



*What factors are associated with public perception of enclosure size and quality
for pinnipeds, and how does this compare to legal requirements?*

Presented by

Zoe Hollick

as a Project

in part fulfilment of the requirements for the Bachelor's Degree in

BSc (Hons) Applied Animal Behaviour and Welfare Top-up

at Plumpton College

2020.

Abstract

Providing a good standard enclosure is important for pinniped welfare to ensure psychological and physiological needs are met, otherwise issues such as stereotypic behaviours may develop. Understanding public perception on enclosure and welfare standards is vital for promoting awareness and changes in attitudes towards welfare (Fuente et al, 2017). Despite common use of pinnipeds in captivity, research into this field is relatively new and modern scientific research regarding marine mammals has increased in the last 30 years (Würsig, Perrin and Thewissen, 2018). Numerous studies have been conducted regarding enclosure design and the benefits of naturalistic enclosures for both visitors and the animals, although not specifically regarding pinnipeds. Therefore, an experimental-design questionnaire was conducted to ascertain public perception and knowledge of pinniped enclosure requirements, which was then compared to existing UK legal requirements. Influence from the presentation of information was also explored; it was found that presenting a naturalistic pinniped enclosure versus a barren enclosure significantly affected public perception of enclosure standards; with a high association between the naturalistic enclosure being perceived as a good standard, versus the barren enclosure being deemed a poor standard. As expected, public knowledge on the Animal Welfare Act (2006) five animal welfare needs and enclosure legal requirements was poor and participants had high expectations for requirements, which UK legislation does not meet. Zoo-based educational initiatives could be beneficial in increasing public knowledge on pinniped needs and legislation, although effectiveness of these methods is difficult to measure. Future research into perception of pinniped enclosures would be valuable to substantiate this study's findings and further explore public perception of pinniped enclosures.

Table of Contents

Abstract	2
1. Introduction	5
1.2. Use of Pinnipeds in Captivity	8
1.3. Pinniped Enclosure Design.....	8
1.4. United Kingdom Legal Requirements for Captive Pinnipeds.....	10
1.4.1. Zoo Licensing Act 1981 and Council Directive 1999/22/EC	10
1.4.2. Secretary of State's Modern Standards of Zoo Practice.....	11
1.4.3. Animal Welfare Act 2006	12
1.4.4. Voluntary Accreditations	14
1.5. Public Perception of Captive Animal Enclosures.....	18
1.6. Influences of Presentation of Information.....	19
1.7. Study Aims and Hypotheses.....	21
2. Materials and Methods	22
2.1. Ethics Statement:.....	22
2.2. Questionnaire Design.....	22
2.3. Data Collection.....	25
2.4. Data Analysis	25
3. Results	27
3.1. Demographic Data	27
3.2. Participant Knowledge of UK Legal Requirements for Pinniped Enclosures	34
3.3. Association between Perception of Pinniped Enclosure Standard and Questionnaire Condition Shown	35
3.4. Correlation between Participant Knowledge of the Five Animal Welfare Needs and Knowledge of UK Legal requirements for Pinniped Enclosures	37

3.5. Effect of Questionnaire Condition on Participant Perceptions of UK Legal Requirements for Pinniped Enclosures	38
3.6. Effect of Condition Shown, Number of Zoo Visits and Participant Perception of Pinniped Enclosure Standards	40
.....	40
3.7. Animal Attitude Scale Score	42
4. Discussion	42
4.1. Perception of Naturalistic and Barren Enclosures	42
4.2. Perception of Enclosure Quality	43
4.2.1 Colchester Zoo	44
4.2.2. Enclosure Enrichment	45
4.3. Perception of Pinnipeds in Captivity	47
4.4. Perception of Animal Welfare and UK Legal Requirements for Pinniped Enclosures	48
4.4.1. Zoo-based Education	49
4.5 Study Limitations	50
5. Conclusion	51
Acknowledgements	52
References	52
Appendices	74
Appendix 1: Questionnaire Design	74
Condition 1	74
Condition 2	81
Appendix 2: Annotated GenStat Analysis Output	89
Chi-square Goodness of Fit Test	89
Chi-square Test of Association	91
Non-parametric Spearman's Rank Correlation	93
Independent T-test	95
Two-way Analysis of Variance (ANOVA)	106

Appendix 3: Result Data from Qualtrics.....	109
Appendix 4: Converting Qualitative Data into Keywords.....	119

1. Introduction

The meaning of pinniped is flipper-footed, referring to several families of carnivorous marine mammals with front and rear flippers (Berta, 2018); the order



(Pinnipedia) comprises of seals (Phocidae), sea lion and furred seals (Otariidae) and the walrus (Odobenidae) (Würsig, Perrin and Thewissen, 2018), see figures 1, 2 and 3 for pinniped species examples.

<u>Grey Seal</u>	<u>California Sea Lion</u>	<u>Walrus</u>
		
Figure 1: Grey Seal, <i>Halichoerus grypus</i> (Al-Heeti, 2020).	Figure 2: California Sea Lion, <i>Zalophus californianus</i> (Smithsonian, 2020).	Figure 3: Walrus, <i>Odobenus rosmarus</i> (Jensen, 2020).

Currently there are no captive walrus in the United Kingdom (UK) (Zootierliste, 2020); they are logistically difficult to house, reproduce poorly and have a low life expectancy in captivity (Salas and Manteca, 2016). Therefore, for the purpose of this study, pinniped will refer to seals and sea lions, excluding walrus.

Pinnipeds vary in size and appearance, the smallest is the Baikal seal (*Pusa sibirica*) reaching approximately 45 kilograms in weight and one metre in length, the largest is the male Southern elephant seal (*Mirounga leonina*) which reaches approximately 3200 kilograms and five metres in length (Bonn, 2015). See table 1 for comparison of pinniped characteristic physiological differences using the grey seal (*Halichoerus grypus*) and California sea lion (*Zalophus californianus*) as examples.

Table 1: Comparing pinniped physiological characteristics using the grey seal and California sea lion (Smithsonian's National Zoo & Conservation Biology Institute, 2020; Bonn, 2015)

	<u>Grey seal</u>	<u>California sea lion</u>
<u>Photographic image</u>	 <p>Figure 4: Grey Seal laying on land (Chapman, 2020).</p>	 <p>Figure 5: California Sea Lion standing on all four flippers (National Ocean Service, 2019).</p>
<u>Size</u>	<p>Adult males: approximately 2.3 meters in length and can weigh more than 750 pounds.</p> <p>Adult females: approximately 2 meters in length, weigh up to 575 pounds.</p>	<p>Adult males: approximately 2.4 meters in length, weighing on average 600 pounds. Weight can increase to 1,000 pounds for breeding season.</p> <p>Adult females: approximately 1.8 metres in length, weighing on average 220 pounds.</p>
<u>Ears</u>	Ear hole, no external ear flap. Valvular and closes under water. Perceiving sounds in air is reduced due to no ear flaps and a wax coating in the auditory canal.	External ear flap. Valvular and closes under water. Good perception of sounds in air and underwater.
<u>Hips</u>	Fused hip bones.	Hip bones can rotate.
<u>Flippers</u> (Webbed digits)	Short limbs with elongated digits. Short front flippers.	Short limbs with elongated digits. Long front flippers. Rear flippers can be rotated forwards under their body.
<u>Swimming</u>	Propel with rear flippers, steer with front flippers.	Propel with front flippers, steer with rear flippers.
<u>Swim speed</u>	Reach up to 14-23 mph, generally cruise at <6 mph.	Reach up to 25-30 mph, generally cruise at <11 mph.
<u>Locomotion</u>	Cannot stand on flippers, rolls body or shuffles body on land by alternatively shifting weight from chest to pelvic region to move forwards.	Able to hold up body weight and stand or walk on all four flippers. Thoracic flippers flex laterally at the carpus enabling locomotion.
<u>Colouration</u>	Greys or browns. Can be one colouration all over body or mottled.	Dark chestnut brown (males) or tan (female). Usually the same colouring all over body.
<u>Vocalisations</u>	Grunting, growls, hooting and hissing.	Barking, growls, bleats and roars.

1.2. Use of Pinnipeds in Captivity

Animal collections are popular public attractions, globally approximately 700 million people visit zoos and aquariums annually (WAZA, 2015). Records show Mediterranean monk seals (*Monachus monachus*) were being used in captivity in 1760 (Maxwell, 1967), pinnipeds are now commonly housed in modern zoos, their ability to learn complex behaviours makes them beneficial for demonstrations (Bonn, 2015), which are popular visitor exhibits (see figure 6). The California sea lions at Woburn Zoo respond to a repertoire of over 100 commands (Woburn Safari Park, 2020).

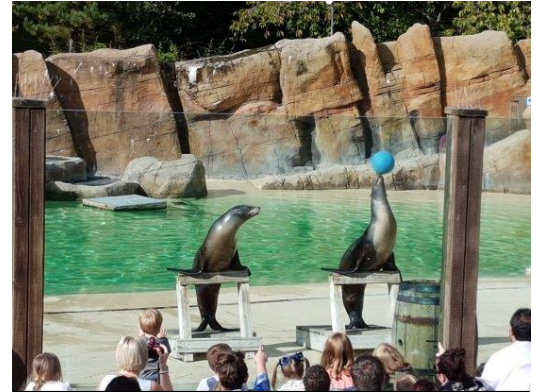


Figure 6: Seal lion balancing a ball on their nose during performance for visitors at Blackpool Zoo (Richards, 2020).

According to Zootierliste (2020), in the UK there are currently 20 facilities housing sea lions and 19 housing seals, the most common species is the California sea lion housed in 13 facilities and the Eastern Atlantic Harbour Seal (*Phoca vitulina vitulina*) housed in 12 facilities (Zootierliste, 2020).

1.3. Pinniped Enclosure Design

As an aquatic species provision of water and land space are imperative aspects of the enclosure (Villegas-Amtmann et al, 2008). Varying between species pinnipeds are capable of diving hundreds of metres (Schreer, Kovacs and Hines, 2001) and replicating this pool depth in captivity is not feasible; however, they should be provided with as much land and water space as possible (DEFRA, 2012). It is psychologically and physically enriching to encourage natural diving behaviour (Renouf, 2012), by providing deep pools and novel objects on the pool floor for pinnipeds to interact with (Bonn, 2015). Additionally, diving flushes the

ear canal and promotes ear health as pinnipeds with access to deep pools have less cases of otitis externa (ibid).

A stereotypic behaviour is repetitive, unvarying and apparently functionless (Mason and Latham, 2004). Common pinniped stereotypies include pattern swimming, head-bobbing and self-directed behaviours such as overgrooming (Smith and Litchfield, 2010). Pinnipeds have been found to exhibit motor bias in the direction of their swimming patterns (Wells, Irwin and Hepper, 2006), however, pattern swimming is distinguished from regular swimming if the behaviour pattern is unbroken and continues for at least three cycles (Samuelson et al 2016). A lack of stimuli, or an inappropriate, sub-standard environment could result in development of stereotypic behaviours in response to motivational frustration, habit-formation or as a coping mechanism to stress or boredom (Mason et al, 2007). However, presence or absence of stereotypies is not always a reliable predictor of good or poor welfare, as once an animal has formed a stereotypy it is difficult to abolish irrespective of higher standards being provided (Mason and Latham 2004).

Furthermore, water is used to behaviourally thermo-regulate and maintain approximately 37°C body temperature, as pinnipeds are at risk of hyperthermia on land (Bonn, 2015). Water between the sea lions' fur and skin warms and raises body temperature, to lower body temperature pinnipeds may submerge their flippers or flipper-fan the water (Renouf, 2012).

Pinnipeds are sociable, with sea lions congregating in large herds of hundreds of individuals in the wild (Wolf et al, 2007), therefore, they should not be housed individually. It is feasible to house seals alone, as they are more solitary unless sharing a



Figure 7: Large number of Grey seals hauling out on a rock to moult in May and early June in the Baltic Sea (Lundberg, 2007).

haul-out site (see figure 7) or are breeding (Hiby et al, 2007), though they can still benefit from the stimulation and enrichment of co-habiting. Pinnipeds have been shown to have individual preferences for interaction (Pomeroy et al, 2005), therefore, co-habiting numerous pinnipeds provides interaction choices.

Larger land areas for sea lions can be beneficial as they are more active and better physically adapted for land locomotion, compared to seals, whom spend a larger proportion of time in water (DEFRA, 2012). Some species, such as California sea lions will choose close or direct contact between individuals when hauled-out, whereas harbour seals prefer more space (Bonn, 2015). If the enclosure is not large enough for the animal density, pinnipeds may swat each other which can cause corneal injuries.

1.4. United Kingdom Legal Requirements for Captive Pinnipeds

Ideally, to standardise enclosure provisions for pinnipeds, requirements such as enclosure size, animal density, dietary and enrichment needs would be specifically laid out in law. Thus, ensuring physical and psychological needs are met (Dawkins, 2006) by maintaining a good level of animal welfare and making animal keepers accountable for their actions (Rivlin, 2015). In the UK enclosure requirements applicable to pinnipeds are minimal, leading varied standards between zoos.

1.4.1. Zoo Licensing Act 1981 and Council Directive 1999/22/EC

The Zoo Licensing Act (1981) requires inspection and licensing of all UK zoos, ensuring captive animals are provided with a suitable environment to satisfy physical, psychological and social needs by providing a high standard of animal husbandry and veterinary care (c.37). Risk of animal escape and public safety must be considered in enclosure design.

1.4.2. Secretary of State's Modern Standards of Zoo Practice

To meet the stipulations within the Zoo Licensing Act (1981), zoos must accommodate the standards set out in the Secretary of State's Standards of Modern Zoo Practice. The pinniped section includes specifications relating to enclosure design, hygiene and safety of both animals and the public (see table 2).

Table 2: Summary of the pinniped requirements section within the Secretary of State's Modern Standards of Zoo Practice (DEFRA, 2012)

<u>Aspect</u>	<u>Summary of guidelines for zoo facilities and inspectors</u>
Enclosure design	<ul style="list-style-type: none">• Adequate provision of both land and water space.• Materials used for pool and land surfaces should be durable, non-toxic and waterproof.• Salt water for pool is preferable (excluding Baikal seals (<i>Pusa sibirica</i>) which are adapted to fresh water).
Animal safety	<ul style="list-style-type: none">• Surfaces should be non-reflective as this is known to pose risks of eye discomfort and disease.• Pool walls should be smooth to prevent injury.• Access to shade from exceptionally harsh or hot weather.
Hygiene	<ul style="list-style-type: none">• After scatter feeding uneaten food should be removed.• Adequate monitoring of water hygiene and condition.• Land surfaces should allow water and waste to run off without contaminating the pool (sand, pebbles or vegetation can be used as surface materials).
Public safety	<ul style="list-style-type: none">• To prevent injury to humans or animals the staff must be trained in restraint techniques.

	<ul style="list-style-type: none"> • Appropriate barriers around pools and land areas.
--	---

1.4.3. Animal Welfare Act 2006

The Animal Welfare Act 2006 places duty of care onto the person responsible for an animal, to ensure the five animal welfare needs are met (see figure 8) and unnecessary suffering is prevented (c.45). Inspectors appointed by the local or national authority ensure zoos are following legislative guidelines.

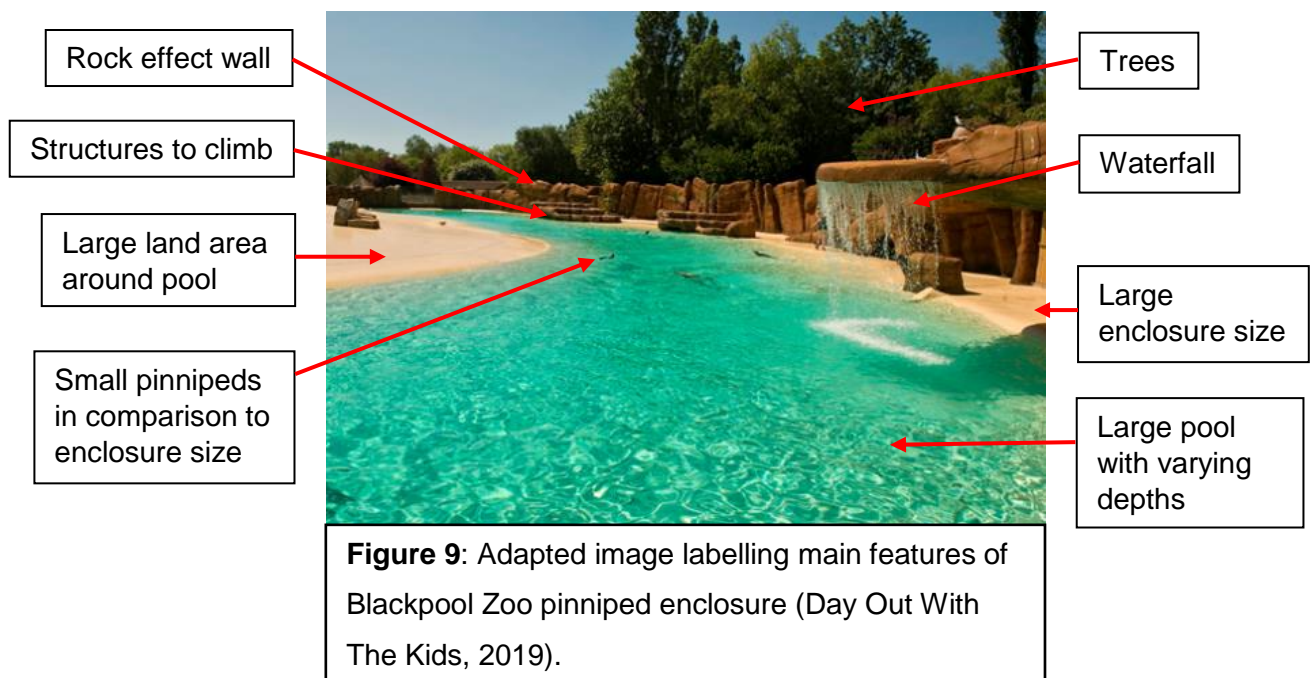


Figure 8: The Five Animal Welfare Needs Outlined by the Animal Welfare Act 2006 (Arthur, 2016).

The lack of specification within the above legislations regarding how to meet environmental, dietary, behavioural, social and health needs for pinnipeds leaves guidelines open to interpretation of meaning, by both zoos and the zoo inspectors (Draper and Harris, 2012). For example, despite land and water provision being a crucial element of the enclosure (Villegas-Amtmann et al, 2008), the legislation does not specify what measurements are deemed adequate. Additionally, specifications on enrichment or social needs are not addressed which could impede psychological and physical health (Hunter et al, 2002).

Occurrence of variation in standards is evident in figures 9 and 10, as both enclosures are deemed compliant with UK laws. Nevertheless, the Blackpool Zoo

enclosure is more naturalistic, with larger water and land size and includes enrichment features such as the waterfall and structures to climb which can stimulate natural behaviours (Watters, Miller and Sullivan, 2010). It is becoming increasingly common to see naturalistic enclosures that closely imitate natural habitats (Fàbregas, Guillén-Salazar and Garcés-Narro, 2012) and these types of enclosure are perceived by visitors as the best at meeting animals biological needs (Melfi, McCormick and Gibbs, 2015). Comparatively, the Skegness Natureland enclosure is small and barren posing an increased risk of pinniped stereotypies (Mason et al, 2007; Grindrod and Cleaver, 2001), and animal density is high in relation to enclosure size, increasing the risk of stress and swatting (Bonn, 2015).





1.4.4. Voluntary Accreditations

Voluntary accreditations provide guidelines for animal care and accommodation in zoos (see table 3), membership provides assurance to visitors that the zoo is compliant in maintaining the required high standards.

Table 3: Summarising aims of the British and Irish Association of Zoos and Aquariums (BIAZA), European Association of Zoos and Aquaria (EAZA) and the World Association of Zoos and Aquaria (WAZA)

<u>Professional Body</u>	<u>Summary of organisation aims</u>
British and Irish Association of Zoos and Aquariums	<ul style="list-style-type: none"> • Participating in conservation and breeding programmes. • Delivering environmental education and training for animal keepers.

 <p>Figure 11: BIAZA logo (BIAZA, 2020)</p>	<ul style="list-style-type: none"> • Contributing to research. • Follow Animal Welfare Toolkit principles on animal health, nutrition, environment, behaviour, mental state. • Veterinarian care (preventative and curative) • Exchanging animals between collections when appropriate. <p>(BIAZA, 2020)</p>
<p>European Association of Zoos and Aquaria</p>  <p>Figure 12: EAZA logo (EAZA, 2020)</p>	<ul style="list-style-type: none"> • Facilitate cooperation within the European zoo and aquarium. • Provide funding and manpower to <i>in situ</i> conservation projects. • Educate visitors on animals and their habitats. • Animal biology research. • Meet highest standards of care and breeding. <p>(EAZA, 2020)</p>
<p>World's leading Zoos and Aquaria</p>  <p>Figure 13: WAZA logo (WAZA, 2020)</p>	<ul style="list-style-type: none"> • The global alliance of regional associations, national federations, zoos and aquariums. • Provides guidance and encouragement to zoos, aquariums and organisations. • Promotes high standards of animal care and welfare, environmental education and global conservation of animals and their habitats. <p>(WAZA, 2020)</p>

The EAZA pinniped husbandry guide includes enclosure design specifications (see table 4) and recommends the enclosure should represent the species natural habitat (Gili, Meijer and Lacave, 2018).

Table 4: Summary of EAZA husbandry guidance for pinniped enclosure standards (Gili, Meijer and Lacave, 2018)

<u>Enclosure feature</u>	<u>Design guideline</u>
--------------------------	-------------------------

Pools	<ul style="list-style-type: none"> • Preferably a circular pool to improve water flow • Ornamental (rocky or beaches) • Non-porous, waterproof material facilitating cleaning • Maintained in good repair • Non-glare dark-coloured finish, reducing reflection and excessive heating • Gently sloping sunken pool • Additional outside/indoor pools for social management, veterinary care, training, stimulation/variability • Pool size horizontally and vertically must allow freedom of movement • At least half of the pool surface depth should be a minimum of one third more than the average length of the animal
Deck space	<ul style="list-style-type: none"> • Several beach areas • Areas to climb • Floors should be made from natural materials • Professional epoxy surface compound ideal for floor covering • With low barrier to prevent excreta entering pool
Shelter	<ul style="list-style-type: none"> • Natural or artificial shelter • Providing protection from environmental conditions, con-specifics, public and context variability
Quarantine and isolation facility	<ul style="list-style-type: none"> • Independent, self-contained facility • As a temporary quarter it does not need to comply with space requirements of main enclosure • Below drainage flow from main enclosure • Microbiological isolation tools
Separation enclosures	<ul style="list-style-type: none"> • Non-toxic, corrosion-resistant, nonabrasive material • As pens have no water access they should be used as temporary measure, such as post-surgery • Mesh/spaces must be small enough to prevent mouth injuries or full mouth grasp for gnawing

Boundaries	<ul style="list-style-type: none"> Enclosed by sufficient perimeter fence (at least 3-4 metres above water level for large pinnipeds) Unless the enclosure is protected by an effective natural barrier
Enclosure size	<ul style="list-style-type: none"> Scientifically defended space requirements have not yet been defined Sufficient to enable postural and social freedom of movement on land and in water

EAZA also provides details on minimum enclosure size according to species and group size, which is a significant exhibit requirement to sufficiently meet species needs (see figures 14 and 15).

Species with similarly range size	Average species length (m)	Group size	Land area (m ²)*	Additional land area per extra animal (m ²)	Pool area (m ²)	Additional pool area per extra animal (m ²)*	Minimum Volume (m ³)
<i>P. hispida</i>	1.6	1-6	18	3	72	12	153
<i>P. vitulina</i>	1.9	1-6	24	4	92	15	233
<i>H. grypus</i>	2.3	1-6	30	5	120	20	367
<i>A. tropicalis</i> <i>A. australis</i>	1.9	1-6	20	3,3	80	13	202
<i>A. pusillus</i> <i>Z. californianus</i> <i>O. flavescens</i>	2.6	1-4 to max 1-6	36	6	144	24	500
<i>E. jubatus</i>	3.3	1-4 to max 1-6	54	9	216	36	948

Figure 14: EAZA main pool minimum space requirements (Gili, Meijer and Lacave, 2018).

Species with similarly range size	Average species length (m)	Land area / each individual (m ²)	Pool area / each individual (m ²)	Minimum depth (m)
<i>P. hispida</i>	1.6	3	12	1,6
<i>P. vitulina</i>	1.9	4	15	1,9
<i>H. grypus</i>	2.3	5	20	2.3
<i>A. tropicalis</i> <i>A. australis</i>	1.9	3,3	13	1,9
<i>A. pusillus</i> <i>Z. californianus</i> <i>O. flavescens</i>	2.6	6	24	2,6
<i>E. jubatus</i>	3.3	9	36	3.3

Figure 15: EAZA secondary pool minimum space requirements (Gili, Meijer and Lacave, 2018).

