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RESEARCH ARTICLE

Is restricting mobile communication a solution to overcrowding? A test from Yala National Park, Sri Lanka

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Highlights

- Visitor satisfaction was positively related to sightings of the 'big three', elephants, leopards and sloth bears.
- Visitor satisfaction was not related to overcrowding at sightings.
- Reduced mobile coverage lessened overcrowding at sightings.
- Reduced mobile coverage decreased sightings, resulting in reduction of visitor satisfaction.
- Eliminating mobile communication is not a viable solution to overcrowding.

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RESEARCH ARTICLE

Is restricting mobile communication a solution to overcrowding? A test from Yala National Park, Sri Lanka

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Abstract: The Yala National Park is the premier protected area in Sri Lanka. Overcrowding has been an issue in Yala for over a decade. Information sharing by mobile communication was thought to result in safari jeeps flocking to favoured sightings, causing overcrowding and reckless driving. We assessed visitor satisfaction and the impact of switching off mobile communication towers providing park coverage, by conducting a questionnaire survey, checking signal strength and assessing vehicle speed. We found that visitor satisfaction was related to sightings of the 'big three', elephants, leopards and sloth bears, but not to overcrowding at sightings. Reckless driving impacted visitor satisfaction both negatively and positively. High speed driving was mostly due to trying to exit the park before the park-closure time. Switching off mobile communication towers reduced signal strength and accessibility but did not eliminate it. Reduced mobile coverage lessened overcrowding at sightings but also decreased sightings, resulting in an overall reduction of visitor satisfaction. We conclude that reducing or eliminating mobile communication is not a viable solution to overcrowding.

***Keywords*:** Overcrowding; Visitor satisfaction; Tourism management; National Park; Large mammals

INTRODUCTION

Protected areas serve a dual function of conserving nature and providing 'nature experiences' to the public. They can be of major socio-economic importance, contributing significantly to national and local economies through tourism revenue and providing direct and indirect employment (Higginbottom & Tribe, 2004). However, tourism in protected areas may also have negative consequences (Green & Giese, 2004). Overcrowding at favoured sightings is one such issue that degrades visitor experience and can negatively impact animals (Karanja, 2003; Timmons, 2019). With the rapid growth of nature-based tourism, it is becoming an issue of increasing concern worldwide.

Tourism was the third highest foreign exchange earner for Sri Lanka in 2018 and wildlife parks were responsible for 17% of public sector revenue from tourism (SLTDA, 2018). The Yala National Park is the premier protected area in Sri Lanka and is visited by a large number of visitors. For example, in 2018 a total of 629,246 people visited the park (SLTDA, 2018). Concerns regarding overcrowding in Yala have been expressed for over a decade (Buultjens et al., 2005; Newsome, 2013; Prakash et al., 2019).

Drawing of safari vehicles to locations of favoured sightings by information sharing through mobile communication may cause overcrowding in protected areas (Kabii & Wandaka, 2018; Aththanayaka et al., 2019). Driving at high speed causing road kills (Karunarathna et al., 2017), is an additional concern and maybe precipitated by rushing to locations of sightings. Yala is famous for Sri Lanka's 'big three', leopards (*Panthera pardus* Linnaeus), sloth bears (*Melursus ursinus* Shaw) and Asian elephants (*Elephas maximus* Linnaeus), and visitors place a premium on their sighting (Weerasinghe et al., 2003). The use of mobile phones to relay information of sightings and its impacts have been previously identified as a problem in Yala and banning mobile phone use suggested as a mitigation measure (Aththanayaka et al., 2019).

Here we report on the results of a survey of visitor satisfaction at the Yala National Park with particular emphasis on perceived overcrowding and reckless driving. We assess the impacts of switching off the mobile phone towers that cover the park and discuss the implications of our results for park management.

MATERIALS AND METHODS

Study area

The Yala National Park is situated in south-eastern Sri Lanka at the coast. Yala is 979 km^2 in extent and is divided into 5 'blocks'. Block I, the most visited area of the park, is 141 km^2 in extent and occupies the south-western quadrant of the park. Most people use commercial safari jeeps for park visitation while a few do self-drive safaris. Two mobile phone towers were located in Palatupana and Situlpawwa at the perimeter of Block I, providing mobile coverage to the park. Multiple network providers shared the towers. The two mobile phone towers were switched on and off for a week at a time from July to August 2015 at the request of the Department of Wildlife Conservation, in order to assess their impact on overcrowding.

