

reforms and innovations in the area of school and undergraduate science in India. He also suggested specific measures to be adopted in science education. Pradhan stated that although India has made substantial progress in setting up a number of science education establishments and has achieved remarkable qualitative success in research, taking benefits of science to the underprivileged and masses remain unfulfilled. In the light of the demographic advantage that India has until the year 2030, this matter is of concern and urgency.

According to Pradhan, the key to take on the challenge is reforming the system of education from primary to higher education, including research. He suggested that education should be viewed as a future investment as it was done in countries like Finland, where the process of reforms once undertaken was sustained irrespective of the political group in power. He felt that the educational system requires massive infrastructural contributions such as proper toilets, classrooms, blackboards, laboratories, equipment, etc. in addition to recruiting and training of teachers and educational administrators. The whole educational initiative requires a paradigm shift in thinking and orientation.

Pradhan mentioned about many positive developments that have taken place

during the last two decades, for instance, the national curricular framework (2005) brought out by NCERT, the national curricular framework for teacher education (2010) brought out by NCTE, the RTE Act, the national assessment and accreditation exercise, autonomous colleges, establishment of special science education institutes, talent nurture schemes, undergraduate research schemes, etc. Many of these reforms have brought about path-breaking changes in the fields of educational philosophy and pedagogy across the world. Today, both ICT and knowledge explosion have enforced one to think differently.

Uday Panchpor and Amit Ranade (Maharashtra Knowledge Corporation Limited (MKCL), Pune), gave a joint presentation on technology for large-scale access to holistic education. MKCL is a company promoted by Higher and Technical Education Department of the Government of Maharashtra and was established in year 2000, with an objective to bridge the digital divide. To achieve this, a course of IT literacy is designed and over one crore students have become IT literate in Maharashtra, informed the speakers. They also revealed that the company has set up a network of public-private-partnership framework of 5000+ authorized learning centres in more than 400 talukas of Maharashtra. A holistic

education process 'From inform-to-perform and perform-to-transform approach' is adopted. This is achieved through high-quality learning content, unique learning process and good learning environment. Panchpor and Ranade have designed 'situation-based content' with integral skills and best global practices. They lead the learner to create 'Socially useful and productive output'. According to them, learning happens through four steps of principles of andragogy, which include appreciation, imitation, emulation and self-direction, and that learning should be problem-centred rather than content-oriented.

Education happens through the principle of continuity of challenges leading to continuity of creative engagement and enjoyment. MKCL's e-assessment management and evidence-based on-line testing system emphasizes on five major areas – e-objective evaluation, practical-based evaluation, e-portfolio, process-portfolio and peer assessment methods. The focus is on learning and not merely on technology alone.

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MEETING REPORT

Human-wildlife conflict or coexistence: what do we want?*

In recent times, human-wildlife conflict has received much attention in scientific, popular and social media as it poses major threats to the wildlife populations, man and his crops in forest fringes and also in the urban areas. Some of the pertinent questions raised by the human-wildlife conflict are: Is this conflict in an increasing mode? If so, what are the plausible reasons? and how can we reduce the conflict and facilitate coexistence? To

brainstorm some of these volatile issues, the Central University of Kerala (CU-Kerala), Kasaragod, organized a national-level symposium. Participants from all sectors of the community, including farmers, forest officials, wildlife biologists, National Wildlife Board and Biodiversity Board members, behavioural ecologists, media persons, researchers, post-graduate and secondary-level students of local schools, colleges and universities attended this symposium.

In the welcome address, P. A. Sinu (CU-Kerala) highlighted that the glorified coexistence between man and wildlife in India, if switched to the conflict mode, certainly has something to do with the threshold level of tolerance of both

man and the wild animals. The unprecedented loss of wild habitats has decreased the tolerance level of wild animals to man and his actions. Urbanization, climate change, crop loss, steady depreciation of crop products, import and export policies of the government and occasional wildlife raids to 'encroached and intensified' farmlands affected man's tolerance level to the wild animals. G. Gopakumar (CU-Kerala) in his presidential remarks emphasized that the increase in human population, resulting in encroachment of the habitats of wildlife and unscientific planning of our land for developmental activities are obvious reasons for the conflict, and we should try to regain the coexistence between man

*A report on the brainstorming symposium on the 'Human-wildlife conflict or coexistence: what do we want?' organized by the Central University of Kerala Padannakad, Kasaragod on 15 October 2014 as an event of Swaraya Bharath 2014.

and wildlife. Harish B. Nair (Kasaragod District Panchayat member) representing the farmer community shared his apprehension on the poor response of the Forest Department to wildlife attack on human beings and the related government policies.

