) because people need to be informed about the nature of the study, and informed consent was obtained from the participants. Sampling was conducted in a haphazard manner (Martin & Batesson, 1993). The interviewer was posted on a footpath within the park or the city and asked the nearest person that approached her. If the person refused to answer or after having completed the interview, the next person that approached was asked. Only one person from each group was chosen when persons arrived in groups. A pilot study was not necessary, because the procedure was used in previous work (Randler, Höllwarth, & Schaal, 2007), and there are studies about knowledge about animals from the author (e.g., Randler, 2008).

Species selection for the animal knowledge questionnaire

The questionnaire contained twelve colored A4 sized pictures. People were asked to name the species as precisely as possible. The focus was on native (indigenous) species and on species active during daylight. Further criteria also influenced the choice of species: Species should not be extremely unknown or extremely well-known in the common public to avoid ceiling and bottom effects. I chose animals that were common breeders/residents in the Leipzig area: four insect species: firebug (family Pyrrhocoridae), peacock caterpillar (*Inachis io*), brimstone (*Gonepteryx rhamni*), hoverfly (family Syrphidae); and eight bird species: moorhen (*Gallinula chloropus*), great spotted woodpecker (*Picoides major*), woodpigeon (*Columba palumbus*), hooded crow (*Corvus cornix*), blackbird (*Turdus merula*), blue tit (*Parus caeruleus*), chaffinch (*Fringilla coelebs*) and nuthatch (*Sitta europaea*). As animal coloration is a major trait for its identification, a color-laser-printer HP 3750 used to print out photos of all ten species in full color and good quality, each animal on an extra A4 sized sheet.

Variables and coding of the questionnaire

Demographic questions: Age classes (<16 [N=4], 16-25 [N=118], 26-35 [N=75], 36-45 [N=99], 46-55 [N=46], 56-54 years [N=33], >65 [N=15]), gender (dichotomous), educational level (no certificate [N=12] low level [N=28], middle school [N=87], specialized grade for University [N=19], full certificate [244]).

Animal-related activities: These were assessed on a five-point Likert scale ranging from never to very often. Activities included: walking in nature, reading books or journals about animals and nature, watching TV shows about animals, using Internet resources for information about wildlife, visiting the zoo, watching animals in nature, feedings ducks and swans, feedings birds at a feeder, feeding pigeons and doves, visiting natural history museums, visiting game parks.

Animals: When coding data, every correct species identification received the value of 1. When the participants were only able to identify the correct genus or family they received 0.5 points to test the factual species knowledge in general. For example, many persons were not able to identify a great spotted woodpecker *Picoides major* correctly, but were able to identify the bird as a woodpecker (taxonomic family level). The mean score from all answers was calculated (ranging from 0 to 1).

What do you do when you encounter an unfamiliar animal? These questions were coded dichotomously, e.g. do nothing (yes/no), look at an identification book (yes/no), ask friends (yes/no), using the Internet (yes/no).

Statistical procedure

Different statistical techniques were used to analyze the results: T-test, Pearson's correlation, regression and

factor-analysis. T-tests were used to compare means based on dichotomous variables (e.g. using books or not as independent variables and the mean scores of identification as dependent variable). Pearson's correlation was used when looking at relationships between two continuous variables. The regression analysis was applied to assess the importance of the different independent variables on an outcome variable, i.e. on species knowledge. A stepwise forward procedure was used and the criterion to enter the model was $p<0.05$. The reliability was tested using Cronbach's alpha. *indicates $p<0.05$, **indicates $p<0.01$, ***indicates $p<0.001$.

RESULTS

Animal species knowledge questionnaire

The animal species knowledge questionnaire showed a high reliability, suggesting a good internal consistency of the scale (Cronbach's alpha = 0.79). Inter-item correlations ranged from 0.15 to 0.48 with a mean of 0.25.

Animal-related activities

Animal-related activities are ordered according to their frequency in Table 1. Walking in nature, watching animals and watching TV shows were the most common animal-related activities, while feeding ducks, using the internet, visiting natural history museums and feeding pigeons and doves ranked lowest.