Contrasting enclosure standards in zoos could potentially be influenced by voluntary accreditations. From the previously shown enclosure images (figures 9 and 10), Blackpool Zoo is a member of EAZA and BIAZA (Blackpool Zoo, 2020) and provides a higher standard enclosure. Whereas, Skegness Natureland is not a member of any voluntary accreditation (Skegness Naturland, 2020) and provides a lower standard enclosure. However, this could be coincidental, and zoos may still provide good standard enclosures without membership.

1.5. Public Perception of Captive Animal Enclosures

Public perception can be influenced by biological and sociocultural factors (Fuente et al, 2017) such as personal experiences, values, norms, interests (Boogaard, Oosting and Bock, 2006), gender, age, location and education level (Ohl and Staay 2012; Signal and Taylor, 2006). Zoos are a primary point of engagement between people and animals, visitor perception on animal welfare and use of captive animals for entertainment purposes can be influenced by zoo-based educational activities (Wagoner and Jensen, 2010).

Conflicts in visitor expectations can occur between the enjoyment of observing and learning about natural animal behaviour, conflicting with desire to observe and interact with the animals closely (Fernandez et al, 2009). A study at Lahore Zoo in Pakistan (Ahmad et al, 2015) found 38% of 190 participants thought the animals were in healthy condition and seemed at ease with their enclosure environment, when visitors were asked what the zoo should prioritise, 29% believed providing fun and recreation for visitors should be main priority.

Additionally, enclosure style can impact public perception as comparatively to traditional barren enclosures, naturalistic enclosures are rated more positively and are assumed to inherently promote good welfare (Melfi, McCormick and Gibbs, 2015; Rhoads and Goldsworthy, 1979; Finlay et al, 1988). Visitors at Paignton Zoo Environmental Park were shown a series of photographs depicting various primate enclosure styles and the visitors consistently rated the naturalistic enclosures as good. The greenest enclosure was rated the highest and there was consistent perception that its inhabitants would have optimal welfare (ibid).

The Animal Attitude Scale (AAS) has demonstrated acceptability, reliability, adaptability and validity in measuring individual attitudes towards animal welfare (Herzog, Grayson and McCord, 2015). It has been previously used in zoo contexts; for example, an adaptation of the AAS was used to assess the effects of a zoo environmental education programme on attitudes towards orangutans (Pearson, Dorrian and Litchfield, 2011). Public attitudes and evolving expectations increase pressure on establishments to continually adapt and improve standards (Fuentes et al, 2017).

1.6. Influences of Presentation of Information

As previous human psychological studies have found, the presentation of information can affect a person's opinion or reaction (Hansen, Christensen and

Lundsteen, 2007). An experimental conditions survey-based study was conducted to test effects of specific image characteristics on attitudes towards chimpanzee (*Pan troglodytes*) conservation and use as pets (Ross, Vreeman and Lonsdorf, 2011). The survey was conducted by telephone and 1203 participants were asked to look at images and answer a series of questions.

Participants viewing the composite image of a chimpanzee with a human were 35.5% more likely to consider wild populations to be stable and healthy and 30.3% more likely to perceive chimpanzees as an appealing pet than participants viewing images with no human (see figure 16). Compared to a natural, neutral or zoo background, the anthropomorphic background (office setting) significantly

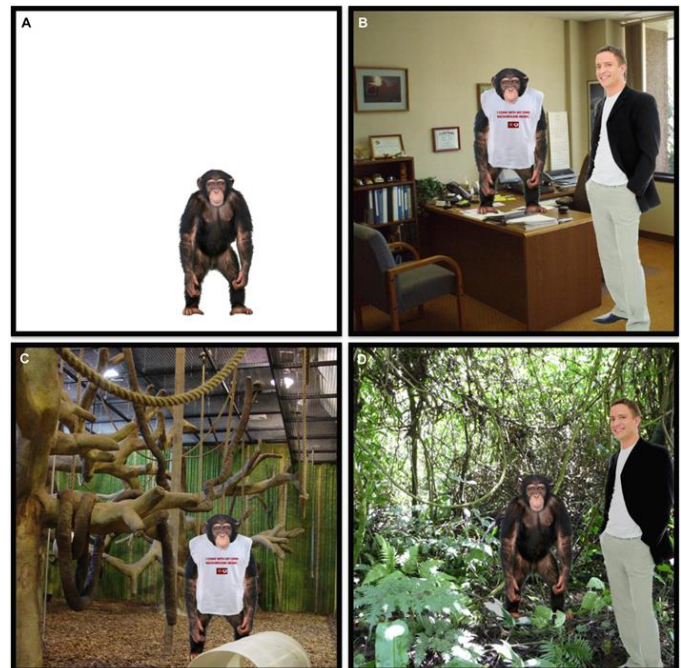


Figure 16: Sample images of Chimpanzees provided to survey respondents in human psychology research (Ross, Vreeman and Lonsdorf, 2011).

effected perception, participants were less likely to categorise chimpanzee populations as endangered or declining. The large sample size strengthened the statistical significance of these findings, although limitations of the images used were recognised. Using a juvenile chimpanzee in a bi-pedal position may have encouraged anthropomorphism compared to using a seated or quadrupedal adult chimpanzee.

1.7. **Study Aims and Hypotheses**

This project endeavours to complement existing literature on perception of zoo enclosures, by ascertaining public perception of pinniped enclosure standards and knowledge of enclosure legal requirements and comparing this to existing UK legislation. Exploring influence of presentation of information by using two questionnaire conditions. The hypotheses (see table 5) are based on literature suggesting animal welfare expectations within the UK are generally high (Main and Mullan, 2017), public knowledge of legal requirements can be poor (Farnworth, Campbell and Adams, 2010) and presentation of information may influence participant responses (Ross, Vreeman and Lonsdorf, 2011).

Table 5: Detailing the four hypotheses that this study aims to test

	<u>Alternate hypothesis</u>
(H₁)	A significant proportion of the participants will have expectations for pinniped enclosure size and quality that exceed legal requirements.
(H₂)	A significant proportion of participants will not know what the legal requirements are for pinniped enclosures.
(H₃)	Public knowledge of the five animal welfare needs encompassed by the Animal Welfare Act 2006, will positively correlate with participant knowledge of pinniped enclosure legal requirements in the United Kingdom.
(H₄)	There will be a significant difference in public perception of enclosure size and quality between participants shown a larger, more naturalistic enclosure than participants shown a smaller, more barren enclosure.

2. Materials and Methods

2.1. Ethics Statement:

The questionnaire received ethical approval from the Plumpton College Research Ethics Committee.

2.2. Questionnaire Design

An online questionnaire was used to collect data, as this is an inexpensive, convenient and achievable method to obtain data from a large sample size and test the hypotheses (Clifford et al, 2016; Smith, 2008).

Qualtrics (computer software) was used to generate the experimental independent measured design questionnaire; creating two questionnaire versions (condition 1 and condition 2 which can be seen in appendix 1) with each participant completing the questionnaire once. Qualtrics randomly allocated participants condition 1 or condition 2 with approximately a 50/50 split to approximately obtain an even amount of data for analysis per condition. Both conditions had the same format and question wording, however displayed different photographic images to the participant.

The questionnaire began with demographic questions: gender, age, education level, current work industry, as this enables accurate description of the sample and may be useful in determining whether identity is influencing participant choice (Hughes, Camden and Scott, 2016).

Followed by topical questions: detail on any prior animal related academic study or previous animal experience, specifying roles and which species were involved as previous animal experience could affect knowledge on animal related laws or influence welfare expectations, thereby altering perception of enclosures (Boogaard, Oosting and Bock, 2006).

The participants were shown two photographic images of a pinniped enclosure located in the United Kingdom, either condition 1 or condition 2:

(1) Condition 1: larger, higher standard, more naturalistic pinniped enclosure (see figure 17 and 18).



Figure 17: Blackpool Zoo pinniped enclosure (Day Out With The Kids, 2019).



Figure 18: Blackpool Zoo pinniped enclosure (Waterco, 2016).

(2) Condition 2: smaller, lower standard, barren pinniped enclosure (see figure 19 and 20).



Figure 19: Skegness Natureland pinniped enclosure (Mann, 2018).



Figure 20: Skegness Natureland pinniped enclosure (Hallam, 2012).

The enclosure standards are contrasting; condition 1 (naturalistic) features a large enclosure size, large pool and land area, shelter, rock feature wall, nearby foliage, and varying levels of structures. Condition 2 (barren) features a small enclosure, small pool and land area, relatively high number of inhabitants to enclosure size, low enclosure barriers and no hiding areas. This method was chosen to test effect of images on participant perception of enclosures, following study results that found images containing specific chimpanzee image characteristics altered participant perception of chimpanzee conservation status (Ross, Vreeman and Lonsdorf, 2011).

Open questions can complement data collection as they do not restrict the participant to a set of answers. A mixture of open and closed questions were used to obtain participants' knowledge of: pinniped enclosure legal requirements, familiarity of the Animal Welfare Act 2006, information on prior zoo experiences and perception of the condition images. Perception of pinnipeds in captivity was

measured using data collected on participants perception of pinnipeds suitability in captivity, what they believe should be legally required for enclosures and what features constitute a good standard pinniped enclosure.

Concluding with the five-item animal attitude scale (AAS-5), consisting of five questions using a likert scale to ascertain the participants' attitude towards animals (Herzog, Grayson and McCord, 2015). Numerical points were assigned to the participants answers to calculate their overall animal attitude score.

2.3. Data Collection

The questionnaire was distributed electronically on the following Facebook groups:

- Dissertation Survey Exchange
- The Research Survey Exchange Group
- Dissertation Survey Exchange – Share Your Research Study
- Dissertation Survey Exchange Thesis Survey Sharing
- Student Survey Swap

These survey exchange groups were chosen based on ease of obtaining permission for questionnaire distribution and likelihood of maximising potential sample size. The questionnaire was distributed for two weeks with an aim of obtaining a minimum of 100 responses to provide sufficient data quantity for statistical analysis.

2.4. Data Analysis

The data exported from Qualtrics was prepared for statistical analysis using GenStat software. Qualitative answers were numerically coded or converted into keywords, for example the five animal welfare needs listed by participants were numerically coded into number of correctly identified needs. Descriptive data

describing enclosure features was coded into keywords, see guidance in appendix 4.

The statistical tests conducted to test for effect, correlations or associations within the data can be seen in table 6. See appendix 2 for annotated GenStat statistical analysis output.

Table 6: List of statistical tests conducted, and variables used for each test

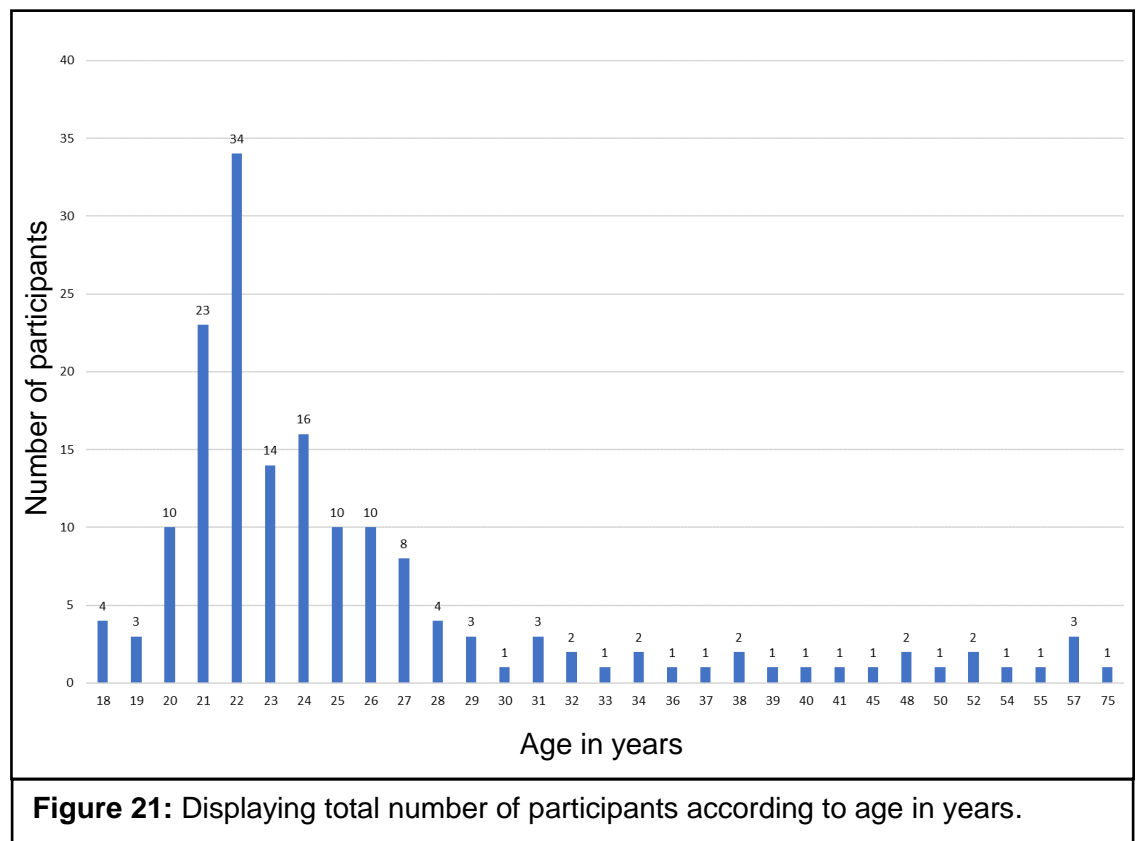
<u>Statistical Test</u>	<u>Variables per test</u>
Chi-square Goodness of Fit	<ul style="list-style-type: none"> Quantities of legal requirements selected that participants believed were legally required
Chi-square test of Association	<ul style="list-style-type: none"> Questionnaire condition and participant perception of the closure displayed
Spearman's Rank Correlation	<ul style="list-style-type: none"> Participant knowledge of the five animal welfare needs and knowledge of pinniped legal requirements Animal attitude scale score and quantity of features participants believed should be legal requirements for pinniped enclosures
Independent T-test	<ul style="list-style-type: none"> Questionnaire condition shown and number of pinniped enclosure legal requirements participants believe are included in law Questionnaire condition shown and number of pinniped enclosure legal requirements participants believe should be included in law
Two-way ANOVA	<ul style="list-style-type: none"> Perception on standard of enclosure shown and number of previous zoo visits the participant has memory of

3. Results

3.1. Demographic Data

The questionnaire received a total of 191 participants, of which 167 had completed 100% of the survey and were used for analysis. Further break down of results can be seen in appendix 3.

Of the 167 participants, 124 were female, 43 were male and participant ages ranged from 18 to 75 years (see figure 21).



Seventy-percent (117) of participants did not correctly identify any of the five animal welfare needs listed by the Animal Welfare Act 2006, seven participants correctly identified all five needs (see table 7).

Table 7: Quantity of the five animal needs encompassed by the Animal Welfare Act 2006 legislation identified by each participant

<u>Number of correct welfare needs listed</u>	<u>Condition 1 (naturalistic)</u>	<u>Condition 2 (barren)</u>	<u>Total</u>
0	56	61	117
1	7	6	13
2	5	7	12
3	5	9	14
4	3	1	4
5	5	2	7
			167

Among participants, 115 had visited zoos one to five times, 23 had visited zoos six to ten times, 24 had experienced more than ten zoo visits and five participants did not remember ever visiting a zoo. See table 8 for number of participants that identified seeing pinnipeds during a zoo visit.

Table 8: Number of participants that identified seeing a pinniped enclosure during a zoo visit

<u>Answer</u>	<u>Condition 1</u>	<u>Condition 2</u>	<u>Total</u>
Yes	46	46	92
No	24	26	50
Not sure	11	14	25
			167

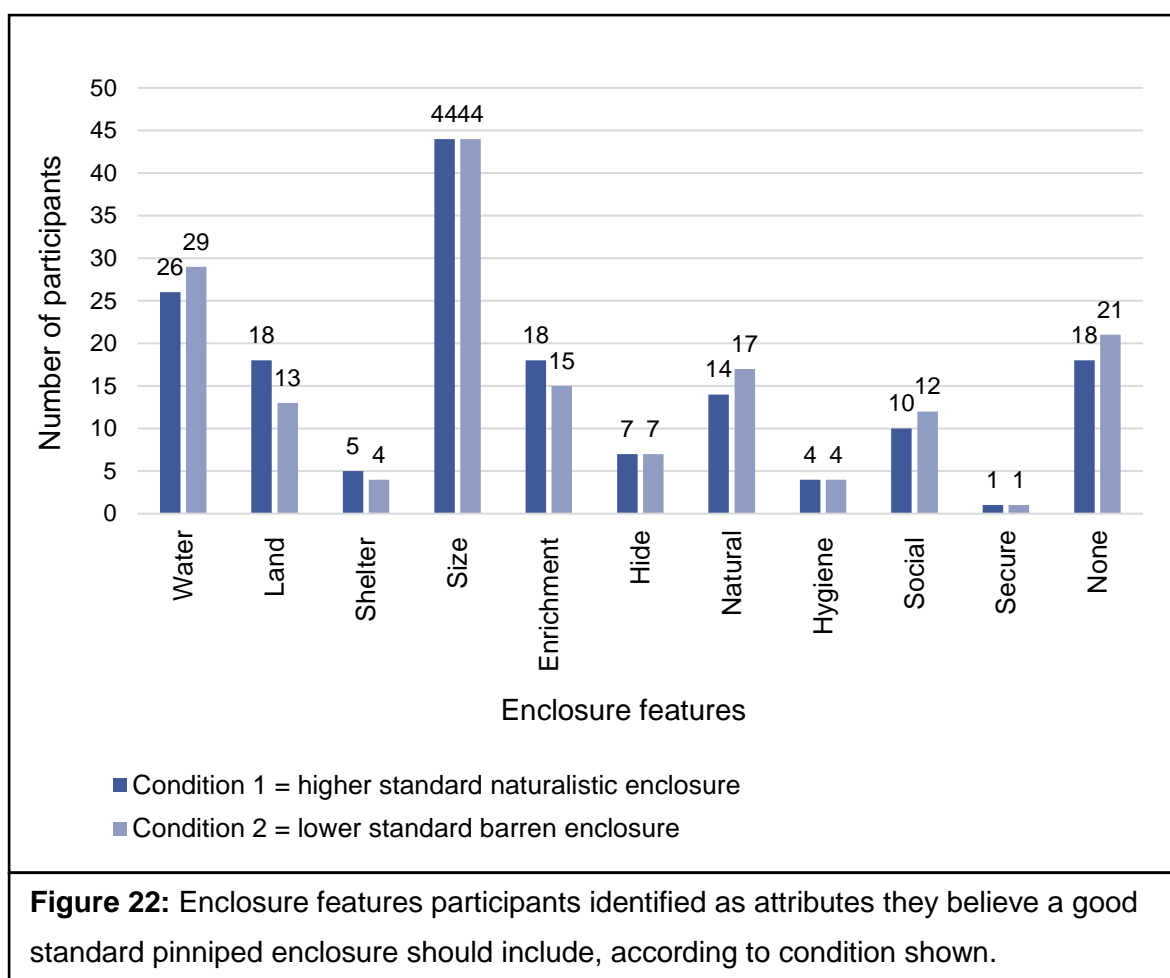
Of the 92 participants that identified seeing a pinniped enclosure, 29 of these facilities were located in the UK and can be seen in table 9, including participant satisfaction of the enclosure standards.

Table 9: The zoos within the United Kingdom in which participants identified seeing pinniped enclosures, including the pinniped species housed and participant perceptions of the enclosure standard

<u>Zoo name</u>	<u>Pinniped species housed</u>	<u>Participant satisfaction on enclosure standard</u>			<u>Participant total</u>
		Yes, it was very good standard	Yes, but it could be improved	No, it was not adequate	
Colchester Zoo	Patagonian Sea Lion (<i>Otaria flavescens</i>) (Colchester Zoo, 2020)	2	3	0	5
Whipsnade Zoo	California Sea lion (<i>Zalophus californianus</i>) (ZSL Whipsnade Zoo, 2019)	1	2	1	4
Dudley Zoo	Patagonian Sea Lion (<i>Otaria flavescens</i>) (Dudley Zoo, 2020)	0	0	1	1
London Zoo	Temporarily housed California Sea lion (<i>Zalophus californianus</i>) (Davis, 2012)	2	3	1	6
Chessington Zoo	California Sea lion (<i>Zalophus californianus</i>) (Chessington Zoo, 2020)	1	4	0	5
Woburn Safari Park	California Sea lion (<i>Zalophus californianus</i>) (Woburn Safari Park, 2020)	0	1	1	2
West Midland Safari Park	California Sea lion (<i>Zalophus californianus</i>) (West Midland Safari Park, 2020)	0	1	0	1
Flamingo Land Resort Yorkshire	California Sea lion (<i>Zalophus californianus</i>) (Flamingo Land, 2020)	0	1	1	2
Cornish Seal Sanctuary	California Sea lion (<i>Zalophus californianus</i>), Grey seal (<i>Halichoerus grypus</i>), Common seal (<i>Phoca vitulina</i>), Southern sea lion (<i>Otaria flavescens</i>) (Semantic, 2020)	0	1	0	1

Blackpool Zoo	California Sea lion (<i>Zalophus californianus</i>) (Blackpool Zoo, 2020)	1	0	0	1
Bristol Zoo	South American fur seals (<i>Arctocephalus australis</i>) (Bristol Zoo, 2020)	0	1	0	1
					29

Participants identified 11 attributes that a good standard pinniped enclosure should include (see figure 22). The feature most frequently identified was enclosure size (total of 86 participants), followed by availability of water (55 participants) and enrichment (33 participants).

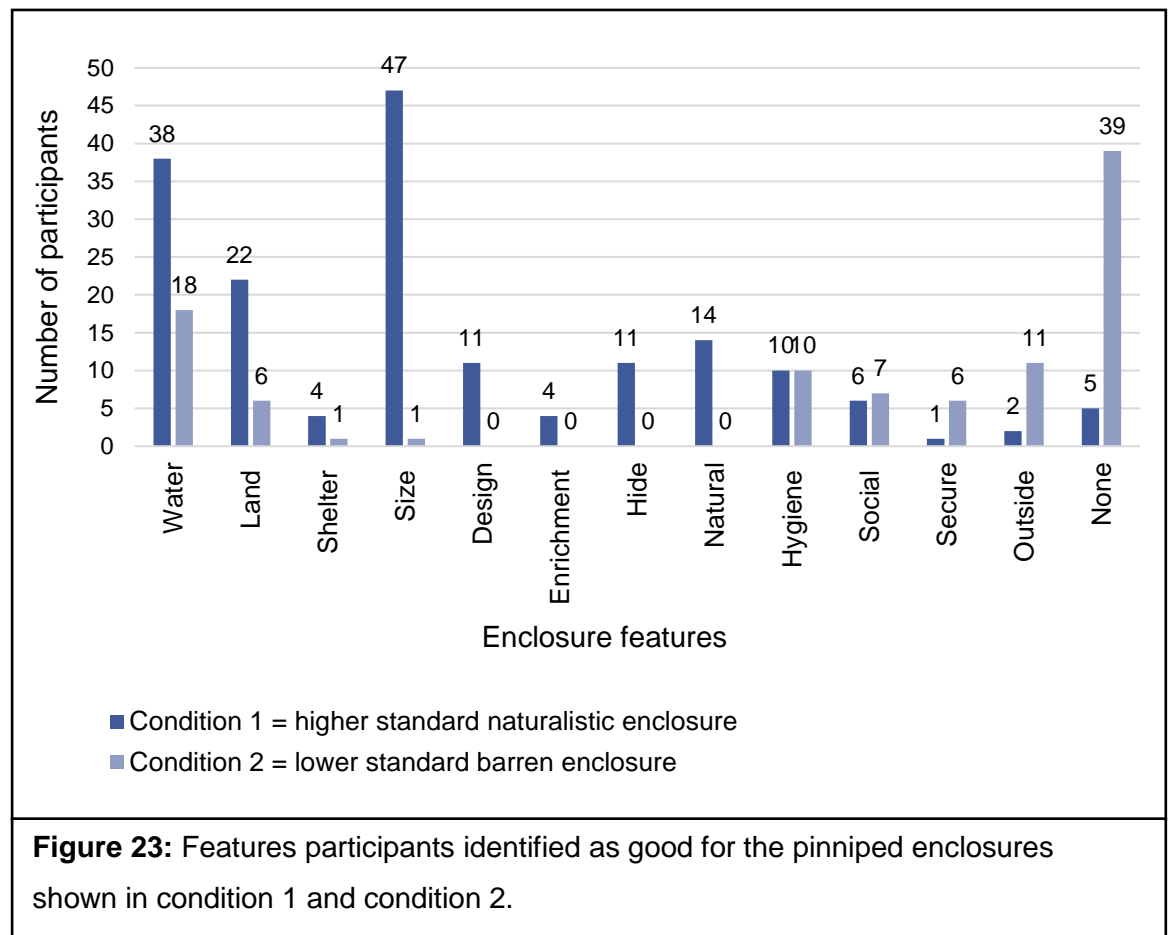


Participant perception of condition 1 (naturalistic) and condition 2 (barren) enclosure standards can be seen in table 10. Of the 81 participants shown condition 1, 33% perceived the enclosure as a good standard, with a further 50% believing it was a good standard although improvements could be made. Eighty-five percent of the 86 participants shown condition 2 did not believe the enclosure was a good standard.

