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Journal of Threatened Taxa

Building evidence for conservation globally

www.threatenedtaxa.org

ISSN 0974-7907 (Online) | ISSN 0974-7893 (Print)

CONSERVATION APPLICATION

TAKING THE FIRST STEPS: INITIAL MAPPING OF THE HUMAN-WILDLIFE INTERACTION OF THE MAURITIUS FRUIT BAT *PTEROPUS NIGER* (MAMMALIA: CHIROPTERA: PTEROPODIDAE) IN MAURITIUS BY CONSERVATION ORGANIZATIONS

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26 July 2018 | Vol. 10 | No. 8 | Pages: 12073–12081

10.11609/jott.4063.10.8.12073-12081



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Abstract: Interactions between people and wildlife have both positive and negative aspects. Negative interactions, commonly termed human-wildlife conflict (HWC), have increased in recent decades due to a number of factors including difficulties in identifying and communicating the complexities of stakeholder values and positions over wildlife and its management. Here, we present the perceptions of two conservation organizations on the landscape of HWC involving the threatened Mauritius Fruit Bat *Pteropus niger*, Kerr 1792 in Mauritius, including damage to fruit crops and controversial government culls in 2015 and 2016. Participants identified 18 stakeholders in the conflict varying in importance and influence, examined where and how hostility is manifested, and delineated both perceived and real costs of the conflict. Additionally, 13 environmental and 17 social risk factors associated with the conflict were categorized, along with potential policy and management options for mitigation. We argue that initial in-house workshops are advantageous in understanding conservation conflicts before extending dialogue with other stakeholders.

Keywords: Conflict mitigation, fruit bat, human-wildlife conflict, Mauritius, *Pteropus niger*, stakeholder engagement.

DOI: <http://doi.org/10.11609/jott.4063.10.8.12073-12081>

Editor: Anonymity requested.

Date of publication: 26 July 2018 (online & print)

Manuscript details: Ms # 4063 | Received 08 February 2018 | Final received 30 March 2018 | Finally accepted 15 June 2018

Citation: Anthony, B.P., V. Tatayah & D. de Chazal (2018). Taking the first steps: Initial mapping of the human-wildlife interaction of the Mauritius Fruit Bat *Pteropus niger* (Mammalia: Chiroptera: Pteropodidae) in Mauritius by conservation organizations. *Journal of Threatened Taxa* 10(8): 12073–12081; <http://doi.org/10.11609/jott.4063.10.8.12073-12081>

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Funding: This work was supported by Central European University Foundation of Budapest Academic Travel Grant BPF/11783.

Competing interests: The authors declare no competing interests.

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Author Contribution: Designed study (BPA); data collection (BPA, VT); data analysis (BPA); write up (BPA, VT, DDC).

Acknowledgements: We thank MWF for logistical support, all workshop participants for their involvement, and Viktor Lagutov for Figure 1.



INTRODUCTION

Human-wildlife conflict (HWC) traditionally arises from a rivalry or antagonism between humans and wildlife (Woodroffe et al. 2005), or between people over wildlife and/or its management (Madden 2004; Redpath et al. 2013). The former typically emerge from territorial proximity between humans and wildlife, conflict over the same resource or even a direct threat to human wellbeing. People-people conflicts on the other hand, characteristically emerge when disparate values clash in the face of management decisions (Nyhus 2016).

While humans and wildlife have a long history of interaction, the frequency and complexity of conflicts has grown in recent decades, mainly because of the exponential increase in human populations and concomitant human footprint, expansion of some wildlife distributions (Chapron et al. 2014), as well as a frequent inability of institutions that are meant to mediate such conflicts to respond effectively (Anthony et al. 2010). HWC often pits disparate values against one another (Tajfel 1981; Kellert 1993; Young et al. 2010) and demands attention from economic, legal, social and environmental policy makers (Knight 2000; White et al. 2009; Nyhus 2016). Moreover, these values influence people's behaviour towards wildlife and institutions responsible for conservation (Manfredo & Dayer 2004; Manfredo 2008; Dickman et al. 2013). Therefore, HWCs are best managed through a shared understanding of the broader context of the situation, necessitating both natural and social science approaches (Dickman 2010; Redpath et al. 2013), and often utilizing workshops (Madden 2004; Reed et al. 2009; WWF 2015). This shared understanding is of key importance to finding long-lasting solutions to such conflicts, and to avoid potential escalation (Treves et al. 2009; Anthony et al. 2010).