P. S. Easa (Kerala Forest Research Institute, Thrissur) in his keynote address, gave an overview of human-wildlife conflict in India. The farmlands of Wayanad district in Kerala were once dotted by the treetop patrolling huts, and people at the community level were used to patrolling in the nights to protect their crops from elephants. This indicates that the human-wildlife conflict was present in the past as well. The recent national figures show that the human casualties to wildlife are decreasing (excluding snake bites), but the wildlife casualties are increasing. The crop loss and human casualty in South India, particularly in Kerala, despite their increase, are still low when compared to the national average. Farmers of Jharkhand, Chhattisgarh, Assam, Bihar and parts of North Bengal (Dooars) and West Bengal are worst hit by elephant raids. Kerala has lost most of its share of quality wildlife habitat for grazing and preying. It has not been possible to effectively replace night patrolling by any of the new techniques in the light of the wild animals' ability to adapt to and overcome the new techniques being devised to prevent man-elephant conflict. Solar fencing is an effective strategy against elephants, but the hiccups associated with its installation and continued maintenance often reduce its efficiency. Wild boar is a global pest of many crops both in developing and developed countries. When the rest of the world is granting permission to kill this species in their farmlands, India should think twice before granting such permissions to its farmers, as wild boar is our native species unlike being an invasive species in many other countries. The traditional cloth-fencing (saree-fencing) is the most effective strategy that works against the wild boars. Monkeys pose major threat to crops in almost all parts of India. They have destabilized the local governments in North India. Earlier, monkeys were confined only to the surroundings of temples and some popular tourist places in India and did not trouble the local farmers. India has 15 species of primates; five species are present in South India. Among them only rhesus monkey,

Macaca radiata has acclimatized to the human surroundings, so the conflicts too come only from this species.

Sindhu Radhakrishna (National Institute of Advanced Studies, Bengaluru) mentioned that now-a-days the primate-human conflict is common in urban areas as well. The change in the attitude of man, particularly the provisioning habit, is the major reason why monkeys have become more aggressive these days. The conflict with monkeys in urban areas can be solved only through an effective garbage and solid waste management. Caging and translocation of monkeys are the traditional strategies followed to reduce the monkey menace, which however, is no longer a viable solution as they soon come back to their original home. Biologists suggest that selective culling of both males and females based on the demography status may be allowed to reduce this problem. Insufficient compensation from local governments to farmers aggravated the conflict between monkeys and human beings. Preventive management is always better than the reactive management.

Leopard may be the only wild cat species that lives in all sorts of habitats, including the managed habitats and settlements in rural and urban areas of India. Ganesh Raghunathan (Wildlife Conservation Society, Bengaluru) mentioned that leopards have tremendous ability to coexist not only with man but also with several other wild cat species due to their perfect niche partitioning mechanism.

Camera-trap images and monitoring of the radio-collared animals indicate that leopards show exceptional homing behaviour; there are evidences to indicate that relocated leopards travelled as much as 125 km through a range of contrasting habitats to reach their home territory in Maharashtra.

Kasaragod, the northern district of Kerala shares its boundary with the forests of Kodagu, probably the western extremity of the Mudumalai-Bandipur-Wayanad-Nagarahole-Talacauvery corridor. The dense forests end in Karnataka and plantations start in Kerala at this boundary. Kasaragod district has only about 100 sq. km of forests as its share of the Western Ghats, which is scattered in a mosaic of human settlements, plantations and areca orchards; the maximum width of the forest tract is only about 1.5 km (Figure 1). This explains why the recently held elephant raid in the eastern villages of Kasaragod district was persistent for many months that eventually ended up with the mysterious (herpes-related) death of a tusker elephant. E. Kunhikrishnan (formerly University College, Thiruvananthapuram and a noted environmentalist), analysed the scenario of human-wildlife conflicts in Kasaragod district. The elephant conflict in Kasaragod has become a menace since 2008, when developmental activities, including fencing activities in the Karnataka part, started interrupting the elephant corridor that left a small population of elephants trapped amidst the fragmented



Figure 1. Map of Kasaragod district showing its share of the Western Ghats.

forests of Kasaragod. Increasing garbage deposit sites, particularly from the butcher shops, in the fringes of the forests increased the wild boar incidences in the villages and towns of the district.

