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Knowledge and concern about sharks in Switzerland

MSc Thesis
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Contents

Summary

This study investigated the Swiss public's attitudes towards and knowledge about sharks. Several possible influences such as sex, age, source of information about and previous experiences with sharks were tested. The main focus was the expected correlation between knowledge and attitude. Data were collected with the help of a questionnaire survey (n = 600 participants), interviews (n = 20) and a brief feedback after a presentation about sharks (n = 11). The feedback mainly showed that the audience had previously been unaware of the large diversity of shark species, shapes and strategies. The interviews indicated huge differences in attitudes towards sharks; the statements ranged from negative and fearful ('evil', 'murderer', 'feeding frenzy') to defending ('they do not go on a man-hunt', 'sharks do not target humans') or even sympathetic ('humans use sharks for cutting off their fins', 'sharks are endangered by humans'). The survey showed that, for instance, participants' sex as well as having seen a shark before influenced knowledge as well as attitudes positively, whereas source of information did not have a big influence at all. Most importantly, the study showed a strong influence of knowledge on attitudes. With this high correlation, it thus can be concluded that increasing a person's knowledge about sharks would help to create more positive attitudes towards this group of organisms. This could lead to conservationists receiving more support for their protection; and sharks hence could benefit largely from a more positive attitude. Since sharks are not subject of educational systems in Switzerland, such programs would have to be established. These programs however should not be limited to merely increasing the awareness about sharks; they should also impart the value of biodiversity as an entire system.

1. Introduction

The accelerating loss of biodiversity due to human activities is one of the most pressing environmental issues (Wilson and Peter, 1988). In order to conserve this richness of life on a global scale, it is essential to raise public awareness for the necessity to preserve biological diversity (UNESCO, 1993). People personally form their opinion on whether a certain species should be protected or not greatly by its (visual) attractiveness (Kellert, 1993a); consequently most of biodiversity is ignored if not neglected (Ballouard *et al.*, 2012). It is hence important to extend the appreciation people have towards 'loveable' organisms to a wider range of species (Kellert, 1993b; Kellert, 1996; Lindemann-Matthies and Bose, 2006). The evoking of affection or sympathy could increase support for conservation (Tisdell *et al.*, 2006). Opportunities need to be embraced to redress the deleterious bias against detested and neglected species (Ballouard *et al.*, 2011; Ballouard *et al.*, 2012; Knight, 2008). Main aim of the present study was thus to investigate what the general public of Switzerland knows about sharks and what their attitudes towards this group of organisms are.

Sharks have been around in the ocean ecosystem for over 400 million years. They are highly evolved (Helfman *et al.,* 1997; Hamlett, 1999) and large shark species are the apex predators of their food webs (Compagno *et al.*, 1997). Yet, many of the large shark species are in danger of overexploitation and are hence facing extinction. There are 35 shark species that are considered vulnerable, endangered or critically endangered on the IUCN Red List (Topelko, 2005; IUCN, 2007). In the past two decades it has become evident that shark fishing and finning has increased around the world, which resulted in declines in stocks of many of the shark species (Abercrombie *et al.*, 2005; Baum *et al*., 2003). Threats to sharks include loss or degradation of habitat, sport fishing, and eradication programs; but commercial fishing and finning as well as bycatch account for the largest number of takes by far (Topelko, 2005; Lewison *et al.*, 2004), which are estimated to be in the hundreds of millions of sharks per year (Lack and Sant, 2006; SSG, undated). The declines in stocks are aggravated by the sharks' life history; late maturity, small number of offspring as well as low growth rates (Musick, 1999). As sharks are top-predators, they exert top-down effects on their ecosystems (Carlson, 2007) and their loss may have important and indirect effects on populations (Heithaus *et al.*, 2008; Polovina *et al.*, 2009) that can cascade down through

marine food webs (Baum and Worm, 2009; Myers *et al*., 2007). This will ultimately lead to a less healthy ecosystem (Christensen *et al.*, 2003; Jackson, 2010; Stevens *et al.*, 2000).

The human dimension of the shark decline is an important issue, since managing resources is not just about understanding the resource itself, but also about managing the people who exploit that resource (Hilborn, 2007). Sharks are perceived to be dangerous. Thompson and Mintzes (2002) called them 'culturally rich, emotionally laden and media saturated' (Thompson and Mintzes, 2002: 646). Human fear of sharks has a significant influence in hampering efforts to protect them, and more positive attitudes might substantially benefit their persistence. Generally, there is a lack of conservation measures when it comes to sharks. Although as of 2008 19 countries and the EU have banned finning in their coastal waters (Dulvy *et al.*, 2008), there is no legislation in international waters (Dulvy *et al.*, 2008). If sharks are to be better protected, legislation that better regulates their use must be developed.

Kellert (2008) stated that both changes in attitude and behavior of the general public can cause major shifts in policy. Therefore, support for shark conservation will need changing attitudes of the general public. This might be difficult as many individuals have negative attitudes towards sharks (Dobson, 2007; Reynolds and Braithwaite, 2001; Thompson and Mintzes, 2002; Tsoi, 2011). People prefer animals that are cute and 'human-like', but they dislike those that are perceived to be dangerous towards humans (Cériaco, 2012; Dobson, 2007; Morris and Morris, 1966; Philpott, 2002; Reynolds and Braithwaite, 2001; Simpfendorfer *et al.*, 2011; Spruill, 1997; Tisdell *et al*., 2006). This leads to the assumption that laypersons' spontaneous reaction to sharks might include that they are bloodthirsty man-eaters and generally unpleasant animals (Philpott, 2002).
Thus, the following hypothesis was developed:

Hypothesis 1: *People have negative attitudes towards sharks.*

Several studies have shown that laypersons have little knowledge about animals other than 'loveable' ones (Ballouard *et al*., 2012; Kellert, 1996; Kellert, 2008; Knight, 2008; Lindemann-Matthies, 2005; Philpott, 2002). Moreover, they know hardly anything about the biology,

ecology, behavior and conservation of threatened animals (Lindemann-Matthies and Kamer, 2006; Pearson *et al.*, 2011; Thompson and Mintzes, 2002).

Thus, the following hypothesis was put forward:

***Hypothesis 2**:* *Laypersons in Switzerland have little knowledge about the biology, ecology, behavior and conservation of sharks.*

More knowledge about animals in general and sharks in specific might lead to more positive attitudes towards such organisms (Barney *et al.*, 2005; Boeck Yore and Boyer, 1997; Kellert, 1996; Thompson and Mintzes, 2002; Tsoi, 2011).

Hence, the following hypothesis was put forward:

Hypothesis 3: *The more knowledgeable people are about sharks, the more positive is their attitude towards this group of organisms; and vice versa.*

A study by Lindemann-Matthies (2002) showed that women are often more knowledgeable about plants and animals than are men. A study by Thompson and Mintzes (2002) however showed that there is no evidence for gender-related differences when it comes to knowledge.

Still, I hypothesized that:

Hypothesis 4: *Women know more than men about the biology, ecology, behavior and conservation of sharks.*

Women are also more concerned about conservation (Ashworth *et al.*, 1995; Stern *et al.*, 1993; Tikka *et al.*, 2000). It was shown that there is a general difference between the two sexes (Ashworth *et al.*, 1995; Kellert, 1987; Montgomery, 2002; Prokop and Tunnicliffe, 2008; Stern *et al.*, 1993; Tsoi, 2011). Thompson and Mintzes (2002) found women to be more moralistic towards sharks and men more utilitarian. Moreover, if attitudes and knowledge are closely linked it can thus be hypothesized that:

Hypothesis 5: *Women have more positive attitudes than men towards sharks.*

People who generate their main knowledge about animals from mass media such as prime time movies or gossip news might have more fictional than real knowledge about organisms

(Dobson, 2007; Morey, 2002; Peschak, 2006; Philpott, 2002; Reynolds and Braithwaite, 2001; Thompson and Mintzes, 2002).

This led to the hypothesis:

Hypothesis 6: *People who mainly generate their knowledge from non-verified sources have less profound knowledge about AND more negative attitudes towards sharks than those who use scientific sources.*

Several studies have shown that age is a factor influencing people's attitudes (Boeck Yore and Boyer, 1997; Kellert, 1976; Kellert, 1996; Lindemann-Matthies and Kamer, 2006; Thompson and Mintzes, 2002; Tikka *et al.*, 2005; Tsoi, 2011). Thompson and Mintzes (2002) as well as Kellert (1996) found that also the membership in an environmental group is influenced by attitude and vice versa.

Hence, the following hypotheses were developed:

Hypothesis 7: *The older people are the more positive is their attitude towards sharks and the more knowledgeable about this group of organisms they are.*

Hypothesis 8: *People who are members of an environmental group are more knowledgeable about sharks and display more positive attitudes towards these animals.*

Hypothesis 9: *People whose current occupation is related to biology or ecology are more knowledgeable about sharks and also more positive about shark conservation.*

2. Methodology

2.1. Data collection

Data were collected in summer 2013 with the help of a written questionnaire, interviews and a brief feedback after a presentation about sharks.

2.1.1. First approach: Questionnaire study

Main aims of the questionnaire study were to investigate participants' level of knowledge about sharks as well as their attitudes towards this group of organisms. An online survey was developed and conducted over a period of four months, from March 10th to July 9th, 2013. People were addressed by a letter that contained the URL of the Online Survey-webpage along with a statement that the data were being used for scientific purposes only and that the provided answers were recorded anonymously. These letters were distributed to previously assigned households which had been determined by randomly choosing street names from the street-list on a map of the area of Zurich.

Online surveys have the advantage that participants who are otherwise difficult to reach can be contacted (Wright, 2005). A possible disadvantage could be the uncertainty over the validity of the sampling (Wright, 2005). Since data on demographic variables are self-reported, there can never be absolute certainty that the person really is who or what he/she claims to be. Moreover, some individuals are more likely than others to complete an online survey, so there is a tendency of some individuals to respond to an invitation to participate in an online survey, while others ignore it, which can lead to a systematic bias (Vehovar *et al.*, 2002; Wright, 2005). Koch (1997) as well as Hartmann and Schimpl-Neimanns (1992) stated that the sampling of online respondents was distorted towards male, higher education and people that are generally interested in the covered topic. According to Wright (2005), as well as Thompson *et al.* (2003), these sampling issues inhibit researchers' ability to make generalizations about study findings, which in turn lowers the ability to estimate population parameters. The purpose of this questionnaire, however, was mainly to detect

possible correlations (e.g. between the knowledge level and the attitude). And according to Schnell (1991) correlations are relatively robust against sampling distortions and biases.

The questionnaire

A testing phase done with 52 people showed that generally the directions were clear and that the reader comprehension was high. I still considered it to be wise to apply minor changes in the wording of some of the questions; the questions however remained the same. The final questionnaire consisted of 30 items (see Appendix B).

Attitude

Many studies have shown that people have negative attitudes as they are perceived to be dangerous towards humans (Batt, 2009; Dobson, 2007; Philpott, 2002; Reynolds and Braithwaite, 2001; Simpfendorfer *et al.*, 2011; Spruill, 1997; Tisdell *et al*., 2006). One question (item 2; see questionnaire in Appendix B) thus investigated people's general attitudes towards sharks with the help of a 10-step scale. The scale was anchored at both sides and ranged from 'strongly dislike sharks' to 'strongly like sharks'.

Three questions (items 24 to 26; see questionnaire in Appendix B) more specifically investigated people's conservation attitudes towards sharks; I wanted to find out how important participants deem a given conservation measure for sharks. For all three questions participants were given a 10-step scale, ranging from 'very unimportant' to 'very important'. Spruill (1997) found that the public generally was concerned about the state of the oceans, but that it depended on what issues were being discussed; the slaughtering of sharks mostly not being one of them (Spruill, 1997). Simpfendorfer *et al.* (2011) as well as West (2011) stated that there was a change in public perception on the way from one that we have to protect humans from sharks to one that we have to protect sharks from humans.

Knowledge

A total of 18 questions (items 6 to 23 of the questionnaire) established people's knowledge about sharks; items 6 to 17 (see questionnaire in Appendix B) incorporated mostly knowledge about the biology, ecology and behavior of sharks while items 18 to 23 targeted shark conservation knowledge.

I asked the participants to estimate the number of shark species (item 6, see questionnaire) using an open answer question, because I wanted to capture the full spectrum of people's answers without leading them into the right direction with possible responses. Hamlett (1999) and later Carwardine (2005) showed that there are discrepancies in the definite number of shark species.

Two questions (items 7 and 8) investigated the basic taxonomy of sharks. Sharks are fish and belong to the group of Chondrichthes, so have a cartilage skeleton (Hamlett, 1999; DK Animal, 2001).

Three questions (items 9, 11 and 13) dealt with the basic anatomy of sharks. Not all sharks lay eggs (Hamlett, 1999; DK Animal, 2001). Helfman *et al.* (1997) showed that sharks have an extra electrical sense, which also could be the reason why they have a bigger brain in relation to their body mass when compared to other fish. This sense might also explain why they are such successful hunters (Hamlett, 1999). It is a common myth – especially in Asia – that sharks do not get cancer (Luer, 2008), and that the consumption of shark meat therefore has cancer curing effects (Cunningham-Day, 2001). This however has never been proven (Luer, 2008). One question (item 13) thus investigated participants' knowledge about this myth.

Item 10 (see questionnaire) aimed at the morphological diversity of sharks; there are many different shapes and species (Hamlett, 1999; Helfman *et al.*, 1997), but Philpott (2002) hypothesized that people don't distinguish between different types of sharks. I was interested in whether people would recognize sharks that were not as popular as the ones on the magazine front pages.

There are sharks in all the oceans of the world (Compagno *et al.*, 1997; Hamlett, 1999). Item 12 of the questionnaire investigated people's knowledge about sharks' habitats.

Philpott (2002) showed that sharks have great value to humans and can be used in a variety of ways. Studies mentioned that sharks are being used for their meat, skins, organs, and tissues for human consumption, liver oil extracted for vitamins, carcass used for fishmeal and fertilizer, skin for leather, cartilage for medicines and artificial cartilage, fins for shark-fin soup etc. (Abercrombie *et al.*, 2005; Philpott, 2002). Item 14 of the questionnaire thus investigated participants' knowledge about the usefulness of sharks.

Three questions (items 15 to 17) were about sharks' behaviors, including the attacks on humans. Multiple studies have shown (Dobson, 2007; Philpott, 2002; Reynolds and

Braithwaite, 2001; Simpfendorfer *et al.*, 2011; Spruill, 1997; Tisdell *et al*., 2006) that people perceive sharks to be dangerous towards humans; but according to the International Shark Attack File (2003), the probability of being killed by a shark is very low. Still, sharks in deed are excited by blood (DK Animal, 2001), and this is frequently displayed in movies (Peschak, 2006; Philpott, 2002; Thompson and Mintzes, 2002).

Six questions (items 18 to 23) made up the conservation knowledge part. Many of the large shark species are in danger of overexploitation and are hence facing extinction (Abercrombie *et al.*, 2005; Baum *et al*., 2003; IUCN, 2007; Topelko, 2005). Threats to sharks include loss or degradation of habitat, sport fishing, and eradication programs; but commercial fishing and finning as well as bycatch account for the largest number of takes by far (Abercrombie *et al.*, 2005; Baum *et al.*, 2003; Philpott, 2002; Topelko, 2005; Kampwirth, 2009; Lack and Sant, 2006; Lewison *et al.*, 2004). With sharks being the apex predators of their ecosystems they exert a top-down controlling effect (Carlson, 2007) and a disappearance of their kind could lead to strong reactions that cascade down through the food webs (Baum and Worm, 2009; Christensen *et al.*, 2003; Edwards, 2007; Heithaus *et al.*, 2008; Jackson, 2010; Myers *et al.*, 2007; Polovina *et al.*, 2009; Stevens *et al.*, 2000).

Self estimated knowledge

One question (item 1, see questionnaire in Appendix B) investigated people's self estimated knowledge on a 10-step rating scale, ranging from 'very bad' to 'very good'. As discussed in several studies (Dobson, 2007; Morey, 2002; Peschak, 2006; Philpott, 2002) people whose only source of information is mass media not only have a low level of knowledge, but also sometimes have acquired false knowledge.