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Data collection

We administered a questionnaire to groups exiting the park on 8 days between 19th July and 14th August 2015. The occupants of a safari vehicle were considered a 'group'. The questionnaires were administered on 4 days the mobile towers were switched on and on 4 days they were switched off. Both data sets consisted of 4 different weekdays (Monday, Thursday, Friday and Sunday). Vehicles exiting the park were given a questionnaire (in English), which the visitors filled out anonymously and on their own. A single questionnaire was handed over to each vehicle. No assessment was made whether the responses reflected the views of the person filling out the questionnaire or the consensus of all occupants. Respondents were asked to rank their experience using a 5-point scale ranging from 'excellent' to 'terrible' and they also answered questions on overcrowding, reckless driving and sightings. No personal data of respondents were obtained other than the nationality of the group. Visitors were informed of the conducting of a survey by notices posted at the Wildlife Department office, ticket counter and entrance.

Observations on vehicle speed were made during a total of 17.6 hours on 5 different days from a vehicle parked on the side of the Yala main road. The speed of passing vehicles was subjectively assessed and listed under four categories (Table 1). The time of day was noted for each vehicle. No data on individual vehicle identity was recorded.

Table 1: Categories of speed assigned to passing vehicles.

Category	Approximate speed
Slow	< 20 km/h
Normal	20 – 30 km/h
Fast	30 – 50 km/h
Very fast	> 50 km/h

We checked the mobile signal of three main providers, Dialog, Mobitel and Etisalat (now Hutch), at 36 different locations along the most used roads within the park by using a mobile phone. The signal strength at each location was noted based on the number of bars (0–5) indicated on the phone.

The data was entered into Excel 16.8.1 and statistically analysed in JMP 17.0.0 (www.jmp.com). To accommodate small sample sizes, we converted the level of satisfaction into a continuous data set by assigning values to each answer (1 = terrible, 2 = poor, 3 = average, 4 = good, 5 = excellent). We then applied the Wilcoxon (for two samples) or Kruskal-Wallis (three or more samples) test to evaluate differences in visitor satisfaction. Chi-square tests (χ^2) were conducted to compare different samples.

RESULTS

Interview survey

We received responses from 936 groups. When asked about their overall experience, 302 (32.9%) considered it 'excellent', 413 (44.9%) 'good', 160 (17.4%) 'average', 31 (3.4%) 'poor' and 14 (1.4%) 'terrible'. Sixteen groups did not provide an answer.

There were no significant differences in the level of experience on the 4 different weekdays (Kruskal-Wallis test, $\chi^2 = 0.885$, DF = 3, P = 0.829, Table 2).

Nationality of visitors

Groups from 53 countries visited the park during the survey period of 8 days. The highest number of groups was from China (173), followed by the Netherlands (126). Sri Lanka was third with 116 groups followed by the UK (98). In assessing visitor satisfaction in relation to country of origin, the 5 countries with more than 50 visitor groups were treated individually. All other countries were lumped together by continent (Africa – including the Middle East, America, Asia and Europe).

The level of satisfaction was influenced by nationality. The most dissatisfied visitors came from Africa-Middle East, 5% of whom thought the experience was 'terrible' and another 20% 'poor'. The most appreciative visitors were from Australia where two thirds (67.9%) felt they had an 'excellent' experience. From China, Australia and all European countries, more than 75% of visitors reported either a 'good' or 'excellent' experience. About one third of the respondents from America (30.4%), Sri Lanka (32.1%) and Other Asian countries (33.3%) had an 'average' experience (Fig. 1).

Overcrowding and reckless driving

About half of the groups (52.3%) stated that there was overcrowding at sightings. Perception of overcrowding did not significantly alter the rating of the overall experience (Wilcoxon test, P = 0.605, Table 2). Reckless driving was reported by 17.2% of the respondent groups, with more groups noting reckless driving having a terrible or poor experience (Fig. 2). However, reckless driving did not significantly alter the overall visitor experience (Wilcoxon test, P = 0.888, Table 2).