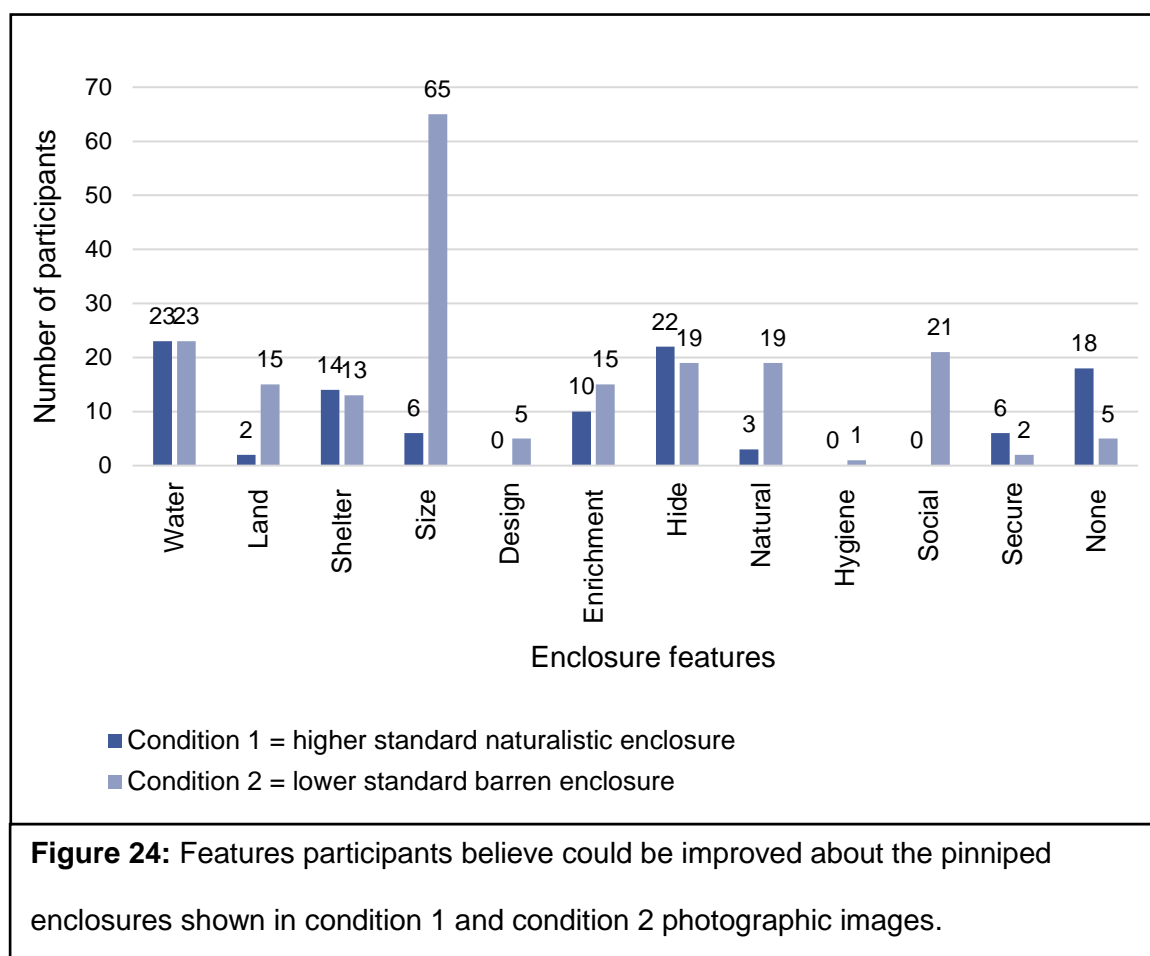
Table 10: Participant perception on standard of the pinniped enclosures illustrated in condition 1 and condition 2 photographic images

<u>Answer</u>	<u>Condition 1</u>	<u>Condition 2</u>	<u>Total</u>
Yes, it is a good standard	27	1	28
Yes, but it could be improved	41	8	49
No, it is not of a good standard	6	73	79
Don't know	7	4	11
			167

Participants identified 12 good enclosure features in the condition photographic images (see figure 23). For condition 1 the features most frequently identified as good were the enclosure size (47) and water availability (38). For condition 2, 39 participants did not believe there was a good enclosure feature and 18 participants selected water availability as a good feature.



Participants identified 11 enclosure features as attributes that could be improved in the condition photographic images (see figure 24). Water availability was equally identified as an improvement for both conditions. The improvement identified most frequently for condition 2 was enclosure size.



Generally, participants either believed pinnipeds were not suited to captivity or believed suitability was dependent on enclosure standard (see table 11).

Table 11: Participant perception on suitability of pinnipeds for use in captivity, according to condition shown

<u>Participant response</u>	<u>Condition 1 (naturalistic)</u>	<u>Condition 2 (barren)</u>	<u>Total</u>
Yes, they are well adapted to captivity	2	1	3
It depends on the standard of the enclosure	37	35	72
No, they should not be kept in captivity	35	46	81
Don't know	7	4	11

3.2. Participant Knowledge of UK Legal Requirements for Pinniped

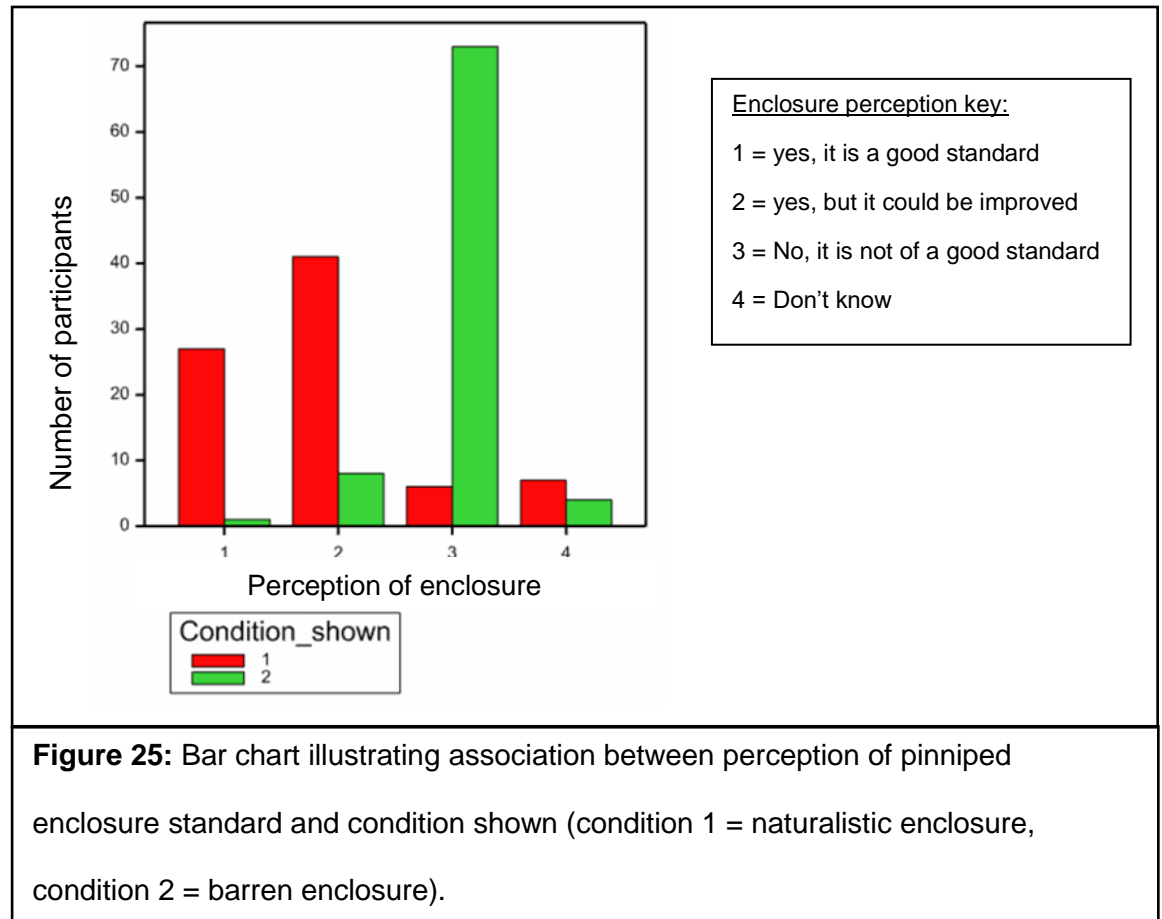
Enclosures

The features selected that participants believed are legal requirements for pinniped enclosures was significantly different to what is legally required ($\chi^2_{(17)} = 215.49$, $p < 0.001$). There were two correct legal requirements, see table 12 for the frequencies in which each quantity of legal features was selected.

Table 12: Illustrating the frequencies of participants that selected each quantity of pinniped enclosure legal requirements features

<u>Number of legal requirements</u>	<u>Frequency</u>
0	52
1	3
2	2
3	6
4	5
5	9
6	9
7	13
8	10
9	13
10	14
11	6
12	9
13	6
14	3
16	3
17	1
19	3

3.3. Association between Perception of Pinniped Enclosure Standard and Questionnaire Condition Shown



There was a significant association between participant perception of enclosure standard and condition shown ($\chi^2_{(3)}=122.23$, $p<0.001$) (see figure 25). A higher quantity of participants shown condition 1 selected options 1 or 2 compared to condition 2, and a higher quantity of participants in condition 2 selected option 3 than those in condition 1. Participants perceived the naturalistic enclosure as a good standard, those shown the barren enclosure did not perceive the enclosure as a good standard. Cramer's coefficient (V) was calculated as 0.854, indicating a high association between condition shown and public perception of enclosure

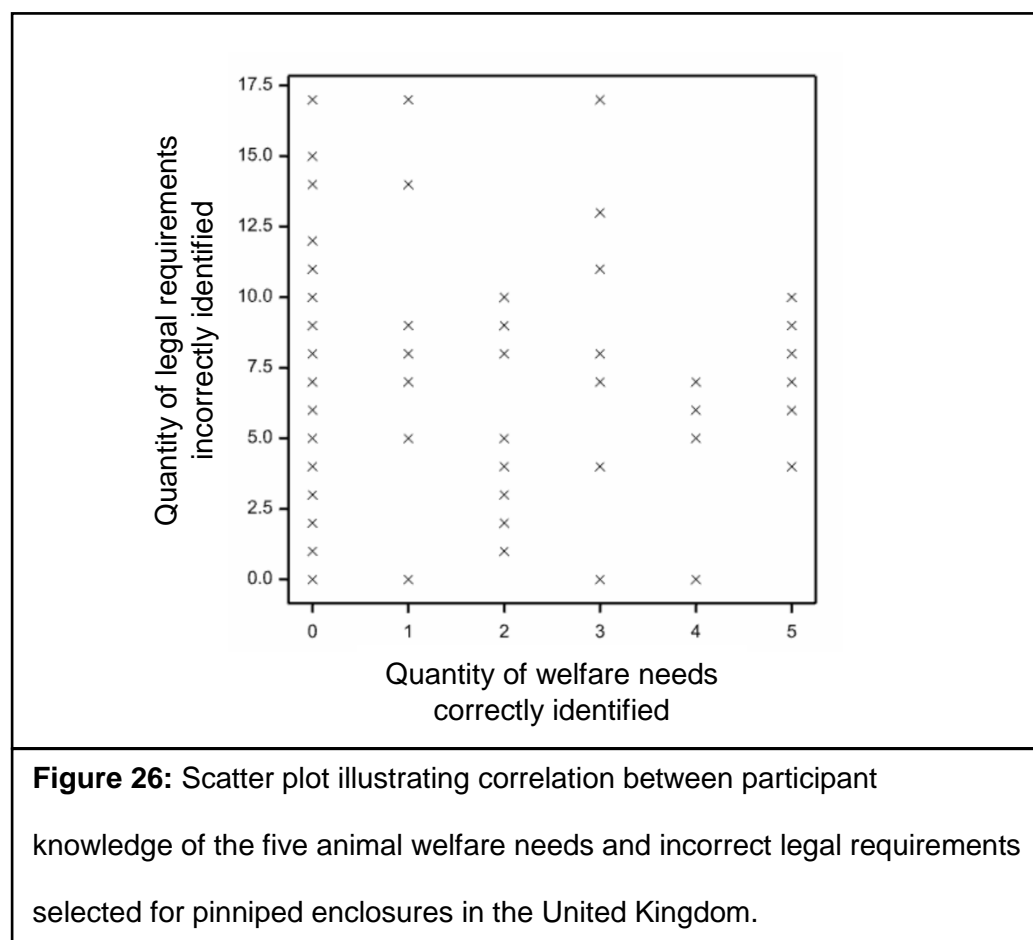
standard. See contingency table (table 13) for observed and expected values.

The observed frequencies are compared with expected frequencies calculated by GenStat.

Table 13. Summary of participant perception of pinniped enclosure standard by condition shown. Expected frequencies are shown in brackets. Perception of pinniped enclosure key: 1 = yes, it is a good standard, 2 = yes, but it could be improved, 3 = No, it is not of a good standard, 4 = Don't know.

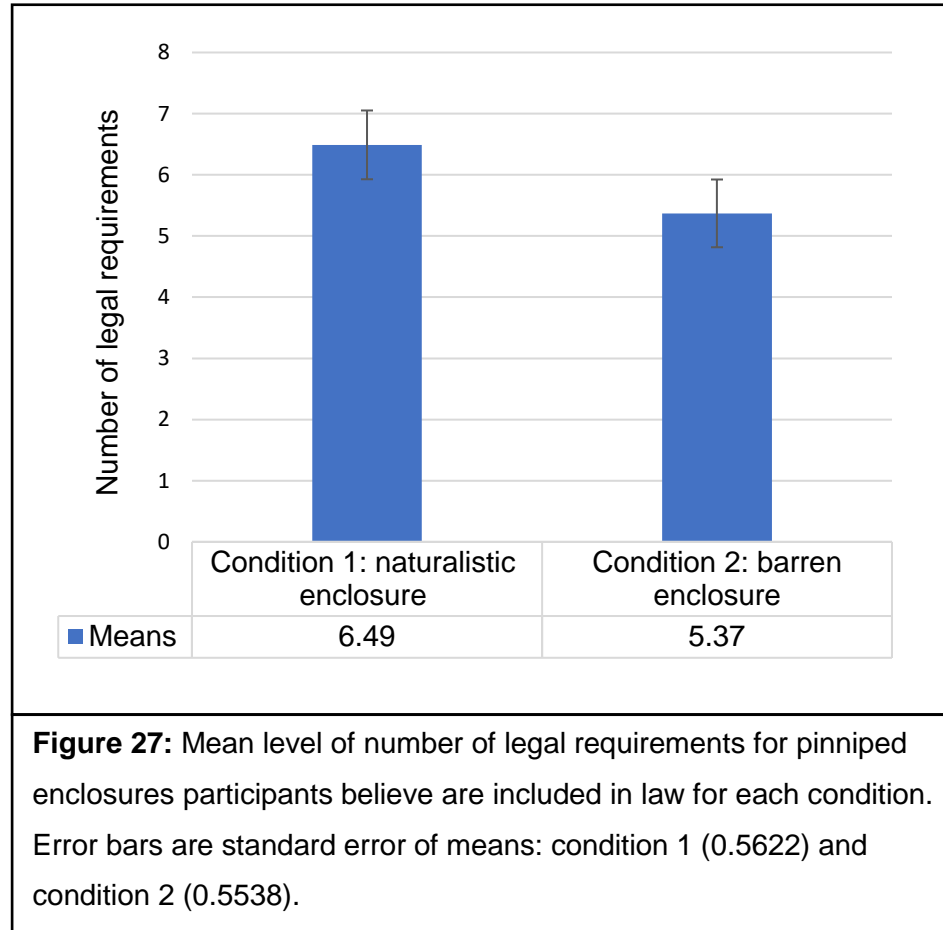
		Condition shown		
		1	2	Total
Perception of pinniped enclosure	1	27 (13.6)	1 (14.4)	28
	2	41 (23.8)	8 (25.2)	49
	3	6 (38.3)	73 (40.7)	79
	4	7 (5.3)	4 (5.7)	11
	Total	81	86	167

3.4. Correlation between Participant Knowledge of the Five Animal Welfare Needs and Knowledge of UK Legal requirements for Pinniped Enclosures

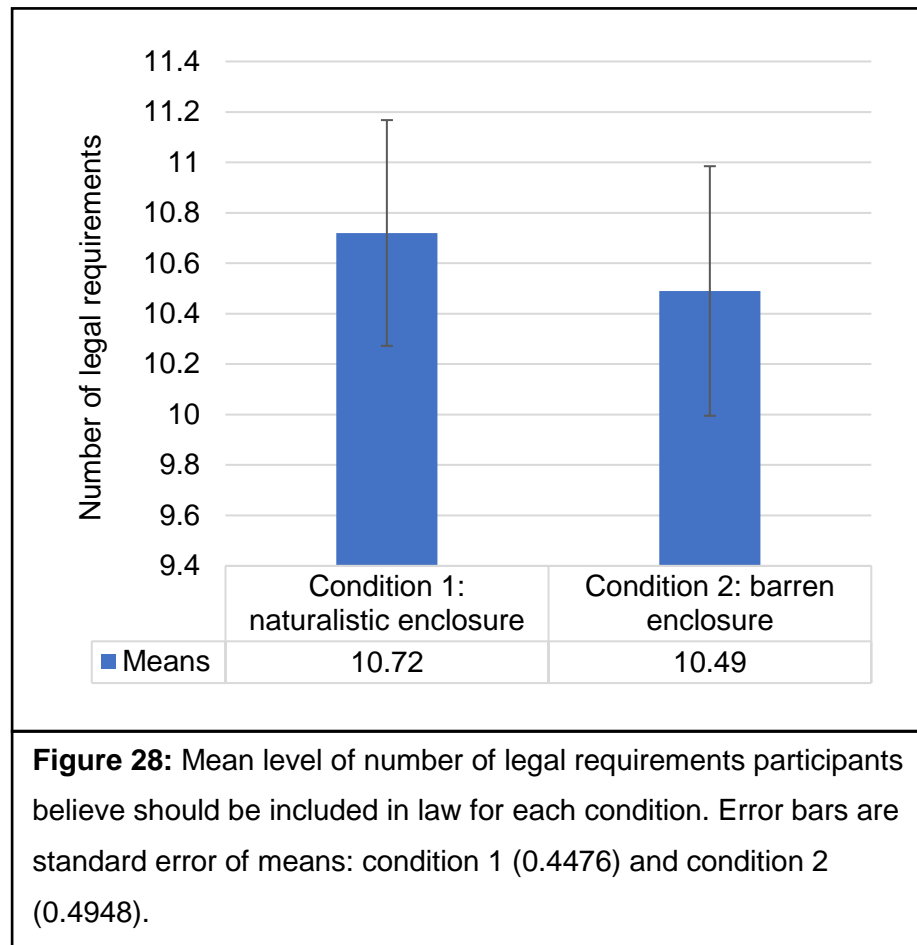


There is a significant weak correlation ($r=0.390$, $p<0.001$) between knowledge of the five animal welfare needs and participant knowledge of legal requirements (see figure 26). Indicating the less knowledge the public had on the five welfare needs (fewer correct animal needs identified), the less knowledge they also had on pinniped enclosure legal requirements (indicated by selecting incorrect legal requirements).

3.5. Effect of Questionnaire Condition on Participant Perceptions of UK Legal Requirements for Pinniped Enclosures



There was no significant difference in number of features selected that participants believe are included in law between the two conditions ($t_{(165)} = 1.42$, $p = 0.157$) (see figure 27). Participants in condition 1 (mean = 6.49, s.d. = 5.06, $n = 81$) chose on average 1.1 more legal features than condition 2 (mean = 5.37, s.d. = 5.13, $n = 86$). From the calculated interval there is 95% confidence that number of legal features selected in condition 1 are between -0.4 lower and 2.7 higher than condition 2.



There was no significant difference in number of features selected that participants believe should be included in law for pinniped enclosures between the two conditions ($t_{(165)} = 0.34$, $p = 0.734$) (see figure 28). Participants in condition 1 (mean = 10.72, s.d. = 4.03, $n = 81$) chose on average 0.23 more features compared to condition 2 (mean = 10.49, s.d. = 4.6, $n = 86$). From the calculated interval there is 95% confidence that number of features selected in condition 1 is between -1.09 lower and 1.5 higher than condition 2.

3.6. Effect of Condition Shown, Number of Zoo Visits and Participant Perception of Pinniped Enclosure Standards

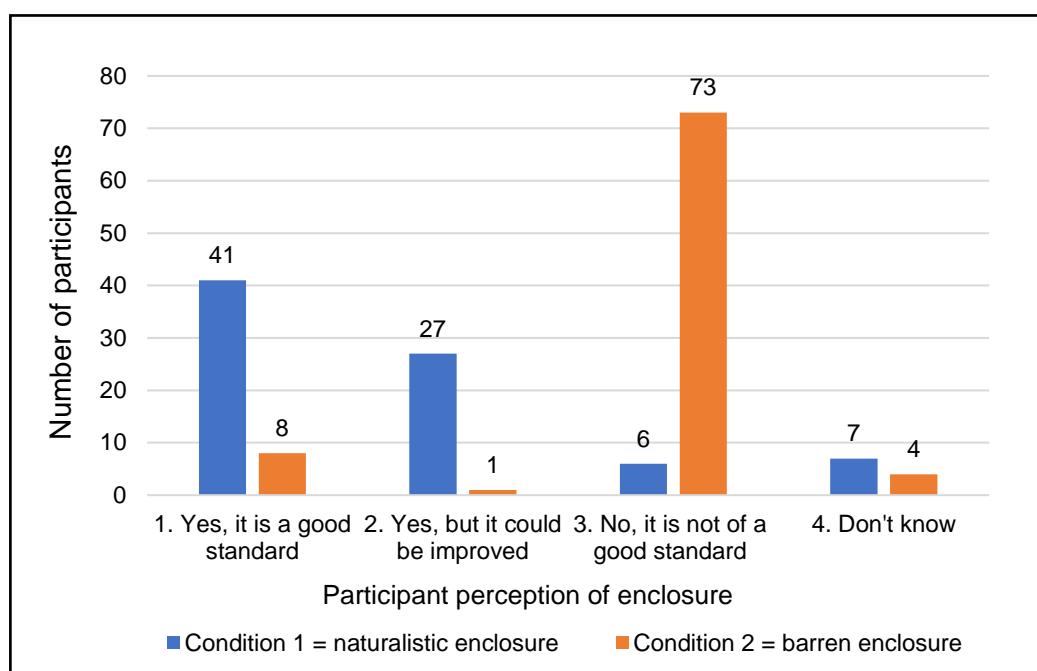


Figure 29: Bar chart illustrating participant perception of enclosure standard according to questionnaire condition.

