



The Lower Secondary School Pupils' Attitudes Toward and Knowledge About Water Birds

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ABSTRACT

The water birds are inseparable part of the environment and ecosystems. This group of birds has got an important role in the functioning of aquatic ecosystems make them sensitive indicators of the health of these environments. The main aim of the study was to find out the attitudes toward and knowledge about water birds among lower secondary school pupils. The partial aims were to find out the influence of demographic variables like gender, grade, residence and the ownership of pet on the attitudes toward and knowledge about water birds. The sample size consisted of 340 lower secondary school pupils from Czech Republic. The obtained data were analyzed by the methods of descriptive (mean score), inferential (analysis of variance) and also multidimensional statistics (factor analysis). The gender and grade level of pupils had got significant level on knowledge. All observed variables had got significant level on the attitudes toward water birds. And the relationship between knowledge and attitudes was negative. The implications to educational practice are discussed.

Keywords: attitudes toward water birds; knowledge about water birds; lower secondary school pupils; water birds

INTRODUCTION

The water birds are inseparable part of the environment and ecosystems. This group of birds has got an important role in the functioning of aquatic ecosystems make them sensitive indicators of the health of these environments. These birds have enriched and supported human existence and experience in economically, culturally and aesthetically way. They are recyclers, predators, prey and they also served as diffuser of other aquatic organisms (Figuerola & Green 2002). Water birds are inseparably part of water biodiversity and it constitutes a valuable natural resource, in economic, cultural, aesthetic, scientific and educational terms. Their conservation and management are critical to the interests of all humans, nations and governments (Dudgeon et al. 2006). Water birds require water and associated habitat of adequate quality and quantity, their successes or declines are indicative

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State of the literature

- Studies regarding to attitudes toward and knowledge about water birds are rare.
- The educational programs have got positive effect on the attitudes toward water birds.
- Pupils generally has got limited knowledge about water birds.

Contribution of this paper to the literature

- The relationship between knowledge about and attitudes toward water birds was negative.
- The sympathies, attitudes toward and knowledge about water birds were relative weak among pupils.
- The girls achieved higher score in knowledge and effect of grade level on attitudes was significant and consistent.

of the health of environments. The influence of human activities can lead to the declining of the water birds' occurrence and it can have got the influence on quality of environment. The effects of different factors were examined in some studies (e.g. Hockin et al. 1992). It is obvious, water birds are very important for the nature, for the people, so it is important to examine pupils' knowledge and attitudes toward this group of animals. Because it is important to protect water birds for the retention of the quality of our life.

THEORETICAL BACKGROUND

The studies, which are focused on the attitudes toward and knowledge about water birds, are very rare. This group of animals is examined only as a part of bigger research. Authors Dautopoulos & Pyrovetsi (1990) focused on the conservation attitudes of fishermen. Authors identified, the conflict was towards the fish-eating birds, particularly cormorants preying heavily on the fish ponds they have constructed. Problems with cormorants are according many authors exaggerated (e.g. Duffy 1995). According to author there is little evidence to suggest that cormorants seriously deplete commercial food sources. Klein (1993) warned on the disturbing behavior of the recreationists on the water animals. Author noticed, that the people, who spoke with refuge staff early during their visit caused the least disturbance. Authors highlighted the importance of educational programs. Educational programs, coupled with the use of observation blinds or guided tours, could help reduce bird disturbance. The similar study is possible to find out in the region of Australia, where authors (Glover et al. 2011) were focused on the disruptive behavior of the people on shorebirds in Australia. Respondents from the research reported an overall positive attitude to shorebird conservation. The similar results are possible to find in the research of Lafferty, Rodriguez & Chapman (2013) and also the influence of buses, cars and other was examined in the study of McLeod et al. (2013). Similar study was focused on the disturbance of wintering water birds. The results show that the awareness of environmental issues and knowledge of bird disturbance depends on the socioeconomic characteristics of each user group, both between the two sites and within each site. Results also indicate that, whatever the site and the user group, the vast majority of the respondents believed that their own presence had no adverse

effects on the local bird population (Le Corre et al. 2013). Kellert (1993) examined among other attitudes toward wildlife in the United States, Japan, and Germany. Respondents in each country had a distinctive pattern of basic attitudes toward wildlife and its conservation. These differences are described and interpreted in terms of the biogeographical, cultural, and historical characteristics of each country. Jacobson et al (2005) focused on the attitudes toward birds among farmers. According to authors, farmers' overall willingness to attract birds to their farms was not correlated with economic or non-economic incentives and barriers to adopting bird-friendly practices, such as current costs of pest management, experience with bird damage to crops, and farmers' knowledge of insectivorous birds and birds on their farms. Jorgensen & Brown (2015) examined attitudes of recreationists toward piping plover in USA. The respondents' age, sex, or location of primary residence had less influence. Recreationists with increased awareness of piping plovers and their protected status did not have more favorable attitudes toward plovers and recreation restrictions. The more frequently recreationists visited lakes, the less receptive they were to alternative management strategies. Clucas & Marzluff (2012) found out, that attitudes toward birds varied across the urbanization gradient. The most examined demographic variable is gender. And many authors found out the males had got more positive attitudes toward bird in comparison with females (Kellert & Berry 1987). The similar results were found out in the study of Prokop & Tunnicliffe (2010). Authors also examined the influence of pets on the attitudes toward animals. Having pets at home was associated with more positive attitudes to, and better knowledge of animals. And in other studies is possible to find out similar results (e.g. Hummell et al 2015; Prokop, Kubiato & Fancovicova 2008). Evans, Dixon & Heslop (2006) found out limited knowledge of pupils about birds. The limited knowledge did not improve with age and appears to be derived from indirect sources, such as television programs, motifs on Christmas cards and nursery rhymes, rather than actually seeing birds in the wild. The similar result with the problems with basic knowledge about some birds is able to detect in the studies of Kubiato & Balatova (2014) or Prokop, Kubiato & Fancovicova (2007).

