

Uncertainty and Markets for Endangered Species under CITES

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At the next Conference of the Parties in 2016, the parties to the Convention on International Trade in Endangered Species (CITES) will likely be presented with proposals for legal trade in some of the most iconic endangered species covered by the treaty – elephants, rhinoceroses and tigers. This article evaluates the proposals for legal trade and discusses how the parties to CITES should approach the questions raised by these proposals. The projections about trade in elephants, rhinoceroses and tigers reveal deep and multilayered uncertainty. The article concludes by suggesting that conservation principles, sound science and the legal mandate of CITES itself should lead the parties to adopt a cautious approach. Trade bans should be maintained to protect species from extinction due to trade.

INTRODUCTION

At the next Conference of the Parties (CoP) in 2016, if not sooner, the parties to the Convention on International Trade in Endangered Species (CITES)¹ will likely be asked by some parties and commentators to consider authorizing legal trade in some of the most iconic endangered species covered by the treaty – elephants, rhinoceroses and tigers. Many of the sub-populations of these species have been listed on Appendix I of CITES for several years, meaning that commercial international trade in them and their parts is banned. Yet as CITES enters its fifth decade, some commentators are questioning whether trade bans are the most effective means of protecting these species and are proposing some form of legal trade. The question of whether legal trade or trade bans is the most effective means of protecting these species is particularly urgent because the last few years have seen a severe escalation of poaching in many areas.² These iconic species hover on the brink

of extinction and even traditionally well-managed populations are feeling the threat of escalating demand. What, then, should the relationship be between trade and endangered species in CITES?

This article evaluates the proposals for legal trade and discusses how the parties to CITES should approach the questions raised by these proposals. Specifically, it explores some of the often unquestioned assumptions made in these proposals and demonstrates that there is great uncertainty surrounding many of the assumptions in these arguments. Because arguments for legal trade are based on assumptions surrounded by uncertainty and backed up with little or no empirical data, the article demonstrates that the benefits of legal trade to endangered species are therefore both unproven and likely cannot be proven. Given this uncertainty, the article suggests that consistency with conservation principles and sound science should lead parties to adopt a cautious approach that will be consistent with the CITES mandate to protect species from extinction due to trade. In a world of perfect information, it would be easier to identify whether legal trade or a ban in trade is the most effective way of achieving that mandate. However, we do not and cannot have perfect information. The projections about trade in elephants, rhinoceroses and tigers reveal deep and multilayered uncertainty. In the face of this uncertainty, this article urges caution and proposes a way to apply that caution.

CITES AND TRADE IN ENDANGERED SPECIES

The two primary appendices for the listing of species in CITES create an important dynamic within the treaty. Appendix I listing is reserved for ‘all species threatened with extinction which are or may be affected by trade’.³ For these endangered species, the Convention prescribes a ban on trade ‘for primarily commercial purposes’.⁴ Appendix II listing is intended for ‘all species

¹ Convention on International Trade in Endangered Species of Wild Fauna and Flora (Washington, DC, 3 March 1973; in force 1 July 1975) (‘CITES’).

² Elephant Conservation, Illegal Killing and Ivory Trade (SC62 Doc. 46.1 (Rev.1), 2012), Report to the 62nd Meeting of the Standing Committee, Geneva, Switzerland, 23–27 July 2012, found at: <<http://www.cites.org/eng/com/sc/62/E62-46-01.pdf>>, at 7; S. Stoner and N. Pervushina, *Reduced to Skin and Bones Revisited: An Updated Analysis of Tiger Seizures from 12 Tiger Range Countries (2000–2012)* (TRAFFIC, 2012), at 15; T. Milliken and J. Shaw, *The South*

Africa–Viet Nam Rhino Horn Trade Nexus: A Deadly Combination of Institutional Lapses, Corrupt Wildlife Industry Professionals and Asian Crime Syndicates (TRAFFIC, 2013), at 68–73.

³ CITES, n. 1 above, Article 3.1.

⁴ *Ibid.*, Article 3.3(c).

which although not necessarily now threatened with extinction may become so unless trade in specimens of such species is subject to strict regulation in order to avoid utilization incompatible with their survival'.⁵ Appendix II-listed species can be commercially traded with permits, provided the trade will not be detrimental to the survival of the species.⁶

The existence of an interim listing option on Appendix II for species not yet considered endangered means that regulators can manage species with some flexibility before the moment of imminent extinction with more options than just relying on a trade ban. However, once a species is identified as endangered and threatened by trade, Appendix I comes into play and the treaty takes a different approach to the role of trade in conservation.

For some in the CITES and conservation communities, this different view of the role of trade for species at different levels of threat has been problematic. As CITES entered its second and third decades, commentators began to push against what they saw as a constricting and ecologically unsound approach of assuming that all trade in endangered species was a threat.⁷ The parties also acted at CoPs, agreeing to adjustments for certain species, such as the Nile crocodile (*Crocodilus niloticus*) and the vicuña (*Vicugna vicugna*).⁸ Both the crocodile and the vicuña have in turn been seen as examples of successfully using legal trade and farming or captive-breeding operations to save the species and, for some, have fed support for CITES to adapt and accommodate some trade in endangered species.⁹

⁵ Ibid., Article 2.2. Article 2 also provides for listing of so-called 'lookalike species' on Appendix II. Ibid., Article 2.2(b). Appendix III is intended for species that are identified by a party as being subject to regulation within its domestic jurisdiction to prevent or restrict exploitation and for which international cooperation is needed. Ibid., Article 2.3.

⁶ Ibid., Article 4.

⁷ See, e.g., C. Huxley, 'CITES: The Vision', in: J. Hutton and B. Dickson (eds.), *Endangered Species, Threatened Convention: The Past, Present and Future of CITES* (Earthscan, 2000), 3, at 10–11; R.B. Martin, 'When CITES Works and When It Does Not', in: J. Hutton and B. Dickson, *ibid.*, 29, at 36.

⁸ H. Kievit, 'Conservation of the Nile Crocodile: Has CITES Helped or Hindered?', in: J. Hutton and B. Dickson, n. 7 above, 88, at 93; R.R.J. McAllister, D. McNeill and I.J. Gordon, 'Legalizing Markets and the Consequences for Poaching of Wildlife Species: The Vicuña as a Case Study', 90:1 *Journal of Environmental Management* (2009), 120, at 121.

⁹ See J.P. Ross (ed.), *Crocodiles: Status Survey and Conservation Action Plan*, 2nd edn. (IUCN/SSC Crocodile Specialist Group, 1998), at 48–50; H. Kievit, n. 8 above; M. Kreger, 'Sustainable Use for Vicuña Conservation', 30:2 *Endangered Species Bulletin* (2005), 12; Department of Environmental Affairs, Republic of South Africa, *Rhino Issue Management Report 2013* (2013), at 17; J. Hutton and G. Webb, 'Crocodiles: Legal Trade Snaps Back', in: S. Oldfield (ed.), *Trade in Wildlife: Regulation for Conservation* (Earthscan, 2003), 108, at 111–118; D. Biggs, F. Courchamp, R. Martin and H.P. Possingham, 'Legal Trade of Africa's Rhino Horns', 339:6123 *Science* (2013), 1038; E. Lapointe, 'Myth of Trade or No Trade', in:

During the Convention's first forty years, parties have also sought to ensure that listing on CITES appendices and decision making by the parties are based on science and facts.¹⁰ Proponents of opening up trade often suggest that allowing for some legal trade would be an objective and scientifically based approach.¹¹ In particular, commentators often suggest that counter-arguments are motivated by ethical considerations in the form of animal welfare or a dislike of killing that do not belong in the conservation world.¹² The implicit message is, then, that counter-arguments to allowing some legal international trade in elephant, rhino and tiger parts are ungrounded in science.

