

Why Discuss Fake Rhino Horns?



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PHOTO BY DAVID CLODE

Rhinos are both iconic animals as well as keystone species in the various ecosystems they inhabit. So it is tragic that in the past hundred years rhinoceros numbers have been decimated first by hunting and now through poaching.

In Asia, very few rhinos are left in the wild. In Africa, the situation is somewhat better although even there, in most ecosystems, local populations are under tremendous pressure through human activity.

Initially, the hunting was about pleasure and land use. Today hunting has become criminal poaching, often very sophisticated, to acquire and trade the horns that have price tags equivalent to the price of gold. The reason for this high value is the unrelenting demand, mostly in Asia, specifically China and Vietnam. Highly prized in Traditional Chinese Medicines (TCMs), this demand is based primarily, if not exclusively, on a deep-rooted belief of some mystical medical powers inherent in rhino horn. Whether swallowed as a powder or drunk for tea, it is believed to relieve fever, chest and stomach

TOP RIGHT: A rhino with the horns cut off. A rhino's horn is made of keratin, the same substance that makes up human hair and fingernails and despite the fact that numerous scientific studies have proved there is no medical benefit to taking rhino horn remedies, the demand in many Asian countries is still very high.

BELOW: In both Africa and Asia the natural habitat of the rhino is being eroded as more and more land is claimed for human settlements and farmland.



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TODAY HUNTING HAS BECOME CRIMINAL POACHING, OFTEN VERY SOPHISTICATED, TO ACQUIRE AND TRADE THE HORNS THAT HAVE PRICE TAGS EQUIVALENT TO THE PRICE OF GOLD.

ailments, and indeed other vital or imaginary conditions and concerns. Of increasing concern, is the rising use in Vietnam to “seal the deal” in elite business circles.

As we have seen, the issue of rhino poaching revolves around demand. The consumer is the driving force. The apothecary (or seller of a status symbol in the case of a rich big-man) is the Business-to-Customer (B2C) intermediary. The trader is the Business-to-Business (B2B) intermediary concerning the apothecary. He is also linked to the poacher who can be a business or an individual.

At the beginning of the pipeline is, of course, the ultimate supplier, the individual rhino -





PHOTO BY KEVIN FOLK

usually well protected, a factor that seriously restricts the supply chain. As it happens, there are of course bottlenecks in the trade chain to do with, firstly, security alertness and, secondly, the severe restrictions (a total ban of cross border trade) imposed by CITIES. Finally, there can be another bottleneck policing the trade in the final destination. China is an interesting example because rhino horn as a traded 'medicine' was banned although the implementation of the ban is being reconsidered pending further study.

Looking at rhino killing as an ecological and bio-ethical issue places it firmly in the realm of animal and ecosystem conservation. Here the many and powerful tools of traditional conservation and guardianship can be applied to great effect. Those would be, principally, ranger boots on the ground combined with hearts-&-minds in the local communities well supported and enforced by vigilant national as well as international cross-border officials in the police, customs, and judiciary.

In this context, also important are the wildlife detectives and sleuths as well as the powerful international lobbies engaged in banning all manner of trade. This is, especially for rhino horn, an important component in throttling a trade that does not even spare tame animals in zoos. Nor are long-dead stuffed animals in museums safe from poacher-burglars.