METHODS

The study has got a quantitative research design and we adhere the principles of this kind of design. In order to determine pupils' knowledge and attitudes about water birds, a study was designed in which participants were asked to a series of test and attitudinal items regarding to study problematic. This study was conducted in the 4 lower secondary schools in Czech Republic. On the request of school principals, their location and name are anonymous. The participants were assured that their responses would only be used for research purpose and would not affect their final exam scores. The research tool was administered in a group format among participants and data were analyzed by adequate method. The similar principle is possible to find in studies like Chairam, Klahan & Coll (2015), Rusek & Metelkova (2014) or Torkar (2015).

The main aim of the study was to find out the attitudes toward and knowledge about water birds among lower secondary school pupils. The partial aims was to find out the

influence of demographic variables like gender, grade, residence and the ownership of pet on the attitudes toward and knowledge about water birds.

Participants

The sample size consisted of 340 lower secondary school pupils from Czech Republic. The respondents were from 4 lower secondary schools. The average age of pupils was 13.10 (SD = 1.22). The research tools were distributed among pupils by their teacher. Teachers were instructed, how to work with research tool. The basic demographic characteristics of participants are presented in **Table 1**.

Table 1. Basic demographic characteristic of participants

gender	boys	girls		
	189 (56%)	151 (44%)		
grade	6th	7th	8th	9th
	104 (31%)	71 (21%)	80 (23%)	85 (25%)
	Town	village		
	165 (48%)	175 (52%)		
ownership of pet	pet owner	non-pet owner		
	250 (73%)	90 (27%)		

Research tool

The research tool used in the research was divided into four parts. The first part included demographic variables, in the next part respondents should expressed sympathies toward 19 birds on the 5-point scale (strongly unsympathetic – slightly unsympathetic – neutral – slightly sympathetic – strongly sympathetic). There were chosen birds, which should be well known for pupils like The Mute swan (*Cygnus olor*) or The White stork (*Ciconia ciconia*); birds not so known for pupils like The Little-ring plover (*Charadrius dubius*) or The White-throated dipper (*Cinclus cinclus*); birds of prey like The White-tailed eagle (*Haliaeetus albicilla*) or The Western marsh harrier (*Circus aeruginosus*) and also birds, which are not common in the nature of Middle Europe, but they are common in zoos like The American flamingo (*Phoenicopterus ruber*) or The Great white pelican (*Pelecanus onocrotalus*). The third part of research tool included 16 questions regarding to knowledge about water birds, 13 of them were closed and three were open-ended. The questions were divided into four groups:

1. Birds behavior (e.g. Why does The Mute swan attack on the intruder?) – 5 questions
2. Food of birds (e.g. How much food The Grey heron eat during day?) – 3 questions
3. Breeding of birds (e.g. Which of these birds are building “floating” nests?) – 5 questions
4. Identification of birds (e. g. Which of the following birds don’t have webbed foots?) – 3 questions

The last part of the research tool was focused on the attitudes toward water birds. It was created by 26 Likert type items. The items were formulated in positive and also in the negative meaning. The respondents were assured about the anonymity of research tool. The time for the completing of research tool was not longer than 30 minutes.

Analysis of data

The data from the second part of research tool (sympathies to birds) were coded from the 1 to 5 (strongly unsympathetic -...- strongly sympathetic). The responses in third part of research tool (knowledge about birds) were analyzed following: for the correct answer was code 1 and for incorrect answer was code 0. The last part of the research tool was coded similar like answers from the second part of the research tool. The items in positive meaning were coded following: 1 - strongly disagree; 2 - slightly disagree; 3 - neutral; 4 - slightly agree; 5 - strongly agree. The items in negative meaning were coded reversely.

Table 2. Results of factor analysis of the part of research tool focused on the sympathies toward birds

	I.	II.	III.
Factor 1			
The Eurasian bittern	0.79	0.16	0.26
The White wagtail	0.85	0.20	0.37
The Great cormorant	0.48	0.33	0.23
The Little-ring plover	0.72	0.29	0.36
The Common kingfisher	0.56	0.33	0.27
The Great crested grebe	0.49	0.39	0.31
The Common tern	0.80	0.35	0.25
The White-throated dipper	0.58	0.34	0.18
The Corn crake	0.51	0.37	0.30
Factor 2			
The Western marsh harrier	0.29	0.45	0.36
The Black-headed gull	0.17	0.52	0.35
The White-tailed eagle	0.21	0.87	0.17
The American flamingo	0.32	0.56	0.23
The Great white pelican	0.23	0.74	0.31
Factor 3			
The Wild duck	0.37	0.06	0.75
The White stork	0.22	0.38	0.80
The Greylag goose	0.27	0.30	0.47
The Grey heron	0.33	0.32	0.55
The Mute swan	0.18	0.22	0.77
Eigenvalue	13.50	1.24	1.05
% of variance	67.51	6.22	5.25

The factor analysis with Varimax rotation was used for the construct validity determination and also for the distribution of items in the dimensions. The factor analysis was used for every part of the research tool, so below are results of three factor analyses. The critical

value factor score for every factor analysis was 0.40. The items from the first part of the research tool regarding to sympathies toward birds were distributed into three factors (**Table 2**).

