

RESEARCH ARTICLE

Evaluating the Conservation Impact of an Innovative Zoo-Based Educational Campaign: ‘Don't Palm Us Off’ for Orang-utan Conservation

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With significant biodiversity loss occurring presently, increased emphasis is being placed upon the capacity of zoos to contribute to species conservation. This paper evaluates an innovative conservation education campaign ‘Don't Palm Us Off’ implemented at Melbourne Zoo, Australia. This sought to address a lack of public awareness regarding palm oil (the product most threatening the survival of the orang-utan) and to create public support for mandatory labeling of palm oil on food products, allowing for informed consumer purchasing. Communication tools utilized included an educational video presentation played on-site, as well as YouTube video, celebrity ambassadors, and social media. Evaluation took place across four time-points: baseline, mid-point, conclusion (12 months), and follow-up. Zoo visitors ($N = 403$) were randomly selected whilst visiting the orang-utan exhibit, completing a questionnaire regarding knowledge about orang-utans, attitudes toward orang-utans, support for palm oil labeling, previous conservation behavior, and intentions for future behavior. Results revealed significant increases in palm oil awareness; attitudes toward orang-utans; support for palm oil labeling; and indicating labeling would influence purchasing behavior, at all times relative to baseline ($P < 0.01$). There were also significant increases in self-reported conservation behavior at the end of the campaign and follow-up ($P < 0.05$). In excess of 160,000 people additionally signed an associated petition for mandatory palm oil labeling. Overall the findings support the efficacy of this multi-faceted initiative; highlighting the importance of continued innovation in zoo-based conservation education and practice (including the integration of emerging technologies with traditional on-site education) to maximize contributions to species conservation. *Zoo Biol.* 33:184–196, 2014. © 2014 The Authors. *Zoo Biology* published by Wiley Periodicals, Inc.

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INTRODUCTION

Environmental issues are one of the most pressing challenges facing humanity at present [Clayton and Brook, 2005]. Human actions are directly contributing to climate change, over-consumption of the earth's limited resources, and a loss of biodiversity [Stern, 1992; Saunders, 2003; Clayton and Myers, 2009; Wich et al., 2011]. The impacts of human behavior and population expansion on other animal species have been particularly significant [McKee, 2009]. The International Union for the Conservation of Nature (based on evaluations of nearly 56,000 different species) suggests that 33% of animal life on earth is presently threatened [IUCN, 2010]. Some have even argued that humans have entered a new geological epoch, the Anthropocene, in recognition of the immense human impacts on the planet and ecology since the industrial revolution [Steffen

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et al., 2007]. One challenge in addressing these issues and seeking to minimize the environmental impact of human actions is education.

Environmental issues are often poorly understood by the general public, due in part to their invisible nature [i.e., it is difficult to perceive the absence of a species from a traditional habitat and impossible to directly view greenhouse gases being emitted into the atmosphere; Moser and Dilling, 2011] and beyond the school or university setting there may be scarce formal opportunities to learn about environmental challenges and the environmental impacts of an individual's actions [Tilbury, 1995; Ballantyne and Packer, 2005]. Increasingly, attention is being placed upon the role of free-choice learning experiences in filling these voids and providing new knowledge and understandings over the life course [Falk, 2005]. In relation to biodiversity loss specifically, much emphasis has been placed upon the potential of reputable zoological parks and aquaria to serve this role in society [AZA, 2011]. Beyond places for entertainment and leisure, zoos are increasingly seeking to build their capacity to educate the public and contribute to a conservation ethic [Ballantyne et al., 2007; Falk et al., 2007].

Learning Opportunities Within the Zoo Environment

Historically, the education and conservation roles of zoos were expected to take place through visits to animal exhibits, where observing animals and their behavior was hoped to inspire appreciation for, and connectedness to, other species [Whitehead, 1995; MacDonald and Gavin, 2010]. Educational outcomes were anticipated as a result of visitors actively reading the signage and viewing the animal displays provided at these exhibits [Andersen, 2003]. Such signage information usually covers aspects of animal biology, taxonomy, lifespan, and sometimes the conservation threats they face in the wild [Fraser et al., 2009]. Evidence for the efficacy of these approaches however is inconclusive, with inconsistent previous research findings. Some authors suggest there is little or no data supporting the educational benefits of zoos [Mazur and Clark, 2001; Tribe and Booth, 2003; Marino et al., 2010], while others emphasize the need for continued improvement in educational practices and evaluation [i.e., Broad and Weiler, 1998]. On the basis of a recent evaluation of visitor understanding about orang-utans and the conservation challenges they face, following a visit to orang-utan exhibits at several Australian zoos [Pearson et al., 2013], the current authors concur with the latter perspective.

In particular, previous studies have suggested traditional zoo signage is often poorly attended to and may miss the most important information required by visitors; not that there is a problem, but what visitors can actually do to help [Falk, 2005]. In response to these challenges, and to enhance traditional approaches, zoos are continually developing new educational techniques and practices, to complement their existing signage and animal displays, and enhance their

conservation outcomes. One technique with growing support for its efficacy is the combination of animal displays, on-exhibit animal training and keeper presentation. In a study of visitors to an otter exhibit, it was demonstrated that training and training with interpretation resulted in greater satisfaction ratings and longer view times than passive viewing or the keeper talk in isolation [Anderson et al., 2003]. Although learning was not directly assessed, it follows logically that longer viewing times provide more learning opportunities. Children have shown similar knowledge benefits from the combination of these processes, with the group who viewed training with an interactive keeper presentation far outscoring children who heard a factual presentation alone or passively viewed an animal training session [Vischer et al., 2009]. This is consistent with the findings of Weiler and Smith [2009] that more layers of interpretation (and different interpretive experience opportunities, i.e., walking along the trail with static displays, attending a keeper talk, interacting with/asking questions of a volunteer guide, or participating in a behind-the-scenes tour) are associated with greater learning. Comparable positive impacts have also been seen through the use of zoo theatre performances or placing costumed interpreters at selected exhibits to provide information to the public and answer questions arising from the viewing experience [Penn, 2009].

Different styles of exhibits are another strategy which may produce increased learning outcomes. Broad and Weiler [1998] compared visitor learning at a traditional tiger zoo exhibit (Western Plains Zoo) with learning at the tiger exhibit at Dreamworld. The former contains a single tiger on exhibit accompanied by a sign providing basic facts about tigers and the specific tiger displayed. The exhibit within the Dreamworld theme park differs greatly, housing multiple tigers in an exhibit with several keepers also present who interact with the tigers and provide information during keeper talks, public interaction, and regular animal behavior shows throughout the day. Results indicated that while three quarters of visitors to each zoo reported learning something from their visit, the depth of understanding was far greater at Dreamworld.

