**Functional traits of lichens in Himalayan forests as indicators of Nitrogen deposition**

Pat Wolseley1\*; Sudipto Chatterjee2; Matthew Jones3; Sarath Nissanka4; Bishnu Pandey5; Mark Sutton3; Dendup Tshering6; Buddhika Weerakoon4; Gothamie Weerakoon1; Christopher Ellis7

1 The Natural History Museum, UK; 2 The Energy and Resources Institute, India; 3Centre for Ecology and Hydrology, UK; 4University of Peradeniya, Sri Lanka; 5Kathmandhu University, Nepal; 6Royal University of Bhutan, Bhutan; 7Royal Botanic Garden, Edinburgh, UK. \*E-mail: pwolseley@nhm.ac.uk

How are epiphytic lichen communities responding to increased nitrogen deposition in Himalayan regions? The Indo-Gangetic plain has among the highest levels of atmospheric ammonia globally, leading to an air mass of excess nitrogen that is pushed northwards into the Himalaya. Adopting thresholds that are already established for lichen bioindicators in Europe and North America, our preliminary work suggests that c. 80% of Himalayan forests exceed their critical levels for ammonia and critical loads for nitrogen deposition. These putative impacts now need to be verified through field observation, to confirm the consequences for lichen diversity, for forest health, and to understand the risk of nitrogen pollution to local communities reliant on forest ecosystem services. Lichen bioindicators are ideal for these purposes. However, the transfer of lichen bioindicators (e.g. oligotrophs/nitrophytes), based on previous studies – European or North American – is not possible because of taxonomic differences between these regions and the Himalaya. The lack of detailed and extensive taxonomic investigations in the Himalaya further challenges the development of regionally specific bioindicators. Here, we propose a traits approach to lichen bioindication, with the opportunity to combine work on the trait-based sensitivity of lichens from European and North American studies, with comparable studies from the tropics, to maximise transferability into a Himalayan context. We outline our choice of traits, which we propose to develop and trial for sampling along nitrogen pollution gradients in Himalayan forests.