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An attempt to evaluate selected animal exhibitions in zoological garden based on their educational role

***Abstract**: An attempt to evaluate selected animal exhibitions in zoological garden based on their educational role.* The aim of the hereby research was to identify the criteria influencing the educational value of animal enclosures. Next, the criteria were used to evaluate 13 selected exhibitions of common hippopotamus (Hippopotamus amphibius) in different zoological gardens. The criteria were identified during two-stage cameral analysis, which included project, behavioural and organisational assumptions. The analysis provided 61 criteria divided into 11 groups: position (location), area size, vegetation, water, relief, light, ground (surface), landscape (shaping of visibility), arrangement, other animals, animal behaviour. The criteria were then used to evaluate the exhibition using an ordinal scale (-1, 0, +1). The total result indicated the best designed and arranged exhibitions with highest educational value in Berlin, Hanover, Antwerp and Basel. Criteria from the groups: area size, number of animals and relief were the key points for evaluating the educational value o fan exhibition. High notes obtained for these groups of criteria had positive influence on other criteria. Moreover, it was proved that a large water reservoir with high-efficiency water filtrating system allowed to create a fragment of ecosystem with many interrelations.

Key words: zoological garden, exhibitions, education, transmission of information, landscape immersion, landscape replication

INTRODUCTION

Zoological gardens have various roles: educational, recreational, scientific, conservation (preservation of endangered species) and protecting genetic resources of animals (diversity). Education is among the most significant roles and may include environment protection programs presenting dangers to various species, relations between economy, lifestyle and natural environment with its resources (Olech 2003). However, the most important aspect of the zoo's educational role is presenting animals and their behaviour in environment similar to natural. Presentation of the complexity of an ecosystem: environment, animals, interrelations and interactions can have influence on the society's educational awareness. It is estimated that American zoological garden are visited by over 104 million visitors every year (AAZPA 1992) while 14 Polish zoos are visited by 2.5 million individuals annually (Topola 2004). Assuming that every visitor spends 2 hours in the zoo and that every minute they learn (consciously or subconsciously) 1 piece of information, the number of educational opportunities is about 12.5 billion for American zoos and 300 million for Polish zoos (Coe 1987). Moreover, a visit to zoo is a direct and real experience and not TV fiction. It is also important to mention that, according to Joslin's et al. (1986), research in Chicago zoo, 80% of visitors are children under 10 years of age with parents.

Nowadays, during the design phase or rearrangement of animal exhibitions, the needs and safety of animals as well as the visitors' safety are among the top priorities. Unfortunately, the first impression and imitation of the natural environment are neglected. Even exhibitions which satisfy all the needs of animals, often give the visitors a wrong idea about the natural habitat of the animal. Creating the impression of an animal being shown in a fragment of its natural habitat is often wrongly implemented or even totally omitted.

The information provided above indicates that there are huge possibilities for zoological gardens to influence environmental awareness of the society. This was included in the hereby article as analysis of educational role of hippopotamus exhibitions. This evaluation will be focused on exhibitions and their functioning and special attention will be given to the impression (information) which the visitors may acquire themselves having seen a given

exhibition. All the information facilities located in the visitors' area (information boards, models, educational corners with artistic presentations) will not be described in this article The aim of this evaluation is to identify the exhibitions with the best arrangement and highest educational value as well as to answer the question *Which criteria have the most influence on the educational value of an exhibition?*

METHOD OF RESEARCH

The subject of research was analysed based on a number of information and data obtained in theoretical research (chamber) and outdoor research. The first type was two-stage research using analysis of content method (Cartwright 1965). The starting point in the analysis identifying the set of criteria were 3 ideas creating an educational message: context, content and message (Coe 1987). The second stage of theoretical research included review and analysis of publications to identify behavioural (Coe 1985), project (Coe 1994) and organisational assumptions (Coe 2004). This resulted in identification of 61 criteria divided into 11 groups such as position (location), area size, vegetation, water, relief, light, ground (surface),landscape (shaping of visibility), arrangement, other animals, animal behaviour.