The identification, differentiation and meaningful involvement of all affected stakeholders and the mapping of their goals and opinions on the resource(s) in question and potential mitigation strategies are crucial before crafting or implementing management decisions (Reed 2008; Reed et al. 2009; White et al. 2009; Redpath et al. 2013). Recent cases where stakeholder analysis and participatory strategies have been applied with the aim of conflict resolution range from conflicts concerning Hen Harriers *Circus cyaneus* in Scotland (White et al. 2009), Eastern Imperial Eagles *Aquila heliaca* in Hungary (Kovács et al. 2016), to livestock depredation by large carnivores in South Africa (Anthony & Swemmer 2015). Before engaging with wider actors, however, it has been suggested that organizations first develop a

coherent understanding of the issue within their own institution and/or with institutions that share common values, serving to enhance channels of communication and catering to a unified backing of wider stakeholder engagement (FAO 2002), particularly in contexts where complex multi-actor governance models exist (Funtowicz et al. 1999). Thus, there has been greater realization by management authorities that focusing on both wildlife and human dimensions together is critical, as opposed to treating them separately, even within organizations (Clark et al. 1996; Baruch-Mordo et al. 2009; Treves et al. 2009).

Mauritius Fruit Bats

Bats are the only mammals native to the Mascarene Islands, consisting of Mauritius, Réunion and Rodrigues (Fig. 1). Historically, three fruit bat species occupied these islands: one is now extinct (*Pteropus subniger*), leaving one species each on Mauritius (*P. niger*, Kerr 1792) and Rodrigues (*P. rodricensis*). Once widespread over Mauritius, the Mauritius Fruit Bat population decreased considerably from its original population due to habitat loss and degradation, cyclones, invasive alien species, climate change and illegal hunting (Hutson & Racey 2013; Vincenot et al. 2017). Due to lack of major cyclones for well over a decade, however, the population has increased, thus shifting its IUCN Red List status from Endangered (2008) to Vulnerable (in 2013), which was also based on an assurance that culling would not be considered (Hutson & Racey 2013). Assessing the status of this bat species has been complicated by discrepancies in population estimates yielded by different census techniques, ranging in 2015 from ~50,000 by the Mauritian Wildlife Foundation (MWF), to ~90,000 by the National Parks and Conservation Service (NPCS) (Hansard 2016). In October 2016 a population estimate was undertaken by the NPCS in collaboration with the Forestry Service and MWF, using both evening dispersal counts and direct counts, which are believed to be more accurate (Kunz 2003), yielding an estimate of ~62,000 individuals.

Mauritius Fruit Bats are considered keystone species as they provide critical pollinating and disseminating services (Vincenot et al. 2017). They are mainly nocturnal or crepuscular, and roost chiefly in primary forests or areas containing a mixture of native and introduced plant species. Bats may travel long distances to visit orchards and garden fruit trees for exotic fruits when their natural food supplies are limited (Aziz et al. 2016). The reported level of fruit damage by bats has ranged from 9.3%