Experiences with sharks

Two questions (items 3 and 4) investigated people's previous experiences with sharks. Dobson (2004, 2007) as well as Ballantyne *et al.* (2007) found that attitudes can not only be shaped by the amount of knowledge one has about a species but also by whether or not one has encountered that species. Already Tanner (1980) and Palmer (1993) found that such experiences (during childhood) are the single most important factor for the development of personal concern for the environment. Dobson (2004, 2007) believes that allowing people to see sharks in their natural environment will break down stereotypes of sharks and create

more positive attitudes (Dobson, 2004; Dobson, 2007). It was thus investigated whether participants had already seen a living shark (item 3). Additionally, sharks can be used in a variety of ways and the consumption of their meat is one of them. Item 4 thus investigated whether participants had already eaten shark meat (yes, no, do not know).

Sources of information

One questions (item 5, see questionnaire) investigated people's source of information about sharks. Many authors stated that the public's perception of sharks as brainless man-eaters is mostly due to the media's sensational treatment and reporting of shark attacks which in turn leads to exaggeratedly negative attitudes (Barney *et al.*, 2005; Dobson, 2007; Morey, 2002; Peschak, 2006; Philpott, 2002; Reynolds and Braithwaite, 2001; Thompson and Mintzes, 2002). Reynolds and Braithwaite (2001) as well as Dobson (2007) stated that for some people in the USA prime time TV movies are their only source of information about sharks; some people therefore have difficulties to distinguish between fact and fiction (Morey, 2002). Respondents were given a list of seven possible answers (plus 'others' for uncovered sources) out of which they were asked to choose two.

Demographic variables

Four questions (items 27 to 30) established demographic variables of the participants. People who encounter biological and ecological subjects in their work life might have a broader knowledge about biodiversity, food webs and other related topics. Thus, a specific question on whether participants' occupation was related to biology or ecology was included in the survey. Occupation has been used in surveys by, for instance, Montgomery (2002) and by Kellert (1996) to test for differences in human attitudes towards nature. As a study have shown, women are often more knowledgeable about plants and animals than are men (Lindemann-Matthies, 2005). They are also more concerned about conservation (Ashworth *et al.*, 1995; Kellert, 1987; Montgomery, 2002; Prokop and Tunnicliffe, 2008; Stern *et al.*, 1993; Tsoi, 2011). Yet, at the same time it was found by Lindemann-Matthies (2002) that boys like exotic species better than girls. Besides age being a standard demographic factor, it was also shown to be a factor influencing people's attitudes (Kellert, 1996; Thompson and Mintzes, 2002). Age had been used in this way in many other studies (e.g., Boeck Yore and Boyer, 1997; Kellert, 1976; Kellert, 1996; Lindemann-Matthies and Kamer, 2006; Tikka *et al.*,

2000; Tisdell *et al.*, 2006; Tsoi, 2011). Membership in an environmental group is certainly something that influences general attitudes towards nature (Thompson and Mintzes, 2002; Kellert, 1996).

Every participant answered all questions which is why the number of respondents is not mentioned in the tables and figures of the result part.

2.1.2. Second approach: Interviews

The interviews were used to gain in-depth insights into laypersons' attitudes towards sharks, their beliefs about how sharks behave in the wild, and their thoughts on the relationship between humans and sharks. Since Philpott (2002) as well as Thompson and Mintzes (2002) believed that people get their negative opinions about sharks from the mass media, particular attention was paid to statements about the source of information.

Interview agenda

The start-up question was 'What comes to mind spontaneously when you hear the word 'shark'?' The second question was 'How would you describe a shark? What do you think a shark does all day long?' The third question was 'Comment on the relationship between humans and sharks…' The interviews were conducted during the month of June, choosing adult participants randomly on the streets and in parks. Interviewees were asked if they wanted to participate in a short interview about sharks and the answers were recorded with the help of a Dictaphone.

2.1.3. Third approach: Presentation impressions

To see what people remember after receiving information about sharks I had a presentation with the title: 'Sharks – mindless eating machines or perfection of evolution?' which I held on July 5th, 2013. The presentation lasted almost one hour (excluding the audience's questions) and was well appreciated. The slides can be seen in Appendix E.

Main aim of the power-point presentation was to educate people about the behavior of sharks and to demonstrate that they are hardly 'mindless man-eaters' (see Dobson, 2007;

Peschak, 2006; Philpott, 2002; Thompson and Mintzes, 2002). I talked about the wide variety of sharks, highlighted some 'special shark features' like the electromagnetic sense or the 'denticles', and mentioned in what ways we use them and how threatened they are. I additionally discussed why sharks attack humans and compared those numbers to deaths by other animals. An important part was the sharks' role in the ecosystem, the services they provide. The slides of the presentation can be found in Appendix E.

After the presentation the following question was addressed to the audience: 'What surprised you the most?' With that question I wanted to investigate what the audience had expected differently and what had astonished most.

2.2. Participants

Overall, 758 participants filled in the questionnaire. In order to meet the intended sex and age classes (see Table 1 below) some surveys from overrepresented classes were randomly deleted. Eventually analyzed were 600 participants. They were on average 47.6 ± 0.64 years old; they were all adults.

Table 1: Distribution of participants among sex and age classes.

	Male	**Female**	**Total**
Age 20-39	100	100	200
Age 40-59	100	100	200
Age 60-79	100	100	200
Total	300	300	600

Participants were supposed to be adults, because they should be able to make their own decisions about consumption activities. Also, one of my co-variables was the membership in an environmental group, which is only possible when being 18 or older. Because I wanted to have the same age range in all my age classes, I decided to allow participants between the ages of 20 and 79, ignoring the 18-19 year old. I also chose not to consider persons older than 79 years of age, because according to the 'Bundesamt für Statistik' the sex-ratio rapidly starts to diverge above that age (BSF, 2011).

Only about 3% of participants answered that their current occupation had something to do with biology or ecology. However, about 35% of the participants stated to be members of one or more environmental organizations (item 30 of the questionnaire). Among those, 58% were women. The high number of environmental group members was to be expected since these people are somewhat more likely to participate in such a questionnaire.

Interviewees (nine women and eleven men) were all adults.

Although several people were informed about the presentation, only eleven (six men and five women) actually came to the talk about sharks and gave a brief feedback. Among them were two children.

2.3. Data analysis

Analysis of the questionnaire

Data were first analyzed through descriptive statistics as well as Chi-square tests. For the final analyses, multiple regressions (Type II sums of squares, backwards method) were used. Since these types of analyses do not allow strong correlations between explanatory variables, Pearson correlations between the explanatory variables were tested. Only variables with $r < 0.35$ were included in the models (Crawley, 2005). Because 'Knowledge estimate' (item 1, see questionnaire in Appendix B), 'Protection attitude' (item 24), 'Marine area attitude' (item 25) as well as 'Legislation attitude' (item 26) were highly correlated with 'Attitude' ($r > 0.35$) only 'Attitude' was taken for the final analysis. I also condensed the entire knowledge question part into a 'Total knowledge score' as a single variable for the analysis. As only about 3% of participants answered that their current occupation had something to do with biology or ecology (item 27 of questionnaire), this variable was left out of the analyses.

The following variables or factors were included in the models:

- Independent variables:
  - Sex (factor)
  - Origin of information about sharks (factor)
  - Age (variable)
  - Membership in an environmental group (factor)
- Dependent variables:
  - Knowledge (scores)
  - Attitude (scores)

To test for the influence on attitude and knowledge score, the following steps were carried out:

- Frequency distributions of the answers.
- Analysis of covariance/ regression analysis with attitude as co-variable and knowledge as dependent variable; and vice versa.
- Analysis of variance with knowledge (scores)/ attitude (scores) as dependent variables. The independent variables are sex (factor), origin of information (factor),

membership in an environmental group (factor), age (co-variable), having seen a shark before (factor), occupation (factor) and having eaten shark meat before (factor). Type II backward regression (multiple regression analysis) was used.

All analyses were carried out with PASW Statistics, version 18 for Windows.

Scores were assigned to the knowledge items of the questionnaire (Table 2). The maximum score a person could achieve was 36.

Analysis of the interviews

The interviews were tape-recorded and transcribed into English. Qualitative text analysis was used. The given answers I condensed into two categories: 'Attitude points' and 'Moral points'. The 'Attitude points' were determined by attitudinal remarks, choice of words, mentioning of shark attacks, defending sharks and so on. The 'Moral points' were assigned according to the expressed sympathy towards sharks when it comes to their killing.

Analysis of the presentation

The replies to the question asked after the presentation ('What surprised you the most?') could give some more impressions about the audience's previous knowledge about sharks. I decided to analyze the given answers in a quantitative way. I grouped the answers into categories and counted them.

Table 2: Assignment of scores to the knowledge items of the questionnaire.

Question number	Conditions	Score
6 (open answer)	If within range of 350 to 550 → 1	1
	If not within accepted range	0
7 (single choice)	Correct answer ('Fish')	1
	Every other answer	0
8 (single choice)	If correct answer ('Cartilage skeleton')	1
	Every other answer	0
9 (single choice)	If correct answer ('No')	1
	Every other answer	0
10 (multiple choice)	If all four (and ONLY) sharks marked	3
	Every other option	0
11 (multiple choice)	If all four senses marked	3
	If less than four senses marked	0
12 (multiple choice)	If all five habitats marked	3
	If less than five habitats marked	0
13 (single choice)	If correct answer ('False')	1
	Every other option	0
14 (multiple choice)	If all five uses marked	3
	If four uses marked	2
	If two or three uses marked	1
	If zero or one use marked	0
15 (ranking)	If entire ranking correct	3
	If shark in '5', but rest wrong order	2
	If shark other rank than '5'	0
16 (single choice)	If correct answer ('True')	1
	Any other option	0
17 (multiple choice)	If both correct answers	3
	If only 'Because they confuse us with their prey'	2
	If only 'Because they defend their territory'	1
	Any other choice (or correct ones PLUS wrong)	0
18 (single choice)	If correct answer ('decreased')	2
	Any other option	0
19 (single choice)	If correct answer ('False')	2
	Any other choice	0
20 (single choice)	If correct answer ('False')	2
	Any other answer	0
21 (choose 2 of 6)	If 'Commercial fishing' AND 'Bycatch'	2
	Any other option	0
22 (single choice)	If correct answer ('Removal of fins for consumption')	2
	Any other choice	0
23 (single choice)	If correct answer ('Generally legal')	2
	Any other choice	0

3. Results

3.1. Results of the questionnaire

Sources of information about sharks

Participants had to indicate two main sources of information about sharks (item 5 of the questionnaire). Most respondents gained their information from nature documentations (including TV documentations, nature magazines, and encyclopedias; Table 3).

Table 3: Sources of information about sharks. Participants had to indicate their two main sources in a list of seven choices.

Source	Responses [%]
Nature documentations	83.7
News	50.0
Movies	21.5
Wikipedia	12.2
School	10.3
Other	9.8
Friends / Family	9.5
University	3.0

For the analysis, the chosen sources (two per participant) were condensed into the characteristics 'Scientific', 'Balanced' and 'Popular'. This was done to indicate whether the favored sources were trustworthy or not. Respondents who had indicated sources such as 'University' or 'Nature documentations' fell into the category 'Scientific'. Respondents who had exclusively chosen sources such as 'Friends', 'Newspaper' or 'Movies' were labeled 'Popular', and respondents who had chosen one scientific and one popular source of information were categorized as 'Balanced'. The distribution of these characteristics can be seen in Table 4.

Table 4: Sources of information about sharks; condensed into three categories (compare Table 3).

Source	Responses [%]
'Balanced'	65.5
'Scientific'	24.2
'Popular'	10.3

Experiences with sharks

About 85.5% of participants answered that they already had seen a shark (item 3 of the questionnaire) either in nature, an aquarium or in both (nature: 22.8%, aquarium: 51.5%, both: 12.2%).

About 30% of participants stated to have already eaten shark meat (item 4 of the questionnaire) and about 63% denied it. Among those who had already eaten shark meat, 59% were men (df = 1, Chi-square value = 7.70, p = 0.021).

Self estimated knowledge about sharks

On average, respondents estimated their knowledge about sharks neither bad nor good (mean: 3.9 ± 0.9 on the 10 step scale). In the model (R Squared = 0.09) sex had an influence on self-estimated knowledge about sharks. Men estimated their knowledge higher than did women (4.4 ± 0.12 vs. 3.5 ± 0.12; $F_{1,597} = 32.17$, $p < 0.001$). The older the participants were the lower they estimated their knowledge about sharks ($r = -0.03$, $F_{1,597} = 25.83$, $p < 0.001$).

Real knowledge about sharks

Participants were asked to estimate the number of shark species in the world (item 6 of the questionnaire; see Appendix B). One estimate (80'000'000'000 shark species) was three orders of magnitude higher than the next highest estimate and was thus taken out of the analysis. The mean estimate was 12244.6 ± 6351.54 shark species. However, the median was just 80. To be accepted as correct, the answers had to be within a range of 350 to 550 (see 'Data analysis'). Most participants estimated the total number of shark species in the world too low (Figure 1; compare Table 5).

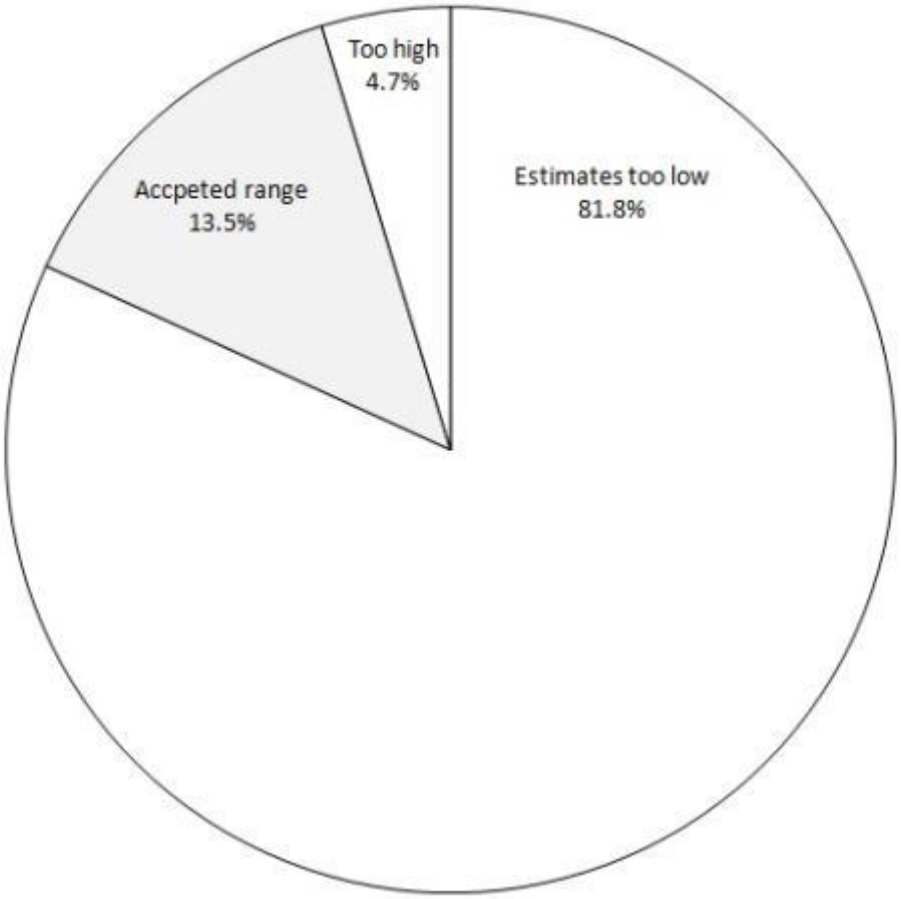

Figure 1: Estimated numbers of shark species in the world. A correct estimate would have been between 350 and 550 species.

Table 5: Estimated numbers of shark species in the world.

Estimates	Responses
1-49	221
50-99	85
100-149	79
150-199	25
200-249	43
250-299	13
300-349	25
350-399	4
400-449	21
450-499	20
500-549	36
550-599	0
600-649	5
650-699	1
1000-10‘000	12
>100‘000	10

Most participants correctly assumed that sharks belong to the group of fish (item 7 of the questionnaire; Table 6).

