WILDLANKA Vol.8, No.3, pp. 108 - 119, 2020.

PROTECTED AREA OFFENCES IN SRI LANKA: A CASE STUDY OF THE KUMANA NATIONAL PARK AND PANAMA-KUDUMBIGALA SANCTUARY

K.T. KRISHAN, C.R. GULEGODA, R.P.T.I. RANASINGHE and M.R. WIJESINGHE*

Department of Zoology and Environment Sciences, University of Colombo, Colombo 03, Sri Lanka.

**mayuri@sci.cmb.ac.lk*

ABSTRACT : The effective management of the protected areas will play a pivotal role in conserving Sri Lanka's biological diversity. Although the country's protected area network is extensive and governed by a stringent set of laws and regulations, resource limitations for detecting and monitoring offences have hampered management efforts. This study focused on examining trends in the occurrence of offences in two protected areas, Kumana National Park and Panama-Kudumbigala Sanctuary, located adjacent to each other, in the southeastern region of Sri Lanka. Data relevant to offences relating to both protected areas were obtained from records lodged at the site office of the Department of Wildlife Conservation and covering a period of ten years (January 2010 to September 2019). Further information was gathered through informal interviews with park officials.

The data on offences committed during the past decade revealed annual and monthly (and concomitantly seasonal) trends. The number of offences was highest, 41, in 2014, and lowest, 6, in 2010. The most common offences were trespassing, possession of game meat, possession of illegal firearms, illegal fishing, and forest clearing. Offences were more frequent during the latter half of the year (August to December). This pattern is most likely linked to the seasonality in rainfall and the availability of brackish water fishery resources. Several faunal species – Spotted deer (*Axis axis*), Black-headed ibis (*Threskiornis melanocephalus*), Asian elephant (*Elephas maximus*), Flapshell turtle (*Lissemys ceylonensis*), Wild boar (*Sus scrofa*) and the Indian crested porcupine (*Hystrix indica*) were targeted; the elephant, by villagers mainly for self protection and safeguarding crops, and the others for bush meat by poachers. The highest month for offences related to game meat (August) coincided with the peak tourist season in Arugam Bay. The majority of the offenders were from Panama and Pottuvil, which are peripheral villages. The findings of the present study would be useful in managing the limited resources so as to alleviate the incidence of offences and address underlying driving forces. The latter would lead to more effective management of the protected areas in the long term.

KEY WORDS: seasonality, protected area management, wildlife offences

INTRODUCTION

A protected area (PA) is defined as an area of land and/or sea especially dedicated to the protection and maintenance of biological diversity, and of natural and associated cultural resources, and managed through legal or other effective means (IUCN and WCMC, 1994). Effective protected area management might, in the future, be one of the most important responses in addressing the global biodiversity crisis (Pimm *et al.*, 2001; Mora and Sale, 2011). This would apply particularly to the Asian tropics where the decline in biodiversity has been severe (Hoffmann *et al.*, 2010). Apart from providing a safe haven for many endangered plant and animal species, protected areas offer a range of ecosystem services that are vital for the sustenance of local communities (Andrade and Rhodes, 2012).

Sri Lanka has an extensive protected area network which, in the two categories National Park and Sanctuary, includes 26 National Parks and 59 Sanctuaries, under the jurisdiction of the Department of Wildlife Conservation (DWC). These protected areas are governed by comprehensive laws and regulations set out

under the Fauna and Flora Protection Ordinance (GoSL, 2013). National Parks include only state-owned land whereas Sanctuaries may include state-owned and private lands. Hence, the law and regulations pertaining to National Parks are more stringent than those applicable to Sanctuaries. For instance, no person shall enter a National Park unless authorized to do so and in accordance with conditions stipulated in a permit issued by a prescribed officer. This regulation does not apply to Sanctuaries. Some laws (e.g. pertaining to hunting and shooting) are commonly applicable to both National Parks and Sanctuaries.

