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## COMMUNICATION

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## INVESTIGATING SRI LANKA'S HUMAN-MONKEY CONFLICT AND DEVELOPING A STRATEGY TO MITIGATE THE PROBLEM

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**Abstract:** Human-monkey conflicts reached crisis proportions in Sri Lanka over the last 10 years due to extensive deforestation to promote rapid economic growth and agricultural expansion. This resulted in complaints from the public with demands for Sri Lanka's Department of Wildlife Conservation (DWC) to solve the problem without delay. Caught between political pressure and public outcry, the DWC's efforts to deal with the crisis gradually fell into disarray. To overcome this, the SPEARS Foundation, offered to help the DWC to develop a strategic plan to deal with human-monkey conflicts. This plan was developed through a series of workshops and submitted to the Ministry of Sustainable Development and Wildlife in March 2016 for approval. During and after the development of the strategy, some of its key elements were implemented by the SPEARS Foundation. One of these elements was documenting details of human-monkey conflict from letters of complaint received by DWC. This information was used to initiate a series of field surveys to identify sites suitable for long-term protection of monkeys and other wildlife. When these areas are identified they would be designated as community conservation areas (CCAs), and managed by local stakeholders on a sustainable basis under the supervision of DWC. Establishing CCAs is a new paradigm for Sri Lanka to conserve wildlife while benefitting local communities. Its details were presented in the strategic plan submitted to the government. In this paper, we present the information obtained from the letters of complaint received by DWC and discuss its details. In subsequent reports, we will discuss the results of our field surveys to identify areas suitable for the establishment of CCAs.

**Keywords:** Conservation, human-monkey conflict, primates, strategic plan.

**Abbreviations:** DWC - Department of Wildlife Conservation; CCA - Community Conservation Areas; IUCN -International Union for Conservation of Nature.

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## INTRODUCTION

Human-monkey conflicts in Sri Lanka reached crisis proportions, when the country's 26-year ethnic war ended in 2009, and the pent-up desire for progress led to the extensive destruction of natural habitats for agricultural expansion and economic development. These conflicts resulted in complaints from the public with demands for Sri Lanka's Department of Wildlife Conservation (DWC) to find an immediate solution to the problem. In response, DWC attempted to do what it could with the small number of staff and annual budget available to it. Caught between political pressure and public outcry the DWC's efforts to deal with the human-monkey conflict gradually fell into disarray.

To overcome the disarray, the SPEARS Foundation (a conservation-oriented organization), offered to help DWC to develop a strategy to resolve the human-monkey conflict. A workshop was conducted in September 2014 to discuss details of the conflict, and to develop a strategy to deal with the problem. Two more workshops were held in February 2015 and March 2016 respectively, and at the end of the third workshop a strategic plan that included financial costs to conserve and coexist with Sri Lanka's monkeys was submitted to the Ministry of Sustainable Development and Wildlife (Rudran & Kotagama 2016). A formal cabinet approval for the strategic plan is pending.

While developing the strategic plan, we implemented some of its key elements. One of these elements was to review the letters of complaint received by DWC and document details of human-monkey conflicts in the 25 districts of Sri Lanka. This information was then used to begin a series of field surveys, to augment the database on conflicts and people's attitudes towards the problem. These on-going surveys are also collecting estimates of monkey populations and the size and quality of habitats available to them. The ultimate objective of these surveys is to identify areas that are suitable for the long-term protection of monkeys and other wildlife throughout the island. When these areas are identified, they would be designated as community conservation areas (CCAs), and managed by local stakeholders on a sustainable basis under the supervision of DWC. The details of this objective, which would be a new paradigm for conserving Sri Lanka's wildlife while benefitting local communities, was presented in the strategic plan submitted to the government. In this paper, we present the information obtained from the letters of complaint received by DWC and discuss its details. In subsequent reports, we will discuss the results of our field surveys

to identify areas suitable for the establishment of CCAs.