Table 6: Responses to the question to which groups of animals sharks may belong. Only one answer was possible.

Group	Responses [%]
Fish	**77.3**
Mammals	18.8
Don't know	2.8
Amphibians	0.5
Reptiles	0.5
Insects	0.0

Most participants correctly assumed that sharks have a cartilage skeleton (item 8; Table 7).

Table 7: Responses to the question which kind of skeleton sharks may have. Only one answer was possible.

Kind of skeleton	Responses [%]
Cartilage skeleton	**61.3**
Bone skeleton	25.3
Don't know	11.5
No skeleton	1.8

About 62.5% of the participants knew that not all sharks lay eggs (item 9 of the questionnaire; see Appendix B). About 19.0% of respondents stated not to know the answer and 18.5% assumed that indeed ALL sharks lay eggs.

When eight ocean animals were shown (item 10 of the questionnaire), respondents had to determine for each animal whether it was a shark species or not. For all shown species more than half of all participants knew the correct answer (Table 8).

Table 8: Responses to the question whether the pictured animal was a shark. Animals in rows 3, 5, 7 and 8 are shark species.

Animal shown		Correct responses [%]
	*Gadus morhua*	98.3
	*Stenella frontalis*	97.8
	*Carcharhinus perezii*	97.3
	*Dasyatis pastinaca*	94.3
	*Sphyrna mokarran*	94.3
	*Orcinus orca*	91.7
	*Rhincodon typus*	77.2
	*Scyliorhinus canicula*	62.7

About 20.7% of participants knew that the four pre-given senses (item 11 of the questionnaire) were indeed all senses sharks possess. Least known was that sharks can hear (Table 9).

Table 9: Knowledge about the senses of sharks. Participants had to answer the multiple-choice question. All the pre-given senses were correct answers.

Senses	Responses [%]
Electromagnetic sense	**63.0**
Seeing	**60.5**
Feeling	**59.8**
Hearing	**52.8**
Don't know	*6.3*

About 22% of participants knew that all pre-given answers options were habitats in which sharks can live (item 12 of the questionnaire). Least often they knew that sharks inhabit the Black sea as well as Northern polar sea (Table 10).

Table 10: Knowledge about the habitats of sharks. Participants had to answer the multiple-choice question. All pre-given habitats were correct answers.

Habitats	Responses [%]
Pacific	**94.5**
Atlantic	**89.8**
Mediterranean	**68.7**
Northern Polar Sea	**31.8**
Black Sea	**28.0**
Don't know	*3.8*

Most participants (63.7%) correctly assumed that sharks can get sick (question 13 of the questionnaire; see Appendix B). Only 4.2% of participants thought this to be untrue and 32.2% stated not to know.

Only about 2.7% of participants correctly ticked all five uses of sharks (item 14 of the questionnaire). Most often, they knew that sharks can be eaten (Table 11).

Table 11: Knowledge about the uses of sharks. Participants had to answer the multiple-choice question. All pre-given uses were correct answers.

Form of use	Responses [%]
In soups	**76.2**
For cosmetics	**34.7**
As a model for divers' wet suits	**31.7**
For the production of vitamins	**16.5**
As artificial cartilage for humans	**15.7**
Don't know	*14.3*

Respondents were asked to rank groups of animals according to their danger towards humans (item 15 of the questionnaire). The correct ranking would have been (from the most dangerous to the least dangerous): 1: Snakes; 2: Bees; 3: Crocodiles; 4: Elephants; 5: Sharks. More than half (57%) of participants ranked sharks as more dangerous than at least one other group of animals (shark on ranks 1 to 4; Figure 2).

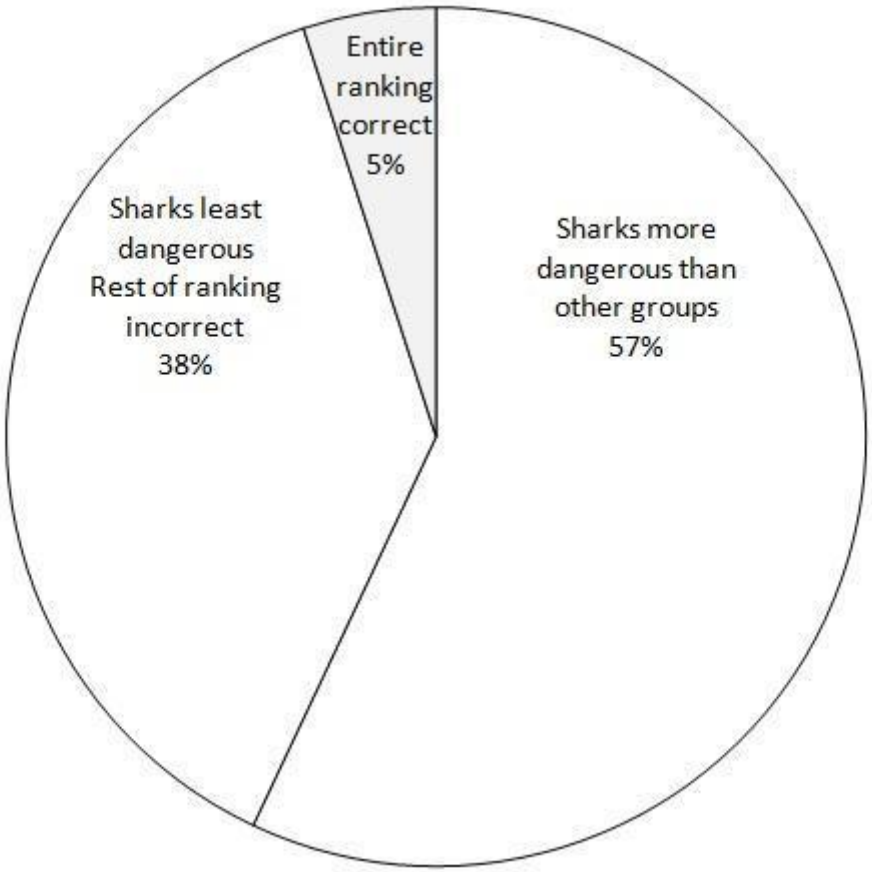

Figure 2: Danger of sharks compared to other groups of animals.

Most participants (84.8%) correctly assumed that sharks are excited by blood (item 16 of the questionnaire). Only 9.7% thought this statement to be wrong and 5.5% stated they did not know the answer.

When asked for reasons why sharks attack humans (item 17 of the questionnaire), 30.2% of participants knew the correct two answers (Table 12).

Table 12: Responses to the multiple-choice question why sharks attack humans. The two answers marked in bold are the correct ones.

Reason for attack	Responses [%]
Because they mistake us for their prey	**80.5**
Because they defend their territory	**44.0**
Don't know	*4.2*
Because they specifically target us	2.5
Because they have fun doing so	1.8

Most participants (85.3%) correctly assumed that shark populations around the world have declined over the past 20 years. About 10.5% stated that they did not know it, 3.3% stated that the populations had stayed the same and 0.8% of participants stated that the populations had increased.

Most participants (92.5%) knew that a decline in shark numbers would lead to changes in the oceans. Only 4.5% answered that they did not know it and 3.0% wrongfully thought that nothing would change.

Moreover, most participants (92.0%) knew that the statement 'too many sharks in the oceans is the main reason for the decline in fish stocks worldwide' is false. Only 5.5% stated not to know the answer and 2.5% thought it to be true.

Respondents had to indicate in a list of six two threats that sharks are faced with. The correct answers would have been 'Commercial fishing' and 'Bycatch'. However, almost 64% of respondents felt that sea pollution was the main threat to sharks (Table 13). About 50% indicated one and 20.5% both of the two correct answers.

About 54% of participants correctly assumed that finning is the removal of shark fins for consumption. However, almost 39% did not know the correct answer (see Table 14).

Only 24.8% of participants knew that the import of shark products into Switzerland is generally legal. A total of 43.3% believed that the import was generally illegal and 31.8% stated not to know.

Table 13: Assumed threats that sharks are faced with. The respondents were asked to choose two of the possible six answers. The correct answers are marked in bold.

Threats to sharks	**Responses [%]**
Pollution of the Sea	63.7
Bycatch	**52.3**
Commercial fishing	**48.7**
Warming of the Sea	18.3
Acidification of the Sea	10.0
Boating	6.5

Table 14: Participants' assumptions about the meaning of the term 'Finning'. The correct answer is marked in bold.

Definition of finning	**Responses [%]**
Removal of shark fins for consumption	**53.8**
Don't know	38.5
Being pulled through the water on a fin	5.0
Hunting strategy of sharks	1.3
General overfishing of the Sea	1.3

As explained in the Method part, scores were awarded for all answers to the knowledge questions (items 6 to 23 of the questionnaire; see Appendix B), and a total knowledge score was calculated. Overall, a maximum of 36 knowledge points could have been achieved by a participant. On average, participants achieved 17 ± 0.22 knowledge points. The minimum score achieved was 2 and the maximum score was 32, which gives a range of 30 points (Figure 3).

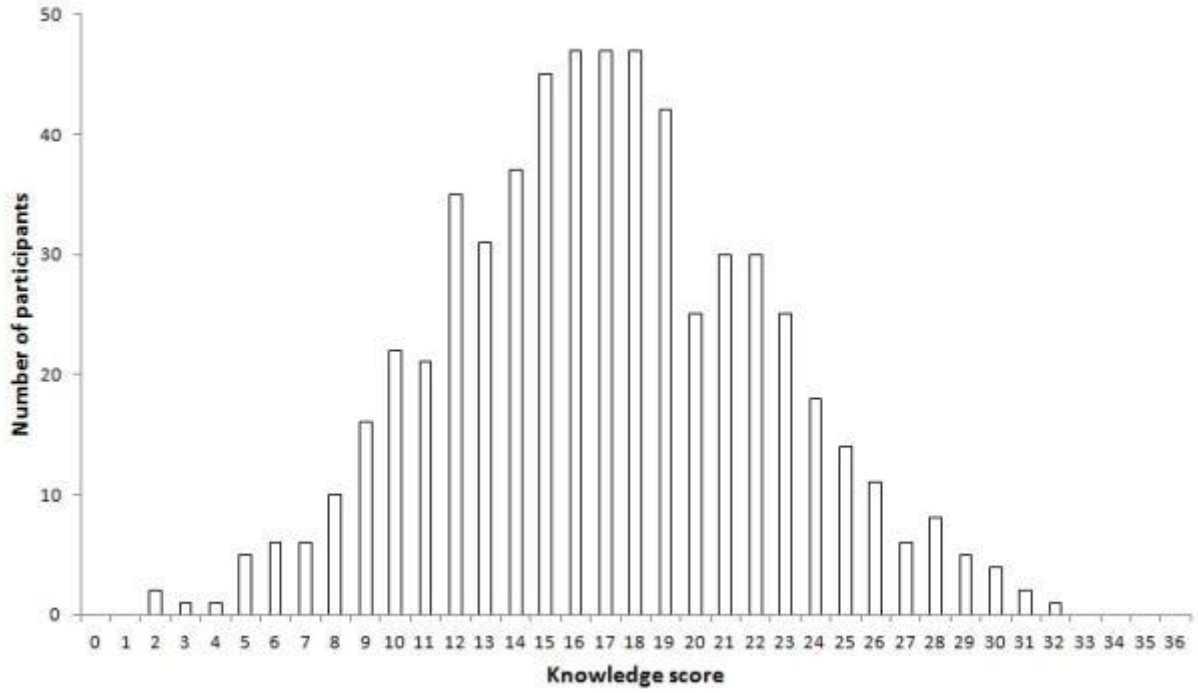

Figure 3: Histogram of knowledge scores. The lowest possible score was 0; the lowest actual score was 2. The highest possible score was 36; the highest actual score was 32.

In the model (R Squared = 0.27) the overall knowledge score was influenced as follows:

- Participants who had already seen a shark had a higher total knowledge score than those who had not (on average 19.1 ± 0.55 vs. 15.9 ± 0.71; $F_{1,593} = 32.12$, $p < 0.001$).
- Men scored higher than women (on average 18.0 ± 0.61 vs. 17.0 ± 0.60; $F_{1,593} = 7.79$, $p = 0.005$).
- The elder the participants were, the lower their knowledge scores were ($r = -0.07$, $F_{1,593} = 31.75$, $p < 0.001$).
- Participants who were a member of an environmental group had higher knowledge scores than those who were not (on average 18.1 ± 0.61 vs. 16.9 ± 0.60; $F_{1,593} = 9.00$, $p = 0.003$).

In the overall model, the source of information about sharks had no influence on knowledge score. However, as one hypothesis refers to the influence of information sources on knowledge, a univariate analysis with source of information as a factor was additionally carried out.

- The origin of information about sharks influenced the total knowledge level in the following way: 'Popular' sources of information: mean 13.9 ± 0.67; 'Balanced' sources

of information: mean 17.0 ± 0.27; 'Scientific' sources of information: mean 18.1 ± 0.44; $F_{2, 597} = 14.18$, $p < 0.001$; R Squared = 0.05.

Attitudes towards sharks

Participants were asked how they felt about the protection of sharks (item 24 of questionnaire). They generally considered shark protection to be important (mean: 7.6 ± 0.9 on the 10-step scale). Participants felt rather strongly about the establishment of marine protected areas (item 25 of questionnaire; mean: 8.4 ± 0.8 on the 10-step scale). They also considered the legislation for international shark protection (item 26 on questionnaire) as important (mean: 8.0 ± 0.8 on the 10-step scale).

Respondents neither especially disliked or especially liked sharks (mean attitude score of 6.0 ± 0.10 on the 10-step scale). The minimum attitude score was 1 and the maximum score was 10, so all possible attitude scores occurred (Figure 4).

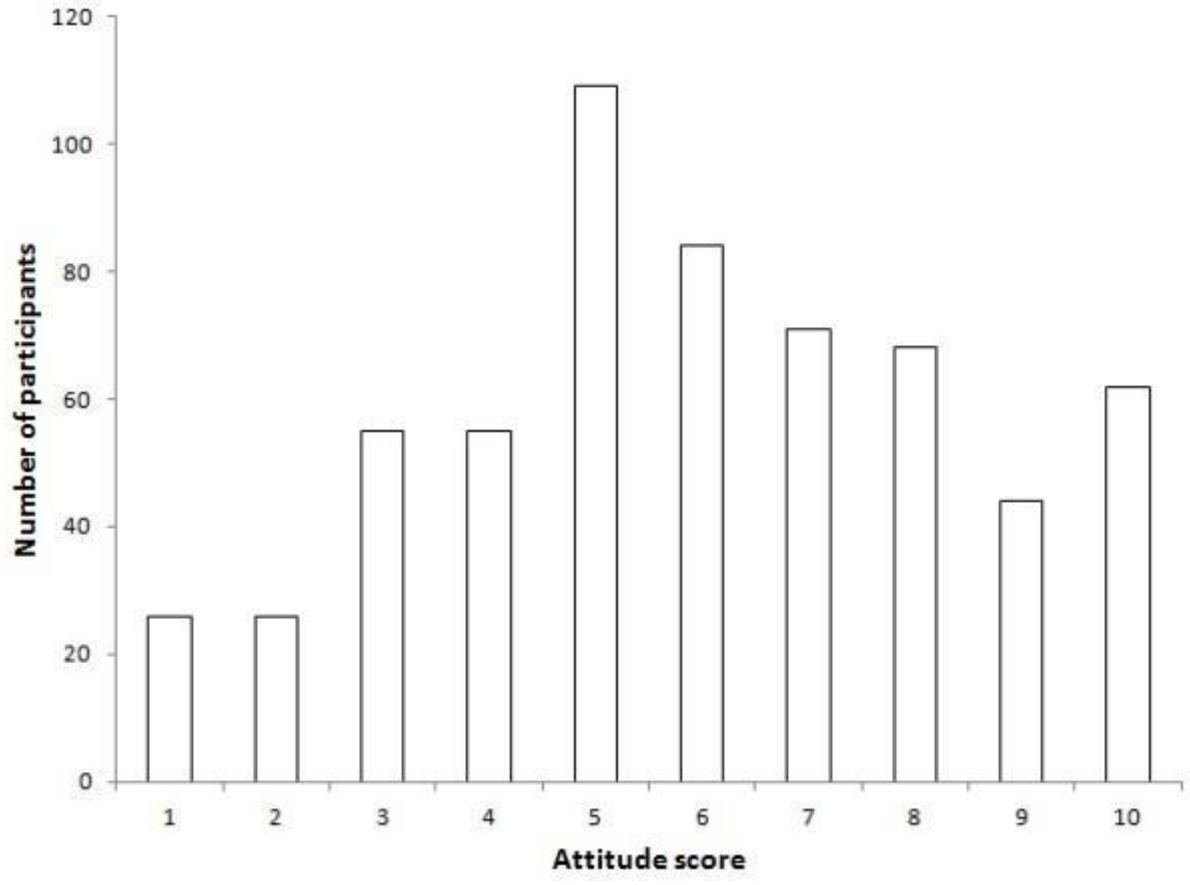

Figure 4: Attitude towards sharks. Participants were asked to estimate their attitude on a 10-step scale ranging from 1: strongly dislike sharks to 10: strongly like sharks.