Seeing elephants, leopards and bears

About one third of the groups spotted leopard (34.5%) and/or bear (36.1%). Satisfaction of visitors was significantly higher (Wilcoxon test, P < 0.001) if they spotted a leopard with 48.5% of respondents rating it as excellent vs. 24.8% rating it excellent without seeing a leopard (Fig. 3, Table 2). Also, the sighting of a bear significantly changed (Wilcoxon test, P < 0.001) visitors' overall assessment with 43.3% reporting an excellent experience after seeing a bear vs. 27.2% giving an excellent rating without having encountered one (Fig. 3, Table 2). Most (97.4%) visitors had sightings of elephants. Spotting an elephant did not cause a significant difference in the overall experience (Wilcoxon text, P = 0.070, Fig. 3, Table 2).

Respondents were significantly (Kruskal-Wallis test, $\chi^2 = 83.783$, DF = 3, P < 0.001) more satisfied with their visit if they saw the 'big three'. Of 15 groups (1.6%) that did not see any of the 'big three', 20.0% rated the experience as excellent and 26.7% as good, while 13.3% thought it was terrible (Fig. 4, Table 2). Of the 126 groups who had seen all 'big three', 56.4% had an excellent and 39.7% a good

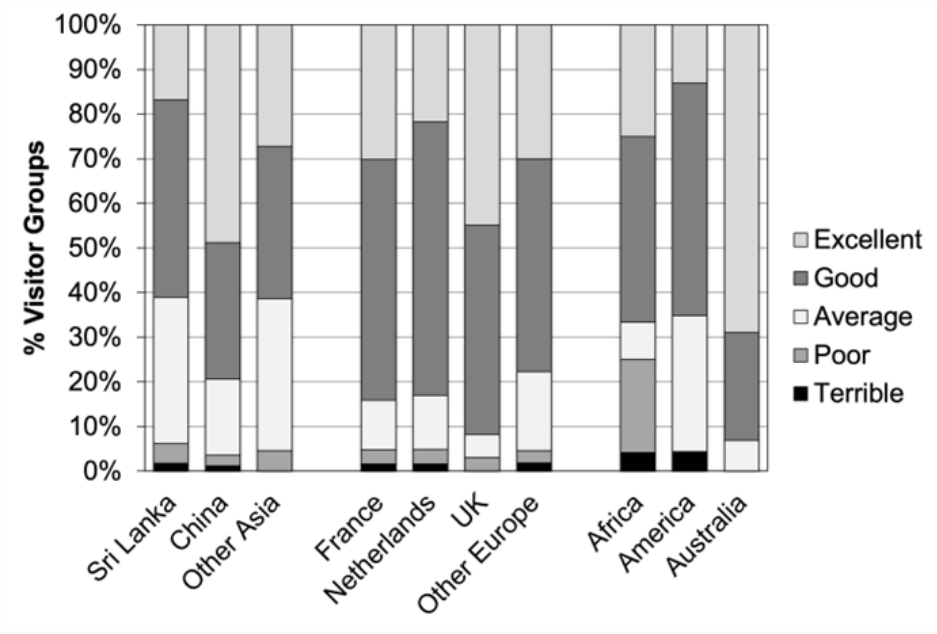

Figure 1: Visitor satisfaction by country/region of origin.

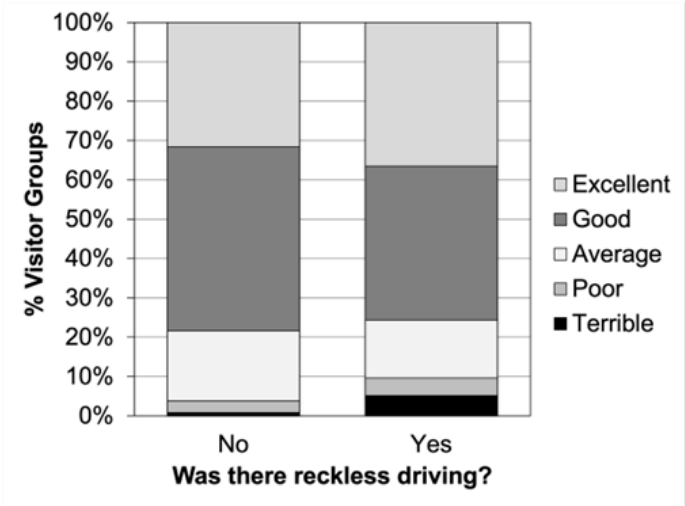

Figure 2: Rating of overall experience by those who did and did not perceive reckless driving.