The knowledge part of research tool was also distributed into three factors. The factors are named according to character of questions: 1. Food and breeding; 2. Identification of birds; 3. Birds behavior. In the **Table 3** are presented only numbers of the questions, the knowledge test is as an appendix.

Table 3. Results of factor analysis of the part of research tool focused on the knowledge about birds

	I.	II.	III.
Food and breeding			
Question no. 2	0.57	-0.45	-0.02
Question no. 5	0.99	0.02	0.01
Question no. 6	0.99	0.01	0.02
Question no. 7	0.99	0.02	0.01
Question no. 8	0.99	0.02	0.01
Question no. 9	0.99	0.03	0.01
Question no. 10	0.99	0.03	0.01
Question no. 13	0.44	0.02	0.29
Identification of birds			
Question no. 14	0.06	0.68	0.02
Question no. 15	-0.02	0.53	0.04
Question no. 16	0.01	0.51	-0.40
Birds behavior			
Question no. 1	-0.03	0.05	0.81
Question no. 3	0.04	0.34	0.49
Question no. 4	0.05	0.15	0.46
Question no. 11	-0.02	0.04	0.43
Question no. 12	-0.02	0.06	0.51
Eigenvalues			
	5.98	1.71	1.20
% of variance			
	37.40	10.67	7.47

The last part of the research tool (attitudes toward water birds) was divided into 5 factors. As it was in previous part, in the **Table 4** are presented only numbers of items. The part of research tool regarding to attitudes toward water birds is as an appendix.

Table 4. Results of factor analysis of the part of research tool focused on the attitudes toward water birds

	I.	II.	III.	IV.	V.
Factor 1					
Item no. 5	0.69	0.07	0.11	0.07	0.09
Item no. 6	0.66	0.03	0.10	0.25	-0.04
Item no. 7	0.71	0.01	0.16	0.10	0.18
Item no. 8	0.57	0.04	0.03	-0.12	0.18
Item no. 14	0.68	-0.13	0.19	0.15	-0.07
Item no. 15	0.44	0.39	-0.28	0.17	-0.03
Item no. 16	0.47	0.16	0.37	0.28	-0.22
Item no. 19	0.74	0.06	0.24	0.05	-0.02
Item no. 21	0.56	0.11	0.38	0.32	-0.02
Factor 2					
Item no. 12	0.37	0.54	0.01	0.30	0.03
Item no. 13	-0.29	0.67	-0.06	0.08	0.07
Item no. 17	0.38	0.60	0.02	0.00	-0.02
Item no. 18	0.01	0.67	0.22	-0.14	-0.07
Factor 3					
Item no. 10	0.18	0.03	0.60	-0.16	-0.21
Item no. 20	0.24	0.05	0.57	0.32	0.03
Item no. 22	0.05	-0.18	0.42	0.24	-0.04
Item no. 23	0.14	0.10	0.61	0.12	0.17
Item no. 24	0.19	0.14	0.56	0.27	0.11
Factor 4					
Item no. 1	0.32	0.09	0.15	0.63	-0.05
Item no. 2	0.34	0.03	0.08	0.60	0.09
Item no. 4	0.03	-0.08	0.29	0.64	0.18
Item no. 4	-0.06	0.37	0.10	0.44	-0.19
Factor 5					
Item no. 9	0.06	-0.02	0.00	0.03	0.79
Item no. 11	0.31	-0.02	0.37	0.22	0.42
Item no. 25	-0.01	0.23	0.17	-0.13	0.68
Item no. 26	0.05	-0.06	0.03	-0.12	0.65
Eigenvalues	6.30	2.25	1.70	1.24	1.16
% of variance	24.22	8.66	6.52	4.75	4.45

The reliability of the research tool was determined by the Cronbach's alpha coefficient (α). The part regarded to sympathies toward birds achieved $\alpha = 0.97$, the knowledge part $\alpha = 0.71$ and attitudinal part $\alpha = 0.84$. All values indicated high reliability of the research tool.

The obtained data were analyzed by the methods of descriptive (mean score) and inferential (analysis of variance) statistics. The demographic variables were as independent variables and score for sympathies, knowledge and attitudes were as dependent variable. The analysis of

variance (ANOVA) was used for the determination of differences and the Pearson product moment was used for the determination of relationship between dependent variables.

RESULTS

The overall score indicated, that the pupils had got relatively positive sympathies toward water birds ($x = 3.28$). The influence of observed variables (gender, grade, residence and ownership of pet) on the sympathies toward water birds was not statistically significant (**Table 5**). The most sympathetic birds are The Mute swan ($x = 4.10$), The White-tailed eagle ($x = 4.08$) and The American flamingo ($x = 3.76$) and the least sympathetic water birds are The Eurasian bittern ($x = 2.46$), The Corn crake ($x = 2.80$) and The White wagtail ($x = 2.82$). The sympathies toward concrete water birds were similar with respect to gender, residence, grade and ownership of pet.