From these findings, it is evident that change and evolution are an important component of enhancing zoo-based education and conservation outcomes into the future. The rest of this paper will discuss an innovative campaign launched at Melbourne Zoo in 2009–2010, which combined zoo experiences and resources with social networking and media in the interests of public education and species conservation.

The 'Don't Palm Us Off' [DPUO] Campaign

The orang-utan is one of the closest living human relatives, yet human actions are currently pushing this species toward extinction [Payne and Prudente, 2008; Wich et al., 2011]. The rainforest habitat of the orang-utan in Borneo and Sumatra is being cleared to produce timber products and plant palm oil crops [Ancorenaz et al., 2010]. As people around the globe purchase these products, they

indirectly (and often unknowingly) contribute to driving greater demand and accelerated habitat loss through their actions as consumers [Goodall and Berman, 2003; Koh and Wilcove, 2007]. In response to these issues, in 2009, Melbourne Zoo launched a conservation campaign named 'Don't Palm Us Off.' There were three goals of this initiative. The first was to use the zoo experience to raise public awareness about what palm oil is, the many products it is contained in, and the impact on rainforests and orang-utans. This and the associated conservation implications are the focus of the present paper. Other goals were to change the food labeling laws in Australia and New Zealand to make palm oil labeling compulsory and to subsequently drive a market need for certified sustainable palm oil.

One of the primary tools utilized to raise awareness was a video which described the links between palm oil and orang-utan habitat destruction, as well as the prolific use of palm oil in food products sold within Australia. The 1 min video was played on a constant loop on a large television screen within the visitor center for the duration of the campaign, ensuring all visitors through the exhibit had an opportunity to learn about this issue. The video was narrated by a prominent Australian TV presenter (Kim Watkins) and featured other TV celebrities (George Calombaris from Masterchef and Claire Hooper from Good News Week) as well as everyday Australian families proclaiming "*we want the choice.*" Petition cards were provided at the exhibit for visitors to sign in support of mandatory palm oil labeling.

The campaign also extended beyond Zoos Victoria, with several other Australian Zoos launching their own awareness campaigns and the video being made publicly available on YouTube (this can be seen at: <http://www.youtube.com/watch?v=oRQWj4H9nH0>) and screening on free-to-air television in Australia on Channel Ten during the campaign. Awareness was further enhanced by a Melbourne Zoo website, which provided information about the palm oil issue, links to conservation organizations, and an online petition which could be signed by zoo visitors and other members of the public alike. Palm oil wallet cards were also made available to visitors to the Zoo or the Zoo website in hard and/or soft-copy which explained to consumers the common product names under which palm oil can be listed (i.e., sodium lauryl sulfate, sodium laureth sulfate). Social networking was additionally utilized with pages established on Facebook to further disseminate the message. The campaign received national media coverage with segments on the 7 PM Project (a television news program in Australia) and national radio.

As this campaign is the first of its kind within Australia, the research sought to explore its effectiveness. Specifically, groups of visitors were sampled at four different time points to evaluate changes in visitor responses as the campaign progressed. Outcome variables included:

- Visitor satisfaction with their experience.
- General knowledge about orang-utans.

- Specific knowledge about the main threats to wild orang-utan populations.
- Attitudes toward orang-utans.
- The subjective norm (visitors rating of the importance of orang-utan conservation to friends and family).
- Support for palm oil labeling.
- Palm oil purchasing.
- General commitments to support orang-utan conservation.

MATERIALS AND METHODS

The research received ethics approval from the University of South Australia Human Research Ethics Committee (P029/09) and the research/ethics panel at Zoos Victoria.

Procedure

Four data collection sessions took place at Melbourne Zoo to evaluate the impact of the campaign. The first of these was a baseline measure and took place 6 months prior to the campaign commencing. The second took place at 6 months (or halfway) into the campaign. The third was held nearing 12 months into the campaign, to evaluate the full impact as the campaign reached its conclusion. The fourth and final session was then conducted 6 months after the campaign ended to determine whether there was any lasting influence. For each session the data collection procedure was held constant. Data were always collected on a Friday and Saturday to balance the different visitor demographics expected on weekdays compared with weekends and there was no extreme weather during the data collection periods. All surveys were distributed at the orang-utan exhibit at Melbourne Zoo between 10 AM and 4 PM on data collection days.

Participation was voluntary and for eligibility in the research visitors were required to be above 18 years of age and have adequate English proficiency. Visitors were also required to have at least paused momentarily and oriented their gaze toward the orang-utan exhibit (i.e., they stopped to view the exhibit). Visitors were selected upon entering the enclosed visitor viewing area, which provided viewing to three distinct enclosures as well as a TV monitor and interactive touch-screen computers. It is important to note the 'Don't Palm Us Off' video only screened within the visitor center during the campaign (i.e., at data collection times two and three). Visitors were then monitored to ensure they had viewed one of the orang-utan exhibits and were approached for participation in the research as they turned to exit or after several minutes had elapsed. Upon completing the anonymous surveys, visitors placed these in a clearly marked "return" box, which was located within the visitor center.

Materials

Upon volunteering to take part in the research, participants were provided with a survey pack. This

contained an information sheet as well as several separate survey sections, discussed below as relevant to this study.

Visitor satisfaction

Visitors were asked to indicate their satisfaction with their visit to the orang-utan enclosure across three individual items. Responses ranged from (1) dissatisfied to (5) satisfied and considered: (a) their satisfaction with the overall experience; (b) their satisfaction with the activity level of the orang-utans; and (c) their satisfaction with the size and features of the exhibit.

Knowledge about orang-utans

General knowledge about orang-utans was assessed using a 10-item multiple choice quiz. This covered basic aspects of orang-utan behavior and ecology, as well as understanding of conservation threats, consistent with the type of information often provided on zoo signage. Two specific items were expected to be particularly influenced by the 'Don't Palm Us Off' campaign: Question 8 which assessed understanding of the major threat to wild orang-utan populations (habitat loss); and Question 10 which explored knowledge of the product most threatening the survival of the orang-utan (palm oil). As such, these items were considered individually, as well as the overall knowledge scores.

Attitudes toward orang-utans

Attitudes toward orang-utans were measured using a 10-item adaptation of the Animal Attitude Scale [Herzog et al., 1991]. While the original scale assesses general attitudes toward animals, the modified scale was designed to capture attitudes toward orang-utans specifically. The scale has acceptable psychometric properties and has been used previously in research exploring and documenting changes in attitudes toward orang-utans and their conservation [Pearson et al., 2011]. Participants responded on a 5-point Likert scale ranging from strongly disagree (1) to strongly agree (5). Negatively worded items were reversed prior to analysis such that a higher score indicates more positive attitudes toward orang-utans. Possible scores range from 10 to 50.