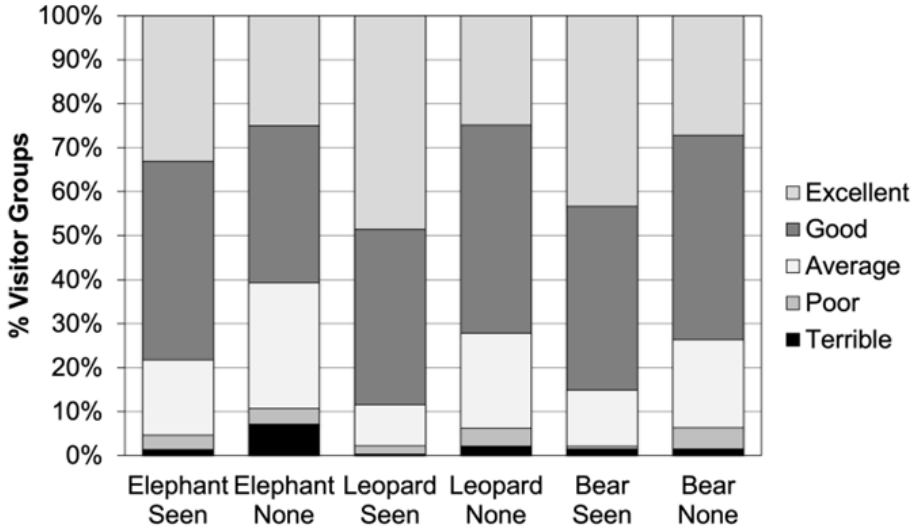

Figure 3: Visitor satisfaction and its relation to sighting of elephant, leopard or bear.

experience. Only 5 (4.0%) felt the experience was average and none rated it as poor or terrible (Fig. 4).

Vehicle speed

The speed of 361 vehicles was assessed, of which 19.4% were categorized as slow, 55.4% as normal, 19.4% as fast and 5.8% as very fast. There was a significant difference in speed related to time of day (χ^2 test, DF = 12, -LogLike = 40.357, $R^2 = 0.099$, $P < 0.001$). Speeding vehicles were mostly observed in the 17:00–19:00 slot, with more than half of the vehicles monitored going fast (30.7%) or very fast (25.3%) (Fig. 5). Speeding was particularly high between 18:00 and 18:30. For all other time periods, normal speed was the most commonly recorded (53.5–72.1%).

Impact of mobile phone towers being switched on/off

Mobile signal was detectable within the park with the two towers switched off at 19 of the locations checked for Dialog (52.8%), at 17 locations for Mobitel (47.2%) and at 16 locations for Etisalat (44.4%). For Dialog, the average signal strength at the 36 locations was 1.00 ± 1.17 (range 0–4), for Mobitel it was 0.86 ± 1.13 (range 0–4) and for Etisalat it was 0.97 ± 1.42 (range 0–5).

Having normal mobile coverage did not make a difference in the probability of seeing elephants (χ^2 test, DF = 1, -LogLike = 0.896, $R^2 = 0.007$, $P = 0.181$), which were seen by 97.7% when the mobile towers were on and by 96.2% when they were off. With normal mobile coverage there was a significantly greater probability of seeing a leopard (χ^2 test, DF = 1, -LogLike = 67.647, $R^2 = 0.114$, $P < 0.001$) or a bear (χ^2 test, DF = 1, -LogLike = 2.205, $R^2 = 0.004$, $P = 0.036$). When the mobile towers were on 51.1% of the visitors spotted a leopard and when they were off 15.6% saw a leopard. With the towers on 54.7% saw a bear and when off 31.9%.