This article tests the proposals for trade, examining in detail the assumptions they make and the evidence they rely upon. Only in this way can we assess what will be the most scientific and fact-driven strategy for the parties to CITES to adopt for these three species. The article presents counter-arguments to the proposals' assumptions in order to highlight areas where models may be unreliable or data insufficient but does not try to prove definitively that the proposals are either correct or incorrect in their assumptions. It is the position of this article that such proof would be impossible. The next section thus raises more questions than it answers about the potential effect of legal trade on the survival of endangered species.

PROPOSALS TO LEGALIZE TRADE IN ENDANGERED SPECIES UNDER CITES

THE SPECIES

Proposals to legalize some trade in endangered species frequently focus on one or more of three animal species: elephants, rhinoceroses and tigers. This article refers to these as three species, although there are a number of sub-species with different circumstances, threats and legal protection.¹³ All three are under severe threat from

IWMC World Conservation Trust (ed.), *Tiger Conservation: It's Time to Think Outside the Box* (IWMC World Conservation Trust, 2007), 4, at 5–6. For a less wholehearted endorsement of the lessons to be drawn from crocodiles for sustainable use proposals generally, see: J. Thorbjarnarson, 'Crocodile Tears and Skins: International Trade, Economic Constraints and Limits to the Sustainable Use of Crocodilians', 13:3 *Conservation Biology* (1999), 465.

¹⁰ See CITES Resolution Conf. 9.24 (Rev. CoP16), Criteria for Amendment of Appendices I and II (1994/2013).

¹¹ See K. Conrad, 'Trade Bans: A Perfect Storm for Poaching?', 5:3 *Tropical Conservation Science* (2012), 245, at 252.

¹² See H. Jenkins, 'Conservation of the Tiger: The Need for New and Radical Approaches', in: IWMC World Conservation Trust, n. 9 above, 11, at 12; D. Biggs *et al.*, n. 9 above, at 1039.

¹³ See Department of Environmental Affairs, Republic of South Africa, n. 9 above, at 9; H.S. Riddle, B.A. Schulte, A.A. Desai and L. van der Meer, 'Elephants: A Conservation Overview', 2:1 *Journal of Threat-*

poaching, although they are also subject to threats from factors such as habitat loss.¹⁴ Most of the sub-populations of these species are listed on Appendix I of CITES and are considered endangered, resulting in a ban in commercial trade.¹⁵ For elephants and tigers, the main demand is for parts that are only available if the animal is killed – namely ivory, tiger skins and tiger bones. For rhinos, demand is primarily for rhino horn, which can – with the right expertise and equipment – be harvested from rhinos without killing them.¹⁶ However, poachers kill rhinoceroses to obtain the horn.

Despite listing on Appendix I, some legal international or domestic trade has continued for certain elephant, rhino and tiger parts, albeit in different forms depending on the species. In the case of the African elephant (*Loxodonta africana*), after listing on Appendix I in 1989,¹⁷ some populations of the species were downlisted from Appendix I to Appendix II in 1997 and two international sales of State-controlled stockpiles of ivory have since been authorized by CITES to two States – Japan and China.¹⁸ Domestic trade in ivory has also continued in some countries.¹⁹ Rhinoceros species were listed on Appendix I in 1977.²⁰ In 1994 and 2004, respectively, South Africa and Swaziland's populations of white rhinoceros (*Ceratotherium simum*) were transferred to Appendix II, with an annotation limiting permissible international trade of rhino parts to hunting trophies.²¹ International trade in tiger parts has been banned through Appendix I listing on CITES since 1975,²² with the exception of the Siberian Tiger

(*Panthera tigris altaica*), which was listed on Appendix I in 1987.²³ Yet some domestic trade in certain parts of captivity-bred tigers that have died in captivity appears to be authorized within China.²⁴

At the next CITES CoP in 2016 or sooner, some or all of these three species are likely to be the subject of proposals to legalize some international trade in their parts. These proposals are not all the same, just as the species are not all the same. For ivory, parties to CITES are being asked to develop a decision-making mechanism to govern periodic sales of ivory.²⁵ This intended trade is not proposed to result in farming of elephants. The ivory to be sold comes from some form of sanctioned killing of wild elephants from culling programmes or hunting, from natural deaths in protected reserves, or from seizures of illegal ivory. For tigers, proposals for legal trade primarily involve allowing captive-breeding operations to trade in tiger parts.²⁶ For rhinos, proposals could involve both wild and ranched animals.²⁷ Sources of rhino horn could include stockpiles of rhino horn gained from wild rhinos in much the same way as stockpiles of ivory, as well as sales of rhino horn from State dehorning programmes. Sources could also include rhino horn from dehorning and hunting trophies of rhinos held on private land in operations more akin to farming or ranching.

Because the proposals are all slightly different, some of the arguments by both proponents and opponents to legal trade are inapplicable to some species. This article notes these differences where relevant. Nevertheless, the article addresses arguments favouring legal trade for all three species at the more general level, focusing on the assumptions behind these arguments.

EVALUATING THE PROPOSALS

Aspects of the arguments by commentators proposing consideration of legal trade in endangered species can be grouped into four categories. First, many arguments centre on economic models of supply and demand drawing on supply-side economics. Second, arguments often discuss the demand for wildlife products and argue that this demand is inelastic. Third, many of the proposals make assumptions about the level of legal and regulatory infrastructure required for legal trade and how

ened Taxa (2010), 653; R. Tilson and P.J. Nyhus (eds.), *Tigers of the World: The Science, Politics and Conservation of Panthera Tigris*, 2nd edn. (Elsevier, 2010), at 37–41 and 45–48.

¹⁴ United Nations Environment Programme (UNEP), CITES, International Union for Conservation of Nature (IUCN) and TRAFFIC, *Elephants in the Dust: The African Elephant Crisis* (UNEP, 2013), at 6; Department of Environmental Affairs, Republic of South Africa, n. 9 above, at 16; S. Stoner and N. Pervushina, n. 2 above, at 1–2. ¹⁵ CITES, n. 1 above, Article 3.3(c).

¹⁶ See D. Biggs *et al.*, n. 9 above, at 1038; P.A. Lindsey and A. Taylor, *A Study on the Dehorning of African Rhinoceroses as a Tool to Reduce the Risk of Poaching* (Department of Environmental Affairs, Republic of South Africa, 2011), at 24.

¹⁷ Amendments to Appendices I and II of CITES (Lausanne, 20 October 1989; in force 18 January 1990), at 73.

¹⁸ Amendments to Appendices I and II of CITES (Harare, 20 June 1997; in force 18 September 1997), at 151; H. Kiyono, *Japan's Trade in Ivory after the Tenth Conference of the Parties to CITES* (TRAFFIC, 2002), at 1; CITES Notification to the Parties No. 2004/073, Amendments to Appendices I and II of the Convention (19 November 2004), at 4–5.

¹⁹ A.M. Lemieux and R.V. Clarke, 'The International Ban on Ivory Sales and Its Effects on Elephant Poaching in Africa', 49:4 *British Journal of Criminology* (2009), 451; D. Carrington, 'Thailand's Prime Minister Pledges to Outlaw Domestic Ivory Trade', *The Guardian* (3 March 2013).