## METHODS

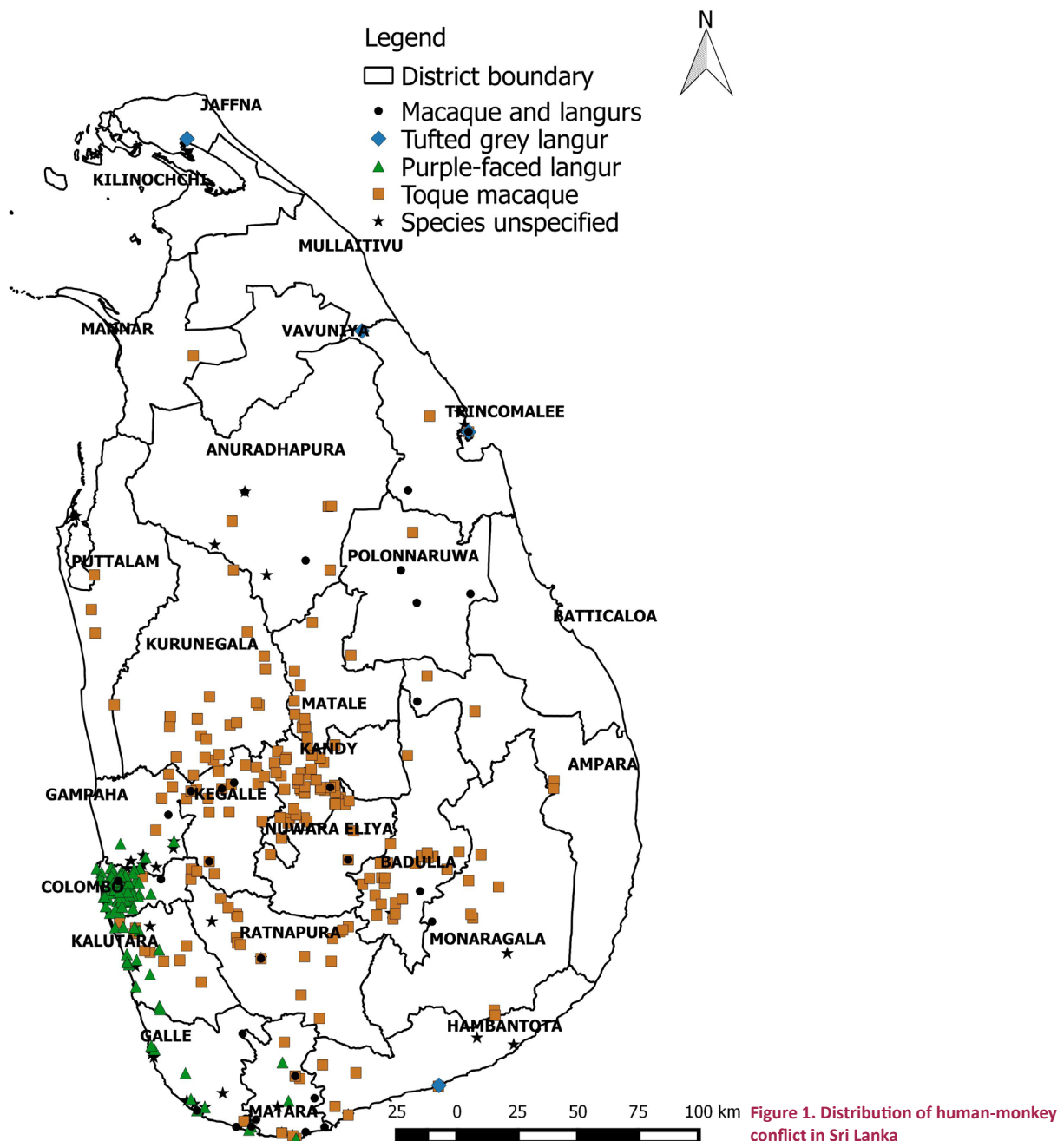
We reviewed the letters of complaints received by DWC from 2007–2015, and extracted information such as localities of conflict, species causing conflict, the type of problems they caused and human responses to the conflict. Localities of conflicts were mapped using QGIS (QGIS Development Team 2015), and the data were then analysed using Microsoft Excel.

