

Observations and thoughts on Indian Rhino conservation triggered by a visit to Manas and Kaziranga in March 2018

Andrew Laurie, May 2018

I made comparative observations in Kaziranga and Manas as part of a four year study on rhino ecology and behaviour focused mainly on Chitwan in Nepal. That was many years ago, from 1972 to 1976, and I found it very interesting to return this year to Assam to see rhinos and their habitat again, and to meet and talk with people concerned with their conservation. I am very grateful to those in the Forest Department, Assam, the Diphlu River Lodge, Kaziranga, and Green Hub, Tezpur who made me and my wife, Haruko, so welcome and facilitated our field visits. I make the following general observations on various aspects of rhino conservation in case of interest and I would be happy to expand on these comments if requested. Andrew Balmford, whose book *Wild Hope* (University of Chicago Press, 2012) includes a chapter on "*Guarding the Unicorn: Conservation at the Sharp End*", visited both Manas and Kaziranga in April 2018 and shares the concerns expressed here.

The census

Numbers of rhinos and other large animals recorded in the three yearly wildlife censuses in major protected areas of Assam have continued to rise. I was in Kaziranga shortly before the 2018 census that took place at the end of March and I later heard something about the results and the discussion about the accuracy of the total count method, and what confidence limits should be applied to the final estimates. I think that there are fundamental uncertainties in the repeatability of the method. It would be interesting for example, to repeat the census after an interval of about a week to assess repeatability. On the one hand it is desirable to have an accurate estimate of population size, but even a reliable index of population size that would accurately indicate trends in population would be useful.

During my 1972-1976 study I estimated the numbers of rhinos in Chitwan, Nepal (about 300 at that time) by gradually registering individual rhinos, identifying them through individual differences in horn shape, ear nicks, tail cuts, scars, skin folds and tubercles. I used film photographs glued to index cards, with notes. Recently this kind of approach has been developed to a very sophisticated level using digital photographs and computer software to read tiger stripe patterns (<https://qz.com/310448/india-is-tracking-its-tigers-by-counting-their-stripes>) and cheetah spot patterns (<http://www.maracheetahs.org/cheetah-identification/>) for example. Numbers are now being assessed in many species through a wide range of computer software (<http://www.uef.fi/web/photo-id/photo-id-tools-useful-links>), including ExtractCompare (<http://conservationresearch.org.uk/Home/ExtractCompare/index.html>) which has been used for tigers in India (Ullas Karanth and James Nichols (eds) (2017) *Methods For Monitoring Tiger And Prey Populations* (Springer)).

I recommend that such an approach be developed for the rhinos of Assam using the patterns of tubercles and folds on the skin. Many people own digital cameras now, and the software would accept images taken with mobile phones. Photographs could be collected by national park staff while going about their daily patrols, by tourist guides, tourists, and

even members of the general public outside the protected areas. I would be happy to look further into the technical aspects of this if requested. It would take time to build up a picture of the population size, but no longer than the current three year interval between the standard full count censuses, and it would probably be more robust. Not every individual would be registered, but there is no need to do this, because the registration of new individuals, shown as a "discovery curve", should eventually level off towards an asymptote indicating the likely total population size. See, for example, this population estimation for Hawaiian Monk Seals - http://homepages.abdn.ac.uk/lighthouse/pages/lighthouse/documents/Baker_2006_MMS.pdf.

Antipoaching

The antipoaching force has expanded enormously both in numbers and coverage, apparently with great effect on cases of poaching. I visited several antipoaching camps and was impressed by the scale of the operations and the sophistication of the communication procedures and the remote observation towers in Kaziranga. I did not see the work done in local communities to reduce incentives to poach and increase incentives to turn in poachers known to members of the public, but I understand that this important work is being done.

Tourism

I was impressed by the highly organized tourism management that enables visitors to view wildlife and habitats by elephant and jeep in morning and afternoon slots. It is apparent that many local people are benefitting financially from wildlife tourism, thus increasing incentives to cooperate with the authorities in protecting wildlife and natural habitats. The tourism operation is large scale and well regulated, but I noticed some things that I think are worth addressing in tourist driver and guide training. On several occasions in both Manas and Kaziranga I saw what seemed to be overcautious reaction to the presence of elephants or rhinos near the road, involving readying firearms, banging the sides of vehicles, shouting, revving of engines and racing past at high speed. Sometimes, I was told, this kind of behaviour might be motivated by a wish to impress tourists. I am well aware that on occasion elephants, rhinos and other large animals attack vehicles but what I saw demonstrated, in my opinion, a lack of reading of the situation so that peacefully grazing rhinos that could have been observed quietly, were disturbed for no reason. This was in marked contrast to my experience, also in March 2018, on foot safari in Pakke Tiger Reserve, where we observed wild elephant and gaur at pretty close quarters on foot under the guidance of a guide and ranger who reacted only with sound insight into animal behaviour.