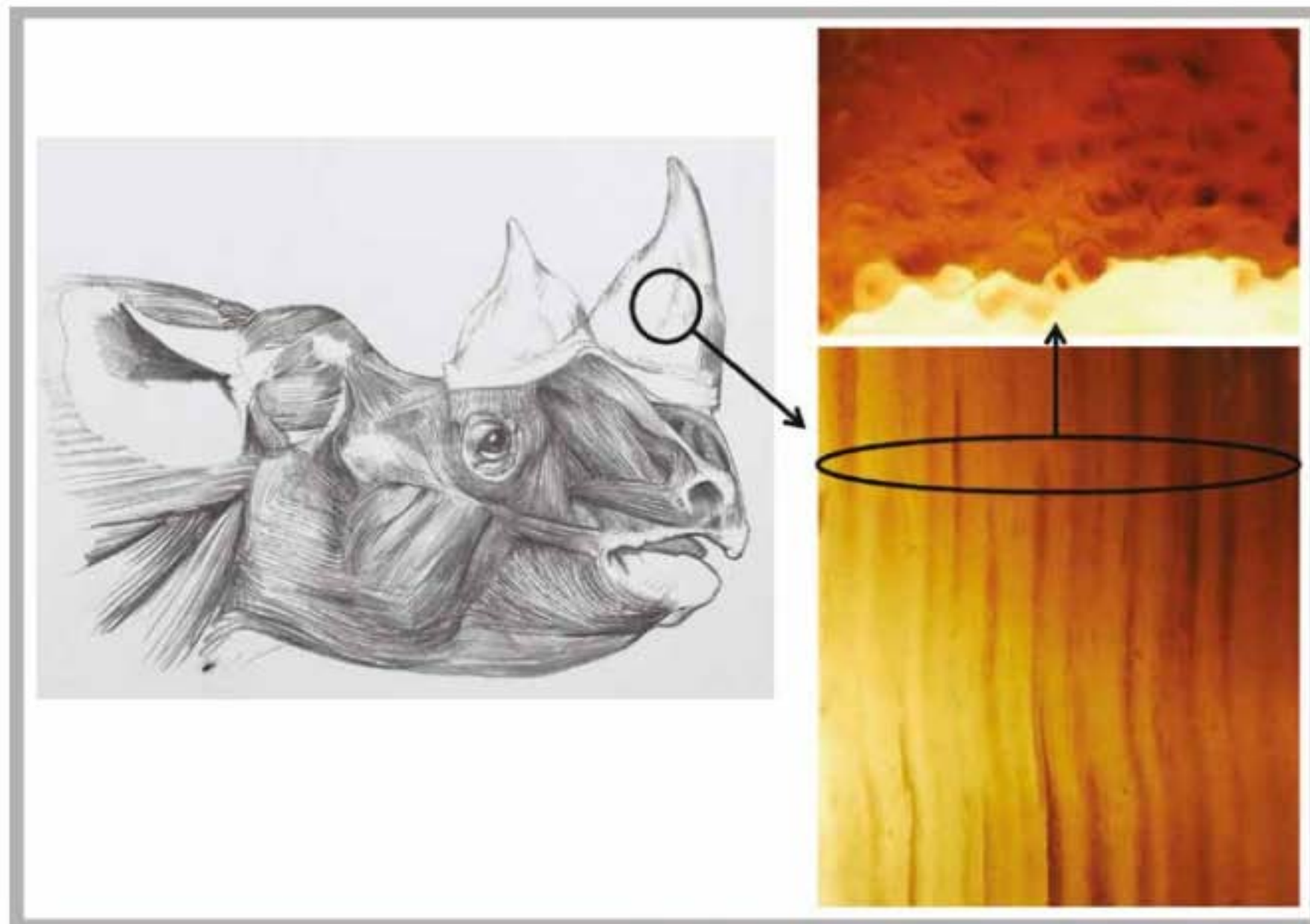
Obviously, black market prices in the range of tens of thousands of dollars per kilogram

TOP: A crash of Black rhinos. Effective conservation efforts have seen Black rhino numbers inch upwards in recent years after a long and devastating period of hunting and poaching. Even so, Black as well as White rhinos remain critically endangered, with poaching for their horns posing a constant threat to their survival.

of horn are very tempting no matter one's criminal background. Indeed, it seems that frequently rhino horn (as well as elephant ivory and pangolin parts) are traded by organisations with deep roots in criminal or even terrorist backgrounds and using trade routes that are also used to smuggle drugs and weapons.

Since the rhino horn trade is, fundamentally, fueled by financial motives, it behooves us to consider the issue of rhino killing and horn trading, not only as one of animal and habitat conservation, but also as one of economics. From an economic perspective, one way to reduce or discourage the rhino horn trade is to introduce wild horn substitutes. It is critical to note, however, that different strategies could be pursued concerning using wild horn substitutes, and that the potential effects on the rhino horn market could depend on which strategy is utilized.

One approach for using wild horn substitutes (e.g., synthetic horns, horns from farmed rhinos) is to introduce and market them explicitly as an alternative to wild horns. The idea here is to shift demand away from wild horns towards the substitute products. For this to work, it is essential that the substitutes are considered to be of equal or similar value to wild horns, and that buyers are able to distinguish between wild horns and their substitutes. Some potential drawbacks of this approach, as several rhino conservation groups have pointed out, are that it can help do



TOP: Schematic of Black rhinoceros (*Diceros bicornis*) horn showing a section of horn with the hair tubules. The rhino head drawing is by Jonathan Kingdon (reproduced with permission).

the following; lend legitimacy to the purchase of wild horns; enhance the desirability of real horns as a status symbol as people try to obtain them to differentiate themselves from those who purchase horn substitutes; and provide a legal cover for those transacting in wild horns.