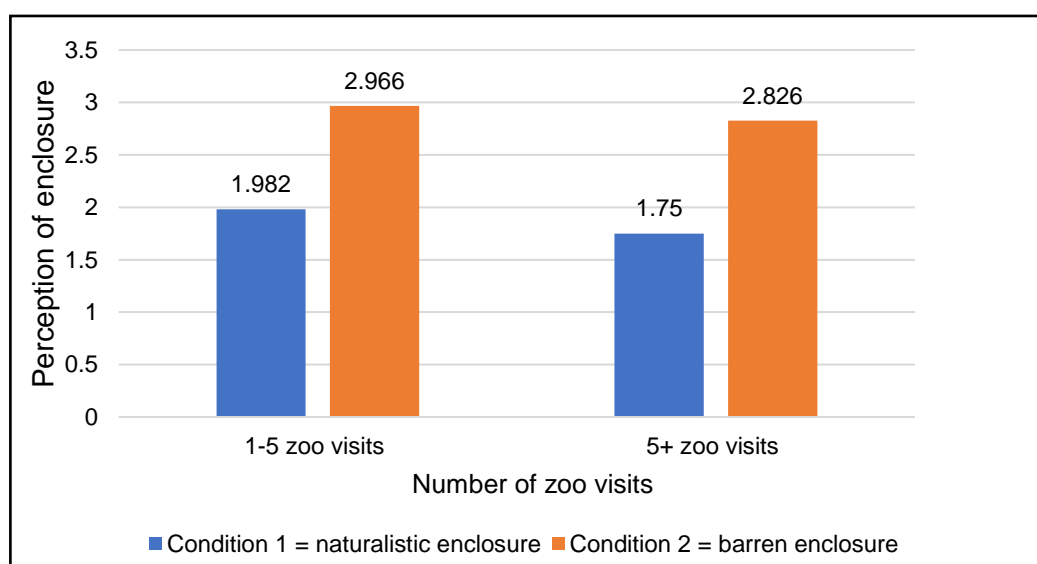
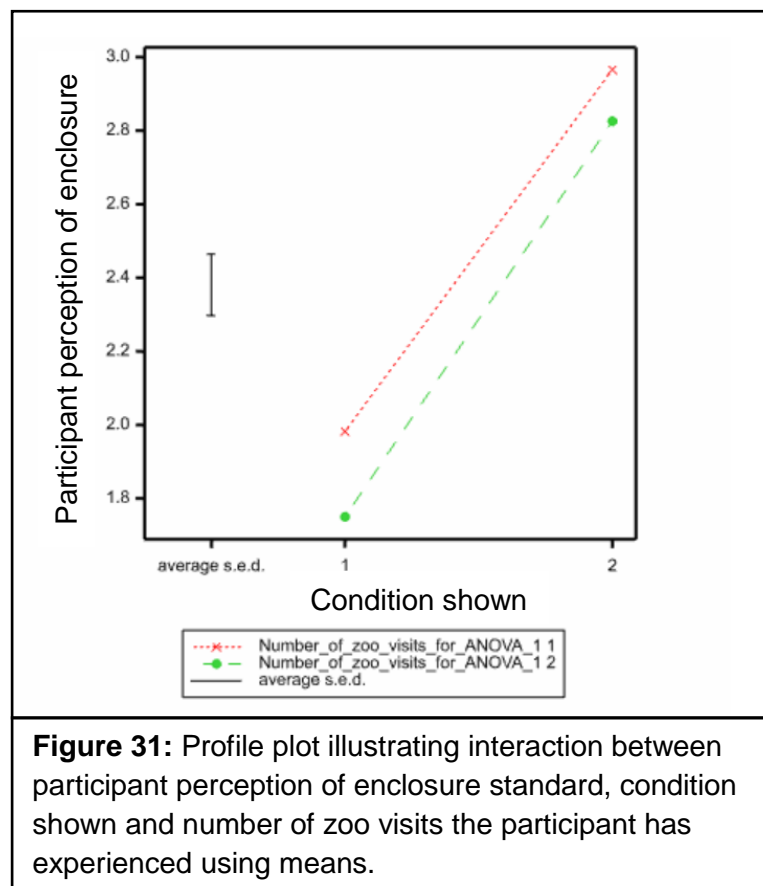


Figure 30: Bar chart illustrating participants perception of condition 1 and condition 2 enclosures (using means) according to number of zoo visits (1-5 or 5+). Mean results for condition 1 equate to questionnaire answer 'yes, but it could be improved', means results for condition 2 equate to answer 'no, it is not of a good standard.'

The condition shown significantly effected perception of enclosure standards ($F_{(1,158)}=88.10$, $p<0.001$) (see figure 29), with those shown the naturalistic enclosure perceiving the enclosure as a significantly higher standard than those shown the barren enclosure condition. There was no significant effect of number of zoo visits and participant perception of enclosure standards ($F_{(1,158)}=3.12$, $p=0.079$), with participants visiting 1-5 zoos rating condition 1 on average 1.982 and condition 2 on average 2.966 and those with 5+ visits rating condition 1 on average 1.750 and condition 2 on average 2.826 (see figure 30). There was no significant effect between the number of zoo visits and the condition shown ($F_{(1,158)}=0.15$, $p=0.699$), the perception of enclosure standard was higher for the naturalistic enclosure (condition 1) compared to the barren enclosure (condition 2) regardless of whether they had visited 1-5 zoos or 5+ zoos. This interaction is illustrated in figure 31, using the means.



3.7. Animal Attitude Scale Score

A higher score is indicative of a higher level of concern for animal welfare, the maximum score achievable is 25. The mean animal attitude scale score for all 167 participants was 20.15 (3.259 standard deviation), see table 14 for mean score per condition.

Table 14: Mean Animal Attitude Scale (AAS) score for participants shown condition 1 (naturalistic) and condition 2 (barren), including standard deviation

<u>Condition</u>	<u>Number of participants</u>	<u>Mean score</u>	<u>Standard deviation</u>
1 (naturalistic)	81	20.25	3.219
2 (barren)	86	20.06	3.313

4. Discussion

4.1. Perception of Naturalistic and Barren Enclosures

The public make judgements on animal welfare at zoos based on what they see (Melfi, McCormick and Gibbs, 2015) and as expected the questionnaire condition significantly affected participant perception of enclosures (Ross, Vreeman and Lonsdorf, 2011). Traditional enclosures tend to be perceived negatively (Yilmaz, Mumcu and Ozbilen, 2010) which was reflected in this study as 85% of participants rated the barren enclosure (condition 2) as poor standard, 35% believed there were no good features, and 76% believed the enclosure size needed improving. However, the naturalistic enclosure (condition 1) was consistently perceived as a good standard, which supports the conception that naturalistic designs are perceived more positively (Melfi, McCormick and Gibbs, 2015; Fàbregas, Guillén-Salazar and Garcés-Narro, 2012) and in turn increases

visitor perceptions of zoos and animal welfare (Davey, 2007). Despite naturalistic enclosures being favoured and regarded as crucial for visitor enjoyment (Yilmaz, Mumcu and Ozbilen, 2010), only 19% of all participants identified 'naturalistic' as a feature a good standard pinniped enclosure should include, and just 22% proposed that naturalistic features would improve the barren enclosure. Observations of 825 visitors found that 59% more time was spent at naturalistic exhibits and visitors passed these enclosures more slowly than traditional (barren) exhibits (Ross et al, 2012). This might suggest that naturalistic enclosures are favoured for being aesthetically pleasing, so when participants were asked what comprises a good standard enclosure for pinnipeds, they did not necessarily regard naturalistic design as a necessary animal welfare aspect. If executed correctly naturalistic enclosures can provide optimal environments to cater for animals psychological and physical needs (Yilmaz, Mumcu and Ozbilen, 2010), however, naturalistic does not necessarily equate to good standard. A study analysing 1,381 naturalistic and non-naturalistic enclosures in 63 Spanish zoos found 22.2% of the naturalistic enclosures were not appropriate for the species housed (Fàbregas, Guillén-Salazar and Garcés-Narro, 2012). Additionally, increasing visitor stay time per enclosure may have welfare implications for pinnipeds; it has been shown increased visitor presence led to seals spending more time submerged under water, appearing to hide from visitors which could indicate stress (Stevens et al, 2013).

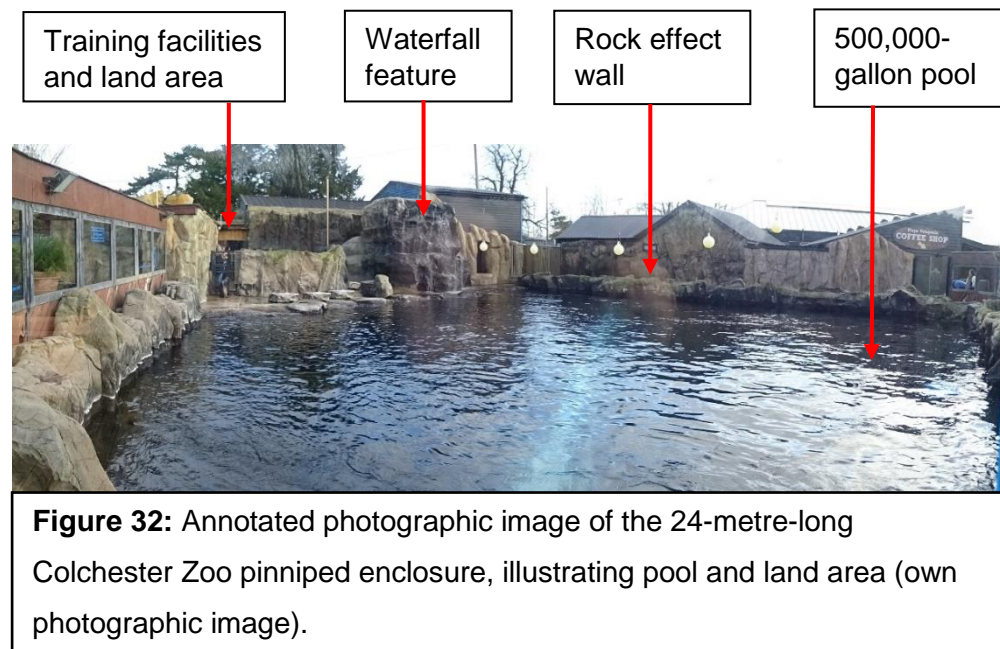
4.2. Perception of Enclosure Quality

It is suggested that people who do not visit zoos are more likely to have a negative perception of zoos and their welfare conditions, compared to a more positive perception from frequent visitors (Davey, 2007; Reade and Waran, 1996). Contrary to this, number of zoo visits did not affect the participants

perception of enclosures, a correlation test would have tested this more accurately, however this was not possible due to categorisation of zoo visit quantities.

4.2.1 Colchester Zoo

Of the 29 UK zoos specified by participants, five had visited the pinniped enclosure at Colchester Zoo which houses five female Patagonian sea lions (*Otaria flavescens*) (Colchester Zoo, 2020), see figures 32 and 33 for enclosure features.



The Colchester enclosure was perceived as a good standard by all five participants, which may be explained by provision of naturalistic features, which visitors place importance on (Reade and Waran 1996). Coinciding with literature

that pinnipeds should be given as much land and water space as possible (DEFRA, 2012), participants most frequently identified enclosure size and provision of water as the features a good pinniped enclosure should include. Three participants felt Colchester's enclosure could be improved if it were larger and provided a larger land area; large

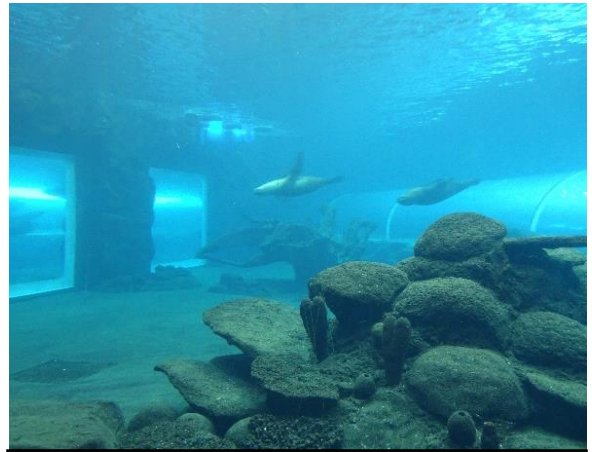


Figure 33: Colchester Zoo pinniped enclosure pool, with viewing tunnel and windows for visitors (own photographic image).

artificial environments that mimic the animal's original habitat are important to visitors (Yilmaz, Mumcu and Ozbilen, 2010). Hiding areas that allow pinnipeds to be out of public view were also identified as an important enclosure feature; distance from the public, particularly from noisy crowds, can reduce animal stress (Davey, 2007; Quadros et al, 2014). However, proximity and interaction with animals entices visitors, therefore distancing or minimising visitor and animal interaction may result in lower visitor attendance (ibid).

4.2.2. Enclosure Enrichment

Reade and Waran's (1996) study found 96% of zoo visitors rated provision of enrichment as highly important, and 98% thought it should be provided. Enrichment was placed as the third most important aspect a good pinniped enclosure should include in this study; perhaps because visitors favour entertaining animals (Carr, 2016), and therefore enjoy watching them interact with enrichment.

At Colchester Zoo enrichment includes games such as fetch, and target training, which is psychologically stimulating (Colchester Zoo keeper, 2020). Behaviours

on command such as laying down, displaying flippers, opening their mouth, and twisting their head are also beneficial for health checks (see figures 34, 35 and 36). While training can strengthen social-cognitive skills and is impressive to visitors, it often does not necessarily challenge physical-cognitive skills (Clark, 2013).



Figure 34: Sea lion laying for health check at Colchester Zoo (own photographic image, 2020).



Figure 35: Sea lion presenting flipper for health check at Colchester Zoo (own photographic image, 2020).



Figure 36: Sea lion opening mouth to check dental health at Colchester Zoo (own photographic image, 2020).

Barren, under-stimulating enclosures with predictable routines limit pinniped expression of behaviour and choice of enrichment (Grindrod and Cleaver, 2001). The enrichment must be relevant and motivating for the individual (Clark, 2013), therefore, dependent on individual preference, various positive reinforcers (food, vocal, or touch) are used during training sessions at Colchester Zoo (Colchester Zoo keeper, 2020). Use of environmental enrichment not only stimulates visitor interest (Watters, Miller and Sullivan, 2010) it also provides opportunity for species-appropriate behaviour which can be beneficial in reducing stereotypies (Miller, Kuczaj and Herzing, 2010). Providing structures to climb (Bonn, 2015), toys, balls and interactive feeders can alleviate boredom and reduce stereotypies by stimulating random swimming and exploration (Hunter et al, 2002; Samuelson et al, 2016; Hocking, Salverson and Evans 2015). Patterned swimming was

reduced by using environmental enrichment with captive common seals (*Phoca vitulina*) (Grindrod and Cleaver, 2001), olfactory enrichment with California sea lions (Samuelson et al, 2016) and a mixture of environmental and food enrichment with Australian sea lions (*Neophoca cinerea*) (Smith and Litchfield, 2010).

Although visitors favour enclosures with enrichment, naturalistic furnishings and novel objects can reduce enclosure visibility and visitors do not want the enrichment to be unsightly (Kutska, 2008). However, a study of 251 participants found that unnaturalistic enrichment did not negatively affect public perception of a polar bear exhibit at Central Park Zoo, New York (Kutska, 2008). Additionally, it has been found visitor interest in naturalistic enclosures is not necessarily compromised when animals are not visible (Davey, 2006). Enrichment is beneficial to animals and results in an overall higher appreciation of zoo exhibits (Kutska, 2008), thus, animal needs and visitor needs can be balanced (Davey, 2006).

4.3. Perception of Pinnipeds in Captivity

Whilst there is increased public concern towards the use of farm and laboratory animals, less attention is given to the use of captive wild animals for entertainment purposes (Fuente et al, 2017). The participants' mean AAS score was 20.15 out of a possible 25 points, indicating high concern for animal welfare (Bradley et al, 2020). Additionally, 48% of participants believed pinnipeds were not suitable for captivity and 43% believed suitability was dependant on enclosure standard. Rising public awareness of ethical issues surrounding animal use, in addition with campaigns against keeping marine mammals in captivity, could be promoting negative perception towards the use of pinnipeds (Jiang, Luck and Parsons, 2007; Shani and Pizam, 2009). It has been suggested

females have less agreeability towards the use of animals (Bradley et al, 2020) and would be interesting to test this regarding pinnipeds, using a more gender-balanced sample.

4.4. Perception of Animal Welfare and UK Legal Requirements for Pinniped Enclosures

The two correct legal features in the survey were: (1) adequate land and pool area must be provided, and (2) the animals must have access to land, 38% of participants selected both of these amongst their other selections. Only two participants selected two features, though neither of them chose a single correct option. Therefore, zero participants solely identified the two correct UK legal requirements for pinniped enclosures. This supports the notion that public knowledge of legal requirements is often poor (Farnworth, Campbell and Adams, 2010) and during questionnaire feedback it was highlighted that some participants had little to no knowledge on pinnipeds. Raising awareness to the legal limitations, and simultaneously increasing public and scientific knowledge and concern for animal welfare, can increase public pressure and encourage legislature improvements (Broom, 2010; Fuente et al, 2017). As has been done previously, with public pressure leading to implementation of world-leading animal welfare laws in the UK (Main and Mullan, 2017).

Furthermore, 60% of participants had higher expectations for the legal requirements than are specified in law, supporting the notion that expectations for animal welfare standards in the UK are high (Main and Mullan, 2017). It is thought the public deem animal welfare and enclosure standards to be an important topic (Fraser, 2009) and research into animal welfare science is an evolving area, leading to continual increases in the understanding of species' needs (BIAZA, 2020). The data indicates that less knowledge on pinniped

enclosure legal requirements coincides with less knowledge on the five welfare needs, as 70% of participants could not identify any of the five animal welfare needs. Similarly, a study asking 120 visitors at a marine park in Canada about their environmental values and beliefs found 62.8% were not aware of captive marine mammal welfare issues (Jiang, Luck and Parsons, 2007). Knowledge on species' needs is beneficial to accurately judge welfare and enclosure standards. Although it is claimed the public prioritise welfare, realistically this is not always the case; a survey of 697 visitors at six public zoos in Korea found visitors generally placed importance on convenience and safety of observing animals, whereas attributes relating to animal welfare had low importance (Lee, 2015).

4.4.1. Zoo-based Education

A study of 190 zoos across 52 countries found zoos prioritised visitor education over scientific research, wildlife conservation and public recreation (Roe, McConney and Mansfield, 2015) and visitors include learning experiences when describing their best wildlife tourism experiences

(Woods, 2015). Zoo-based educational activities such as keeper talks, interactive exhibits and signage (see figure 37) can influence public perception (Wagoner and Jensen, 2010) and



Figure 37: Oregon Zoo Education Centre Exhibit (Discovery Plaza, 2020).

visitors develop an increased positive perception of zoo animals if they are educated on the species during their visit (Fernandez et al, 2009).

Motivation for protecting animals is associated with a feeling of emotional connection towards them, which can occur during zoo visits (Clayton, Fraser and

Saunders, 2009). This motivation provides an opportunity for zoos to educate visitors on animal needs and legal requirements. However, there is limited research on how zoo visitors respond emotionally to specific animals (Myers, Saunders, Birjulin, 2010), and has not yet been measured for pinnipeds. Zoo exhibits are free-choice learning, therefore, predicting or measuring what a visitor may learn from an exhibit is difficult (Kutska, 2008). Additionally, zoos may be reluctant to highlight limitations in legal standards for captive animals, as this may impede public perception of animal welfare in zoos, thus possibly reducing visitor support of zoos.

4.5 Study Limitations

Possible limitations using an online questionnaire that can reduce generality of findings (Smith, 2008) can be seen in table 15.

Table 15: Illustrating potential limitations to this study, including age and gender bias and survey fatigue.

<u>Limitation</u>	<u>Limitation explanation</u>	<u>Effect on this study sample</u>
Age bias	Younger people are more likely to participate than older people (Smith, 2008)	Sixty-four percent of participants were aged 20-25
Gender bias	Females are more likely to participate in surveys (Porter and Whitcomb, 2005)	This sample contained 124 females and 43 males
Survey fatigue	Participants become tired of the questions and cease to participate (Saxon et al, 2003), particularly in long surveys	Twenty-four participants were excluded from analysis as they had not completed enough of the survey

These limitations may have been exacerbated by distributing via Facebook student survey swap webpages. Additionally, people may have chosen not to

participate if they had no knowledge or interest in pinnipeds, as relevance of the survey topic has been shown to influence response rates (Groves, Singer and Corning, 2000).

The survey was launched on the 12th of March 2020. On the 17th of March (by which time the survey had obtained 34 participants) a 'don't know' option was added to questions seven, fifteen and eighteen, following a participant highlighting that the lack of this option had forced them into guessing what the legal requirements are, despite having no knowledge of the subject. It cannot be known how many of the 34 participants were similarly affected or how this may have impacted the results, providing the no-opinion option prevents forcing participants into an arbitrary response (Krosnick, 2002).

5. Conclusion

This study demonstrates that pinniped enclosure design is strongly associated with public perception of enclosure standards, complementing existing literature suggesting that naturalistic enclosures are rated a higher standard than barren enclosures (Melfi, McCormick and Gibbs, 2015; Fàbregas, Guillén-Salazar and Garcés-Narro, 2012). Participant knowledge on legal requirements and the Animal Welfare Act (2006) welfare needs was low, although relevant enclosure features were identified that are important for comprising a good standard pinniped enclosure; enclosure size, water and land provisions and enrichment. This study suggests zoo-based education interventions could be used to improve knowledge on animal needs. Some findings in this study that are trending towards significance, and future research obtaining larger sample sizes would be advantageous to further explore these: (1) whether the public's perception on what is, or should be, legally required is affected by enclosure design (naturalistic

versus barren), (2) whether higher AAS scores (higher welfare concern) results in higher expectations for what should be included in law.

Acknowledgements

Project supervisor: Thank you to Dr Amber de Vere, whom provided continuous guidance and support throughout the project process from start to finish, without which this study would not have been possible.

References

- Ahmad, A., Ali, Z., Nemat, A., Sikander, S., Hussain, Z., and Saleem, K., 2015. The Study of Public Perception for Captive Animals at Lahore Zoo, Pakistan. *The Journal of Animal & Plant Sciences*, [e-journal] 25(3), pp.509-513. Available through: Google Scholar
<https://www.researchgate.net/profile/Zulfiqar_Ali32/publication/282943842_The_study_of_public_perception_for_captive_animals_at_Lahore_zoo_Pakistan/link/s/562386f908aed8dd19487a38/The-study-of-public-perception-for-captive-animals-at-Lahore-zoo-Pakistan.pdf> [Accessed 12 December 2019].
- Al-Heeti, A., 2020. *Grey seals can communicate by clapping, a study finds*. [photographic image] Available at: <<https://www.cnet.com/news/grey-seals-clap-underwater-to-communicate-study-finds/>> [Accessed 20 February 2020].
- Animal Welfare Act, 2006. *Chapter 45 – Animal Welfare Act 2006*. [pdf] Available at: <<file:///C:/Users/holli/AppData/Local/Temp/AWA%202006.pdf>> [Accessed 1 January 2020].

Arthur, K., 2016. *The Five Welfare Needs*. [photographic image] Available at: <<https://dogwellnet.com/content/welfare-legislation/welfare-and-health/vets-speaking-up-for-animal-welfare-bva-animal-welfare-strategy-r448/>> [Accessed 1 December 2019].

Berta, A., 2018. *Encyclopaedia of Marine Mammals*. 3rd ed. [e-book] Massachusetts: Academic Press. Available through: Google Scholar <<https://www.sciencedirect.com/science/article/pii/B9780128043271001990>> [Accessed 2 January 2020].

BIAZA, 2020. *BIAZA Animal Welfare Policy*. [pdf] Available at: <<file:///C:/Users/holli/AppData/Local/Temp/BIAZA%20Animal%20Welfare%20Policy%202020-1.pdf>> [Accessed 21 February 2020].

BIAZA, 2020. *Homepage*. [online image] Available at: <<https://biaza.org.uk/>> [Accessed 11 January 2020].

BIAZA, 2020. *Our Vision*. [online] Available at: <<https://biaza.org.uk/our-vision>> [Accessed 8 January 2020].

BIAZA, 2020. *Requirements for membership of BIAZA*. [pdf] Available at: <file:///C:/Users/holli/AppData/Local/Temp/Requirements%20of%20Membership_vJuly%202019-2.pdf> [Accessed 20 January 2020].

Bradley, A., Mennie, N., Bibby, P., and Cassady, H., 2020. Some animals are more equal than others: Validation of a new scale to measure how attitudes to animals depend on species and human purpose of use. *PLoS One*, [e-journal] 10(1), pp.1-23. Available through: Google Scholar <<https://journals.plos.org/plosone/article/file?id=10.1371/journal.pone.0227948&type=printable>> [Accessed 23 May 2020].

Bristol Zoo, 2020. *Seal and Penguin Coasts*. [online] Available at:
<<https://bristolzoo.org.uk/explore-the-zoo/seal-and-penguin-coasts>> [Accessed 10 May 2020].

Blackpool Zoo, 2020. *Californian Sealion*. [online] Available at:
<<https://www.blackpoolzoo.org.uk/animals/californian-sealion>> [Accessed 10 May 2020].

Blackpool Zoo, 2020. *Homepage*. [online] Available at:
<<https://www.blackpoolzoo.org.uk/>> [Accessed 5 January 2020].

Bonn, W., 2015. *Fowler's Zoo and Wild Animal Medicine. Volume 8. Chapter 44*. [e-book] Missouri: Elsevier Saunders. Available through: Science Direct
<<https://www.sciencedirect.com/science/article/pii/B978145577397800044X>> [Accessed 2 April 2020].

Boogaard., B, Oosting., S, and Bock., B, 2006. Elements of societal perception of farm animal welfare: a quantitative study in The Netherlands. *Livestock Science*, [e-journal] 104(1-2), pp.13-22. Available through: Google Scholar
<<https://www.sciencedirect.com/science/article/abs/pii/S1871141306000667>> [Accessed 16 April 2020].

Broom, D., 2010. Animal welfare: an aspect of care, sustainability, and food quality required by the public. *Journal of Veterinary Medical Education*, [e-journal] 37(1), pp.83-88. Available through: Google Scholar
<<https://jvme.utpjournals.press/doi/abs/10.3138/jvme.37.1.83>> [Accessed 13 May 2020].

Carr, N., 2016. An analysis of zoo visitors' favourite and least favourite animals. *Tourism Management Perspective*, [e-journal] 20(1), pp.70-76. Available through: Google Scholar

<<https://www.sciencedirect.com/science/article/abs/pii/S2211973616300708>>

[Accessed 15 May 2020].