²⁰ See T. Milliken and J. Shaw, n. 2 above, at 44.

²¹ CITES Resolution Conf. 9.14 (Rev. CoP15), Conservation of and Trade in African and Asian Rhinoceroses (1994), at 1.

²² CITES Resolution Conf. 12.5 (Rev. CoP15), Conservation of and Trade in Tigers and Other Appendix-I Asian Big Cat Species (2002/2010), at 1.

²³ Amendments to Appendices I and II of CITES (Ottawa, 24 July 1987; in force 22 October 1987), at 98.

²⁴ Environmental Investigation Agency (EIA), *Hidden in Plain Sight: China's Clandestine Tiger Trade* (EIA, 2013), at 5.

²⁵ Decision-making Mechanism for a Process of Trade in Ivory (CoP 16 Com. II.18, 2013).

²⁶ See K. Nowell and X. Ling, *Taming the Tiger Trade: China's Markets for Wild and Captive Tiger Products since the 1993 Domestic Trade Ban* (TRAFFIC, 2007), at 6; E. Dinerstein *et al.*, 'The Fate of Wild Tigers', 57:6 *BioScience* (2007), 508, at 512.

²⁷ See Department of Environmental Affairs, Republic of South Africa, n. 9 above, at 22–24; D. Biggs *et al.*, n. 9 above, at 1038.

that compares to the infrastructure needed to enforce bans on products. Finally, proposals often make arguments that implicate principles of ecology and conservation biology. These four categories of arguments are discussed in turn in the following sections.

Economic Models of Supply and Demand

Some of the proposals advocating trade rely heavily on supply-side economics for the proposition that increasing supply will reduce the price of the commodity – in this case, wildlife products – and thereby result in the legal market crowding out the illegal supply.²⁸ With legal products reducing the price, incentives to poach should, under this approach, be diminished.²⁹

Models that rely on supply-side economics and predict that legal products will compete with and end the illegal market in certain wildlife products are built on three core assumptions. (An additional assumption – namely that demand for wildlife products will not increase with increased availability of that product – is addressed in the next section). First, this basic supply-side model assumes that the wildlife product market is perfectly competitive.³⁰ However, there is strong evidence to contradict this assumption. In the case of illegal international wildlife trade, the evidence suggests that there are relatively few powerful traders and that these traders act as an oligopoly.³¹ This is key, because when the market is not perfectly competitive, it is no longer as predictable what will happen when a legal source is introduced to the market.³² For example, Bulte and Damania use mathematical models to show that where the market is dominated by an oligopoly, two alternate outcomes might result from introducing farmed or captive-bred products through a legal market.³³ If illegal traders act passively and continue to operate on their existing supply curve, they would no longer make as much money from illegal trade and would, it is

assumed, seek out other opportunities for financial gain.³⁴ The result could indeed be a reduction in poaching as the traders driving the poaching move into other, more lucrative fields.³⁵ If, however, illegal traders act aggressively and decide to make up for lost profit per unit by increasing their supply, the introduction of a legal supply will lead to a possible increase in poaching.³⁶ Thus, because the market is not perfectly competitive, it is impossible to predict with certainty whether introducing a legal market will reduce poaching as assumed by supply-side wildlife economists.³⁷

Bulte and Damania go on to use mathematical modelling to predict that limiting legal supply could lead to greater likelihood that illegal traders will act passively and poaching would go down.³⁸ However, their proof lies in modelling rather than empirical research.³⁹ Evidence from the introduction of farmed stocks of bear bile suggests that traders will sometimes increase illegal supply rather than face losing profit.⁴⁰ Importantly, there is not enough information to allow us to make an informed inference one way or the other about whether traders are likely to act passively or aggressively. Thus, within the supply-side models, there is a great deal of uncertainty about which models are the most likely to predict the effects of a legal trade on traders.

Many variables will play a role in determining how traders are likely to behave.⁴¹ These include the behaviour and incentives of poachers, the ease of increasing supply of illegally obtained wildlife parts, the demand for wildlife parts and the motivations of illegal traders. These variables may also play out differently for different species. Many of these variables are addressed in the remainder of this article. For now, using the supply-side model that assumes that illegal traders will withdraw from the market if legal products become available does not account for the potential for an increase in poaching for some or all of these endangered species. The assumption, then, that the wildlife product market is perfectly competitive and that introduction of a legal source of wildlife parts will therefore reduce illegal trade is unproven.

The second assumption behind the supply-side arguments is that legal products can be produced cheaply enough and in enough quantity that they can undercut the illegal market.⁴² Having legal products compete in

²⁸ M. 't Sas-Rolfes, *Who Will Save the Wild Tiger?* (PS-12 PERC Policy Series, 1998), at 10; G. Brown and D.F. Layton, 'A Market Solution for Preserving Biodiversity: The Black Rhino', in: J.F. Shogren and J. Tschirhart (eds.), *Protecting Endangered Species in the United States* (Cambridge University Press, 2001), 32; R.C. Kirkpatrick and L. Emerton, 'Killing Tigers to Save Them: Fallacies of the Farming Argument', 24:3 *Conservation Biology* (2010), 655, at 657; E.H. Bulte and R. Damania, 'An Economic Assessment of Wildlife Farming and Conservation', 19:4 *Conservation Biology* (2005), 1222, at 1223.

²⁹ See B. Abbot and G.C. van Kooten, *Can Domestication of Wildlife Lead to Conservation? The Economics of Tiger Farming in China* (Resource Economics and Policy Analysis Research Group, Department of Economics, University of Victoria, 2009), at 12, stating the proposition with regard to tigers.

³⁰ See E.H. Bulte and R. Damania, n. 28 above, at 1224; and R.C. Kirkpatrick and L. Emerton, n. 28 above, at 658.

³¹ See E.H. Bulte and R. Damania, n. 28 above., at 1226; T. Milliken and J. Shaw, n. 2 above, at 81–82; and R.C. Kirkpatrick and L. Emerton, n. 28 above, at 657 and 658.

³² See E.H. Bulte and R. Damania, n. 28 above, at 1227; and M. 't Sas-Rolfes, n. 28 above, at 10.

³³ See E.H. Bulte and R. Damania, n. 28 above, at 1227.

³⁴ *Ibid.*

³⁵ *Ibid.*

³⁶ *Ibid.*

³⁷ *Ibid.*; and R.C. Kirkpatrick and L. Emerton, n. 28 above, at 657.

³⁸ See E.H. Bulte and R. Damania, n. 28 above, at 1227.

³⁹ *Ibid.*, at 1228.

⁴⁰ See R.C. Kirkpatrick and L. Emerton, n. 28 above, at 657 and 658.

⁴¹ *Ibid.*, at 657.

⁴² See D. Biggs *et al.*, n. 9 above, at 1038; and Z. Jiang, C. Li, H. Fang, Z. Meng and Y. Zeng, 'Captive-bred Tigers and the Fate of Wild Tigers', 57:9 *BioScience* (2007), 725.

price with illegal products is key to the success of the pro-trade models because the models themselves rely on the possibility of an increase in supply deflating price, thereby diminishing incentives for poachers and illegal wildlife traders.⁴³ With regard to cost, the cost of producing legal wildlife parts will vary depending on the species, particularly since – as discussed earlier – the source of the legal wildlife parts varies across the species. Selling pre-existing stockpiles of wildlife parts, for example, does not require any additional investment of resources to obtain the product, whereas beginning a breeding programme would. The quantity of a legal product that will be available is also variable, depending on breeding rates.