The rating of experience between days with or without the mobile towers on was significantly different (Wilcoxon test, $P = 0.011$) with more groups reporting an 'excellent' instead of a 'good' experience on days the towers were on (Fig. 6, Table 2). On days with the towers on, significantly more (χ^2 test, DF = 1, -LogLike = 11.497, $R^2 = 0.020$, $P < 0.001$) overcrowding was reported (61.7 vs. 45.0%. There was no difference in reporting of reckless driving between days the mobile towers were switched on or off (χ^2 test, DF = 1, -LogLike = 1.566, $R^2 = 0.004$, $P = 0.077$).

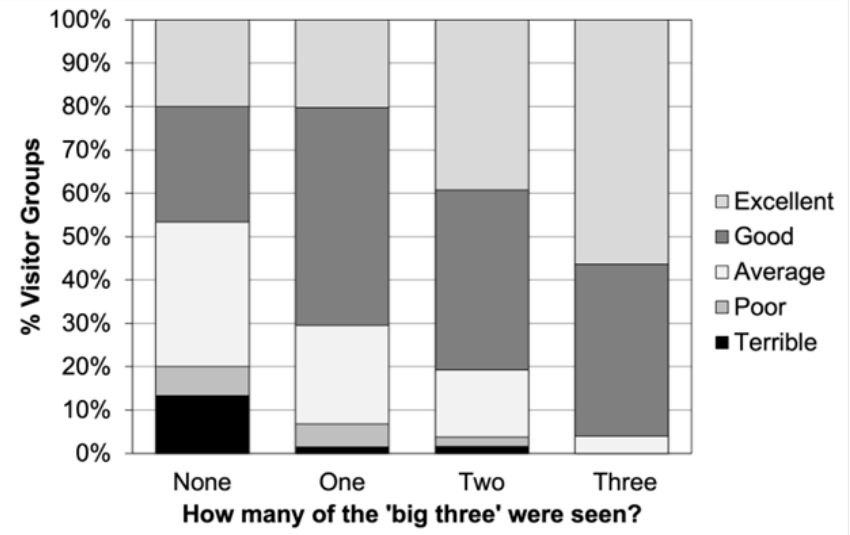

Figure 4: Visitor satisfaction by the number of the 'big three' (elephant, bear and leopard) they have seen.

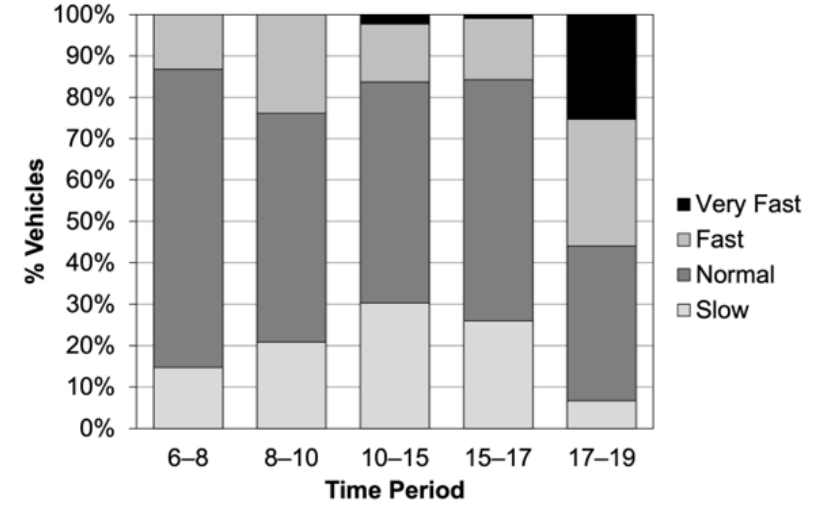

Figure 5: Vehicle speeds by time of day.

