

BEFORE THE SECRETARY OF THE INTERIOR

PETITION TO BAN THE IMPORT, EXPORT, AND SALE OF “CULTURED” RHINOCEROS HORN  
AND CULTURED PRODUCTS OF OTHER PROTECTED WILDLIFE SPECIES

February 10, 2016



On behalf of:



**WILDAID**

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On behalf of the Center for Biological Diversity (“the Center”) and WildAid, we hereby petition the Secretary of the Interior through the United States Fish and Wildlife Service (“the Service”) to prohibit the import, export, and sale of “cultured” or biologically engineered rhinoceros horn, as well as cultured parts or products of other protected wildlife. We submit this petition pursuant to the Administrative Procedure Act (“APA”)<sup>1</sup> and request that the Service immediately ban trade in these products pursuant to its existing authority and obligations under the Endangered Species Act (“ESA”) and the Rhinoceros and Tiger Conservation Act (“RTCA”)<sup>2</sup> and additionally promulgate specific regulations affirmatively prohibiting the products’ trade.

The world’s five rhinoceros species are all threatened by an ongoing poaching epidemic. African rhinos, including both white rhinos and critically endangered black rhinos, have been hit particularly hard, with poaching increasing in Africa from 62 rhinos in 2007 to an estimated 1,295 killed in 2014, or approximately *one African rhino killed every eight hours*. Asia’s rhinos are faring little better, with many populations already extinct and some populations dropping to only a few dozen individuals.

Rhinos are primarily killed for their horns, which are used, principally in Asia, to treat ailments ranging from impotence to hangovers, and even cancer – despite the lack of medical evidence supporting such curative properties. Powdered horn is also consumed in Vietnam as a recreational drug, and whole horns are used to make durable products, such as jewelry and libation cups.

In response to the recent poaching crisis, many conservationists, including most prominently WildAid, have initiated far-reaching consumer campaigns across China, Vietnam, and other parts of

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<sup>1</sup> 5 U.S.C. § 553(e); 43 C.F.R. § 14.2.

<sup>2</sup> 16 U.S.C. §§ 1531 *et seq.* (ESA); 16 U.S.C. §§ 5301 *et seq.* (RTCA).

Southeast Asia to reduce demand for rhino horn. Surveys indicate that these campaigns have already had a positive impact, as consumer awareness increases and attitudes shift.

However, several U.S. companies, including the biotechnology startup Pembient out of Seattle, have begun bioengineering rhino horns and rhino horn powder. These companies speculate that their visually, structurally, and purportedly even genetically identical “cultured” horn products will replace real, poached rhino horn in the marketplace. Pembient and other companies have announced that they eventually plan to produce other cultured wildlife products, including elephant ivory, tiger bone, and pangolin scales.

Conservationists and rhino scientists have strongly criticized the production and sale of cultured rhino horn, or any other cultured endangered animal product, because it raises serious conservation concerns and is likely to *exacerbate* existing threats to rhinos. Specifically, sale of cultured rhino horn: (1) severely complicates law enforcement, as the real and synthetic products are visually indistinguishable, allowing real rhino horn to be laundered as faux, (2) undermines effective, ongoing educational efforts to: reduce demand, dispel unfounded belief in rhino horn’s curative properties, and inform consumers about the impacts of rhino horn products on wild rhinos, and (3) introduces a new, broader consumer base to rhino horn products, stimulating demand for “real” rhino horn.

Accordingly, the Center and WildAid hereby petition the Service to prohibit the import, export, and trade of cultured rhino horn and other cultured products from protected species. As described below, trade in these products is already clearly banned under the ESA, the Convention on Trade in Endangered Species of Wild Fauna and Flora (“CITES”), and the RTCA, and we request the Service exercise its authorities and obligations under these provisions to prohibit the products’ trade, including through issuance of a Director’s Order to enforcement officials. Moreover, because additional clarity on regulation of these new wildlife products would be helpful to wildlife managers, law enforcement officials, and conservationists, as well as to product manufacturers and their current and potential investors, we urge the Service to promulgate regulations affirmatively banning the products’ domestic and international trade.

## **I. Factual Background**

### **A. Status of the Five Rhino Species**

The world’s five rhinoceros species, two in Africa and three in Asia, are all imperiled by the ongoing poaching crisis. As described below, despite their relatively small populations, Africa’s black and white rhinos have been killed at incredibly high rates since 2008, with approximately one rhino now killed every eight hours. Asian rhinos are also severely threatened, with some populations dwindling to just a few dozen individuals.

#### **1. Black Rhino**

The black rhino (*Diceros bicornis*) is the smaller of the two African species. Sometimes referred to as the hook-lipped rhino, black rhinos use their characteristic pointed upper lip to browse on

woody species such as shrubs and trees.<sup>3</sup> Black rhinos were once widely distributed across southern, southeastern, and parts of central Africa, from the Namibian desert to wetter, forested areas near the Congo Basin.<sup>4</sup> However, the species is now restricted to small reserves in a tiny portion of its historical range due to massive population reductions.<sup>5</sup>

Black rhinos are listed as Critically Endangered by the IUCN, as “endangered” under the ESA, and on Appendix I of CITES. Scientists estimate that in 1960, there were at least 100,000 black rhinos in Africa,<sup>6</sup> but by 1995, only 2,410 remained.<sup>7</sup> Following intensive management, the population began to recover, but numbers remain critically low with an estimated 5,081 black rhinos as of 2012.<sup>8</sup> However, due to recent rampant poaching – with record high poaching levels in 2014 – there is concern that population growth has halted.<sup>9</sup>

There are four recognized subspecies of black rhino,<sup>10</sup> but one subspecies – the western black rhino (*D. b. longipes*) – was hunted to extinction.<sup>11</sup> The eastern black rhino (*D. b. michaeli*), which inhabits Kenya, Tanzania, and South Africa, is considered Critically Endangered by the IUCN due to a 90% population decline.<sup>12</sup> While intensive management resulted in a population increase from 2001 to 2012, growth rates appear to have leveled off in recent years.<sup>13</sup> The eastern black rhino remains the rarest of the three extant subspecies.<sup>14</sup>

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<sup>3</sup> Hutchins, M. & M.D. Kreger. 2006. Rhinoceros behaviour: implications for captive management and conservation. INT'L ZOO YEARBOOK 40(1), 150-173, at 154; Emslie, R. 2012. *Diceros bicornis*. The IUCN Red List of Threatened Species 2012: e.T6557A16980917.

<http://dx.doi.org/10.2305/IUCN.UK.2012.RLTS.T6557A16980917.en>.

<sup>4</sup> *Id.*

<sup>5</sup> Harley, E.H., I. Baumgarten, J. Cunningham, & C. O’Ryan. 2005. Genetic variation and population structure in remnant populations of black rhinoceros, *Diceros bicornis*, in Africa. MOLECULAR ECOLOGY 14(10), 2981-2990, at 2981; Rookmaaker, K. & P. Antoine. 2012. New maps representing the historical and recent distribution of the African species of rhinoceros: *Diceros bicornis*, *Ceratotherium simum* and *Ceratotherium cottoni*. PACHYDERM No. 52 July–Dec. 2012.

<sup>6</sup> Milliken, T. 2014. Illegal Trade in Ivory and Rhino Horn: an Assessment Report to Improve Law Enforcement Under the Wildlife TRAPS Project. USAID and TRAFFIC. 24pp., at 14.

<sup>7</sup> Emslie, R.H., T. Milliken, & B. Talukdar. 2013. African and Asian Rhinoceroses – Status, Conservation and Trade: A report from the IUCN Species Survival Commission (IUCN/SSC) African and Asian Rhino Specialist Groups and TRAFFIC to the CITES Secretariat pursuant to Resolution Conf. 9.14 (Rev. CoP15). CoP16 Doc. 54.2, 18pp., at 2.

<sup>8</sup> Milliken (2014), at 15.

<sup>9</sup> Ferreira S.M., C. Greaver, G.A. Knight, M.H. Knight, I.P.J. Smit, & D. Pienaar. 2015. Disruption of Rhino Demography by Poachers May Lead to Population Declines in Kruger National Park, South Africa. PLoS ONE 10(6): e0127783. doi:10.1371/journal.pone.0127783. 18pp., at 12; Milliken (2014), at 16.

<sup>10</sup> Du Toit, R., T.J. Fosse., & D.H.M. Cummings, eds. 1987. Proceedings of African Rhino Workshop, Cincinnati, October 1986. PACHYDERM Special Issue no. 9., cited in Harley et al. (2015), at 2981.