Subjective norm

As the campaign sought to widely disseminate information about the plight of orang-utans in the wild and the consequences of the growing palm oil industry, it was expected this may influence the level of concern about orang-utan conservation in the wider community. Subsequently, a subjective norm measure was included to track these changes over time and since theoretical models (such as the theory of planned behavior) link norms around an issue to intentions for future behavior [Ajzen, 1991]. Participants were asked to indicate how important they felt the issue of orang-utan conservation was to their friends and family [the groups expected to exert the greatest social influence; Terry

et al., 2000]. Possible responses ranged from unimportant (1) through to highly important (4), with an unsure response category also provided.

Support for palm oil labeling

Participants were asked two questions to directly assess their support for palm oil labeling: (1) At present it is not compulsory for palm oil products to be labeled, would you prefer the government to change legislation to mandate labeling of palm oil products? (2) If palm oil products were labeled would this influence your purchasing decisions as a shopper? Participants provided a yes, no, or unsure response.

Previous behavior and commitments to support orang-utan conservation

Participants were asked to report whether in the previous 12 months they had engaged in any behaviors to support orang-utan conservation (donations, avoiding palm oil products, or purchasing behind the scenes zoo tours with proceeds supporting conservation projects). This was included to gain a baseline for prior conservation support. Following their zoo visit, participants were asked whether they would be willing to change their future behavior to support orang-utan conservation (yes, no, or unsure) and whether they felt their visit would directly impact on their future conservation behavior (yes or no). During the campaign (i.e., data sessions two and three) participants were also asked whether they had/would complete a 'Don't Palm Us Off' petition post-card during their visit. The card image is depicted in Figure 1 below along with the banner of support from the campaign launch. Petition cards were self-addressed to Melbourne Zoo and could be placed in a return box or mailed back. On the back of the card participants were asked to tell Food Standards Australia and New Zealand they wanted a choice regarding what they purchased. A space was



Fig. 1. 'Don't Palm Us Off' Petition Postcards (left) and the 'Don't Palm Us Off' banner of support (right) which was displayed at the exhibit during the campaign.

provided for their name and address to indicate their support for mandatory palm oil labeling.

Demographic information

Visitors also provided background and demographic information including: age category (18–30, 31–50, or ≥ 51 years old); gender; education level (whether participants had completed an undergraduate university degree); whether they identified as vegetarian; and whether they were a pet owner, from a rural location, had visited a zoo in the previous 12 months, or had visited orang-utans in their natural habitat. This information was important to determine the comparability of the visitors at different sampling time points across the campaign and, as conceptually or on the basis of previous research, these were considered likely to influence pro-animal attitudes and/or behavior [i.e., Plous, 1991; Driscoll, 1992; Pifer, 1996; Lukas and Ross, 2005; Signal and Taylor, 2007; Ross and Gillespie, 2009; MacDonald and Gavin, 2010]. As the campaign did not run in every Australian state or in other countries, visitors were also asked to indicate if they were an interstate or overseas visitor.

Participants

A total of 403 participants took part in the research (92 during the baseline, 103 at DPUO 6 months, 100 at DPUO 12 months, and 108 during the follow-up). The survey acceptance and return rate was very high across all data collection sessions, suggesting the sample is representative of typical Melbourne Zoo visitors (93%, 94%, 94%, and 91%, respectively). The exhibit structure at Melbourne Zoo is likely an important factor in this high acceptance and return rate, with a large visitor center where participants could sit in a sheltered area and complete the survey, while still viewing the orang-utans or the adjacent siamang exhibit. A full demographic profile of each sample is provided in Table 1 below. Consistent with zoo visitor characteristics reported at other Australian Zoos [Frede, 2008] and by the Association of Zoos and Aquariums [AZA, 2011], the majority of visitors at

all time points were female. Approximately three quarters were pet owners and while approximately one-fifth of visitors were zoo members, a high proportion also came to visit Melbourne Zoo from interstate and overseas [relatively high levels of international zoo visitation to Australian Zoos were also reported in Smith, 2013].

Analysis of Data

As the purpose of this research was to identify the influence of the ‘Don’t Palm Us Off’ campaign on a range of knowledge, attitudinal, and behavioral measures it was necessary to ensure any differences between time points were due to campaign effects rather than differences in sample characteristics. As reflected in Table 1, chi square analysis was used to determine whether there were significant differences in visitor characteristics across time points. Where this difference was significant (i.e., visitors from a rural location and international visitors), these variables were controlled for consistently in all statistical analysis. Visitor satisfaction variables which differed significantly across time points were also controlled for in the analysis of data (i.e., satisfaction with orang-utan activity level; see section below). Statistical analysis was performed using ANCOVA and binary logistic regression. Only significant predictors and time are included and reported in final models. For behavioral variables which had a yes, no, or unsure response, the regression predicts yes responses, with no and unsure pooled together.

Visitor satisfaction

Visitor satisfaction scores with their overall experience, orang-utan activity levels, and the size and features of the exhibit were consistently high at Melbourne Zoo across the data collection periods. As reflected in Table 2, mean scores for all satisfaction variables were above four on a five-point scale. There was no significant difference in overall experience satisfaction between time points ($F_{3,396} = 0.35$, $P > 0.05$). A small significant difference between time points

TABLE 1. Participant characteristics across time

	Baseline	DPUO 6 months	DPUO 12 months	Follow-up	$\chi^2(3)$
Gender (female)	67.4%	68%	65.3%	76.2%	3.31
University education	49.5%	41.9%	53.8%	49.0%	2.82
Age (18–30)	44.6%	38.0%	50.5%	38.1%	9.89
Age (31–50)	44.6%	46.0%	35.1%	38.1%	
Age (51+)	10.9%	16.0%	14.4%	23.8%	
Vegetarian	12.1%	11.1%	10.4%	3.8%	5.16
Pet owner	75.8%	75.8%	77.3%	77.1%	0.11
Zoo member	19.8%	26.3%	13.5%	19.2%	5.00
Zoo visit <12 months ago	48.4%	51.5%	52.6%	61.5%	3.86
Visited natural habitat	7.6%	10.9%	8.2%	3.7%	3.98
Reside/d in a rural location	34.1%	43.4%	47.9%	27.6%	10.64 ^a
International visitors	6.6%	6.1%	10.3%	1.0%	8.15 ^a
Interstate visitors	30.8%	22.2%	26.8%	23.8%	2.11

^aDenotes there was a significant difference in the proportion of visitors within the given category across the four time-points ($P < 0.05$).

