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# Social Narratives Surrounding Dolphins: Q Method Study

ABSTRACT

In preparation for development of an exhibit on the cognitive abilities of dolphins, the Wildlife Conservation Society sought to determine potential visitor's social perspectives about dolphin intelligence, and how these beliefs might influence acceptance of scientific information. The study reported here used Q methodology to identify these underlying social perspectives. The study of adults and the study of children each revealed three distinct perspectives. While consensus emerged among adults on points about dolphins' high intelligence and communication abilities, the three perspectives differed in their acceptance of the extent of self-awareness, learning capacity, and affinity for humans shown by dolphins. Among children, consensus emerged about dolphins' physical abilities, but analysis found differences in belief regarding instinctive versus intentional behavior, mystical connections, and dolphins' relationship to humans. Agreement among all of these perspectives, particularly on the topic of communication, suggests powerful common ways to begin thinking about dolphin cognition. Conversely, the unique attributes of each perspective, and the potential for interaction between individuals with differing perspectives in an exhibit setting, provide opportunities to engage visitors in discussion about animal intelligence.

Research in the field of animal intelligence and cognition has uncovered a rich variety of abilities in

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other species that long have been thought unique to humans (Griffin, 1976). Recent research on the cognitive, behavioral, and communicative abilities of bottlenose dolphins (*Tursiops truncatus*) has demonstrated these nonhuman animals' abilities in the areas of symbolic and referential behavior (Herman, 1983), inventive play, and creativity (McCowan, Marino, Vance, Walke, & Reiss, 2000), vocal and behavioral learning (Reiss & McCowan, 1993), sensory processes, use of echolocation (Herman, Pack, & Hoffman-Kuhnt, 1998), and self-awareness demonstrated by mirror self-recognition (Reiss & Marino, 2001). This research into dolphin cognition has added new information to current theories of the evolution of animal cognition. Such findings, if they become public knowledge, could alter those popular beliefs that identify a fundamental separation between the quality of human minds and those of other animals.

The research reported here was conducted by the Wildlife Conservation Society (WCS) and inspired by the organization's mission to increase public concern and respect for wildlife and conservation. Our research was supported, in part, by a grant from the Institute for Museum and Library Services (a federal funding institution) to develop an exhibit at the New York Aquarium to explore recent scientific research about dolphin cognition. This exhibit would present scientific findings and information through technology-based exhibits and interactives, without the presence of live dolphins at the aquarium.

As preparation for development of the exhibit, we sought to better understand how visitors think about, and understand, dolphin intelligence to ensure the exhibit would facilitate learning on this complex topic for the broadest possible audience. We investigated two aspects of these incoming perspectives, the second of which we report upon here. First, we examined the common portrayals of dolphins in popular media (Fraser et al., in this issue). Second, we inquired into the public's beliefs about the capacity of the dolphin mind. In particular, we sought to document differing social perspectives about dolphins and to understand how these beliefs might influence people's acceptance of the new information about dolphin intelligence emerging from the research cited above. Our study investigated these questions with children (ages 8 to 12) and adults (ages 18 and older) in the New York metropolitan area. These two populations were selected because they represented two main target audiences for this exhibit.

The results of this research are intended to serve not only the needs of the New York Aquarium, but also those of the larger aquarium community by helping to shape new approaches to dolphin exhibit development and those of marine mammal cognitive researchers in the public dissemination of their research.

## Background

Empirical research into public perceptions of dolphins and dolphin intelligence is young and extremely sparse. Although dolphins appear to have a significant place as literary devices in music, children's literature, and fantasy fiction, very few studies question the difference between the animal as literary device and the public perception of the species.

In his comprehensive research on public perceptions of marine mammals, Kellert (1999) found that dolphins—their conservation and their welfare—are viewed positively by the American public. When considering public perceptions about the dolphin mind, there has been little research specifically on this topic. Some study has been conducted on more general belief in animal mind and the attribution of cognitive abilities to animals (Driscoll, 1995; Herzog & Galvin, 1997; Phillips & McCulloch, 2005; Rasmussen, Rajecki, & Craft, 1993). These studies have consistently found that the attribution of more complex mental abilities follows a perceived phylogenetic hierarchy, with large-brained mammals (primates, dolphins) and companion animals (especially cats and dogs) given greatest credit. Just two of these studies included dolphins among the range of animals used as prompts to respondents (Herzog & Galvin, 1997; Driscoll, 1995). In both, people assigned very high, even human-like, cognitive capacities to dolphins. Driscoll's study even found that dolphins received a higher rating of perceived smartness than either humans or chimpanzees.

A recent study by Barney, Mintzes, and Yen (2005) took a more focused look at public knowledge, attitudes, and behaviors toward bottlenose dolphins, building directly upon Kellert's (1980) attitudinal research work and Thompson and Mintzes's (2002) earlier work on sharks. Because of its recent nature and direct relevance to this study, we discuss the Barney et al. study in some detail. It contained two general components.

When comparing people of different ages at different levels of their education (elementary school, secondary school, college, or graduate school in marine sciences), they found that people with more education were more knowledgeable about, and had more positive attitudes toward, dolphins and were also less likely to engage in harassing behaviors. The researchers also found a set of commonly used descriptors of dolphins across education levels that included physical characteristics, environment, human use of dolphins, entertainment value, and the characteristic of intelligence.

The second part of their study is of more direct consequence to our study. In their survey of 124 undergraduate college students on 60 attitudinal statements toward dolphins, they used factor analysis to reveal three underlying perspectives. The authors did not supply text to interpret the factors, instead they reported the factor-loading scores of each attitudinal statement. Their "Humanistic" perspective, defined by 19 statements, described a perspective in which dolphins are admired—even loved—not only as pets or performers but also as wonderful, wild creatures exhibiting grace and beauty. A "Utilitarian" perspective, described by 8 statements, portrayed a perspective focused mainly on the proper interaction between dolphins and humans. The "Ecoscientific" perspective, defined by 12 statements, described an interest in studying dolphins and their role in marine ecology. The researchers found some correlations between loading score on each perspective and subject's level of education, but these were not consistent.