## RESULTS

**Distribution of Conflicts:** From 2007 to 2015, DWC received 493 letters about human-monkey conflicts from 21 of 25 districts of the island (Table 1). These letters indicated that all three monkey species, the Purple-faced Langur *Semnopithecus vetulus*, the Tufted Grey Langur *S. priam thersites*, and Toque Macaque *Macaca sinica* were responsible for the conflicts in different parts of the country (Fig. 1).

Four districts (Colombo, Kandy, Badulla, and Kaluthara) contributed over 50% to the total number of complaints (Table 1). Macaques were responsible for 53.6% of the conflicts, while Purple-faced Langur accounted for 30%. Besides being most frequent, conflicts with macaques were also the most widespread, reported from 20 of 21 districts (Table 1). Some letters reported that macaque and a type of langur were responsible for conflicts, but did not specify which langur species was involved (macaques and langurs column in Table 1). Because the Tufted Grey Langur is found only in the dry zone, complaints about langurs from other climatic zones indicated that the Purple-faced Langur was responsible. When complaints were received from districts where both langur species occur it was not possible to say which was responsible for the conflicts. Thus from the information on the conflict and its location we estimated that the Purple-faced Langur was responsible for causing problems in at least eight districts (Colombo, Kaluthara, Matara, Galle, Gampaha, Rathnapura, Nuwara Eliya, Kegalle), and the Tufted Grey Langur was involved in conflicts in five districts (Hambantota, Trincomalee, Monaragala, Kandy and Jaffna) and possibly in four more (Anuradhapura, Polonnaruwa, Ampara, Badulla) as well.

**Sources of Conflict:** The conflicts mentioned in the letters of complaint were of six different types, and multiple sources of conflicts were mentioned in most



**Figure 1. Distribution of human-monkey conflict in Sri Lanka**

letters (Table 2). Damage to commercial and non-commercial crops was the most frequent category of conflict (70%). Because of such damage, 9% of the complainants said they were unable to benefit from the agricultural programmes supported and encouraged by the government. Damage to infrastructure, like TV antennas, water pipes and electric and telephone wires was also reported at a fairly high frequency (35%). The frequency of monkeys damaging roofs, wounding humans or pets and being a general nuisance ranged from 20% to 25%. Reports of stealing food from public

places and houses contributed 14% to the sources of conflict.

**Results of Conflict:** Perhaps the most important result of human-monkey conflicts was financial loss incurred due to crop, infrastructure and roof damage. This loss was quite evident when reviewing the complaints, but it could not be quantified with the information provided in the letters. Nevertheless, financial losses are likely to create animosity towards monkeys especially when they occur frequently. Wounding of humans and pets may result in psychological fear of monkeys. Additionally, the

**Table 1. Percentage of complaints received from different districts against monkeys**

District	Total number of reports	Toque Macaque	Purple-faced Langur	Tufted Grey Langur	Macaques and Langurs*	Species unspecified
Colombo	23.33	0.81	21.70	-	0.61	0.20
Kandy	12.98	12.78	-	-	0.20	-
Badulla	9.94	9.53	-	-	0.20	0.20
Kaluthara	6.90	1.83	4.46	-	0.20	0.41
Matara	6.29	2.23	1.22	-	1.62	1.22
Kurunegala	5.48	5.48	-	-	-	-
Kegalle	5.27	4.46	-	-	0.81	-
Galle	4.87	-	1.42	-	0.61	2.84
Rathnapura	4.46	3.85	-	-	0.20	0.41
Gampaha	3.85	1.83	0.61	-	0.20	1.22
Matale	2.84	2.84	-	-	-	-
Monaragala	2.43	2.03	-	-	0.20	0.20
Hambantota	2.03	1.01	-	0.20	-	0.81
Trincomalee	2.03	0.41	-	0.41	0.81	0.41
Anuradhapura	1.83	1.01	-	-	0.20	0.61
Nuwara Eliya	1.62	1.42	-	-	0.20	-
Polonnaruwa	1.22	0.41	-	-	0.81	-
Ampara	1.01	0.81	-	-	0.20	-
Puttalam	0.81	0.61	-	-	-	0.20
Jaffna	0.61	-	-	0.61	-	-
Mannar	0.20	0.20	-	-	-	-
Mullativu	-	-	-	-	-	-
Batticaloa	-	-	-	-	-	-
Vavunia	-	-	-	-	-	-
Kilinochchi	-	-	-	-	-	-
Total	100.00	53.55	29.41	1.22	7.10	8.72