The knowledge level of respondents about water birds was relatively low ($x = 0.40$). The difference in results with respect to gender was significant ($F = 6.58$; $p < 0.05$). The girls achieved higher score in comparison with boys (**Table 5**). The statistical significant difference was observed in the variable grade ($F = 4.23$; $p < 0.01$). The highest score achieved pupils from 7th grade and the lowest one pupils from 8th grade. The influence of other variables was insignificant.

The attitudes toward water birds were relatively neutral ($x = 2.95$). The influence of all observed variables was significant. The boys achieved higher score in comparison with girls ($F = 10.14$; $p < 0.01$), the score for grade was consistent, the youngest pupils achieved the lowest score and the oldest pupils achieved the highest score ($F = 7.07$; $p < 0.001$). The pupils from town had got more positive attitudes in comparison with pupils from village ($F = 16.74$; $p < 0.001$) and pupils without pet achieved higher score than pupils with pet ($F = 5.68$; $p < 0.05$) (**Table 5**).

Table 5. Mean score and values of ANOVA

		gender		residence		grade				ownership of pet	
		boys	girls	village	town	6th	7th	8th	9th	yes	no
sympathies	x	3.28	3.29	3.26	3.30	3.30	3.24	3.18	3.39	3.29	3.27
	F	0.03		0.20		0.99				0.02	
knowledge	x	0.43	0.38	0.41	0.39	0.37	0.44	0.37	0.43	0.41	0.38
	F	6.58*		1.00		4.23**				0.97	
attitudes	x	3.06	2.83	2.82	3.10	2.74	2.95	3.09	3.11	2.91	3.09
	F	10.14**		16.74***		7.07***				5.68*	

x – mean score; F – value of ANOVA

The relationship between knowledge and attitudes was negative and was significant ($r = -0.31$; $p < 0.05$). It means with higher knowledge about water birds the level of attitudes was decreasing (**Figure 1**).

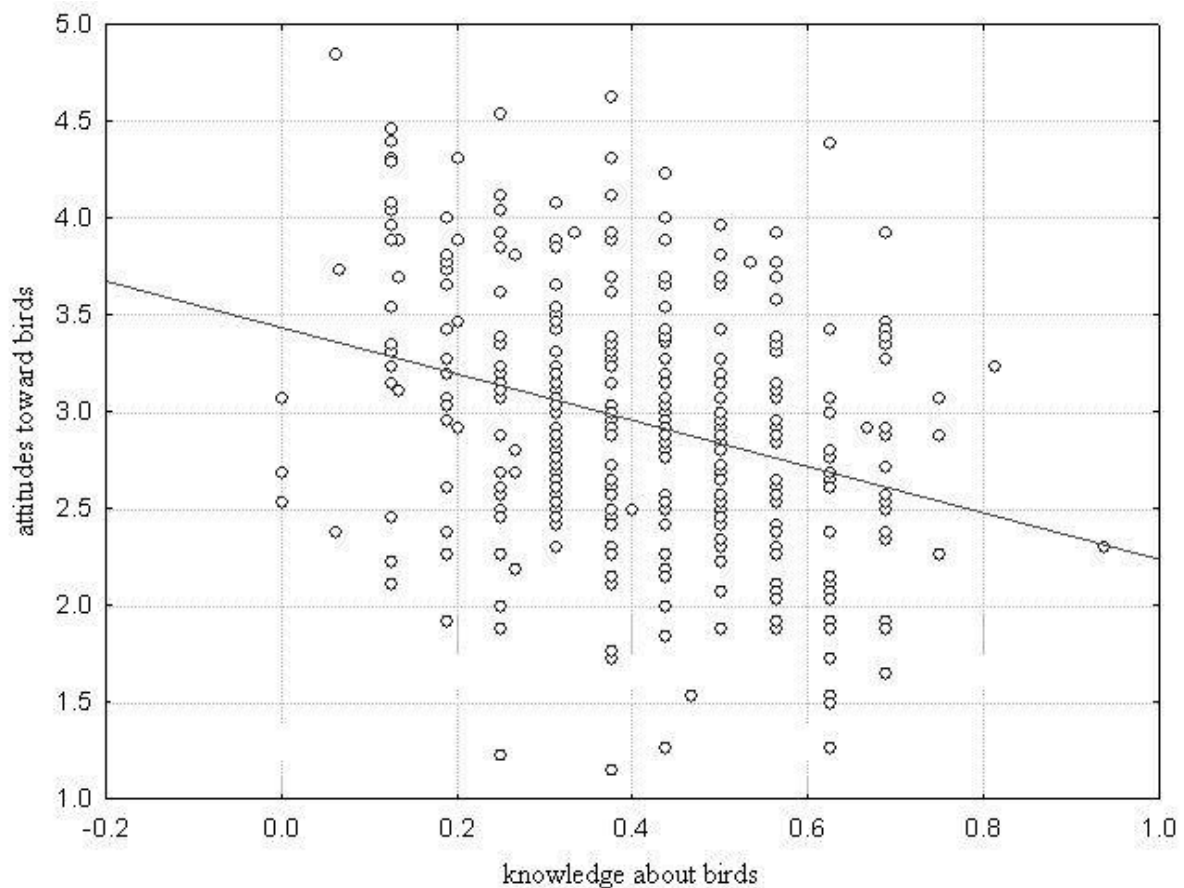


Figure 1. The relationship between knowledge about water birds and attitudes toward water birds

The negative relationship ($r = -0.47$; $p < 0.05$) was found out between attitudes toward water birds and sympathies toward water birds, when the sympathies were positive, the attitudes toward water birds were negative (Figure 2).