Our research also sought to reveal social perspectives on dolphins but differed from Barney et al. (2005), focusing on the population of potential aquarium visitors in the New York metropolitan area, including both adults and children. This project was inspired by an earlier survey of zoo and aquarium visitors that WCS conducted in 2003-2004 (Sickler et al, 2006).[2] In that study, visitors widely characterized dolphins as intelligent, though how they were intelligent was not addressed. These results confirmed prior findings about public perceptions of dolphin intelligence (Herzog & Galvin, 1997; Driscoll, 1995). These studies found that the public maintains a strong positive stereotype about dolphins and thinks of them as intelligent creatures. Although this is important information, we recognize that, when used to describe an animal, "intelligent" is a relative term. Some respondents may have meant that dolphins were smarter than humans, while others indicated that dol-

phins had the same kind of intelligence as a dog or cat. For addressing the topic of dolphin cognition with the public in an exhibit context, we felt it was necessary to have a more thorough understanding of people's incoming perceptions about dolphins and the nature of their intelligence.

As noted above, we initially reviewed the use and characterization of dolphins in popular media, including television, literature, movies, and music, which uncovered four themes of dolphin portrayals (Fraser et al., this issue). This led us to suspect that these themes may be intertwined with the public's perceptions of dolphin minds.

Building from this consideration and the recognition of widespread general consensus that dolphins are intelligent, this research sought to clarify a more specific framework to reflect how the public defines intelligence in dolphins. Exhibit developers at the New York Aquarium would use such detail to select appropriate content and modes of presentation for the scientific research and findings on this topic.

## Research Question and Approach

This project was developed primarily to serve the needs of exhibit developers in creating an exhibit about dolphin intelligence and research at the New York Aquarium. In constructing exhibit experiences, the WCS design team adheres to a constructivist philosophy of learning, in which visitors learning is considered to involve an individual construction of meaning through interaction with, and discussion about, experiences. In this way, an exhibit is seen as a contributor to public discourse on a topic. For this project, we sought to create an exhibit experience that would allow visitors to integrate new information about dolphins' cognitive abilities into their existing beliefs and perspectives about these animals. Our goal with the present study was to understand what people think and believe about dolphin intelligence and cognition as a starting point for exhibit development. Because this research was conducted for a New York Aquarium exhibit project, we focused mainly on people who live in and around the city, potential Aquarium visitors. It was obvious that we should study adults (those aged 18 and older); however, because the exhibit was intended to serve family (or intergenerational) audiences, we also chose to study children aged 8-12.

We began with the premise that people are likely to have varying perspectives about dolphin intelligence, simply because they have different knowledge, experience, and worldviews. Furthermore, we surmised that, although individuals would have their own personal perspectives on dolphins, there would also be overarching social perspectives on dolphin intelligence. We sought to reveal the content of these social perspectives.

By "social perspectives," we mean coherent patterns of beliefs that are idealized in ways that may not exactly mimic individual beliefs. Consider that two social perspectives on American democracy are Democratic and Republican. There are a few individuals (party leaders and ideological politicians) whose individual perspective matches one of these social perspectives exactly. Most Americans, we believe, will adopt beliefs from both perspectives in making their unique viewpoint on an issue, even if they identify more with one perspective than the other. Conceptualizing American democracy in terms of these two social perspectives is one, but certainly not the only, interpretation.[3]

To reveal social perspectives about dolphin intelligence and cognition, we employed a technique known as Q methodology.[4] With Q methodology, we begin by collecting a small number of distinctly different individual perspectives and then employ non-parametric statistics to reveal the underlying social perspectives. This is achieved by having individual respondents react to pre-selected statements by sorting them according to personal relevance. The statements are the ingredients that the researcher believes respondents need to wholly portray their perspective. People assign relative ranks to each statement, according to how important each statement is to how they think. This is called a "Q sort." Inverted factor analysis is used to find patterns in the Q sorts. The analysis reveals patterns across the individuals' responses and, after examining these patterns, the researchers compose the social perspectives.

Q methodology differs from surveys in that it looks at the respondents as the variables, while the statements to which they respond are equivalent to "subjects" (virtually inverting the survey method, which sees each question as a variable). The name Q comes from an attempt to distinguish Q method from the survey method, which commonly produces an "r" statistic (the Pearson product moment coefficient).

The keys to succeeding with this method are to select an appropriate sample of Q statements and to select an appropriate group of people to sort the statements.

*Selecting the Q statements*

In a Q study, researchers assemble a set of statements that they assume will supply all the ingredients necessary for the subjects to express their personal perspectives on a subject. Q statements are taken from a collection of text that has been written or spoken about the subject of study. Normally, no more than 4 or 5 dozen statements are included in a study (getting people to sort more than this number is difficult). The sample of statements must represent all key aspects of all the relevant perspectives on the issue and are selected in such a way that researchers do not impose their attitudes on the study.

We generated Q statements for our study in two ways. First, we interviewed both adults and children who held a variety of opinions about dolphins about their thoughts on dolphins, dolphin intelligence, and capacity for thinking. The interviews were intended to be as open-ended as possible, ensuring that we collected data as true to the individual's own language as possible. Conversational probes were used to obtain greater depth in answers. We specifically asked about thinking, identity, learning, and intelligence in dolphins. We also collected statements from content analysis of popular media including books (adults' and children's), newspapers, magazines, and websites. These activities yielded some 150 Q statements that focused on dolphin intelligence, behavior, and the dolphin mind[5] for the adult study and some 80 statements for the children's study.

To ensure a full collection of Q statements, we developed a conceptual taxonomy and sorted our two collections of statements into six categories:

1. Capacity for emotion;
2. Capacity for learning;
3. Communication;
4. Spiritual/mystical/healing capacity;
5. Self-awareness; and
6. Intentionality.

These categories emerged from a day-long discussion by the research team of the interviews and textual sources. The team then reviewed statements under each category and selected the most appropriate statements for the study. A broad representation of statements was chosen, with four to six statements in each category. Some slight rewording of statements was necessary for clarity, and we generated several statements for the children's Q set to fill in categories using age-appropriate language. Thirty-two statements were selected for adults; 28 were selected for children. The statements appear in Tables 1 and 2. These tables also include results from our analysis, which discovered social perspectives on dolphin intelligence. The rank scores of statements on each perspective are explained in the Results section.