TABLE 2. Mean scores and standard deviations for satisfaction variables by time

	Baseline	DPUO 6 months	DPUO 12 months	Follow-up
Overall experience	4.6 (0.80)	4.67 (0.68)	4.71 (0.75)	4.70 (0.69)
Orang-utan activity	4.18 (1.10)	4.41 (0.93)	4.59 (0.76)	4.43 (0.86)
Size and features of the exhibit	4.45 (0.93)	4.62 (0.77)	4.76 (0.52)	4.71 (0.64)

was observed for satisfaction with orang-utan activity ($F_{3,396} = 3.13$, $P = 0.026$) and satisfaction with the size and features of the exhibit ($F_{3,396} = 2.89$, $P = 0.035$). As the assumption of homogeneity of variances was violated, Dunnett T3 post hoc tests were conducted. The mean score for satisfaction with orang-utan activity levels was significantly higher ($P = 0.023$) at DPUO 12 months ($M = 4.58$, $SD = 1.10$) than in the baseline ($M = 4.18$, $SD = 0.76$). All other comparisons were non-significant ($P > 0.05$).

RESULTS

Knowledge About Orang-utans

Zoo visitor scores on the global knowledge about orang-utans 10-item multiple choice quiz remained relatively stable (between 5.82 and 6.16) across each time point (as seen in Fig. 2A). An ANCOVA was conducted to determine whether there was an effect of time on scores. The covariate, being an international visitor, was significantly related to knowledge levels, with international visitors scoring lower on

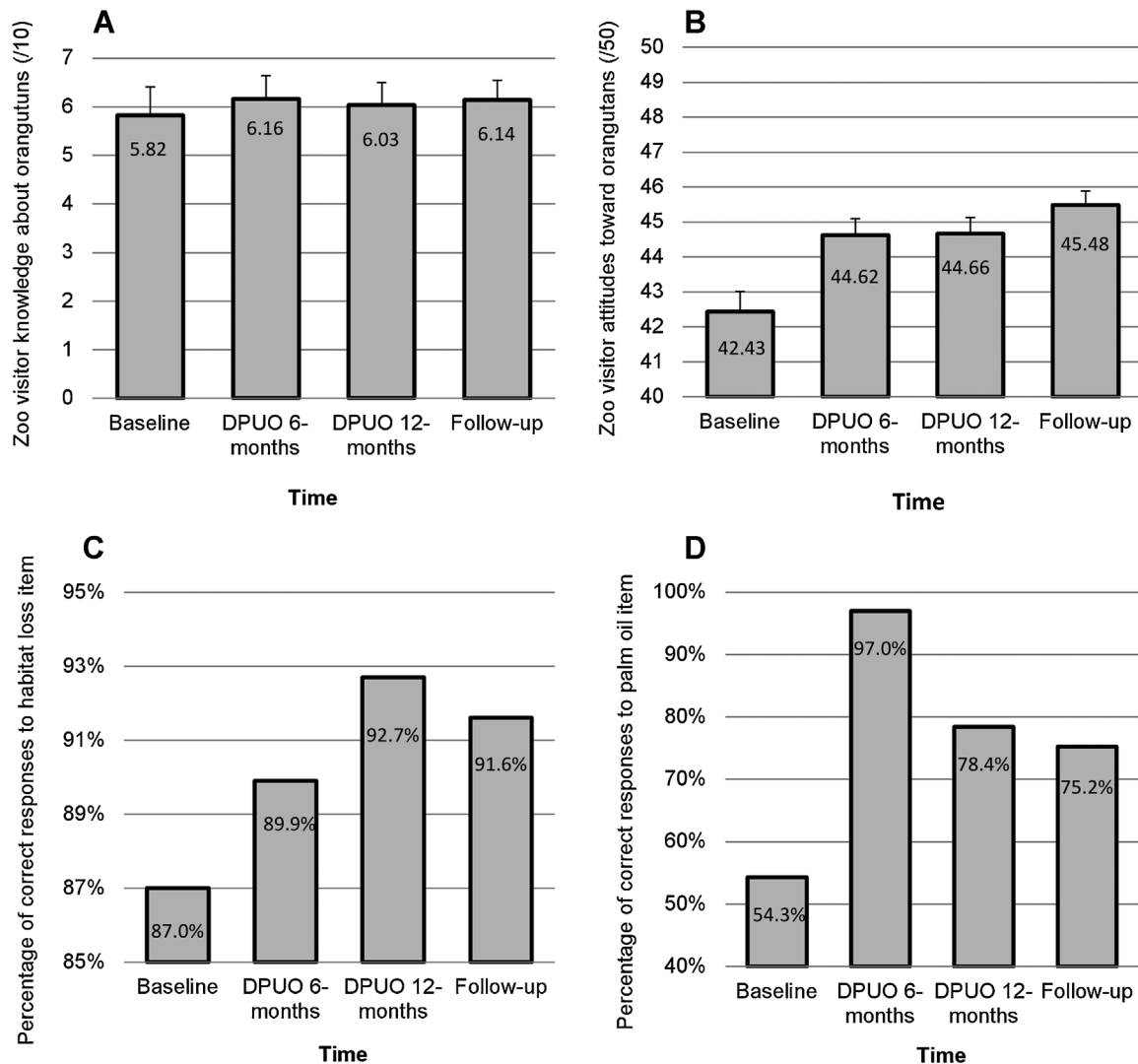


Fig. 2. Changes in attitudes toward orang-utans and knowledge about orang-utans across time (bars represent standard error).

average ($F_{1,376} = 4.80$, $P = 0.029$). There was no significant effect of time on overall knowledge about orang-utans controlling for international visitors ($F_{3,376} = 1.30$, $P = 0.274$). The two items from the overall knowledge measure most relevant to the campaign are also depicted in Figure 2C, D. There were small increases observed in the amount of visitors who correctly answered habitat loss as the greatest threat to wild orang-utans; however baseline scores indicated many visitors (87%) were already aware of this issue. A logistic regression, controlling for the influence of international visitors revealed there was no significant effect of time ($P = 0.437$) on the odds of answering this question correctly (for the full model summary and summaries of all subsequent regression analyses, please refer to Table 3).