Chapman, A., 2020. *Grey Seal*. [photographic image] Available at:

<[https://www.eyem.com/search/pictures/Horsey?marketScore\[\]=great&marketStatus=commercial&page=1&q=Horsey&replaceQuery=true&sort=relevance](https://www.eyem.com/search/pictures/Horsey?marketScore[]=great&marketStatus=commercial&page=1&q=Horsey&replaceQuery=true&sort=relevance)>

[Accessed 23 February 2020].

Chessington Zoo, 2020. *California Sea Lion*. [online] Available at:

<<https://www.chessington.com/explore/theme-park-zoo/zoo-sea-life/california-sea-lion/>> [Accessed at 10 May 2020].

Clark, F., 2013. *Marine mammal cognition and captive care: A proposal for cognitive enrichment in zoos and aquariums*. [pdf] Available at:

<<file:///C:/Users/holli/AppData/Local/Temp/19-Article%20Text-66-1-10-20130722.pdf>> [Accessed 22 May 2020].

Clayton, S., Fraser, J., and Saunders, C., 2009. Experiences: Conversations, Connections, and Concern for Animals. *Zoo Biology*, [e-journal] 28(5), pp.377-397. Available through: Google Scholar

<https://www.researchgate.net/publication/26887243_Zoo_Experiences_Conversations_Connections_and_Concern_for_Animals> [Accessed 5 April 2020].

Clifford, N., Cope, M., Gillespie, T., and French, S., 2016. *Key Methods in Geography*. 3rd ed. [e-book] London: SAGE Publications. Available through: Google Books

<https://books.google.co.uk/books?hl=en&lr=&id=7hcFDAAAQBAJ&oi=fnd&pg=PA129&dq=using+online+questionnaires+increases+sample+size&ots=TCRPut1Rfw&sig=vkdVjYdEAbAzxr9MmCpDciaD9EE&redir_esc=y#v=onepage&q&f=false>

[Accessed 14 December 2019].

Colchester Zoo, 2020. *Our Animals: Mammals*. [online] Available at:
<<https://www.colchester-zoo.com/animals/mammals/>> [Accessed 10 May 2020].

Colchester Zoo keeper, 2020. *Patagonian sea lion training*. [presentation]
(Personal communication, 7 January 2020).

Council Directive 1999/22/EC. *Council Directive 1999/22/EC of 29 March 1999 relating to the keeping of wild animals in zoos*. [pdf] Available at:
<<file:///C:/Users/holli/AppData/Local/Temp/Council%20Directive%201999%2022%20EC.pdf>> [Accessed 3 January 2020].

Day Out With The Kids, 2019. *Blackpool Zoo*. [photographic image] Available at:
<<https://www.dayoutwiththekids.co.uk/attractions/blackpool-zoo-6ec65328>>
[Accessed 14 December 2019].

Davey, G., 2007. Public Perceptions in Urban China Towards Zoos and Their Animal Welfare. *Human Dimensions of Wildlife*, [e-journal] 12(5), pp.367-374.
Available through: Google Scholar
<<https://www.tandfonline.com/doi/abs/10.1080/10871200701555188>> [Accessed 15 May 2020].

Davey, G., 2006. Relationships between exhibit naturalism, animal visibility and visitor interest in a Chinese Zoo. *Applied Animal Behaviour Science*, [e-journal] 96(1-2), pp.92-102. Available through: Google Scholar
<<https://www.sciencedirect.com/science/article/abs/pii/S0168159105001255>>
[Accessed 2 May 2020].

Davey, G., 2007. Visitors' Effects on the Welfare of Animals in the Zoo: A Review. *Journal of Applied Animal Welfare Science*, [e-journal] 10(2), pp.169-183. Available through: Google Scholar
<<https://www.tandfonline.com/doi/abs/10.1080/10888700701313595>> [Accessed 1 May 2020].

Davis, L., 2012. *London Zoo sea lions*. [online] Available at:
<<https://www.zoochat.com/community/media/london-zoo-sea-lions.176272/>>
[Accessed 10 May 2020].

Dawkins, M., 2006. A User's Guide to Animal Welfare Science. *Trends in Ecology and Evolution*, [e-journal] 21(2), pp.77-82. Available through: Google Scholar
<<https://naturali.campusnet.unito.it/didattica/att/ffc4.9785.file.pdf>> [Accessed 5 March 2020].

DEFRA, 2012. *Zoo Licensing Act 1981 Guide to the Acts provisions*. [pdf]
Available at:
<https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/69595/zoo-licensing-act-guide.pdf> [Accessed 15 December 2019].

DEFRA, 2012. *Secretary of State's Standards of Modern Zoo Practice*. [pdf]
Available at:
<https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/69596/standards-of-zoo-practice.pdf> [Accessed 2 December 2019].

Discovery Plaza, 2020. *Field Trip: Zoo Education Centre & Play Area*.
[photographic image] Available at: <<https://pdxparent.com/field-trip-apr-18/>>
[Accessed 20 May 2020].

Draper, C., and Harris, S., 2012. The Assessment of Animal Welfare in British Zoos by Government-Appointed Inspectors. *Animals*, [e-journal] 2(4), pp.507-528. Available through: Google Scholar <<https://www.mdpi.com/2076-2615/2/4/507/htm>> [Accessed 10 February 2020].

Dudley Zoo, 2020. *Sea Lion / Otaria flavescens*. [online] Available at:
<<https://www.dudleyzoo.org.uk/animal/sea-lion/>> [Accessed 20 May 2020].

EAZA, 2020. *About Us*. [online] Available at: <<https://www.eaza.net/about-us/>> [Accessed 8 January 2020].

EAZA, 2020. *Homepage*. [online image] Available at: <<https://www.waza.org/>> [Accessed 12 January 2020].

Fàbregas, M., Guillén-Salazar, F., and Garcés-Narro, C., 2012. Do naturalistic enclosures provide suitable environments for zoo animals? *Zoo Biology*, [e-journal] 31(3), pp.362-373. Available through: Google Scholar <<https://onlinelibrary.wiley.com/doi/abs/10.1002/zoo.20404>> [Accessed 20 March 2020].

Farnworth, M., Campbell, J., and Adams, N., 2010. Public awareness in New Zealand of animal welfare legislation relating to cats. *New Zealand Veterinary Journal*, [e-journal] 58(4), pp.213-217. Available through: Google Scholar <<https://www.tandfonline.com/doi/abs/10.1080/00480169.2010.68624>> [Accessed 11 December 2019].

Fernandez, E., Tamborski, M., Pickens, S., and Timberlake, W., 2009. Animal–visitor interactions in the modern zoo: Conflicts and interventions. *Applied Animal Behaviour Science*, [e-journal] 120(1-2), pp.1-8. Available through: Google Scholar <https://www.academia.edu/1120958/Animal-visitor_interactions_in_the_modern_zoo_conflicts_and_interventions> [Accessed 10 December 2019].

Finlay, T., James, L., Maple, T., 1988. People's perceptions of animals: the influence of zoo environment. *Environment and Behaviour*, [e-journal] 20(4), pp.508–528. Available through: Google Scholar <https://www.researchgate.net/publication/237966793_People's_Perceptions_of_AnimalsThe_Influence_of_Zoo_Environment> [Accessed 25 April 2020].

Flamingo Land, 2020. *California Sea Lion*. [online] Available at:

<<https://www.flamingoland.co.uk/zoo/animals/mammals/california-sea-lion/>>

[Accessed 10 May 2020].

Fowler, J., Cohen, L. & Jarvis, P., 1998. *Practical Statistics for Field Biology*. 2nd ed. [e-book] Chichester: Wiley-Blackwell. Available through: Google books

<https://books.google.co.uk/books?id=zq9Lyqi3YL4C&printsec=frontcover&dq=Practical+Statistics+f%20or+Field+Biology&hl=en&sa=X&ved=0ahUKEwiYpq_R4KTfAhXKPFAKHfRKDMIQ6AEIKDAA#v=onepage&q=Practical%20Statistics%20for%20Field%20Biology&f=false> [Accessed 20 April 2020].

Fraser, D., 2008. Understanding Animal Welfare. *Acta Veterinaria Scandinavica*, [e-journal] 50(1), pp.1-7. Available through: Google Scholar

<<https://actavetscand.biomedcentral.com/articles/10.1186/1751-0147-50-S1-S1>>

[Accessed 10 December 2019].

Fraser, D., 2009. Assessing animal welfare: different philosophies, different scientific approaches. *Zoo Biology*, [e-journal] 28(6), pp.507-518. Available through: Google Scholar

<<https://onlinelibrary.wiley.com/doi/abs/10.1002/zoo.20253>> [Accessed 12 December 2019].

Fuente, M., Souto, A., Caselli, C., and Scheil, N., 2017. People's perception on animal welfare: why does it matter? *Ethnobiology and Conservation*, [e-journal] 6(18), pp.1-7. Available through: Google Scholar

<<file:///C:/Users/holli/AppData/Local/Temp/155-924-1-PB-1.pdf>> [Accessed 25 April 2020].

Gili, C., and Meijer, G., and Lacave, G., 2018. *EAZA and EAAM Best Practice Guidelines for Otariidae and Phocidae (Pinnipeds)*. [pdf] Available at:

<<https://www.eaza.net/assets/Uploads/CCC/EAZA-EAAM-PinnipedGuidelines-approved.pdf>> [Accessed 20 May 2020].

Grindrod, J., and Cleaver, J., 2001. Environmental Enrichment Reduces the Performance of Stereotypic Circling Behaviour in Captive Common Seals (*Phoca vitulina*). *Animal Welfare*, [e-journal] 10(1), pp.53-63. Available through: Google Scholar

<https://www.researchgate.net/publication/233580534_Environmental_Enrichment_Reduces_the_Performance_of_Stereotypic_Circling_Behaviour_in_Captive_Common_Seals_Phoca_Vitulina> [Accessed 22 April 2020].

Groves, R., Singer, E., and Corning, A., 2000. Leverage-Saliency Theory of Survey Participation: Description and an Illustration. *Public Opinion Quarterly*, [e-journal] 64(3), pp.299-308. Available through: Google Scholar

<<https://academic.oup.com/poq/article/64/3/299/1858441>> [Accessed 18 May 2020].

Hallam, J., 2012. *Skegness Natureland pinniped enclosure*. [photographic image] Available at: <<http://www.jamesalexanderhallam.com/2012/07/21/skegness-natureland-seal-sanctuary/>> [Accessed 14 December 2020].

Hansen, F., Christensen, S., and Lundsteen, S., 2007. *Emotions, Advertising and Consumer Choice*. [e-book] Liber: Copenhagen Business School Press. Available through: Google Books

<https://books.google.co.uk/books?hl=en&lr=&id=g9rXVe6jmiQC&oi=fnd&pg=PA11&dq=advertising+affect+on+consumer+choice&ots=XXWr-TDKEz&sig=edj9LyISh4sr2Lz9oD0RSmlW5Fk&redir_esc=y#v=onepage&q=advertising%20affect%20on%20consumer%20choice&f=false> [Accessed 20 February 2020].

Herzog, H., Grayson, S., and McCord, D., 2015. *Brief Measures of the Animal Attitude Scale*. [pdf] Available at:
<<file:///C:/Users/holli/AppData/Local/Temp/Herzog%202014%20Brief%20Measures%20of%20the%20Animal%20Attitude%20Scale-1.pdf>> [Accessed 25 October 2019].

Hiby, L., Lundberg, T., Karlsson, O., Watkins, J., Jüssi, M., Jüssi, I., and Helander, B., 2007. Estimates of the size of the Baltic grey seal population based on photo-identification data. *NAMMCO Scientific Publications*, [e-journal] 6(1), pp.1-13. Available through: Google Scholar
<<file:///C:/Users/holli/AppData/Local/Temp/2731-Article%20Text-10439-1-10-20131016.pdf>> [Accessed 13 April 2020].

Hocking, D., Salverson, M., and Evans, A., 2015. Foraging-based Enrichment Promotes More Varied Behaviour in Captive Australian Fur Seals (*Arctocephalus pusillus doriferus*). *PLoS One*, [e-journal] 10(5), pp.246-259. Available through: Google Scholar <<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4422692/>> [Accessed 13 May 2020].

Hughes, J., Camden, A., and Scott, T., 2016. Rethinking and Updating Demographic Questions: Guidance to Improve Descriptions of Research Samples. *Journal of Psychological Research*, [e-journal] 21(3), pp.164-204. Available through: Google Scholar
<<https://pdfs.semanticscholar.org/ff22/0054c30a8c2497e6e285add1b32f8e4885e2.pdf>> [Accessed 27 April 2020].

Hunter, S., Bay M., Martin M., and Hatfield, J., 2002. Behavioural effects of environmental enrichment on harbour seals (*Phoca vitulina concolor*) and grey seals (*Halichoerus grypus*). *Zoo Biol*, [e-journal] 21(4), pp.375–387. Available through: Google Scholar

<<https://onlinelibrary.wiley.com/doi/abs/10.1002/zoo.10042>> [Accessed 21 April 2020].

Jenson, J., 2020. *Walrus*. [photographic image] Available at:
<<https://www.pinterest.co.uk/pin/370421138082551963/>> [Accessed 20 February 2020].

Jiang, Y., Luck, M., and Parsons, E., 2007. Public Awareness, Education, and Marine Mammals in Captivity. *Tourism Review International*, [e-journal] 11(3), pp.237-249. Available through: Google Scholar
<<https://www.ingentaconnect.com/content/cog/tri/2007/00000011/00000003/art00006>> [Accessed 15 April 2020].

Kutska, D., 2008. Variation in Visitor Perceptions of a Polar Bear Enclosure Based on the Presence of Natural vs. Un-Natural Enrichment Items. *Zoo Biology*, [e-journal] 28(4), pp.292-306. Available through: Google Scholar
<<https://onlinelibrary.wiley.com/doi/abs/10.1002/zoo.20226>> [Accessed 1 May 2020].

Krosnick, J., 2002. The Causes of No-Opinion Responses to Attitude Measures in Surveys: They Rarely Are What They Appear to Be. *Survey Non-response*, [e-journal] 6(1), pp.88-100. Available through: Google Scholar
<<https://pprg.stanford.edu/wp-content/uploads/2002-The-causes-of-no-opinion-responses-to-attitude-measures-in-surveys-.pdf>> [Accessed 10 April 2020].

Lee, H., 2015. Measurement of visitors' satisfaction with public zoos in Korea using importance-performance analysis. *Tourism Management*, [e-journal] 47, pp.251-260. Available through: Google scholar
<<https://www.sciencedirect.com/science/article/abs/pii/S0261517714002064>> [Accessed 10 May 2020].

Lundberg, T., 2007. *Grey Seal Haul-out*. [photographic image] Available at: <file:///C:/Users/holli/AppData/Local/Temp/2731-Article%20Text-10439-1-10-20131016.pdf> [Accessed 5 April 2020].

Main, D., and Mullan, S., 2017. A New Era of UK Leadership in Farm Welfare. *Veterinary Record*, [e-journal] 181(2), pp.49-50. Available through: Google Scholar <<https://veterinaryrecord.bmj.com/content/181/2/49.abstract>> [Accessed 13 May 2020].

Mann, K., 2018. *Skegness Natureland*. [photographic image] Available at: <https://www.flickr.com/photos/poppynation/42582229620> [Accessed 14 December 2019].

Mason, G., Clubb, R., Latham, N., and Vickery, S., 2007. Why and how should we use environmental enrichment to tackle stereotypic behaviour? *Applied Animal Behaviour Science*, [e-journal] 102(3-4), pp.163-188. Available through: Google Scholar <<https://www.sciencedirect.com/science/article/abs/pii/S0168159106001900>> [Accessed 21 April 2020].

Mason, G., and Latham, N., 2004. Can't stop, won't stop: is stereotypy a reliable animal welfare indicator? *Animal Welfare*, [e-journal] 13, pp.1-13. Available through: Google Scholar <https://atrium.lib.uoguelph.ca/xmlui/bitstream/handle/10214/4716/Mason_%26_Latham_2004.pdf> [Accessed 18 December 2019].

Maxwell, G. 1967. *Seals of the world*. Boston: Houghton Mifflin.

Melfi, V., McCormick, W., and Gibbs, A., 2015. A preliminary assessment of how zoo visitors evaluate animal welfare according to enclosure style and the expression of behaviour. *Anthrozoos*, [e-journal] 17(2), pp.98-108. Available through: Google Scholar

<<https://www.tandfonline.com/doi/abs/10.2752/089279304786991792>>

[Accessed 20 March 2020].

Miller, L., Kuczaj, S., and Herzing, D., 2010. Stereotypic behaviour in wild marine carnivores? *Zoo Biology*, [e-journal] 30(4), pp.365-370. Available through: Google Scholar <<https://onlinelibrary.wiley.com/doi/abs/10.1002/zoo.20347>> [Accessed 20 April 2020].

Myers, O., and Saunders, C., 2002. *Chapter 6: Animals as links toward developing caring relationships with the natural world*. [e-book] Cambridge: The MIT Press. Available through: Google Books <http://playspaces.ru/wp-content/uploads/2016/08/Kahn_Kellert_Children_and_nature.pdf#page=176> [Accessed 2 April 2020].

Myers, O., Saunders, C., and Birjulin, A., 2010. Emotional Dimensions of Watching Zoo Animals: An Experience Sampling Study Building on Insights from Psychology. *The Museum Journal*, [e-journal] 47(3), pp.229-321. Available through: Google Scholar <<https://onlinelibrary.wiley.com/doi/abs/10.1111/j.2151-6952.2004.tb00127.x>> [10 May 2020].

National Ocean Service, 2019. *California Sea Lions*. [photographic image] Available at:

<<https://montereybay.noaa.gov/visitor/access/sealssealionsotters.html>>

[Accessed 23 February 2020].

Ohl, F., and Staay, F., 2012. Animal Welfare: at the Interface between Science and Society. *The Veterinary Journal*, [e-journal] 4(3), pp.13-19. Available through: Google Scholar <<https://www.ncbi.nlm.nih.gov/pubmed/21703888>> [Accessed 20 April 2020].

Pearson, E., Dorrian, J., and Litchfield, C., 2011. Harnessing visual media in environmental education: Increasing knowledge of orangutan conservation

issues and facilitating sustainable behaviour through video presentations.

Environmental Education Research, [e-journal] 17(6), pp.751-767. Available

through: Google Scholar

<https://www.researchgate.net/publication/230764906_Harnessing_visual_media_in_environmental_education_Increasing_knowledge_of_orangutan_conservation_issues_and_facilitating_sustainable_behaviour_through_video_presentations>

[Accessed 3 November 2019].

Pomeroy, P., Redman, P., Ruddell, S., and Twiss, S., 2005. Breeding site choice

fails to explain interannual associations of female grey seals. *Behavioural*

Ecology and Socio-biology, [e-journal] 57, pp.546-556. Available through: Google

Scholar <<https://link.springer.com/article/10.1007/s00265-004-0882-6>>

[Accessed 20 April 2020].

Porter, S., and Whitcomb, M., 2005. Non-response in student surveys: The Role

of Demographics, Engagement and Personality. *Research in Higher Education*,

[e-journal] 46(2), pp.1-26. Available through: Google Scholar

<<https://stephenporter.org/surveys/Nonresponse%20in%20student%20surveys%20RHE%202005.pdf>> [Accessed 10 April 2020].

Quadros, S., Goulart, V., Passos, L., Vecchi, M., and Young, R., 2014. Zoo visitor

effect on mammal behaviour: Does noise matter? *Applied Animal Behaviour*

Science, [e-journal] 15(6), pp.78-84. Available through: Google Scholar

<<https://www.sciencedirect.com/science/article/abs/pii/S0168159114001051>>

[Accessed 8 March 2020].

Reade, L., and Waran, N., 1996. The Modern Zoo: How Do People Perceive Zoo

Animals? *Applied Animal Behaviour Science*, [e-journal] 47(1-2), pp.109-118.

Available through: Google Scholar

<<https://www.sciencedirect.com/science/article/abs/pii/S0168159195010149>>

[Accessed 15 May 2020].

Renouf, D., 2012. *The Behaviour of Pinnipeds*. [e-book] Bristol: Springer.

Available through: Google Books

<https://books.google.co.uk/books?hl=en&lr=&id=_8voCAAQBAJ&oi=fnd&pg=PP9&dq=encourage+natural+diving+behaviour+pinnipeds&ots=9m1CfRI2nu&sig=qArBwBclkvVCilPZ1Pqx24bPGs&redir_esc=y#v=onepage&q&f=false>

[Accessed 8 January 2020].

Rhoads, D., and Goldsworthy, R., 1979. The effects of zoo environments on public attitudes toward endangered wildlife. *International Journal of Environmental Studies*, [e-journal] 13(4), pp.283-287. Available through: Google Scholar

<<https://www.tandfonline.com/doi/abs/10.1080/00207237908709834?journalCode=genv20>> [Accessed 25 April 2020].

Richards, T., 2020. *Great show by these fabulous sea lions*. [photographic image]

Available at: <https://www.tripadvisor.com/LocationPhotoDirectLink-g186332-d216481-i264614142-Blackpool_Zoo-Blackpool_Lancashire_England.html>

[Accessed 1 May 2020].

Rivlin, G., 2015. *First Steps in the Law*. [e-book] Oxford: Oxford University Press.

Available through: Google books

<<https://books.google.co.uk/books?id=B6w7CQAAQBAJ&printsec=frontcover&dq=importance+of+law&hl=en&sa=X&ved=0ahUKEwjTpd3NsK7nAhXISxUIHcm0B7kQ6AEIMTAB#v=onepage&q=importance%20of%20law&f=false>> [Accessed 28

January 2020].

Roe, K., McConney, A., and Mansfield, C., 2015. The Role of Zoos in Modern Society—A Comparison of Zoos' Reported Priorities and What Visitors Believe

They Should Be. *Anthrozoos*, [e-journal] 27(4), pp.529-541. Available through: Google Scholar

<<https://www.tandfonline.com/doi/abs/10.2752/089279314X14072268687808>>

[Accessed 19 May 2020].

Ross, S., Melber, L., Gillespie, K., and Lukas, K., 2012. The Impact of a Modern, Naturalistic Exhibit Design on Visitor Behaviour: A Cross-Facility Comparison.

Visitor Studies, [e-journal] 15(1), pp.3-15. Available through: Google Scholar

<<https://www.tandfonline.com/doi/abs/10.1080/10645578.2012.660838>>

[Accessed 5 May 2020].

Ross, S., Vreeman, V., and Lonsdorf, E., 2011. Specific Image Characteristics Influence Attitudes about Chimpanzee Conservation and Use as Pets. *PLoS ONE*, [e-journal] 6(7), pp.1-5. Available through: Google Scholar

<<https://journals.plos.org/plosone/article/file?id=10.1371/journal.pone.0022050&type=printable>> [Accessed 8 December 2019].

<<https://journals.plos.org/plosone/article/file?id=10.1371/journal.pone.0022050&type=printable>> [Accessed 8 December 2019].

Salas, M., and Manteca, X., 2016. *Can Some Animals Adapt Better to Captivity than Others?* [pdf] Available at:

<https://www.zawec.org/media/com_lazy/pdf/Sheet%20ZAWEC%203.pdf>

[Accessed 2 April 2020].

Samuelson, M., Lauderdale, L., Pulis, K., Solangi, M., Hoffland, T., and Lyn, H., 2016. Olfactory Enrichment in California Sea Lions (*Zalophus californianus*): An Effective Tool for Captive Welfare? *Journal of Applied Animal Welfare Science*,

[e-journal] 20(1), pp.75-85. Available through: Google Scholar

<https://www.researchgate.net/profile/Heidi_Lyn/publication/309828241_Olfactory_Enrichment_in_California_Sea_Lions_Zalophus_californianus_An_Effective_Tool_for_Captive_Welfare/links/5b842da04585151fd13602fd/Olfactory-

<https://www.researchgate.net/profile/Heidi_Lyn/publication/309828241_Olfactory_Enrichment_in_California_Sea_Lions_Zalophus_californianus_An_Effective_Tool_for_Captive_Welfare/links/5b842da04585151fd13602fd/Olfactory-

[Enrichment-in-California-Sea-Lions-Zalophus-californianus-An-Effective-Tool-for-Captive-Welfare.pdf](#)> [Accessed 20 May 2020].

Saxon, D., Garratt, D., Gilroy, P., and Cairns, C., 2003. *Collecting Data in the Information Age: Exploring Web-Based Survey Methods in Educational Research*. [pdf] Available at:

<<https://journals.sagepub.com/doi/abs/10.7227/RIE.69.5?journalCode=riea>>

[Accessed 20 May 2020].

Schreer, J., Kovacs, K., and Hines, R., 2001. Comparative Diving Patterns of Pinnipeds and Seabirds. *Ecological Monographs*, [e-journal] 71(1), pp.137-162.