<sup>11</sup> Emslie, R. 2011a. *Diceros bicornis* ssp. *longipes*. The IUCN Red List of Threatened Species 2011: e.T39319A10198340. <http://dx.doi.org/10.2305/IUCN.UK.2011-2.RLTS.T39319A10198340.en>; Lagrot, I., J.F. Lagrot, & P. Bour. 2007. Probable extinction of the western black rhino, *Diceros bicornis longipes*: 2006 survey in northern Cameroon. PACHYDERM (43), 19-28, at 28.

<sup>12</sup> Emslie, R. 2011b. *Diceros bicornis* ssp. *michaeli*. The IUCN Red List of Threatened Species 2011: e.T39320A10198874. <http://dx.doi.org/10.2305/IUCN.UK.2011-2.RLTS.T39320A10198874.en>.

<sup>13</sup> *Id.*

<sup>14</sup> *Id.*

The southwestern black rhino (*D. b. bicornis*), of which Namibia holds almost 90%,<sup>15</sup> is ranked as Vulnerable by the IUCN.<sup>16</sup> This population, which exceeded 1,000 individuals in 2010, has been recovering but at a very slow growth rate.<sup>17</sup> Recently, however, Namibia has experienced an upsurge in poaching. A single rhino was poached in 2009, but the number rose to 25 in 2014 and to 80 in 2015.<sup>18</sup> Lastly, the south-central black rhino (*D. b. minor*) is the most widely distributed subspecies due to reintroduction efforts, but it is still listed as Critically Endangered.<sup>19</sup> Over three-quarters of this population occurs in South Africa,<sup>20</sup> where the population has been increasing.<sup>21</sup> In Kruger National Park, however, the black rhino population (which includes all three subspecies) declined from 2009 to 2013.<sup>22</sup>

## 2. White Rhino

White rhinos (*Ceratotherium simum*) are the largest rhino and the second largest land mammals in the world. They use their characteristic wide, square-shaped mouths to graze primarily on grasses.<sup>23</sup> While black rhino populations plummeted in recent decades, white rhino populations have rebounded, at least until recently.

The white rhino is ranked as Near Threatened by the IUCN due to the remarkable success of conservation and reintroduction programs of the southern white rhino subspecies (*C. s. cinum*). There are two subspecies of white rhino – southern and northern.<sup>24</sup> Due to overhunting, the southern white rhino was close to extinction in the early 1900s,<sup>25</sup> but beginning in 1960, intensive recovery and reintroduction efforts led to the subspecies' recovery, from 600 animals in 1960 to 5,790 in 1992.<sup>26</sup> The population continued to increase to over 20,000 in recent years, but due to renewed poaching, the growth rate has slowed and may soon turn negative. In fact, in Kruger National Park, an important stronghold for the southern white rhino, growth rates have decreased

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<sup>15</sup> Milliken (2014), at 15.

<sup>16</sup> Emslie, R. 2011. *Diceros bicornis* ssp. *bicornis*. The IUCN Red List of Threatened Species 2011: e.T39318A10197840. <http://dx.doi.org/10.2305/IUCN.UK.2011-2.RLTS.T39318A10197840.en>.

<sup>17</sup> Brodie, J.F., J. Muntifering, M. Hearn, B. Loutit, R. Loutit, B. Brell, & P. Du Preez. 2011. Population recovery of black rhinoceros in northwest Namibia following poaching. ANIMAL CONSERVATION 14(4), 354-362, at 7.

<sup>18</sup> Tuyeimo Haidula, *Rhino poaching toll at 80*, THE NAMIBIAN (Jan. 7, 2016). Available at: <http://www.namibian.com.na/index.php?page=read&id=35672>.

<sup>19</sup> Emslie, R. 2012a. *Diceros bicornis* ssp. *minor*. The IUCN Red List of Threatened Species 2012: e.T39321A16981557. <http://dx.doi.org/10.2305/IUCN.UK.2012.RLTS.T39321A16981557.en>.

<sup>20</sup> Milliken (2014), at 15.

<sup>21</sup> Emslie (2012a).

<sup>22</sup> Ferreira et al. (2015), at 14.

<sup>23</sup> Hutchins & Kreger (2006), at 154; Emslie, R. 2012b. *Ceratotherium simum*. The IUCN Red List of Threatened Species 2012: e.T4185A16980466. <http://dx.doi.org/10.2305/IUCN.UK.2012.RLTS.T4185A16980466.en>.

<sup>24</sup> Emslie (2012b).

<sup>25</sup> Hillman-Smith, K. & F. Smith. 1986. A last chance to save the northern white rhino? ORYX 20(01), 20-26, at 20.

<sup>26</sup> Orenstein, R. 2013. Ivory, horn and blood: behind the elephant and rhinoceros poaching crisis. Firefly Books, at 70-71.

from 6.75% in 2008<sup>27</sup> to zero by 2013 and may already be negative.<sup>28</sup> If poaching rates do not decrease, Kruger may lose two-thirds of its current population by 2018.<sup>29</sup>

The southern white rhino subspecies is listed as “threatened” under the ESA due to its similarity of appearance to other rhino species.<sup>30</sup> In 1977, all species of rhinos were included on Appendix I of CITES; however, in 1994 and 2004, South Africa and Swaziland’s populations of southern white rhinos were moved to Appendix II with an annotation limiting trade in the populations to live specimens and sport-hunted trophies.<sup>31</sup> Accordingly, commercial trade in southern white rhino horn is strictly prohibited under CITES, regardless of its country of origin.

Unfortunately, conservation efforts were too late to save the northern white rhino subspecies (*C. s. cottoni*). This subspecies once ranged throughout much of Central Africa,<sup>32</sup> but by 1960 had declined to 2,250<sup>33</sup> and was eventually reduced to only about 30 individuals in a single national park in the Democratic Republic of Congo.<sup>34</sup> This last remaining wild population has likely gone extinct,<sup>35</sup> and only three individuals remain in captivity in Kenya.<sup>36</sup> The subspecies is listed as “endangered” under the ESA.

### 3. Greater One-Horned or Indian Rhino

The greater one-horned rhino (*Rhinoceros unicornis*) is, as its name suggests, characterized by a single, large nasal horn.<sup>37</sup> This species’ dramatically folded skin gives it an “armored” appearance.<sup>38</sup> The greater one-horned rhino prefers alluvial plain grasslands but also occurs in swamps and forests; although development has restricted some populations to adjacent cultivated areas.<sup>39</sup> The species feeds largely on grasses and aquatic plants.<sup>40</sup>

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<sup>27</sup> Emslie R.H. & M. Brooks. 1999. African rhino: Status survey and conservation action plan. Gland: IUCN/SSC African Rhino Specialist Group, cited in Ferreira et al. (2015), at 2.

<sup>28</sup> Ferreira et al. (2015), at 12.

<sup>29</sup> *Id.*

<sup>30</sup> 79 Fed. Reg. 28,847 (May 20, 2014).

<sup>31</sup> See Resolution Conf. 9.14 (Rev. CoP15).

<sup>32</sup> Hillman-Smith et al. (1986), at 20.

<sup>33</sup> Orenstein (2013), at 67

<sup>34</sup> Emslie (2012b); Milliken, T. & J. Shaw. 2012. The South Africa – Viet Nam Rhino Horn Trade Nexus: A deadly combination of institutional lapses, corrupt wildlife industry professionals and Asian crime syndicates. TRAFFIC, Johannesburg, South Africa. 173pp., at 18.

<sup>35</sup> *Id.*

<sup>36</sup> <http://www.olpejetaconservancy.org/wildlife/rhinos/northern-white-rhinos/>.

<sup>37</sup> Das, P.K., U. Borthakur, H.K. Sarma, & B.K. Talukdar. 2015. Population genetic assessment of extant populations of greater one-horned rhinoceros (*Rhinoceros unicornis*) in India. EUROPEAN JOURNAL OF WILDLIFE RESEARCH 61(6), 841-851, at 841.

<sup>38</sup> Orenstein (2013), at 30.

<sup>39</sup> Talukdar, B.K., R. Emslie, S.S. Bist, A. Choudhury, S. Ellis, B.S. Bonal, M.C. Malakar, B.N. Talukdar, & M. Barua. 2008. *Rhinoceros unicornis*. The IUCN Red List of Threatened Species 2008: e.T19496A8928657. <http://dx.doi.org/10.2305/IUCN.UK.2008.RLTS.T19496A8928657.en>.

<sup>40</sup> Hutchins & Kreger (2006), at 154.