Visitor understanding that palm oil was the product most responsible for this habitat loss was comparatively lower at baseline, with only 54% of visitors answering correctly. A logistic regression revealed time significantly contributed to the prediction of correct responses to this question, model $\chi^2(3) = 55.11$, $P < 0.001$. The odds of visitors correctly identifying palm oil as the major product impacting on orang-utans were significantly higher during both points of the campaign and during the follow-up compared to the baseline. The odds of participants answering correctly (compared to baseline) were 26.9 times higher 6 months into the campaign (as only 3% of visitors answered incorrectly at this time point—see Fig. 2D), 3 times higher 12 months into the campaign, and 2.5 times higher in the follow-up. The 95% confidence

TABLE 3. Logistic regression summaries

	Odds ratio Exp (B)	95% CI lower	95% CI upper	Wald	df	Sig.
Habitat loss question correct						
Baseline (ref)				2.72	3	0.437
DPUO 6 months	1.20	0.48	3.03	0.15	1	0.697
DPUO 12 months	2.31	0.82	6.54	2.49	1	0.115
Follow-up	1.51	0.57	3.99	0.70	1	0.403
International	0.13	0.05	0.35	16.00	1	<0.001
Palm oil question correct						
Baseline (ref)				34.47	3	<0.001
DPUO 6 months	26.88	7.94	91.06	27.95	1	<0.001
DPUO 12 months	3.04	1.61	5.73	11.82	1	0.001
Follow-up	2.55	1.40	4.67	9.25	1	0.002
Prefer mandatory labeling						
Baseline (ref)				18.04	3	<0.001
DPUO 6 months	3.95	1.74	8.95	10.82	1	0.001
DPUO 12 months	3.80	1.69	8.55	10.39	1	0.001
Follow-up	3.25	1.49	7.08	8.74	1	0.003
International	0.17	0.06	0.43	13.49	1	<0.001
Labeling would influence purchases						
Baseline (ref)				22.09	3	<0.001
DPUO 6 months	3.29	1.57	6.88	9.96	1	0.002
DPUO 12 months	5.20	2.26	11.96	15.04	1	<0.001
Follow-up	3.54	1.68	7.50	10.95	1	0.001
International	0.29	0.11	0.77	6.22	1	0.013
Willing to change future behavior						
Baseline (ref)				18.86	3	<0.001
DPUO 6 months	2.90	1.47	5.74	9.37	1	0.002
DPUO 12 months	3.74	1.81	7.72	12.76	1	<0.001
Follow-up	3.18	1.60	6.33	10.87	1	0.001
International	0.17	0.07	0.44	13.29	1	<0.001
Visit impacted specifically on future conservation behavior						
Baseline (ref)				9.44	3	0.024
DPUO 6 months	2.26	1.26	4.06	7.41	1	0.006
DPUO 12 months	2.18	1.21	3.95	6.63	1	0.010
Follow-up	1.70	0.96	3.01	3.35	1	0.067
Have engaged in at least one of the conservation behaviors in the previous 12 months						
Baseline (ref)				9.16	3	0.027
DPUO 6 months	1.39	0.77	2.51	1.19	1	0.275
DPUO 12 months	2.16	1.20	3.91	6.54	1	0.011
Follow-up	2.11	1.19	3.76	6.43	1	0.011
Perception of the subjective norm as highly important						
Baseline (ref)				15.70	3	0.001
DPUO 6 months	1.73	0.94	3.20	3.08	1	0.079
DPUO 12 months	3.12	1.67	5.82	12.82	1	<0.001
Follow-up	2.68	1.47	4.90	10.25	1	0.001
International	0.25	0.08	0.77	5.88	1	0.01

interval for the odds ratio for DPUO at 6 months was however very large, again as a result of the very high proportion of correct answers at this time point, with a lower estimate of 7.9 and an upper estimate of 91.1.

Attitudes Toward Orang-utans

Attitudes toward orang-utans also increased across the campaign period and this was sustained into the follow-up (as seen in Fig. 2B). Mean scores at baseline were already very positive (above 42 on a 50 point scale) and rose further to over 45 at the conclusion of the research. An ANCOVA was performed to examine whether these increases over time were significant. Due to significant negative skew in the attitude variable the data were reflected and a square root transformation applied. The ANCOVA revealed the covariate, satisfaction with orang-utan activity levels was signifi-

cantly related to more positive attitudes toward orang-utans ($F_{1,381} = 6.59$, $P = 0.011$). The effect of time on attitudes toward orang-utans was also significant controlling for activity level satisfaction ($F_{3,381} = 5.25$, $P = 0.001$). Planned contrasts (based on adjusted marginal means) revealed that attitudes 6 months into the 'Don't Palm Us Off' campaign ($P = 0.008$), 12 months into the campaign ($P = 0.016$) and at the follow-up ($P < 0.001$) were all significantly higher than baseline attitudes toward orang-utans.

Support for Palm Oil Labeling

Support for palm oil labeling increased from the baseline (69.6% reporting they would like mandatory labeling) through to 6 months into the campaign (90% reporting they would like mandatory labeling). As seen in Figure 3A, this increase remained quite stable over time. A