The outdoor research included inspections in 13 zoological gardens over four years (1999-2005) mostly in July and August (Whipsnade and Verona were visited in March). The exhibitions in question are found in 8 European countries: Poland, Germany, Holland, Great Britain, Belgium, Switzerland, Austria and Italy. The data for research was collected in all zoological gardens with hippopotamus exhibitions which were visited by the author during work on this and other research projects. Selection of subjects for research was guided by information from publications as well as specialist guidelines from research centres (zoological gardens, EAZA). Actually the subject of outdoor research were 6 hippopotamus exhibitions using permanent water supply and filtering technologies located in Berlin (Berlin Zoo), Hanover, Emmen, Antwerp, Basel, Vienna and 7 "traditional" exhibitions in Warsaw, Łódź, Wrocław, Cologne, Frankfurt am Main, Whipsnade and Verona.

During the inspections, exhibitions were measured on the basis of detail maps, described and photographed, animal behaviour was observed and local specialists were consulted to determine criteria.

All observations took place at the same time of the day (10.00, 13.00 and 18.00 hrs) for one hour at a time (except for Whipsnade – only one observation from 13.00 to 14.00 hrs). Three periods of observation were necessary to obtain the average daily behaviour of animals, that is a preliminary etogram (Shepherdson 1989). Based on the observed behaviour, the educational role of individual exhibitions can be evaluated.

Data gathered during the research was analysed according to 61 criteria measure in an ordinal scale (-1, 0, +1), -1 stands for unacceptable conditions (bad), 0 – intermediate, +1 – proper conditions (good).

Each exhibition were compered to determined author's pattern, which it will best optimal solution of exhibition for common hippopotamus in an urban zoo. The final educational value was determined having the total value of all criteria for every exhibition. The content of criteria and evaluation method were determined by author according to information from publications and consulting local specialists in zoological gardens. Consultations included surveys and latest information obtained in each zoo. The survey consisted of several question groups: general information, light, vegetation, relief, ground (surface) and functioning of exhibitions. During the author's visits in zoological gardens, the research was consulted with many renowned specialists such as dr Ragnar Kühne (Berlin Zoo), dr Werner Kaumanns (Cologne), dr Heiner Engel (Hanover), dr Pierre de Wit (Emmen) and dr Bruno Van Puijenrocoeck (Antwerp).

Table 1. Criteria for evaluation of common hippopotamus exhibitions – results of content analysis in publications (selection of author)

Group	Number	Criterion
Position (location)	A.1	Enclosure should not have northern exhibition
	A.2	Enclosure should not be sloping from the North (cold air flow)
Area size	B.1	Is the external enclosure larger than 750 m^2?
	B.2	Is the internal enclosure larger than 200 m^2?
	B.3	Is the area of internal enclosure larger than 40 m^2 for each hippopotamus?
Vegetation	C.1	Do plants cover over 25% of the exhibition area?
	C.2	Is vegetation in the exhibition similar to vegetation in hippopotamus' natural environment?
	C.3	Is vegetation in good shape?
	C.4	Is part of the vegetation in the internal exhibition the same as vegetation in hippopotamus' natural environment
	C.5	Is part of the vegetation accessible to animals?
Water	D.1	Is the size of external reservoir for hippopotamuses larger than 500 m^2?
	D.2	Is the area of external reservoir for each hippopotamus as large as 120-160 m^2 or bigger?
	D.3	Is water transparency over 2 m?
	D.4	Is water in the reservoir filtered at rate of 100m3/h?
	D.5	Is water clear enough for fish to live in the reservoir?
	D.6	Is water clear enough for water birds to live next to the reservoir?
	D.7	Is water clear enough for interaction between hippopotamuses and fish?
	D.8	Is there at least 10 meters of coastline for each hippopotamus?
Relief	E.1	Is the area slightly rough? Are there hills and hollows?
	E.2	Is water access slightly sloping?
	E.3	Is the slightly slope water access at least 20 m long?
	E.4	Is there an island on the reservoir for the hippopotamuses to rest?
Light	F.1	Are the animals able to stay in the sunshine during all day?
	F.2	Are the animals able to hide in the shadow?
	F.3	Is there electric light in the exhibition?
	F.4	Is the water tank illuminated underwater?
	F.5	Is the sunlight behind the visitors' back while watching the animals?
Ground (surface)	G.1	Is water access covered with sand?
	G.2	Is water access (beach) large enough for all hippopotamuses to rest (about 20m^2)?
	G.3	Is the enclosure's area covered with grass?