For a developing tropical country such as Sri Lanka, endowed with a rich complement of biodiversity and having a high human population density, safeguarding its natural habitats poses an enormous challenge. When protected areas are so declared, local communities are inconvenienced through restrictions imposed particularly in terms of traditional practices relating to accessibility and harvesting (Khan and Bhagwat, 2010). Thus, despite strong protection measures, offences are regularly reported from protected areas, and conflicts arise between park management and local communities which tend to hinder effective management. Detection of offences within protected areas is often difficult owing to limitations in patrolling effort, considering the size of area that requires protection (Hossian *et al.*, 2016). Thus, information on annual and seasonal trends in offences relating to protected areas, while providing some insight into the efficacy of the presently implemented management strategies, would help to optimize the use of the limited resources available for detection of offences (Jachmann, 2008).The present study examines offences recorded in two protected areas located adjacent to each other, the Kumana National Park and Panama-Kudumbigala Sanctuary, over a ten year period (January 2010 – September 2019), with a view to discerning trends in types of offences, seasonality in their occurrence, and other related matters.

METHODOLOGY

Study site

The two protected areas under consideration, Kumana National Park and Panama-Kudumbigala Sanctuary, are situated adjacent to each other and form a complex with the Ruhuna National Park. Kumana National Park, covering an extent of 35,665 ha, was so declared in 2006. A section of this park had earlier – in 1970 – been designated Yala East National Park. Panama-Kudumbigala was declared a Sanctuary in 2006; it covers an extent of 6534 ha. The locations of the two protected areas are shown in Figure 1.

FIGURE 01: The Kumana National Park and the Panama-Kudumbigala Sanctuary (left); map of Sri Lanka showing the location of the enlarged section (right).

The two protected areas, located in southeast Sri Lanka, fall within the administrative districts of Ampara and Monaragala. Being located adjacent to the coast, the heterogeneous landscape of both PAs includes coastal wetlands, such as lagoons, estuaries, mangroves and salt marshes, interspersed with sand dunes, scrublands, and dry mixed evergreen forest, all supporting a rich and diverse faunal assemblage. The fauna include the charismatic species *Panthera pardus kotiya* (Sri Lankan Leopard), *Elephas maximus* (Asian Elephant) and *Melursus ursinus* (Sloth bear). In the coastal sections, in recognition of the high diversity of wetlands supporting a rich avifaunal community, an extent of 19,011 ha falling within both PAs was declared a Ramsar Site in 2010.

Data collection

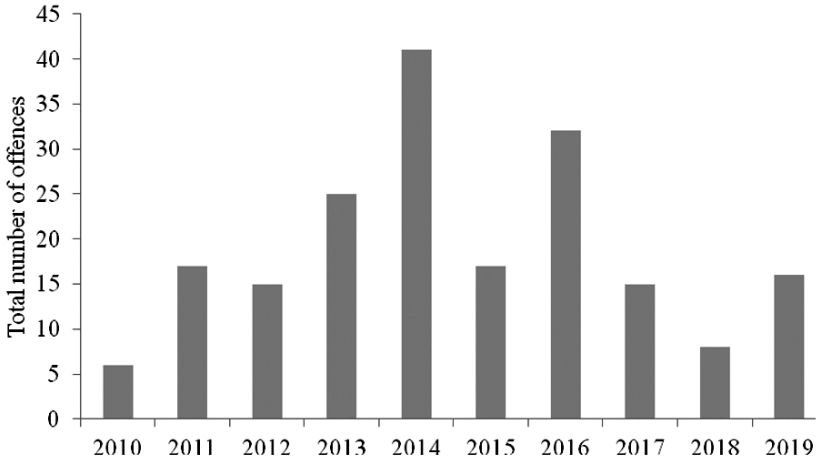
Kumana National Park and the Panama-Kudumbigala Sanctuary are managed by the DWC office located within the premises of Kumana National Park. The office systematically records information related to offences detected in both PAs. Therefore, the record books of the park served as the main source of information for the present study. The information extracted from the books included details relating to the offences, such as the type of offence, year and month in which it was detected, information on offender(s) such as the village from where they hailed, and the imposed fine. Informal interviews were conducted with park officials for obtaining information on the management of the park. Data were gathered covering the ten-year period from January 2010 to September 2019.

The data were analyzed using the Chi-Square test, one-way Anova and Pearson's correlation test to deduce annual and monthly trends.