The greater one-horned rhino is listed as Vulnerable by the IUCN, “endangered” under the ESA, and on Appendix I of CITES.<sup>41</sup> It is currently restricted to the eastern portions of its historical range, which once covered much of the Indian subcontinent.<sup>42</sup> The population was reduced to only a few hundred animals by the early 1900s but has been slowly recovering and now occurs in a patchy distribution in northeastern India and Nepal.<sup>43</sup> The species is confined to fewer than ten sites, but the population continues to increase,<sup>44</sup> growing from 2,800 in 2007 to 3,264 in 2012.<sup>45</sup>

#### 4. Javan or Lesser One-Horned Rhino

The Javan rhino (*Rhinoceros sondaicus*) also has one horn but is smaller than the greater one-horned rhino.<sup>46</sup> The Javan rhino is arguably the rarest large mammal on earth.<sup>47</sup> It occurs in lowland tropical rainforests near water and formerly occurred in mixed forests and grasslands on high mountains, although little is known about the Javan rhino’s preferred habitat due to its rarity.<sup>48</sup>

Javan rhinos are listed as Critically Endangered by the IUCN, as “endangered” under the ESA, and on Appendix I of CITES.<sup>49</sup> Historically, Javan rhinos roamed from northern India through Bangladesh and Southeast Asia to the islands of Java and Sumatra.<sup>50</sup> They were numerous enough in the 18th century to be considered agricultural pests but by the 20th century had disappeared from most of their range.<sup>51</sup>

Two of the three Javan rhino subspecies have already gone extinct, including the Indochinese subspecies (*R. s. annamiticus*) that died out in 2010 when the last individual was shot in Vietnam.<sup>52</sup> The last extant subspecies (*R. s. sondaicus*) survives only in a single national park in West

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<sup>41</sup> Talukdar et al. (2008).

<sup>42</sup> Emslie et al. (2013), at 12; Rao, H.S. 1947. History of our knowledge of the Indian fauna through the ages. JBNHS 54:251–280; Tun, Y.U. 1956. Rhinoceros in Kachin State. JBNHS 53(4):692–694; Tun Y.U. 1967. Wild animals of Burma. Rangoon Gazette Ltd., Rangoon, Burma, cited in Das et al. (2015), at 841.

<sup>43</sup> Laurie, W.A., E.M. Lang, & C.P. Groves. 1983. Rhinoceros unicornis. MAMMALIAN SPECIES 211:1–6, cited in Das et al. (2015), at 841; Subedi, N., S.R. Jnawali, M. Dhakal, N.M. Pradhan, B.R. Lamichhane, S. Malla, & Y.V. Jhala. 2013. Population status, structure and distribution of the greater one-horned rhinoceros *Rhinoceros unicornis* in Nepal. ORYX 47(3), 352-360, at 352.

<sup>44</sup> Talukdar et al. (2008).

<sup>45</sup> Emslie et al. (2013), at 12.

<sup>46</sup> van Strien, N. 2015. Javan Rhino Information. Save the Rhino. Available at: [https://www.savetherhino.org/rhino\\_info/species\\_of\\_rhino/javan\\_rhinos/factfile\\_javan\\_rhino](https://www.savetherhino.org/rhino_info/species_of_rhino/javan_rhinos/factfile_javan_rhino).

<sup>47</sup> Fernando, P., G. Polet, N. Foad, L.S. Ng, J. Pastorini, & D.J. Melnick. 2006. Genetic diversity, phylogeny and conservation of the Javan rhinoceros (*Rhinoceros sondaicus*). CONSERVATION GENETICS 7(3), 439-448, at 439.

<sup>48</sup> Schenkel, R. & L. Schenkel-Hulliger. 1969. The Javan rhinoceros (*Rhinoceros sondaicus* Desm.) in Ujung Kulon Nature Reserve: its ecology and behaviour. Field Study 1967 and 1968. ACTA TROPICA 26: 97-134, cited in van Strien, N.J., R. Steinmetz, B. Manullang, Sectionov, K.H. Han, W. Isnan, K. Rookmaaker, E. Sumardja, M.K.M. Khan, & S. Elli. 2008. *Rhinoceros sondaicus*. The IUCN Red List of Threatened Species 2008: e.T19495A8925965. <http://dx.doi.org/10.2305/IUCN.UK.2008.RLTS.T19495A8925965.en>; Fernando et al. (2006), at 441.

<sup>49</sup> van Strien et al. (2008).

<sup>50</sup> Fernando et al. (2006), at 439.

<sup>51</sup> *Id.* at 440.

<sup>52</sup> Emslie et al. (2013), at 12.

Java, Indonesia.<sup>53</sup> Population estimates have hovered around 40 to 60 animals since the 1980s;<sup>54</sup> the latest survey in 2013 confirmed 58 individuals.<sup>55</sup> These remaining rhinos have a skewed sex ratio,<sup>56</sup> but the recent birth of four calves leaves scientists optimistic.<sup>57</sup>

## 5. Sumatran Rhino

The Sumatran rhino (*Dicerorhinus sumatrensis*) is the smallest, hairiest, and most primitive of the five species, as its closest relative is the extinct woolly rhino of the Pleistocene epoch.<sup>58</sup> The Sumatran rhino generally inhabits tropical rainforest and montane moss forest, feeding on a variety of tropical plants.<sup>59</sup> The species has been extirpated from 99% of its former Southeast Asian range.<sup>60</sup>

The Sumatran rhino is listed as Critically Endangered by the IUCN, as “endangered” under the ESA, and on Appendix I of CITES.<sup>61</sup> In 1985, scientists estimated there were 600 Sumatran rhinos remaining,<sup>62</sup> but by 1995, there were fewer than 300.<sup>63</sup> There are three recognized Sumatran rhino subspecies; however, officials recently confirmed that the subspecies *D. s. harrisoni* has gone extinct in the wild in Malaysia, with only three individuals remaining in captivity.<sup>64</sup> The subspecies *D. s. lasiotis* is likely extinct,<sup>65</sup> but there may be a small population in its northern range of Myanmar.<sup>66</sup>

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<sup>53</sup> Haryono, M., U.M. Rahmat, M. Daryan, & A.S. Raharja. 2015. Monitoring of the Javan rhino population in Ujung Kulon National Park, Java. PACHYDERM No. 56. July 2014-June 2015. 82-86, at 84.

<sup>54</sup> Emslie et al. (2013), at 12; Ujong Kulon National Park (UKNP). 2010. Laporan Sensus Badak Java (*Rhinoceros sondaicus* Desmarest 1882) di Tama Nasional Ujong Kulon. Pandeglang., cited in Haryono et al. (2015), at 83; Ramono W.S., C. Santiapillai, & K. MacKinnon. 1993. Conservation and management of Javan rhino (*Rhinoceros sondaicus*) in Indonesia. In: Rhinoceros Biology and Conservation (eds. Ryder OA), pp. 265–273. Zoological Society of San Diego, California., cited in Fernando et al. (2006), at 440.

<sup>55</sup> Haryono et al. (2015), at 84.

<sup>56</sup> Ewen, J.G., R. Thorogood, & D.P. Armstrong. 2011. Demographic consequences of adult sex ratio in a reintroduced Hihipopulation. JOURNAL OF ANIMAL ECOLOGY 80: 448-455, cited in Haryono et al. (2015), at 84-85.

<sup>57</sup> Haryono et al. (2015), at 85.

<sup>58</sup> Orlando, L., J.A. Leonard, A. Thenot, V. Laudet, C. Guerin, & C. Hanni. Ancient DNA analysis reveals woolly rhino evolutionary relationships. MOL PHYLOGENET EVOL 2003; 28: 485–499. PMID: 12927133, cited in Pusparini, W., P.R. Sievert, T.K. Fuller, T.O. Randhir, & N. Andayani. 2015. Rhinos in the Parks: An Island-Wide Survey of the Last Wild Population of the Sumatran Rhinoceros. PLoS ONE 10(9): e0136643. doi:10.1371/journal.pone.0136643, 16pp., at 2.

<sup>59</sup> van Strien, N.J., B. Manullang, Sectionov, W. Isnan, M.K.M. Khan, E. Sumardja, S. Ellis, K.H. Han, Boeadi, J. Payne, & B. Martin. 2008a. *Dicerorhinus sumatrensis*. The IUCN Red List of Threatened Species 2008: e.T6553A12787457. <http://dx.doi.org/10.2305/IUCN.UK.2008.RLTS.T6553A12787457.en>; Hutchins & Kreger (2006), at 154.

<sup>60</sup> Havmøller, R.G., J. Payne, W. Ramono, S. Ellis, K. Yoganand, B. Long, & B.K. Talukdar. 2015. Will current conservation responses save the Critically Endangered Sumatran rhinoceros *Dicerorhinus sumatrensis*?. ORYX 1-5; Pusparini et al. (2015), at 3.

<sup>61</sup> van Strien (2008a).