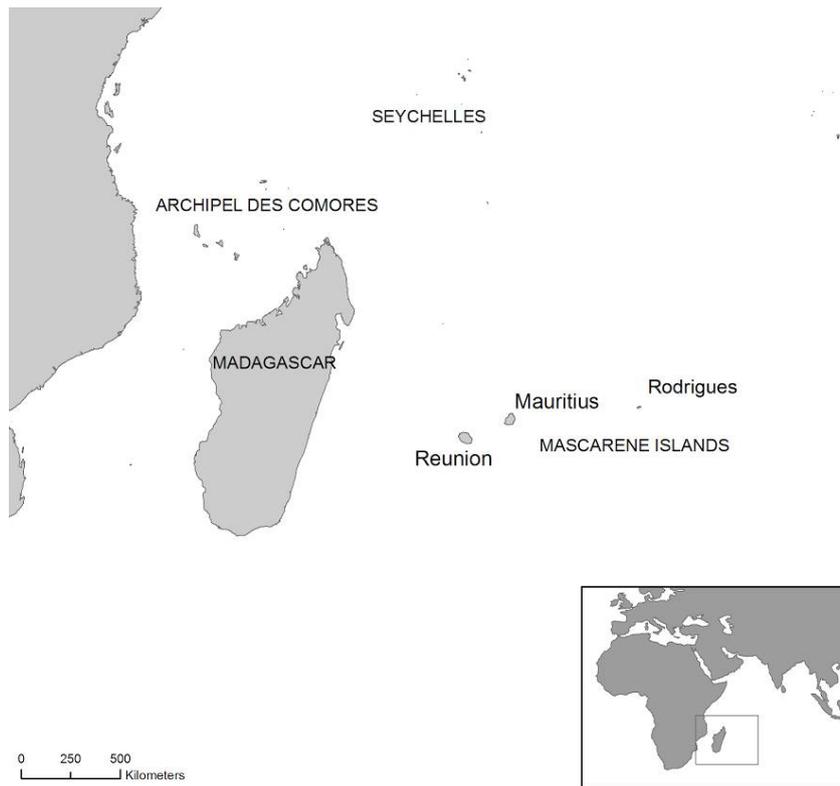


Figure 1. Location of Mascarene Islands

and 11.4% on Lychee *Litchi chinensis* and Large Mango *Mangifera indica* trees, respectively (Oleksy 2015), to over 50% of Lychee trees (Hansard 2016). Despite a subsidized tree netting scheme, and due in part to alleged significant increases in fruit damage by bats and the lobbying of fruit growers for its lethal control, the government passed the Native Terrestrial Biodiversity and National Parks Act in November 2015, legalizing the culling of any wildlife that has attained 'pest' status. Consequently, a highly controversial government sanctioned cull was conducted in November-December 2015, with a reported 30,938 bats culled (Hansard 2016). A second official cull was conducted in December 2016 in which 7,380 bats were killed (Hansard 2017). This culling largely contributed to a subsequent uplisting of the species from Vulnerable to Endangered by the IUCN in 2018 (Kingston et al. 2018).

The Mauritian Fruit Bat cull has pitted a number of stakeholders and their values against one another (MWF 2016). This sensitive situation, involving disputed bat population and fruit damage estimates, and the role of culling to alleviate fruit damage, requires joint actions from fruit growers, local organizations and governmental bodies, and also calls for a deeper understanding of the conflict by conservation organizations to provide a basis for developing effective management strategies. In order

to improve this understanding, we utilized a workshop targeted specifically to conservation organizations to map how they perceive the conflict landscape by identifying the scope and scale of human-bat interaction issues associated with relevant actors in Mauritius, and to propose strategies to navigate forward. It specifically aimed to explore intra-stakeholder complexities involved in preventing and resolving conflicts and fostering coexistence between people and bats, acknowledging data deficiencies along the way.

METHODS

As an overarching framework, but restricted to organizations with similar values, we utilized Lasswell's (1971) general strategy for problem solving that undertakes five 'intellectual tasks':

- (1) clarify the goals of people involved or affected by the problem and its solution.
- (2) describe the history and trends of the problem (including empirical data on the biophysical and cultural context of the problem and relevant processes such as decision making).
- (3) understand the relationships of all factors that have influenced, affected, or caused the problem.

(4) project the trajectory, severity, and consequences of future developments.

(5) invent, appraise, and select alternatives.

In addition, we incorporated a number of relevant sub-frameworks drawing from examples from the literature on the targeted theme.

To implement this framework, we convened a one-day workshop for MWF and NPCS staff in May 2017. All staff who were directly or indirectly engaged with the fruit bat conflict were invited, and included organization directors, project managers, and field-level officers. Participants were provided with a pre-workshop package consisting of a schedule, and group member allocation along with assigned readings and tasks. The workshop consisted of introductory sessions on the background of human-wildlife conflict and its mitigation, the Mauritius Fruit Bat, and an outline for group exercises (see Appendix 1). These were followed by three parallel group sessions, the composition of which was based on maintaining equally sized groups and personnel expertise and awareness. Each group had a number of iterative tasks to complete including an ongoing assessment of knowledge gaps and/or research needs (Table 1). A group-appointed rapporteur recorded notes on both a flip chart and notebook, then communicated findings back to all workshop participants at the end of the day. Notes for each group were subsequently compiled and categorized according to pre-defined conceptual codes according to the sub-frameworks used, and were largely descriptive in nature.

Secondly, in June 2017, we administered a follow-up questionnaire to all workshop participants consisting of two parts. First, we captured information on length of involvement in their organization, and perceived knowledge of the fruit bat conflict prior to the workshop. Second, we requested their opinion as to (i) whether the workshop met their expectations, (ii) assisted them to see and appreciate the wider conflict landscape, (iii) what was particularly useful with the workshop, and (iv) how it could be improved. Univariate statistics were computed using SPSS ver. 22 (IBM Corp 2013). Qualitative responses to questionnaire items were analysed using emergent content coding (Stemler 2001).