The last correlation was slightly positive ($r = 0.25$; $p < 0.05$) and it was between knowledge about water birds and sympathies toward water birds.

DISCUSSION

The sympathies, attitudes toward and knowledge about water birds were relatively weak. It could be caused by the relative marginal effect of water birds. Many children know only basic water birds like The White stork or The Mute swan (e.g. Kellert 1984). So for many pupils could be presented birds small surprise, because many of them did not listen about some offered birds anything. This situation can be caused by the effect of biology education, where still teacher-centered approach and teachers is favor the education in class, the effect of informal education, and education in the nature is not presented. On the basis of these ideas, the pupils have got chance to meet with wide spectrum of water birds only minimal. One short

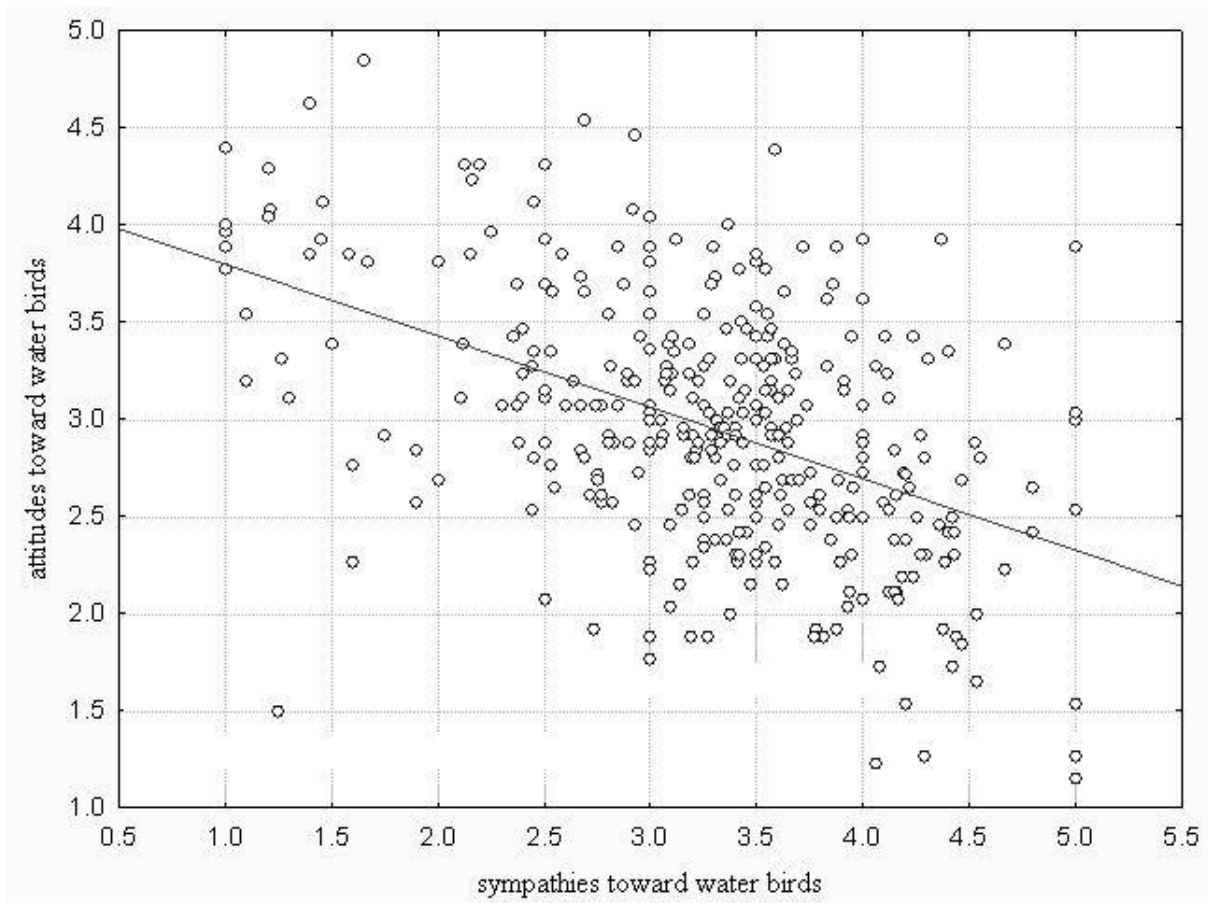


Figure 2. The relationship between sympathies toward water birds and attitudes toward water birds

comment toward relatively poor knowledge about water birds. It can be also caused by presenting animals in fantastical and unrealistic ways, such as wearing clothes, talking and engaging in human-like activities. Ganea et al (2014) quoted that anthropomorphized animals in books may not only lead to less learning but also influence children's conceptual knowledge of animals.