\*Distribution of langurs: Out of the districts where complaints have been received both langur species (Purple-faced Langur and Tufted Grey Langur) are found in Badulla, Matara, Kurunegala, Anuradhapura, Polonnaruwa, Ampara, Mannar districts either in sympatry or are found in different parts of the district. Only Purple-faced Langurs are found in Colombo, Kaluthara, Kegalle, Galle, Rathnapura, Gampaha, Matale, Nuwaraeliya districts and Tufted Grey Langurs are found in Kandy, Monaragala, Hambantota, Trincomalee, Puttalam and Jaffna.

**Table 2. Types of conflict**

Category	Description	%
Crop damage	Damage to both commercial and non-commercial crops. (It was not possible to differentiate between commercial and non-commercial crops because most are subsistence farmers who would sell their excess harvest to earn an income)	70.39
Infrastructure damage	Damage to antennas, telephone wires, electric wires, pipes, bulbs, mirrors, vehicles, household equipment etc.	34.89
Roof damage	Damage caused to roof tiles or sheets by jumping on them, lifting and shaking them.	25.76
Wounding humans/animals	Monkeys injuring humans or pets by biting or scratching	20.49
Nuisance	Aggressive behaviour of monkeys towards people, stealing clothes, urinating and defecating inside houses and water tanks, eating from garbage bins and general mention about monkeys as a nuisance without specifying a problem	19.68
Food theft	Stealing food in houses, public places such as schools and tourist sites; stealing food laid out in home gardens to dry	14.40
Injured Monkey	Informing about injured or dead monkey due to electrocution, dog bites, injury caused by humans or other unknown factor	2.64



action of one animal may be taken to represent typical behaviour and create fear of all individuals of that species. Another fear reported in the complaint letters was the health hazard monkeys pose by urinating and defecating in open water, home gardens and sometimes inside houses. For reasons that were unclear, some letters indicated that monkeys target women and children more than they do adult men. Since monkeys are involved in many types of conflicts and they can instil fear and cause financial loss, human attitudes towards them can be expected to be more intolerant than against other animals like birds or giant squirrel that cause fewer problems to people.

Solutions suggested to resolve conflict: About 49% of the letters of complaint demanded that the monkeys be translocated from problem areas to localities like protected areas (n=243). There were also requests for air rifles (n=11) that could be used to frighten monkeys, and for a program to sterilize them (n=8) to prevent their populations from increasing. In addition to offering solutions to resolve the problem, some letters of complaint (n=17) mentioned that human monkey conflicts arose in their areas only after these animals were translocated into these localities from elsewhere. Hence, they felt that translocation was not a solution to deal with the conflict between humans and monkeys.

## DISCUSSION

All three species of monkeys involved in conflicts with humans are endemic to Sri Lanka. Therefore, they make a unique contribution to global biological diversity, and for this reason, they should be considered on par with other national treasures and provided adequate protection. Furthermore, all of them are listed as endangered by the IUCN, and one of the Purple-faced Langur subspecies (*S. v. nestor*) is designated as Critically Endangered (Dittus et al. 2008). Additionally, *S. vetulus* is included among the world's 25 most endangered primates (Rudran & Cabral 2017). The biological significance of the above-mentioned features of Sri Lanka's monkeys is an important reason for conserving these species despite the conflict they have with humans. Moreover, since the wide distribution of the Toque Macaque and the Purple-faced Langur has resulted in their radiation into subspecies occupying different climatic zones (Dittus 2013a), all three subspecies of the Toque Macaque (*M. s. sinica*, *M. s. aurifrons* and *M. s. opisthomelas*) and the four subspecies of the Purple-faced Langur (*S. v. nestor*, *S. v. vetulus*, *S. v. monticola*, and *S. v. philbricki*) must be

conserved, along with the Sri Lankan subspecies of the Tufted Grey Langur (*S. priam thersites*).