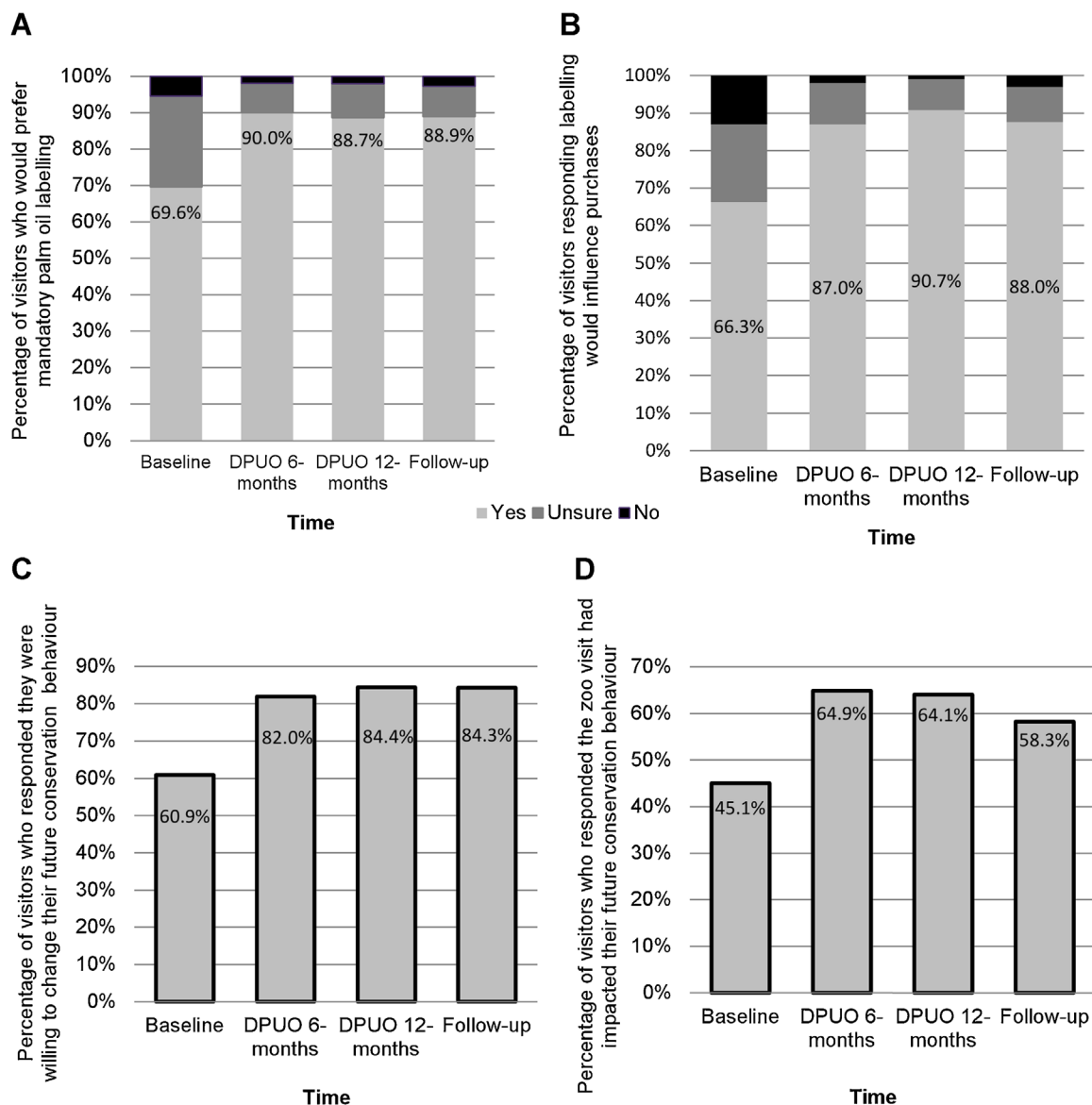


Fig. 3. Support for palm oil labeling and behavioral intentions over time.

logistic regression revealed time ($P < 0.001$) significantly predicted whether visitors would prefer mandatory palm oil labeling, model $\chi^2(4) = 29.89$, $P < 0.001$. The odds of visitors responding they would like mandatory labeling were over three times greater during the campaign and follow-up relative to baseline. The odds of reporting support for mandatory labeling were significantly lower for international visitors ($P < 0.001$, refer to Table 3 for further detail).

There were also marked increases in participant responses to whether mandatory labeling would influence their purchasing decisions (this rose from 66.3% at baseline to 87% 6 months into the campaign, as seen in Fig. 3B). This too remained quite stable for the remainder of the campaign and into the follow-up. Logistic regression, model $\chi^2(4) = 27.43$, $P < 0.001$, revealed there was a significant effect of time ($P < 0.001$) on whether visitors responded labeling would influence their purchasing behavior, controlling for the effect of international visitors. The odds ratio indicates the odds of visitors responding yes were 3.3 times higher at DPUO 6 months, 5.2 times higher at DPUO 12 months, and still 3.5 times higher in the follow-up (compared with the baseline). Again international visitors had reduced odds of answering yes.

Previous Behavior and Commitments to Support Orang-utan Conservation

At baseline 60.9% of visitors responded they would be willing to change their behavior to support orang-utan conservation. This increased over the campaign and remained high in the follow up (as seen in Fig. 3C). Time was a significant predictor of whether participants reported being willing to change their future behavior ($P < 0.001$), controlling for international visitors, model $\chi^2(4) = 31.87$, $P < 0.001$. The odds of visitors reporting willingness to change their future behavior were approximately three times higher at all subsequent time points relative to baseline.

When asked whether the visit to the orang-utan exhibit specifically would impact on future conservation behavior, visitors most often answered yes during the 'Don't Palm Us Off' campaign (refer to Fig. 3D). A logistic regression revealed time ($P = 0.024$) was a significant predictor of responding yes, model $\chi^2(3) = 9.55$, $P = 0.023$. The odds of visitors indicating the visit would impact their future behavior were 2.3 and 2.2 times higher during the campaign respectively, compared with the baseline. The follow up did not differ significantly from baseline ($P > 0.05$).

There were also changes evident regarding actual behavioral action. At baseline, 18.5% of visitors reported having donated to a wildlife charity supporting orang-utans in the previous year. This increased to 23.8% 6-month into the campaign and 27.8% 12 months into the campaign. This reduced slightly in the follow up to 22.2%. A similar pattern was observed for intentional purchasing of palm oil free products. Only 18.7% of visitors reported avoiding palm oil products at baseline, compared with 28.7% 6 months into the campaign, 38.1% 12 months into the campaign and 38.9% at the follow-up.

Participant responses to these two items were combined with participation in behind the scenes zoo tours to create a composite measure of orang-utan conservation behavioral support in the previous 12 months (yes was recorded for engaging in any of the three selected behaviors, while no was recorded if participants answered no to all three questions). The combined conservation behavior data revealed 33% of visitors had engaged in at least one conservation behavior at baseline. This increased to 40.6%, 51.5%, and 50.9% at DPUO 6 months, 12 months, and the follow-up, respectively. Logistic regression analysis indicated time contributed significantly to previous conservation behavior (yes compared to no), model $\chi^2(3) = 9.39$, $P = 0.025$. While there was no significant difference between DPUO 6 months and the baseline ($P = 0.275$); by the end of the campaign and in the follow-up, there were significant increases in the odds people had supported orang-utan conservation through one of the target behaviors ($P = 0.011$). This was twice as high at the end of the campaign and at the follow-up compared with at baseline.

A majority of visitors also demonstrated behavioral support for palm oil labeling by completing a 'Don't Palm Us Off' card during the campaign. At the mid-point of the campaign (6 months) 73.3% of visitors surveyed reported already completing or intending to complete a petition card during their visit. This was similar at the end of the campaign (12 months) with 74.5% of those surveyed completing or intending to complete a card. Behavioral observations by the researcher confirm a majority of these visitors did complete a card.