In the model (R Squared = 0.21), the self estimated attitude scores were influenced as follows:

- Men felt more positive towards sharks than did women (mean of 6.5 ± 0.14 vs. 5.6 ± 1.13 on the 10-step rating scale; $F_{1,595} = 24.14$, $p < 0.001$).
- With increasing age of participants attitude scores decreased ($r = -0.01$, $F_{1,595} = 4.13$, $p = 0.043$).
- Members of an environmental group had higher attitude scores than non-members (mean of 6.5 ± 1.16 vs. 5.7 ± 0.11; $F_{1,595} = 18.18$, $p < 0.001$).

In the overall model, both source of information about sharks and direct contact with sharks had no influence on attitude. However, as some hypotheses dealt with these influences, univariate analyses were also carried out.

- In a single analysis, the source of information about sharks influenced people's attitudes ($F_{2,597} = 8.58$, $p < 0.001$). 'Popular' sources of information: mean 4.8 ± 0.31; 'Balanced': mean 6.0 ± 0.12; 'Scientific': mean 6.3 ± 0.20.
- If people had already seen a shark, they scored higher on the attitude scale: mean of 5.1 ± 0.27 vs. 6.1 ± 0.11; $F_{1,598} = 12.06$, $p < 0.001$.

The influence of knowledge on attitude

There was a strong positive correlation between knowledge (measured as total knowledge score) and self-estimated attitude towards sharks. The more participants knew about sharks, the more positive they felt about them, and vice-versa ($r = 0.15$, $F_{1,595} = 66.57$, $p < 0.001$).

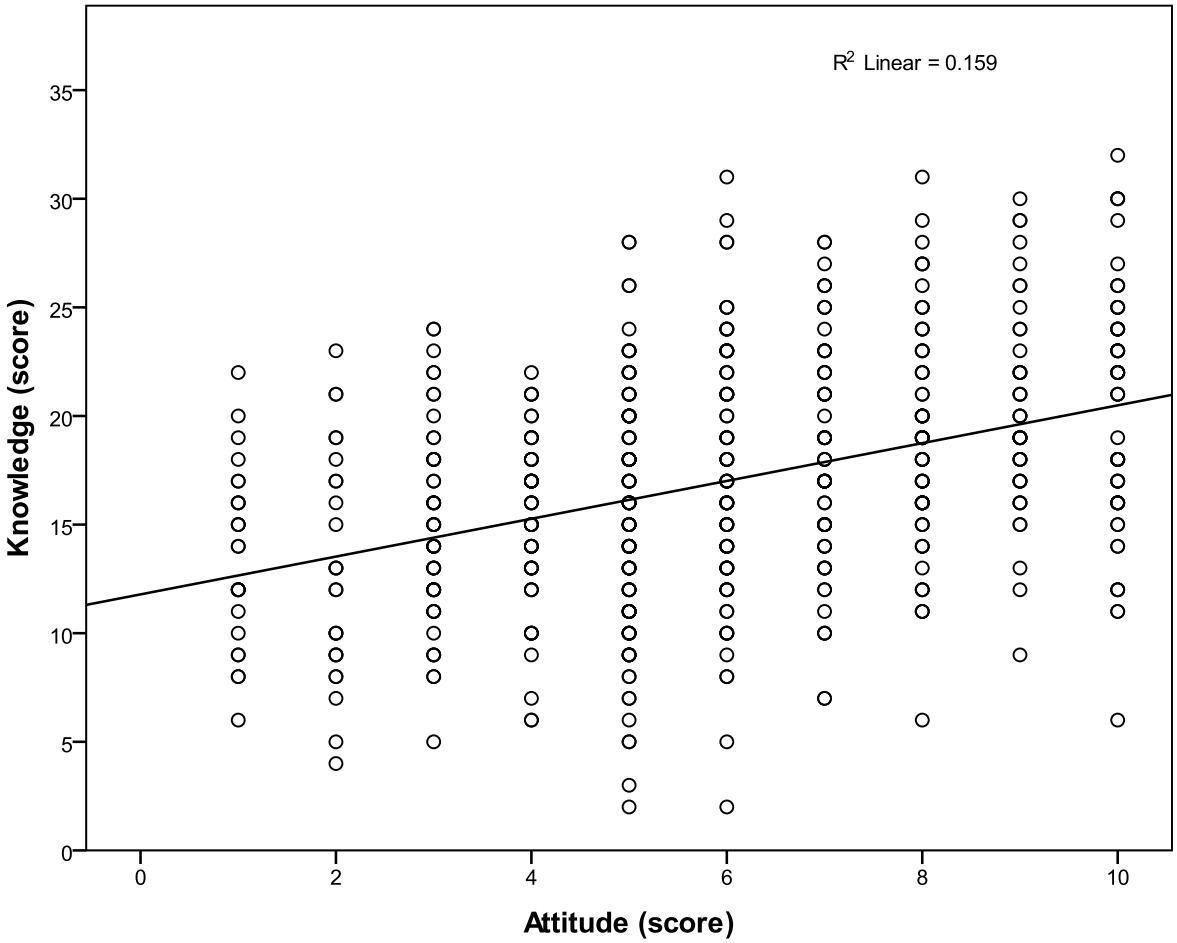

Figure 5: Scatterplot of the correlation between ‚Attitude (score)' and ‚Knowledge (score)' with corresponding regression line.

3.2. Results of the interviews

When asked about their spontaneous associations with the word 'shark', interviewees displayed more negative than positive attitudes (Table 15).

Table 15: Answers to the open question: 'What comes to mind when you hear the word 'shark'?' 20 people were interviewed. Only one answer per person was allowed.

What comes to mind when hearing 'shark'?	Sex	Attitude
A shark devouring swimmers	Female	Negative
Dead surfers	Male	Negative
Dead surfers	Male	Negative
Pain and sharp teeth	Male	Negative
Shark attacks	Female	Negative
Evil mammal	Male	Negative
Teeth	Female	Negative
Dangerous fish	Female	Negative
Danger	Male	Negative
Predator	Male	Negative
Fins on the water surface	Male	Negative
The movie "Jaws" by Spielberg (1975)	Male	Negative
The movie "Jaws" by Spielberg (1975)	Female	Negative
The movie "Jaws" by Spielberg (1975)	Female	Negative
There are dangerous ones and less dangerous ones	Female	Positive
Divers' saying: You'll never see a shark, it's always behind you	Male	Positive
The Sea	Male	Positive
Hammerhead shark	Female	Positive
Primeval fish that were successful throughout evolution	Female	Positive
Public's prejudice against a fascinating animal	Male	Positive

There were interesting aspects in each interview as demonstrated and summarized below.

1.Male

- Four negative expressions (murderer, problem, to tear open, 'bugbear')
- Blames "Jaws" for negative attitudes towards sharks (And he's a bugbear… because of the movie "Jaws" / The relationship shark – humans is miserable, and it all started with the movie "Jaws")
- Sees that humans are not specifically targeted, but still considered sharks to be dangerous towards humans (But he certainly doesn't go on a man-hunt / …but if they get in his way there will be a problem / And if a human is swimming where a sharks hunt he'll consider him another prey fish)

Overall: negative, fearful

2.Male

- Three negative expressions (dead, evil, 'beast')
- Blames media stories for negative attitude towards sharks → but he believes that it is overrated (Generally humans are greatly afraid of sharks because there are stories of people having been attacked – I however believe that this is overrated)
- Mentions humans killing sharks (But the sharks are more afraid of humans than the other way around)
- Mentions that there is more than one kind of shark

Overall: defending

3.Male

- Four negative expressions (pain, ugly, dark and wet, 'feeding-frenzy')
- Sees sharks as dangerous towards humans; never disputes sharks targeting humans (The relationship between sharks and humans is very negative because of ALL that what has happened)

Overall: negative

4.Female

- Two negative expressions (dangerous (2x))
- Science wrong (They live in the deep sea / They have a good sonar system)
- She thinks that they are dangerous towards humans and she doesn't believe that this is not true (One KNOWS about sharks that they can become dangerous; but one HEARS from biologists that this wasn't even true)
- Mentions shark finning (…but the humans use sharks for cutting off shark fins)

Overall: negative, but sympathetic

5.Male

- No negative expression
- Recognizes that sharks only attack humans when they are provoked (But if you don't provoke a shark you shouldn't have to be afraid)
- Mentions humans killing sharks (Humans hunt sharks in order to eat them)

Overall: defending, sympathetic

6.Male

- One negative expression (evil)
- Wrong science (It's a big, evil mammal)
- Blames media for negative attitudes, but says it is not true (Because of the media we think that sharks were evil animals, but actually most sharks aren't aggressive and don't attack humans)
- Mentions humans killing sharks (I think that more humans kill sharks; humans are the big enemy of the shark, not the other way around)

Overall: neutral, defending

7.Female

- Five negative expressions (aggressive (2x), fear (2x), rival)
- Science wrong (The shark is a mammal)
- Believes that sharks naturally are dangerous and aggressive towards humans (We're rivals. Humans challenge sharks, they want to confirm the cliché that sharks ARE dangerous over and over again)

Overall: negative

8.Male

- No negative expression
- Recognizes that people are afraid of sharks even though they would not have to be so (Just like with wolves… The shark is negatively associated, even though he wouldn't have to be)
- Believes that sharks are dangerous towards people, but calls them 'accidents' (I believe that sharks don't like turmoil - like at the beach - otherwise there would be more accidents / Humans are afraid of sharks which is justified because there had been accidents)

Overall: neutral, defending

9.Female

- No negative expression
- Blames "Jaws" for negative attitudes and recognizes that it is not real (Fearful relationship if you think of movies like "Jaws" where the shark is represented as a beast that attacks humans without reason; but that doesn't happen usually)

Overall: neutral, defending

10.Female

- No negative expression
- Calls attacks 'accidents' and states that a shark only eats not to starve (It swims around and looks for its prey so that it doesn't starve / Repeatedly, there are accidents)

Overall: neutral

11.Male

- Two negative expressions (dangerous, danger)
- Thinks that sharks are dangerous for surfers, but mentions the 'confusion' on the shark's part. Recognizes that sharks do not specifically target humans (except if they are really hungry) (A shark does not usually eat humans, except he is really hungry. But humans are really afraid that sharks are aggressive. For surfers they are dangerous in case that sharks confuse them with other animals)

Overall: neutral – negative

12.Female

- One negative expression (to sneak up)
- Recognizes that sharks do not specifically target humans (Sharks usually do not attack humans – except maybe surfers. But humans have such an illogical fear of sharks. Most shark species are not dangerous for us. It is much more likely to be struck by lightning than to be eaten by a shark)
- Blames "Jaws" for the negative attitudes towards sharks (The movie "Jaws" has drawn a perverted picture)

Overall: defending

13.Male

- No negative expression
- Sees that sharks do not target humans; she does not mention attacks (They do not go on a man-hunt / They are not as dangerous as one always thinks)
- Mentions humans killing sharks (They are threatened with extinction, we should not eat them / Per human that gets killed by a shark humans kill about a million sharks or so)

Overall: defending, sympathetic

14.Male

- Two negative word (dangerous, dumb)
- Blames "Jaws" for negative attitudes (It all started with the movie "Jaws" because sharks are painted as killers and men-eaters)
- Sees that sharks don't specifically target humans (But generally they are not aggressive / In the meantime one is a bit more sensitized. It is understood that – if a shark attacks – it is confusion because he thinks it was a seal or so. But generally the sharks don't have a problem with humans)
- Mentions humans killing sharks (Sharks have been slaughtered and hunted)

Overall: defending, sympathetic

15.Male

- No negative expression
- Recognizes that sharks can be dangerous towards humans, but that they do not target them specifically (Sharks do not target humans. But if you annoy them or have cut your finger and go swimming – bad idea)

Overall: neutral

16.Female

- Five negative expressions (to devours, screaming, dangerous (2x), aggressive)
- Cannot decide which information she is supposed to believe (They can also be dangerous. According to all accounts sharks can smell one drop of blood over great distances and are very aggressive. On the other hand it is understood that they are rather peaceful and only attack humans if they look like seals or something)

- Recognizes that people are afraid because they do not know anything about sharks (including herself) (A lot of people are afraid of sharks because they do not know anything about them but have read about an 'accident' again)
- Mentions sharks being killed by humans (…because sharks are caught and eaten by us. They are also hunted for their teeth or because they are dangerous. They also attack us because they can feel that we attack them too ; if they feel threatened)

Overall: negative, confused

17.Female

- One negative expression (dangerous)
- Mentions sharks being killed by humans (unfortunately too many sharks are killed by humans)

Overall: neutral, sympathetic

18.Female

- One negative expression (sly)
- Mentions positive aspects of sharks (How should I put this: sharks are the police of the ocean and they make sure everything is alright. They maintain a healthy balance)
- Mentions sharks being killed by humans (Actually it is the other way around: sharks are endangered by humans)

Overall: positive, sympathetic

19.Female

- No negative expression
- States that sharks do not target humans specifically (For humans the shark is an aggressive, belligerent killer; which is not true if you leave it in peace)
- Mentions sharks being killed by humans (And humans are a threat to sharks: overfishing, deprivation of its habitat and also its food stock)

Overall: defending, sympathetic

20.Male

- No negative expression
- Mentions positive aspects of sharks (They are important for the balance in the ocean; indispensable for the ecosystem 'Sea')
- Defends sharks (They are largely unexplored and misunderstood / They are called 'monsters' wrongfully)
- Sympathetic when talking of people's attitudes towards sharks (They are sold as a symbol of evil, of danger, of insatiability; in nature as well as in a metaphorical sense, for example in the world of finance / There are many sensational newspaper articles)

Overall: defending, sympathetic

Considering the spontaneous association with the word 'shark', the choice of words, the presence or absence of defending remarks and the more general expressions, 'attitude

points' were assigned to the respondents' answers (on a scale of -5 to +5). There were some respondents who had mentioned moral issues like the killing of sharks, despite their generally negative attitude towards these animals. It was thus distinguished between a general and a moral attitude (Table 16).

The mean of attitude points was -0.8 ± 0.40, so neutral to negative (below zero). The mean of the moral points was 1.2 ± 0.25.

There were many negative attitudes, yet some of the answers were differentiated. Some who had mentioned attacks on surfers also mentioned that sharks do not specifically target humans. Some respondents mentioned the killing of sharks and some even mentioned the ecosystem services performed by sharks. The overall notion however was fearful, neutral to negative.

Table 16: Overview of 'Attitude points' and 'Moral points' assigned to the expressions of 20 interviewees. The 'Attitude points' were influenced by the choice of words and the expressing of either positive or negative attitudes generally. The 'Moral points' were determined by the expression of sympathy towards sharks.

Respondent ID	Sex	Attitude points	Moral points
1	Male	-1	0
2	Male	0	1
3	Male	-3	0
4	Female	-3	3
5	Male	1	1
6	Male	0	1
7	Female	-3	0
8	Male	-1	2
9	Female	0	1
10	Female	-1	0
11	Male	-2	0
12	Female	-1	0
13	Male	0	3
14	Male	-1	1
15	Male	-2	0
16	Female	-4	1
17	Female	0	2
18	Female	2	2
19	Female	1	3
20	Male	3	2

3.3. Results of the presentation

After the presentation (slides can be seen in Appendix E) the audience was asked one question: 'What surprised you the most?' The answers were rather divers (see Appendix F), but could be summarized as shown in Table 17.