In support of a legal trade in rhino horn, Biggs *et al.* argue that cost-effectiveness is achievable with rhino horn because of the possibility of dehorning rhinos relatively cheaply.⁴⁴ However, even if these cost projections hold true in the case of rhinos, or for sales of stockpiles, it is not clear that this will be true of all markets. In many instances, even possibly with rhinos, illegal hunting will be more cost-effective than farming.⁴⁵ Costs may also vary over time. Hunting or poaching could be more cost-effective initially until the wild source runs out due to extinction.⁴⁶ Alternatively, relying on stockpiles could make the legal source more cost-effective initially until that legal source runs out or can no longer meet demand. Abbot and van Kooten have observed that captive-breeding operations of tigers might be able to benefit from economies of scale where they can produce multiple products from tigers that they cannot produce where activities have to be done in secret.⁴⁷ Yet they also observe that if this hypothesis is wrong and the output from tiger farms does not affect the price of wild-caught tigers – because it is not cheap enough to flood the market – then tiger farming will have no effect on poaching of wild tigers.⁴⁸ Conrad proposes that cost analysis could reveal the relative cost of bringing captive-bred and wild products to market.⁴⁹ Yet it is unlikely that such cost analysis could eliminate all uncertainty about costs and supply. In addition, farmers and ranchers engaged in a legal operation would not necessarily have an incentive to keep prices down. Indeed, farmers and ranchers have an incentive to allow particular species to go extinct in the wild since that would give these farmers and ranchers a monopoly in the market and allow their products

to gain in value.⁵⁰ There is some evidence of players in wildlife markets engaging in this kind of speculation, stockpiling products until the species is extinct or severely endangered, so that they can realize greater profits in the future.⁵¹

The third assumption in the supply-side models is that the legal products that would be introduced into the market can substitute for the illegal ones.⁵² If consumers do not perceive wild-caught and domestically raised products as perfectly substitutable, it will be harder to undercut one with another. Thus, it is critical for us to know the level of substitutability between legally and illegally traded wildlife parts. For some wildlife, the legal source of parts will come from wild populations that have died naturally or been culled as part of population control measures. This is true, for example, of sales of stockpiles of ivory by States. In those instances, substitutability between the legally traded part and the illegally traded part is likely to be high, since both originally come from a wild animal. However, for some species – tigers and rhinos, for example – legally traded parts could come from captive-breeding operations or ranching and farming operations. For these species, substitutability may be different because the legally traded product will not come from wild populations.

What is the evidence about substitutability? Inevitably, it is limited because of the absence of regulated legal markets in tiger and rhino products, although some evidence can perhaps be gleaned from some clandestine markets in captive-bred products. Gratwicke *et al.* point to evidence that there can be higher demand for wild-caught products, with those products commanding a significantly higher price because they are believed to be more potent.⁵³ At the very least, we can say that it is not certain that buyers of wildlife products will treat legally sourced products as substitutable for illegally sourced products.

Thus, substitutability may vary depending on the species at issue, but in most proposals for trade, substitutability is assumed. In a more nuanced approach, Bulte and Damania assume a figure to represent the elasticity of substitution between farmed and poached rhino horns.⁵⁴ Although this assumption of a figure is necessary for modeling, the authors themselves acknowledge that they set this elasticity of substitution

⁴³ D. Biggs *et al.*, n. 9 above, at 1038.

⁴⁴ *Ibid.*, at 1039.

⁴⁵ M.H. Mockrin, E.L. Bennett and D.T. LaBruna, *Wildlife Farming: A Viable Alternative to Hunting in Tropical Forests?* (Wildlife Conservation Society, 2005), at 15; E. Dinerstein *et al.*, n. 26 above, at 512.

⁴⁶ See E. Dinerstein *et al.*, n. 26 above, at 512.

⁴⁷ See B. Abbot and G.C. van Kooten, n. 29 above, at 3.

⁴⁸ *Ibid.*, at 7–8.

⁴⁹ K. Conrad, 'Could Farming Save the Wild Tiger?', in: IWMC World Conservation Trust, 2007, n. 9 above, 7, at 8.

⁵⁰ C. Mason, E.H. Bulte and R.D. Horan, 'Banking on Extinction: Endangered Species and Speculation', 28:1 *Oxford Review of Economic Policy* (2012), 180; B. Gratwicke *et al.*, 'The World Can't Have Wild Tigers and Eat Them, Too', 22:1 *Conservation Biology* (2008), 222, at 223.

⁵¹ See C. Mason, E.H. Bulte and R.D. Horan, n. 50 above.

⁵² See D. Biggs *et al.*, n. 9 above, at 1038.

⁵³ See B. Gratwicke *et al.*, n. 50 above, at 222.

⁵⁴ See E.H. Bulte and R. Damania, n. 28 above, 1229.

'arbitrarily' and that varying the parameter representing substitutability has consequences for the outputs of their model.⁵⁵

These three assumptions are therefore highly uncertain. This uncertainty is significant, because it fundamentally alters the supply and demand curves of these models and the effect of supply on price. For example, two practical consequences could flow from a scenario where farms are not cheaper producers of the product. First, poachers and smugglers would have substantial incentive to undercut farmers and increase poaching.⁵⁶ If poached products are cheaper to bring to the market and also substitutable, this problem is exacerbated. Evidence regarding tiger skins suggests that this combination is a real possibility since captive-bred tiger skins can sell for 1.5–3 times higher than the price of wild tiger skins.⁵⁷ Second, farmers are unlikely to want to sell their products at a deflated price; indeed, they would have every incentive to increase their prices above cost, again opening the door to increased poaching.

Markets for wildlife products are complex and affected by many variables.⁵⁸ While economic models can help us see some of the factors in how they react, these models are only as good as the assumptions and data that go into them. In the case of markets for wildlife products and the effects of legal sales, particularly regarding elephants, rhinos and tigers, there are more questions than answers about these assumptions and the data. Further, as discussed below, what may be true for one species may not be true for another.

Demand Elasticity

An important argument put forward by advocates of a legal trade in one or more endangered species is that demand for products from these species is inelastic, both in its strictly economic sense as unresponsive to price and in the sense that demand cannot be reduced.⁵⁹ Conrad posits five conditions for her perfect storm scenario of a trade ban being ineffective.⁶⁰ The first of these factors is that demand is inelastic.⁶¹ The second is that use of these products has a long history of cultural significance.⁶² For Conrad, the inability to shift demand for these wildlife products is at the core of her view that trade bans for elephants, rhinos and tigers will be

ineffective.⁶³ Some proponents of trade concede that even if demand is not completely inelastic, campaigns to reduce demand will work too slowly and are expensive and difficult.⁶⁴ Feeding into this, in turn, is an argument that consumption of wildlife products is based on traditions going back thousands of years and is embedded in strong cultural values.⁶⁵ These cultural roots affect not only the elasticity of demand, but also lead to arguments that demand reduction efforts are inappropriate because they imply that cultural beliefs and different approaches to medicine are not as important as values of conservation or animal rights.⁶⁶ In support of the view that demand for wildlife products is inelastic, some commentators note that the most severe criminal penalties, including the death penalty, have not prevented poaching.⁶⁷

Demand is certainly difficult to address. Looking at empirical evidence from TRAFFIC, Biggs *et al.* argue that 'education, enforcement, protection, and awareness efforts aimed at reducing the use of [rhino] horn have all demonstrably failed to turn the tide of this rising demand'.⁶⁸ However, there is also counter-evidence that suggests that demand can change. Some examples suggest that demand can go down. Campaigns aimed at reducing consumption of shark fin soup in China appear to have had the effect of reducing demand, even though shark fin soup is a traditional dish for important celebrations.⁶⁹ In Yemen, a traditionally large market for rhino horn, demand has gone down in response to economic conditions, changing norms and price.⁷⁰ Demand has also gone down for some products in response to a change in legal status of a product; when a product is no longer legally available, a negative stigma can attach to that product, reducing demand.⁷¹ Nowell and Ling document a decline in the use of tiger bones after China's 1993 ban on the use of tiger bone in traditional Chinese medicine (TCM).⁷² It may be true that demand cannot go below a certain threshold, but this is uncertain and does not alone justify an assumption that demand is fixed.