<sup>62</sup> Foose T.J. & N.J. van Strien. 1997. Asian Rhinos: Status Survey Conservation Action Plan. IUCN, Gland, Switzerland, and Cambridge, UK.; 112 + v pp., cited in Pusparini et al. (2015), at 2.

<sup>63</sup> *Id.*

<sup>64</sup> Hance, J. 2015. *Officials: Sumatran rhino is extinct in the wild in Sabah*. MONGABAY (Apr. 23, 2015). Available at: <http://news.mongabay.com/2015/04/officials-sumatran-rhino-is-extinct-in-the-wild-in-sabah/>.

<sup>65</sup> Foose & van Strien (1997), cited in Pusparini et al. (2015), at 2.

<sup>66</sup> van Strien et al. (2008a).

Only one of three subspecies (*D. s. sumatrensis*) is known to survive in the wild, in Indonesia.<sup>67</sup> The most recent population studies estimate that between 87 and 179 of this last Sumatran subpopulation remain.<sup>68</sup> Rhino conservationists are considering taking the remaining Sumatran rhinos into captivity to breed.<sup>69</sup>

## B. The Ongoing Rhino Poaching Crisis

As long-lived species with slow reproductive rates and high resource requirements,<sup>70</sup> rhinos are particularly vulnerable to extinction due to over-hunting. Rhinos are hunted for their horns, which are used medicinally, primarily in Asia, because horn is believed to cure a range of ailments including fevers, measles, epilepsy, and, more recently, impotence and cancer.<sup>71</sup> Horns were once widely used to make traditional dagger handles in Yemen<sup>72</sup> – a practice is thought to have become far less common in recent years – and are still used for durable products, such as jewelry and libation cups.

Globally, rhinos have faced two catastrophic poaching cycles that have pushed populations to near extinction: the first from the 1960s to the early 1990s and the second that began in 2008 and is ongoing.<sup>73</sup> Asian rhinos suffered earlier declines, due to a combination of extreme habitat loss and poaching.<sup>74</sup> In Taiwan, the “fire” horn of Asian rhinos was once considered more effective for treating illness than the “water” horn of African animals,<sup>75</sup> and in Vietnam, some believed that Asian rhinos consumed more herbs in their habitat, and therefore their horns were superior.<sup>76</sup> In the early 1990s, Asian horns reportedly fetched up to nine times the price of African rhino horns.<sup>77</sup> To satisfy this demand, harvest drove the most populous of the Asian species, the greater one-horned rhino, to fewer than 100 individuals by the early 1960s.<sup>78</sup>

By the 1970s, with Asian rhino populations depleted, most horns were coming out of Africa, and Yemen had become the largest single consumer, where the horn was used for traditional dagger handles.<sup>79</sup> From 1970 to the early 1990s, 96% of the black rhino population had been lost<sup>80</sup> due to

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<sup>67</sup> Pusparini et al. (2015), at 2.

<sup>68</sup> Miller, P.S., C. Lees, W. Ramono, A. Purwoto, A. Rubianto, S. Sectionov, B. Talukdar, & S. Ellis (Eds). 2015. Population Viability Analysis for the Sumatran Rhino in Indonesia. Bogor, Indonesia. Apple Valley, MN: IUCN/SSC Conservation Breeding Specialist Group, cited in Pusparini et al. (2015), at 2.

<sup>69</sup> Pusparini et al. (2015), at 10-11.

<sup>70</sup> Garnier, J.N., M.W. Bruford, & B. Goossens. 2001. Mating system and reproductive skew in the black rhinoceros. *MOLECULAR ECOLOGY* 10(8), 2031-2041; Pienaar, D.J. 1994. Social organization and behaviour of the white rhinoceros. In Proceedings of a symposium on “Rhinos as game ranch animals”, Onderstepoort; van Strien et al. (2008, 2008a).

<sup>71</sup> Orenstein (2013), at 89; Milliken & Shaw (2012), at 118, 122.

<sup>72</sup> Milliken (2014), at 14.

<sup>73</sup> *Id.*

<sup>74</sup> Subedi et al. (2013), at 352; Fernando et al. (2015), at 439; Emslie et al. (2013), at 13; Pusparini et al. (2015), at 11.

<sup>75</sup> Orenstein (2013), at 40; Milliken & Shaw (2012), at 124.

<sup>76</sup> *Id.*

<sup>77</sup> Orenstein (2013), at 40.

<sup>78</sup> *Id.* at 69; Subedi et al. (2013), at 352.

<sup>79</sup> Orenstein (2013), at 41.

<sup>80</sup> Harley et al. (2005), at 2981.

poaching to satisfy the horn trade.<sup>81</sup> Only a handful of northern white rhinos remained, confined to a single national park.<sup>82</sup> Southern white rhino populations, however, continued to recover during this period.<sup>83</sup>

Yemen, South Korea, Taiwan, and China were the top consumers of rhino horn in the first poaching surge, but after being threatened with trade sanctions by the United States, these nations moved to close their domestic markets. The three Asian nations labeled rhino horn as a prohibited substance in the traditional medicine pharmacopeia,<sup>84</sup> and China forbade the selling, purchasing, transporting, carrying, or mailing of rhino horn or anything labeled as such.<sup>85</sup> Poaching essentially halted, and black and white rhino populations in Africa and the greater-one horned rhino populations of Asia began to recover.<sup>86</sup>

In 2008, rhino horn trade resurged, this time mostly between South Africa and Vietnam, and it has escalated every year since to crisis levels,<sup>87</sup> from 262 rhinos poached in Africa in 2008 to 1,295 in 2014.<sup>88</sup> At current rates *an average of three rhinos a day are being killed*,<sup>89</sup> halting the period of recovery for African rhinos, while two African subspecies (*D. b. longpipes*, *C. s. cottoni*) and two Asian subspecies have been driven to extinction (*D. s. harrisoni*, *R. s. annamiticus*).<sup>90</sup>

South Africa holds 83% of Africa's rhinos and is experiencing the highest levels of poaching, threatening to cause overall population decline for the nation's black and white rhinos beginning as early as 2016.<sup>91</sup> Though recently released data show a slight decrease in the number of rhinos poached in South Africa, from 1,215 in 2014 to 1,175 in 2015, the rate of illegal killing remains unacceptably high.<sup>92</sup> The large population in Kruger National Park is likely already declining.<sup>93</sup> Kruger's entire rhino population will likely be reduced to a third of its current size by 2018 if poaching rates do not subside.<sup>94</sup> Virtually all known rhinos near the border of Kruger and Mozambique have been wiped out due poaching linked to economic hardship in Mozambique.<sup>95</sup> Poaching has already caused population declines for Zimbabwe's black and white rhinos as well as

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<sup>81</sup> Leader-Williams, N. 1992. *The World Trade in Rhino Horn: A Review*. TRAFFIC International, Cambridge; Leader-Williams N. 2002. Regulation and protection: successes and failures in rhinoceros conservation. In: *The Trade in Wildlife: Regulation for Conservation* (ed. Oldfield S), pp. 89–99. Earthscan, London, cited in Harley et al. (2005), at 2981; Garnier et al. (2001), at 2031.

<sup>82</sup> Milliken (2014), at 14; Emslie (2012b); Milliken & Shaw (2012), at 18.

<sup>83</sup> Milliken (2014), at 14.

<sup>84</sup> *Id.*

<sup>85</sup> Orenstein (2013), at 72.

<sup>86</sup> Milliken (2014), at 14; Emslie et al. (2013), at 12.

<sup>87</sup> Milliken (2014), at 14.

<sup>88</sup> Knight, M. 2015. African Rhino Specialist Group Report. PACHYDERM No. 56. July 2014-June 2015. 10-39, at 10.

<sup>89</sup> Milliken (2014), at 16.

<sup>90</sup> Emslie (2011a); Emslie (2012b); Hance (2015); Brook et al. (2014), at 25.

<sup>91</sup> Emslie et al. (2013), at 3.