The relationship between knowledge and attitudes was negative and also between sympathies and attitudes. This result is in discrepancy with the other studies. For example Prokop, Kubiатko & Fancovicova (2008) found out positive relationship between knowledge and attitudes toward birds. The neutral or slightly positive relationships were found out in the studies of Kaczensky, Blazic & Gossow (2004) and Torkar et al. (2010). However, the negative relationship is very surprising result. It can be caused by the character of attitudinal items, they are connecting with the activities outside of school environment and with informal learning. If pupils are realizing these activities, there is decreasing of interest about acquisition of knowledge.

The effect of grade level on attitudes was significant and consistent. The older pupils had got the more positive attitudes than younger. This trend is possible to see in the study from authors Prokop, Kubiato & Fancovicova (2008). It is possible to also find studies, where the influence of age was insignificant (e.g. Signal & Taylor 2006). The one explanation is, that older pupils are aware of human activities and they have got higher need to protect a nature. The effect of grade on knowledge was insignificant and inconsistent. The inconsistency in the knowledge level about animals is mentioned also in the study of Randler (2008). The relatively same knowledge about animals was also presented in the study of Rosengren et al. (1991), where is stated that pupils from schools and adults had got similar knowledge about animals, but only preschool children had got bigger misconceptions about animals.

The girls achieved higher score in knowledge level in comparison with boys. This fact is in contrast with the ideas of Randler (2008), who stated that nowadays girls generally perform better even in subjects that were considered to be a domain of boys such as science subjects and others. Also Prokop, Prokop & Tunnicliffe (2008) showed better knowledge about animals at girls in comparison with boys. When we look at the past, we can see, that boys achieved better score on knowledge test about animals in comparison with girls (Ryman 1974), but nowadays is situation different as quoted Randler (2008). The girls achieved lower attitudes in comparison with boys. This result is in contradiction with the findings of Herzog, Betchart & Pittman (1991), where girls had got more positive attitudes toward animals. This situation can be explained by the character of items, as it was mentioned above. The items are focused on the outside activities and some studies showed, the boys more like outside activities and had got more enjoy being out of school environment (Baranowski et al. 1993; Carroll & Loumidis 2001).

The level of knowledge was similar between pupils from village and from town. The similar result was done by Arcury (1990), the aim was find out the environmental knowledge and attitudes with the effect of different variables. Author did not mention the influence of residence on the level of knowledge. Maybe, there is an influence of intensive life with ICT. The pupils from both environments are living similar way of life, where the visiting of nature is only in the level of hypothesis. However, the attitudes toward water birds were more positive among pupils from town. This variable was also studied in the study of Kellert (1984), but the results were not significant. The possible explanation is, that pupils from village have got animals connected with livestock and they had to care about them, so they perceived the animals only with work, so they attitudes are relatively negative. The pupils from town observed animals maximally in zoos, parks, surroundings of home, so they evaluated mainly look of animals, so they attitudes are more positive.

The effect of having pets was insignificant in the knowledge level and also in the attitudes. This finding is in opposite with findings of Prokop, Prokop & Tunnicliffe (2008) and Prokop & Tunnicliffe (2010). Also Drews (2002) found out positive effect of having animals as pets on respondents' level of knowledge and attitudes. The similar result is possible to find out in the study of Signal & Taylor (2006), where authors did not find any significant effect of

ownership of animals on attitudes toward animals. It can be caused by the losing of free time due to care about pet. The first enjoyment is substituted by daily care about animal, which perceived by many pupils by negative way. It can lead to decrease of knowledge about and attitudes toward animals.

CONCLUSION

This study has got many ways, how it can be done other way. But, we can try to offer interesting results, which can lead to better understand of the knowledge and attitudes of lower secondary school pupils toward part of fauna called water birds. As it was mentioned at the beginning of the test, the water birds are inseparable part of nature with the direct and indirect effect of human life. So without protecting them, their fading could have got negative impact on our lives. So there is very important to increase knowledge about and attitudes toward water birds among pupils. There are some possibilities how to do it.

Significant positive relationships between 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 (Randler 2010). Tarlowski (2006) found that the effects of direct experiences with nature (examined indirectly by comparing rural vs. urban children) and the biological expertise of parents affected the concepts of humans, mammals and insects held by children. The similar approach was possible to find in the study of Hacieminoglu et al. (2016), where authors showed the positive effect of teacher on the attitudes. The condition was, that the teacher had got experiences with any program, which can improve knowledge about some biological topics.

There are also some possibilities of further research, for example in the method part of the study are presented dimension, which were created by the using of factor analysis. In the next study it is possible to work with them and it can produce more detailed results, which can help to improve level of knowledge and also improve attitudes toward water birds.

We hope, our study fill the gap in this area of research.

REFERENCES

- Arcury, T. (1990). Environmental attitude and environmental knowledge. *Human Organization*, 49(4), 300-304.
- Baranowski, T., Thompson, W. O., Durant, R. H., Baranowski, J., & Puhl, J. (1993). Observations on physical activity in physical locations: age, gender, ethnicity and month effects. *Research Quarterly for Exercise and Sport*, 64(2), 127-133.
- Carroll, B., & Loumidis, J. (2001). Children's perceived competence and enjoyment in physical education and physical activity outside school. *European Physical Education Review*, 7(1), 24-43.