⁵⁵ *Ibid.*, at 1230.

⁵⁶ *Ibid.*

⁵⁷ See EIA, n. 24 above, at 7.

⁵⁸ TRAFFIC, *What's Driving the Wildlife Trade? A Review of Expert Opinion on Economic and Social Drivers of the Wildlife Trade and Trade Control Efforts in Cambodia, Indonesia, Lao PDR and Vietnam* (TRAFFIC, 2008).

⁵⁹ See, e.g., K. Conrad, n. 11 above, at 249–250; M. 't Sas-Rolfes, *The Rhino Poaching Crisis: A Market Analysis* (unpublished, 2012), at 12; D. Biggs *et al.*, n. 9 above, at 1038.

⁶⁰ See K. Conrad, n. 11 above.

⁶¹ *Ibid.*, at 249.

⁶² *Ibid.*, at 250.

⁶³ *Ibid.*

⁶⁴ *Ibid.*, at 249. Conrad notes that 'successful [demand reduction] campaigns must be carefully crafted and culturally relevant'. *Ibid.*

⁶⁵ *Ibid.*, at 250; M. 't Sas-Rolfes, n. 59 above, at 4–6.

⁶⁶ See M. 't Sas-Rolfes, n. 59 above, at 14.

⁶⁷ See K. Conrad, n. 11 above, at 249.

⁶⁸ See D. Biggs *et al.*, n. 9 above, at 1039.

⁶⁹ WildAid, 'WildAid's Campaign Helps Reduce Shark Fin Demand' (6 February 2013), found at: <<http://www.wildaid.org/news/wildaid-campaign-helps-reduce-shark-fin-demand>>. On demand reduction efforts generally, see S. Zain, *Behavior Change We Can Believe In: Towards a Global Demand Reduction Strategy for Tigers* (TRAFFIC, 2012).

⁷⁰ L. Vigne and E. Martin, 'Demand for Rhino Horn Declines in Yemen', 47:3 *Oryx* (2013), 323.

⁷¹ See B. Gratwicke *et al.*, n. 50 above, at 223.

⁷² See K. Nowell and X. Ling, n. 26 above, at 20.

Furthermore, demand can certainly increase. Changes in the legality of products can affect the stigma attached to their use.⁷³ It also changes in response to economic conditions and cultural norms. For example, Milliken and Shaw document that the rise in use of rhino horn in Vietnam, which appears to be driving so much of the increased poaching in rhinos, is primarily due to new uses.⁷⁴ Some of those new uses appear to be a response to traders stimulating demand by marketing to cancer patients.⁷⁵ While one of the current main uses of rhino horn does appear to be connected with TCM,⁷⁶ this new, but more traditionally oriented, use is not the horn's primary use in Vietnam.⁷⁷ Rather, new uses that are related to status and conspicuous consumption are the primary drivers of increased demand.⁷⁸ Indeed, Vietnam's markets for rhino horn are now believed to be the main consumer markets and markets elsewhere have gone down.⁷⁹

At the very least, the evidence is uncertain. It is difficult to trace causal connections between certain events and increases or decreases in demand. This is particularly true where some legal trade has either been occurring or has been a possibility for the future, as is the case for all three species addressed here. For example, commentators disagree about the effect of the CITES-authorized ivory sales to Japan and China on demand for ivory, but demand has certainly increased since the sale of ivory stockpiles to China.⁸⁰ While interest in tiger bones appears to have gone down after the Chinese domestic ban on the use of such products in TCM in 1993, some evidence also links a revival of interest to Chinese official action changing the illegal status of tiger bone products and appearing to sanction a current or future trade in such products.⁸¹ Abbot and van Kooten note the possibility that an anticipated shift to permitting legal trade may already be shifting behaviour with carcasses of tigers that have died in captivity frozen and stored 'as owners speculate that the domestic trade ban will be relaxed'.⁸²

The evidence suggests, then, that demand is not completely fixed in either direction. Further, uses for certain wildlife products change over time and not all uses are traditional. This is significant because if

demand does increase in response to legalizing wildlife products, economic models predict that higher demand will lead to higher prices and greater harvesting from the wild due to the higher incentives for traders and poachers, unless the legal source can supply sufficient quantities to meet this increased demand.⁸³ Some commentators simply do not address this possibility or argue that demand is not related to factors other than price.⁸⁴ However, some commentators concede that demand may increase in response to legalization of certain wildlife products.⁸⁵ 't Sas-Rolfes concedes that aggressive product marketing is likely easier in a legal market, allowing producers and traders to push up demand, but he also argues that a legal market will in turn allow easier regulation of that advertising.⁸⁶

In the case of rhinos, Biggs *et al.* acknowledge that for a legal trade in rhino horn to be successful at stemming poaching, 'demand [must not] escalate to dangerous levels as the stigma associated with the illegality of the product is removed'.⁸⁷ Yet they believe that demand can be met with a growing population of rhinos and posit that an increase in demand would signify success.⁸⁸ Implicitly, this assumes that the higher demand can also be met quickly enough by farmed animals to respond to any increase in demand. Yet, with the size of the TCM market and with new uses being developed for rhino horn and other wildlife products, it is far from certain that demand can be met and met quickly if it increases in response to legal trade.⁸⁹ Increased demand that cannot be entirely satisfied by legal supply would reignite traders' interest in bringing illegally obtained – poached – wildlife products to the market.

Where there is substitutability, legalizing a product can have an impact on demand even before the product becomes available. Indeed, some traders may be trying to cash in before others enter the market, so it is possible that there would be an upsurge in poaching in the immediate aftermath of a decision to legalize trade in certain wildlife products before the legal supply is on the market.⁹⁰ In the case of the babirusa (*Babirusa babyroussa*) – a type of wild pig – a planned international captive breeding programme had a dramatic effect on trade in wild babirusas over a period of just a few months.⁹¹ This increase in trade occurred before the

⁷³ C. Fischer, 'The Complex Interactions of Markets for Endangered Species Products', 48:2 *Journal of Environmental Economics and Management* (2004), 926, at 927–929 and 932–934.

⁷⁴ See T. Milliken and J. Shaw, n. 2 above, at 118–123.

⁷⁵ *Ibid.*, at 118–123 and 134.

⁷⁶ This is use by young mothers to reduce fevers in their infant children. *Ibid.*, at 136–137.

⁷⁷ *Ibid.*, at 136.