Landscape (shaping of visibility)	H.1	Do visitors watch the animals from view spots hidden behind plants?
	H.2	Is it possible to watch the animals from different altitudes?
	H.3	Is it possible to watch the animals underwater?
	H.4	Are visitors on one viewing spot not visible from other viewing spots?
	H.5	Does arrangement of the exhibition allow for watching the animals with other exhibitions or animals in the background?
	H.6	Are the animals shown with vegetation or other natural forms in the background?
	H.7	Attention of visitors on the viewing spots should be directed to one exhibition
	H.8	Is there "landscape immersion"?
	H.9	Is the exhibition surrounded by plants or other natural screen so that the animals are not visible from each side (animals cornered by visitors)?
	H.10	Visitors should not be mislead about the hippopotamus' natural habitat (landscape)
	H.11	Do individual elements of the exhibition create a landscape similar to hippopotamus' natural habitat?
Arrangement	I.1	Do visitors walk into the area occupied by an animal (e.g. the viewing spot is surrounded by the exhibition)?
	I.2	Do visitors try to spot the animals?
	I.3	Are visitors at the outer edges of exhibition and animals in its centre?
	I.4	Is the exhibition arranged in the way that viewers may be surprised by unexpected appearance of an animal?
	I.5	Do visitors watch the animal in surroundings similar to natural?
	I.6	Is it possible to watch the animals at night?
	I.7	Do viewers watch the hippopotamuses without any visible barriers between them?
	I.8	Is it possible to watch the animals from water?
	I.9	Is it possible to watch the animals at close distance?
	I.10	Exhibition should not be predictable for visitors
Other animals	J.1	Are hippopotamuses presented together with other mammals?
	J.2	Are hippopotamuses presented together with birds?
	J.3	Are hippopotamuses presented together with fish?
	J.4	Are there interactions between hippopotamuses and other animals?
Animal behaviour	K1	Do the animals reproduce?
	K.2	Do hippopotamuses brand the area?
	K.3	Are hippopotamuses presented in family groups (male, females and offspring) of at least four specimens?
	K.4	Is the observed behaviour similar to natural?
	K.5	Does unnatural behaviour occur often?
	K.6	Is there no abnormal behaviour (stereotypical or pathologic)?