**Table 1. Adults' Q Statements Organized by Category with Rankings by Each Perspective**

| | | Perspective | | |
|---|---|---|---|---|
| No. | **Communication** | A | B | C |
| S1 | Although some interspecies communication does exist between dolphins and humans, it is more akin to what occurs between you and your dog than you and your friends. | 3 | 18 | 13 |
| S2 | Dolphin languages could help with the recognition of an extra-terrestrial language. | 25 | 25 | 20 |
| S12 | Dolphins communicate to each other and understand each other. | 1 | 1 | 1 |
| S23 | Dolphins have their own language. | 2 | 6 | 3 |
| S27 | Dolphins understand our language and are patiently waiting for us to learn theirs. | 30 | 23 | 24 |
| | | | | |
| | **Capacity for learning** | | | |
| S5 | Dolphins are inventive and creative. | 5 | 2 | 2 |
| S6 | Dolphins are more intelligent than humans. | 27 | 21 | 16 |
| S7 | Dolphins are not capable of higher forms of learning; they only learn through imitation and observation. | 10 | 26 | 28 |
| S9 | Dolphins are the humans of the sea—wise, shrewd, and super-intelligent. | 9 | 4 | 18 |

Table 1. (*cont.*)

| | | Perspective | | |
|---|---|---|---|---|
| No. | | A | B | C |
| S15 | Dolphins draw on their memory to interpret new situations. | 6 | 5 | 6 |
| S19 | Dolphins have a capacity to learn that's more like dogs than humans. | 4 | 29 | 19 |
| S24 | Dolphins only learn if there is a reward. | 17 | 27 | 22 |
| | **Self-awareness** | | | |
| S14 | Dolphins do not understand the consequences of their actions; they do not know they can be wrong. | 12 | 24 | 21 |
| S20 | Dolphins have a well-developed sense of humor. | 23 | 9 | 11 |
| S21 | Dolphins have an ability to think, reason, and plan their futures. | 24 | 28 | 8 |
| S25 | Dolphins possess self-awareness similar to humans and other primates. | 14 | 15 | 4 |
| S31 | There may be a common thread of consciousness between humans and dolphins. | 13 | 14 | 7 |
| | | | | |
| | **Capacity for emotion** | | | |
| S11 | Dolphins can recall happy or sad experiences. | 11 | 11 | 10 |
| S13 | Dolphins do not have emotions. | 20 | 30 | 30 |
| S16 | Dolphins experience emotions in the same way that humans do. They can feel a wide range of emotions, from exuberance to sadness. | 19 | 12 | 9 |
| S17 | Dolphins experience emotions like dogs and cats do. | 7 | 16 | 15 |
| S32 | We have killed off thousands of them, but dolphins still love us unconditionally. | 26 | 7 | 32 |
| | | | | |
| | **Intentionality** | | | |
| S8 | Dolphins are not purely instinctual; they make conscious choices and decisions like we do. | 16 | 20 | 5 |
| S18 | Dolphins harbor murderous urges unrelated to hunger. | 22 | 32 | 31 |

Table 1. (*cont.*)

| | | Perspective | | |
|---|---|---|---|---|
| No. | | A | B | C |
| S26 | Dolphins seek friendship for purely altruistic reasons, without any thought of personal gain. | 15 | 19 | 14 |
| S28 | Even when provoked, a dolphin will choose not to attack a human. | 18 | 3 | 26 |
| S29 | If dolphins see a person in danger in the ocean, they will come to the person's rescue. | 21 | 8 | 17 |
| | | | | |
| | **Spiritual /Mystical/Healing Abilities** | | | |
| S3 | Dolphins are here to connect human beings to a higher power. | 32 | 22 | 29 |
| S4 | Dolphins are here to teach us how to live peacefully. | 31 | 13 | 25 |
| S10 | Dolphins can heal humans, and scientists can explain how. | 28 | 10 | 23 |
| S22 | Dolphins have mystical healing powers. | 29 | 17 | 27 |
| S30 | There is nothing magical or mystical about dolphins; they are beasts just like us. | 8 | 31 | 12 |

**Table 2. Children's Q Statements Organized by Category with Rankings by Each Perspective**

| | | Perspective | | |
|---|---|---|---|---|
| No. | **Communication** | X | Y | Z |
| S4 | Dolphins are good at listening and are attentive and responsive to humans | 9 | 16 | 7 |
| S14 | Dolphins can talk to people | 20 | 2 | 25 |
| S19 | Dolphins have their own language | 10 | 12 | 2 |
| S22 | Dolphins know what we think | 27 | 26 | 26 |
| S25 | Dolphins make funny noises and chirps | 6 | 7 | 6 |
| S26 | Dolphins only share simple feelings with each other | 19 | 27 | 17 |
| | | | | |

Table 2. (*cont.*)

| | | Perspective | | |
|---|---|---|---|---|
| No. | | X | Y | Z |
| | **Capacity for Learning** | | | |
| S3 | Dolphins are born knowing how to swim | 12 | 9 | 10 |
| S6 | Dolphins are more intelligent than humans | 24 | 25 | 4 |
| S7 | Dolphins are smart like dogs | 2 | 21 | 12 |
| S15 | Dolphins do amazing stunts. | 1 | 1 | 1 |
| S23 | Dolphins learn by watching other dolphins | 15 | 15 | 14 |
| | | | | |
| | **Self-Awareness** | | | |
| S2 | Dolphins are aware of themselves | 7 | 5 | 9 |
| S13 | Dolphins can pretend | 18 | 23 | 18 |
| S18 | Dolphins get bored | 17 | 24 | 11 |
| S20 | Dolphins in the wild have names for each other | 25 | 10 | 19 |
| S21 | Dolphins know that people think about different things than they do. | 22 | 3 | 13 |
| | | | | |
| | **Capacity for Emotion** | | | |
| S10 | Dolphins can feel sad | 4 | 11 | 8 |
| S11 | Dolphins can get angry | 11 | 18 | 3 |
| S16 | Dolphins enjoy being with people | 3 | 6 | 20 |
| S17 | Dolphins feel human emotion | 14 | 22 | 21 |
| | | | | |
| | **Intentionality** | | | |
| S1 | Dolphins always act instinctively | 16 | 8 | 23 |
| S9 | Dolphins can do things to make themselves happier | 13 | 20 | 15 |
| S24 | Dolphins make choices (decisions) | 8 | 13 | 5 |
| S27 | Dolphins sometimes choose to help people in trouble | 5 | 14 | 16 |
| | | | | |

Table 2. (*cont.*)

| | | Perspective | | |
|---|---|---|---|---|
| No. | | X | Y | Z |
| | **Spiritual Nature/Mystical/Healing** | | | |
| S5 | Dolphins are magical creatures | 21 | 28 | 28 |
| S8 | Dolphins bring sailors good luck | 23 | 4 | 24 |
| S12 | Dolphins can heal sick people | 26 | 17 | 27 |
| S28 | Dolphins were put on earth to teach people | 28 | 19 | 22 |

*Selecting Participants for the Q Sort Exercise*

Since Q method is intended to reveal social perspectives, we strategically sought out individuals with clear and distinct points of view and a wide range of experience with dolphins and aquariums. Among the adults surveyed there was a marine mammal trainer, a poet who wrote about dolphins, and people who have had significant life experiences with dolphins. To ensure we did not miss any important perspective, we also selected at random (over a two day period) adults who visited the New York Aquarium. In addition, we approached several different social groups, such as running clubs, health care groups, and professional organizations to reach members with diverse opinions about dolphins. In total, 39 adults completed the Q sort.