RESULTS

A total of 20 participants representing staff from MWF (18) and NPCS (2) attended the workshop, and contributed to its results. Below, we present findings from the group exercises, including coded indications of knowledge level of the respective concept/stakeholder by workshop participants (bold = well known; normal font = somewhat known; italics = unknown).

Group A

Group A participants identified 18 stakeholders involved in human-bat interaction, ranging from highly influential and important fruit-growers, to leisure parks holding relatively little influence and power in the

Table 1. Workshop outline and group tasks for participants

Objectives	Task(s)	Supporting reference(s)
Group A		
Stakeholder identification	<ul style="list-style-type: none"> identify relevant stakeholders in conflict rank stakeholders according to importance & influence using stakeholder matrix assess what is/isn't known about stakeholder(s) 	Messmer 2000; IFC 2007
Identify responses and consequences due to conflict	<ul style="list-style-type: none"> identify direct and indirect responses and consequences of conflict by stakeholders estimate level of hostility assess what is/isn't known about responses and consequences 	Dickman 2010
Group B		
Identify environmental and social risk factors associated with conflict	<ul style="list-style-type: none"> identify environmental risk factors associated with conflict: environmental characteristics; land use & management; human behavior (e.g. protection & management); species' behavior identify social risk factors associated with conflict: inequality & power; distrust & animosity; vulnerability & wealth; beliefs & values assess what is/isn't known about risk factors 	Clark et al. 1996; Treves et al. 2009; Dickman 2010
Identify perceived and real costs of conflict	<ul style="list-style-type: none"> identify type and variation in perceived costs of conflict identify type and variation in real costs of conflict assess what is/isn't known about perceived and real costs 	Inskip & Zimmermann 2009; Anthony & Szabo 2011; Barua et al. 2013
Group C		
Identify and assess policy and management options for conflict	<ul style="list-style-type: none"> explore and identify relevant and feasible policy and management options to minimize/mitigate conflict assess options according to efficiency, costs, and durability assess what is/isn't known about policy and management options 	Morrison et al. 2009; Chardonnet et al. 2010; Dickman 2010; Redpath et al. 2013

Table 2. Stakeholder matrix based on influence and importance of stakeholder (bold = well known; normal font = somewhat known; italics = unknown)

		Importance			
		Unknown	Little/No importance	Some importance	Significant importance
Influence	Significant influence			government (Cabinet)	fruit growers (commercial + backyard)
	Somewhat influential	<i>movies</i>	public press	fruit sellers/traders private companies NPCS	<i>FAREI</i> <i>funders</i>
	Little/No influence	hunters	<i>leisure parks</i>	tourists	conservationists (MWF)
	Unknown	<i>Religious organizations</i>	<i>nature-lovers (IUCN; NGOs; individuals)</i>		<i>net sellers</i>

FAREI = Food and Agricultural Research & Extension Institute; IUCN = International Union for Conservation of Nature; MWF = Mauritian Wildlife Foundation; NGO = Non-government organization; NPCS = National Parks and Conservation Service

conflict. In addition, there were a number of 'unknown' actors of varied influence and importance, including the role of religious organizations (Table 2). Group A also explicated a number of current interactions between stakeholder groups, outlining the perceived level of hostility, stakeholder activity, and current expressions of the conflict. These interactions represented public, government, and NGO sectors (Appendix 2), ranging from varied responses to media campaigns, frustration with current mitigation strategies (tree netting), and conflicting government mandates across ministries.

Group B

Group B participants identified 13 environmental and 17 social risk factors associated with the human-bat interaction, along with knowledge gaps (Appendix 4), which would necessitate targeted investigation before and during extended dialogue with other stakeholders. Environmental risk factors included the influence that climatic conditions (e.g., cyclones), forest health and composition, fruiting season, fruit tree pruning and protection, and bat behaviour have on the conflict. Social risk factors were also varied, ranging from market disparities, powerful lobbying interests, media influence, distrust, and folklore.

Further, Group B participants assessed both the perceived and real costs of conflict, with an indication of level of knowledge concerning these factors (Appendix 3). Most discrepancies between perceived and real costs of the conflict were economical in nature, including those relating to fruit tree maintenance, the price of fruit, and the potential impact on tourism if Mauritius' world renowned reputation in conservation is seen as eroding.