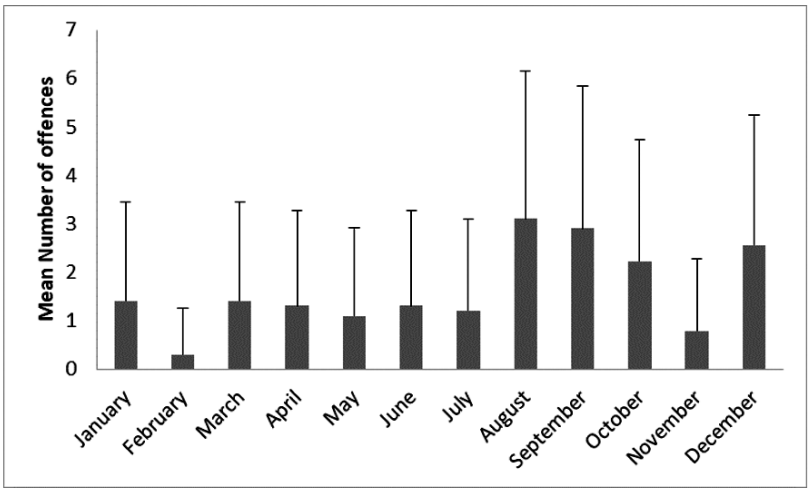
RESULTS

Total number of offences and temporal trends

The total number offences of all types recorded each year, during the period January 2010 to September 2019, is shown in Figure 2(a). There is a fluctuation in the number of offences, with the highest (41) being recorded in 2014 and the lowest (6) in 2010. The differences between the counts across years were highly significant (Chi-Square test: χ^2=54.04, P<0.001). The mean number of all offences in each month, covering the ten year period, is shown in Figure 2(b). Here too fluctuations are seen, the highest in August and the lowest in February. In this case, however, the differences were not significant (One-way Anova: F = 1.38, P= 0.19), most likely as a result of marked variations in the number of offences in the individual months across the different years.



(a)



(b)

FIGURE 02: Number of offences recorded from January 2010 to September 2019 in the two selected protected areas; (a) total across years and (b) mean (± standard deviation) across months

Types of offences and seasonality

A total of 21 types of offences were recorded during the period January 2010 to September 2019. They included poaching; transportation and possession of game meat, eggs and live/ dead animals; illegal possession of firearms and explosives; and carrying out prohibited activities within the PA which include illegal fishing, forest clearing, cultivating, logging, setting fire, sand and gem mining, and carrying out illegal construction work. Trespassing was recorded as a separate offence which in most instances was linked to other types of illegal activities. Obstruction of wildlife officials was also recorded as an offence.

The mean number of offences per year in each category is shown in Table 1. Possession of game meat and trespassing were the frequently recorded offences. Some offences such as the possession of dead/live animals or eggs, illegal agricultural activities and illegal gem mining were seldom recorded. It was also reported that forest clearing, cultivating, and setting fire were more frequent in areas within the Sanctuary than within the National Park. The crops grown include paddy (*Oryza sativa*) – *'goda wee'* a variety of paddy grown on high ground – peanuts (*Arachis hypogaea*), mung bean (*Vigna radiata*) and cowpea (*V. unguiculata*). We selectively analyzed the data on four important and more frequent offences (possession of game meat, possession of illegal firearms, forest clearing, and illegal fishing) for studying annual and seasonal trends (Figure 3). Trespassing was omitted in this analysis as it is often incidental to other types of offences.

The occurrence of the four selected offences during the ten year period under consideration (Figure 3) shows that the numbers of these offences vary across both years and months. No strict patterns were identifiable across years. On the total number of each type of offence each year, a spike is evident for the possession of game meat in 2019 (it should be noted that this is only over a period of nine months from January to September 2019), and the years 2010, 2011 and 2018 had relatively low numbers for all four types of offences. Statistical analyses revealed that the variation across years for forest clearing and the possession of firearms were significant, whereas it was not significant for the other two offences (Chi-Square test: Forest clearing χ^2=29.47, P<0.001; Possession of firearms χ^2=23.28, P<0.01; Possession of game meat

TABLE 01: Occurrence (mean per year± SD) of the different types of offences recorded in Kumana National Park and Panama-Kudumbigala Sanctuary from January 2010 to September 2019.