⁷⁸ *Ibid.*, at 134–136.

⁷⁹ *Ibid.*, at 104 and 111.

⁸⁰ EIA, *Stop Stimulating Demand!: Let Wildlife Trade Bans Work* (EIA, 2013); D. Biggs *et al.*, n. 9 above, at 1039.

⁸¹ See EIA, n. 24 above, at 9–11.

⁸² See B. Abbot and G.C. van Kooten, n. 29 above, at 2. See also C. Mason, E.H. Bulte and R.D. Horan, n. 50 above.

⁸³ See E.H. Bulte and R. Damania, n. 28 above, at 1231; and R.C. Kirkpatrick and L. Emerton, n. 28 above, at 657.

⁸⁴ See M. 't Sas-Rolfes, n. 59 above, at 6.

⁸⁵ See, e.g., D. Biggs *et al.*, n. 9 above, at 1039.

⁸⁶ See M. 't Sas-Rolfes, n. 59 above, at 6.

⁸⁷ See D. Biggs *et al.*, n. 9 above, at 1038.

⁸⁸ *Ibid.*, at 1039.

⁸⁹ See B. Gratwicke *et al.*, n. 50 above, at 223.

⁹⁰ For an argument that this is happening with rhinos, see EIA, *Poaching Increases as SA Pushes Legal Rhino Horn Trade* (EIA, 2013).

⁹¹ L.M. Clayton, E.J. Milner-Gulland, D.W. Sinaga and A.H. Mustari, 'Effects of a Proposed *Ex Situ* Conservation Program on *In Situ* Conservation of the Babirusa, an Endangered Squid', 14:2 *Conservation Biology* (2000), 382, at 383.

captive breeding programme had begun and before permits for legal trade had been issued.⁹² It appears to have been fuelled by the belief that there would be a lucrative trade that was now officially sanctioned.⁹³

Although we do not know enough about how demand will respond, one thing is clear: careful examination of the models pertaining to lifting trade bans establishes that they do not account for the myriad factors that affect the demand for elephant, rhinoceros and tiger parts. Thus, if proponents of legal bans base models on 'a linear derived demand function' – for example, for wild tigers – or inelastic demand, the output of the model is not necessarily a reflection of what will happen in practice.⁹⁴ These models do not demonstrate empirically that demand for wildlife products cannot be reduced, even though this is a cornerstone of many justifications for developing a legal trade. Nor can they demonstrate that demand will not rise in response to the introduction of a legal source of a given wildlife product.

Legal and Regulatory Requirements of Dual Stream Markets

Among the arguments that many proponents of opening up trade advance is that alternatives such as enforcement of bans and demand reduction campaigns are expensive and have proven ineffective. Conrad's fifth element for the perfect storm is inadequate enforcement of the ban.⁹⁵ On this view, the market models discussed above predict that legalizing trade in wildlife products will allow market forces to drive down the price, removing the incentive to poach and trade illegal wildlife products. Some commentators simply fail to discuss what will be needed to ensure that a legal market in wildlife products operates as hoped, preferring instead to highlight the costs of trying to enforce a ban in wildlife products.⁹⁶

Opponents of allowing legal trade often express concern that allowing legal trade will make it harder to crack down on illegal trade.⁹⁷ A legal market can allow traders to launder illegal products through the legal market and evidence from the Environmental Investigation Agency (EIA) suggests that this has been happening with the legal domestic trade in tiger pelts in China.⁹⁸ Other concerns include the potential for

impacts on wildlife populations because farms and captive-breeding facilities can look to wild populations to repopulate their stock.⁹⁹

To address these concerns, a strong enforcement infrastructure is required. For this reason, dual streams involving both legal and illegal products can increase the burden on enforcement.¹⁰⁰ In addition to the increased burden for enforcement, dual streams create difficulties for consumers, making it harder for consumers to exercise a preference for legal products because they may not know which are legally sourced and which are illegally sourced. In the case of tropical timber, the European Union and the United States have both sought to limit the burden on consumers by placing the burden on importers to demonstrate that imported timber was not harvested contrary to the domestic laws of the source country.¹⁰¹ Although such a system shifts the burden away from consumers, it does not lessen the monitoring and enforcement burden. Indeed, it may increase the enforcement and monitoring burden as regulators have to determine whether the source of the item was legal or illegal under a foreign country's domestic laws.

Some commentators acknowledge that legal infrastructure is needed if a legal market is going to be introduced.¹⁰² However, many of these commentators assume that the costs for this will not outweigh the benefits of a legal market. If the market operates as predicted in the supply-side models, the costs of developing the necessary infrastructure to regulate the legal market and end the illegal market are presumed to be lower because the market's invisible hand will lead to the intended result of less poaching. Thus, Biggs *et al.* identify the need for regulators to prevent laundering of illegal products through legal markets as one of the factors necessary for a legal trade to be effective in helping to protect species.¹⁰³ However, they also argue that this is possible with rhino horn because enforcement efforts will be most cost-effective with a legal market.¹⁰⁴ They rely on the existence of technologies to use DNA testing and assume that these technologies will be available and cost-effective.¹⁰⁵

Let us assume that market forces would indeed drive down pressure for poaching and thereby make enforcement easier and more cost-effective. Decisions will still need to be made about allocating permits, licensing

⁹² *Ibid.*, at 384.

⁹³ *Ibid.*

⁹⁴ See B. Abbot and G.C. van Kooten, n. 29 above, at 8 and 12.

⁹⁵ See K. Conrad, n. 11 above, at 251.

⁹⁶ See, e.g., *ibid.*, at 17; and B. Mitra, 'How the Market Can Save the Tiger', 168:6 *Far Eastern Economic Review* (2005), 44, at 47.

⁹⁷ See T. Milliken and J. Shaw, n. 2 above, at 105; EIA, n. 80 above.

⁹⁸ See EIA, n. 24 above, at 7–8.

⁹⁹ See M.H. Mockrin, E.L. Bennett and D.T. LaBruna, n. 45 above, at 11.

¹⁰⁰ See R.C. Kirkpatrick and L. Emerton, n. 28 above, at 657.

¹⁰¹ Regulation 995/2010/EU of 20 October 2010 Laying Down the Obligations of Operators who Place Timber Products on the Market, [2010] OJ L 295/23; The Lacey Act, 16 USC §§ 3371–3378 (2013).

¹⁰² See, e.g., J. Hutton and G. Webb, n. 9 above, at 115.

¹⁰³ See D. Biggs *et al.*, n. 9 above, at 1038.