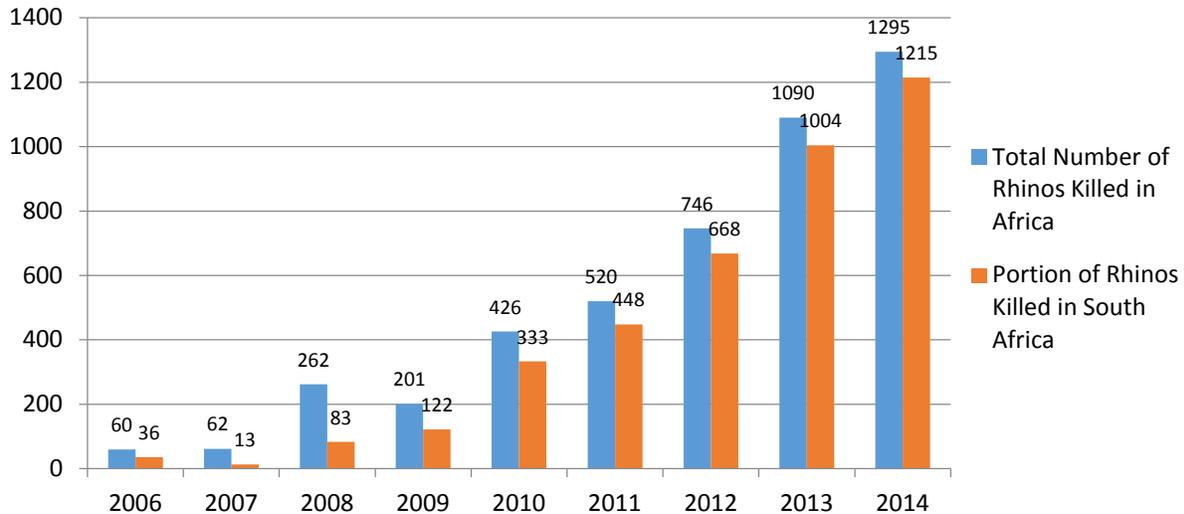
<sup>92</sup> TRAFFIC, *South Africa reports small decrease in rhino poaching, but Africa-wide 2015 the worst on record*, Jan. 21, 2016. Available at: <http://www.traffic.org/home/2016/1/21/south-africa-reports-small-decrease-in-rhino-poaching-but-af.html>.

<sup>93</sup> Ferriera et al. (2015), at 12.

<sup>94</sup> *Id.* at 12-13.

<sup>95</sup> Emslie et al. (2013), at 3.

Kenya’s population of eastern black rhinos.<sup>96</sup> Rising poaching rates in Namibia have become a concern;<sup>97</sup> the number of rhinos killed in Namibia rose from 25 in 2014 to 80 in 2015.<sup>98</sup> Tanzania’s rhino population is also of significant concern. Given the documented crash in Tanzania’s elephant populations due to widespread poaching, it is unlikely that many rhinos have survived.<sup>99</sup>



**Figure 1: Total detected number of rhinos illegally killed in Africa and South Africa.**<sup>100</sup>

Unsurprisingly, there has been a steady increase in the volume of rhino horns illegally leaving Africa for Asia.<sup>101</sup> South Africa has made more seizures than any other country, followed by China, then Vietnam, representing the top source country and two top consumer countries in illegal rhino horn.<sup>102</sup>

<sup>96</sup> Milliken (2014), at 16; Mulama, M., P. Omondi, C. Musyoki, C. Khayale, L. Kariuki, & R. Ndeti. 2015. Lessons learned in the implementation of endangered species specific strategies: Midterm Review of the Kenya Black Rhino Strategy (2012-2016). *PACHYDERM* 1(56), 97-101, at 98.

<sup>97</sup> Knight (2015), at 10.

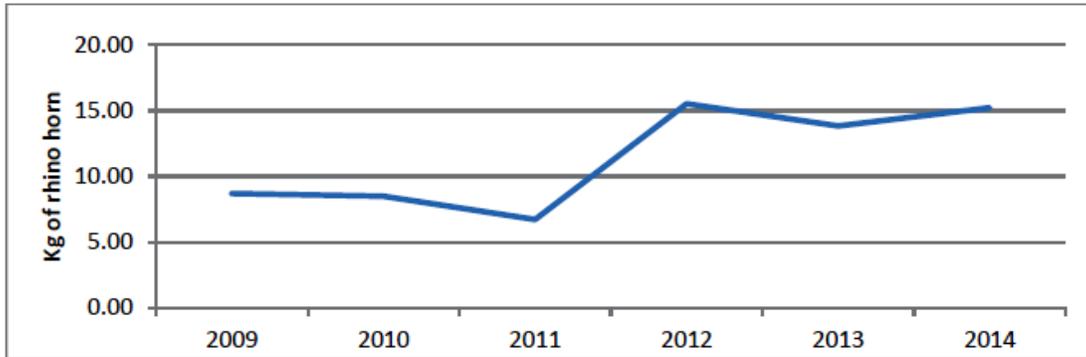
<sup>98</sup> Robin Dixon, *South Africa reports a decrease in 2015 rhino poaching*, *LA TIMES* (Jan. 21, 2016). Available at: <http://www.latimes.com/world/africa/la-fg-south-africa-rhinos-20160122-story.html>

<sup>99</sup> Milliken (2014), at 16.

<sup>100</sup> Data from Milliken (2014), Table 6; Knight (2015), at 10.

<sup>101</sup> Milledge, S. 2007. Rhino-related crimes in Africa: an overview of poaching, seizure and stockpile data for the period 2000-2005. CoP14 Inf. 41. CITES Secretariat, Geneva, Switzerland; Milliken T, Emslie, R.H., & B. Talukdar. 2009. African and Asian Rhinoceroses – Status, Conservation and Trade. CoP15, Doc. 45.1 Annexe CITES Secretariat, Geneva, Switzerland., cited in Emslie et al. (2013), at 4; Milliken (2014), at 19.

<sup>102</sup> Milliken (2014), at 20; Emslie et al. (2013), at 6.



**Figure 2: Average quantity of rhino horn (kg) per seizure by year, 2009-March 2014.**<sup>103</sup>

Law enforcement data “overwhelmingly” demonstrate that Vietnam is now the primary destination for rhino horn.<sup>104</sup> The spike in demand for rhino horn since 2008 is partly attributed to rumors that rhino horn cured a Vietnamese politician of cancer, among other similar stories. The belief that horn can be used to treat cancer has been widely accepted in Vietnam.<sup>105</sup> Of 43 documented arrests of Asian nationals for rhino crimes in South Africa, 56% were Vietnamese, 28% were Chinese, and the remainder were from Thailand and Malaysia.<sup>106</sup> Additionally, data from horn seizures in which the destination country was known implicate Vietnam as a primary consumer, with China becoming a growing concern.<sup>107, 108</sup>

Highly valued for unproven medicinal purposes as described above, the habitual use of rhino horn is also a symbol of newfound status and wealth in Vietnam.<sup>109</sup> Rhino horns are openly traded in Vietnamese markets and online, including among government officials.<sup>110</sup> Horns are crafted into lamps, candlestick holders, bowls, and cups;<sup>111</sup> they are mixed with alcoholic beverages at parties to prevent hangovers, given as gifts to business partners, and bought solely because they are rare and expensive. Rhino horns have even been used as payment for other luxury items, including cars.<sup>112</sup>

Demand for rhino horn is so high that fake rhino horn products, labeled and sold as real rhino horn, are widely available in Vietnamese markets and are able to fetch high prices as imitations.<sup>113</sup> In fact, the high value of rhino horns is so important in sustaining demand that traders

<sup>103</sup> Milliken (2014), Figure 12.

<sup>104</sup> Brook et al. (2014), at 26; Milliken & Shaw (2012); Milliken (2014), at 17; Emslie et al. (2013), at 5.

<sup>105</sup> Milliken & Shaw (2012), at 118-120.

<sup>106</sup> Milliken & Shaw (2012); Emslie et al. (2013), at 5.

<sup>107</sup> Milliken (2014), at 21.

<sup>108</sup> Particularly alarming was the sudden influx of Vietnamese nationals in South Africa’s trophy hunting industry. Beginning in 2003, Vietnamese nationals began to exploit loopholes in South Africa’s trophy hunting regulations to bring horns back for sale in Vietnam. Milliken & Shaw (2012), at 10. Between July 2009 and May 2012, Vietnamese nationals accounted for almost half of all foreign nationals who hunted rhinos in South Africa. *Id.* Vietnam does not prohibit sale of trophies once imported. Emslie et al. 2013, at 8. In 2012, South Africa began refusing to issue hunting permits to Vietnamese hunters. *Id.*

<sup>109</sup> Milliken & Shaw (2012), at 134; Orenstein (2013), at 88.

<sup>110</sup> Brook et al. (2014), at 26.

<sup>111</sup> Emslie et al. (2013), at 8.

<sup>112</sup> Milliken & Shaw (2012), at 134-137; Orenstein (2013), at 88.