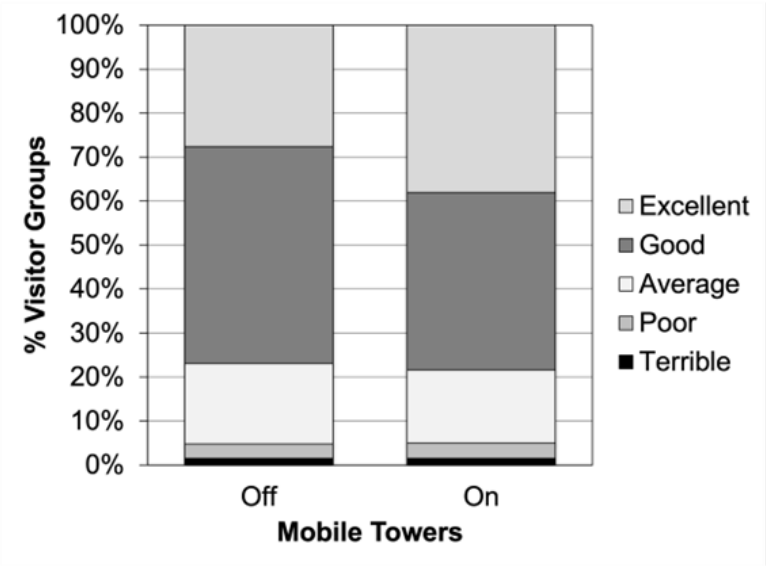

Figure 6: Visitor satisfaction while having mobile signal or not.

DISCUSSION

Visitor experience

In our study the majority (77.7%) of visitors to Yala National Park had a positive experience. Our results are consistent with previous surveys that found 73% of visitors intending to revisit Yala and 98% willing to recommend it to others (Arachchi et al., 2017). Similarly, an analysis of online reviews posted by visitors to Yala found the number satisfied to be three times that disappointed (Egresi & Prakash, 2019). Yala compares favourably with visitor satisfaction at some well-known tourist attractions such as Tsavo-west, Kenya where over 70% indicated a satisfactory experience (Akama & Kieti, 2003) and Tanzania with 86% interested in revisiting six parks (Okello & Yerian 2009). However, it falls below some such as Amboseli, Kenya with 97% satisfied and 99% recommending it (Okello et al., 2008), Kinabatangan, Sabah with over 85% very satisfied and 87% willing to recommend it (Newsome et al., 2017) and wildlife refuges in USA where 89% of visitors to 53 refuges were satisfied (Sexton et al., 2012). Therefore, despite issues (Newsome, 2013; Prakash et al., 2019), Yala National Park provided a nature experience that was appreciated by a majority of visitors. However, there is clearly room for improvement.

Behaviour patterns and outlooks of visitors to protected areas are influenced by visitor characteristics (Arnberger & Brandenburg, 2002). We found the rating of experience to be related to visitor nationality, suggesting that socio-cultural characteristics of visitors influenced their expectations and evaluation of the experience. In contrast, tourist satisfaction of Amboseli was independent of nationality (Okello et al., 2008), perhaps because almost all rated the experience highly.

We found that sighting of the 'big three' on a safari had a significantly positive impact on visitor satisfaction. The sighting of charismatic mega-vertebrates such as elephants, leopards and bear is one of the main draws of Sri Lankan National Parks, particularly for first time visitors (Senevirathna & Perera, 2013). Almost all the surveyed groups sighted elephants. With one of the highest densities recorded, Yala is among the best locations globally for seeing leopards (Kittle et al., 2017). While bear sightings are not uncommon in Yala, bear presence is more seasonal (de Silva et al., 1996). Therefore, Yala provided a good opportunity of seeing two or all three of the 'big three'.

Our survey results indicated that half of the visitors that did not see any of the big three still rated their experience as excellent or good. Similarly, a survey in Amboseli found that sighting of the 'big five' was not necessary for visitor satisfaction (Okello et al., 2008). Yala has a high diversity of habitats including scrub, secondary and riverine forest, short grass clearings, water holes, lakes, rock outcrops, sand dunes and the seashore. While visitor access to rock outcrops, sand dunes and the beach is limited or prevented, most of the other habitats are easily accessed. It also has an impressive array of birdlife with 215 recorded species (Senaratna, 2009). Other mammals such as water buffalo, wild boar, sambur, spotted deer, golden jackal, three species of mongoose, toque macaque, langur, hare, crocodiles, land monitors, lizards and terrapins are commonly observed on safari. Therefore, Yala provided a nature experience beyond charismatic mega-vertebrates.