Territorial expansion of Kaziranga and Manas

It was very good to see and hear that protection is being extended to rhino habitat to the west of Manas, and to the west and north of Kaziranga. The addition of the Northern Range in Kaziranga on the north bank of the Brahmaputra is particularly insightful in view of the gradual southward movement of the Brahmaputra River, which is advancing southwards towards National Highway 37 at an alarming rate (<https://www.earth-syst-dynam-discuss.net/esd-2012-31/>). I was told by one scientist that recent analysis indicates that the river will reach the National Highway within the next 30 years. I think that it would be wise

to look at protection for further parts of the northern bank of the Brahmaputra and for the many islands formed mid-stream and this need is referred to again below. There will be problems of course - many people live in those areas, moving as necessary - and rhino protection programmes that are not dependent on permanent gazettement of a protected area could be instituted. There are many keen conservation groups eager to assist.

Habitat management - the "highlands" construction scheme

In Kaziranga I was amazed to see huge earth moving machines almost everywhere we went. I understand that there is a project to construct 33 new "highlands" piling up earth excavated locally into platforms of 200m long by 50m wide by 5m high to provide refuges for rhinos and other species during the monsoon floods. I heard that platforms have been constructed in earlier interventions but on a smaller scale and building on natural high points in woodland in particular, and I saw some of these places. I have big doubts about the advisability of doing earthmoving on such a scale. Quite apart from the huge disturbance created by the operations and the associated workforce and machinery, soil compaction caused by the machines in the area, the holes in the ground from where soil is collected, and the tendency for invasive species (including alien invasives) to colonize disturbed areas (the "highlands" themselves and the source and compacted areas), I am not convinced that the highlands will be an effective rhino conservation measure. The platforms appeared fragile and at risk of erosion as there is no coherent soil structure or established vegetation. The cost - I was told it is in the region of Indian Rupees 100 million crores - is extremely high as an allocation of conservation funds for such an untested scheme with so many potential damaging side-effects. I think that such a large sum could and should be used in a more effective way. We should be looking at "the big picture" and the reality of climate change which is likely to lead to increased snow melt in the Himalayas and therefore increased flooding, for which more robust solutions will be required than fragile earth mounds. Re-establishment of access for rhinos to the higher land to the south of National Highway 37 would be helpful. And, as stated in the section above, further additions to the protected area on the north bank of the Brahmaputra are also required.

I find it hard to see how this approach could have been accepted as a conservation measure. The census figures indicate a substantial annual increase in rhino numbers, so building the highlands was not in response to an existential threat. Some rhinos are known to drown every year during the monsoon floods, but this cause of death contributes relatively little to annual mortality from all causes. The rhino's status as an endangered species has led, I think, to overreaction in response to normal levels of mortality and an expensive intervention led by a desire to do something quickly and to spend a lot of money. On the other hand, expansion of protection to include a Northern Range was eminently sensible.

Looking at "the big picture"

The habitat

One of the characteristics the rhino's homeland, whether in the *terai* of Nepal or the Brahmaputra Valley of Assam, is the shifting nature of its habitat and the versatility of the species in its feeding habits. Riverine erosion that takes away land on one side of the river, builds up new land on the other side and leads to a mosaic of habitats at various stages of ecological succession from grassland to riverine forest and seasonally stagnant ox-bow lakes.

Rhinos are suited to this shifting pattern with a diverse diet consisting mainly of grass, both short and tall, and including browse, aquatic plants and forest fruits such as those of *Trewia nudiflora*, as well as rice, wheat and other agricultural crops according to season and availability. Not long ago - in geological time - there were no humans in the foothills of the Himalayas and the Brahmaputra Valley and the megafauna of rhinos, buffalo, gaur, swamp deer and elephant were distributed in unbroken habitat from present day Pakistan to Assam and beyond. Constantly shifting river courses carved away at established woodland and built up new grassland, eroded or enlarged existing islands and formed new ones according to rainfall patterns and geology, leaving behind ox-bow lakes and swamps as a record of past river courses.

Rhinos could often move easily during monsoon floods from lower to higher ground within their established annual ranges, and cumulative annual changes in habitat led to gradual shifts in distribution of rhinos and other large animals. There was more than enough land to accommodate rhinos displaced by both annual and cumulative shifts in habitat patterns.

Conservation implications

Protected areas are defined with geographical coordinates. So if significant natural habitat changes occur within a protected area, species dependent on habitats that are depleted, or affected by the expansion of habitats that they cannot utilize, may exhibit local reductions in population size and breeding success and shifts in population distribution to adjacent areas less affected by habitat change.

Kaziranga is a relatively small protected area and more and more of it is being converted into river water, riverine sandbanks and early succession grassland in the north, at the expense of more established grassland and woodlands to the south. The protected area remains the same size as gazetted, but the habitat composition changes. There is plenty of habitat if one looks beyond the current protected area boundaries, because the Brahmaputra is shifting southwards building up land on the north bank (although analysis so far indicates that accretion so far has been slower than erosion). As more and more of the present Kaziranga NP is converted to river bed and is thus uninhabitable during monsoon floods, it makes excellent sense to seek to extend the NP north of the existing geographical boundaries as far as possible. If actual gazettement is not possible then extension of protection and community engagement activities should be implemented. As mentioned above, establishment of the Northern Range does exactly this, and the same should, if possible, be done to the east of the Northern Range. On the other hand, the current efforts to build "highlands" should ideally be abandoned and the land restored as far as possible.