<sup>113</sup> Milliken & Shaw (2012), at 129.

offering rhino horn at a lower price are often suspected of trying to sell a fake product.<sup>114</sup> Most fake rhino horns are made of cow or buffalo horns, but others are fashioned out of plastic and hair.<sup>115</sup> These fake products are sold in both medicine shops and stores selling jewelry and other gift or decorative items.<sup>116</sup> Forensic testing is rare and only done when an item is shipped outside the country, therefore it is very difficult to discern just how much real horn is on the market,<sup>117</sup> but one market investigator estimated that up to 90% of the rhino horn products offered for sale could be fake.<sup>118</sup>

Vietnam has a population of 90 million people, and per capita income has more than quadrupled in the last 15 years.<sup>119</sup> The country is projected to become one of the fastest growing economies by 2025.<sup>120</sup> The poaching crisis and demand for rhino horn has risen to such a level that some have even suggested syndicates may be “banking on extinction” of rhinos to drive up the value of their rhino horn stockpiles.<sup>121</sup> Demand for horn also appears to be on the rise in China,<sup>122</sup> which accounted for almost 80% of the reported horn seizures in Asia from 2009 to 2012.<sup>123</sup> Like Vietnam, China also has a booming market for luxury wildlife products.<sup>124</sup> A significant reduction in demand for rhino horn is a prerequisite for successful rhino conservation.

### C. Other Species Affected by the Wildlife Trade

Thousands of species worldwide are threatened by wildlife trade. Among the most prominent, Africa’s elephants, like rhinos, are facing an unprecedented poaching crisis due to demand for their ivory, with an estimated 100,000 elephants killed from 2010 to 2012 alone.<sup>125</sup> Similarly, tigers have been relentlessly killed for their skins and bones, which are used for decoration and traditional medicine, and the global tiger population has declined by an estimated 98%.<sup>126</sup> Pangolins are the most trafficked mammal in the world, with an estimated one million animals taken

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<sup>114</sup> *Id.* at 130.

<sup>115</sup> *Id.* at 129.

<sup>116</sup> *Id.*

<sup>117</sup> *Id.*

<sup>118</sup> Ammann, K. 2011. The Vietnamese and Rhino horn – a dealer speaks. *Swara*, Oct.-Dec. 2011, pp. 33-37, cited in Milliken & Shaw (2012), at 130.

<sup>119</sup> World Bank (2015). Available at: <http://www.worldbank.org/en/country/vietnam/overview>; Orenstein (2013), at 88.

<sup>120</sup> Milliken & Shaw (2012), at 14, cited in Environmental Investigation Agency (EIA). 2013. Vietnam’s Illegal Rhino Horn Trade: Undermining the Effectiveness of CITES. Feb. 2013. 12pp., at 5.

<sup>121</sup> Mason, C.F., E.H. Bulte, & R.D. Horan. 2012. Banking on extinction: endangered species and speculation. *OXF REV ECON POLICY* 28(1): 180-192., cited in EIA (2013), at 5.

<sup>122</sup> Emslie et al. (2013), at 6; Brook et al. (2014), at 22.

<sup>123</sup> Emslie et al. (2013), at 7.

<sup>124</sup> Milliken & Shaw (2012), at 134.

<sup>125</sup> Wittemyer, G., J.M. Northrup, J. Blanc, I. Douglas-Hamilton, P. Omondi, & K.P. Burnham. 2014. Illegal killing for ivory drives global decline in African elephants. *PNAS*. vol. 111, no. 36, 13117-13121.

<sup>126</sup> Seidensticker, J. 2010. Saving wild tigers: A case study in biodiversity loss and challenges to be met for recovery beyond 2010. *INTEGRATIVE ZOOLOGY* 5: 285-299, at 286; Gratwicke, B., J. Mills, A. Dutton, G. Gabriel, & B. Long. 2008. Attitudes Toward Consumption and Conservation of Tigers in China. *PLoS ONE* 3(7): e2544.

from the wild over the past decade to service demand for their meat and scales, which are believed to have medicinal properties in parts of Asia.<sup>127</sup>

#### D. Reducing Demand Through Education

Protecting the world's rhinos undoubtedly requires a reduction in poaching and trafficking through increased law enforcement. But to truly eliminate the supply of poached rhino horn, demand must also be addressed – consumers must be persuaded to stop buying rhino horn products. Through consumer education and stigmatizing endangered wildlife products, reducing demand is the most effective long-term solution to combating illicit wildlife trade.<sup>128</sup> In fact, as the Parties to CITES have recognized, “[a] key long-term solution to address rhino poaching in Africa and Asia lies in curbing demand for the horn.”<sup>129</sup>

In contrast, legalizing wildlife markets to satisfy demand through controlled trade has proven ineffective, particularly in protecting high-value wildlife. Among numerous concerns, legal markets: (1) create the opportunity for illegal wildlife products to be laundered as legal goods, hampering enforcement, (2) reduce the stigma associated with banned products, (3) confuse consumers who mistake availability for legality, and (4) defeat educational campaigns regarding the product's lack of benefits and the species' status and threats.<sup>130</sup> For example, many experts believe that the CITES-approved one-off sale of ivory to China in 2008 stimulated demand for ivory in that country, which prompted the current elephant poaching crisis.<sup>131</sup> Additionally, legalizing trade in endangered wildlife requires a complex and well-regulated system, uninfluenced by corruption,<sup>132</sup> which is simply not realistic in many developing nations.

WildAid and its partners have committed substantial time and resources to reduce demand for rhino horn products. Specifically, in 2013, WildAid launched a campaign in partnership with African Wildlife Foundation and CHANGE to reduce rhino horn demand in China and Vietnam, the world's leading consumers of rhino horn. The campaign has three primary goals: raise awareness

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<sup>127</sup> Challender, D.W.S., C. Waterman, & J.E.M. Baillie, Scaling up Pangolin Conservation: IUCN SSC Pangolin Specialist Group Conservation Action Plan, IUCN Species Survival Comm'n (Pangolin Specialist Group, London, Eng.) (July 2014).

<sup>128</sup> See Crookes, D.J. & J.N. Bignaut. 2015. Debunking the myth that a legal trade will solve the rhino horn crisis: A system dynamics model for market demand. *Economic Research Southern Africa*. J. FOR NATURE CONSERVATION 28:11-18 (finding that, “less conventional demand management strategies (such as consumer education, behaviour modification), appear to be more effective strategies in managing rhino horn demand than legalising the trade in rhino horns”); Bennett, E. 2014. Legal ivory trade in a corrupt world and its impact on African elephant populations. *CONSERVATION BIOLOGY* Vol. 29, No. 1, 54–60. DOI: 10.1111/cobi.12377 (noting that, to address elephant declines, “the only sustainable solution is for demand for ivory – the ultimate driver of the system – to be reduced”).

<sup>129</sup> CoP16 Doc. 54.1 (Rev. 1) Annex: Strategy for Reducing the Demand for Rhino Horn Products of Illegal Origin. See also Decision 16.85 (adopted at CoP16) (directing Parties to implement demand reduction strategies, taking into considering the Annex recommendations).

<sup>130</sup> See South African Institute of International Affairs, Submission to Committee of Inquiry to deliberate on matters relating to a possible trade of rhino horn (undated) (describing concerns with legalizing rhino market). Available at: [http://www.saiia.org.za/doc\\_view/741-saiia-submission-to-committee-of-inquiry-to-deliberate-on-matters-relating-to-a-possible-trade-of-rhino-horn](http://www.saiia.org.za/doc_view/741-saiia-submission-to-committee-of-inquiry-to-deliberate-on-matters-relating-to-a-possible-trade-of-rhino-horn).