Available through Google Scholar

<https://www.researchgate.net/profile/Kit_Kovacs/publication/228989267_Comparative_Diving_Patterns_of_Pinnipeds_and_Seabirds/links/5a7ccee4aca272341aed7ced/Comparative-Diving-Patterns-of-Pinnipeds-and-Seabirds.pdf> [Accessed

15 January 2020].

Semantic, 2020. *About the Sanctuary*. [online] Available at:

<<https://sealsanctuary.sealifetrust.org/en/about-the-sanctuary/>> [Accessed 10

May 2020].

Shani, A., and Pizam, A., 2009. Tourists' Attitudes Toward the Use of Animals in Tourist Attractions. *Tourism Analysis*, [e-journal] 14(1), pp.85-101. Available

through: Google Scholar

<https://www.researchgate.net/profile/Amir_Shani/publication/250263644_Tourists'_Attitudes_Toward_the_Use_of_Animals_in_Tourist_Attractions/links/54cdd9310cf298d6565e39bf.pdf> [Accessed 15 May 2020].

Signal, T., and Taylor, N., 2006. Attitudes to animals: Demographics within a community sample. *Society & Animals Journal of Human-Animal Studies*, [e-journal] 14(2), pp.147-157. Available through: Google Scholar

<<https://www.animalsandsociety.org/wp-content/uploads/2016/04/signal.pdf>>

[Accessed 20 April 2020].

Skegness Natureland, 2020. *What we do*. [online] Available at:

<<https://www.skegnessnatureland.co.uk/what-we-do/>> [Accessed 5 January 2020].

Smith, G., 2008. *Does gender influence online survey participation: A record-linkage analysis of university faculty online survey response behaviour*. [pdf]

Available at:

<https://scholarworks.sjsu.edu/cgi/viewcontent.cgi?article=1003&context=elementary_ed_pub> [Accessed 10 April 2020].

Smith, B, and Litchfield, C., 2010. An empirical case study examining effectiveness of environmental enrichment in two captive Australian sea lions (*Neophoca cinerea*). *Journal of Applied Animal Welfare Science*, [e-journal] 13(2), pp.103–122. Available through: Google Scholar

<<https://www.tandfonline.com/doi/abs/10.1080/10888700903371863>> [Accessed 20 May 2020].

Smithsonian, 2020. *California Sea Lion*. [photographic image] Available at:

<<https://nationalzoo.si.edu/animals/california-sea-lion>> [Accessed 20 February 2020].

Smithsonian's National Zoo & Conservation Biology Institute, 2020. *California sea lion*. [online] Available at: <<https://nationalzoo.si.edu/animals/california-sea-lion>> [Accessed 20 February 2020].

Smithsonian's National Zoo & Conservation Biology Institute, 2020. *Grey seal*.

[online] Available at: <<https://nationalzoo.si.edu/animals/gray-seal>> [Accessed 20 February 2020].

Stevens, J., Thyssen, A., Laevens, H., and vervaecke, H., 2013. The Influence of Zoo Visitor Numbers on the Behaviour of Harbour Seals. *Journal of Zoo and Aquarium Research*, [e-journal] 1(1), pp. 23-26. Available through: Google Scholar <<https://jzar.org/jzar/article/view/20>> [Accessed 12 May 2020].

Villegas-Amtmann, S., Costa D., Tremblay Y., Salazar S., Auriolles-Gamboa, D., 2008. Multiple foraging strategies in a marine apex predator, the Galapagos sea lion *Zalophus wollebaeki*. *Marine Ecological Process Series*, [e-journal] 36(3), pp.299-309. Available through: Google Scholar <<https://www.int-res.com/abstracts/meps/v363/p299-309/>> [Accessed 5 February 2020].

Wagoner, B., and Jensen, E., 2010. *Science Learning at the Zoo: Evaluating Children's Developing Understanding of Animals and their Habitats*. [pdf] Available at: <[file:///C:/Users/holli/Downloads/Science_Learning_at_the_Zoo_Evaluating_C\(4\).pdf](file:///C:/Users/holli/Downloads/Science_Learning_at_the_Zoo_Evaluating_C(4).pdf)> [Accessed 12 April 2020].

Waterco, 2016. *California dreaming for Blackpool sea lions*. [photographic image] Available at: <<https://www.poolandspareview.com.au/content/commercial/case-study/california-dreaming-for-blackpool-sea-lions-1064100187>> [Accessed 15 December 2019].

Watters, J., Miller, J., and Sullivan, T., 2010. Note on optimizing environmental enrichment: a study of fennec fox and zoo guests. *Zoo Biology*, [e-journal] 30(6), pp.647-654. Available through: Google Scholar <<https://onlinelibrary.wiley.com/doi/abs/10.1002/zoo.20365>> [Accessed 10 May 2020].

WAZA, 2015. *Committing to Conservation*. [pdf] Available at: <https://www.waza.org/wp-content/uploads/2019/03/WAZA-Conservation-Strategy-2015_Portrait.pdf> [Accessed 7 March 2020].

WAZA, 2020. *About WAZA*. [online] Available at: <<https://www.waza.org/about-waza/>> [Accessed 10 January 2020].

WAZA, 2020. *Homepage*. [online image] Available at: <<https://www.waza.org/>> [Accessed 12 January 2020].

Wells, D., Irwin, R., and Hepper, P., 2006. Lateralised Swimming Behaviour in the California Sea Lion. *Behavioural Processes*, [e-journal]. 73(1), pp.121-123. Available through: Google Scholar <<https://www.ncbi.nlm.nih.gov/pubmed/16682155>> [Accessed 20 April 2020].

West Midland Safari Park, 2020. *Sea Lion Theatre*. [online] Available at: <<https://www.wmsp.co.uk/discovery-trail/>> [Accessed 10 May 2020].

Woburn Safari Park, 2020. *Californian Seal Lion*. [online] Available at: <<https://www.woburnsafari.co.uk/discover/meet-the-animals/mammals/californian-sea-lion/>> [Accessed 10 May 2020].

Wolf, J., Mawdsley, M., Trillmich, F., and James, R., 2007. Social structure in a colonial mammal: unravelling hidden structural layers and their foundations by network analysis. *Animal Behaviour*, [e-journal] 74(10), pp.1293-1302. Available through: Google Scholar <https://www.researchgate.net/profile/Fritz_Trillmich/publication/223898985_Social_structure_in_a_colonial_mammal_unravelling_hidden_structural_layers_and_their_foundations_by_network_analysis/links/5ce3f805a6fdccc9ddc2ced2/Social-structure-in-a-colonial-mammal-unravelling-hidden-structural-layers-and-their-foundations-by-network-analysis.pdf> [Accessed 1 April 2020].

Woods, B., 2015. Good zoo/bad zoo: Visitor experiences in captive settings. *Anthrozoos*, [e-journal] 15(4), pp.343-360. Available through: Google Scholar <<https://www.tandfonline.com/doi/abs/10.2752/089279302786992478>> [Accessed 1 May 2020].

Würsig, B., Perrin, W., and Thewissen, J., 2018. *Encyclopaedia of Marine Mammals*. 3rd ed. [e-book] Massachusetts: Academic Press. Available through: Science Direct

<<https://www.sciencedirect.com/science/article/pii/B9780128043271001503>>

[Accessed 17 April 2020].

Yilmaz, S., Mumcu, S., and Ozbilen, A., 2010. Effects of spatial differences on visitor perceptions at zoo exhibits. *Scientific Research and Essay*, [e-journal] 5(16), pp.2327-2340. Available through: Google Scholar

<https://www.researchgate.net/profile/Sema_Mumcu/publication/267952397_Effects_of_spatial_differences_on_visitor_perceptions_at_zoo_exhibits/links/566310a508ae418a786badc7.pdf> [Accessed 1 May 2020].

Zoo Licensing Act, 1981. *1981 Chapter 37*. [online] Available at:

<<http://www.legislation.gov.uk/ukpga/1981/37>> [Accessed 18 December 2019].

Zootierliste, 2020. *Eared Seals*. [online] Available at:

<<https://www.zootierliste.de/en/?klasse=1&ordnung=115&familie=11515>>

[Accessed 20 May 2020].

Zootierliste, 2020. *Earless Seals*. [online] Available at:

<<https://www.zootierliste.de/en/?klasse=1&ordnung=115&familie=11517>>

[Accessed 20 May 2020].

Zootierliste, 2020. *Walruses*. [online] Available at:

<<https://www.zootierliste.de/en/?klasse=1&ordnung=115&familie=11516&art=21102500&subhaltungen=2>> [Accessed 2 April 2020].

ZSL Whipsnade Zoo, 2019. *ZSL Whipsnade Zoo - January 2019 stocklist*.

[online] Available at: <<https://www.zsl.org/sites/default/files/media/2019-04/ZSL%20Whipsnade%20Zoo%20-%20January%202019%20stocklist.pdf>>

[Accessed 10 May 2020].

Appendices

Appendix 1: Questionnaire Design

Copies of both versions of the questionnaire, condition 1 and condition 2.

Condition 1 illustrates photographic images of a larger, higher standard, more naturalistic pinniped enclosure to participants, condition 2 illustrates a smaller, lower standard, barren pinniped enclosure.

Condition 1

1. What is your gender?

- ☐ Male
- ☐ Female
- ☐ Other
- ☐ Prefer not to say

2. What is your age (in years)?

.....

3. What is your highest education level? Please specify topic and level of education:

.....

.....

4. Have you completed academic study in an animal related subject? Please specify course name and level of education:

.....

.....

5. What industry do you currently work in?

.....

.....

6. Please specify if you have worked with animals in a voluntary or employment basis, including what your general role was, which animal species you worked with and what setting this occurred (i.e. zoo, sanctuary, farm):

.....

.....

The following photographic images display an example of a seal enclosure in a UK zoo:





7. What are the legal requirements for seal / sea lion enclosures in the United Kingdom? Please select all correct answers from the following list:

- ☐ Males and females must be housed separately
- ☐ Adequate pool and land area must be provided
- ☐ The pool length must be a minimum of 3 metres
- ☐ Toys must be provided to play with (e.g. balls)
- ☐ The pool must be a minimum depth of 2 metres at the deepest part of the pool
- ☐ The animals must have access to land
- ☐ No more than 15 animals should be housed in the enclosure
- ☐ The pool must be a minimum depth of 5 metres at the deepest part of the pool
- ☐ The pool length must be a minimum of two metres
- ☐ They must not be housed with other animal species
- ☐ Different enrichments (toys, interactive feeders) should be provided weekly
- ☐ Barriers around the pool must be a minimum of 1.5 metres high
- ☐ A variety of fish should be fed
- ☐ Drinking water must be provided
- ☐ No more than 10 animals should be housed in the enclosure

- They must be provided with salt water to swim in
- They must be provided with weekly training sessions with zoo keepers
- The animals must be health checked by a veterinarian monthly
- One seal/sea lion must never be housed alone
- Don't know

8. Are you aware of the Animal Welfare Act 2006 legislation?

- Yes, and very familiar with its content
- Yes, and familiar with various sections of the content
- I know it exists, but unsure of the content
- No, I have not heard of this legislation

9. What are the five animal needs that must be met? Please list up to five

.....

.....

10. How many times have you visited a Zoo (of which you remember your visit)?

- Never
- 1-5
- 6-10
- 10 +

11. During those visits did you see seals / sea lion enclosures?

- No
- Yes
- Not sure

12. Please list the name of the zoo/aquarium where you most recently saw seals or sea lions:

.....

Please answer questions 13 and 14 with regards to the enclosure you specified in question 12

13. Were you satisfied with the enclosure provided to the seals / sea lions?

- ☐ Yes, it was very good standard
- ☐ Yes, but improvements could have been made
- ☐ No, it was not adequate
- ☐ Not applicable, I have never seen seals / sea lions in captivity

14. If you believed improvements could have been made to that enclosure, please specify what they are:

.....

.....

15. Do you think seals and sea lions are a suitable animal to be kept in captivity?

- ☐ Yes, they are well adapted to captivity
- ☐ It depends on the standard of the enclosure
- ☐ No, they should not be kept in captivity
- ☐ Don't know

16. In your opinion, what features do you think a good standard seal / sea lion zoo enclosure should have?

.....

.....

17. What seal / sea lion enclosure features do you think should be included in legal requirements? Please tick any that apply

- ☐ Minimum enclosure space provided per animal
- ☐ Specific dietary requirements for each life stage
- ☐ Specific measurements for amount of land provided
- ☐ Pool size: length, depth, width
- ☐ Enrichment requirements
- ☐ Scheduled health checks
- ☐ Amount of training conducted
- ☐ Limitations on time interacting with the public
- ☐ Shelter from weather conditions
- ☐ Space provided for the animal to choose to be out of view from the public
- ☐ Materials used to build enclosure
- ☐ Providing a naturalistic enclosure
- ☐ Spaces animals can retreat in enclosure to separate themselves from the other animals in the enclosure
- ☐ Housed in appropriate social structures / groupings
- ☐ Limitations on number of animals housed in one enclosure



18. Looking at the above photographic images of a seal enclosure, do you think this enclosure is a good standard?

- ☐ Yes, it is a good standard
- ☐ Yes, but it could be improved

- No, it is not of a good standard
- Don't know

19. Please list what you believe are good features of the enclosure in the photographic images:

.....

.....

20. Please list what you think could be improved about the enclosure in the photographic images and specify why:

.....

.....

Listed below are a series of statements regarding the use of animals in zoos. Circle the letters that indicate the extent to which you agree or disagree with the statement:

SA = Strongly Agree, A = Agree, U = Undecided, D = Disagree, SD = Strongly Disagree

1. It is morally wrong to hunt wild animals just for sport.

SA A U D SD

2. I do not think that there is anything wrong with using animals in medical research.

SA A U D SD

3. I think it is perfectly acceptable for cattle and hogs to be raised for human consumption.

SA A U D SD

4. Basically, humans have the right to use animals as we see fit.

SA A U D SD

5. The slaughter of whales and dolphins should be immediately stopped even if it means some people will be out of work.

SA A U D SD

6. I sometimes get upset when I see wild animals in cages at zoos.

SA A U D SD

Thank you for completing this survey

Condition 2

1. What is your gender?

- ☐ Male
- ☐ Female
- ☐ Other
- ☐ Prefer not to say

2. What is your age (in years)?

.....

3. What is your highest education level? Please specify topic and level of education:

.....

.....

4. Have you completed academic study in an animal related subject? Please specify course name and level of education:

.....

.....

5. What industry do you currently work in?

.....

.....

6. Please specify if you have worked with animals in a voluntary or employment basis, including what your general role was, which animal species you worked with and what setting this occurred (i.e. zoo, sanctuary, farm):

.....

.....

The following photographic images display an example of a seal enclosure in a UK zoo:





7. What are the legal requirements for seal / sea lion enclosures in the United Kingdom? Please select all correct answers from the following list:

- ☐ Males and females must be housed separately
- ☐ Adequate pool and land area must be provided
- ☐ The pool length must be a minimum of 3 metres
- ☐ Toys must be provided to play with (e.g. balls)
- ☐ The pool must be a minimum depth of 2 metres at the deepest part of the pool
- ☐ The animals must have access to land
- ☐ No more than 15 animals should be housed in the enclosure
- ☐ The pool must be a minimum depth of 5 metres at the deepest part of the pool
- ☐ The pool length must be a minimum of two metres
- ☐ They must not be housed with other animal species
- ☐ Different enrichments (toys, interactive feeders) should be provided weekly
- ☐ Barriers around the pool must be a minimum of 1.5 metres high
- ☐ A variety of fish should be fed
- ☐ Drinking water must be provided
- ☐ No more than 10 animals should be housed in the enclosure
- ☐ They must be provided with salt water to swim in

- They must be provided with weekly training sessions with zoo keepers
- The animals must be health checked by a veterinarian monthly
- One seal/sea lion must never be housed alone
- Don't know

8. Are you aware of the Animal Welfare Act 2006 legislation?

- Yes, and very familiar with its content
- Yes, and familiar with various sections of the content
- I know it exists, but unsure of the content
- No, I have not heard of this legislation

9. What are the five animal needs that must be met? Please list up to five

.....

.....

10. How many times have you visited a Zoo (of which you remember your visit)?

- Never
- 1-5
- 6-10
- 10 +

11. During those visits did you see seals / sea lion enclosures?

- No
- Yes
- Not sure

12. Please list the name of the zoo/aquarium where you most recently saw seals or sea lions:

.....

.....

Please answer questions 13 and 14 with regards to the enclosure you specified in question 12

13. Were you satisfied with the enclosure provided to the seals / sea lions?

- ☐ Yes, it was very good standard
- ☐ Yes, but improvements could have been made
- ☐ No, it was not adequate
- ☐ Not applicable, I have never seen seals / sea lions in captivity

14. If you believed improvements could have been made to that enclosure, please specify what they are:

.....

.....

15. Do you think seals and sea lions are a suitable animal to be kept in captivity?

- ☐ Yes, they are well adapted to captivity
- ☐ It depends on the standard of the enclosure
- ☐ No, they should not be kept in captivity
- ☐ Don't know

16. In your opinion, what features do you think a good standard seal / sea lion zoo enclosure should have?

.....

.....

17. What seal / sea lion enclosure features do you think should be included in legal requirements? Please tick any that apply

- ☐ Minimum enclosure space provided per animal
- ☐ Specific dietary requirements for each life stage
- ☐ Specific measurements for amount of land provided
- ☐ Pool size: length, depth, width
- ☐ Enrichment requirements
- ☐ Scheduled health checks
- ☐ Amount of training conducted
- ☐ Limitations on time interacting with the public
- ☐ Shelter from weather conditions
- ☐ Space provided for the animal to choose to be out of view from the public
- ☐ Materials used to build enclosure
- ☐ Providing a naturalistic enclosure
- ☐ Spaces animals can retreat in enclosure to separate themselves from the other animals in the enclosure
- ☐ Housed in appropriate social structures / groupings
- ☐ Limitations on number of animals housed in one enclosure



18. Looking at the above photographic images of a seal enclosure, do you think this enclosure is a good standard?

- Yes, it is a good standard
- Yes, but it could be improved
- No, it is not of a good standard
- Don't know

19. Please list what you believe are good features of the enclosure in the photographic images:

.....

.....

20. Please list what you think could be improved about the enclosure in the photographic images and specify why:

.....

.....

Listed below are a series of statements regarding the use of animals in zoos. Circle the letters that indicate the extent to which you agree or disagree with the statement:

SA = Strongly Agree, A = Agree, U = Undecided, D = Disagree, SD = Strongly Disagree

1. It is morally wrong to hunt wild animals just for sport.

SA A U D SD

2. I do not think that there is anything wrong with using animals in medical research.

SA A U D SD

3. I think it is perfectly acceptable for cattle and hogs to be raised for human consumption.

SA A U D SD

4. Basically, humans have the right to use animals as we see fit.

SA A U D SD

5. The slaughter of whales and dolphins should be immediately stopped even if it means some people will be out of work.

SA A U D SD

6. I sometimes get upset when I see wild animals in cages at zoos.

SA A U D SD

Thank you for completing this survey

Closing message displayed at the end of the survey in both condition 1 and condition 2:

Thank you for completing this survey.

In case of interest to you:

In the UK there are no legal requirements for minimum enclosure size for captive seals or sea lions.

Legally, the five welfare needs encompassed by the Animal Welfare Act 2006 do apply to seal and sea lions. However, without minimum standards being specifically laid out in law, interpreting the five welfare needs can lead to significant variation in the standards of enclosures provided.

The five welfare needs:



Thank you for taking the time to complete this survey.

Appendix 2: Annotated GenStat Analysis Output

Chi-square Goodness of Fit Test

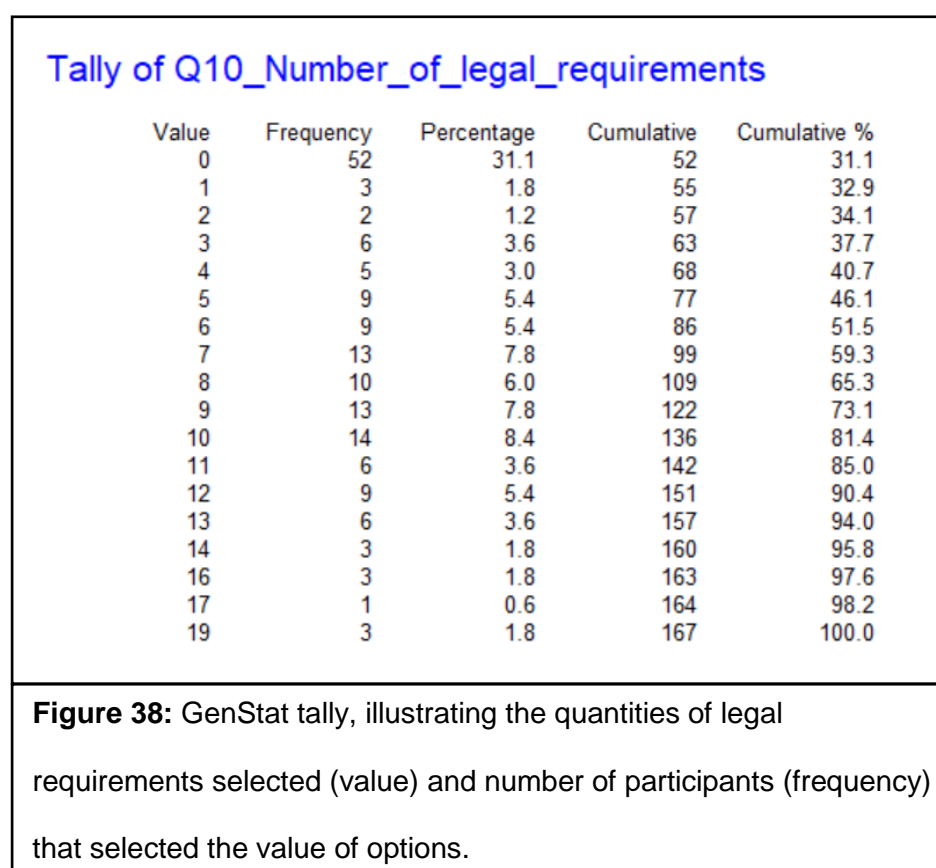
This test was conducted to test both the following hypotheses:

Null Hypothesis (H_0): An insignificant proportion of the participants will have expectations for pinniped enclosure size and quality that exceed legal requirements.

Alternate Hypothesis (H_1): A significant proportion of the participants will have expectations for pinniped enclosure size and quality that exceed legal requirements.

Null Hypothesis (H_0): An insignificant proportion of participants will not know what the legal requirements are for pinniped enclosures.

Alternate Hypothesis (H_2): A significant proportion of participants will not know what the legal requirements are for pinniped enclosures.



The tally (see figure 38) was used to obtain the quantities of legal requirements selected and number of participants that selected each amount options.

Chi-square test for equal proportions within the table

Pearson chi-square value is 215.49 with 17 d.f.

Probability level (under null hypothesis) $p < 0.001$

Figure 39: GenStat statistical output of Chi-square goodness of fit test for total number of legal requirements selected that participants believed were legally required for pinniped enclosures in the United Kingdom.

The Chi-square goodness of fit test (see figure 39) illustrates the features participants believed were legal requirements was significantly different to what is legally required ($\chi^2_{(17)} = 215.49$, $p < 0.001$). The null hypotheses for H_1 and H_2 are rejected ($p < 0.001$). There were two correct legal requirement options, a significant proportion of participants did not choose two requirements and therefore did not know what the legal requirements for pinniped enclosures are. Additionally, instances in which a higher quantity than two options were selected indicates the participants have expectations for pinniped enclosure standards that exceed legal requirements.

Chi-square Test of Association

Chi-square test of association was conducted to test the following hypothesis:

Null Hypothesis (H_0): There will be no significant difference in public perception of enclosure size and quality between participants shown a larger, more naturalistic enclosure than participants shown a smaller, more barren enclosure.

Alternate Hypothesis (H₄): There will be a significant difference in public perception of enclosure size and quality between participants shown a larger, more naturalistic enclosure than participants shown a smaller, more barren enclosure.

The participant perception of enclosure standard is categorised as follows: 1 = 'yes, it is a good standard', 2 = 'yes, but it could be improved', 3 = 'no, it is not of a good standard', 4 = 'don't know.' Condition 1 = naturalistic enclosure and condition 2 = barren enclosure. This data meets the Chi-square test of association assumptions; independent data reflects isolated events and uses frequencies rather than percentages or proportions (Freund, Wilson, and Mohr, 2010).

Chi-square test for association between Q44 _KEY_are_condition_photos_goo and Condition_shown

Likelihood chi-square value is 122.23 with 3 d.f.

Probability level (under null hypothesis) $p < 0.001$

		Observed	Fitted
Q44_KEY_are_condition_photos_goo	Condition_shown		
1	1	27.00	13.58
	2	1.00	14.42
2	1	41.00	23.77
	2	8.00	25.23
3	1	6.00	38.32
	2	73.00	40.68
4	1	7.00	5.34
	2	4.00	5.66

		Residual
Q44_KEY_are_condition_photos_goo	Condition_shown	
1	1	4.88
	2	-7.28
2	1	5.30
	2	-6.85
3	1	-12.39
	2	8.96
4	1	0.99
	2	-1.10

Figure 40: GenStat statistical output illustrating Chi-square test of association for condition shown and participant perception of enclosure.