Subjective Norm

Following the changes in attitudes and increases in behavioral support for orang-utan conservation, there were also pronounced shifts in visitor perceptions of the importance of orang-utan conservation to their friends and family. The changes are depicted in Figure 4. Visitor perceptions that friends and family felt orang-utan conservation to be highly important increased from 28% at baseline to 54% at the end of the campaign and remained stable at the follow up (53%). Decreases were also seen in the unimportant and unsure categories. A binary logistic regression analysis revealed there was a significant effect of time on highly important responses (compared with all other categories), model $\chi^2(4) = 23.8$, $P < 0.001$. The odds of visitors rating the subjective norm as highly important were significantly different 12 months into the campaign ($P < 0.001$) and at the follow-up ($P = 0.001$) compared with baseline; 3.1 times and 2.7 times higher respectively at these time points.

DISCUSSION

Visitor Satisfaction

With mean scores above four on all satisfaction variables, the data suggest visitors generally rated their

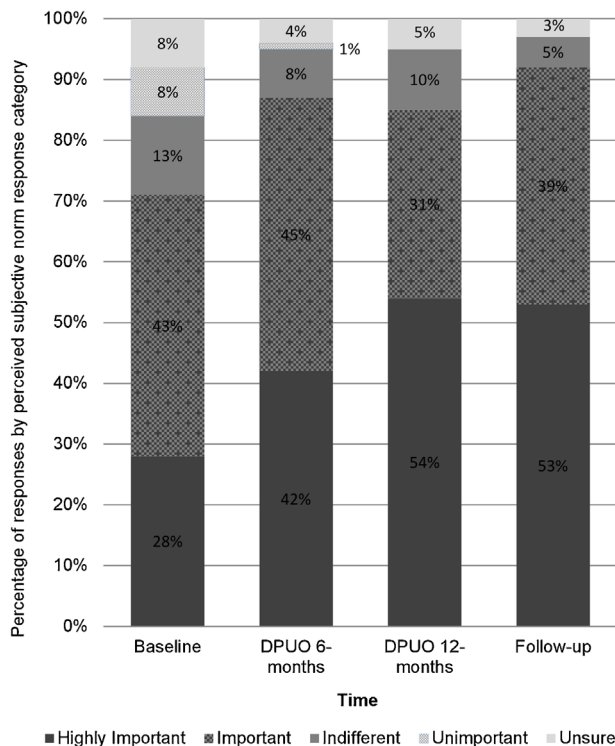


Fig. 4. Visitor ratings of the subjective norm across time.

experience at Melbourne Zoo very favorably and were happy with the activity of the orang-utans on display and the zoo environment. There were also slight (although non-significant) increases in overall experience satisfaction at baseline through to the campaign period. This suggests there was no negative impact of the campaign and the targeted educational messages provided at the exhibit on visitor satisfaction levels. This complements the view of Packer [2006] that people can “learn for fun” in the context of the zoo environment. In fact, the highest levels of visitors reporting the visit would directly impact on their conservation behavior (64%) occurred during the campaign. This reinforces that zoo experiences can be highly satisfying and enjoyable for visitors, while also providing education which encourages conservation action [Ballantyne et al., 2007].

Knowledge About Orang-utans

Overall knowledge about orang-utans was quite low at baseline (below 6 on a 10-point scale). Perhaps unsurprisingly, given the tailored focus of the campaign to the palm oil issue, there were no significant increases in overall knowledge across the campaign. There was a marked difference in palm oil awareness however, with the odds of participants answering the question about the product most threatening the orang-utan correctly significantly higher during the campaign than at baseline. Importantly, this knowledge was sustained at the follow-up, even after the campaign had ended and focus was drawn away from this issue.

It is pertinent to note that at DPUO 12 months there was some maintenance work occurring at the exhibit for a portion of the data collection period, with the campaign television advertisement not playing on the exhibit screen at this time. This likely accounts for the reduction in correct responses from DPUO 6 to 12 months (although still significantly higher than baseline). This commercial was not played at all during the follow-up, hence the higher proportion of correct responses at this time compared with the baseline provides tentative support for the wide-reaching effects of the campaign in educating the broader public about this issue (i.e., correct responses at this time reflect pre-existing knowledge about palm oil rather than on-exhibit learning). This is likely a result of the media coverage the campaign received and the creation of social networking sites supporting the mandatory labeling cause. However, an important limitation to acknowledge of the present research is that this study sought to explore the effectiveness of the campaign as a whole, and subsequently does not have the ability to determine which specific elements of the campaign had the strongest impacts on visitor learning or conservation intentions/behaviors. A key direction for any future research will be to explicitly ask where people have acquired their knowledge from, such that on-site and off-site learning facilitated by zoos can be accurately assessed, as well as other sources of conservation understanding (e.g., media, books, the internet).

In combination, the findings suggest that although there is still a need for improvement in the broader educational outcomes of a visit to the orang-utan exhibit, highly tailored messages with conservation relevance can be delivered effectively to zoo visitors on exhibit and the wider public alike. This is of significance given the paucity of such evidence to date [Mazur and Clark, 2001; Marino et al., 2010] and the importance of such education in helping to address the rapid loss of biodiversity occurring at present [IUCN, 2010]. The lasting educational effect of the campaign 6 months after its conclusion also provides encouragement for zoos that such investments are worthwhile, with the knowledge about palm oil retained and the public able to make more informed purchasing decisions into the future.

Attitudes Toward Orang-utans

Attitudes toward orang-utans were very positive at baseline and across the ‘Don’t Palm Us Off’ campaign these were observed to rise significantly higher than these baseline levels. The mean score at follow-up (45.48) has important practical significance, as it represents a majority of strongly agree responses to all items and demonstrates evaluations of this species are extremely positive, nearing the maximum possible on the scale. There are several potential explanations for these rises. It may be that increased awareness of the palm oil issue, and the knowledge that human actions are contributing to marked decreases in orang-utan populations, promoted greater empathy and concern for orang-utans,

which is reflected in the attitude scores. It could reflect the wider effects of the campaign with media coverage providing more footage of orang-utans and discussion of their intelligence and genetic relatedness to humans, which also may foster more positive attitudes. Or the increases may stem from shifts in the social norms surrounding this issue. Over the campaign, the perception of orang-utan conservation as highly important to friends and family increased significantly, whilst marked reductions were seen for the indifferent or unimportant categories. Given the association between social norms and attitudes, it seems attitudes may also have increased as a result of social influences [Terry et al., 2000]. Regardless of the specific cause, these increases in attitudes are an important change associated with the campaign, in: (a) demonstrating public support and concern for the plight of this species; and (b) since attitudes often shape intentions for related behaviors [Ajzen, 2001; Armitage and Conner, 2001].