Offence Category	Occurrence
Possession of game meat	4.51 ± 13.35
Possession of live animals	0.10 ± 0.30
Possession of dead animals	0.10 ± 0.30
Possession of illegal firearms	1.95 ± 5.77
Escaping from custody	0.92 ± 2.73
Trespassing	3.49 ± 10.31
Transportation of game meat	0.72 ± 2.12
Illegal fishing	1.54 ± 4.55
Duty obstruction	0.62 ± 1.82
Clearing of state land	0.51 ± 1.52
Setting fire	0.31 ± 0.91
Possession of explosives	0.21 ± 0.61
Possession of eggs	0.10 ± 0.30
Forest clearing	1.64 ± 4.86
Illegal mining	0.82 ± 2.43
Illegal gemming	0.10 ± 0.30
Attempting to poach	0.21 ± 0.61
Poaching	0.41 ± 1.21
Illegal agricultural activities	0.10 ± 0.30
Forest logging	0.62 ± 1.82
Illegal constructions	0.92 ± 2.73

χ^2=12.15, P=0.21; Illegal fishing χ^2=11.71, P=0.23). This suggests that the occurrence of offences relating to the possession of game meat and illegal fishing were relatively constant across the ten years. Considering the month-wise variations in the occurrence of each of these offences, there appears to be evidence of seasonality. There is a high degree of overlap between the timing of the two offences possession of illegal firearms and illegal fishing, with both being more frequent during the latter part of the year (August to December). Possession of game meat occurred at a moderate level throughout the year. All three of these offences reached a peak in August/September and were lowest in November. Forest clearing was highest in November whereas no incidents were reported during January to May and in September. Other than for illegal fishing, the month-wise differences were not statistically significant (One-way Anova: Forest clearing– F=0.84, P=0.62; Possession of game meat – F=1.12, P=0.36; Possession of firearms – F=0.88, P=0.57; Illegal fishing – F=0.94, P<0.05). A lack of significant differences across months is most likely driven by the considerable fluctuation of each type of offence in individual months across the different years under consideration.