The Chi-square test of association (see figure 40) shows a significant association between condition shown and public perception of enclosure standard ($X^2_{(3)}=122.23$, $p<0.001$). For condition 1, the majority of participants selected option 1 or 2, perceiving the enclosure as a good standard. For condition 2, the majority of participants selected option 3, they did not perceive the enclosure as a good standard.

Cramer's V coefficient was calculated to quantify the strength of the association:

$$V = \sqrt{\frac{\chi^2}{N(L-1)}}$$

$$V = \sqrt{\frac{122.23}{167 (2-1)}} \quad V = \sqrt{0.73} \quad V = 0.854$$

The coefficient value ($v = 0.854$) is interpreted as a high association between condition shown and public perception of enclosure standard.

Non-parametric Spearman's Rank Correlation

This correlation test was conducted to test the following hypothesis:

Null Hypothesis (H₀): There will be no correlation between public knowledge of the five animal welfare needs encompassed by the Animal Welfare Act 2006 and participant knowledge of pinniped enclosure legal requirements in the United Kingdom.

Alternate Hypothesis (H₃): Public knowledge of the five animal welfare needs encompassed by the Animal Welfare Act 2006, will positively correlate with participant knowledge of pinniped enclosure legal requirements in the United Kingdom.

Spearman's rank correlation coefficient

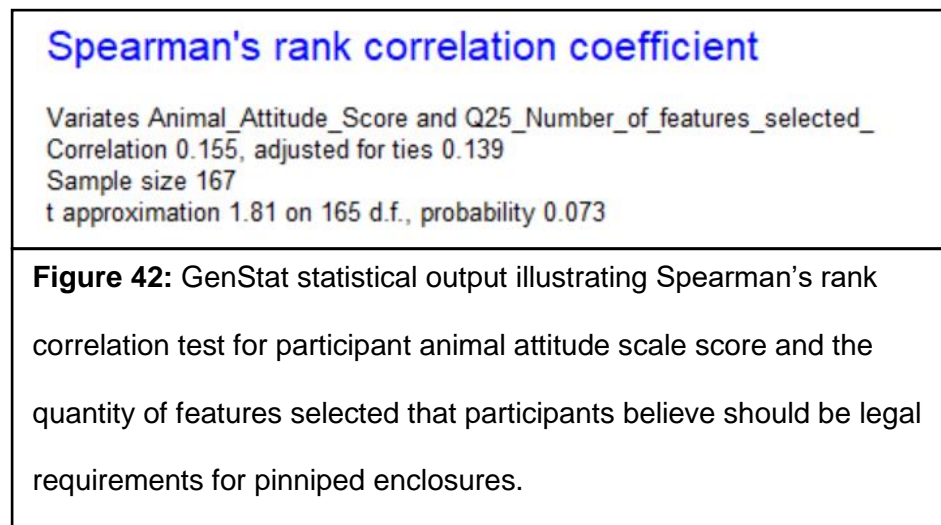
Variates Q12_Number_of_correct_animal_nee and Q10_How_many_wrong_legal_feature
Correlation 0.390, adjusted for ties 0.252
Sample size 167
t approximation 3.34 on 165 d.f., probability 0.001

Figure 41: GenStat statistical output illustrating Spearman's rank correlation test for participant knowledge of the five animal welfare needs and knowledge of pinniped enclosure legal requirements.

The null hypothesis is rejected, there is a significant but weak negative correlation ($r=0.390$, $p<0.001$) between number of correct animal welfare needs identified and number of pinniped enclosure legal requirements incorrectly selected (see figure 41).

The following Spearman's rank correlation test was conducted as a check, to test whether animal attitude score positively correlates with the number of features

selected that participants believe should be included in legal requirements for pinniped enclosures.



The correlation between animal attitude score and participant perception on which features should be legally required for pinniped enclosures was not significant ($p=0.073$) (see figure 42). The p value is below 0.08 which is trending towards significance, perhaps with a larger participant sample this may have been significant. There is a very weak positive correlation ($r=0.155$, $p=0.073$), indicating as animal attitude score increases the number of features selected that participants believe should be included in legal requirements for pinniped enclosures increases.

Independent T-test

The following independent t-tests were conducted as checks.

To test whether condition shown (photographic images) effected the number of legal requirements participants believe are currently or should be legally required for pinniped enclosures. As presenting the photographic images at the beginning of the survey has the potential to effect participant response.

1. Did condition shown effect number of legal requirements selected participants believe are included in law for pinniped enclosures in the United Kingdom?

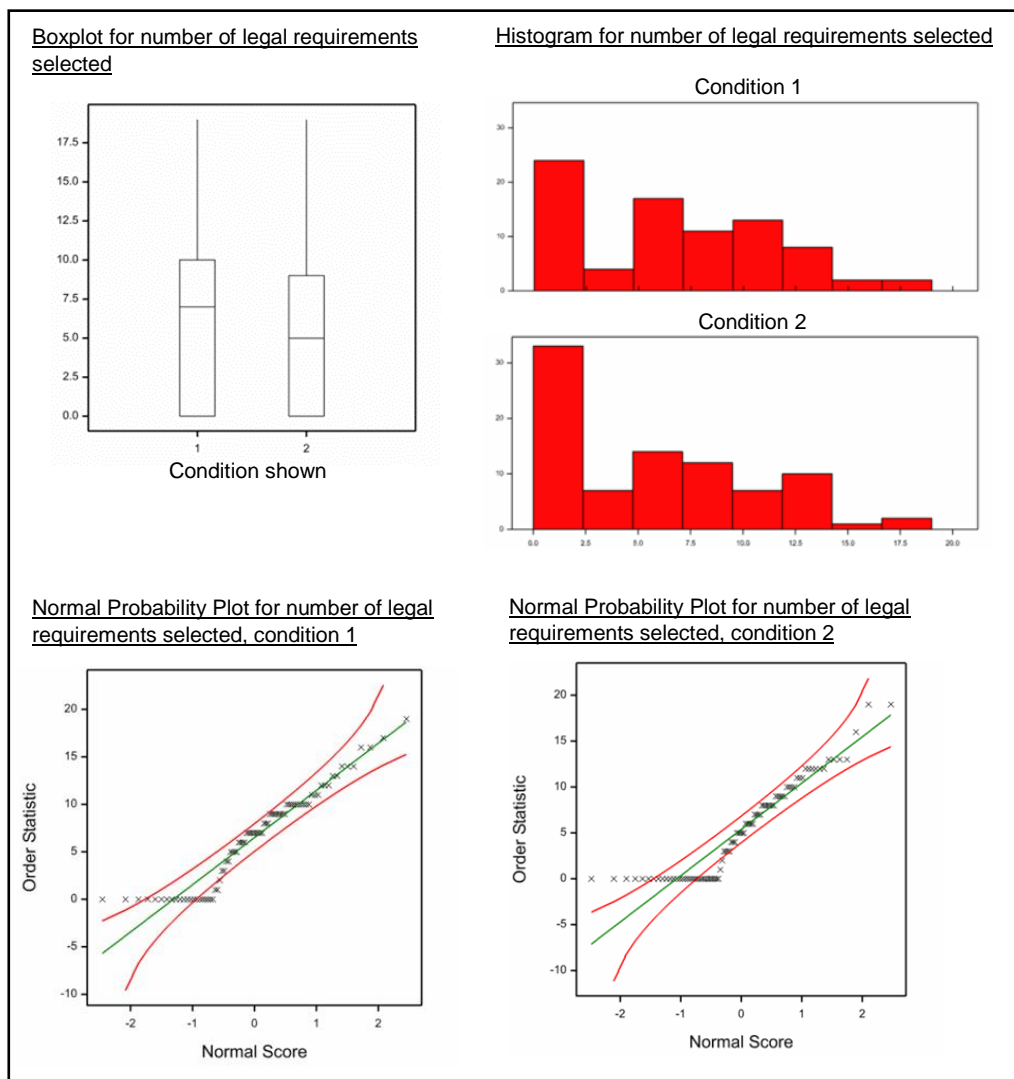


Figure 43: GenStat summary statistics output: Boxplot, Histogram and Normal Probability Plot for number of legal requirements selected for pinniped enclosures that participants believe are legal requirements in the United Kingdom for condition 1 and condition 2.

The summary statistics (see figure 43) were used to assess the data for normal distribution. Ideally there should be symmetry in the boxplot with the median line in the middle of the box and similar length whiskers both sides. The histogram and boxplot distributions show a positive skew, this skew is causing a slight deviation from the assumption. However, the majority of the observations are close to line or within the confidence limits in the normal probability plots and the histogram curve meets the assumptions closely enough to proceed with the t-test.

Two-sample t-test

Variate: Q10_Number_of_legal_requirements
Group factor: Condition_shown

Test for equality of sample variances

Test statistic F = 1.03 on 85 and 80 d.f.

Probability (under null hypothesis of equal variances) = 0.89

Summary

Sample	Size	Mean	Variance	Standard deviation	Standard error of mean
1	81	6.494	25.60	5.060	0.5622
2	86	5.372	26.38	5.136	0.5538

Difference of means: 1.122

Standard error of difference: 0.790

95% confidence interval for difference in means: (-0.4372, 2.681)

Test of null hypothesis that mean of Q10
_Number_of_legal_requirements with Condition_shown = 1 is
equal to mean with Condition_shown = 2

Test statistic $t = 1.42$ on 165 d.f.

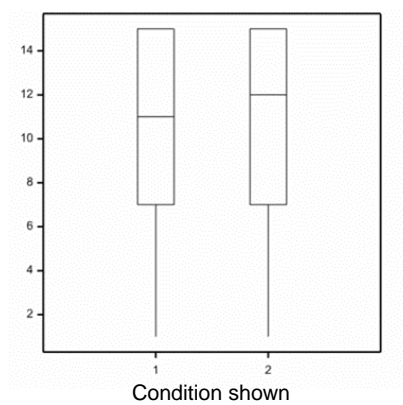
Probability = 0.157

Figure 44: GenStat statistical output of two-sample t-test for number of pinniped enclosure legal requirements selected that participants believe are legally required for pinniped enclosures in the United Kingdom, for condition 1 and condition 2.

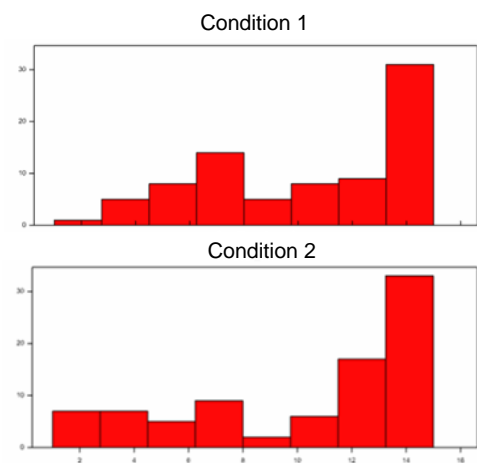
The two-sample t-test result (figure 44) shows there was not a significant difference in number of features selected that participants believe are included in law for pinniped enclosures between the two conditions ($t_{(165)} = 1.42$, $p = 0.157$), with participants in condition 1 (mean = 6.49, s.d. = 5.06, $n = 81$) choosing on average 1.1 more features compared to condition 2 (mean = 5.37, s.d. = 5.13, $n = 86$). From the calculated interval there is 95% confidence that number of features selected in condition 1 are between -0.4 lower and 2.7 higher than condition 2.

2. Did condition shown effect number of features selected that participants believe should be included in law?

Boxplot for number of legal requirements selected



Histogram for number of legal requirements selected



Normal Probability Plot for number of legal requirements selected, condition 2

Normal Probability Plot for number of legal requirements selected, condition 1

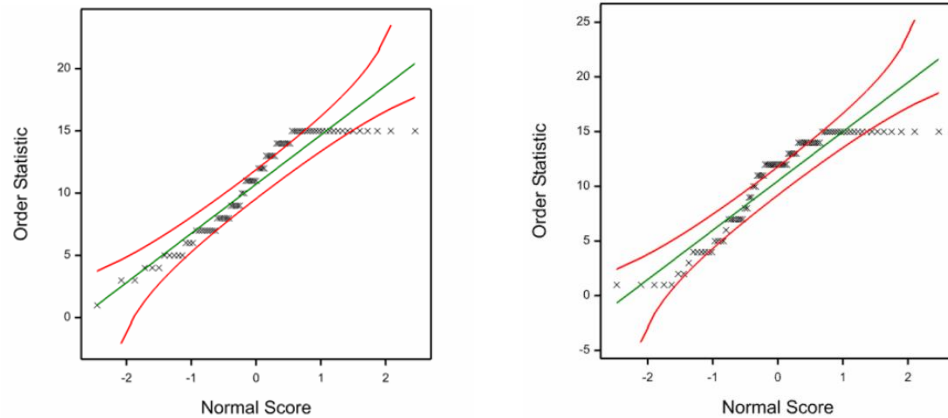


Figure 45: GenStat summary statistics output: Boxplot, Histogram and Normal Probability Plot for number of pinned enclosure legal requirements selected that participants believe should be legally required for pinned enclosures, for condition 1 and condition 2.

The summary statistics (see figure 45) were used to assess the data for normal distribution. Ideally there should be symmetry in the boxplot with the median line in the middle of the box and similar length whiskers both sides and the histogram curve should be bell-shaped. The histogram and boxplot distributions show a negative skew, this skew is causing a slight deviation from the assumption. However, the majority of the observations are close to line or within the confidence limits in the normal probability plots and the histogram curve meets the assumptions closely enough to proceed with the t-test.

Two-sample t-test

Variate: Q25_Number_of_features_selected_
Group factor: Condition_shown

Test for equality of sample variances

Test statistic $F = 1.30$ on 85 and 80 d.f.

Probability (under null hypothesis of equal variances) = 0.24

Summary

Sample	Size	Mean	Variance	Standard deviation	Standard error of mean
1	81	10.72	16.23	4.029	0.4476
2	86	10.49	21.05	4.588	0.4948

Difference of means: 0.228

Standard error of difference: 0.670

95% confidence interval for difference in means: (-1.095, 1.550)

Test of null hypothesis that mean of Q25
_Number_of_features_selected_ with Condition_shown = 1 is
equal to mean with Condition_shown = 2

Test statistic $t = 0.34$ on 165 d.f.

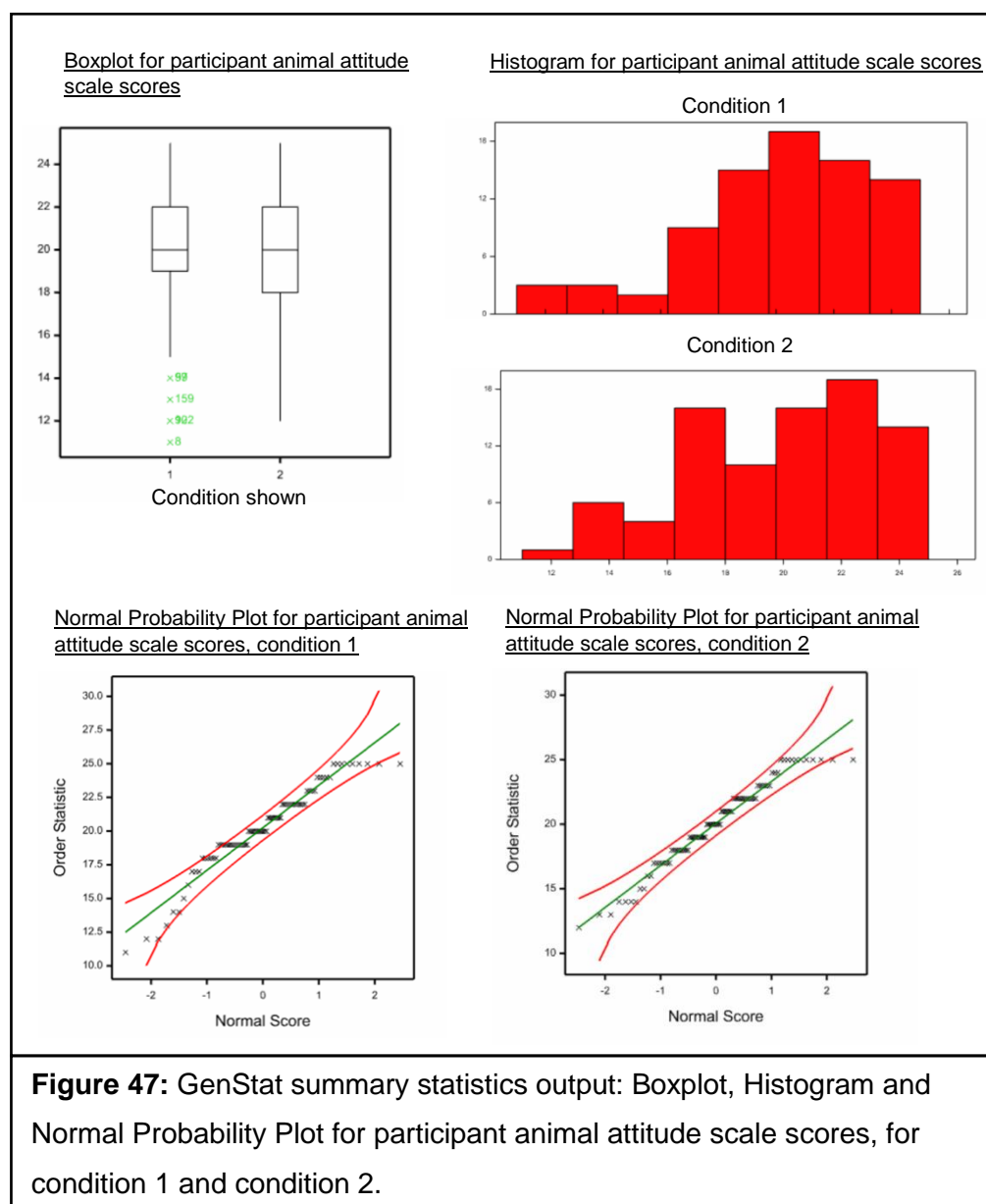
Probability = 0.734

Figure 46: GenStat statistical output of two-sample t-test for number of pinniped enclosure legal requirements selected that participants believe should be legally required for pinniped enclosures, for condition 1 and condition 2.

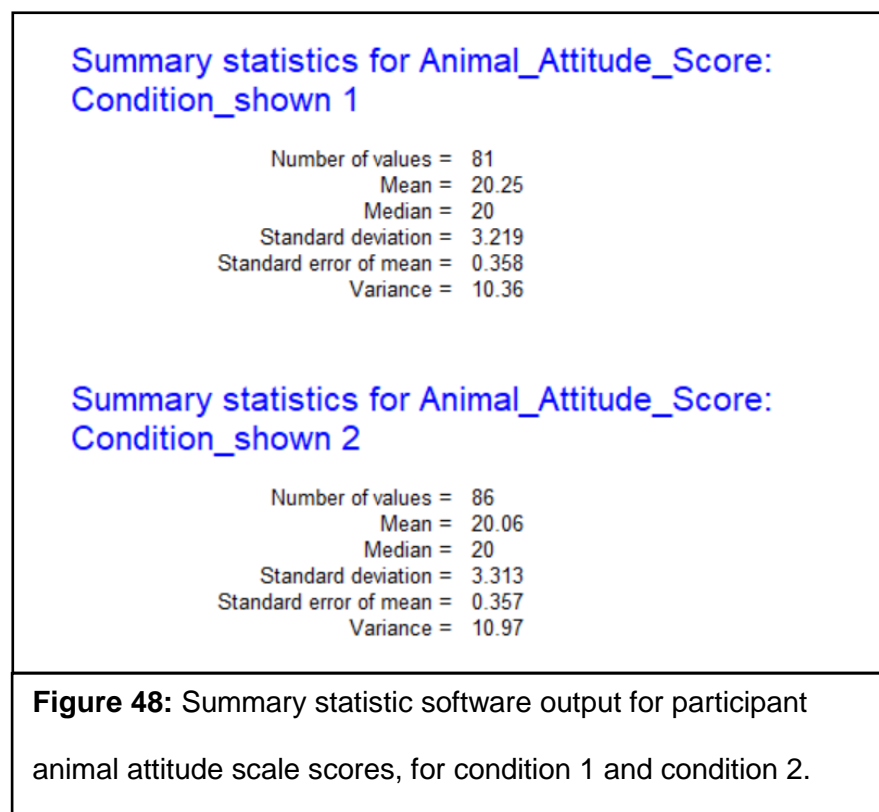
The two-sample t-test results (see figure 46) show there was not a significant difference in number of features selected that participants believe should be included in law between the two conditions ($t_{(165)} = 0.34$, $p = 0.734$). With participants in condition 1 (mean = 10.72, s.d. = 4.03, $n = 81$) choosing on average 0.23 more features compared to condition 2 (mean = 10.49, s.d. = 4.6, $n = 86$). From the calculated interval there is 95% confidence that number of features selected in condition 1 are between -1.09 lower and 1.5 higher than condition 2.

3. Did the condition shown effect the participants animal attitude scale score?

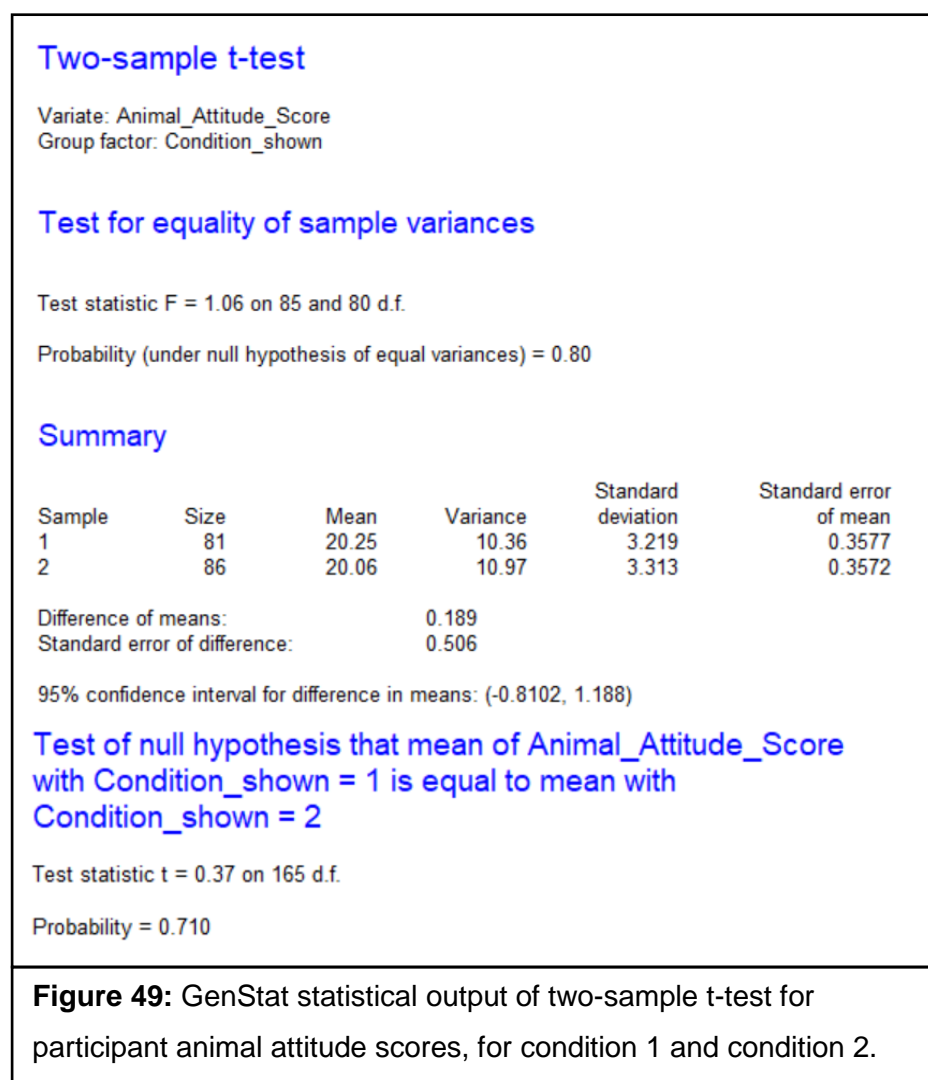
As the animal attitude scale was included in other statistical analysis, this t-test was conducted to check whether the condition shown effected how participants answered the animal attitude scale. As the condition photographic images were presented to the participant prior to completing the animal attitude scale and presentation of information can alter participant response.



The summary statistics (see figure 47) were used to assess the data for normal distribution. Ideally there should be symmetry in the boxplot with the median line in the middle of the box and similar length whiskers both sides and the histogram curve should be bell-shaped. The boxplot and histogram distributions indicate a negative skew, causing a slight deviation from the assumption. However, the majority of observations are close to line and within the confidence limits in the normal probability plots and the histogram curve meets the assumptions closely enough to proceed with the t-test.