Table 17: Answers to the open question 'What surprised you the most?' This question was asked after a one-hour presentation about sharks.

What surprised you the most?	Responses [#]
Diversity and variety of shark species	6
Speed of attack, jumps	4
Multiplicity of reproductive strategies	4
Statistics of deaths (3:150'000'000)	3
Dermal denticles	3
Homeothermy	1
Diversity of feeding habits / tooth shape	1
Jaws not attached to cranium	1
Constant replacement of teeth	1
Sensory system	1

The most unexpected fact for the audience was the diversity and variety of shark species. Specifically named were the total number of species, the range in size, the 'diversity' and the 'variety' of species. Closely related to this species diversity is the multiplicity of reproductive strategies as well as the variety in tooth shapes and hence variety in desired prey that surprised people.

Besides some other shark specific characteristics like the 'dermal denticles', people were astonished by the 'death statistics'. The replies included (citation): "Only 3 deaths (by sharks) per year → the ratio to the number of sharks that we kill" or "That we still slaughter that many sharks!" Since I presented not only the number of people killed by sharks on average per year as well as the number of sharks killed by humans each year but also the number of people killed by other kinds of animals, people were amazed by those numbers as well.

4. Discussion

Knowledge

Several studies indicate that laypersons have little knowledge about animals other than 'loveable ones' (Ballouard *et al*., 2012; Kellert, 1996; Kellert, 2008; Knight, 2008; Lindemann-Matthies, 2005; Philpott, 2002); even if they are endangered ones (Lindemann-Matthies and Kamer, 2006; Pearson *et al.*, 2011; Thompson and Mintzes, 2002). As sharks qualify as 'other than loveable' ones (Dobson, 2007; Morris and Morris, 1966; Philpott, 2002; Reynolds and Braithwaite, 2001; Simpfendorfer *et al.*, 2011; Spruill, 1997; Tisdell *et al*., 2006), it can be assumed that people will know little about sharks. Even though the range of knowledge scores in this study was wide, people indeed had little knowledge about sharks (see hypothesis 1). On average, they achieved less than half of the possible knowledge points.

There were many factors that influenced knowledge about sharks. Since education about sharks usually is not incorporated into curricula this kind of information has to be obtained deliberately, which presupposes an already existing interest in sharks or the environment in general. Hence, the study showed that those who had seen a shark before had higher knowledge scores than those who had not. Moreover, participants who had stated to be members on an environmental group had higher knowledge scores than those who had not.

The older participants were, the lower their knowledge was (see hypothesis 7). Studies by Thompson and Mintzes (2002) as well as Barney (2005) showed that knowledge increases with age. However, both studies were dealing with different ages of students. It could thus be assumed that in schools today at least some information about sharks is provided (in the USA). In Switzerland it's not in the curriculum yet.

Men were more knowledgeable about sharks than were women (see hypothesis 4). Of those who had thought that sharks were mammals most were women. A study by Lindemann-Matthies (2002) showed that women are often more knowledgeable than men about plants and animals in general. A study by Thompson and Mintzes (2002) however showed that there was no gender-related difference when it comes to knowledge about sharks in specific.

A possible explanation for the sex differences in the present study could be a different use of information sources about sharks. More men than women used scientific sources, while more women used popular ones.

Attitudes

People prefer animals that are cute and 'human-like' and dislike those that are perceived to be dangerous towards humans (Cériaco, 2012; Dobson, 2007; Morris and Morris, 1966; Philpott, 2002; Reynolds and Braithwaite, 2001; Simpfendorfer *et al.*, 2011; Spruill, 1997; Tisdell *et al*., 2006). However, in this study respondents displayed a rather neutral attitude towards sharks in both questionnaire and interviews (see hypothesis 2). However, when the respondents of the interviews had to name their spontaneous reaction to the word 'shark', 14 of 20 answers were negatively attributed, as assumed by Philpott (2002). Philpott (2002) also assumed that people do not distinguish between different types of sharks. When asked 'What did surprise you the most?' after the presentation a big part of the audience mentioned facts related to the diversity of sharks. Also, most participants of the questionnaire estimated the number of shark species too low.

Many factors may influence attitude scores. Dobson (2004, 2007), Tomazic (2008) as well as Ballantyne *et al*. (2007) found that attitudes towards a species can be shaped by whether or not one has encountered that species first hand. This study showed that having seen a shark before had a positive influence on people's attitudes.

The study showed that respondents who were a member of an environmental group had more positive attitudes towards sharks than those who were not (see hypothesis 8). This confirms the findings of Thompson and Mintzes (2002) as well as Kellert (1996) that the membership in an environmental group influences attitudes and vice versa. Generally, it can be expected that members of environmental groups have more positive attitudes towards nature and its conservation. The attitude towards sharks could quite simply be based on their opinion of the environment as a whole and not on specific knowledge about sharks. The attitude additionally was influenced by the source of information in the same way as

was knowledge. The ones with popular sources also had the lowest attitude score and the highest attitude score had the ones with scientific sources (see hypothesis 6).

Several studies showed that age is a factor influencing people's attitudes (Boeck Yore and Boyer, 1997; Kellert, 1976; Kellert, 1996; Lindemann-Matthies and Kamer, 2006; Thompson and Mintzes, 2002; Tikka *et al.*, 2005; Tsoi, 2011). This study showed that just like the knowledge decreased with age, attitudes were generally more negative the older participants were (see hypothesis 7).

When it comes to differences between sexes, other studies showed that women are more concerned about conservation (Ashworth *et al.*, 1995; Stern *et al.*, 1993; Tikka *et al.*, 2000). It was shown that there is a difference between the two sexes (Ashworth *et al.*, 1995; Kellert, 1985b; Kellert, 1987; Montgomery, 2002; Prokop and Tunnicliffe, 2008; Stern *et al.*, 1993; Tsoi, 2011). Thompson and Mintzes (2002) found women to be more moralistic[1] towards sharks and men to be more utilitarian[2] and naturalistic[3]. Already Kellert (1996) had seen this effect for animals in general. This study showed that men had higher attitude scores, i.e. more positive attitudes towards sharks than did women (see hypothesis 5). Moreover, in the interviews more women expressed clearly negative attitudes. This confirms the findings of Lindemann-Matthies (2005) and Kellert (1985a) which were that girls particularly liked attractive (mostly domestic pet) animals – and sharks do not qualify as such (Dobson, 2007; Philpott, 2002; Reynolds and Braithwaite, 2001; Simpfendorfer *et al.*, 2011; Spruill, 1997; Tisdell *et al*., 2006). Lindemann-Matthies (2005) as well as Kellert (1985a) found that boys have a greater interest in exotic wildlife. On the other hand, when it comes to moralistic attitudinal tendencies, woman had the higher average of 'moral points' in the interviews. Of those who had stated to be a member of an environmental group, most were women.

Even though the general attitude average was neutral to negative, the averages of the three questions in which participants were asked to personally grade the importance of a certain measure to protect sharks (questions 24 to 26) were high. Also, some participants of the interviews mentioned moral issues like shark finning. Czech *et al.* (1998) found that despite

[1] Definition of ‚moralistic': concern for the right and wrong treatment of animals, with strong opposition to exploitation or cruelty towards animals; Thompson and Mintzes, 2002: 647.

[2] Definition of ‚utilitarian': concern for the practical and material value of animals; their body parts and/or habitats; Thompson and Mintzes, 2002: 647.

[3] Definition of ‚naturalistic': interest in the direct experience with animals and exploration of nature; Thompson and Mintzes, 2002: 647.

fear and dislike, most of their participants reported to believe that ALL species are worth conserving.

The influence of total knowledge score on attitude

Other studies have shown that more knowledge about animals in general and sharks in specific might lead to more positive attitudes towards such organisms (Barney *et al.*, 2005; Boeck Yore and Boyer, 1997; Kellert, 1996; Lindemann-Matthies (2010); Spash, 2002; Thompson and Mintzes, 2002; Tsoi, 2011). The present results show a clear positive correlation between attitudes towards (measured as self-reported attitude scores) and knowledge about sharks (measured as total knowledge scores; see hypothesis 3). This indicates that educational attempts aiming at fostering knowledge about "non-loveable" animals such as sharks might lead to more protective behavior towards this group of organisms.

5. Conclusions and implications

In line with other studies (Barney *et al.*, 2005; Boeck Yore and Boyer, 1997; Kellert, 1996; Lindemann-Matthies, 2010; Spash, 2002; Thompson and Mintzes, 2002; Tsoi, 2011), the present results show a strong positive influence of (measurable) knowledge on attitudes.

However, among the participants of this study – as a sample of the general public of Switzerland – the knowledge about sharks was rather low. Unless someone is looking for information about sharks on purpose it is very unlikely that he or she will stumble across anything that would increase scientific knowledge about sharks. Sharks are just not subject of everyday life or even educational systems. And the information that does appear ubiquitously is often biased, not necessarily accurate, and tends to evoke negative emotions.

This leads to the conclusion that in strategies to get more support for shark conservation, the role of education should be great. Kellert (1985a) suggested that the first to fifth grade of school would be the best time for emphasizing affective, emotional concern for living species. The emphasis is on a greater appreciation of species other than 'loveable ones' (Kellert, 1993b), which could be a small, but still important contribution to the conservation of those species (Lindemann-Matthies, 2005). Also McVay (1993) highlighted the capacity for bioaffiliation with school children.

To encourage all aspects of a child's relationship with wildlife, outdoor experiences and physical handling of wildlife is thought to be important (Ballantyne *et al*., 2005; Lindemann-Matthies, 2005; Prokop *et al.*, 2007). With sharks however, this kind of direct experience is not possible. Hence, other ways of 'experiencing sharks' will have to be found; one possibility could be to visit aquaria.

Educational programs should not be limited to merely increasing awareness and affection towards a particular group of species; it should also impart knowledge about critical issues such as the value of biodiversity as a system (like ecosystem services) (Christon and Wilson, 2000; Tisdell *et al.*, 2006). Because if just sharks are talked about, but not why they are important as a part of biodiversity, we would hence commit the same mistake of neglecting major parts of the ecosystem functioning as when we would not take sharks in at all.

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Appendix A: List of Figures and Tables

Figures:

Tables:

Appendix B: Questionnaire (German with English translation)

1. **Wie schätzen Sie Ihr Wissen über Haie ein? (1= sehr tiefer Wissensstand; 10=sehr hoher Wissensstand)**
   How do you rate your general knowledge about sharks? (1= very low knowledge level; 10= very high knowledge level)

   1 2 3 4 5 6 7 8 9 10

---

2. **Wie ist Ihre Einstellung Haien gegenüber? (1= Ich mag sie überhaupt nicht; 10= Ich mag sie sehr)**
   What is your attitude towards sharks? (1= I strongly dislike them; 10= I strongly like them)

   1 2 3 4 5 6 7 8 9 10

---

3. **Haben Sie schon mal einen lebenden Hai gesehen?**
   Have you ever seen a living shark?

   Ja, in einem Aquarium
   Yes, in an aquarium

   Ja, in der Natur
   Yes, in nature

   Nein
   No

---

4. **Haben Sie schon einmal Hai-Fleisch gegessen?**
   Have you ever eaten shark meat?

   Ja
   Yes

   Nein
   No

   Weiss nicht
   Don't know

---

5. **Kreuzen Sie bitte Ihre zwei wichtigsten Informationsquellen über Haie an:**
   Please indicate your two main sources of information about sharks:

   Freunde / Verwandte
   Friends / Family

   Schule
   School

   Studium
   University

   Spielfilme
   Movies

   Naturdokumentationen (TV, Buch, …)
   Nature documentations (TV, books, …)

   Nachrichten (TV oder Zeitung)
   News (TV or newspaper)

   Wikipedia
   Wikipedia

   Andere:_____
   Others:_____

---

6. **Schätzen Sie doch einmal, wie viele Hai-Arten es auf der Welt gibt: _____**
   Please estimate how many shark species there are in the world:_____

---

7. **Zu welcher dieser Gruppen gehören Haie?**
   What group do sharks belong to?

   Säugetiere
   Mammals

   Fische
   Fish

   Insekten
   Insects

   Amphibien
   Amphibians

Reptilien
Reptiles

Weiss nicht
Don't know

---

8. Haie haben…
Sharks have…

Knochen-Skelett
Bone skeleton

Knorpel-Skelett
Cartilage skeleton

Kein Skelet
No skeleton

Weiss nicht
Don't know

---

9. Alle Haie legen Eier!
All sharks lay eggs!

Ja
Yes

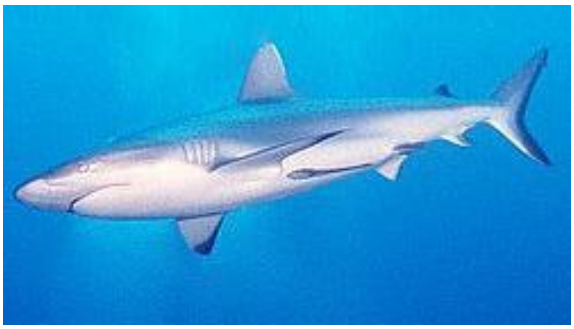
Nein
No

Weiss nicht
Don't know

---

10. Ist dieses Tier ein Hai?

Is this animal a shark?



Ja

Yes

Nein

No

Ja

Yes

Nein

No

Ja

Yes

Nein

No

Ja
Yes

Nein
No

Ja
Yes

Nein
No

Ja
Yes

Nein
No

Ja
Yes

Nein
No

Ja
Yes

Nein
No

---

11. Welche Sinne besitzen Haie?
What senses do sharks have?

Sehsinn
Seeing

Spürsinn
Feeling

Hörsinn
Hearing

Elektromagnetischer Sinn
Electromagnetic sense

Weiss nicht
Don't know

---

12. **Es gibt Haie im…**
There are sharks in the…

Pazifik
Pacific

Nord-Polarmeer
Northern Polar Sea

Schwarzen Meer
Black Sea

Atlantik
Atlantic

Mittelmeer
Mediterranean

Weiss nicht
Don't know

---

13. **Haie werden nie krank!**
Sharks never get sick!

Richtig
True

Falsch
False

Weiss nicht
Don't know

---

14. **Haie werden verwendet…**
Sharks are being used…

In der Kosmetik
For cosmetics

Als künstlicher Knorpel für Menschen
As artificial cartilage for humans

Als Vorbild für Taucheranzüge
As a model for divers‘ wet suits

In der Vitaminherstellung
For the production of vitamins

In Suppen
In soups

Weiss nicht
Don’t know

---

15. **Bitte bringen Sie folgenden Tiergruppen in die Reihenfolge ihrer Gefährlichkeit für den Menschen weltweit (Nach Anzahl Todesfälle pro Jahr; 1=am Gefährlichsten; 5=am Ungefährlichsten)**
    Please rank the following groups of animals in their danger to humans worldwide (By number of deaths per year; 1=the most dangerous; 5=the least dangerous)

    Elefanten
    Elephants

    Haie
    Sharks

    Schlangen
    Snakes

    Bienen
    Bees

    Krokodile
    Crocodiles

---

16. **Haie werden durch Blut angeregt!**
    Sharks are excited by blood!

    Richtig
    True

    Falsch
    False

Weiss nicht
Don't know

---

17. Haie greifen Menschen an…
Sharks attack humans because…

Weil sie uns Menschen mit ihrer Beute verwechseln
They mistake us for their prey

Weil sie uns Menschen gezielt fressen wollen
They specifically target us

Zum Spass
They have fun doing so

Weil sie ihr Territorium verteidigen
They try to defend their territory

Weiss nicht
Don't know

---

18. In den letzten 20 Jahren sind die Hai- Populationen auf der Welt…
Within the past 20 years shark populations around the world have…

Gewachsen
Increased

Geschrumpft
Decreased

Gleich geblieben
Stayed the same

Weiss nicht
Don't know

---

19. Wenn es keine Haie mehr gäbe, würde sich im Meer nichts ändern!
If there weren't any sharks anymore, nothing would change in the oceans!