- Chairam, S., Klahan, N., & Coll, R. K. (2015). Exploring secondary students' understanding of chemical kinetics through inquiry-based learning activities. *Eurasia Journal of Mathematics, Science & Technology Education*, 11(5), 937-956.
- Clucas, B., & Marzluff, J. M. (2012). Attitudes and actions toward birds in urban areas: Human cultural differences influence bird behavior. *The Auk*, 129(1), 8-16.
- Daoutopoulos, G. A., & Pyrovetsi, M. (1990). Comparison of conservation attitudes among fishermen in three protected lakes in Greece. *Journal of Environmental Management*, 31(1), 83-92.
- Drews, C. (2002). Attitudes, knowledge and wild animals as pets in Costa Rica. *Anthrozoos*, 15(2), 119-138.
- Dudgeon, D. et al. (2006). Freshwater biodiversity: importance, threats, status and conservation challenges. *Biological Reviews*, 81(2), 163-182.
- Duffy, D. C. (1995). Why is the double-crested cormorant a problem? Insights from cormorant ecology and human sociology. *Colonial Waterbirds*, 18(1), 25-32.
- Evans, S., Dixon, S., & Heslop, J. (2006). Pupils' knowledge of birds: how good is it and where does it come from? *School Science Review*, 88(322), 93-98.
- Figuerola, J., & Green A. J. (2002). Dispersal of aquatic organisms by waterbirds: a review of past research and priorities for future studies. *Freshwater Biology*, 47(3), 483-494.
- Ganea, P. A., Canfield, C. F., Simons-Ghafari, K., & Chou, T. (2014). Do cavies talk? The effect of anthropomorphic picture books on children's knowledge about animals. *Frontiers in Psychology*, 5. online <<http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3989584/>> [2015-10-14].
- Glover, H. K., Weston, M. A., Maguire, G. S., Miller, K. K., & Christie, B. A. (2011). Towards ecologically meaningful and socially acceptable buffers: Response distances of shorebirds in Victoria, Australia, to human disturbance. *Landscape and Urban Planning*, 103(3-4), 326-334.
- Hacieminoglu, E., Ali, M. M., Oztas, F., & Yager, R. E. (2016). Successes with reversing the negative student attitudes developed in typical biology classes for 8th and 10th grade students. *Eurasia Journal of Mathematics, Science & Technology Education*, 12(1), 153-160.
- Herzog, H., Betchart, N. S., & Pittman, R. B. (1991). Gender, sex role orientation, and attitudes toward animals. *Anthrozoös*, 4(3), 184-191.
- Hockin, D., Ounsted, M., Gormant, M., Hillt, D., Kellert, V. & Barker, M. A. (1992). Examination of the effects of disturbance on birds with reference to its importance in ecological assessments. *Journal of Environmental Management*, 36(4), 253-286.
- Hummel, E., Ozel, M., Medina-Jerez, W., Fancovicova, J., Usak, M., Prokop, P., & Randler, C. (2015). Interest in birds and its relationship with attitudes and myths: A cross-cultural study in countries with different levels of economic development. *Educational Sciences: Theory & Practice*, 15(1), 285 - 296.
- Jacobson, S. K., Sieving, K. E., Jones, G. A., & Van Doorn, A. (2005). Assessment of farmer attitudes and behavioral intentions toward bird conservation on organic and conventional Florida farms. *Conservation Biology*, 17(2), 595-606.
- Jorgensen, J. G., & Brown, M. B. (2015). Evaluating recreationists' awareness and attitudes toward Piping plovers (*Charadrius melodus*) at Lake McConaughy, Nebraska, USA. *Human Dimensions of Wildlife*, 20(4), 367-380.
- Kaczensky, P., Blazic, M., & Gossow, H. (2004): Public attitudes towards brown bears (*Ursus arctos*) in Slovenia. *Biological Conservation*, 118(5), 661-674.