Group C

Group C was assigned to outline what policy and management measures are, and potentially could be,

leveraged to mitigate conflict between fruit bats and the various stakeholders. Results are outlined in Appendix 5, conforming to the same scheme of level of knowledge about the effectiveness of policy and management options. Measures identified by workshop participants included extended tree netting and pruning service to fruit growers (both backyard and larger orchards), initiating decoy crops, increased bat awareness campaigns, stricter control on fruit prices, and expanded research on bat ecology.

Workshop Assessment

Fifteen (75%) workshop participants completed and returned the questionnaire, representing both the MWF (13), and the NPCS (combined response from 2 participants). Length of time employed in their respective organizations ranged from 0.5-20 years (\bar{x} = 7.9, sd = 5.63). On a 10 point scale (1=very low to 10=very high), prior knowledge regarding the fruit bat conflict ranged from 5 to 9 (\bar{x} = 7.4, sd =1.39), and was greater among those who held higher positions within their organization and/or those who worked directly with the bat issue.

On a scale of 1 to 10 (1=not at all to 10=completely), participants rated whether the workshop met their expectations, and opportunity was granted to explain their response. Scores ranged from 3 to 8 (\bar{x} = 6.0, sd =1.65). Those with higher scores noted that the workshop helped to (i) increase appreciation of the wider legal, social, and institutional aspects of the conflict, (ii) provide intra-agency exposure and awareness of the conflict complexity, and (iii) provide a much-needed platform to hear other agency views (and challenges) associated with the conflict.

Workshop participants were asked more specifically to rate how well the workshop helped them to see the wider social and management aspects of the issue both within their own organization and with another

conservation organization. Scores ranged widely (\bar{x} = 6.1, sd = 2.53), with those with higher scores noting how well the workshop helped them to understand the breadth of stakeholders directly or indirectly involved in the conflict, to see underlying issues, and recognize political dimensions of conservation conflicts (including public and political resistance). Others commented on how well the workshop disclosed how even two pro-conservation organizations can have disparate opinions on how to manage such conflicts. For those who perceived themselves to have moderate experience in conflict management and resolution, the workshop did not add much to their understanding of the breadth of social and management facets of this particular conflict. Participants believed the workshop was particularly useful in that, before extending dialogue with other stakeholders, it:

- involved group sessions within conservation-oriented stakeholders in which issues could be openly discussed and debated;
- encouraged wider understanding of models by which conservation conflicts can be framed; and
- provided pre-workshop readings and introductory sessions which facilitated improved framing of workshop tasks.

Finally, ideas on improving such workshops included eventually expanding stakeholder representation, extending its duration to 3–4 days, developing a common strategy to move forward, providing a broader array of theories, case studies, and bat research, and allowing for prolonged inter-group discussions on findings.

DISCUSSION

Our initial findings demonstrate that inter- and intra-organizational workshops designed to map conservation conflict landscapes, before extending dialogue with a wider spectrum of stakeholders, can be of immense value in a number of ways. First, a broader array of stakeholders can be acknowledged at the onset, each with varying degrees of influence and importance which, in turn, allows for more strategic and prioritized engagement (IFC 2007). Second, conflict nodes between stakeholders and their intensity can be identified, facilitating more nuanced strategies for addressing particular conflict dimensions, and allowing for a more appreciative inquiry of the conflict typology that currently exists, or may develop in the future. Third, delineating environmental and social risk factors including both perceived and real conflict costs can assist the designing of more complex

mitigation strategies including more focused awareness raising campaigns, as well as leveraging existing and potential policy and management options (Dickman 2010). Finally, by recognizing where knowledge gaps exist, conservation organizations can channel appropriate resources towards research needs and/or solicit support from other stakeholders for both research and appropriate monitoring.

We believe initial conflict mapping workshops of this nature can elevate pan-organizational understanding of conservation conflicts and build consensus by identifying, appreciating, and eventually communicating the positions and values of stakeholders, and their justification. Of course, this is only the first step in realizing true resolution, as other stakeholders may have vastly different or contrasting opinions, attitudes and values concerning the conflict (White et al. 2009). Moreover, we recognize that in-house workshops represent only one of many options for participatory and non-participatory processes which can be used to address conservation conflicts (Reed et al. 2009). Nevertheless, our assessment demonstrates that organizations would benefit from in-house workshops in order to develop an inclusive and coherent approach to engage other stakeholders before taking that next step.