¹⁰⁴ *Ibid.*

¹⁰⁵ *Ibid.*, at 1039.

captive-breeding and ranching facilities, monitoring of trade, policing illegal trade, and allocations of funding to various stakeholders and conservation efforts. All of those activities will require administrative resources. In addition, regulation of captive-breeding and ranching facilities will need to ensure that these facilities do not result in negative ecological effects for the species of concern or more generally.¹⁰⁶ Decisions will also need to be made about the structure of the legal market. Options include whether to privatize the commodity, allowing ranchers or captive-tiger breeding operations to operate within a regulated market, or whether to develop central selling organizations.¹⁰⁷ CITES parties could opt to allow only country-to-country sales, or sales between countries and private individuals, or sales between private individuals and private individuals.¹⁰⁸

These are not trivial questions, because they affect the flows of funds that are supposed to be generated by sales. In other words, who will profit from legal sales of wildlife products? Some arguments in favour of trade posit that legal trade in wildlife will provide local populations with a revenue stream, thereby giving them a financial stake in the survival of the species.¹⁰⁹ However, this will only happen if local populations benefit directly from the legal sale. Yet in a private market system where ranchers and captive-breeding facility operators can sell products on the market, profits will likely go to them rather than to local populations. Indeed, in the case of tigers, captive-breeding operators are often located closer to consumption markets than to the range of the tigers. If, instead, the choice is made to develop a closed market with government control, this could be used to channel money from the sales back to local communities or conservation efforts. Alternatively, local populations can be given control over the resources. Yet even these choices will require a strong regulatory infrastructure. McAllister, McNeill and Gordon argue with regard to the vicuña that in order to channel resources to local communities, community-based conservation must be managed carefully, with strong oversight of trade. Otherwise, poaching could increase, depriving local populations of their income.¹¹⁰

If the decision is made to rely on private markets, some of the regulatory costs could be borne by ranchers and

farmers. This could allow for a legal trade to offset the costs of enforcing a ban. Nevertheless, any decision about who should bear the costs of this regulatory structure can have consequences for the market models above, since increasing the costs to farmers and breeders could undermine the requirement that these operations provide wildlife parts at a cheaper price than illegally acquired parts. It is far from certain, then, that the legal and regulatory infrastructure required for a functioning dual stream market would be less than that required for effective enforcement of a trade ban. It may in fact be larger and more expensive. Further, the development of that infrastructure may have unanticipated consequences for the market models relied on by some of the proponents of legal trade.

Ecological and Conservation Principles

Some proponents of legal trade in species suggest that trade bans are an outdated or overly simplistic approach to conserving species.¹¹¹ Embedded within these arguments is an assumption that allowing for legal trade, captured by the phrase ‘sustainable utilization’, is more consistent with modern ecological principles and the tenets of conservation biology. This assumption is, however, debatable.

Ecologists and conservation biologists argue that conservation is complex and filled with uncertainty and unpredictability.¹¹² Conservation is context-dependent.¹¹³ Further, humans are part of the ecosystem and human behaviour is an important component of conservation strategies.¹¹⁴ Because of this complexity, conservation biologists point out the need for experimentation and adaptive approaches to management.¹¹⁵

All of these principles support the view that conservation decisions are not simple and it is certainly true that the survival of species does not depend on simply agreeing to a ban on trade. Nevertheless, some arguments by proponents of legal trade do not always seem to take full account of the true complexity of conservation. This plays out in three ways. The first way the complexity of conservation plays out is in whether it is possible to rely on analogies with other species for decisions on how best to conserve species. As we have seen, proponents

¹⁰⁶ See M.H. Mockrin, E.L. Bennett and D.T. LaBruna, n. 45 above, at 8–13; and J.A. Cousins, J.P. Sadler, and J. Evans, ‘The Challenge of Regulating Private Wildlife Ranches for Conservation in South Africa’, 15:2 *Ecology and Society* (2010), 28.

¹⁰⁷ Biggs *et al.*, n. 9 above, at 1039, advocate a central selling organization.

¹⁰⁸ Milliken and Shaw, n. 2 above, at 104, set out a number of considerations and options that would need to be considered for any legal trade in rhino horn.

¹⁰⁹ See B. Mitra, n. 96 above, at 47.

¹¹⁰ See R.R.J. McAllister, D. McNeill and I.J. Gordon, n. 8 above, at 126.

¹¹¹ See, e.g., B. Moyle, ‘Regulation, Conservation and Incentives’, in: S. Oldfield, n. 9 above, 41; and M.A. du Plessis, ‘CITES and the Causes of Extinction’, in: J. Hutton and B. Dickson, n. 7 above, 12, at 22–24.

¹¹² D. Lindenmayer and M. Hunter, ‘Some Guiding Concepts for Conservation Biology’, 24:6 *Conservation Biology* (2010), 1459, at 1460; and C.S. Holling, ‘What Barriers? What Bridges?’, in: L.H. Gunderson, C.S. Holling and S.S. Light (eds.), *Barriers and Bridges to the Renewal of Ecosystems and Institutions* (Columbia University Press, 1995), 3, at 19.

¹¹³ See D. Lindenmayer and M. Hunter, n. 112 above, at 1463.

¹¹⁴ R.E. Grumbine, ‘What is Ecosystem Management?’, 8:1 *Conservation Biology* (1994), 27, at 31; D. Lindenmayer and M. Hunter, n. 112 above, at 1465.

¹¹⁵ See R.E. Grumbine, n. 114 above, at 31.

of legal trade sometimes rely on stories of the successful use of legal trade for conserving some species, particularly crocodiles and vicuña, to demonstrate that legal trade is appropriate for other species.¹¹⁶ Yet given the lessons from ecology, decision makers should be careful when assuming that species are analogous. Proposals for legal trade in rhino horn and proposals for legal trade in tigers are not directly analogous. Similarly, examples of success or failure with legal trade in some species are not, alone, adequate predictors of success or failure with legal trade in other species. Species vary, for example, in reproductive rates, in the product for which they are killed, in whether they can be bred in captivity, and in whether their products can be obtained without killing or harming individual animals. What may work for the crocodile may not work in the same way for other species. In addition, the economic, social and cultural context affecting conservation efforts varies over species, over geographical space and over time.¹¹⁷ For example, civil wars and the availability of arms can trigger increased poaching, and the development of highways can create trade routes that make it easier to smuggle illegal wildlife products across borders. Indeed, even the initial success of introducing legal trade can change – for example, if market demand for the product changes.¹¹⁸ Economic models and policy approaches that do not take these various contexts into account will be limited in their predictive capacity.¹¹⁹

The second way the complexity plays out is in addressing the role of humans in conservation. Proponents of legal trade often stress the conflict between the relevant species and the humans that live with or near those species¹²⁰ – for example, tigers kill people and elephants trample crops.¹²¹ Two related consequences flow from this conflict. First, some killing will likely happen whether or not there is demand for products from the animal. Second, proponents of legal trade suggest that killing is less likely to happen if locals have a financial

incentive to protect the species.¹²² Of course, as we have seen in the previous section, it is not clear that profits from legal trade in wildlife will flow to local populations. However, even assuming that it did, commentators' emphasis on conflict between humans and animals oversimplifies a complex set of forces at play in the market for wildlife products. In some regions, hunting for food may be the primary driver of threats to certain species. In others, poachers are driven by demand from middlemen for ivory, rather than by their own desire for food or revenge.¹²³ In the case of tigers, villagers may kill tigers that threaten them even without any demand.¹²⁴ In those situations, it is unclear that financial incentives would supersede the desire to kill an animal that poses a threat to villagers. Human–wildlife conflicts can also be exacerbated by decreased habitat for the wildlife.¹²⁵ Ultimately, the root causes of conflicts between wildlife and people are complex and need to be addressed. While some economic incentive for local people not to kill animals could benefit the species, it is not clear that this would address many of the root causes of conflict. Proponents of legal trade that connect trade to human–wildlife conflict are oversimplifying the complex interactions between humans and species and the role of humans in the ecosystem.