- Kellert, S. R. (1984). Attitudes toward animals: Age-related development among children. In M.W. Fox & L.D. Mickley (Eds.), *Advances in animal welfare science 1984/85* (pp. 43-60). Washington, DC: The Humane Society of the United States.
- Kellert, S. R. (1993). Attitudes, knowledge, and behavior toward wildlife among the industrial superpowers: United States, Japan, and Germany. *Journal of Social Issues*, 49(1), 53–69.
- Kellert, S. R., & Berry, J. K. (1987). Attitudes, knowledge, and behaviors toward wildlife as affected by gender. *Wildlife Society Bulletin*, 15(3), 363-371.
- Klein, M. W. (1993). Water bird behavioral responses to human disturbances. *Wildlife Society Bulletin*, 21(1), 31-39.
- Kubiátko, M., & Balatova, K. (2014). Are storks homosexuals? Persistence of misconceptions among university students. *Journal of Baltic Science Education*, 13(4), 448-457.
- Lafferty, K. D., Rodriguez, D. A., & Chapman, A. (2013). Temporal and spatial variation in bird and human use of beaches in southern California. *SpringerPlus*, 2(38), 1-14.
- Le Corre, N., Peuziat, I., Brigand, L., Gelayaud, G., & Meur-Ferec, C. (2013). Wintering water birds and recreationists in natural areas: A sociological approach to the awareness of bird disturbance. *Environmental Management*, 52(4), 780-791.
- McLeod, E. M., Guay, P. J., Taysom, A. J., Robinson, R.W., & Weston, M. A. (2013). Buses, cars, bicycles and walkers: The influence of the type of human transport on the flight responses of water birds. *PLoS ONE*, 8(12).
- Prokop, P., Kubiátko, M., & Fančovičová, J. (2007). Why do cocks crow? Children's concepts about birds. *Research in Science Education*, 37(4), 393–405.
- Prokop, P., Kubiátko, M., & Fančovičová, J. (2008). Slovakian pupils' knowledge of and attitudes toward birds. *Anthrozoös*, 21(3), 221–235.
- Prokop, P., Prokop, M., & Tunnicliffe, S. D. (2008). Effects of keeping animals as pets on children's concepts of vertebrates and invertebrates. *International Journal of Science Education*, 30(4), 431-449.
- Prokop, P., & Tunnicliffe, S. D. (2010). Effects of having pets at home on children's attitudes toward popular and unpopular animals. *Anthrozoös*, 23(1), 21-35.
- Randler, C. (2008). Pupils' factual knowledge about vertebrate species. *Journal of Baltic Science Education*, 7(1), 48-54.
- Randler, C. (2010). Animal related activities as determinants of species knowledge. *Eurasia Journal of Mathematics, Science & Technology Education*, 6(4), 237-243.
- Rosengren, K. S., Gelman, S. A., Kalish, C. W., & McCormick, M. (1991). As Time Goes By: Children's Early Understanding of Growth in Animals. *Child Development*, 62(6), 1302-1320.
- Rusek, M., & Metelkova, I. (2014). Chemistry teachers' opinion of chemistry education. In P. Cieřla & A. Michniewska (Eds.), *Teaching and Learning Science at All Levels of Education* (pp. 139-143). Krakow: Pedagogical University of Krakow.
- Ryman, D. (1974). The relative effectiveness of teaching methods on pupils' understanding of the classification of living organisms at two levels of intelligence. *Journal of Biological Education*, 8(3), 219-222.
- Signal, T. D., & Taylor, N. (2006). Attitudes to animals: Demographics within a community sample. *Society and Animals*, 14(2), 147-157.
- Tarlowski, A. (2006). If it's an animal it has axons: Experience and culture in preschool children's reasoning about animates. *Cognitive Development*, 21(3), 249–265

- Torkar, G. (2015). Pre-service teachers' fear of snakes, conservation attitudes, and likelihood of incorporating animals into the future science curriculum. *Journal of Baltic Science Education*, 14(3), 401-410.
- Torkar, G., Mohar, P., Gregorc, T., Nekrep, I., & Adamic, M. H. (2010). The conservation knowledge and attitudes of teenagers in Slovenia toward the Eurasian Otter. *International Journal of Environmental & Science Education*, 5(3), 341-352.

APPENDIX

Knowledge and attitudes part of the research tool

A. Knowledge questions

1. Why are the cormorants sitting on the branches with spread wings, when they creep out of water?
2. How much food herons eat during day?
a) 500 grams b) 1000 grams c) 2000 grams d) 5000 grams
3. Where does the white stork winter?
a) Asia b) America c) Antarctica d) Africa
4. Why does swan attack on the intruder?
a) it like fight b) it reacts on colors c) it protects nest d) it hunts a food
5. What is the food of swans?
a) fish b) water plants c) mice d) small birds
6. Which of these birds are building "floating" nests?
a) grebe b) kingfisher c) duck d) goose
7. Who is feeding younglings from the ducks' pair?
a) male b) female c) male and female d) they feed on their own
8. Which of these birds is active during the night?
a) cormorant b) kingfisher c) corncrake d) pelican
9. Which of these birds is nesting in colony?
a) kingfisher b) dipper c) gull d) duck
10. Imagine situation, in the water area are no fish. Which of these birds would not have any food?
a) plover b) duck c) cormorant d) goose
11. Which of these birds is found only on the flow waters?
a) swan b) dipper c) heron d) duck

12. What is the function of coccygeal gland for the water birds?
13. Which of these birds make hole to sand bank as a nest?
a) wagtail b) duck c) kingfisher d) gull
14. Which of the following birds don't have webbed feet?
a) duck b) gull c) swan d) heron
15. Why have ducks more colorful feathers in spring season?
16. Why there is more birds on the lakes in winter time?

B. Attitudes to water birds or activity in nature

1. I like to walk around lake.
2. I like to feed ducks and swans during winter by grain.
3. The hunting of birds for sport is cruel and unnecessary.
4. It is okay to catch birds in the nets.
5. I like to read books about birds.
6. I would like to observe water birds from the boat.
7. I would like to learn about birds in biology class.
8. I would like to have a duck as a pet.
9. The water birds do not belong into the zoo.
10. The keeping of birds in zoo protects these birds from becoming extinct.
11. I would rather see birds in the nature than in zoo.
12. I really do not care about water birds.
13. Cormorants are harmful birds, because they hunt fish.
14. Media should be bringing more information about birds' behavior.
15. I get bored by scientific talk about birds.
16. I would like to watch a female bird how she is giving food to younglings.
17. I have no feelings, when I see water birds.
18. Water birds should live only in birds' reservations.
19. I like to watch documentary films about water birds.
20. It is important to protect rivers and lakes for water birds.
21. I like to observe birds swimming and diving on a lake.
22. Toxic substances from industry waste waters are transferred from plants to birds and endanger them.
23. It is important to conserve water birds and freshwaters for future generations.
24. Endangered water bird species, like corncrake, have the right to live in my country.
25. Many water bird species are dangerous to humans.
26. It is unnecessary to maintain water bird reservations because we have enough rivers and lakes in the county.