For children, we interviewed 24 students, ages 8 to 12, from a variety of neighborhoods in the New York metropolitan area. In addition, we interviewed three children from western Massachusetts. These students had a wide diversity of knowledge, attitudes, and experiences with dolphins. The beauty of Q method is that, if chosen carefully, only a small number of participants are needed. This is because participants do not represent a population; instead, they are the means by which we "measure" the value of the variables.[6]

*Conducting the Q Sort*

We approached the selected individuals, introduced them to the project, and told them about the Q sort exercise. Adults were approached one-on-one by one of three different researchers. Children completed the Q sort in the classroom under the supervision of one researcher.

To conduct the Q sort exercise, we handed the participant a set of small 4" x 6" cards, each with one Q statement printed on it. We asked each participant to sort the cards in accordance with a "condition of instruction." This specified the context under which the participant should interpret and react to the Q statements. Our condition of instruction was

> We are interested in how you think about dolphins. We have a number of statements on these cards of things people may believe about dolphins. Please sort the statements according to what you most believe (indicated to the participant's right) and least believe (indicated to the participant's left).

The researcher directed the participant to sort the statements (32 for adults and 28 for children) into 7 categories in a forced-normal data distribution. These 7 categories were unlabeled during the data collection but were assigned an agreement score from –3 to +3 for the analysis.

*Q Method Data Analysis*

For data analysis, we used a freeware program, MQMethod,[7] which performs a factor analysis upon a correlation matrix.[8] A factor analysis is a way of identifying a handful of underlying variables that account for changes among a larger group of variables. In this instance, the Q sorts were the variables, and the factor analysis reduced them to three factors, or social perspectives. Each factor is a unique Q sort; hence, it represents a social perspective. The tricky part of factor analysis is determining exactly what each factor means. For each factor,[9] MQMethod produces a Q sort and more detailed statistical data about how the Q statements in each sort relate to each other. We interpreted each of these sorts and composed a written narrative that described that particular point of view. The software also correlates each person's Q sort to each social perspective. These are commonly called "factor loading scores" (Table 3).

**Table 3. Re-ordered Adult Factor Loading Matrix. Boldface Entries Indicate Statistical Significance at alpha = 0.05 level, critical value = 0.47, two-tailed.**

| Person | Perspective A | Perspective B | Perspective C |
|---|---|---|---|
| Perspective A | | | |
| A16 | **0.86** | 0.08 | 0.02 |
| A21 | **0.80** | 0.29 | 0.11 |
| A34 | **0.80** | –0.02 | 0.23 |
| A03 | **0.77** | –0.01 | 0.20 |
| A39 | **0.74** | 0.15 | 0.28 |
| A13 | **0.73** | 0.18 | 0.06 |
| A06 | **0.70** | 0.21 | 0.42 |
| A24 | **0.66** | 0.05 | 0.35 |
| A35* | **0.65** | –0.15 | **0.54** |
| A30 | **0.64** | 0.05 | 0.46 |
| A04 | **0.63** | –0.22 | 0.28 |
| A18 | **0.63** | 0.34 | 0.09 |
| A23 | **0.60** | 0.17 | 0.12 |
| A08* | **0.51** | **0.49** | 0.36 |
| Perspective B | | | |
| A17 | 0.03 | **0.81** | 0.21 |
| A10 | 0.00 | **0.74** | –0.12 |
| A11 | 0.09 | **0.70** | 0.05 |
| A01* | **0.55** | **0.61** | 0.24 |
| A09* | –0.19 | **0.55** | **0.49** |
| A12 | 0.38 | **0.53** | 0.23 |
| Perspective C | | | |
| A36 | 0.22 | 0.26 | **0.84** |
| A15 | 0.17 | 0.23 | **0.77** |
| A05 | 0.29 | –0.06 | **0.75** |
| A29* | **0.50** | 0.24 | **0.75** |
| A31 | 0.42 | –0.03 | **0.74** |
| A14 | 0.39 | 0.24 | **0.73** |
| A07* | **0.53** | –0.16 | **0.71** |
| A33 | 0.31 | 0.16 | **0.69** |
| A37* | 0.25 | **0.55** | **0.69** |
| A27* | **0.56** | 0.21 | **0.67** |
| A32* | –0.19 | **0.51** | **0.66** |
| A19* | 0.34 | **0.50** | **0.65** |
| A22* | **0.58** | 0.18 | **0.65** |
| A28* | **0.54** | –0.11 | **0.65** |
| A38 | 0.42 | 0.37 | **0.64** |

Table 3. (*cont.*)

| Person | Perspective A | Perspective B | Perspective C |
|---|---|---|---|
| A26 | 0.07 | 0.36 | **0.62** |
| A20* | 0.33 | **0.53** | **0.57** |
| A25 | –0.03 | 0.04 | **0.51** |
| Non-Loaders | | | |
| A02 | 0.43 | –0.05 | 0.45 |

* Indicates the person loaded significantly on more than one factor.

## Results

*Adults*

For the adults in our study, we discovered three social perspectives about the intelligence of dolphins. Table 3 shows how similar each respondent's Q sort was to the three perspectives. Loading scores above 0.47 are statistically significant at the alpha < 0.05 level. The table shows that some people's sorts (person A16) matched one perspective quite closely (although not identically) while one person's sort (person A02) did not match any of the perspectives. Others loaded on multiple perspectives, meaning they believe aspects of two perspectives (person A07). Thirteen people loaded significantly on more than one perspective, and only one person did not load significantly on any factor. This is a reasonably acceptable solution.

*Commonalities*

Although the three perspectives are distinctly different from each other, they are built on a base of shared fundamental beliefs. We cannot fully depict this core belief here because we intentionally excluded from our study statements with which we anticipated everyone would agree ("dolphins are smart"). Still, among the statements included, we found points of agreement across all three perspectives. We defined these as consensus statements.[10] Table 4 shows the seven consensus statements and their rankings for each perspective. A rank of 1 refers to the statement with which the participant most agrees.