Both human–elephant conflict and their coexistence were high in tea-forest matrix of the Western Ghats of India. Anand Kumar (Nature Conservation Foundation (NCF), Mysuru) mentioned that the conflict aggravates only during the summer months. Once this is understood, some preparations at our end can reduce the human casualties and maintain the safe passage of elephants to their natural water holes during summer. Being a managed landscape, coexistence is possible only through enforcing appropriate warning systems. Being an organized industry, tea plantations and factories can be the hubs to give warning signals, such as red lights and alarm sirens when the elephants are reported to be moving in the vicinity. He shared the success stories where the NCF could reduce the man–elephant conflict through integrating the electronic gadgets, sensors, local television and radio channels and the tea industry in the Valparai region of the Western Ghats. He said that any sort of man–animal conflict can be solved only through an inclusive approach. He found that the human casualties attributed to the so-called man–animal conflict was only a small fraction when compared to casualties caused by mosquitoes. Gaur–human conflict is scarcely reported in South India as gaur is primarily a forest-dweller that hardly moves out to the villages as a browser. K. R. Abhishek (Keystone Foundation, The Nilgiris), who has been monitoring gaurs in the Nilgiri region of Tamil Nadu for many years has now found that gaurs raid the vegetable orchards during summer in search of water, but, damage to

the crop occurs due to the chasing of the animal from one orchard to another.

The symposium concluded with a panel discussion between the forest officials, wildlife experts and farmers. It presented some important recommendations to bring down the human–wildlife conflict in South India. The primary recommendation was on buffer-zone management. It strongly advocated the need to enforce the Supreme Court direction on maintaining buffer zone of 10 km radius with quality habitats surrounding the core zone of the protected areas. It strongly criticized the local governments on their plantation-based afforestation programmes, and advocated for an immediate policy change on the buffer-zone habitat management, including selection of the plant species. The buffer zones should be maintained as fruit belts by planting native plants, such as *Syzygium* spp., *Madhuca* spp., *Mimusops elengi*, *Artocarpus* spp., etc. to reduce monkey menace in the agricultural lands in the fringes. All the developmental activities must be regulated in the buffer zone. The buffer zone should have enough water holes, particularly to meet the water requirements of wild animals during summer. It was recommended to bring out standard operational principles specific to each locality with the involvement of local panchayats, farmers and the forest departments. Local governments should consider extending insurance support to the agricultural crops, and the forest departments should simplify and expedite the process involved in paying compensation for the agricultural crop loss. Considering Mudumalai–Bandipur–Wayanad–Nagarahole–Talacauvery as an important elephant corridor, it was recommended to regulate all developmental activities that can affect the quality of the corridor. It applauded the

Karnataka Forest Department’s decision to continue the ban on night traffic in one of the busy roads intersecting the corridor in Wayanad and Bandipur. It recommended a national-level implementation of such regulations in all major wildlife corridors. It strongly advocated the need for reinstating the night patrolling by the villagers in all volatile places. The experts criticized the local panchayats for their inability to stop butcher waste dumping in the fringes of the forests, as that was identified as one of the major reasons for rise in the wild boar population in many states and wildlife epidemic diseases. It also recommended an effective waste management plan in urban areas, tourist spots and on the streets nationwide to reduce the human–monkey conflicts. Considering the wider application of electronic gadgets and social media, it strongly advocated the need for equipping the forest departments with the latest technologies and to integrate their proactive warning operations with the organized institutions and industries locally, such as religious institutions and plantation industries, like tea, coffee and rubber, as they are grown more in the fringes of the forests. With the growing evidences, it was also recommended that the old practice of relocation of wild cats should be stopped. In summary, the major recommendation was for the governments to take adequate measures to conserve habitats with the participation of local communities as one of the stakeholders.

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