Our findings also suggest that such workshops should extend to a minimum of three days, eventually involve more stakeholders, and generate more tangible outcomes in terms of mitigation strategies. We recommend, however, that such preliminary workshops be restricted to a limited number of stakeholders sharing similar values, involving relevant personnel who interact both directly or indirectly with other stakeholders (including the general public) in HWC issues. Doing so prompts a more collective and nuanced strategy for navigating forward as an organization, and for reducing the risk of conflict escalation. In our case, the fate of an entire species, and the services it provides, may depend on it.

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Appendix 1. Human-Wildlife Conflict Workshop- Schedule

Time	Activity
08:30-09:00	Welcome & Intro to HWC
09:00-09:30	Fruit bat case study - overview
09:30-10:00	Intro to workshop sessions
10:00-10:30	Tea/Coffee break
10:30-12:00	Group Work I: groups (A/B/C)
12:00-13:00	Lunch
13:00-15:00	Group Work II: groups (A/B/C) + finalizing presentation
15:00-16:00	Working groups report findings (knowledge gaps & research needs) [20' per group]
16:00-16:20	Closing remarks + tea/coffee

Appendix 2. Outline of selected stakeholder interactions leading to particular responses and consequences

Stakeholders	Level of Hostility	Activity	Current Response/Consequences
MWF x Public	High	MWF educates and raises public awareness on bat conservation to improve attitudes towards bats and their conservation	<ul style="list-style-type: none"> · little/no change in attitude · people still unaware of importance of bats · some public participate in saving injured bats, but majority do not.
Fruit growers x MWF	High	MWF: Provide info to farmers (netting / pruning) but with mixed results	<ul style="list-style-type: none"> · Fruit growers believe MWF 'do not understand their problems' · because MWF has low influence, the opinion of growers is strongly influencing government decision · damage level not based on scientific results
Government x Civil society	High	Government mandated to both protect wildlife and farmer interests, and wants to appease voters through approving bat culls	<ul style="list-style-type: none"> · Ministry of Agro-Industry and Food Security has conflicting mandates (wildlife protection and food production) · Conservation and animal welfare NGOs lobby for bat protection
Press x Public	Minimal	Press reporting on bat issue to public	<ul style="list-style-type: none"> · Press provide media coverage (good info) · Press communicate wrong or distorted info, leading to negative public opinion · Press has been ambivalent: strongly encourage culling before cull, and after cull was more nuanced · Public: blame MWF for high population of bats · Encourages illegal culling

Appendix 3. Perceived and real cost factors identified by workshop participants

Note: **bold** = well known; normal font = somewhat known; *italics* = unknown

Perceived Costs of Conflict	Real Costs of Conflict
<ul style="list-style-type: none"> · cleaning under fruit trees · removal of fruit trees leads to less fruit · ▲ price of fruit · availability of fruits: <p>less fruit on backyard tree to eat or give to neighbours; market fruit usually available, just expensive</p> <ul style="list-style-type: none"> · bat extinction will deprive future generations of wildlife · less fruit leads to ▼ revenue · sleep disturbance · affects tourist industry negatively if bats culled · Mauritius international reputation as biodiversity champion tarnished · ▼ <i>bats leads to ▼ forest regeneration</i> · <i>psychological impact of culling</i> · <i>physical injury from installation/ removal of netting</i> · <i>boycott in export of Mauritian fruits if bats culled</i> 	<ul style="list-style-type: none"> · subsidy of netting · cost of culling · cost of surveys (bat population and questionnaire) · cost of nets and installation and removal · cost of pruning · cleaning under trees · other methods to keep bats away (guarding, lights, fire crackers, shooting)

Appendix 4. Environmental and social risk factors identified by workshop participantsNote: **bold** = well known; normal font = somewhat known; *italics* = unknown; arrows indicate effect between variables