The other approach – referred to as the “covert” approach by Broad and Burgess (2016, Synthetic biology, product substitution and the battle against illegal wildlife trade) – is using horn substitutes to introduce these products into the wild horn market to create confusion among buyers regarding the authenticity or provenance of the products they are purchasing. The idea is that the uncertainty introduced into the market by the horn substitutes, i.e., fake horns, would reduce what buyers are willing to pay for horns, and the resulting decrease in horn price would reduce the supply of wild horns and rhino poaching (Chen, 2017 The Economics of Synthetic Rhino Horns). For this approach to work, it is necessary that the faux horns be considered inferior to the wild horns by buyers, and that buyers cannot easily distinguish between wild horns and fake horns. With such confusion in the

market should come scepticism about not just the likelihood of paying for a fake but also, we hope, the concept of rhino horn as medicine.

Hence, not surprisingly a range of horn substitutes are being developed and marketed with the ultimate goal of reducing trade in this much sought after if generally banned commodity. Examples for horn replacements would be Pembient’s approach of a complex lab-derived biomaterial (www.pembient.com) as well as the more simplistic products of local markets such as cattle horns and carved wood.

Importantly, the horn of the rhinoceros (*Rhinocerotidae*) is not a horn like the horn of a cow or the nail of a hoof although it is also made of keratin and shares both chemical and mechanical properties with the horns of cattle, sheep and goats. In essence, the rhino’s horn is a tuft of specialist hair that grows from a nose cone very tightly packed and glued together by exudates from sebaceous glands

Interesting details on rhino horn can be found in the literature. For example, Li et al (2011, Identification of Rhinoceros Horn and its Substitutes) examine appearance and



PHOTO BY CHRISTER GUNDERSEN

DEBUNKING THE CURE MYTH

"In looking at solutions to stopping the rhino horn trade, it is important to have in mind one fundamental issue. The rhino horn trade is based on a complete myth, which is that the horn has properties that provide a medical cure to certain illnesses.

Any solution that perpetuates that myth is therefore likely to be deeply flawed and lead to the perpetuation of the trade rather than its cessation. Sadly, with that in mind, I think the making of false rhino horn will not provide any relief to the demand. It may even make things worse if the outcome is an increased demand for the real product rather than the false product.

However much it is an uphill battle, the real solution is an educational one of creating as wide an understanding as possible, in Asia in particular, that rhino horn has absolutely no beneficial medical properties".

- Nigel Hunter

microstructure. Ryder et al (1962, Structure of Rhinoceros Horn) explore the tubular structure of the hair filaments, Boy et al (2015, White rhinoceros horn development and structure) clarify the growth and special formation of the horn tubules, Hieronymus et al (2006, Structure of white rhinoceros horn) analyse the horn with light microscopy and X-ray CT-scanning while Hsieh et al (2003, Species identification of rhinoceros horns) provide a fundamental genetic analysis of it. Last but not least, Cheung et al (2018, Medicinal Use and Legalized Trade of Rhinoceros Horn) review the alleged medicinal effects of rhino horns.

Among the various attempts to make fake rhino horns, the most recent is by Mi et al (2019, Creating artificial Rhino Horns from Horse Hair) who used tail hairs of the rhino's near relative, the horse as the core material for the horn. To glue the tightly bundled hairs together the Shanghai/Oxford team used a silk-protein based organic filler. Importantly, because of the hair, this composite has a microstructure that is surprisingly similar to real rhino horn in both structure and feel if shaped and polished. Not surprisingly, the horsehair horn is also mechanically very similar to rhino horn thus confirming the overall similarity with its model, while also reinforcing the concept that rhino horn, in effect, is just a bundle of hair, if a highly adapted one.

Important for the argument of manipulating the market in horn, is the simple fact that it

TOP: Black rhinos are solitary but White rhinos are often seen in groups. They require large areas in which to graze and live. As human settlements move into rhino territory, there is increasing danger of confrontation and conflict combined with resource depletion. This forces the rhinos to move into more marginal and also more exposed and dangerous habitats.

is rather easy as well as cheap to make a bio-inspired horn-like material that compares well with real rhino horn. This means that the possibility of producing convincing fakes to create confusion in the rhino horn market is no longer just a topic for academic discourse and speculation – it is also a very real strategy based on well-established economic principles and hard science.

Whether flooding the market with confusing horn copies will ultimately lead to saving rhinos roaming in the wild remains to be seen. We can only hope so because we presently see little practical alternative to driving down the price in parallel to diligent guarding in the wild the real material and its pachyderm carriers. ●