Mobile towers

Switching off the perimeter towers did not make Yala Block I a mobile signal-free area. Mobile signal was still accessible over a wide area of the park, but the signal strength was lower than normal. The failure to eliminate signal was probably due to fringe reception from distant towers. It was possible to switch off the two towers as they mainly provided signal over the park and were located within it. There was no possibility of switching off more distant towers as they mainly provided service to those outside the park.

Sightings of bears and leopards were greater when the towers were on. Therefore, relaying information of sightings between safari jeeps through mobile phone communication

clearly played a significant role in increasing sightings. As elephants were commonly observed during the survey period, mobile towers being switched off had no bearing on the probability of elephants being observed. However, in periods when elephant sightings are less frequent, the same would apply to them also. Therefore, having mobile coverage significantly increases sightings of the 'big three'.

The higher sightings were a major reason for the greater visitor satisfaction on days with full mobile signal. As switching off the two towers only decreased the mobile signal but did not eliminate it, it is very likely that the impacts would have been even more pronounced had mobile signals been eliminated or use of mobile phones banned.

Reckless driving and speeding

Reckless driving was reported by less than one fifth of the groups and had no significant influence on rating, as the influence was either negative or positive. While some visitors possibly felt that reckless driving degraded their experience, others may have given more weight to the additional sightings as a consequence, when rating the day's experience.

Mobile signal was not a factor in reporting reckless driving or occurrence of speeding. We did not observe much high-speed driving during the survey and what was observed was mostly after 6 pm. The park management penalized vehicles that did not exit the park by 6:30 pm. Therefore, the main cause of high-speed driving appears to be hurrying to get out of the park by the deadline, rather than driving to sightings informed by phone during the day. The current practice of herding all visitors to two areas for two hours of inactivity during a 'lunch break' from 12 noon to 2 pm (which was not in practice during the study), is likely to cause an additional peak of high-speed driving in the middle of the day.

The far end of the Yala main road is about 15 km from the gate. Dividing the park into a few zones and providing guidelines as to by when visitors should exit each zone, based on the distance and permissible speeds, to make it to the gate by the deadline, could possibly address this issue. Random checking of vehicle speeds with a speed gun and penalizing offenders would also help.

Overcrowding

While overcrowding was perceived by around half the groups interviewed, contrary to expectations, it was not a major determinant of the quality of experience. This is surprising, given the amount of negative comments on overcrowding in Yala in the press and online (Prakash et al., 2019). Scholtz and van der Merwe (2023) found that factors that led to a 'positive memorable experience' lowered perceptions of overcrowding in Pilanesberg National Park in South Africa. Our results suggest that the same would apply to Yala.

The higher reporting of overcrowding on the days the mobile signal was normal confirmed the drawing of safari jeeps to sightings through mobile communication. Overcrowding may not have had a major impact on visitor satisfaction in Yala because dissatisfaction may have been countered by increased sightings. Also, the relationship between overcrowding and visitor satisfaction is complex and not necessarily correlated negatively (Fleming, 2017). None the less, absence of overcrowding at sightings improves nature experience. Visitor tolerance of overcrowding is variable (Fleming, 2017). It is likely to be particularly resented by visitors interested in observing wild animals as opposed to those who simply visit the park as part of a 'package tour' or want to 'tick off' seeing certain species. With the ubiquity of phone cameras and uploading of pictures to social media in real time, some visitors may not be too perturbed by overcrowding, so long as they get their 'shot'.

Actions such as making it difficult to get to sightings – like making the road one-way or banning mobile communication (Aththanayake et al., 2019) – may prevent overcrowding. However, they will also reduce the probability of sightings and decrease visitor satisfaction. Reduced sightings are also likely to make people drive around more in search of animals, increasing impacts on the environment such as dust, noise and pollution.

Limiting visitation has also been proposed as a means of mitigating overcrowding in Yala (Aththanayake et al., 2019). Restricting entry has negative impacts such as decrease in revenue to the park and tourism providers, loss of employment for safari drivers and limitation of the number of visitors that can experience what the park has to offer. Overcrowding at sightings is not proportionate to park visitation *per se*. For example, up to 400 vehicles may enter the Yala National Park on a given day (Newsome, 2013). However, over 5 vehicles at a sighting maybe considered 'overcrowding' (Karanja, 2003). Therefore, it is useful to differentiate between over-visitation and overcrowding. While over-visitation may have impacts on the environment including on fauna and flora, it does not necessarily create overcrowding. The number of visitors entering the park varies by day of the week and is highest on weekends (pers. obs). Failure of our survey to find any difference in visitor satisfaction between days of the week or dates of the survey, reinforces the contention that over-visitation was not the main issue. Thus, reducing the number of vehicles even by half is unlikely to have an impact on overcrowding.