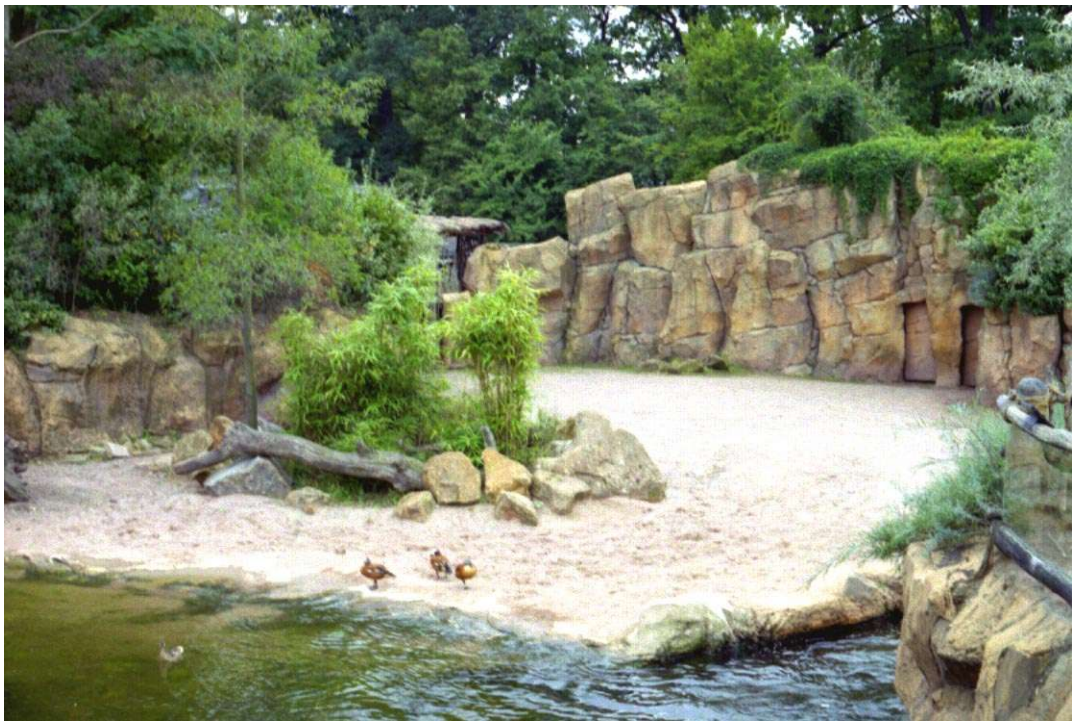

FOTO 1. The animals are shown with vegetation or other natural forms in the background - zoological garden in Hanover

FOTO 2. Visitors watch the animal in surroundings similar to natural – zoological garden in Basel

FOTO 3. It is possible to watch the animals underwater – zoological garden in Hanover

RESULTS

Table 2. Results of outdoor research concerning evaluation of the educational value of common hippopotamus exhibitions in 13 European zoos

		Cities in which are located zoological gardens with researches exhibitions												
Group	**Criterion number**	Berlin zoo	Hannover	Emmen	Antwerp	Basel	Vienna	Warszawa	Łódź	Wrocław	Cologne	Frankfurt am Main	Whipsnade	Verona
Position (location)	A.1	1	1	1	1	1	1	0	-1	1	0	1	0	0
	A.2	1	1	1	1	1	1	1	1	1	1	1	-1	1
	A	**2**	**2**	**2**	**2**	**2**	**2**	**1**	**0**	**2**	**1**	**2**	**-1**	**1**
Area size	B.1	1	1	1	1	1	1	0	0	0	0	0	1	0
	B.2	1	0	-1	1	-1	1	-1	-1	-1	-1	-1	-1	-1
	B.3	1	0	-1	1	-1	1	-1	-1	-1	-1	-1	1	-1
	B	**3**	**1**	**-1**	**3**	**-2**	**1**	**-2**	**-2**	**-2**	**-2**	**-2**	**-1**	**-2**
Vegetation	C.1	1	1	1	1	1	0	-1	-1	-1	-1	-1	-1	-1
	C.2	1	1	0	1	1	-1	-1	-1	-1	-1	-1	-1	-1
	C.3	1	1	1	1	1	1	1	0	0	-1	1	0	-1
	C.4	1	-1	-1	-1	0	0	-1	-1	-1	-1	-1	0	-1
	C.5	1	1	0	1	1	0	-1	-1	-1	-1	-1	0	-1
	C	**5**	**3**	**2**	**3**	**4**	**0**	**-3**	**-4**	**-4**	**-5**	**-3**	**-2**	**-5**