Materials used for animal identification

When encountering an unfamiliar species, 35.4% of the people do nothing but 64.6% use additional materials for identification. From those, 42.1% use an identification book, 10.3% use the internet, and 26.2% ask friends for information. [Please note that the sum exceeds the number given previously because people could rate more than one possibility.]

The main source for species knowledge seem identification books (Table 2) while using the internet did not lead to a higher species knowledge, suggesting that the internet is not an optimal source for identification of unfamiliar species. Also, friends and colleagues seem not to provide additional useful information.

Which animal-related activities determine species knowledge?

Bivariate correlations revealed a significant positive relationship between animal species knowledge and age (r=0.112*), educational level (r=0.135**), the frequency of walking in nature (r=0.163**), reading books and journals about animals (r=0.275***), using the internet as a general source of information about animals (r=0.159**), frequency of zoo visits (r=0.159**), watching animals (r=0.262***), feeding birds at a feeder (r=0.133**), visits to a museum of natural history (r=0.192***), and visits to game park with local animal species (r=0.198***). In contrast, the frequency of watching TV shows about animals (r=0.061), the frequency of feeding ducks (r=-0.051) and doves (r=-0.093) did not correlate with species knowledge. As variables may be interrelated, a stepwise multiple regressions were applied (Table 3). Different sources of animal species knowledge could be identified and the following showed a positive influence on species knowledge: using Internet resources for general information about wildlife, reading books or journals about animals and nature, visiting natural history museums, watching animals in nature, feedings birds at a feeder, while feeding pigeons and doves had a negative influence on the identification score (Table 3. Walking in nature, watching TV shows about animals, visiting the zoo, feedings ducks and swans, and visiting game parks showed significant bi-variate correlations but did not contribute to the regression models. Also, age was found to correlate with species knowledge in bi-variate correlations but this variable did not contribute to the explained variance in the regression analysis suggesting that other confounding factors contribute more.

DISCUSSION

One of the aims of the study was to assess the relationship between different animal-related leisure activities and animal species knowledge. There were significant positive relations between the different activities and the knowledge score. The second aim was to assess to what extent different sources contribute to species knowledge.

Sources of animal species knowledge

A variety of different activities contributed to the animal species knowledge as suggested by other authors (Bogner & Wiseman, 2004; Lindemann-Matthies, 2005; Prokop, Kubiatko, & Fančovičová, 2008; Lindemann-Matthies, 2005; Randler & Bogner, 2006). Some of these activities were related to directly encountering animals in nature or near ones' home (feeding birds), but also media usage was an important predictor which emphasizes the relevance of both sources. Interestingly, when encountered with the question: "What do you do when you see an unfamiliar animal" the people who responded that they use an identification book obtained higher scores while the scores of people using the internet or asking friends did not differ from those

Table 1. Means and standard error (SE) of the animal-related activities based on a Likert scale (N=390) ranging from 1 (never) to 5 (very often).

Animal-Related Activities	Mean	SE
Walking in nature	3.83	0.05
Watching animals	3.31	0.05
Watching TV shows about animals and nature	3.12	0.06
Frequency of zoo visits	2.68	0.05
Visits to game parks	2.51	0.06
Reading books and/or journals about animals	2.49	0.06
Feeding birds at a feeder	2.13	0.07
Feeding ducks and swans	1.98	0.06
Using internet resources for general information about animals	1.96	0.05
Visits to natural history museum	1.61	0.04
Feeding pigeons and doves	1.15	0.03

Table 2. Mean scores and SE of the animal knowledge scale (the scale ranges from 0-1), according to the different responses to the questions "What do you do when you encounter an unfamiliar species?" (based on T-Tests; all df = 388).