The Toque Macaques were responsible for complaints from the highest number of people and districts (Table 1). This may be because Toque Macaques have a wider distribution in Sri Lanka than the other two monkey species (Phillips 1981; Dittus 2013b). Despite being an endemic primate, the Toque Macaque is nationally listed as a species of Least Concern (Weerakoon 2012). It is also unprotected under the Fauna and Flora Protection Ordinance of Sri Lanka (Act No. 22 of 2009). This situation poses a serious problem to conserving the Toque Macaque.

Part of the reason for the Toque Macaque's predicament is that it is typically a forest dwelling omnivore. Having lost its natural habitat to deforestation, it has readily adapted to eating human food discarded with garbage in urban areas. This habit has resulted in noticeable localised increases in macaque populations especially around tourist sites and other public places where food can be obtained from garbage dumps (Dittus 2012a,b, 2013b). In some of these areas the macaques are considered pests. Despite this situation, *M. s. opisthomelas* the highland subspecies has a very restricted distribution in montane habitats (Dittus 2013b). Therefore, it is more threatened than the other two subspecies, and complaints of conflict with this subspecies suggests that special attention must be paid to its conservation.

The most numerous complaints were reported from Colombo District (Table 1). This district with the country's capital has the highest human population density (Department of Census and Statistics 2012) on the island, and the complaints were mainly against the Critically Endangered *S. v. nestor*. The range of this subspecies extends across Colombo, Gampaha and parts of Kaluthara, Kurunegala, Ratnapura and Kegalle districts (Phillips 1981; Dela 2011). Compared to the distribution of the other three subspecies of Purple-faced Langurs, the western form inhabits an area of very high human density with extremely fragmented and sparsely distributed forest patches (Gunatilleke & Gunatilleke 1990). Hence its conflicts with humans severely undermine the future survival of this highly arboreal langur.

Recognizing the dangers to *S. v. nestor*'s long-term survival, a project was launched in 2008 to help promote its conservation. This project was located at Waga, which is close to the largest forest patch remaining within *S. v. nestor*'s range. It began with an investigation of *S. v. nestor*'s food habits to identify plants that could be

used to increase forest cover and enhance its long-term survival (Rudran et al. 2013). This investigation gradually evolved into a broader program that began to provide community development assistance to encourage people of all ages to participate in *S. v. nestor's* conservation. The program included an environmental education program for school children, an income-generating initiative for youths and adults, and a service that provided free medical assistance to seniors with old-age problems like diabetes, hypertension, arthritis and visual impairments (Rudran 2015). Recently, this project launched an ecotourism project as an income-generating initiative that could also promote the conservation of monkeys and other wildlife. The effectiveness of community-based conservation has been widely discussed, and addressing its limitations and integrating cultural values and local needs is important for its success (Munthali 2007; DeCaro & Stokes 2008; Waylen et al. 2010). Educating people, especially the younger generation, can bring about a positive attitudinal change about wildlife and increase tolerance in people, which will help mitigate conflict in the long term (Distefano 2005; Hockings & Humle 2009).

Over the past eight years the project around Waga has evolved into a model for the establishment of CCAs recommended in the strategic plan to conserve and coexist with monkeys of Sri Lanka. It is expected that this model could be replicated in other areas that the on-going surveys identify as suitable for the establishment of CCAs. Establishing CCAs in several areas provides opportunities to conserve and coexist with all subspecies of monkeys as well as other wildlife.

Damage to crops and/or property can be a financial burden. More than 70% of complaints were the result of crop damage, which agrees with the information from other investigators (Dela 2011; Nahallage & Huffman 2013). Financial losses cannot be ignored in efforts to find a solution to human-monkey conflicts. Thus during the on-going field surveys detailed information on financial losses incurred due to conflict with monkeys is being collected. This information will be passed on to government authorities to develop an insurance or compensation scheme to minimize economic loss and mitigate the conflict (Mishra et al. 2003; Distefano 2005).

Macaques acting aggressively towards people, and stealing or forcefully grabbing food from them appears to be a problem created by people (Dittus 2012b, 2013b). In a group of Toque macaques there is a strict dominance hierarchy, and subordinates offer food to dominant individuals. Thus, people giving food to macaques may be perceived as subordinates and evoke

aggressive behaviour from animals that receive food.