**Table 4. Consensus Statements for the Adult Perspectives and Their Rankings by Each of the Three Perspectives**

| Nr. | Statement | A | B | C |
|---|---|---|---|---|
| S12 | Dolphins communicate to each other and understand each other. | 1 | 1 | 1 |
| S5 | Dolphins are inventive and creative. | 5 | 2 | 2 |
| S23 | Dolphins have their own language. | 2 | 6 | 3 |
| S15 | Dolphins draw on their memory to interpret new situations. | 6 | 5 | 6 |
| S11 | Dolphins can recall happy or sad experiences. | 11 | 11 | 10 |
| S26 | Dolphins seek friendship for altruistic reasons, without thought for personal gain. | 15 | 19 | 14 |
| S2 | Dolphin languages could help with the recognition of an extra-terrestrial language. | 25 | 25 | 20 |

The first five statements are strongly to moderately supported by all three perspectives. They speak to the underlying social consensus that dolphins are extremely intelligent animals with substantial cognitive abilities in the areas of language, creativity, memory, and—to a lesser extent—emotion. Statement 26 is ranked near the middle of the distribution for all perspectives, suggesting that it does not elicit a strongly negative or positive reaction. Statement 2, however, falls into the "less like how I think" area of the distribution for all three perspectives. People reacted negatively to this statement for many reasons, including the sentiment that there are no extra-terrestrial languages, making the statement irrelevant. Looking back, this was probably not a valuable statement to include.

*Perspective A*

Across all perspectives, there was scant support for conceiving dolphins as spiritual or mystical, but support was least in this perspective. All statements associated with dolphins being mystical or super-human were ranked lower in this perspective than any other perspective (S3, S4, S10, S22). Instead, Perspective A highlights dolphins' capacities for learning and communication at the same time that it views dolphins as animals no different from other beasts, including humans (S30).

In terms of communication, Perspective A's view is moderate. On one hand, it holds that dolphins do have their own language (S23); on the other, it emphasizes that communication between humans and dolphins is more like speaking to a dog than to a friend (S1).

With regard to learning and intelligence, this perspective tends to believe strongly that dolphins have a keen intelligence (S5, S9), but that it is certainly not superior to that of humans (S6). Instead, dolphins are seen as having a capacity to learn that is more similar to dogs (S19), and as being generally incapable of higher learning (S7).

In sum, this perspective seems based on an adherence to known evidence of dolphins' capabilities. In the absence of such evidence, this perspective seems to err on the side of attributing less intelligence to a dolphin and is certainly suspect of statements that imply dolphins have qualities of intelligence or behavior beyond those of humans.

*Perspective B*

This perspective focuses most of its attention on the learning capacities of dolphins. It is willing to grant dolphins abilities that Perspective A is not. For instance, Perspective B contends the claims held by Perspective A that dolphins are not capable of higher learning (S7), or that they only learn if rewarded (S24). It strongly resists comparisons to dogs (S19), suggesting instead that dolphins are super-intelligent (S9), although it is not willing to go so far as to claim they are more intelligent than humans (S6).

This perspective also highlights intentionality more than the other perspectives do, expressing the view that dolphins might be perceived as having altruistic tendencies; for example, they are seen as unwilling to hurt humans under any conditions (S28), but eager to help humans in need (S29). However, the idea that they could harbor murderous urges was strongly rejected (S18). In terms of emotional capacity, this perspective stands out for its belief that dolphins love humans unconditionally (S32).

Statements regarding the spiritual and mystical qualities of dolphins are weakly emphasized in this perspective, but many of these statements are ranked higher in this perspective than in any other. For instance, the statement about dolphins having no mystical qualities, being beasts just like us

(S30), was ranked second to last. This stands in stark contrast to the support given to that statement by Perspectives A and C. Likewise, the mid-distribution rankings of statements asserting that dolphins have magical or science-based healing powers (S22, S10) is significant in that these ideas are not more strongly rejected, as they are in the other perspectives. We conclude that this perspective, while it emphasizes learning and intelligence much more than magic, is willing to entertain the possibility that dolphins are spiritually or mystically special.

*Perspective C*

The hallmark of this perspective is the emphasis on qualities of self-awareness. Dolphins are seen as having a self-awareness similar to that of humans (S25); making conscious decisions (S8), reasoning and planning their futures (S21); and having a sense of humor (S20). Other beliefs in this perspective are evenly shared across all the categories, but a little more attention is given to emotional qualities. Specifically, moderate support is given to the idea that dolphins and humans experience emotions in the same way (S16).

Along with Perspective B, this perspective shares a resistance to statements that dolphins are not capable of higher order learning (S7) or that they only learn for reward (S24). However, unlike Perspective B, it does not entertain any notion of dolphins being spiritual or mystical/magical (S30). The essential notion in Perspective C is that dolphins are complex creatures, more advanced than dogs, with many human-like mental capacities that possibly equal or surpass those of humans.

*Children*

For the children, three social narratives emerged to explain the cognitive abilities and intelligence of dolphins. Table 5 reveals a very "clean" factor matrix, meaning there are few (only three) children who loaded significantly on more than one factor. Furthermore, only two children did not load significantly on any factors.

**Table 5. Re-ordered Children's Factor Loading Matrix. Boldfaced Entries Indicate Statistical Significance at alpha = 0.05 level, critical value = 0.49, two-tailed.**

| Person | Perspective X | Perspective Y | Perspective Z |
|---|---|---|---|
| Perspective X | | | |
| C01 | **0.81** | 0.10 | 0.12 |
| C07 | **0.79** | 0.02 | 0.02 |
| C03 | **0.77** | 0.12 | 0.22 |
| C05 | **0.77** | 0.21 | 0.15 |
| C06 | **0.77** | 0.18 | 0.26 |
| C26 | **0.70** | –0.14 | 0.34 |
| C24 | **0.68** | –0.10 | 0.35 |
| C02* | **0.64** | 0.21 | **0.52** |
| C21 | **0.63** | 0.24 | 0.23 |
| C09 | **0.61** | 0.25 | 0.37 |
| C20 | **0.60** | 0.22 | 0.25 |
| C25 | **0.60** | 0.27 | 0.23 |
| C16 | **0.50** | 0.17 | 0.48 |
| Perspective Y | | | |
| C08 | 0.30 | **0.78** | 0.03 |
| C12 | 0.13 | **0.69** | 0.09 |
| C13 | –0.33 | **0.69** | 0.11 |
| C14 | 0.30 | **0.64** | –0.10 |
| Perspective Z | | | |
| C23 | 0.40 | –0.13 | **0.70** |
| C22 | 0.36 | 0.02 | **0.69** |
| C04 | 0.08 | –0.07 | **0.64** |
| C18 | 0.18 | 0.30 | **0.63** |
| C11 | 0.06 | 0.38 | **0.58** |
| C15* | **0.50** | 0.13 | **0.58** |
| C10 | 0.40 | 0.13 | **0.55** |
| C27* | **0.49** | –0.15 | **0.54** |
| Non-loaders | | | |
| C17 | 0.37 | –0.19 | 0.43 |
| C19 | 0.48 | 0.47 | 0.34 |

* Indicates the person loaded significantly on more than one factor.