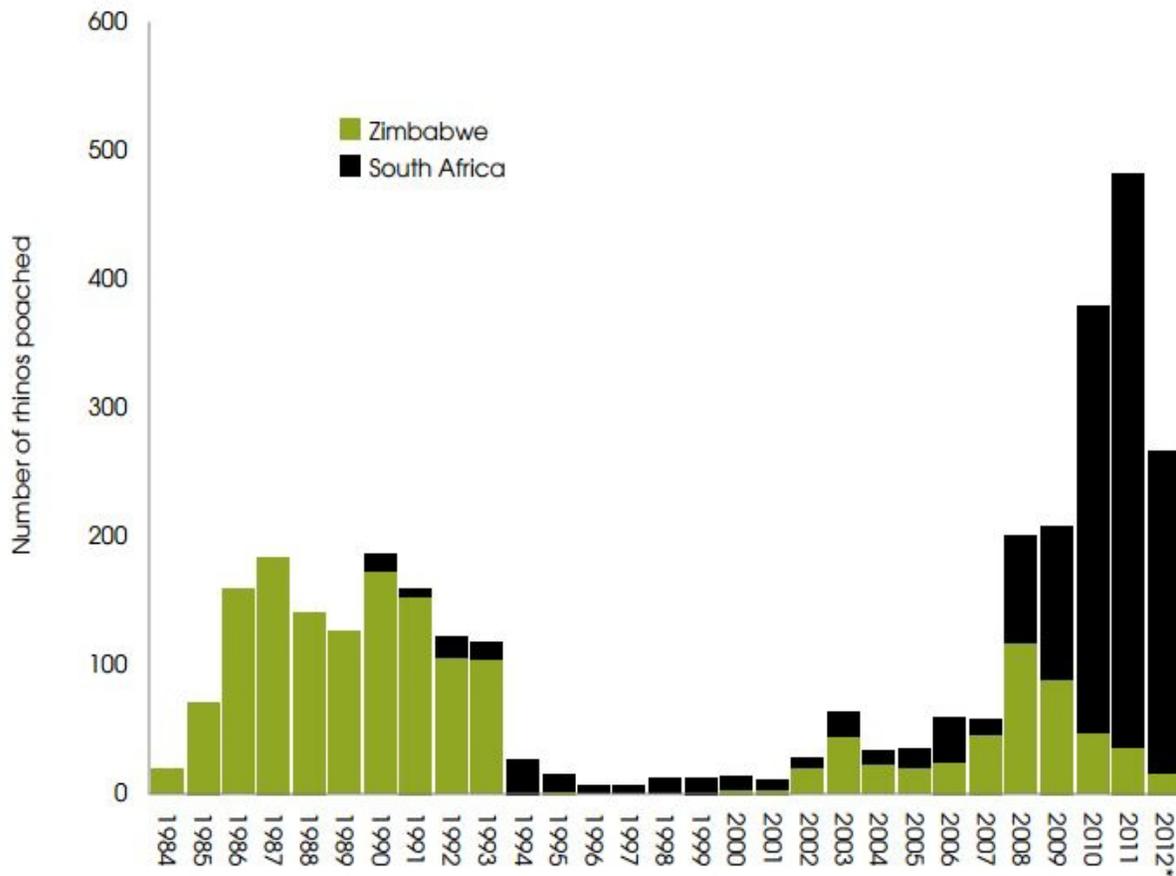
<sup>131</sup> See Orenstein (2013), at 100-101.

<sup>132</sup> Bennett (2014).

about the rhino poaching crisis, support Vietnamese lawmakers in strengthening enforcement efforts, and measurably reduce demand for rhino horn. WildAid has leveraged its extensive pro bono media network in Asia, which in 2014 was worth nearly \$200 million in donated airtime from media partners, to bring this message to millions of people each week, using influential ambassadors such as Vietnamese artists, CEOs, and doctors, as well as international ambassadors such as Prince William and Sir Richard Branson. The campaign uses strategy from previous WildAid campaigns that have shown measurable results in reducing demand for products such as shark fin.

Further, substantial evidence demonstrates the effectiveness of demand reduction campaigns in reducing poaching and conserving species, particularly rhinoceros. Specifically, during the early 1990s, in response to the rhino poaching crisis in eastern and southern Africa, non-governmental organizations and governments began working in parallel to pressure on Taiwan and China, the major consumer nations, to ban the domestic trade in rhino horn. Simultaneously, demand reduction programs were carried out in Yemen, the third main market, and Yemen agreed to accede to CITES and to close down its domestic rhino trade.

As a result of these actions, as well as threatened and actual trade sanctions against China and Taiwan by the United States in 1993, China banned rhino horn trade and removed rhino horn from the traditional medicine pharmacopeia, and Taiwan clamped down on illegal sales of rhino horn. A significant and very rapid reduction in rhino poaching in southern Africa followed, as demonstrated in the graph below.



**Figure 20** Number of rhino poached by year in Zimbabwe and South Africa from January 1984 – 20 June 2012\* (data from N. Anderson, Lowveld Rhino Trust)

Source: TRAFFIC

## E. Cultured Rhino Horn

### 1. Pembient’s Plans to “Flood” the Rhino Horn Market

As an alternative to well-proven demand reduction strategies, several entrepreneurs have recently proposed a new scheme to bioengineer synthetic rhino horn for the commercial market, with the goal of replacing products sourced from wild specimens. Among the most prominent of these companies is the synthetic biology startup Pembient, which was founded in January 2015 in Seattle to produce a synthetic or “cultured” rhino horn that will be visually, genetically, and chemically identical to real horn.<sup>133</sup> Pembient purportedly believes that if cultured rhino horn is

<sup>133</sup> See <http://signup.pembient.com/>; Alice Truong, *Chinese consumers will soon be able to buy beer brewed with synthetic rhino horn*, QUARTZ (June 11, 2015). Available at: <http://qz.com/425212/chinese-consumers-will-soon-be-able-to-buy-beer-brewed-with-synthetic-rhino-horn/>; see also This Week in Start-Ups Podcast. *Pembient’s Matthew Markus creates synthetic rhino horns to stop illegal \$750m trade and endangerment* (Nov. 17, 2015), at 16:40 (CEO Markus stating that the term “cultured” is preferred to “synthetic”). Available at: [https://www.youtube.com/watch?v=JKfVn\\_IfrKQ](https://www.youtube.com/watch?v=JKfVn_IfrKQ); Isha Datar “with input from Matthew Markus,”

priced significantly below market rates for real horn, it will “flood” the market, theoretically satisfying demand and reducing prices for real horn, thus reducing economic incentives for poachers.<sup>134</sup> As Pembient CEO Matthew Markus explains, “We’ll make money; the poaching syndicates won’t.”<sup>135</sup>

Pembient has described plans to manufacture both powdered rhino horn and “carvable” horn for the production of durable goods, such as jewelry, libation cups, and chopsticks.<sup>136</sup> Pembient’s plans for consumer goods containing cultured rhino horn have included a beer brewed in China and a skin cream for distribution in Vietnam labeled “Essence of Rhino Horn.”<sup>137</sup> Indeed, Pembient’s trademark application demonstrates cultured rhino horn’s potential for broad consumer appeal, listing potential consumer goods to include nutritional supplements, homeopathic supplements, vitamin supplements, cosmetics, perfume, hair care products, body lotion, sexual stimulants, and horn.<sup>138</sup> Such commercial breadth reflects the myriad ways in which rhino horn could be marketed in Vietnam and elsewhere – from hangover remedy and recreational drug to cancer cure. The company’s CEO Matthew Markus has said the price point for this product is \$8,000/kg,<sup>139</sup> or approximately one-eighth the black market price for real rhino horn.

The company has already produced its first prototype of both rhino horn powder and carvable horn,<sup>140</sup> and had initially hoped to begin sales in September.<sup>141</sup> However, in part due to fierce opposition from rhino conservationists around the world, Pembient may have recently shifted its product strategy away from cosmetics, beverages, and medicinal uses. In interviews, CEO Markus now emphasizes the use of its horn to produce durable luxury goods, such as carvings and

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*Pembient Profile on New Harvest: Pembient: rhino horns without poaching* (Nov. 17, 2015). Available at: [http://www.new-harvest.org/pembient\\_rhino\\_horns](http://www.new-harvest.org/pembient_rhino_horns) (referring to horn as “cultured”).

<sup>134</sup> Jani Actman, *Can Fake Rhino Horn Stop the Poaching of an Endangered Species?* NAT’L GEOGRAPHIC. Available at: <http://news.nationalgeographic.com/2015/12/151203-pembient-synthetic-rhino-horn-vietnam-poaching/>.

<sup>135</sup> Tekla Perry, *Biotech and 3-D Printing Could Make Rhino Poaching Pointless*, IEEE SPECTRUM (June 15, 2015). Available at: <http://spectrum.ieee.org/view-from-the-valley/at-work/start-ups/biotech-and-3d-printing-poised-to-disrupt-rhino-horn-market>.

<sup>136</sup> Actman (2015).

<sup>137</sup> David Ferry, *This Tech Entrepreneur Is Trying to Disrupt the Illegal Rhino-Horn Trade*, OUTSIDE ONLINE (July 14, 2015). Available at: <http://www.outsideonline.com/1998146/can-tech-entrepreneur-disrupt-illegal-rhino-horn-trade>; Adele Peters, *This New Chinese Beer Will Be Made With Fake Rhino Horn To Help Save Real Rhinos*, CO.EXIST (June 17, 2015). Available at:

<http://www.fastcoexist.com/3047427/this-new-chinese-beer-will-be-made-with-fake-rhino-horn-to-help-save-real-rhinos>; see Pembient – Essence of Rhino Horn Commercial. Available at: <https://www.youtube.com/watch?v=BQHnZfW6538>.