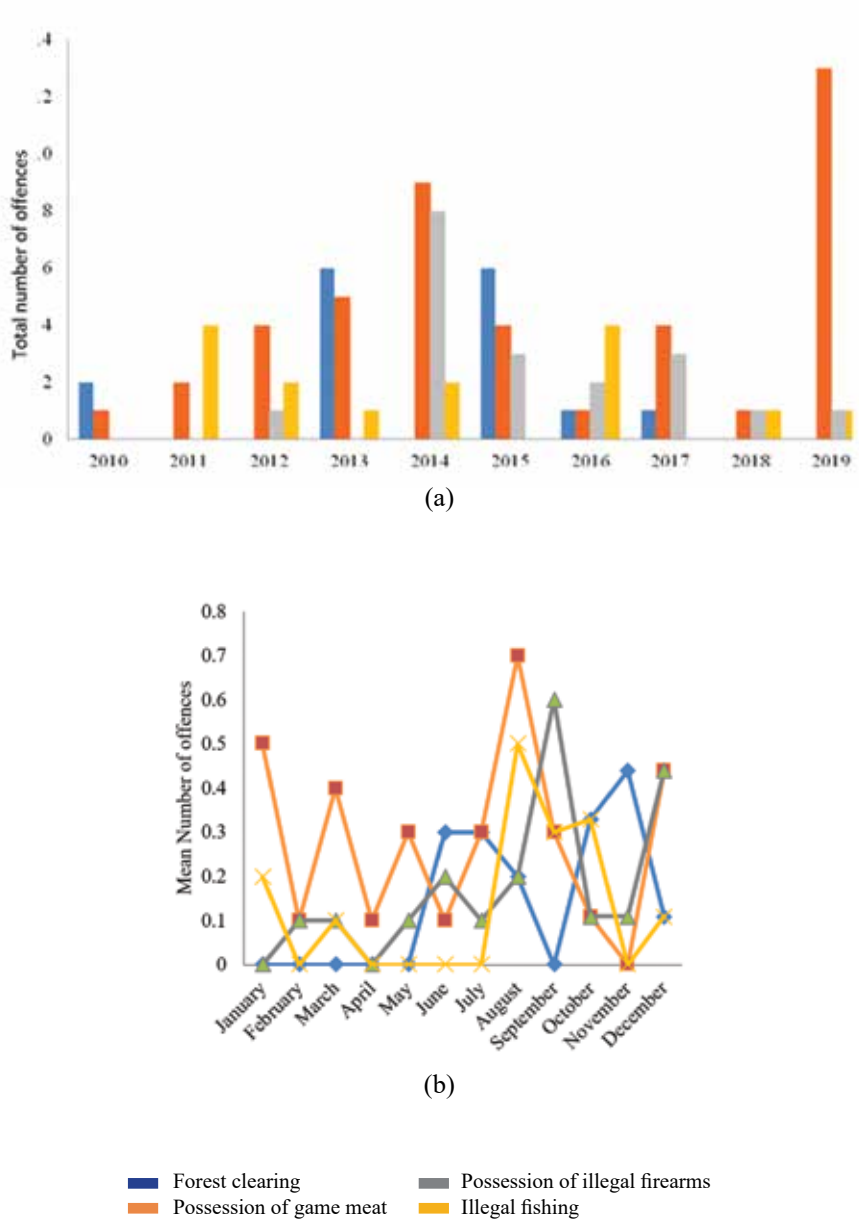


FIGURE 03: Occurrence of four selected offences during January 2010 – September 2019; (a) across years (total), and (b) across months (mean)

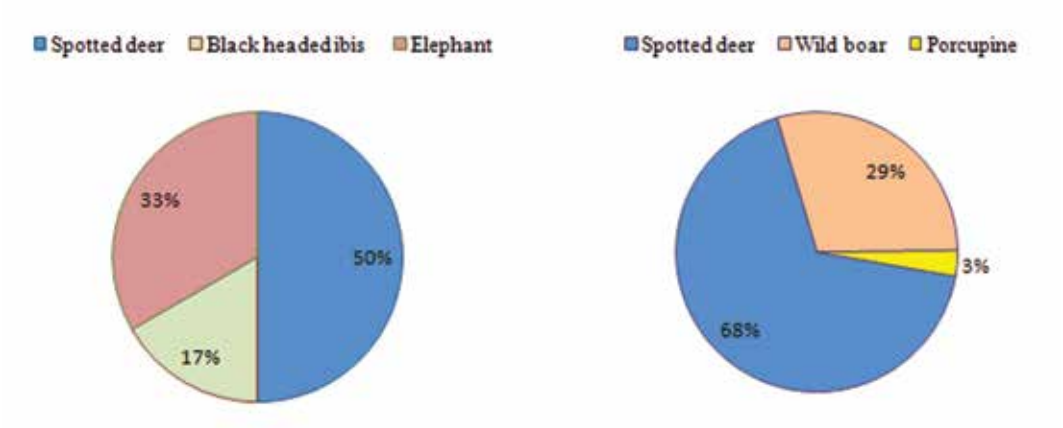
Hunted faunal species

Considering the ten year period for which data were gathered, the records show that a total of seven faunal species were targeted in the two PAs. These include the Spotted deer (*Axis axis*), Black-headed ibis (*Threskiornis melanocephalus*), Asian elephant (*Elephas maximus*), Flapshell turtle (*Lissemys ceylonensis*), Wild boar (*Sus scrofa*) and the Indian crested porcupine (*Hystrix indica*). Eggs

of the Indian Peafowl (*Pavo cristatus*) were illegally collected. The offences pertaining to hunting were poaching and possession of game meat and live/ dead animals. The main species targeted in poaching events and in the possession of game meat was the spotted deer – 50% of the poaching and hunting events and 68% of the cases relating to the possession of game meat (Figure 4).

Locations of offenders

The offences relating to the two PAs in the past ten years had been committed by persons from 24 locations (Figure 5). A majority of the offenders were from Panama and Pottuvil, which border the Panama-Kudumbigala Sanctuary.