Support for Palm Oil Labeling and Behavioral Impacts

As knowledge of the palm oil issue grew and attitudes increased, so did support for palm oil labeling. Although a majority of visitors indicated they would prefer mandatory labeling at baseline (70%), this increased significantly once the campaign commenced to 90%. The odds of visitors responding yes to this question were three times greater at all time points once the campaign commenced, relative to baseline, reflecting a pronounced impact of the campaign on public support for mandatory labeling. These increases in support for labeling were echoed in participant responses to whether labeling would change their purchasing behavior. The odds of participants responding yes were significantly higher at all three time points relative to baseline, with the odds of participants at the follow-up indicating labeling would influence their purchases still 3.2 times greater than at baseline. Taken together, these results suggest that when educated about the impacts of human behaviors on other animal species, people would prefer to be able to make an informed choice about their actions and a majority would try to reduce their impact where possible [Harrison et al., 2005].

Consistent with this interpretation, increases were seen in charitable donations during the campaign and there was a particularly pronounced rise in the proportion of visitors reporting they were intentionally avoiding unsustainably sourced palm oil products over time. At baseline, less than one in five visitors reported avoiding unsustainably sourced palm oil products (18.7%). A 10% increase occurred 6 months into the campaign and a further 9.4% through to the end of the campaign (38.1%). This figure even increased slightly at the follow-up to 38.9%, which provides support the behavioral effects of the campaign and education may also be lasting. Although the sample size represents a small minority of the wider Australian public, the evidence that education does influence consumer action in this context is noteworthy [Stern, 1999]. If similar shifts occurred across the broader

population (i.e., an increase following the campaign such that nearly 40% of the population is avoiding unsustainably sourced palm oil products where possible) this has the potential to send a very strong message to industry, and to encourage shifts to certified sustainable palm oil or to alternate products.

The power of consumers and importance of maintaining a positive brand perception has already been demonstrated by several major companies in Australia, with Cadbury and KFC recently making transitions away from palm oil use due to environmental and health concerns [Sydney Morning Herald, 2009; Cadbury Australia, 2011]. As such, it seems public interest in this issue may help drive a market for certified sustainable palm oil for use in Australian markets should companies wish to continue using this product (an explicit goal of the campaign and something Zoos Victoria are currently seeking to promote through another new initiative in 2013- the "Zooparkmarket"—which allows visitors on-exhibit to scan common grocery products and determine whether the company uses, or has made a time-bound commitment to, certified sustainable palm oil products). A high proportion of visitors also suggested they would be willing to change their future behavior to support orang-utan conservation in some way (over 80% of visitors during the campaign and the follow-up). A significant barrier at present is the lack of labeling laws surrounding the use of palm oil, however if mandatory labeling of palm oil as an ingredient in food products becomes compulsory (a bill which was recently under parliamentary consideration but did not proceed¹) this may lead to even greater consumer impacts in the future.

GENERAL SUMMARY AND CONCLUSIONS

Across the profile of outcomes, from knowledge, to attitudes, to behaviors, and even social norms, there is robust evidence in support of the effectiveness of this innovative campaign by Melbourne Zoo. Through on-exhibit information, social networking/new media (i.e., Zoos Victoria 'Don't Palm Us Off' website- with >138,000 unique views during the campaign, Facebook cause sites- with >33,000 members following the campaign, and the YouTube video), and broader media coverage, it seems the campaign was successful in educating zoo visitors and the general public alike about the palm oil issue. This in turn, led to more concern about the species, marked shifts in social norms surrounding the importance of the conservation of orang-utans, and subsequently also higher attitudes toward this Great Ape 'cousin.' Unsurprisingly, these changes were

¹Coinciding with the "Don't Palm Us Off" campaign, in 2009, a bill was introduced to Australian Parliament titled the "Truth in Labeling Bill" to make listing palm oil as an ingredient on food products compulsory. Data from Melbourne Zoo (petition signatures) as well as preliminary findings of this research were provided to members of parliament in the generation of the bill.

associated with support for mandatory palm oil labeling and saw increases in self-reported donations to conservation organizations supporting orang-utans and decreases in self-reported unsustainably sourced palm oil purchasing. Collectively these demonstrate the successful nature of the campaign and reinforce the role zoos can play as agents for education and conservation in society, consistent with their shifting organizational purpose [Patrick et al., 2007]. More broadly, they also attest to the importance of continued innovation in zoo education practices [Broad and Weiler, 1998; Andersen, 2003; Penn, 2009; Vischer et al., 2009] and highlight how zoos can complement traditional education (i.e., signage and animal displays in isolation) with focused conservation education messages, which cover both the cause of conservation threats as well as what people can do to help [Falk, 2005]. Furthermore, the use of new media in this campaign (i.e., disseminating the campaign video on YouTube as well as screening it at the exhibit; providing an online petition; and developing a Facebook page and dedicated web page through the Zoos Victoria website) demonstrated how traditional and newer forms of educational mediums can be combined to enhance dissemination and efficacy [Lievrouw and Livingstone, 2002; Kahn and Kellner, 2004; Pearson et al., 2011].

Future research can build upon the current findings through documenting and evaluating other zoo-based educational campaigns and building a knowledge base to enable comparison of the efficacy of different campaigns and/or innovative educational strategies. Similarly, given the success of this campaign based on the data available, larger scale studies should be conducted for subsequent campaigns which utilize bigger samples of zoo visitors, complemented with samples from the wider public, to track changes across the campaign duration. The addition of direct behavioral measures would also strengthen the evaluation of future educational initiatives, although it is pertinent to note that in excess of 160,000 people returned petitions for mandatory palm oil labeling during the campaign period, with just over 50% of these on-site at the zoo and the remainder from engagement with the Zoos Victoria website, reflecting widespread community-level behavioral action and support. Furthermore, the Zoo received some 45,000 supportive enquiries from the community during the campaign period, which is indicative of the ability of the campaign to evoke thought and promote understanding and action. Given the negative relationship between international visitors and outcome variables in this study, exploration of geographic and cultural variations in palm oil awareness/support/use and conservation issues will be another important area for future research. Unfortunately, further exploration within this sample was not possible due to the small total number of international visitors ($N=23$). On the basis of this study however, it seems zoos do have a significant role to play in education for species conservation through such initiatives and the continued development of cutting-edge visitor education practices. In the current 'Anthropocene,' this

advancement and focus upon visitor education and conservation could not be more timely, for accurate information gives individuals the power to evaluate the consequences of their actions, and to make informed decisions about future behavior, consistent with personal values and ethical frameworks [Clayton and Myers, 2009]. As emphasized by Jane Goodall, "Let us remember, always, that we are the consumers. By exercising free choice, by choosing what to buy, what not to buy, we have the power, collectively, to change the ethics of business, of industry. We have the power to exert immense power for good..." [Goodall and Berman, 2003, p. 240].

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