Water	D.1	1	1	0	1	1	-1	-1	-1	-1	-1	-1	0	-1
	D.2	1	1	1	1	1	0	1	-1	1	1	-1	1	-1
	D.3	1	1	1	1	0	1	-1	-1	-1	-1	-1	-1	-1
	D.4	1	1	1	1	1	1	-1	-1	-1	-1	-1	-1	-1
	D.5	1	1	1	1	1	1	-1	-1	-1	-1	-1	-1	-1
	D.6	1	1	1	1	1	1	-1	-1	-1	-1	-1	-1	-1
	D.7	1	1	0	-1	0	0	-1	-1	-1	-1	-1	-1	-1
	D.8	0	1	0	1	1	1	-1	-1	-1	-1	-1	1	1
	D	**7**	**8**	**5**	**6**	**6**	**4**	**-6**	**-8**	**-6**	**-6**	**-8**	**-3**	**-6**
Relief	E.1	1	1	1	0	1	0	-1	-1	-1	-1	-1	1	-1
	E.2	1	1	1	1	1	1	0	0	0	-1	-1	0	-1
	E.3	-1	1	1	1	1	0	0	-1	-1	-1	-1	-1	-1
	E.4	1	0	1	1	0	-1	-1	-1	-1	-1	-1	-1	-1
	E	**2**	**3**	**4**	**3**	**3**	**0**	**-2**	**-3**	**-3**	**-4**	**-4**	**-1**	**-4**
Light	F.1	1	1	1	1	1	1	0	-1	1	0	-1	1	1
	F.2	1	1	1	0	1	1	0	1	1	1	1	0	-1
	F.3	1	1	-1	1	1	1	-1	-1	1	1	1	1	-1
	F.4	1	1	-1	-1	-1	1	-1	-1	-1	-1	-1	-1	-1
	F.5	1	1	1	1	1	1	0	-1	1	0	1	0	0
	F	**5**	**5**	**1**	**2**	**3**	**5**	**-2**	**-5**	**3**	**1**	**1**	**1**	**-2**
Ground (surface)	G.1	1	1	1	1	1	1	-1	-1	-1	-1	-1	-1	-1
	G.2	-1	1	1	1	1	1	-1	-1	-1	-1	-1	-1	-1
	G.3	1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	1	-1
	G1	**1**	**1**	**1**	**1**	**1**	**1**	**-3**	**-3**	**-3**	**-3**	**-3**	**-1**	**-3**
Landscape (shaping of visibility)	H.1	1	1	0	1	1	0	-1	-1	-1	0	0	-1	-1
	H.2	1	1	0	0	0	1	-1	-1	-1	-1	-1	1	-1
	H.3	1	1	-1	-1	-1	1	-1	-1	-1	-1	-1	-1	-1
	H.4	1	1	-1	1	1	1	-1	-1	-1	-1	-1	-1	-1
	H.5	1	1	1	1	1	0	-1	-1	-1	0	-1	0	-1
	H.6	1	1	1	0	1	1	-1	-1	-1	-1	-1	0	0
	H.7	1	1	-1	1	1	0	-1	-1	-1	-1	-1	0	-1
	H.8	1	1	-1	1	0	-1	-1	-1	-1	-1	-1	0	-1
	H.9	1	1	0	1	1	1	-1	-1	-1	0	-1	-1	-1
	H.10	1	1	0	1	1	0	-1	-1	-1	-1	-1	-1	-1
	H.11	1	1	1	1	1	-1	-1	-1	-1	-1	-1	-1	-1
	H	**11**	**11**	**-1**	**7**	**7**	**3**	**-11**	**-11**	**-11**	**-8**	**-10**	**-5**	**-10**
Arrangement	I.1	1	0	0	1	0	-1	-1	-1	-1	-1	-1	-1	-1
	I.2	1	0	-1	1	1	0	-1	-1	-1	-1	-1	-1	-1
	I.3	1	0	1	1	1	1	-1	-1	-1	-1	-1	1	1
	I.4	1	1	0	1	1	0	-1	-1	-1	-1	-1	-1	-1
	I.5	1	1	1	1	1	0	-1	-1	-1	-1	-1	0	-1
	I.6	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1
	I.7	1	1	0	0	1	1	-1	-1	-1	-1	-1	0	-1
	I.8	-1	1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1
	I.9	1	1	1	0	0	1	-1	1	0	-1	-1	-1	1
	I.10	1	1	1	1	1	0	-1	-1	-1	-1	-1	-1	-1
	I	**6**	**5**	**1**	**4**	**4**	**0**	**-10**	**-8**	**-9**	**-10**	**-10**	**-6**	**-5**

Other animals	J.1	1	-1	-1	-1	1	1	-1	-1	-1	-1	-1	-1	-1
	J.2	1	1	-1	1	1	-1	-1	-1	-1	-1	-1	1	-1
	J.3	1	1	1	1	1	-1	-1	-1	-1	-1	-1	-1	-1
	J.4	1	1	-1	1	1	-1	-1	-1	-1	-1	-1	-1	-1
	J	**4**	**2**	**-2**	**2**	**4**	**-2**	**-4**	**-4**	**-4**	**-4**	**-4**	**-2**	**-4**
Animal behaviour	K1	-1	-1	1	1	1	1	-1	-1	-1	1	1	1	-1
	K.2	1	1	1	1	1	1	-1	-1	-1	1	1	1	-1
	K.3	1	0	1	-1	-1	0	-1	-1	-1	0	-1	0	-1
	K.4	1	1	1	1	1	1	-1	-1	-1	-1	0	0	-1
	K.5	1	1	1	1	1	1	-1	-1	0	-1	1	0	-1
	K.6	1	1	1	1	1	1	1	-1	1	-1	1	1	-1
	K	**4**	**3**	**6**	**4**	**4**	**5**	**-4**	**-6**	**-3**	**-1**	**3**	**3**	**-6**
Sum		**50**	**44**	**17**	**39**	**37**	**23**	**-46**	**-52**	**-40**	**-41**	**-38**	**-16**	**-49**