(a) (b)

FIGURE 04: Percentages of species targeted from January 2010 – September 2019 as revealed by the records on (a) poaching/hunting and (b) possession of game meat

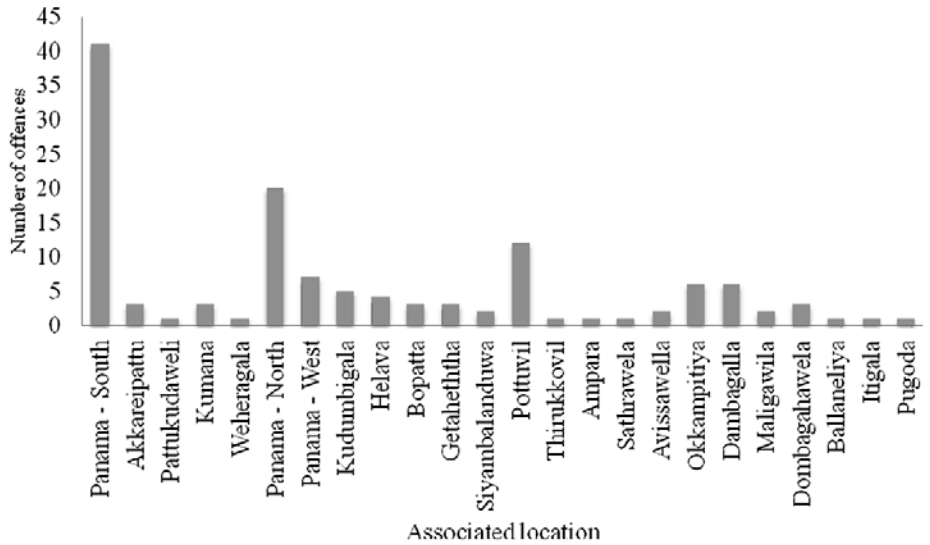


FIGURE 05: Hometowns of those apprehended for offences within the Kumana National Park and Panama-Kudumbigala Sanctuary over the period January 2010 – September 2019

Fines imposed

As expected, the variations in the number of offences across the ten years were positively associated with the amounts imposed as fines (Figure 5; Pearson's correlation r=0.73, P<0.05). The highest collection was in 2014 (Rs. 1.15 million) and the lowest in 2019 (Rs. 50 000). It should be noted that the amount for 2019 is only for a period of nine months.

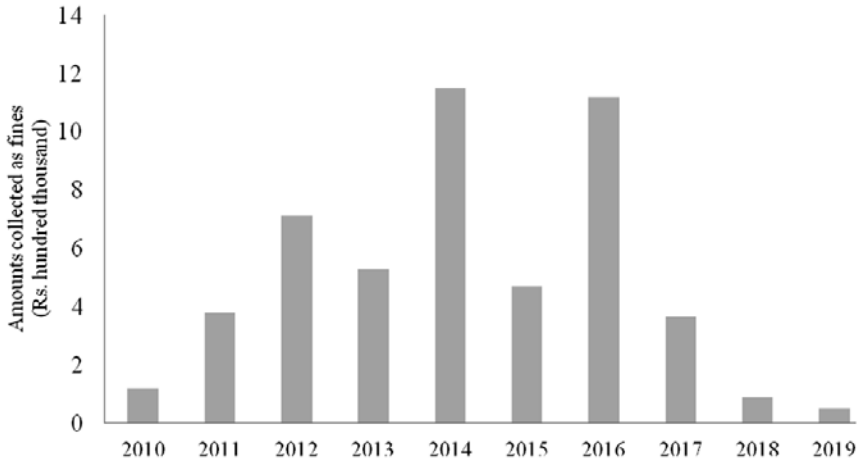


FIGURE 06: Amounts collected as fines from January 2010 – September 2019 in the two protected areas