Richtig
True

Falsch
False

Weiss nicht
Don't know

---

20. Zu viele Haie in den Meeren ist einer der Gründe, warum die Fischvorkommen weltweit kleiner werden.
Too many sharks in the oceans is one of the main reasons for the global decline in fish stocks.

Richtig
True

Falsch
False

Weiss nicht
Don't know

---

21. Kreuzen Sie die <u>zwei</u> grössten Bedrohungen für den Hai an:
Indicate the <u>two</u> main threats sharks are faced with:

Verschmutzung der Meere
Pollution of the sea

Gezielte Fischerei
Commercial fishing

Beifang
Bycatch

Erwärmung der Meere
Warming of the sea

Versauerung der Meere
Acidification of the sea

Schifffahrt
Boating

---

22. Was ist „finning"?
What's „finning"?

Eine Jagd-Strategie der Haie
A hunting strategy of sharks

Die generelle Überfischung der Meere
The general overfishing of the seas

Die Abtrennung von Hai-Flossen für den Konsum
Removal of shark fins for consumption

Sich an einer Fischflosse zu halten und durchs Wasser ziehen zu lassen
Holding on to a fin for being pulled through the water

Weiss nicht
Don't know

---

23. Hai-Produkte in die Schweiz zu importieren ist…
The import of shark products into Switzerland is…

Generell legal
Generally legal

Generell illegal
Generally illegal

Weiss nicht
Don't know

---

24. Der Schutz von Haien ist mir persönlich… (1= Ich mag sie überhaupt nicht; 10= Ich mag sie sehr)
The protection of sharks for me personally is…(1= I strongly dislike them; 10= I strongly like them)

1 2 3 4 5 6 7 8 9 10

---

25. Die Gründung von marinen Schutzzonen ist mir persönlich… (1= Ich mag sie überhaupt nicht; 10= Ich mag sie sehr)
The establishment of marine protected areas to me is… (1= I strongly dislike them; 10= I strongly like them)

1 2 3 4 5 6 7 8 9 10

---

26. Mir persönlich sind rechtliche Regelungen für den internationalen Haischutz… (1= Ich mag sie überhaupt nicht; 10= Ich mag sie sehr)
Legislation for international shark protection for me personally is… (1= I strongly dislike them; 10= I strongly like them)

1 2 3 4 5 6 7 8 9 10

---

27. Hat Ihr derzeitiger Beruf etwas mit Biologie / Ökologie zu tun?
Is your current occupation is any way related to biology / ecology?

Ja (falls ja, was machen Sie)?_____
Yes (if so, what do you do)?_____

Nein
No

---

28. Geschlecht:
Sex:

Männlich
Male

Weiblich
Female

---

29. Alter: _____
Age:_____

---

30. Sind Sie Mitglied bei einer Umweltschutzorganisation (WWF, Pro-Natura, …)?
Are you a member of an environmental group (WWF, ProNatura, …)?

Ja (welche?) _____
Yes (which?)_____

Nein
No

Appendix C: Sources of pictures in questionnaire

Sources in chronological order:

http://en.wikipedia.org/wiki/File:Tibur%C3%B3n.jpg

http://en.wikipedia.org/wiki/File:Killerwhales_jumping.jpg

http://en.wikipedia.org/wiki/File:Dasyatis_americana_bonaire.jpg

http://en.wikipedia.org/wiki/File:Sphyrna_mokarran_at_georgia.jpg

http://en.wikipedia.org/wiki/File:Spotteddolphin1.jpg

http://en.wikipedia.org/wiki/File:Gadus_morhua_Cod-2b-Atlanterhavsparken-Norway.JPG

http://en.wikipedia.org/wiki/File:Scyliorhinus_canicula.jpg

http://en.wikipedia.org/wiki/File:Whale_shark_Georgia_aquarium.jpg

Appendix D: Transcript of Interviews

Respondent 1: Male
„Was fällt Ihnen spontan als Erstes ein, wenn Sie das Wort „Hai“ hören?“
Der Weisse Hai (Jaws, Steven Spielberg, 1975)
„Wie würden Sie einen Hai beschreiben (Biologie, Lebensraum, Ökologie, Verhalten)?“
Es ist ein Einzelgänger. Ein Raubfisch, ein grosser Raubfisch, sogar ein Mörder. Ich nehme an, dass der Hai etwa 3/4 des Tages jagt, weil er eine Riesenmenge Futter zusammensuchen muss. Aber er geht sicherlich nicht auf Menschenjagd, sondern auf Fischjagd. Trotzdem ist er ein Angstmacher…wegen dem Film „Der Weisse Hai“.
„Kommentieren Sie die Beziehung Hai – Mensch.“
Die Beziehung Hai – Mensch ist miserabel, und alles hat begonnen mit dem Film „Der Weisse Hai“ und seit da ist der Hai das Schreckgespenst der Menschen, obwohl er das ja eigentlich nicht wäre. Ich meine der Hai hat ja eigentlich keine Feinde und auch der Mensch ist kein Feind, aber wenn sie sich in den Weg kommen gibt es ein Problem. Der Hai muss sich eigentlich vor niemandem in Acht nehmen, aber wenn ein Mensch dort rumschwimmt wo der Hai jagt, dann schaut er ihn wohl auch als Fisch an. Und wenn er mal Blut riecht – und das ist ja schnell passiert, wenn er ihn aufreisst – dann holt er noch 20 andere dazu.

Respondent 2: Male
„Was fällt Ihnen spontan als Erstes ein, wenn Sie das Wort „Hai“ hören?“
Tote Surfer
„Wie würden Sie einen Hai beschreiben (Biologie, Lebensraum, Ökologie, Verhalten)?“
Grundsätzlich gibt es ja verschiedene Arten, obwohl man immer nur vom einen, bösen Hai spricht. Dieses Viech lebt im Meer - in warmen Gewässern - und es ist ein Räuber. Es gibt tausende verschiedene: die einen haben etwas mehr Zähne, die anderen etwas weniger.
Grundsätzlich paddelt ein Hai im Meer umher, und dann hat er ja auch mal Hunger und sucht sich was zum Essen. Und er will sich ja wahrscheinlich auch mal fortpflanzen. Ich weiss nicht, ob der sonst noch Hobbies hat, ich glaube aber eher nicht…
„Kommentieren Sie die Beziehung Hai – Mensch.“
Grundsätzlich haben Menschen grosse Angst vor Haien, weil es ja Geschichten gibt von Leuten die von Haien angefallen wurden – ich glaube allerdings, dass dies alles recht überbewertet ist. Der Hai hat aber wohl mehr Angst vor dem Menschen als umgekehrt.

Respondent 3: Male
„Was fällt Ihnen spontan als Erstes ein, wenn Sie das Wort „Hai“ hören?“
Der macht Schmerzen, der hat scharfe Zähne.
„Wie würden Sie einen Hai beschreiben (Biologie, Lebensraum, Ökologie, Verhalten)?“
Der Hai hat scharfe Zähne, ist gross, schnell und sieht hässlich aus. Haie haben eine lange Flosse, die oben aus dem Wasser ragt. Dort wo der Hai wohnt, ist es dunkel und nass und es

gibt viel zu Fressen. Es sind Raubtiere, die meistens in Rudel jagen. Sie werden von Blut geleitet, weil es die Fresssucht anregt.
„Kommentieren Sie die Beziehung Hai – Mensch."
Die Beziehung zwischen Hai und Mensch ist sehr negativ durch das, was schon alles vorgefallen ist. Und der Mensch nimmt dem Hai halt den Lebensraum weg. Der Mensch hat daher halt auch selber Schuld, dass sich der Hai so nahe ans Ufer wagt.

Respondent 4: Female
„Was fällt Ihnen spontan als Erstes ein, wenn Sie das Wort „Hai" hören?"
Der Weisse Hai (Jaws, Steven Spielberg, 1975)
„Wie würden Sie einen Hai beschreiben (Biologie, Lebensraum, Ökologie, Verhalten)?"
Sie sind gross und kommen im tiefen Meer vor. Haie sind generell gefährlich. Sie brauchen Platz. Und sie haben ein gutes Echolot-System – glaube ich. Der Hai schwimmt umher und sucht nach Nahrung. Der sperrt einfach das Maul auf und nimmt was eben gerade so kommt. Und ich denke, dass sie irgendwie noch die Jungen aufziehen.
„Kommentieren Sie die Beziehung Hai – Mensch."
Was man halt weiss von Haien ist, dass sie gefährlich werden können, aber von den Biologen hört man immer Aussagen, dass dies gar nicht stimme. Und ich glaube die Haie brauchen die Menschen nicht, aber die Menschen brauchen die Haie um Haifisch-Flossen abzuschneiden und zu essen in den luxuriösen japanischen Restaurants.

Respondent 5: Male
„Was fällt Ihnen spontan als Erstes ein, wenn Sie das Wort „Hai" hören?"
Vorurteile der Öffentlichkeit gegenüber eigentlich sehr eindrucksvollen Tieren.
„Wie würden Sie einen Hai beschreiben (Biologie, Lebensraum, Ökologie, Verhalten)?"
Sie leben im Wasser, sind teilweise gross und haben nicht so viele Feinde – ausser dem Menschen. Haie schwimmen in der Gegend umher und wenn sie Hunger haben, dann jagen sie etwas, zum Beispiel kleinere Fisch. Sie jagen eher allein. Und wenn ein Mensch ihn provoziert, dann beisst er eben zu.
„Kommentieren Sie die Beziehung Hai – Mensch."
Der Mensch macht Jagd auf den Hai um ihn zu essen. Aus der Sicht des Menschen ist die Beziehung recht schlecht. Aber wenn man Haie nicht provoziert, sollte man sich nicht fürchten müssen.

Respondent 6: Male
„Was fällt Ihnen spontan als Erstes ein, wenn Sie das Wort „Hai" hören?"
Ein grosses, böses Säugetier.
„Wie würden Sie einen Hai beschreiben (Biologie, Lebensraum, Ökologie, Verhalten)?"
Der Hai kommt im Wasser vor, in den Ozeanen. Es sind Fleischfresser. Sie sind auf Nahrungssuche und auch Paarungssuche.
„Kommentieren Sie die Beziehung Hai – Mensch."

Durch die Medien meint man, sie seinen böse Tiere, dabei sind die meisten Haie gar nicht aggressiv und greifen die Menschen auch nicht an. Ich denke, dass mehr Menschen Haie töten. Der Mensch ist der grosse Feind des Hais und nicht umgekehrt.

Respondent 7: Female
„Was fällt Ihnen spontan als Erstes ein, wenn Sie das Wort „Hai“ hören?“
Hai-Attacken.
„Wie würden Sie einen Hai beschreiben (Biologie, Lebensraum, Ökologie, Verhalten)?“
Ein Hai ist ein Säugetier und wohnt im Meer. Aber es gibt glaube ich auch Süsswasserhaie, aber die meisten sind schon im Salzwasser. Sie sind manchmal sehr klein und manchmal sehr gross – bis zu 4 Meter lang, glaube ich. Sie sind grau-weiss. Es sind Fleischfresser. Sie schwimmen umher und manchmal riechen sie Blut im Wasser und werden aggressiv und gehen dem Blut nach und fressen alles.
„Kommentieren Sie die Beziehung Hai – Mensch.“
Angst!!! Ganz viel Angst, aber auch Faszination. Wir sind auch Rivalen – die Menschen fordern die Haie heraus. Sie wollen auch immer wieder das Klischee bestätigen, dass die Haie so aggressiv sind.

Respondent 8: Male
„Was fällt Ihnen spontan als Erstes ein, wenn Sie das Wort „Hai“ hören?“
Surfen als Sportart… Surfer werden dann angefallen.
„Wie würden Sie einen Hai beschreiben (Biologie, Lebensraum, Ökologie, Verhalten)?“
Tiere, die vorallem an tropischen Ferienorten vorkommen, aber auf jeden Fall nicht hier am Thunersee oder Bodensee. Haie haben etwas Exotisches. Sie kommen im Salzwasser vor, aber es gab wohl eine Art, die im Süsswasser vorkam – in Nicaragua oder so – aber die ist vielleicht auch wieder ausgestorben. Sie essen andere Fische: es sind auf jeden Fall keine Vegetarier. Sie jagen im Rudel andere Tiere, so Walfische oder so, auch wenn diese grösser sind. Sie haben einen guten Geschmackssinn, zum Beispiel wenn jemand blutet. Sie halten sich dort auf, wo ihre Beute ist. Er präsentiert seine Flosse an der Wasseroberfläche. Ich denke das Verhalten ist je nach Art verschieden und es gibt sehr viele Arten. Ich glaube, dass sie nicht gerne Tumult haben, so am Badestrand, sonst würde es auch mehr Unfälle geben.
„Kommentieren Sie die Beziehung Hai – Mensch.“
Ähnlich wie mit den Wölfen… Der Hai ist negativ belastet, obwohl es gar nicht so sein müsste. Die Menschen haben Angst vor Haien, was sicher auch begründet ist, da es schon Unfälle gegeben hat, aber es ist sicher andersrum, da der Mensch in das Territorium des Hais eingreift.

Respondent 9: Female
„Was fällt Ihnen spontan als Erstes ein, wenn Sie das Wort „Hai“ hören?“
Zähne
„Wie würden Sie einen Hai beschreiben (Biologie, Lebensraum, Ökologie, Verhalten)?“

Knorpelfisch, der normalerweise im Meer vorkommt. Es gibt keine Süsswasserhaie. Es gibt ganz unterschiedliche Arten. Sie leben alle räuberisch, die Beute ist teilweise grösser oder kleiner. Sie legen komische Eier. Sie sind im Wasser und essen. Sie können sehr weit schwimmen. Sie schlafen auch.
„Kommentieren Sie die Beziehung Hai – Mensch."
Furchterfüllte Beziehung, wenn man jetzt so an Filme denkt wie „Der Weisse Hai", wo der Hai als Bestie dargestellt wird, die grundlos den Menschen attackiert, aber das geschieht ja normalerweise nicht wirklich. Es gibt viele Leute, die interessieren sich sehr für Haie. Es gibt auch Leute die tauchen mit Haien. Es gibt auch Leute die essen Haie, was auch nicht gerade gut ist.

Respondent 10: Female
„Was fällt Ihnen spontan als Erstes ein, wenn Sie das Wort „Hai" hören?"
Ein gefährlicher Fisch.
„Wie würden Sie einen Hai beschreiben (Biologie, Lebensraum, Ökologie, Verhalten)?"
Es ist definitiv ein Meeresfisch, aber wo genau er lebt weiss ich nicht. Er schwimmt umher und sucht seine Beute, dass er nicht verhungert.
„Kommentieren Sie die Beziehung Hai – Mensch."
Der Hai hat nicht viele Sympathien bei den Menschen weil er gefährlich ist und nah ans Ufer kommt. Es gibt auch immer wieder Unfälle.

Respondent 11: Male
„Was fällt Ihnen spontan als Erstes ein, wenn Sie das Wort „Hai" hören?"
Gefahr
„Wie würden Sie einen Hai beschreiben (Biologie, Lebensraum, Ökologie, Verhalten)?"
Es sind Fische, aber sie leben nicht so tief unten im Meer. Es sind Fleischfresser und fressen andere Fische. Sie suchen ihr Fressen. Ich weiss nicht, vielleicht schlafen sie auch ein wenig, aber die meiste Zeit suchen sie Nahrung.
„Kommentieren Sie die Beziehung Hai – Mensch."
Die Haie fressen normalerweise nicht Menschen, wenn sie nicht gerade sehr grossen Hunger haben. Aber Menschen haben sehr grosse Angst, dass Haie aggressiv sind. Für Surfer sind sie schon gefährlich, wenn sie sie verwechseln mit anderen Tieren.