Environmental Risk Factors	Social Risk Factors
Environmental characteristics/land use and management <ul style="list-style-type: none"> ▼ native forest extent leads to ▲ bats' reliance on exotic fruits ▼ forest quality leads to ▲ bats' reliance on exotic fruits ▲ urbanisation leads to ▼ tree abundance/density ▼ cyclones leads to ▲ bat population lychee season leads to less native food source for bats ▲ commercial fruit growers leads to ▲ fruit which, in turn, leads to ▲ bats 	<i>Inequality and power</i> <ul style="list-style-type: none"> ● lobbying by influential groups (fruit exporters, NGOs) ● political decision based on popularity (backyard growers as large voting base) ● press influence (affects public perception) ● lack of education leads to less informed judgement ● control of fruit price (for economic gain) and/or unfair trade practices (limiting supply) can lead to and maintain inflated fruit prices
Human Behaviour <ul style="list-style-type: none"> ▲ pruning and netting effectiveness leads to ▼ bat damage to fruits ▲ capacity/willingness to utilize netting leads to ▼ bat damage to fruits ▲ bat culling leads to ▲ illegal killing of bats by public orchard owners: ▲ resources for tree protection leads to ▲ tree protection backyard growers: ▼ resources for tree protection leads to ▲ bats feeding in backyards 	Vulnerability and Wealth <ul style="list-style-type: none"> ● Backyard growers and small scale planters cannot afford netting nor installation which leads to inability to reduce damage by bats and birds ● Returns from harvest significant percentage of annual revenue for orchard owners ● Physical incapacity to install nets may deter use
Behaviour and management of conflict-causing species <ul style="list-style-type: none"> ● bats non-territorial, thus damage by bats widespread ● ▲ protection by law leads to ▲ bat population 	Distrust and animosity <ul style="list-style-type: none"> ● people upset because of fruit predated by bats, noise and faeces/residue ● annoyance over legal protection of bats leads many Mauritians to consider bats as 'pests' ● <i>Distrust towards conservationists ('do not understand farmers losing fruits'; 'all they want to do is to protect bats')</i>
	Beliefs and Values <ul style="list-style-type: none"> ● as bats are believed to be nocturnal, their habits are unknown ● hunting is considered normal (acceptable) killing ● perceptions of bats due to folklore ('evil creatures') ● bats are considered by some to be edible, thus it is more acceptable to kill them (cultural for some sections of the population) ● <i>religions do not promote killing</i> ● <i>superstitions (bats 'dark and evil', 'vampires', 'get entangled in people's hair')</i>

Appendix 5. Existing and potential policy options identified by participants, and level of knowledge regarding these optionsNote: **bold** = well known; normal font = somewhat known; *italics* = unknown

Existing Policy/Management	Proposed Policy/Management	Relevant Considerations
Netting subsidy (75%) scheme	Full canopy netting	<ul style="list-style-type: none"> · extend netting scheme to more than (current) half of all trees in orchards <2 acres, and 5 for backyard growers. · service provider to train (i) teams in community allowing free net installation for backyard growers, and (ii) orchard staff which would increase uptake and effectiveness in orchards
Tree pruning	Tree pruning and compensation against losses	<i>identify team of wood cutters</i>
Sacrificial (decoy) crops	Provide incentive in private sector to plant sacrificial crop	free of charge to farmers
Culling (as and when required)	Controlled hunting	<ul style="list-style-type: none"> · find appropriate hunting season and target number of bats · seen as last option
	More study on bat ecology	Investigate local knowledge (e.g. use of smoke as deterrent)
	Pick your own	Pick your own scheme to lower price
	Price control of fruit	Government to implement measures to ensure free market without price fixing
	Awareness campaign	<ul style="list-style-type: none"> · identify target group and effective communication method · leisure parks: interaction with bats





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ISSN 0974-7907 (Online); ISSN 0974-7893 (Print)

July 2018 | Vol. 10 | No. 8 | Pages: 11999–12146

Date of Publication: 26 July 2018 (Online & Print)

DOI: 10.11609/jott.2018.10.8.11999-12146

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Communications

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-- Saru Rimal, Hari Adhikari & Shankar Tripathi, Pp. 11999–12007

Camera-trapping survey to assess diversity, distribution and photographic capture rate of terrestrial mammals in the aftermath of the ethnopolitical conflict in Manas National Park, Assam, India
-- Dipankar Lahkar, M. Firoz Ahmed, Ramie H. Begum, Sunit Kumar Das, Bibhuti Prasad Lahkar, Hiranya K. Sarma & Abishek Harihar, Pp. 12008–12017

In plain sight: Bacular and noseleaf morphology supports distinct specific status of Roundleaf Bats *Hipposideros pomona* Andersen, 1918 and *Hipposideros gentilis* Andersen, 1918 (Chiroptera: Hipposideridae)
-- Bhargavi Srinivasulu & Chelmala Srinivasulu, Pp. 12018–12026