DISCUSSION

The present study provided important information with respect to offences recorded in two protected areas of Sri Lanka, Kumana National Park and Panama-Kudumbigala Sanctuary. A total of 21 types of offences were recorded during the ten year period January 2010 to September 2019. From among these, trespassing was one of the more frequently recorded offences. The Fauna and Flora Protection Ordinance stipulates that no person shall enter or remain within a National Park unless duly authorized to do so and for a specified purpose. Hence, all offences committed within the Kumana National Park will also involve trespassing, thus accounting for the high number of offences in this category. The restriction on entry does not apply to a Sanctuary. Forest clearing was also frequently reported, but mainly from the Panama-Kudumbigala Sanctuary. This is to be expected since dwellers owning land within the sanctuary depend mainly on farming for their livelihood, and they tend to extend their cultivations on to the state land. Hence, unless the boundaries between the private and state lands within the sanctuary are clearly demarcated and patrolled regularly, encroachment into state-owned land would continue to occur. The need for revision of management strategies in protected areas, including in sanctuaries where there is mixed ownership of land, has been recognized as a priority (Marasinghe, 2013). Poaching and related offences such as the possession of game meat and live or dead animals, and the possession of firearms were also relatively frequent. Although the consumption of bush-meat had been practiced by humans for subsistence since ancient times, today hunting is mainly for the sale of meat (Lindsey *et al.*, 2015). Thus, for rural communities living in close proximity to protected areas, poaching presents an opportunity – though through illegal means – to bring in an additional income from the sale of game meat. The possession of

firearms was also a relatively frequent offence, likely so because these weapons are carried by those involved in poaching and also by other offenders for self protection.

The frequency of occurrence of offences taken as a whole in the two protected areas Kumana National Park and Panama-Kudumbigala Sanctuary during the period January 2010 to September 2019 showed that there was an annual variation in the total number of offences committed. The highest number of offences was detected in 2014 (41 entries) whereas the years 2010 and 2018 recorded low numbers. Temporal variations in the number of offences recorded in protected areas have been attributed to two possible reasons – differences in the frequency of occurrence and/or inconsistency in the detection of offences (Burton, 2010; Hossain *et al.*, 2016). It is reasonable to assume that, in the present case, the fluctuations in the number of total offences across the ten years may have been driven by one or both these factors.

The variations observed in the frequency of occurrence of offences during the study period, led us to examine the monthly patterns in the four types of offences – forest clearing, possession of game meat, illegal possession of firearms, and illegal fishing, that were most frequently recorded. The data showed a clear seasonal trend in the frequency of these four types of offences. Other than in the case of forest clearing, a high degree of overlap was observed among the other three offences – they were more frequent during the latter half of the year (August to December) with a peak in August and a dip in November. Detection of forest clearing offences was highest in November; no incidents were reported for this offence from January to May and in September. Overlaps between offences in terms of seasonality would be inevitable in the case of some types of offences that cannot be treated as isolated events. For instance, firearms may be carried by poachers and also by other offenders (e.g. those engaged in gem mining). Another case in point would be that of an offender who enters the PA for clearing forest land seizing the opportunity to hunt or poach. Seasonality in the occurrence of offences has also been reported from the Udawalawe National Park (Perera *et al.*, 2019).

It is important to examine reasons underlying the seasonality of the recorded offences, and to do so it would be necessary to consider the livelihood practices of the people in the area. Two of the main livelihood practices in the Ampara District are paddy cultivation and fisheries (Silva *et al.*, 2018). Crop cultivation is dependent on rainfall, and in Ampara the main rainy season, as in the rest of Sri Lanka's dry zone, is from September to March, with the highest rainfall occurring in October and November (Murugesapillai, 2017). For paddy farmers this would be the Maha season. It is reported that chena cultivation ("slash and burn" agriculture) although now occurring only on a restricted scale in Sri Lanka is still practiced as sporadic and illegal cultivations (i.e. on state land) in rural areas that are well hidden (Cairns, 2015). In the present study, offences recorded as forest clearing were primarily within Panama-Kudumbigala Sanctuary where illegal chena cultivation is carried out for growing rainfed crops such as *'godawee'* (paddy grown on high ground), peanuts (*Arachis hypogaea*), mung bean (*Vigna radiata*) and cowpea (*V. unguiculata*). The land is cleared and the ground prepared for planting prior to the onset of the rains (Gunasena and Pushpakumara, 2015), and this coincided with one of the periods when the frequency of forest clearing offences was high. It must be noted, however, that discrepancies can occur between the date of clearing and the date of detection, and this may account for the rise in detections recorded in November. Farming activities are allowed in the private lands within the Sanctuary but are prohibited in state land. The problems of preventing illegal land clearings are exacerbated owing to mixed land ownership and the lack of clear boundary demarcation between state and private lands in sanctuaries (Marasinghe, 2013).