Using identification material (mean ± SE)	Not using identification material (mean ± SE)	T-value	P
0.47 ± 0.01	0.31 ± 0.01	7.44	<0.001
Using books	Not using books		
0.51 ± 0.01	0.34 ± 0.01	8.34	<0.001
Using the Internet	Not using the internet		
0.46 ± 0.03	0.41 ± 0.01	1.42	0.156
Asking friends	Not asking friends		
0.43 ± 0.02	0.41 ± 0.01	0.90	0.371

Table 3. Regression analysis (stepwise procedure) using the mean identification score. The final model retains only significant predictor variables (with p<0.05).

Variable	Standardised β
Using identification books	0.225
Using internet resources	0.100
Reading books and/or journals	0.116
Educational level	0.146
Feeding pigeons and doves	-0.122
Watching animals	0.117
Using no additional information source	-0.128
Visits to natural history museum	0.138
Corrected R^2	0.254
F (Total model)	17.564
P (Total model)	<0.001
Df 1, df 2	(8)381

scores of people that do not seek additional identification materials which supports the view that identification books are a more important source of species knowledge. Some aspects might be responsible for this fact: the effort to use a book is higher than asking friends or using the internet, further, the access to identification books depends on various factors, such as availability. In addition, the motivation to learn more about an unfamiliar species might influence the effort one puts into the solution. Although about one fourth of the respondents asked their friends about animal species (which is a high percentage) this social aspects did not contribute to species knowledge. Nevertheless, it should be viewed in a positive manner because a dialogue about an unfamiliar species contains also affective and emotional dimensions.

The results presented here further emphasize the importance of informal learning (Falk, 2005), i.e.

learning in settings out of school and during leisure, e.g. during a visit to a zoo. These sources of informal learning are an important predictor for species knowledge which means that this knowledge is obtained as a by product of visits to zoos, museums and aquariums or during leisure activities.

Additionally, the study shows that even unspecialized leisure activities that are easy to carry out and that do not need special materials (such as angling or birdwatching; see Hvenegaard, 2002; Arlinghaus, 2006) also contribute to knowledge about animal species. This suggests that some kind of informal learning during animal-related leisure activities takes place and that apart from originally encountering animals, media based activities (or visits to a museum) also have benefits for species knowledge. This, in turn, enforced the need to provide a wide variety of informal learning settings to educate the general public with respect to animal conservation.

Demographic determinants of species knowledge

Educational level had a significant impact on species knowledge. This is not surprising since teaching at school may also contribute to a higher knowledge about animals (Randler & Bogner, 2002, 2006; Prokop et al., 2007). In other studies, educational level also was a significant predictor of interest and attitude (Kellert, 1996; Bjerke & Østdahl, 2004; Røskraft et al., 2007). In contrast, Brooks et al. (1999) found no significant correlations between education level and knowledge scores but their study focused on one specific animal species the bobcats (*Lynx rufus*) while the present study covered a variety of species. Despite some differences, it seems clear that educational level is a significant predictor of species knowledge.

In other studies, older people in the USA expressed less interest and affection towards animals (Kellert, 1996) which seems contrasting to this study. In Randler et al. (2007) age also correlated significantly with species knowledge in park visitors. Assume a kind of informal learning in adulthood; one would expect an increasing level of knowledge with an increasing age up to a given threshold when cognitive capacities begin to decrease. The present study did not investigate such old-aged elderly peoples but it can be expected that this effect should occur.

Limitations of the study

The study was based on a sample of park and city visiting residents and may therefore be biased, because it was not a representative sample. Also a bias exists in the men/women quotient because 38.2% of the interviewed persons were men which deviates from 50%. However, this is for two reasons: There were slightly more women present at the study sites, and women were more agreeable when asked for the questions. It was not the major aim of the study to survey animal species knowledge in a more or less representative sample but rather to collect data to look on the determinants and sources of this knowledge and I consider the sampling method sufficient for this specific aim.

CONCLUSION

The results of this study showed that –in addition to demographic factors– a variety of animal related activities was positively related with species knowledge, and it is proposed, that these animal related activities positively contribute to knowledge. That is, people who engage in these activities subsequently acquire knowledge by some kind of informal learning. For educational purposes, animal-related activities should be fostered, and in further studies about human-wildlife relationships, these activities should be accounted for.

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