The amphibian diversity of selected agroecosystems in the southern Western Ghats, India
-- M.S. Syamili & P.O. Nameer, Pp. 12027–12034

Taxonomic status and additional description of White's Stalked-eyed Fly *Cyrtodiopsis whitei* (Curran, 1936) (Diptera: Diopsidae) from India with a key to the allied species and note on its habitat
-- Basant Kumar Agarwala, Pp. 12035–12043

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-- Arnab Basu, Indrani Sarkar, Siddhartha Datta & Sheela Roy, Pp. 12044–12055

Conservation status of Mascarene Amaranth *Aerva congesta* Balf.F. Ex Baker (Eudicots: Caryophyllales: Amaranthaceae): a Critically Endangered endemic herb of the Mascarenes, Indian Ocean
-- Kersley Bruno Pynee, David Harold Lorence & Poojanraj Khurun, Pp. 12056–12063

Vegetative and reproductive phenology of *Aquilaria malaccensis* Lam. (Agarwood) in Cachar District, Assam, India
-- Birkhungur Borogayary, Ashesh Kumar Das & Arun Jyoti Nath, Pp. 12064–12072

Conservation Application

Taking the first steps: Initial mapping of the human-wildlife interaction of the Mauritius Fruit Bat *Pteropus niger* (Mammalia: Chiroptera: Pteropodidae) in Mauritius by conservation organizations
-- Brandon P. Anthony, Vikash Tatayah & Deborah de Chazal, Pp. 12073–12081

Peer Commentary

The term human-wildlife conflict creates more problems than it resolves: better labels should be considered
-- Priya Davidar, Pp. 12082–12085

Short Communications

First photographic evidence of Snow Leopard *Panthera uncia* (Mammalia: Carnivora: Felidae) outside current protected areas network in Nepal Himalaya
-- Rinzin Phunjok Lama, Tashi R. Ghale, Madan K. Suwal, Rishi Ranabhat & Ganga Ram Regmi, Pp. 12086–12090

Small carnivores of Silent Valley National Park, Kerala, India
-- Devika Sanghamithra & P.O. Nameer, Pp. 12091–12097

Status survey and conservation of the House Sparrow *Passer domesticus* (Aves: Passeriformes: Passeridae) through public participation in Kannur, Kerala, India
-- R. Roshnath, C.P. Arjun, J. Ashli, D. Sethu & P. Gokul, Pp. 12098–12102

The ecology and distribution of percoid fish *Dario neela* from Wayanad in the Western Ghats of Kerala, India
-- Dencin Rons Thampy & C.P. Shaji, Pp. 12103–12107

A checklist of the ornamental fishes of Himachal Pradesh, the western Himalaya, India
-- Indu Sharma & Rani Dhanze, Pp. 12108–12116

Odonate diversity of Nalsarovar Bird Sanctuary - a Ramsar site in Gujarat, India
-- Darshana M. Rathod & B.M. Parasharya, Pp. 12117–12122

Root holoparasite *Balanophora polyandra* Griff. (Balanophoraceae) in eastern Himalaya (Sikkim, India): distribution, range, status and threats
-- Prem K. Chhetri, Alexander R. O'Neill & Bijoy Chhetri, Pp. 12123–12129

Notes

Transfer of *Storena gujaratensis* Tikader & Patel, 1975 to the genus *Suffasia* Jocqué, 1991 (Araneae: Zodariidae)
-- Reshma Solanki, Manju Siliwal & Dolly Kumar, Pp. 12130–12132

Intraguild predation of green lacewing larvae (Neuroptera: Chrysopidae) on spider eggs and spiderlings
-- K.K. Srikumar, S. Smitha, B. Suresh Kumar & B. Radhakrishnan, Pp. 12133–12136

Rediscovery, extended distribution and conservation assessment of *Cinnamomum goaense* (Lauraceae) in the Western Ghats, India
-- M.P. Geethakumary, S. Deepu & A.G. Pandurangan, Pp. 12137–12139

***Coltriciella dependens* (Berk. & M.A. Curtis) Murrill, a new addition to wood-rotting fungi of India**
-- Ayangla S. Pongen, Kuno Chuzho, N.S.K. Harsh, M.S. Dkhar & Manoj Kumar, Pp. 12140–12143

Book Review

The need of conservation laws coherent with communities for complete success
-- S. Suresh Ramanan & Lalit Upadhyay, Pp. 12144–12145

Miscellaneous

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