The maximum total number of points was 61 points and the lowest possible result – 61 points. The zoo in Berlin scored the highest (50 points) and the zoo in Łodź scored the lowest (-52 points). Results of the educational evaluation allow for dividing the zoological gardens in question into four groups:

- High educational value: Berlin 50, Hanover 44, Antwerp 39, Basel 37
- moderate (acceptable) educational value: Vienna 23, Emmen 17
- bad educational value: Whipsnade –16
- very bad educational value: (misleading educational message): Frankfurt am Main – 38, Wrocław –40, Cologne –41, Warsaw –46, Verona –49, Łódż -52

The above results may indicate that exhibitions in Berlin, Antwerp, Hanover and Basel meet most of the requirements and convey the right information about the hippopotamus and its environment to visitors. It is interesting that although exhibitions in Vienna and Emmen are equipped with water filtering systems, they scored lower than exhibition in Basel with a river flowing through the enclosure.

The results obtained by other exhibitions clearly indicate that their educational message may be harmful and misleading. It is important to notice that the exhibition in Whipsnade scored better than other exhibitions with bad educational value (-16) probably due to its size, which automatically influenced other criteria.

CONCLUSIONS

1. Area size, number of animals and landscape arrangement of the enclosure are key factors influencing the educational value of an exhibition. In many cases positive interconnections may be noted between other criteria (if those criteria are of high value other will have high value as well). The Whipsnade exhibition illustrates this tendency as its large area influences the criteria from vegetation and visibility shaping groups.
2. Large water reservoir with a highly efficient water filtering system allows to create a fragment of ecosystem with many interrelations.
3. Criteria from groups: landscape (visibility shaping), vegetation and water are decisive creation of a “natural” barrier between the visitors and animals. The analysed zoos which scored high for those criteria used solutions harmonised with the surrounding landscape.
4. The method of research used hereby, proved to be effective in evaluating the educational value of common hippopotamus exhibitions in zoological gardens but it isn’t fully to answer the questions asked. Thus the method could be improved by using a greater number of criteria with different ranks, a criterion referring to natural environment and a questionnaire for visitors (did the actually remember what we intended to teach them).

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Streszczenie: *Próba oceny wybranych ekspozycji dla zwierząt w ogrodach zoologicznych ze względu na rolę edukacyjną*. Celem badań było określenie kryteriów wpływających na wartość edukacyjną wybiegów oraz zastosowanie ich w ocenie 13-stu wybranych ekspozycji dla hipopotama nilowego w ogrodach zoologicznych. Określone kryteria składał się z dwóch etapów badań kameralnych, które odnosiły się do założeń projektowych, behawioralnych i organizacyjnych.
Po analizie materiału uzyskano 61 kryteria, które podzielono na 11 grup: wystawa (położenie), wielkość terenu, roślinność, woda, rzeźba terenu, światło, podłoże, krajobraz (kształtowanie krajobrazu), aranżacja, inne zwierzęta, zachowanie zwierząt. Następnie uzyskane kryteria posłużyły do oceny ekspozycji w skali porządkowej –1, 0, +1. Suma wyników kryterium pozwoliła wytypować najlepiej zaprojektowane i urządzone ekspozycje pod względem wartości edukacyjnych dla hipopotama nilowego, które znajdują się w ogrodach zoologicznych w Berlin, Hanower, Antwerpia, Bazylea. Kryteria z grup: wielkość terenu, ilość zwierząt i aranżacja krajobrazowa zasadniczo oddziałuje na ocenę edukacyjna ekspozycji. Zauważona że wysokie wartości tych kryteriów wpływają dodatnia na innych kryteria. Ponadto wykazano, że duży zbiornik wodny, posiadający system filtracji wody o dużej wydajności, pozwala stworzyć fragment ekosystemu z wieloma zależnościami.