Commonalities among perspectives

Although the three perspectives are distinctly different from each other, as with the adults, they are built on a common base of more fundamental beliefs.

These are points of agreement across all three perspectives, which are defined as consensus statements. Table 6 shows the six consensus statements and their rankings for each perspective.

**Table 6. Consensus Statements Among Children's Perspectives and Their Rank Order in Each of the Perspectives: X, Y, and Z**

| No. | Statement | X | Y | Z |
|---|---|---|---|---|
| 15 | Dolphins do amazing stunts. | 1 | 1 | 1 |
| 25 | Dolphins make funny noises and chirps. | 6 | 7 | 6 |
| 2 | Dolphins are aware of themselves. | 7 | 5 | 9 |
| 3 | Dolphins are born knowing how to swim. | 12 | 9 | 10 |
| 23 | Dolphins learn by watching other dolphins. | 15 | 15 | 14 |
| 22 | Dolphins know what we think. | 27 | 26 | 26 |

The first three statements in Table 6 are ranked high, signifying acceptance. Statement 15 leads all three perspectives, suggesting that impressive physical ability is a widely held belief and a primary association that children have with dolphins. We note that not all the children who did the Q sort reported that they had been to dolphin shows at aquariums, so this belief has permeated our culture quite deeply. More interesting is the belief about dolphins being aware of themselves (S2), which is widely accepted by children. Statements 3 and 23 occur near the middle of the ranking for all three factors, which suggests children reacted very differently to these statements. Indeed, an analysis of the raw data from the Q sorts reveals that children ranked these statements inconsistently. Statement 22, which claims dolphins know what we think, was soundly rejected across all three perspectives. In fact, only one child ranked this statement as high as "0" and all the others ranked it –1, –2, or –3.

*Perspective X*

Perspective X expended most of its emphasis reacting against statements about the spiritual/mystical dimensions of dolphins. Similar to adult Perspectives A and C, there was a strong opposition to ideas of dolphins as spiritual or mystical beings. All four statements about mystical qualities (S5, S8, S12, S28) were ranked negatively. Conversations with several of the chil-

dren during the sorts, however, revealed an interpretation of the word "magical" (in statement 5) as meaning "beautiful" or "special," which may explain why statement 5 received less of a negative reaction by this perspective than did the other spiritual/mystical statements. It also raises the possibility that it is not a simple matter to draw comparisons between the adults' perspectives and the children's.

Perspective X credited dolphins with a higher emotional capacity than did the other perspectives. There was weak support, but much more in this perspective than in any of the others, for dolphins feeling human emotions (S17). Particularly highly ranked were statements about dolphins liking to be with people (S16) and dolphins feeling sad (S10).

Intentionality is another category where this perspective contributed relatively strongly. The driving statement here was that dolphins sometimes choose to help people (S27). But other statements about dolphins making choices (S24) and doing things to make themselves happier (S9) were also ranked high in this perspective. However, this perspective resisted attributing to dolphins certain human-like capacities, such as having names (S20), the ability to pretend (S13), or the ability to talk to people (S14).

Taken together, these results suggest a perspective that is focused on the relationship and interactions between dolphins and humans, a relationship that is seen as positive. Children with this perspective think dolphins sometimes choose to help people (S27) and that they enjoy being with people (S16). Dolphins are seen as having emotional and intellectual capacities that are strong, but not equivalent to, or in excess of, those of humans. Dolphins can feel sad (S10) and get angry (S11), with weaker support for the claim that dolphins feel human emotions (S17). Children who take this perspective believe dolphins are self-aware (S2) and make choices (S24); on the whole, however, they associate these abilities as being more similar to those of dogs (S7) than of humans, disagreeing strongly with claims that dolphins are more intelligent than humans (S6), that dolphins know what people think (S22), or that they can talk to humans (S14).

Most of these children also indicated that their prior experience with dolphins had come through visits to aquariums or dolphin shows. This was not found to be true of children in the other two perspectives.

*Perspective Y*

Where this perspective most stands out is in its characterization of dolphin self-awareness and its limited views of intentionality. All perspectives agreed that dolphins are aware of themselves (S2), but this perspective went further to strongly assert that dolphins know that people think about different things than they do (S21). This presumes a complex sense of self. In addition, this perspective gave more credibility than the other perspectives did to the statement about dolphins having names for each other (S20). In contrast, two other statements that we felt made comments about self-awareness were ranked lowest in this perspective: dolphins can get bored (S18), and dolphins can pretend (S13).

This perspective had the lowest rankings for statements that were generous about assuming dolphin intentionality, including that dolphins can make themselves happier (S9), they sometimes choose to help people (S27), and they can make choices (S24). None of these statements were ranked so low as to allow us to conclude that they were rejected; however, together they signify this perspective presumes a lower sense of intentionality than do the other two perspectives. Further support for this conclusion comes from noticing that the statement about limited intentionality—dolphins always act instinctively (S1)—was ranked highest in this perspective.

Also significant, relating to communication, is the strong ranking by this perspective of the statement asserting that dolphins can talk to people (S14). Indeed, it was the second, most agreed-with statement in this perspective. This perspective did not take a stand on whether there is a dolphin language (S19) but strongly rejected the notion that dolphins only share simple feelings with each other (S26), revealing a sentiment that suggests competent communication.

Finally, this perspective stands out for showing greater acceptance of mystical and spiritual dimensions. Three of the four statements in this category received higher ranks in this perspective than in any other perspective. The most significant of these, by far, was the strongly supported claim that dolphins bring sailors good luck (S8). Compared to Perspectives X and Z, Perspective Y showed greater support for the spiritual/mystical category. However, on the whole, statements with a spiritual/mystical dimension were still less emphasized than those about communication and self-awareness.