Respondent 12: Female
„Was fällt Ihnen spontan als Erstes ein, wenn Sie das Wort „Hai" hören?"
Hammerhai
„Wie würden Sie einen Hai beschreiben (Biologie, Lebensraum, Ökologie, Verhalten)?"
Sie leben im Wasser, im Salzwasser. Es ist ein Raubtier. Sie kommen nicht in grossen Clans vor, es sind eher Einzelgänger, aber nicht ganz allein. Sie schleichen sich an und fressen.
„Kommentieren Sie die Beziehung Hai – Mensch."
Der Hai greift im Prinzip keine Menschen an – ausser vielleicht Surfer. Aber der Mensch hat so eine unlogische Angst vor Haien. Die meisten Haiarten sind nicht gefährlich für uns. Es ist

viel wahrscheinlicher vom Blitz getroffen zu werden als vom Hai gefressen zu werden. Der Film „Der Weisse Hai“ hat ein etwas falsches Bild vermittelt.

Respondent 13: Male
„Was fällt Ihnen spontan als Erstes ein, wenn Sie das Wort „Hai“ hören?“
Flossen.
„Wie würden Sie einen Hai beschreiben (Biologie, Lebensraum, Ökologie, Verhalten)?“
Sie leben im Meer. Es sind recht inaktive Tiere… Auf jeden Fall sind sie nicht auf Menschenjagd. Sie sind vom Aussterben bedroht, man soll sie nicht essen. Sie sind gar nicht so gefährlich, wie man immer denkt. Pro Mensch der von einem Hai getötet wird, töten Menschen etwa eine Million Haie oder so.
„Kommentieren Sie die Beziehung Hai – Mensch.“
Wir haben so ein Angstbild von ihnen, so wie bei Spinnen. Aber eigentlich kommen sich die beiden Lebensräume nicht in die Quere.

Respondent 14: Male
„Was fällt Ihnen spontan als Erstes ein, wenn Sie das Wort „Hai“ hören?“
Meer
„Wie würden Sie einen Hai beschreiben (Biologie, Lebensraum, Ökologie, Verhalten)?“
Sie sind gefährlich, schnell, schnittig, ästhetisch. Auch Majestätisch. Ein Hai ist eben ein geborener Jäger und ist dementsprechend auf Nahrungssuche. Aber er ist grundsätzlich ja nicht aggressiv… Vielleicht etwas dumm.
„Kommentieren Sie die Beziehung Hai – Mensch.“
Gar nicht gut. Ursprünglich hat das angefangen mit dem Hai von „Der Weisse Hai“, weil der Hai dort als Killer und Menschenfresser dargestellt wurde. Und man hat ihn dann auch abgeschlachtet und gejagt. Aber mittlerweile ist man dem Hai gegenüber etwas sensibilisiert worden. Man versteht, dass es – wenn er angreift – eher ein Versehen ist, weil er meint es sei ein Seehund oder so. Aber der Hai hat grundsätzlich keine Probleme mit dem Mensch.

Respondent 15: Male
„Was fällt Ihnen spontan als Erstes ein, wenn Sie das Wort „Hai“ hören?“
Raubtier
„Wie würden Sie einen Hai beschreiben (Biologie, Lebensraum, Ökologie, Verhalten)?“
Sie sind im Meer. Sie werden aggressiv, wenn sie Blut schmecken. Sie schwimmen viel und sind auf Nahrungssuche.
„Kommentieren Sie die Beziehung Hai – Mensch.“
Viele Leute haben Angst vor Haien, wenn sie ins Meer gehen. Die Haie haben es nicht auf Menschen abgesehen. Aber wenn man sie nervt, oder sich in den Finger geschnitten hat und dann Baden geht… Keine gute Idee.

Respondent 16: Female
„Was fällt Ihnen spontan als Erstes ein, wenn Sie das Wort „Hai“ hören?“

Ein Haifisch, wie er Schwimmer verschlingt und alle umherkreischen.
„Wie würden Sie einen Hai beschreiben (Biologie, Lebensraum, Ökologie, Verhalten)?“
Fisch, der im Salzwasser lebt. Es gibt aber auch Süsswasserhaie. Sie haben viele Zähne, ein starkes Gebiss, denn es sind Fleischfresser, die sich von kleineren Fischen ernähren. Sie jagen auch Wale. Sie kommen in allen Weltmeeren vor und in den Flüssen. Es sind majestätische Tiere. Sie können aber auch gefährlich sein. Man hört ja, dass sie schon einen Tropfen Blut über eine grosse Distanzen riechen können und recht aggressiv sind. Aber dann hört man wieder, dass sie eigentlich sehr friedlich sind und sie Menschen nur angreifen wenn sie von unten aussehen wie eine Robbe oder so.
„Kommentieren Sie die Beziehung Hai – Mensch.“
Viele Menschen haben Angst vor Haien weil sie nichts darüber wissen, aber wieder etwas über einen Unfall gelesen haben. In der jetzigen Situation ist es eine eher gestörte Beziehung, weil Haie gefangen und gegessen werden von uns. Sie werden auch gejagt wegen ihren Zähnen oder weil sie gefährlich sind. Sie greifen uns auch an, weil sie spüren, dass wir sie auch angreifen, wenn sie sich bedroht fühlen.

Respondent 17: Female
„Was fällt Ihnen spontan als Erstes ein, wenn Sie das Wort „Hai“ hören?“
Dass es gefährliche und weniger gefährliche gibt.
„Wie würden Sie einen Hai beschreiben (Biologie, Lebensraum, Ökologie, Verhalten)?“
Es ist unbestrittenerweise ein Raubtier. Aber Haie sind wohl auch bekannt dafür, dass sie soziales Verhalten gegenüber Artgenossen zeigen, wenn auch nur zu denen, die dazu passen. Sie sind unberechenbar.
„Kommentieren Sie die Beziehung Hai – Mensch.“
Leider werden zu viele Haie von den Menschen getötet.

Respondent 18: Female
„Was fällt Ihnen spontan als Erstes ein, wenn Sie das Wort „Hai“ hören?“
Ein urtümlicher Fisch, der im Verlaufe der Evolution erfolgreich war.
„Wie würden Sie einen Hai beschreiben (Biologie, Lebensraum, Ökologie, Verhalten)?“
Es sind schnelle, kluge, und sehr anpassungsfähige Tiere. Wie soll ich sagen: Haie sind die Polizisten der Meere und sorgen für Ordnung. Sie halten ein gesundes Gleichgewicht aufrecht. Sie sehen so listig aus mit ihren kleinen Augen und den vielen Zähnen. Es ist ja auch sehr interessant, dass die Zähne das ganze Leben lang nachwachsen.
„Kommentieren Sie die Beziehung Hai – Mensch.“
Die Haie machen den Leuten Angst. Dabei ist es eher umgekehrt, die Haie sind durch den Menschen gefährdet.

Respondent 19: Female
„Was fällt Ihnen spontan als Erstes ein, wenn Sie das Wort „Hai“ hören?“
„Der Weisse Hai“
„Wie würden Sie einen Hai beschreiben (Biologie, Lebensraum, Ökologie, Verhalten)?“

Haie sind mittelgrosse bis grosse Fische. Es gibt etwa 500 verschiedene Arten, die in allen Weltmeeren vorkommen. Sie ernähren sich entweder von Fischen oder von Plankton, je nach Art verschieden.

„Kommentieren Sie die Beziehung Hai – Mensch."

Die Beziehung Hai – Mensch zeichnet sich durch gegenseitige Angst aus. Für den Menschen ist der Hai ein aggressiver, angriffslustiger Killer, was er gar nicht ist, wenn man ihn in Ruhe lässt. Und der Mensch ist für den Hai eine Bedrohung: durch Überfischung, Raub seines natürlichen Lebensraums und auch seines Futters.

Respondent 20: Male

„Was fällt Ihnen spontan als Erstes ein, wenn Sie das Wort „Hai" hören?"

Taucherspruch: You will never see a shark, they are always behind you.

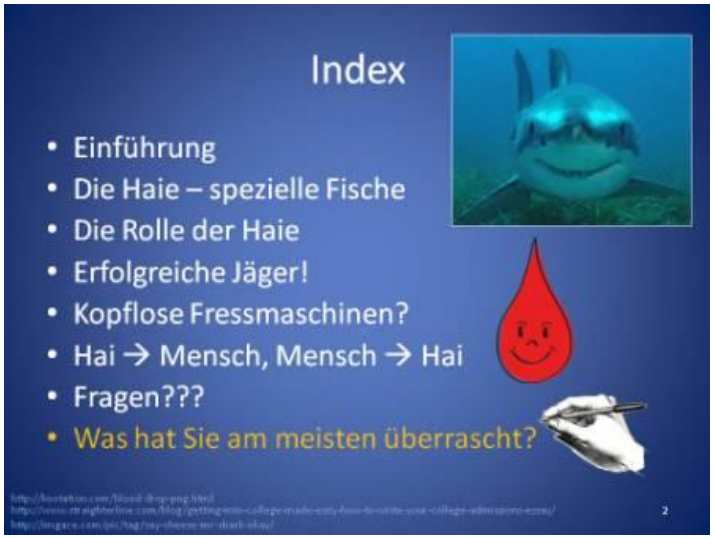
„Wie würden Sie einen Hai beschreiben (Biologie, Lebensraum, Ökologie, Verhalten)?"

Haie sind meist grau gefärbte Meerfische. Es gibt viele Unterarten. Sie sind wichtig für das Gleichgewicht im Meer; für das Ökosystem Meer sind sie unentbehrlich. Sie sind grösstenteils unerforscht und missverstanden.

„Kommentieren Sie die Beziehung Hai – Mensch."

Sie sind eher ängstlich gegenüber uns. Sie werden zu Unrecht als Monster gehandelt. Sie werden als Symbol des Bösen, des Gefährlichen, des Unersättlichen gehandelt; sowohl in der Natur, als auch im übertragenen Sinn, zum Beispiel in der Finanzwelt. Es gibt sehr viele reisserische Zeitungsartikel.