Many complainants requested translocation of monkeys to other areas. Its effectiveness, however, is highly questionable (Singh et al. 2005; Dittus 2012b; Germano et al. 2015; Mendis & Dangolla 2016). Translocation of problem animals to mitigate conflict is merely movement of the problem from one place to another (Dittus 2012b), and several letters received by the DWC provide evidence for this. Translocation is also unsuccessful because it is only a temporary solution, as neighbouring monkey groups will quickly take over the vacated home range and the conflict will recur (Dittus 2012b; Hoffman & O'Rian 2014; Mendis & Dangolla 2016). There is also the issue of mixing of subspecies when translocation is done haphazardly with no knowledge of the adaptations shown by monkeys for their localities, and the importance of maintaining genetic diversity of subspecies (Dittus 2012b). An example of a success story of translocation of monkeys has been recorded from India for *Macaca mulatta* (Imam et al. 2002). Mitigation-driven translocation, however, must be done cautiously with a scientific and conservation basis (Germano et al. 2015).

Preventive strategies such as sterilization of female monkeys to control their reproduction (Singh et al. 2005) may be applicable in Sri Lanka. However, this process requires a large financial investment and is difficult to implement on large monkey populations (Dittus 2012b). Proper waste management systems should be implemented, in public places as well as home gardens, to prevent monkeys from having access to garbage (Distefano 2005). This may be done with use of monkey-proof garbage bins, which should be emptied regularly and closely monitored from collection to disposal (Dittus 2012b; McKinney 2015; Mendis & Dangolla 2016). It is important to enforce strict regulations to prevent feeding monkeys (Singh et al. 2005; Dittus 2012a). It has been reported that even with signage and penalties imposed on people to stop feeding monkeys in public places, people continue to do so (Newsome & Rodger 2008; Hsu et al. 2009). In Buddhist countries like Sri Lanka where monkeys and other animals are given food to gain merit, it is extremely difficult to prevent people from feeding animals. Nevertheless, people must be made aware of the risks and consequences of provisioning food and improper waste disposal, if preventive measures are to be successful (Sabbatini et al. 2006). Barriers to prevent monkeys from entering houses, like blocking gaps between roofs and walls, using wire mesh on windows, applying predator urine as a monkey repellent and guarding crops may be successful methods to minimize



conflict with monkeys (Distefano 2005; Dittus 2012b). If capture of problem monkeys is essential it must be carried out by the DWC under very strict guidelines, as a mitigation effort. Captured animals, however, should not be released to any protected area or other forest, but should be relocated into a monkey shelter after sterilising all individuals as suggested in Singh et al. (2005).

It is important to look at the conflict as a whole, through the perspective of all stakeholders and all issues involved, to help transform the conflict into peaceful coexistence with monkeys (Lederach & Maiese 2009). Through implementation of our strategic plan we hope to minimise conflict and promote harmonious coexistence through attitudinal change among people about monkeys and other wildlife.