Interestingly, the months during which fish and shellfish are harvested from brackish waters in the Ampara District (Ellepola *et al*., 2014), with the exception of November, coincide with the period when illegal fishing was recorded in the Kumana National Park and Panama-

Kudumbigala Sanctuary. The abundance of brackish water habitats such as the lagoons Bagure, Andarakala, Pitikala and Yaakala, and the mouth of the Kumbukkan oya (river) provide ample opportunity for fishing. Access to the lagoons at times during the height of the north-east monsoon might be difficult, and the pattern of occurrence of illegal fishing events might therefore represent a balance between abundance of fish and shellfish and accessibility of the brackish water habitats.

Offences relating to the possession of game meat in the two PAs under consideration were relatively moderate throughout the year, with a peak in August and a dip in November. The targeted species in the Kumana National Park and Panama-Kudumbigala Sanctuary include the Spotted deer (*Axis axis*), Black-headed ibis (*Threskiornis melanocephalus*), Flapshell turtle (*Lissemys ceylonensis*), Wild boar (*Sus scrofa*) and the Indian crested porcupine (*Hystrix indica*). The Spotted deer alone was the target in 50% of the poaching and hunting events and in 68% of the cases relating to the possession of game meat. We are unaware of any published records on social factors associated with the targeting of faunal species for game meat in Sri Lanka. In India bush-meat hunting has been seen to be closely correlated with shortages of food or money (Brashares *et al.*, 2004, Nasi *et al.*, 2008), and it is likely that financial constraints is the reason for the high frequency of offences related to game meat in the two protected areas under consideration. It is interesting to note that the peak in offences related to game meat (August) coincides with the height of the tourist season in Arugam Bay (Pathirana and Samarathunga, 2018), one of the popular tourist destinations in Sri Lanka and located in close proximity to the two PAs considered in this study. The targeting of elephants (*Elephas maximus*) by villagers is mainly for self protection and safeguarding crops (Ekanayake *et al.*, 2011). The Fauna and Flora Protection Ordinance prohibits hunting, wounding or killing any wild animal within a National Park or Sanctuary. It is important to note that some of the targeted species (e.g. Asian elephant, Flapshell turtle) are strictly protected even outside PAs. The elephant is listed as an Endangered species in the national list of threatened species in Sri Lanka (MoE, 2012). Another offence was the collection eggs of the Indian Peafowl (*Pavo cristatus*). Collection of eggs within PAs is also prohibited.

The management of protected areas presents enormous and constant challenges particularly in developing countries owing to the limited resources available for regular patrolling and monitoring (Danielsen *et al.*, 2000). The majority of the offenders in the present study were from the border villages Panama North, Panama South and Pottuvil, suggesting that the peripheral communities are predominantly involved. This fact and the observed seasonal trends might indicate as to where and when resources should be directed for effective detection of offences. Application of more advanced techniques, such as camera trapping and smart patrolling, and capacity building of the Department of Wildlife Conservation through the provision of trained staff and sufficient operational budgets could increase rates of detection considerably and strengthen law enforcement. These measures would also serve as deterrents to would-be offenders, resulting in a lowering of the number of offences (Dudley *et al.*, 2013; Burton, 2010). Surveillance should be strengthened during the peak periods when particular types of offences are committed. The present study emphasizes that, when allocating funds for the management of PAs, due consideration must be given to the resource needs for mitigating offences.

Importantly, the findings of this study could be used in order to understand the factors that underlie the need to commit offences, and this would hopefully lead to measures being taken to address the socio-economic problems faced by the indigent peripheral communities. This would no doubt be beneficial towards achieving more effective management of the protected areas in the long term.

ACKNOWLEDGEMENT

We thank the University of Colombo for financial assistance and the Department of Wildlife Conservation for granting permission to conduct this survey.

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Received Date : 03 July 2020
Accepted Date : 25 August 2020