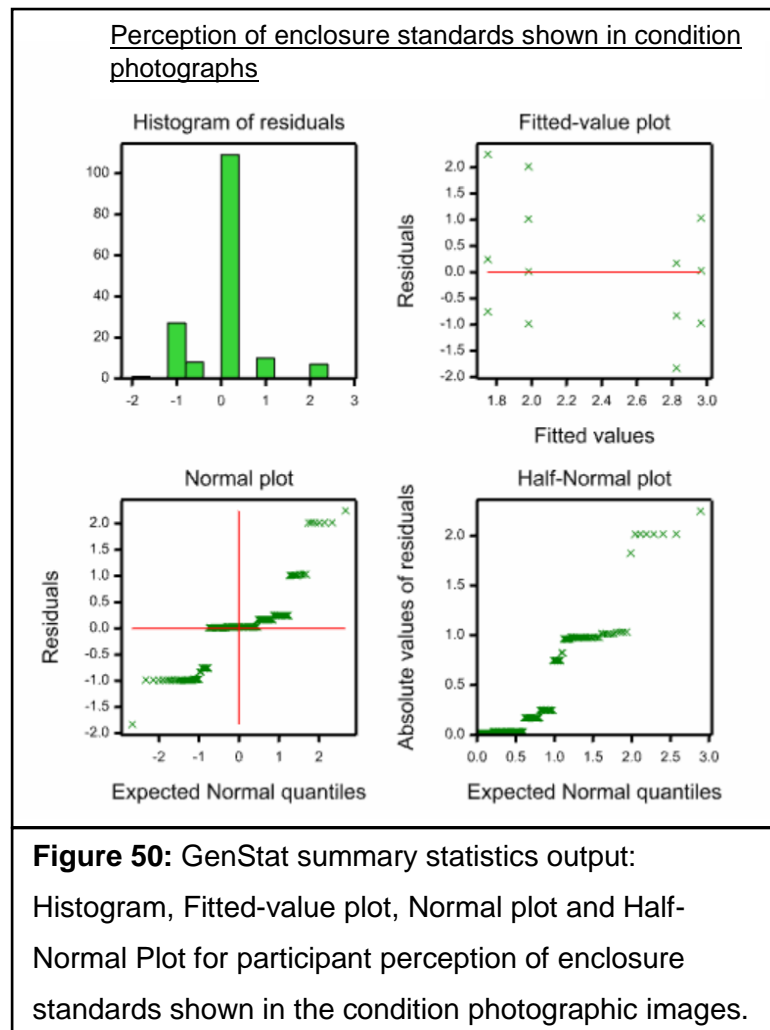
The summary statistics (see figure 48) were used to obtain mean results for participant animal attitude scale scores for condition 1 and condition 2.



The two-sample t-test results (see figure 49) show there was no significant difference in animal attitude score between the two conditions ($t_{(165)} = 0.37$, $p = 0.710$). With participants in condition 1 (mean = 20.25, s.d. = 3.2, $n = 81$) scoring on average 0.19 more compared to condition 2 (mean = 20.06, s.d. = 3.3, $n = 86$). From the calculated interval there is 95% confidence that condition 1 animal attitude scores are between -0.8 lower and 1.2 higher than condition 2. Therefore, the participants AAS scores appear to reflect their underlying attitudes towards animal use as the condition shown did not affect participants animal welfare concern scores.

Two-way Analysis of Variance (ANOVA)

This was conducted as a check to test whether participant perception of enclosure standards was effected by condition shown and number of zoo visits. The five participants that had never visited a zoo were excluded from this test.



The summary statistics (see figure 50) were used to assess the data for normal distribution. Although there are non-homogenous variances on the fitted-value plot and residuals are not following an exact straight line on the normal plot. The residuals on the histogram appear to follow normal distribution closely enough to continue with the two-way ANOVA.

Summary tables of Q44_KEY_are_condition_photos_goo by Condition_shown and Number_of_zoo_visits_for_ANOVA_1

Number_of_zoo_visits_for_ANOVA_1		1		2
		Mean	s.d.	Mean
Condition_shown	s.d.			
	1	1.982	0.9437	1.750
	2	2.966	0.4138	2.826
	0.6757			
	0.4910			
Unknown cell				
	Mean	2.800		
	s.d.	0.4472		

Figure 51: GenStat summary table for participant perception of enclosure standard, condition shown and number of zoos visits the participant has experienced.

Analysis of variance

Source	d.f.	s.s.
Number_of_zoo_visits_for_ANOVA_1 ignoring Condition_shown	1	1.4764
Number_of_zoo_visits_for_ANOVA_1 eliminating Condition_shown	1	1.1590
Condition_shown ignoring Number_of_zoo_visits_for_ANOVA_1	1	41.6626
Condition_shown eliminating Number_of_zoo_visits_for_ANOVA_1	1	41.3452
Number_of_zoo_visits_for_ANOVA_1.Condition_shown	1	0.0708
Residual	158	74.7187
Total	161	117.6111

m.s.	v.r.	F	pr.
1.4764	3.12		0.079
1.1590	2.45		0.119
41.6626	88.10		< 0.001
41.3452	87.43		< 0.001
0.0708	0.15		0.699
0.4729			
0.7305			

Information summary

Design unbalanced, analysed by Genstat regression

Figure 52: GenStat statistical output of Two-way ANOVA for participant perception of enclosure standard, condition shown and number of zoo visits.

The condition shown to the participant significantly effected perception of enclosure standards ($F_{(1,158)}=88.10$, $p<0.001$) (see figure 52). There was no significant effect of number of zoo visits on perception of enclosure standards ($F_{(1,158)}=3.12$, $p=0.079$). Although, a p value of 0.079 can be considered as trending towards significance, if the sample was larger or the data collected was more detailed this may have been significant. The mean results can be seen in the summary table (figure 51). The majority of participants shown the naturalistic enclosure (condition 1) chose option 2 (yes, but it could be improved) as their perception of the enclosure standard (mean=1.982), indicating they perceived the enclosure as a good standard overall. The majority of participants shown the barren enclosure (condition 2) chose option 3 (no, it is not a good standard) as their perception of the enclosure standard (mean=2.966), indicating they did not perceive the enclosure as a good standard. There was no significant effect between the number of zoo visits and the condition shown ($F_{(1,158)}=0.15$, $p=0.699$). No post hoc test was needed as there are two groups in each variable.

Appendix 3: Result Data from Qualtrics

Tables and figures displaying questionnaire data collected via Qualtrics.

Key:

Condition 1 = photographic images of a higher standard naturalistic pinniped enclosure

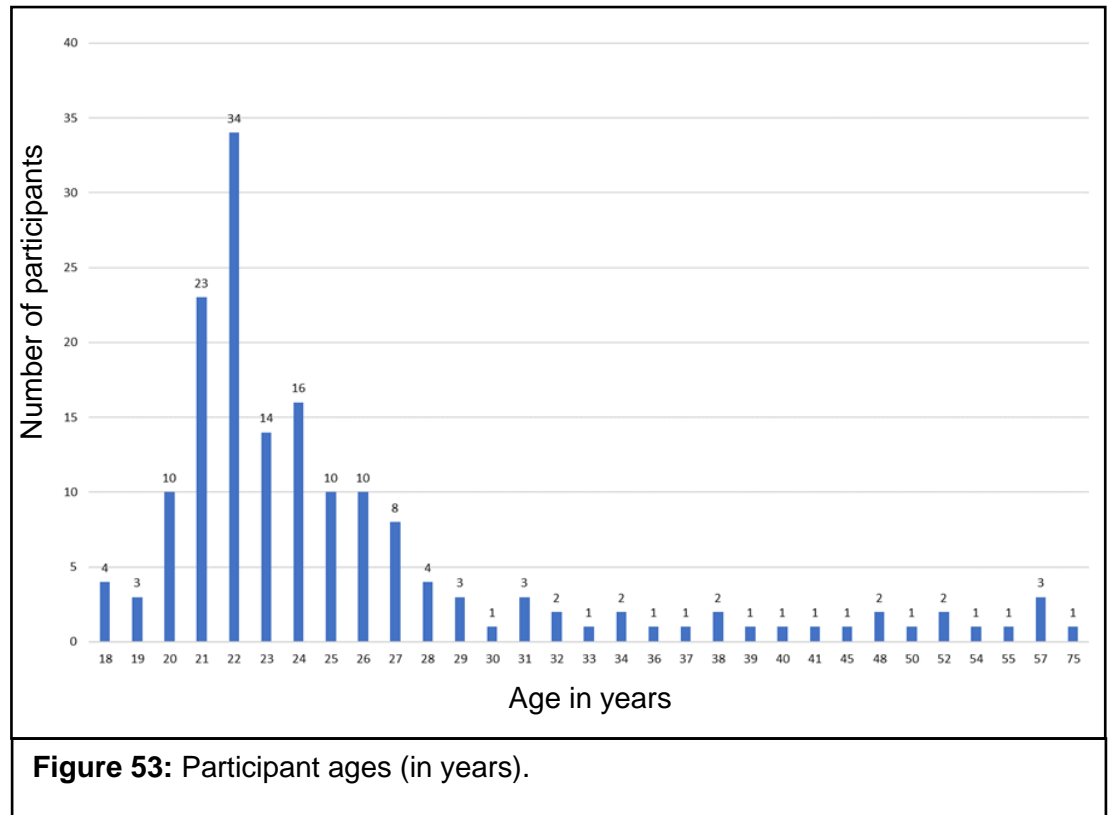
Condition 2 = photographic images of a lower standard barren pinniped enclosure

In total there were 124 female participants and 43 male, with a fairly even split of gender between condition 1 and condition 2, see table 16.

Table 16: Quantities of each gender that participated in the survey, including quantities per condition.

<u>Answer</u>	<u>Condition 1</u>	<u>Condition 2</u>	<u>Total</u>
Female	60	64	124
Male	21	22	43
			167

Participant ages varied from 18 to 75 years of age (see figure 53).



See table 17 for quantities of participants that have or have not completed academic study in an animal related subject.

Table 17: Number of participants that have or have not completed academic study in an animal related subject

<u>Answer</u>	<u>Condition 1</u>	<u>Condition 2</u>	<u>Total</u>
Yes	11	6	17
No	70	80	150
			167

See table 18 for number of participants that have experience working with animals in a voluntary or employment basis.

Table 18: Do participants have experience working with animals in a voluntary or employment basis

<u>Answer</u>	<u>Condition 1</u>	<u>Condition 2</u>	<u>Total</u>
Yes	18	12	30
No	63	74	137
			167

See table 19 for frequencies of occurrence in which each feature that participants believe are legal requirements for pinniped enclosures in the UK were selected.

Table 19: The number of times each feature was selected that participants believe are legal requirements for seal / sea lion enclosures in the United Kingdom

<u>Answer</u>	<u>Condition 1</u>	<u>Condition 2</u>	<u>Total</u>
Adequate pool and land area must be provided	51	44	95
The pool length must be a minimum of 3 metres	33	28	61
Toys must be provided to play with (e.g. balls)	35	22	57
The animals must have access to land	44	35	79
The pool must be a minimum depth of 5 metres at the deepest part of the pool	31	28	59
They must not be housed with other animal species	30	26	56
Drinking water must be provided	27	27	54
They must be provided with saltwater to swim in	24	24	48
The animals must be health checked by a veterinarian monthly	39	34	73
One seal/sea lion must never be housed alone	25	22	47
Different enrichments (toys/interactive feeders) should be provided weekly	21	16	37

Barriers around the pool must be a minimum of 1.5 metres high	23	22	45
A variety of fish should be fed	28	33	61
No more than 15 animals should be housed in the enclosure	31	22	53
The pool length must be a minimum of two metres	10	6	16
No more than 10 animals should be housed in the enclosure	19	24	43
The pool must be a minimum depth of 2 metres at the deepest part of the pool	24	19	43
Males and females must be housed separately	19	19	38
They must be provided with weekly training sessions with zookeepers	13	15	28
Don't know	27	37	64

See table 20 for number of participants that are or are not aware of the Animal Welfare Act 2006 content.

Table 20: Are participants aware of the Animal Welfare Act 2006 legislation

<u>Answer</u>	<u>Condition 1</u>	<u>Condition 2</u>	<u>Total</u>
Yes, and very familiar with the content	3	1	4
Yes, and familiar with various section of the content	5	4	9
I know it exists, but unsure of the content	21	28	49
No, I have not heard of this legislation	52	53	105
			167

See table 21 for how many of the five animal welfare needs participants were able to correctly identify.

Table 21: Number of correct animal needs encompassed by the Animal Welfare Act 2006 legislation each participant listed

<u>Number of correct welfare needs listed</u>	<u>Condition 1</u>	<u>Condition 2</u>	<u>Total</u>
0	56	61	117
1	7	6	13
2	5	7	12
3	5	9	14
4	3	1	4
5 - All five animal needs listed	5	2	7
			167

See table 22 for number of zoo visits each participant can remember their visit.

Table 22: Number of times participants have visited a Zoo (of which they remember their visit)

<u>Answer</u>	<u>Condition 1</u>	<u>Condition 2</u>	<u>Total</u>
Never	1	4	5
1 – 5	56	59	115
6 – 10	11	12	23
10 +	13	11	24
			167

See table 23 for number of participants that have seen a pinniped enclosure during a zoo visit, according to condition.

Table 23: Number of participants that saw a pinniped enclosure during a zoo visit

<u>Answer</u>	<u>Condition 1</u>	<u>Condition 2</u>	<u>Total</u>
Yes	46	46	92
No	24	26	50
Not sure	11	14	25
			167

See table 24 for participant perception on whether pinnipeds are suitable to be kept in captivity.

Table 24: Do participants believe seals and sea lions are a suitable animal to be kept in captivity

<u>Answer</u>	<u>Condition 1</u>	<u>Condition 2</u>	<u>Total</u>
Yes, they are well adapted to captivity	2	1	3
It depends on the standard of the enclosure	37	35	72
No, they should not be kept in captivity	35	46	81
Don't know	7	4	11
			167

See table 25 for features participants believe a good standard pinniped zoo enclosure should have and amount of times each feature was identified.

Table 25: The features participants believe a good standard pinniped zoo enclosure should have (open question answers coded into key words)

<u>Features</u>	<u>Condition 1</u>	<u>Condition 2</u>	<u>Total</u>
Enrichment	18	15	33
Water	26	29	55
Shelter	5	4	9
Hide	7	7	14
Natural	14	17	31
Land	18	13	31
Size	44	44	88
Hygiene	4	4	8
Social	10	12	22
Secure	1	1	2
None specified	18	21	39

See table 26 for the frequency each feature was selected that participants believe should be legal requirements for pinniped enclosures.

Table 26: The number of times each feature was selected that participants believe should be legal requirements for pinniped enclosures

<u>Feature</u>	<u>Condition 1</u>	<u>Condition 2</u>	<u>Total</u>
Minimum enclosure space provided per animal	66	66	132
Specific dietary requirements for each life stage	55	67	122
Specific measurements for amount of land provided	56	62	118
Minimum pool size: length/ depth/ width	70	72	142
Enrichment requirements	51	55	106
Scheduled health checks	72	71	143
Amount of animal training conducted	39	38	77
Limitations on time interacting with the public	60	59	119
Shelter from weather conditions	59	61	120
Space provided for the animal to choose to be out of view from the public	63	61	124
Materials used to build enclosure	44	45	89
Providing a naturalistic enclosure	62	64	126
Spaces animals can retreat in enclosure to separate themselves	56	63	119

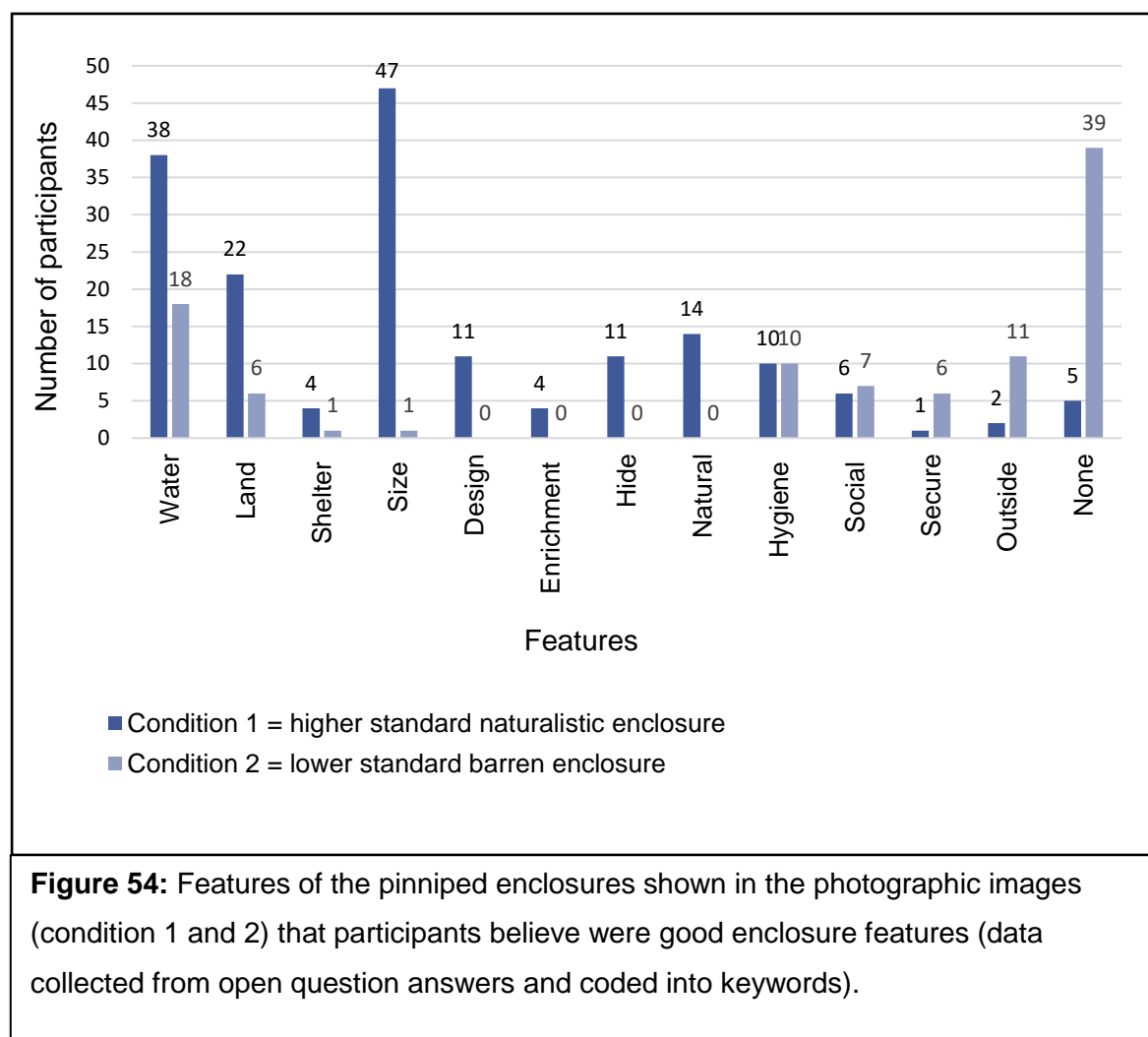
from the other animals in the enclosure			
Housed in appropriate social structures / groupings	58	55	113
Limitations on number of animals housed in one enclosure	58	64	122

See table 27 for public perception on whether the pinniped enclosures shown in each condition were a good standard.

Table 27: Do participants believe the photographic images of a pinniped enclosure shown in the questionnaire are a good standard

<u>Answer</u>	<u>Condition 1</u>	<u>Condition 2</u>	<u>Total</u>
Yes, it is a good standard	27	1	28
Yes, but it could be improved	41	8	49
No, it is not of a good standard	6	73	79
Don't know	7	4	11
			167

See figure 54 for features of the pinniped enclosures shown in the photographic images (condition 1 and 2) that participants believe were good enclosure features.



See figure 55 for features of the condition pinniped enclosures that participants believed could be improved.

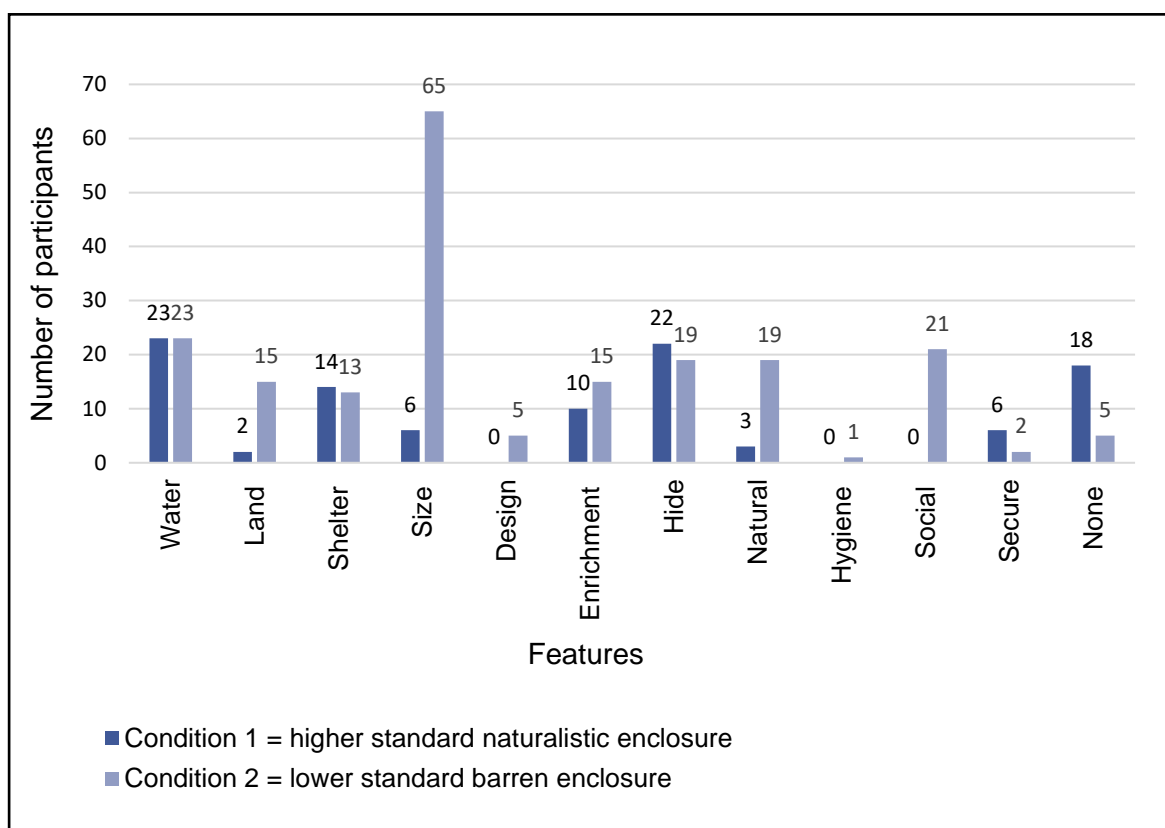


Figure 55: Features of the pinniped enclosure shown in the photographic images (condition 1 or condition 2) that participants believed could be improved (data collected as open question answers and coded into keywords).

Appendix 4: Converting Qualitative Data into Keywords

See table 28 for guidance on how the open-question answers provided by participants when asked to identify good/bad/improvement enclosure features were coded into keywords.

Table 28: List of pinniped enclosure feature keywords, the meaning of the keyword and participant response examples that were categorised as that keyword

<u>Keyword</u>	<u>Keyword meaning</u>	<u>Examples of participant questionnaire responses</u>
Water	Availability and abundance of water	“big pool” “access to water” “place to swim”
Land	Adequate/good provision of land	“plenty of floor for them to lay down” “lots of floorspace”
Size	Relating to overall enclosure size, animals have adequate space	“there is a lot of room” “there is space to distance themselves from each other” “big enclosure”
Enrichment	Provision of items or enclosure structures that provide psychological and physical stimulation	“give them toys” “give them things to play with” “have things to keep them occupied”
Shelter	Shelter from environmental elements is provided	“they have shade” “they can shelter from the weather”
Hide	The animals have areas of privacy to hide from people and other animals in the enclosure	“they can hide from the public” “places to be alone”
Hygiene	The enclosure appears hygienic	“it looks clean” “it isn’t dirty”

Natural	The features (terrain, materials and aesthetic) imitates their natural habitat	"it looks like where they would live in the wild" "they have sand and trees" "waterfall and rocks look like the beach"
Design	The enclosure is aesthetically pleasing and is designed well for the animal needs	"enclosure looks impressive" "interesting design" "well designed"
Social	The animals are in appropriate social groups	"they aren't on their own" "they're not overcrowded" "they have friends" "good number of animals"
Secure	The enclosure is secure preventing animal escapes or the public entering	"big wall to keep animals in" "enclosure looks secure"
Outside	The enclosure has outside space	"they get fresh air" "openness of enclosure is good"
None	No features were specified	"don't know"