## REFERENCES

- DeCaro, D. & M. Stokes (2008). Social-psychological principles of community-based conservation and conservancy motivation: attaining goals within an autonomy-supportive environment. *Conservation Biology* 22(6): 1443–51; <http://doi.org/10.1111/j.1523-7399.2008.00996.x>
- Dela, J.D.S. (2011). Impact of monkey-human relationships and habitat change on *Semnopithecus vetulus nestor* in human modified habitats. *Journal of the National Science Foundation of Sri Lanka* 39(4): 365–82; <http://doi.org/10.4038/jnsfr.v39i4.4144>
- Department of Census and Statistics (2012). Census of population and housing 2011. Department of Census and Statistics, P O Box 563, Colombo, Sri Lanka.
- Distefano, E. (2005). *Human-Wildlife Conflict Worldwide : Collection of Case Studies , Analysis of Management Strategies and Good Practices*. Sustainable Agriculture and Rural Development (SARD), Food and Agricultural Organization of the United Nations (FAO), Rome, Italy. [http://www.fao.org/SARD/COMMON/ecg/1357/en/HWC\\_final.pdf](http://www.fao.org/SARD/COMMON/ecg/1357/en/HWC_final.pdf).
- Dittus, W. (2012a). An online forum for exchanging ideas for dealing with issues of pest monkeys. *Journal of Primatology* 1: 1–2.
- Dittus, W. (2012b). Problems with pest monkeys: myths and solutions. *Loris* 26(3&4): 18–23.
- Dittus, W. (2013a). Subspecies of Sri Lankan mammals as units of biodiversity conservation, with special reference to the primates. *Ceylon Journal of Science (Biological Sciences)* 2(2): 1–27; <http://doi.org/10.4038/cjsbs.v42i2.6606>
- Dittus, W. (2013b). Toque macaque, pp.170–86. In: Johnsingh, A.J.T. & N. Manjrekar (eds.) *Mammals of South Asia Volume 1, 1<sup>st</sup> Edition*. Universities Press (India) Private Limited.
- Dittus, W., S. Molur & K.A.I. Nekaris (2008). *Trachypithecus vetulus* ssp. *nestor*. The IUCN Red List of Threatened Species 2008: e.T39844A10276249. Downloaded on 24 November 2016. <http://doi.org/10.2305/IUCN.UK.2008.RLTS.T39844A10276249.en>
- Germano, J.M., K.J. Field, R.A. Griffiths, S. Clulow, J. Foster, G. Harding & R.R. Swaisgood (2015). Mitigation-driven translocations : are we moving wildlife in the right direction? *Frontiers in Ecology and the Environment* 13(2): 100–105; <http://doi.org/10.1890/140137>
- Gunatilleke, A.I.A.U.N. & C.V.S. Gunatilleke (1990). Distribution of floristic richness and its conservation in Sri Lanka. *Conservation Biology* 4(1): 21–31.
- Hockings, K. & T. Humle (2009). *Best Practice Guidelines for the Prevention and Mitigation of Conflict between Humans and Great Apes*. IUCN/SSC Primate Specialist Group (PSG), Gland, Switzerland, 40pp.
- Hoffman, T.S. & M.J. O'Rian (2014). Monkey management : using spatial ecology to understand the extent and severity of human-baboon conflict in the Cape Peninsula, South Africa. *Ecology and Society* 17(3): 13; <http://doi.org/10.5751/ES-04882-170313>
- Hsu, M.J., C. Kao & G. Agoramoorthy (2009). Interactions between visitors and Formosan macaques (*Macaca cyclopis*) at Shou-Shan Nature Park, Taiwan. *American Journal of Primatology* 71: 214–22; <http://doi.org/10.1002/ajp.20638>
- Imam, E., H.S.A. Yahya & I. Malik (2002). A successful mass translocation of commensal Rhesus monkeys *Macaca mulatta* in Vrindaban, India. *Oryx* 36 (1): 87–93; <http://doi.org/10.1017/S0030605301000011>
- Lederach, J. & M. Maiese (2009). Conflict transformation: a circular journey with a purpose. *New Routes* 14: 7–11.
- Mckinney, T. (2015). Species-specific responses to tourist interactions by White-faced Capuchins (*Cebus imitator*) and Mantled Howlers (*Alouatta palliata*) in a Costa Rican Wildlife Refuge. *International Journal of Primatology* 35: 573–589; <http://doi.org/10.1007/s10764-014-9769-1>
- Mendis, B.C.G. & A. Dangolla (2016). Human-monkey (*Macaca sinica*) conflict in Sri Lanka. *Sri Lanka Veterinary Journal* 63 (2B): 35–37. <http://doi.org/10.4038/slvj.v63i2.15>
- Mishra, C., P. Allen, T. McCarthy, M.D. Madhusudan, A. Bayarjargal & H.H.T. Prins (2003). The role of incentive programs in conserving the snow leopard. *Conservation Biology* 17(6): 1512–1520; <http://doi.org/10.1111/j.1523-1739.2003.00092.x>
- Munthali, S.M. (2007). Transfrontier conservation areas : integrating biodiversity and poverty alleviation in southern Africa. *Natural Resources Forum* 31: 51–60.
- Nahallage, C.A.D. & M.A. Huffman (2013). Macaque-human interactions in past and present-day Sri Lanka, pp. 135–148. In: Radhakrishna, S., M.A. Huffman, & A. Sinha (eds.). *The Macaque Connection: Cooperation and Conflict Between Humans and Macaques*. Springer Science & Business Media.
- Newsome, D. & K. Rodger (2008). To feed or not to feed : a contentious issue in wildlife tourism, pp. 255–70. In: Lunney, D., A. Munn & W. Meikle (eds.). *Too Close for Comfort: Contentious Issues in Human-Wildlife Encounters*. Royal Zoological Society of New South Wales, Mosman, NSW, Australia.
- Phillips, W.W.A. (1981). *Manual of the Mammals of Sri Lanka - 2nd Revised Edition*. Wildlife and Nature Protection Society, Colombo.
- QGIS Development Team (2015). QGIS geographic information system. Open Source Geospatial Foundation Project. <http://qgis.osgeo.org>.
- Rudran, R. (2015). Western Purple-faced Langur *Semnopithecus vetulus nestor* Bennett, 1833. pp. 63–66. In: Schwitzer, C., R.A. Mittermeier, A.B. Rylands, F. Chiozza, E.A. Williamson & J. Wallis (eds.) *Primates in Peril: The World's 25 Most Endangered Primates 2014–2016*. IUCN SSC Primate Specialist Group (PSG), International Primatological Society (IPS), Conservation International, (CI), and Bristol Zoological Society, Arlington, VA.
- Rudran, R., H.G.S.K. Dayananda, D.D. Jayamanne & D.G.R. Sirimanne (2013). Food habits and habitat use patterns of Sri Lanka's Western Purple-faced langur. *Primate Conservation* 27(1): 99–108; <http://doi.org/10.1896/052.027.0111>
- Rudran, R. & S. Kotagama (2016). Strategy to conserve and coexist with Sri Lanka's monkeys [abstract], p. 17. In: *5th Asian Primate Symposium*. Sri Jayewardenepura, Sri Lanka: APS-2016 and Faculty of Humanities and Social Sciences, University of Sri Jayewardenepura, Sri Lanka.
- Rudran, R. & S.J. Cabral (2017). *Semnopithecus vetulus* Erxleben, 1777, pp. 40–43. In: Schwitzer, C., R.A. Mittermeier, A.B. Rylands, F. Chiozza, E.A. Williamson, E.J. Macfie, J. Wallis & A. Cotton (eds.). *Primates in Peril: The World's 25 Most Endangered Primates 2016–2018*. IUCN SSC Primate Specialist Group (PSG), International Primatological Society (IPS), Conservation International, (CI), and Bristol Zoological Society, Arlington, VA.
- Sabbatini, G., M. Stannati, M.C.H. Tavares, M.V. Giuliani & E.