The third way in which complexity plays out is in the role of experimentation, monitoring and adaptive approaches to conservation. Some proponents of trade have suggested that a legal trade should be tried, in keeping with the need for experimentation. The effects of legal trade could then be monitored and the legal trade ended if monitoring indicates that the species is suffering increased decline.¹²⁶ Yet, as a safeguard, this is highly problematic and unreliable. The monitoring system established to track the illegal killing of elephants after the decision to allow limited international sales of ivory, known as 'Monitoring the Illegal Killing of Elephants' (MIKE), is still significantly hampered by lack of data and lack of resources to gather data.¹²⁷ The difficulty of determining cause and effect and the complexity of international drivers of trade also means that any monitoring is inherently value-laden. Decisions will have to be made about initial baselines, how to address gaps in data and the factors that are to be taken into account. Those decisions will in turn form a set of assumptions that could shape the outcome of the monitoring. More critically, commentators disagree about how to read the data, suggesting that it might be

¹¹⁶ See n. 9 above and accompanying text.

¹¹⁷ See R.R.J. McAllister, D. McNeill and I.J. Gordon, n. 8 above.

¹¹⁸ See J. Thorbjarnarson, n. 9 above. See also R.R.J. McAllister, D. McNeill, and I.J. Gordon, n. 8 above.

¹¹⁹ As E. Bulte and E.H. Damania, n. 28 above, at 1230, indicate, 'without sufficient understanding of the market and the biological dimensions of the problem, it is hard to predict what outcome might emerge'. See also D. Lindenmayer and M. Hunter, n. 112 above, at 1461–1462, stressing the need for a holistic approach to conservation that takes account of the full context. R.C. Kirkpatrick and L. Emerton, n. 28 above, at 657.

¹²⁰ This is Conrad's fourth condition for a perfect storm. K. Conrad, n. 11 above, at 250.

¹²¹ C. Sillero-Zubiri and M.K. Laurenson, 'Interactions Between Carnivores and Local Communities: Conflict or Co-existence?', in: J.L. Gittleman, S.M. Funk, D. Macdonald and R.K. Wayne (eds.), *Carnivore Conservation* (Cambridge University Press, 2001), 282, at 285; P. Bal *et al.*, 'Elephants Also Like Coffee: Trends and Drivers of Human-Elephant Conflicts in Coffee Agroforestry Landscapes of Kodagu, Western Ghats, India', 47:5 *Environmental Management* (2011), 789, at 789 and 796.

¹²² See B. Mitra, n. 96 above, at 46.

¹²³ D. Stiles, 'Elephant Meat and Ivory Trade in Central Africa', 50 *Pachyderm* (2011), 26.

¹²⁴ See R. Tilson and P.J. Nyhus, n. 13 above, at 127.

¹²⁵ *Ibid.*, at 131.

¹²⁶ See D. Biggs *et al.*, n. 9 above, at 1039.

¹²⁷ Interpretation and Implementation of the Convention Species Trade and Conservation Elephants: Elephant Conservation, Illegal Killing and Ivory Trade, 62nd Meeting of the Standing Committee (SC 62 Doc. 46.1 (Rev. 1), 2012).

harder than commentators allow to shut down a legal trade even if there are indications of an increase in poaching. Although there is no dispute about the fact that poaching of elephants has increased since the last legal sale of ivory to China, commentators disagree about whether the sale to China triggered the increase in poaching.¹²⁸ These disagreements suggest that a spike in poaching would not necessarily lead proponents of legal trade to conclude that the legal market was driving that poaching. Further, even if the parties to CITES did agree to reverse course in response to the effects of legal trade, it is unclear that they could do so quickly enough to stem any harmful consequences of the legal trade. Indeed, the threat of renewal of a complete ban could fuel poaching and stockpiling.

CONCLUSION: IMPLICATIONS FOR DECISION MAKERS

Significant and multilayered uncertainty exists regarding the likely impact of legalizing trade in elephants, rhinoceroses and tigers. Because often essential data is unavailable, many of the arguments made by proponents of legalizing trade assume rather than prove key aspects. Proposals in favour of allowing legal trade in some or all endangered species are, therefore, often premised on many empirically unproven assumptions. One response to this is to call, as Conrad has, for further exploration and study.¹²⁹ However, it is far from clear that further study can lead to conclusive answers. Demand for wildlife products, for example, may be affected by factors that are unconnected to conservation policies. Models can be useful in predicting what is likely to happen in certain circumstances, but they are limited. This raises the key question for the parties to CITES: What should they do in the face of this kind of uncertainty?

In some cases, uncertainty calls for experimentation. In the case of elephants, rhinoceroses and tigers, however, the stakes are simply too high. Not only are the effects of legal trade uncertain, but the response of the international community to those effects is also uncertain. Given these layers of uncertainty, legal trade is at best a highly risky proposition, untested for these three species, and with as much potential for harm as it seems to offer for benefit. At this point, the parties' best recourse is to turn to the legal mandates of the Convention itself, which calls for the protection of species that

are threatened with extinction and are traded internationally. The listing criteria agreed by the parties urge that:

When considering proposals to amend Appendix I or II, the Parties shall, by virtue of the precautionary approach and in case of uncertainty either as regards the status of a species or the impact of trade on the conservation of a species, act in the best interest of the conservation of the species concerned and adopt measures that are proportionate to the anticipated risks to the species.¹³⁰

In the face of these layers of uncertainty, parties can best fulfil these mandates of protection, precaution and proportionality by pursuing strategies that are directly connected to limiting demand, enforcing bans and ensuring that domestic efforts track international efforts to eliminate trade in endangered species. Important efforts to increase penalties, cooperation and enforcement are underway.¹³¹ It is not just a question of enforcement, however. Efforts are also constantly underway to address demand and better understand the drivers of markets.¹³² Channelling more energy into these efforts and signalling that trade in these wildlife parts is not legal or likely to be legal would in itself be a form of experimentation, in keeping with the mandates of conservation biology, but a far less risky form of experimentation than allowing legal trade. By contrast, parties should be cautious about embarking on an approach of using legal markets that is untried, extremely risky and potentially highly resource intensive. The risks are simply too high.¹³³

Caution in the face of uncertainty is consistent with the mandates of CITES and with the mandates of ecology and conservation biology. It recognizes that data and predictive models are important but inconclusive, thereby acknowledging the uncertainty and unpredictability inherent in conservation. Such caution also recognizes that conservation strategies need to be highly context-dependent. No single approach can provide the panacea for all species. Acknowledging the layers of uncertainty here requires the application of caution and renewed emphasis on methods that do not carry the level of risk that come with legal trade. This response is the most rational and ecologically sound way to respond in the face of such uncertainty.

¹²⁸ See D. Biggs *et al.*, n. 9 above, at 1039; and EIA, n. 80 above. See also EIA, n. 90 above. For a discussion of this issue after the sale to Japan, but before the sale to China, see: E.H. Bulte, R. Damania and G.C. van Kooten, 'The Effects of One-off Ivory Sales on Elephant Mortality', 71:2 *Human Dimensions of Wildlife Management* (2007), 613.

¹²⁹ See K. Conrad, n. 11 above, at 252.

¹³⁰ CITES Resolution Conf. 9.24 (Rev. CoP16), n. 10 above, at 5.

¹³¹ See, e.g., International Consortium on Combating Wildlife Crime (CoP 16 Doc. 15 (Rev. 1), 2013).

¹³² See, e.g., S. Zain, n. 69 above; and T. Milliken and J. Shaw, n. 2 above.

¹³³ See R.C. Kirkpatrick and L. Emerton, n. 28 above, at 658; and E. Dinerstein *et al.*, n. 26 above, at 512.

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