In total, this perspective depicts dolphins as having a highly complex sense of self (S2), including dolphins' awareness that they and humans think different things (S21). This perspective clearly asserts that dolphins can talk with people (S14). Yet this perspective does not give dolphins high marks when it comes to emotional capacity (S10, S11, S17), learning capacity (S23, S6), or intentionality (S1). They are not smarter than people (S6) or able to know what we think (S22). Instead, they are seen as primarily instinctual beings (S1), not even smart like dogs (S7).

The four children whose sorts defined this perspective are all residents of suburban or rural areas outside New York City. In addition, none of them reported having seen dolphins in captivity or in shows.

*Perspective Z*

By far, the most remarkable assertion of this perspective is that dolphins are more intelligent than humans (S6). This statement was ranked fourth highest in this perspective, whereas it was 24th and 25th in the other ones. A second strong feature is the depiction of their emotional capacity. Dolphins can feel angry (S11) and sad (S10), but this is seen as very different from how people experience emotions (S17).

This perspective, like adult Perspectives A and C, consistently discredits the spiritual/mystical claims about dolphins. Dolphins are not magical (S5). They cannot heal sick people (S12). They weren't put here to teach people (S28), nor do they bring good luck (S8).

Unlike Perspective Y, this perspective believes that dolphins do have their own language (S19), but cannot talk with people (S14). Dolphins are, however, granted the skill of good listening (S4). This perspective also stands out for adopting a strong belief in dolphin intentionality. Dolphins are seen as making choices (S24) and are not seen as having always to act instinctually (S1).

In sum, this perspective sees dolphins as incredibly smart, self-aware creatures with highly developed capacities for learning, communication, and emotion. These abilities are used to make intentional choices for their own benefit. At the same time, dolphins are qualitatively different from people. They have different emotions, and they are not able to communicate with, or achieve deep understanding with, humans.

## Discussion

*Adult Perspectives*

This study has demonstrated that social beliefs surrounding dolphins' cognitive abilities are not consistent across our society. In uncovering for both children and adults three distinct perspectives surrounding dolphin cognition, this study has demonstrated that members of the aquarium-going public may approach the subject of animal minds differently. This variation needs to be considered when presenting information about scientific research.

We found that the adults in our study generally believe that dolphins are highly intelligent (consistent with the research by Herzog & Galvin, 1997; Driscoll, 1995; and Barney et al., 2005). A striking point of consensus between all three perspectives was the agreement that dolphins have an advanced system of communication that participants believe constitutes "language." Although animal psychologists have not developed evaluative tools for uncovering whether dolphin communication can be syntactically characterized as language, our findings suggest that exhibit visitors are comfortable considering it as such; that marine mammal researchers studying dolphins are working within the context of decoding language. These adult perspectives consistently support the concept that dolphin learning, cognition, and especially communication are appropriate subjects for exhibit presentation.

The popular literature that we reviewed to develop the Q statements suggested that a distinct population may consider dolphins to be more intelligent than humans and potentially to have spiritual, mystical, or healing capacities or powers. Among the social perspectives uncovered in this study, it is clear that concepts of dolphins as mystical and spiritual beings are generally unsupported or less supported among the public than other concepts of intelligence. Although limitations of the methodology prevent us from being sure that such a social perspective does not exist, it does not appear to be one of influence to our potential audience. For the perspectives found here, we presume that the mystical and spiritual stories of dolphins are acceptable as a literary device but do not dominate actual social narratives. We further believe that, when confronted with either live animals or realistic exhibits about dolphins, our adult audience will not be influenced by the idea that dolphins are spiritually superior to humans.

Two of the three perspectives reveal a willingness to believe that dolphins might demonstrate human-like abilities regarding learning capacity, planning, self-direction, and emotional intelligence. Our data do not enable us to comment on the distribution of these perspectives among a larger population, but scientists wishing to present research on the emotional or learning capabilities of dolphins may count on adult individuals whose beliefs tend toward Perspectives B or C being open to these notions. These results challenge prior research that suggests most adults believe that non-human animals do not have the capacity for complex thinking (Rasmussen, Rajecki, & Craft, 1993). In addition, while research may demonstrate that dolphins have some cognitive abilities and learning skills that are similar to humans, these data suggest that many visitors who hold Perspective A may find some of these topics difficult to accept or not credible without evidence.

Another trend that emerges from this study is the prevalence of analogies to dogs, the primary animal comparison that emerged when selecting Q statements. Our results suggest that analogies to dogs and dog-like capacities marked a reference point that was significant in distinguishing between different perspectives of dolphin intelligence. Perspective A agreed with all three of our Q statements that drew comparisons with dogs (S1, S17, S19), while Perspectives B and C rejected or ignored these statements. The potential impact of trying to debunk such analogies within an exhibit context to show dolphins' advanced capacities is unclear. First, we do not have data that comment on the robustness of these perspectives to know if such contradictions would be controversial or accepted by those in Perspective A. Second, we do not know how visitors actually conceptualize dog intelligence, as research has shown that the public, in fact, ranks dogs' intelligence very highly, near that of humans and other large-brained mammals (Driscoll, 1995; Herzog & Galvin, 1997; Phillips & McCulloch, 2005). Because of these uncertainties and potential conflict in opinions, the use of canine intelligence seems to be a less universally accessible point of comparison for presenting a portrait of dolphin cognition.

One unique attribute of Perspective B appears to be an idealized belief about dolphins as altruistic animals, attributing to their intelligence and behavior a variety of positive characteristics. Perspective B suggests a strong belief in dolphins as both uniquely capable and unwaveringly good creatures. It reacts very negatively to unfavorable portrayals of dolphins, their capabilities, or

their behavior, even when those attributes would demonstrate high levels of intentional thinking. In order to best communicate about dolphins' abilities with individuals in this perspective, the nature of this response should be considered. These individuals will likely respond best to examples of intelligence that show dolphins in a positive light, rather than those, such as situations of aggression, that may appear more negative to the viewer.

A dimension present only in Perspective C offers exhibit developers and animal cognitive psychologists a unique entry into public discourse on these topics of dolphin intelligence. The willingness of this perspective to consider animals having a sense of humor and self-awareness similar to humans suggests an opportunity for the communication of recent findings about mirror self-recognition (Reiss & Marino, 2001) that will be easily accepted by at least one segment of the public. This could allow this research to become part of public discourse on these topics, even if other segments of the public (such as those in Perspectives A and B) are less open to this information.