- Visalberghi (2006).** Interactions between humans and Capuchin monkeys ( *Cebus libidinosus* ) in the Parque Nacional de Brasília , Brazil. *Applied Animal Behaviour Science* 97: 272–283; <http://doi.org/10.1016/j.applanim.2005.07.002>
- Singh, M., I. Malik, W. Dittus, A. Sinha, J. Kirkpatrick, A. Belsare, S.R. Walker, S. Molur, B. Wright, J. Lenin & S. Chaudhuri (2005).** *Action Plan for the Control of Commensal, Non-human Primates in Public Places*. Zoo Outreach Organisation, Coimbatore, India, 16pp
- Waylen, K.A., A. Fischer, P.J.K. McGowan, S.J. Thirgood & E.J. Milner-Gulland (2010).** Effect of local cultural context on the success of community-based conservation interventions. *Conservation Biology* 24(4): 1119–11129; <http://doi.org/10.1111/j.1523-1739.2010.01446.x>
- Weerakoon, D.K. (2012).** The taxonomy and conservation status of mammals in Sri Lanka, pp. 134–144. In: Weerakoon, D.K. & S. Wijesundara (eds.). *The National Red List 2012 Sri Lanka; Conservation Status of Fauna and Flora*. Ministry of Environment, Colombo, Sri Lanka, viii+476pp.



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