

Human–wildlife conflict*

Human–wildlife conflict (HWC) is on the rise globally, and is one of the significant environmental problems in India. In India, HWC manifests itself in several ways, such as wildlife poaching, retaliatory killing of/injury to wildlife species, crop raiding and livestock predation by wildlife species, injury to humans or human mortality, and destruction of property, houses and buildings by wildlife. Of these, wildlife conflict in agro-pastoral contexts has been a subject of debate and great concern nationally, not only for its impact on the farmers, but also for the consequences regarding wildlife conflict. In India, HWC involves multiple stakeholders and multitudinous socio-cultural and environmental issues. Hence any study on this topic must encompass a multi-disciplinary effort that provides a holistic understanding of the history of wildlife, crop and livestock raiding, its nature and consequences and discuss various techniques that have been used or recommended to mitigate the effects of this crisis.

To address these issues, a workshop on HWC in agro-pastoral contexts was organized. One of the main goals of the workshop was to focus on wildlife conflict related to species like monkeys, wild pigs and nilgai, that rarely receive attention in public discussions of the issue, yet cause enormous economic losses to small farmers. A secondary objective of the workshop was to understand different dimensions of HWC in agricultural ecosystems and find ways to mitigate the losses caused to agriculture by wildlife, with minimal impact on wild animals. The workshop was attended by scientists from Indian Council for Agricultural Research (ICAR) institutes; State Agricultural Universities, National Institute of Advanced Studies (NIAS), Bengaluru; Indian Institute of Science

(IISc), Bengaluru; Ashoka Trust for Research in Ecology and the Environment (ATREE), Bengaluru; independent researchers; State Forest Department officials of Karnataka and Andhra Pradesh, and members from NGOs.

Abraham Verghese (ICAR-National Bureau of Agricultural Insect Resources (NBAIR)) welcomed the gathering and P. K. Agrawal (National Agricultural Science Fund (NASF), ICAR, New Delhi) highlighted the objectives and importance of the workshop. In his inaugural address, Baldev Raj (NIAS) stressed upon the need to understand food-related challenges to the co-existence of humans and wildlife. V. S. Ramamurthy (NIAS) called upon the need for a change in perception of human and wildlife conflict, and emphasized that coexistence is the only way forward. In his keynote address, S. Ayyappan (ICAR and DARE) noted that the impact of wildlife on agriculture calls for interdisciplinary collaboration. Presenting a brief overview of conflict mitigation strategies that were developed by ICAR under the All-India Coordinated Research Project on Vertebrate Pest Management, he stressed the need for developing a database on mitigation techniques that would help address the issue.

Sessions of the workshop focused on themes such as wildlife and crop damage, impact on farmers due to wildlife damage, and mitigation strategies for the reduction of agricultural damage due to wildlife. Meena Venkataraman (Carnivore Conservation & Research, Mumbai) spoke on situation of lions in Gir, Gujarat and highlighted issues related to conservation management, human interventions and livestock predation. Verghese highlighted the decline in bird species due to urbanization, and pointed out that peri-urban horticulture has helped in restoring White-cheeked Barbet (*Psilopogon viridis*), Red-whiskered Bulbul (*Pycnonotus jocosus*) and Common Tailorbird (*Orthotomus sutorius*) numbers. N. P. Singh (Indian Institute for Pulses Research, Kanpur) spoke about crop damage by nilgai and suggested that robust management measures need to be evolved. A. Pattnayak

(Vivekananda Parvatiya Krishi Anusandhan Sansthan, Almora) highlighted the losses to agriculture in hills by monkeys and wild boars.

Nitin Rai (ATREE) discussed the views of the Soligas (an ethnic group of India) on government restrictions regarding the use of fire as an agricultural tool, and the complex linkages that exist between state conservation policy, wildlife depredation and peasant livelihoods. Sindhu Radhakrishna (NIAS) presented the results of studies on human–macaque conflict in Himachal Pradesh (HP) and Kerala to show that cultural factors deeply impact how farmers retaliate against such conflicts. Radha Gopalan (Goa) spoke about wild pig crop depredations in Horsley Hills and how it may be possible to work with farmers and revive traditional multi-cropping techniques as a way to mitigate conflict. S. S. Shridhar (Department of Forests, Ananthapur) explained that the Forest Department not only keeps track of wildlife movement near human settlements in an effort to prevent future attacks, but also takes on the responsibility of sensitizing villagers to the reasons behind wildlife conflict by organizing kalajathras or street theatre performances on the topic. Vasudeva Rao (Acharya NG Ranga Agricultural University, Hyderabad) demonstrated the results of his study that used pre-recorded animal distress and alarm calls to deter the movement of wild pigs into farms, and urged the need for more bioacoustics studies of this kind. R. S. Tripathi (All-India Network Project on Vertebrate Pest Management) pointed out that the lack of a collaborative effort involving government authorities, wildlife biologists and plant protection specialists has hindered the development of effective mitigation measures.

The second day of the workshop began with a panel discussion that looked at the efficacy of government policies that have been instituted in response to HWC in the country. Anindya Sinha (NIAS) reviewed the use of sterilization as a tool to tackle rhesus macaque–human conflict in HP and major challenges in the deployment of this method. Charudutt

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Mishra (Nature Conservation Foundation, Mysuru) spoke about the employment of compensation and insurance schemes to mitigate HWC, their success in reducing retaliation against such wildlife species, and the launch of micro-insurance plans to overcome some of the problems inherent in the original schemes. Ajay Mishra (APCCF, Government of Karnataka) briefly summarized the measures taken by the government to deal with HWC such as creation of physical barriers to prevent animal movement into human settlements, reforestation, restriction of human movement into forest areas, and translocation and rehabilitation of humans from tiger reserves and protected areas. Kuldeep Singh Tanwar (Bharat Gyan Vigyan Samithi) spoke about the hardships faced by farmers in HP due to wildlife conflict and their attempts to obtain legal redress for their troubles. The panel discussion then opened out to include other participants of the workshop who shared their views on the need for a new roadmap to deal with HWC.

In his valedictory address, Raman Sukumar (IISc) spoke about how the number of human casualties due to wildlife conflict has risen dramatically over the past three decades, and that attempts at coexistence between humans and wildlife must begin by understanding the eco-

logical factors that drive HWC. A similar message about the need to foster coexistence was echoed by Ayyappan and Baldev Raj in their closing remarks. After summarizing the main insights provided by the discussion amongst the workshop participants, they stressed the need for synergistic activities among all the stakeholders and a multi-pronged approach to bring relief to farmers and conserve wildlife.

The following points emerged as the main recommendations of the workshop.

- Use of the term and concept of ‘coexistence’ should be encouraged over conflict. As we are heading into an age where interactions with wildlife are an inevitable part of our lives, we should work towards coexisting peacefully with wildlife rather than devising ways to deal with what we perceive to be conflict with wildlife.
- Formulation of policy at apex level of governance should include ICAR so as to address the issues related to farming.
- Research on wildlife conflict management in agro-pastoral ecosystem need to be funded adequately.
- ICAR and NIAS must work together to develop innovative strategies that foster coexistence between wildlife

and humans for productive agriculture.

- Periods of drought result in escalated levels of conflict as animals move towards human settlements beside forest ranges in search of better forage. Hence the cropping pattern in lands adjoining forest areas needs to be modified accordingly.
- Development of a database dealing with HWC issues in the country.
- The technologies developed for vertebrate pest management must be validated across AICRP VPM centres.
- A follow-up review meet of this workshop to be organized at the Veterinary College, Bengaluru, calling in experts in vertebrate pest management.

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