*Children's Perspectives*

Children's conceptions of dolphin intelligence appear to be more varied, though these beliefs may be influenced by the individual child's cognitive development and social experience. It is even possible that the differences seen between children and adult perspectives are complicated by a cohort effect. Children demonstrated a consistent openness to ideas of dolphins' ability to learn through observation, interspecies communication, and dolphin self-awareness. This widespread receptivity contrasts with the more fixed adult perspectives on these topics. We believe this difference between children and adults represents a promising area for future research.

Among the three children's perspectives, each held some unique traits that inform us about the perspective. Perspective X, for instance, confers human-like emotional abilities and intentionality on dolphins. This perspective also focused attention on elements of dolphin cognition that indicate a friendly and helpful relationship with humans (S27, S16), suggesting a more anthropocentric quality in this perspective. It is also interesting to note that most of the children who comprised Perspective X indicated experience with seeing dolphins in captivity, shows, and swim-with programs, which was not

the case for the children in either Perspectives Y or Z. It is conceivable that the children's experience seeing dolphins interacting with humans has influenced their anthropocentric perspective, although further research would be required to test this theory.

Children's Perspective Y shows a strong belief in dolphins' self-awareness, which suggests they will be receptive to the presentation of research findings in this area. This perspective also shows some receptivity to dolphins as a mythical construct, similar to their depiction in some media. While popular children's literature supports the mythologizing of dolphins consistent with this perspective, we do not assume that these beliefs will persist into adulthood. In particular, spiritual and magical elements are not as significant in any of the adult perspectives. Further research could explore whether experience with scientific information regarding animal cognitive abilities might help shape a more science-based perspective and loss of mystical beliefs.

In addition to not rejecting the mystical, the children in Perspective Y see dolphins as primarily instinctive and lacking the emotional attributes associated with humans. As learners, these children may prove resistant to reconstructing their understanding of dolphin cognition, particularly when it relies on evidence of intentionality. However, because this perspective appears open to dolphin communication as being complex, discussion of dolphin communication may provide an entry for these children to consider other areas of dolphin cognitive research.

Children's Perspective Z demonstrates a more complete comprehension of animal lives as distinct from human life. It appears to support characteristics of the Myers, Saunders, and Garrett (2003) concept of a psycho-social way of thinking, in which animals are understood to have distinct needs not necessarily mirroring those of humans. In our study, Perspective Z focused on statements that indicated the animals' distinct cognitive abilities, rather than their ability to demonstrate human-like ways of thinking or feeling. For instance, this perspective feels dolphins have their own language but discounts the more human-centric idea of interspecies communication. Generally, it seems these children will accept findings about dolphins' advanced cognitive abilities at face value and potentially ascribe even greater attributes than have been demonstrated in the research.

## Conclusion

Our research has demonstrated that there are various social perspectives regarding the nature of dolphins' cognitive abilities. None of these perspectives are completely resistant to attributing high levels of cognitive skill to dolphins; in fact, it appears that the public is generally receptive to notions of dolphin intelligence. Whether these will rival other evident notions of human exceptionalism remains to be seen and begs further study. We believe that the variation in social narratives surrounding dolphin cognition offers exhibit developers a unique opportunity to present challenging research to the public in ways that will engage their prior understanding. The variability within the adult and child narratives could support engaged discussion in a public forum and the opportunity for an exhibit to challenge visitors' preconceived notions about animal intelligence.

Specifically, the research supports several recommendations. Communication may provide the most useful entry-point for visitors into considering cognitive research about dolphins. A notable similarity between all three of the adult perspectives was the strong belief in dolphins' advanced system of communication. The commonality and strength of this belief could make discussion of communication a way into the subject matter that fits within the belief systems of nearly all visitors. This allows it to act as a familiar way for the visitor to encounter other aspects of cognitive research that may be more challenging to their beliefs.

The finding that dogs are often used as a reference point within public discussion of dolphin intelligence, proved to be unique but not clearly a useful schema for an exhibit context. From the results of this research, we do not know whether it has greater potential to hinder or facilitate understanding of dolphins, particularly because the different adult perspectives reacted in very conflicting ways to this topic. Further research into the nature and complexity of this comparison and its impact on visitors' understanding of dolphin mental capacities would be valuable for considering visitor interaction with this content.

In terms of the exhibit visit, we recognize the likelihood that groups will include visitors with different perspectives or belief systems about animal intelligence. The interaction among these individuals, including intergenerational interactions, is another potential area for research into how social

groups navigate such challenging concepts. In addition, we feel that these findings open a research opportunity to study how individuals' incoming social perspectives may influence how they interact with and make meaning from exhibit content on this topic in an Aquarium environment. Study in each of these areas could provide valuable information for exhibit developers to understand how social groups construct meaning about complex topics and for marine mammal researchers to understand how the public may come to accept new findings from animal cognitive research.

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### Notes

[1] Correspondence should be sent to John Fraser, Wildlife Conservation Society, 2300 Southern Boulevard, Bronx, NY 10460. E-mail: jfraser@wcs.org

[2] Live dolphins were on exhibit at the New York Aquarium until 2002, so there were no live dolphins at the Aquarium at the time of this study.

[3] To read a study of perspectives on democracy in America, see: John Dryzek. 1996 *Democracy in capitalist times*. New York: Oxford University Press. That study used Q methodology to identify four perspectives on American democracy.

[4] Key resources on Q methodology include Brown 1980, 1993, 1996; McKeown and Thomas 1988; Stephenson 1952. Excellent resources that document the application of the method include: Kalof 1998, 2000; Pelletier, et al. 1999; Woolley and McGinnis 2000. Interested readers will also find the following website valuable: http://www.qmethod.org.

[5] Statements about dolphin biology or ecology were filtered out of our collection, as we were interested mainly in how people though about dolphin intelligence.

[6] It is important to note that in a Q study the sample is *not* the people who sort the statements; rather, the sample in a Q study is the set of Q statements, the population is the "concourse" of utterances that have been made on the topic, and the sorts completed by people are the variables.

[7] Available through http://www.qmethod.org. A version for the PC computer is also available.

[8] MQMethod computes a correlation matrix among the Q sorts and performs a factor analysis on the correlation matrix. Any statistical factor analysis requires a certain amount of judgment in determining the factors. We started every analysis using Principle Components Analysis followed by the varimax solution. Theoretically this solution accounts for the most variance in the data.

[9] We determined that three was the best number of factors to extract based on the substantive importance of the factors (Brown 1980: 42).

[10] We operationalized "consensus statements" as those with five or fewer units of rank difference among the three perspectives.

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