Appendix E: Slides of presentation




Knuddeln? Nützlich? Missverstanden!!
5


Verschiedene Arten → verschiedene Lebensformen
6


KLEIN oder GROSS
7

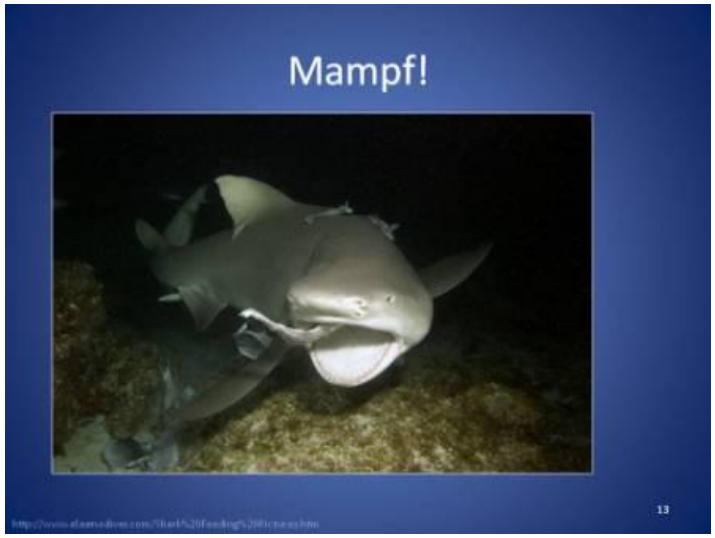

URTÜMLICH oder HOCHENTWICKELT
8

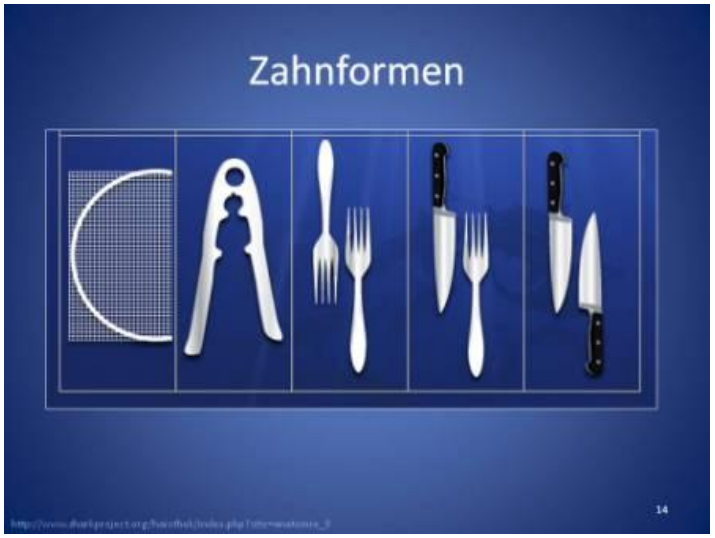

TIEFSEE oder SEICHTES WASSER
9

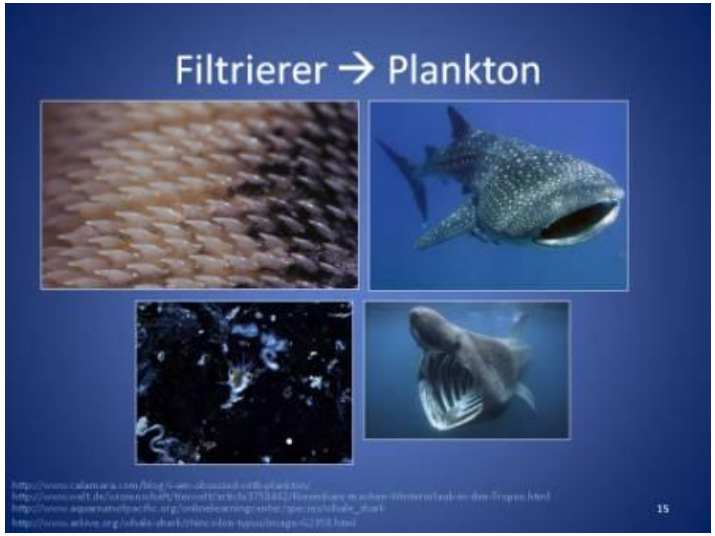

AM GRUND oder OFFENER OZEAN
10


POLAR oder TROPISCH
11

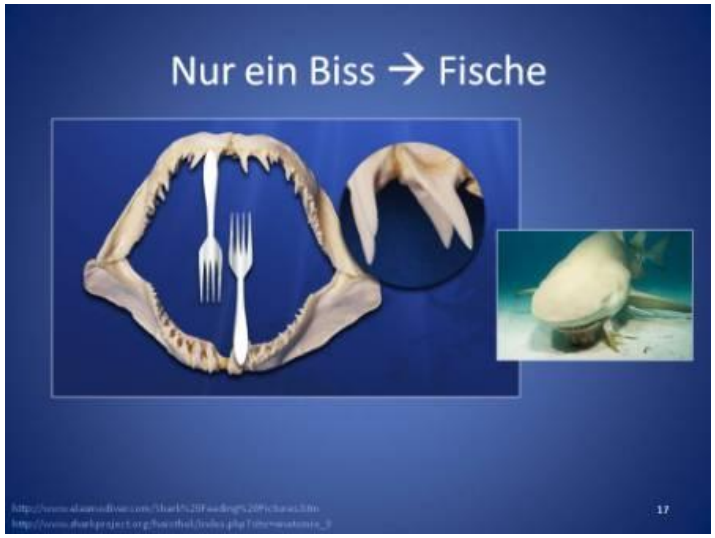

TARNEN oder ANLOCKEN
12

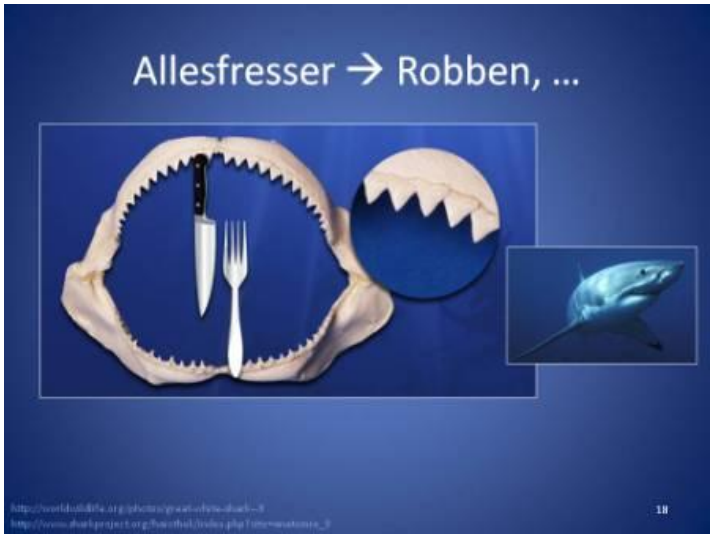

Mampf!
13


Zahnformen
14

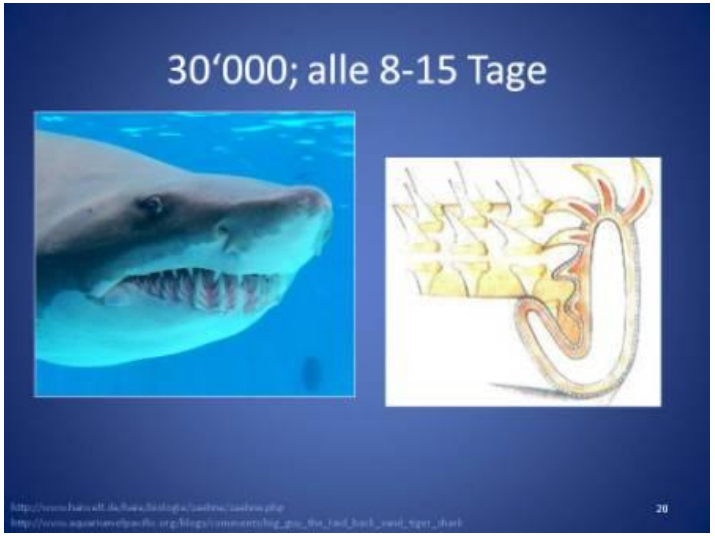

Filtrierer → Plankton
15


Knacker → Krustentiere
16


Nur ein Biss → Fische
17

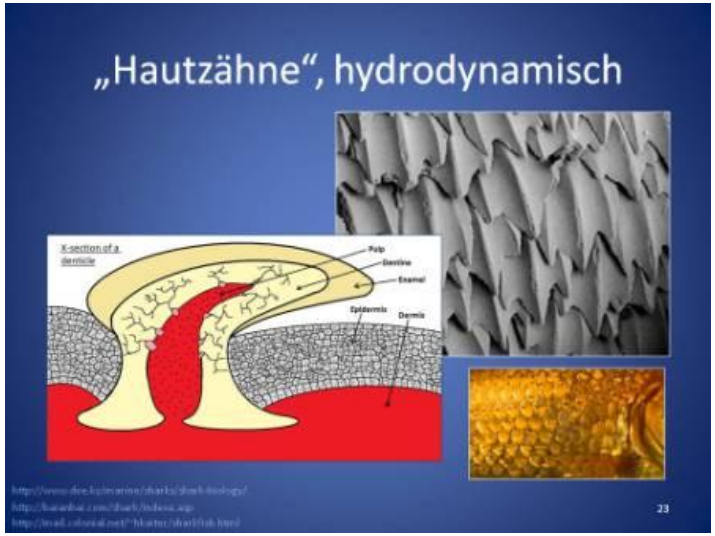

Allesfresser → Robben, …
18


Grosse Beute → Schildkröten, …
19


30‘000; alle 8-15 Tage
20


Loser Kiefer, starker Biss
21


KEIN Knochenfisch sondern
KNORPELFISCH
22


„Hautzähne“, hydrodynamisch
X-section of a dermicle
Pulp
Dentine
Enamel
Epidermis
Dermis
23


Kiemenatmung; kein Auftrieb
24

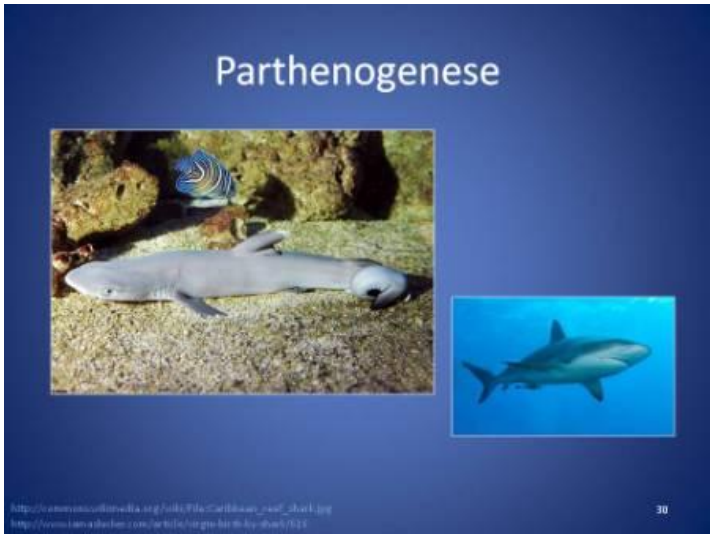

Reproduktion Knochenfische
25


Hai – innere Befruchtung, Klasper
26


Ovoparie
27

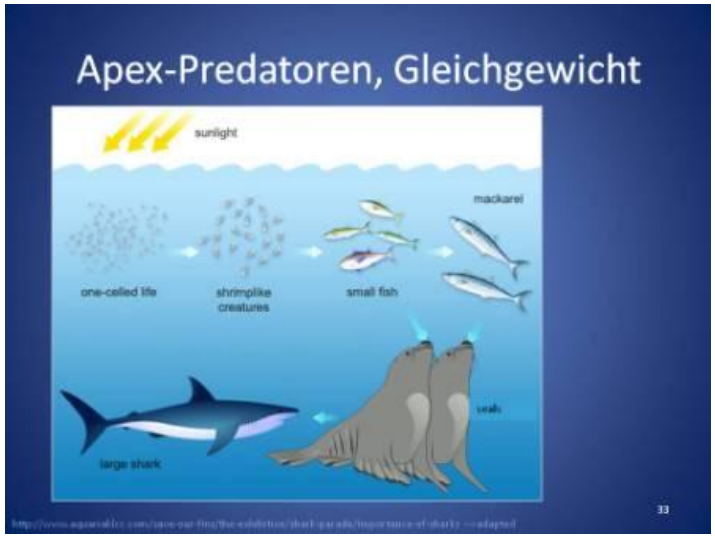

Viviparie, keine Brutpflege
28


Ovoviviparie
29


Parthenogenese
30

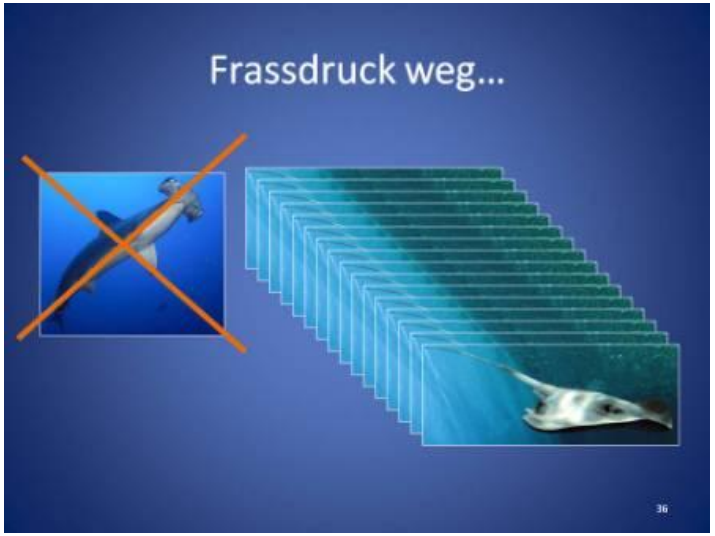

420 Mio, 470 Spec (kein Süsswasser)
31


Die Rolle der Haie
32


Apex-Predatoren, Gleichgewicht
sunlight
mackarel
one-celled life
shrimplike creatures
small fish
large shark
seals
33


Chesapeake Bay, USA
34


Gleichgewicht
35


Frassdruck weg...
36


Explosionsartige Vermehrung...
37


Ausgefischt...
38


Erfolgreiche Jäger! Gross!!
39


Homeotherm, +10-15°C, Energie
40


Wie finden sie ihre Beute?
41

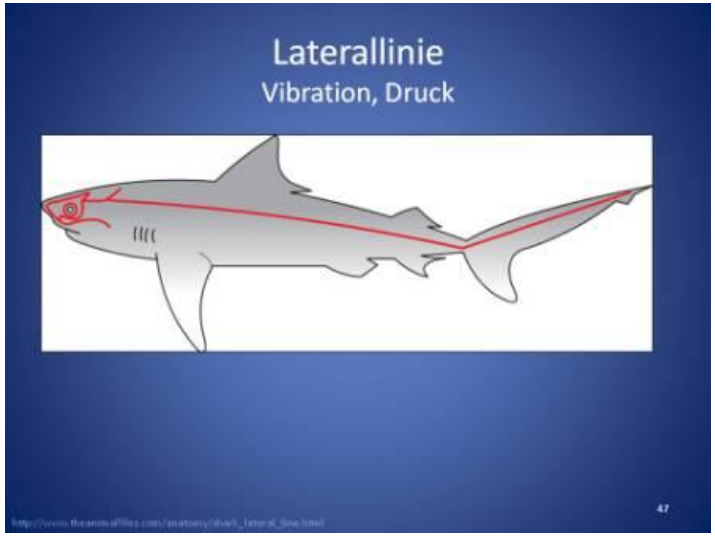

Scharfe Sinne!
42


„Sehen“
Tapetum lucidum, warm, Pupillen, Blinzeln
43


„Riechen“
Nasenlöcher, Richtung, 1ppm
44


Blutrausch…
45


„Hören“
10-345Hz, sehr weit
46


Laterallinie
Vibration, Druck
47


Lorenzinische Ampullen
1500
48

Elektromagnetischer Sinn

→5 nV/cm → 1.5V Batterie auf 3km

49

Filme

50

Hauptnahrung NICHT Mensch

51

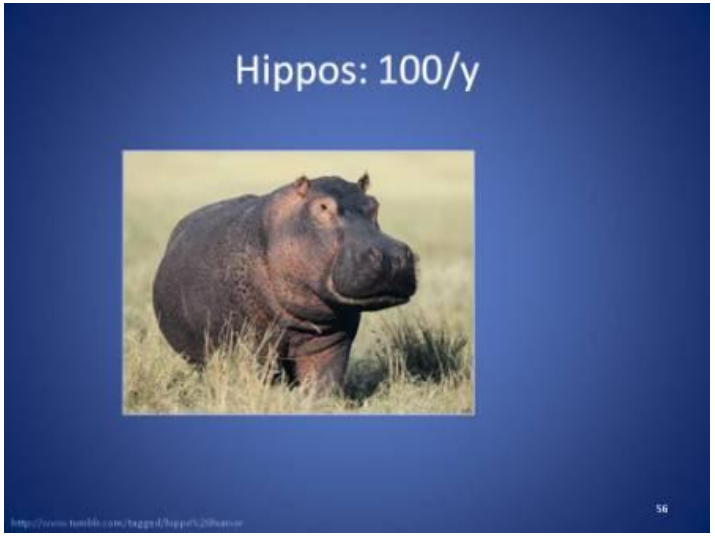
Warum Unfälle?

52


Angriffe
53


Angriffe
3 Tote pro Jahr
54


Quallen: 80/y
55


Hippos: 100/y
56


Grosskatzen: 200/y
57


Elefanten: 300/y
58


Hunde: 800/y
59


Krokodile: 1000/y
60

Bienen: 2500/y

61

Skorpione: 5000/y

62

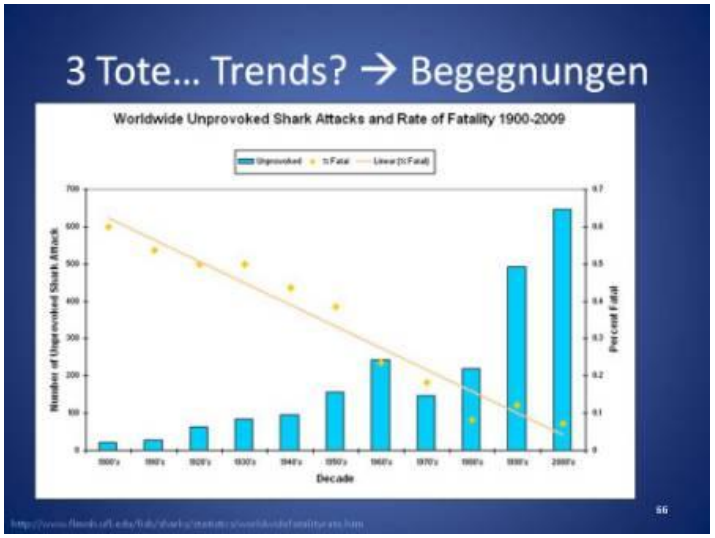
Schlangen: 80‘000/y

63

Mücken: 2‘700‘000/y

64


3 Spezies (GW, Tigerh., Bullenh.)
WEST USA
98
EAST USA
7
22
MEDITERRANEAN
3
JAPAN
1
SOUTH KOREA
1
HAWAII, USA
1
MEXICO
1
CARIBBEAN ISLANDS
3
SOUTH AMERICA
57
AUSTRALIA
58
SOUTH AFRICA
10
NEW ZEALAN
65


3 Tote... Trends? → Begegnungen
Worldwide Unprovoked Shark Attacks and Rate of Fatality 1900-2009
Unprovoked
% Fatal
Linear (% Fatal)
Number of Unprovoked Shark Attack
Percent Fatal
Decade
66


2000: 300 Mio Strand-Touristen
67


Baden im Jagd-Revier
68

Zu Land wohl kaum!

Strandnähe / Assoziation (intelligent)

„Verwertung“ von Haien

Vitamine, Kosmetik

Getrocknet als Medizin…

73

Hai-Fleisch

German Names / Deutsche Namen:

- Seeaal / Meeraal
- Schillerlocken
- Kalbsfisch
- Speckfisch
- Dornfisch
- Karbonadenfisch
- Königsaal / Steinaal
- Steinlachs
- Seestör / Wildstör / Forellenstör
- Tofuhai
- Sokomoro
- Ozean Filet / Meeres Filet
- Falsche Jakobsmuscheln
- Falsches Krabbenfleisch (Surimi)
- Bestandteil von Fish & Chips

74

Shark Finning: 80 Mio pro Jahr

75

Beifang: nochmals 70 Mio pro Jahr

76


Beifang: 10% des Fangs, über Bord


3 : 150‘000‘000
Keine Regelungen in Internationalen Gewässern
>90% Rückgang der Populationen in den letzten 20 Jahren


Lebendig auch viel wert!


Merchandise


Balance, Gesundheitspolizei


Öko-Tourismus


Bionik


Kontrolle invasiver Arten
Feuerfisch: Indies → Karibik


Haie können auch gut sein!!!!


Danke für die Aufmerksamkeit


Fragen??????


Was hat Sie am meisten überrascht?
Zettel ausfüllen
Gewonnen ? (Hai hinten auf Karte)
JA!
Nein...
DVD abholen
Antwort einwerfen, DANKE!
Antwort einwerfen, DANKE!
DEEP BLUE

Appendix F: Replies to 'What surprised you the most?'

- Die Diversität der Haie
- Verschiedene Fortpflanzungsstrategien
- Die Artenvielfalt: 470 Haiarten, wow!
- Nur 3 Tote pro Jahr → das Verhältnis zu den Haien die wir töten
- Dass es Fälle gegeben hat, in denen sich ein Hai ohne Befruchtung fortgepflanzt hat
- Der Walhai ist 14m lang!
- Dass wir immer noch so viele Haie abschlachten
- Dass Haie immer die gleiche Körpertemperatur haben
- Wie die Haie ihren Kiefer aushängen können
- Wie die Zähne immer nachwachsen
- Die spezielle Struktur der Haut (wie Zähne)
- Dass es so kleine gibt
- Aufbau der Haut
- Wie sie aus dem Wasser springen können
- Haut sind eigentlich „Zähne"
- Lebendgeburt anstatt Eier legen
- Vielfältigkeit der Arten
- Verschiedene Gebissarten
- Sinnesorgane
- „Todesstatistik"
- Filmszenen
- Angriffsgeschwindigkeit
- Fortpflanzungsdiversität
- Geschwindigkeit beim Angriff