The impact of overcrowding is magnified by the absence of a protocol to be followed at sightings and unruly behaviour of safari jeeps (Newsome, 2013; Aththanayake et al., 2019). Vehicles often block the entire road at locations of sightings, creating traffic jams and preventing traffic flow. Therefore, providing simple, easy to follow guidelines on behaviour at sightings, including not blocking through traffic, switching off engines, not shouting and limiting the time best viewing positions are occupied, would be beneficial. However, conforming to regulations tends to be low worldwide, especially at favoured sightings. For example, only 6.8% of visitors observed all regulations when viewing lions and cheetahs in Masai Mara (Karanja, 2003). Therefore, enforcement is a prerequisite.

Management

Our results reflect the majority view of those who visit Yala, which may differ substantially from the view of specialized nature-related groups such as wildlife enthusiasts and biologists, who may be more perturbed by negative perceptions such as overcrowding and speeding. Targeted management actions to manage and decrease traffic would go a long way towards taking the edge off overcrowding and providing a better visitor experience in Yala. One such possibility is having a parallel road to the Yala main road with multiple crossroads between the two. The Sithulpawwa approach road from Kirinda could be easily co-opted for this purpose, by making it a park-only road and limiting Situlpawwa access to the Kataragama side. Additional actions include widening roads at places of frequent sightings so that vehicles can park on a side while others can pass through, creating awareness among tourism providers and visitors, diversifying the experience provided by developing additional locations where people can alight from vehicles and providing access to unique locations that currently have little or no accessibility. Such actions can provide a far better wildlife experience than at present and have the potential to make Yala one of the best wildlife destinations globally. However, improvement of visitor experience requires a primarily positive outlook, service provision and logical management rather than *ad hoc* decisions and restrictions. Unfortunately, this appears not to be the case, as exemplified by the 'lunch break' imposed since the survey, where all visitors are herded to a location and kept in limbo for two hours at noon. While the action is based on decreasing visitor impact, it is illogical, considering that the middle of the day is when animals are least active and the lowest visitor traffic occurs. It only penalizes full-day visitors, who tend to be wildlife enthusiasts rather than 'package tourists'.

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DECLARATION OF CONFLICT OF INTEREST

The authors declare no competing interests.

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Table 2: Results for visitor experience evaluated under different aspects.

Factor	Category	Visitor experience					Total
		Terrible	Poor	Average	Good	Excellent	
Weekday	Monday (n=2)	4	3	35	79	63	184
	Thursday (n=2)	4	15	46	117	87	269
	Friday (n=2)	3	7	39	115	72	236
	Sunday (n=2)	3	6	40	102	80	231
Date	19.7.2015	1	3	18	45	54	121
	20.7.2015	1	1	14	40	34	90
	26.7.2015	2	3	22	57	26	110
	27.7.2015	3	2	21	39	29	94
	6.8.2015	2	6	22	63	41	134
	7.8.2015	2	5	26	67	26	126
	13.8.2015	2	9	24	54	46	135
	14.8.2015	1	2	13	48	46	110
Overcrowding	no	6	13	67	177	119	382
	yes	8	14	75	193	146	436
Reckless driving	no	6	22	133	349	236	746
	yes	8	7	23	61	57	156
Elephants	no	2	1	8	10	7	28
	yes	12	30	152	403	295	892
Leopards	no	13	25	131	288	151	608
	yes	1	6	29	124	151	311
Bears	no	9	29	119	277	162	596
	yes	5	2	41	135	140	323
Big Three	none	2	1	5	4	3	15
	one	6	22	93	206	83	410
	two	6	8	57	153	145	369
	all three	0	0	5	50	71	126
Mobile signal	no	7	15	84	227	127	460
	yes	7	16	76	186	175	460
Total		14	31	160	413	302	920