<sup>138</sup> United States Patent and Trademark Office. Pembient Trademark Application for Essence of Rhino Horn (Jan. 30, 2015) (advertising “Essence of Rhino Horn” “for softer and cooler skin”). Available at: [http://tsdr.uspto.gov/#caseNumber=86519584&caseType=SERIAL\\_NO&searchType=statusSearch](http://tsdr.uspto.gov/#caseNumber=86519584&caseType=SERIAL_NO&searchType=statusSearch). As detailed below, Pembient’s trademark application for “Essence of Rhino Horn” was denied.

<sup>139</sup> See Biohack ATX Chat with Matt Markus of Pembient (3D Printed Rhinoceros Horns) (Aug. 31, 2015), at 19:15. Available at: <https://www.youtube.com/watch?v=Y6R-uUHL410>.

<sup>140</sup> This Week in Start-Ups (podcast, Nov. 17, 2015). Pembient’s Matthew Markus creates synthetic rhino horns to stop illegal \$750m trade and endangerment. Available at: [https://www.youtube.com/watch?v=JKfVn\\_lfRko](https://www.youtube.com/watch?v=JKfVn_lfRko).

<sup>141</sup> Kieron Monks, *Biotech startup creates rhino horns - without rhinos*, CNN (May 21, 2015). Available at: <http://www.cnn.com/2015/05/21/tech/pembient-rhino-horns-mci/>.

bracelets.<sup>142</sup> However, the carvable rhino horn will almost certainly be ground into powder by consumers, as “[s]craps from the carving process are edible, and may be resold on to secondary markets.”<sup>143</sup> And as Markus said in an interview, “We can’t really control what happens to our horns once they leave our distribution points.”<sup>144</sup> Recent reports indicate final design for Pembient’s carvable product may not be complete for another year;<sup>145</sup> however, Markus has indicated that some of the product has *already* been exported to China for testing.<sup>146</sup>

In addition to rhino horn, Pembient has said it plans to create a full line of bioengineered animal products from threatened and endangered species, including elephant tusks, tiger bones, and pangolins scales. However, these products are chemically and structurally more complex than rhino horn and apparently are not yet in advanced R&D stages.<sup>147</sup>

Though Pembient is the most prominent U.S. company working to produce synthetic horn and may be the furthest along in product development, it is not the only entity seeking to create this product for intended distribution in Asian markets. Garrett Vygantas, CEO of the San Francisco-based startup CeratoTech, has reportedly sought to patent the process by which pluripotent rhino stem cells are “reprogrammed” to become keratinocytes, which produce the keratin that constitutes rhino horn (see section E-2).<sup>148</sup> Several other companies, including Rhinoceros Horn LLC and Stop Rhino Poaching Through Synthetic Rhino Horns, are also pursuing funding, though little is known about these ventures.<sup>149</sup>

## 2. Producing Synthetic Rhino Horn

Rhinoceros horn is composed of skin cell layers that become hardened due to the fibrous protein keratin and is similar in chemical composition to horns from water buffalo, cattle, and yaks. But unlike the horns of these fellow ungulates, rhino horn lacks a bony center. Instead, the horn is

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<sup>142</sup> Actman (2015) (according to Markus, intact horn is “what the market really desires” because it is the “ultimate marker of authenticity”).

<sup>143</sup> Datar & Markus (2015); This Week in Start-Ups Podcast (2015), at 8:30, 12:20 (CEO Markus stating that “shavings” of carvable products “end up in the folk belief system,” i.e., the medicinal market).

<sup>144</sup> Ben Gruber, *Saving Rhinos in a Lab*, REUTERS (July 30, 2015). Available at: <http://www.reuters.com/article/us-usa-bioengineered-rhino-horns-idUSKCN0Q42DX20150730>.

<sup>145</sup> Actman (2015).

<sup>146</sup> Aaran Fronda, *Synthetic rhino horns could alter black market*, WORLD FINANCE (Sept. 14, 2015). Available at: <http://www.worldfinance.com/markets/synthetic-rhino-horns-could-alter-black-market> (in response to questions about legal issues of importing and exporting, Markus “chuckled” and noted Pembient “had exported stuff to China for various tests” with ease).

<sup>147</sup> Tekla (2015); Monks (2015).

<sup>148</sup> Sachin Rawat, *Pembient – Bioengineered Wildlife Products*, SYNBIOBETA (Jan. 29, 2015). Available at: <http://synbiobeta.com/pembient-bioengineered-wildlife-products/>.

<sup>149</sup> See Rhino Horn LLC Press Release (Dec. 4, 2012). Available at: <http://www.keraplast.com/news/saving-rhinos-ethical-alternative-to-rhino-horn-introduced-by-rhinoceros-horn-llc-on-wildlife-conservation-day>; Stop Rhino Poaching Through Synthetic Rhino Horns (June 12, 2014). Available at: <https://candiceerasmus.wordpress.com/2014/06/12/the-stop-rhino-poaching-through-synthetic-rhino-horns-initiative/>.

entirely composed of elongated keratin tubules, with the core containing the UV light-resistant pigment melanin as well as calcium salts, which act to reinforce the horn's structure.<sup>150</sup>

While several methods for producing cultured rhino horn exist, Pembient's process is most well-documented. Pembient's synthetic product uses a keratin source modified to match the type of keratin that occurs in natural rhino horn.<sup>151</sup> According to CEO Matthew Markus, the company began its product formulation using wool keratins. However, Pembient is now inserting the rhinoceros genetic code for rhino keratin into a specific yeast strain.<sup>152</sup> Because yeast multiplies rapidly, this process can manufacture a significant quantity of rhino keratin in a relatively short period of time. Pembient then seeks to create an authentic "DNA signature" by combining the keratin with either rhino DNA isolated directly from an original sample and amplified in the lab or synthetically-derived rhino DNA.<sup>153</sup> The end-product of this bioengineering is a powder-form substance that is genetically and spectrographically (i.e., chemically) similar to real rhino horn, with the ultimate goal to create a biologically identical product.<sup>154</sup> The powder is then used as "ink" for a 3D printer to produce the full, carvable horn.<sup>155</sup>

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<sup>150</sup> Nowell, K. 2012. Assessment of Rhino Horn as a Traditional Medicine. Report prepared for CITES Secretariat on behalf of TRAFFIC. Available at: <https://cites.org/eng/com/sc/62/E62-47-02-A.pdf>.

<sup>151</sup> Actman (2015).

<sup>152</sup> This Week in Start-Ups Podcast (Nov. 17, 2015), at 19:10, 25:55 (Markus explaining Pembient "us[es] databases [to] look up codes for genes basically, get[s] those gene sequences, actually go[es] from a computer file to a molecule, that molecule can then be pushed inside of an organism like yeast or ecoli and that would then become like a factory to produce that particular substance" and "We're starting to swap out the keratin we derived from sheep's wool with keratin derived from rhinoceros but what we're doing is finding the genes, putting those genes inside yeast, the yeast will then secrete the proteins, you purify them and then put them back in the sheep's wool for the process."); Kari Paul, *3D-Printed Rhino Horns Are Not the Solution to the Poaching Crisis, Experts Say*, MOTHERBOARD (July 7, 2015). Available at: <http://motherboard.vice.com/read/3d-printed-rhino-horns-are-not-the-solution-to-the-poaching-crisis-experts-say> (Pembient will "insert a short gene of rhino keratin into either yeast or bacteria"); Zoe Corbyn, *Can we save the rhino from poachers with a 3D printer?*, THE GUARDIAN (May 24, 2015). Available at: <http://www.theguardian.com/environment/2015/may/24/artificial-3d-printed-fake-rhino-horn-poaching> ("By inserting a gene that codes for a rhino keratin into yeast" the yeast produce rhino keratin).

<sup>153</sup> Laura Ling, *3D Printing Rhino Horns Can Stop Poaching in Africa* (Aug. 13, 2015). Available at: <https://www.youtube.com/watch?v=DbzyzTP-VN4> (Pembient co-founder George Bonaci stating that, to create rhino horn powder, Pembient "combined inorganics, metals, minerals, as well as proteins. We also incorporated *real* rhino DNA into it as well") (emphasis added); Kari Paul, *3D-Printed Rhino Horns Are Not the Solution to the Poaching Crisis, Experts Say*, MOTHERBOARD (July 7, 2015). Available at: <http://motherboard.vice.com/read/3d-printed-rhino-horns-are-not-the-solution-to-the-poaching-crisis-experts-say> (noting from interviews with Markus that Pembient will "copy[ ] and amplify[ ] DNA from an actual rhino or replicat[e] rhino DNA through synthetic DNA processes"); Ben Coxworth, *Synthetic rhinoceros horn could help save real rhinos*, GIZMAG (July 9, 2015). Available at: <http://www.gizmag.com/synthetic-rhinoceros-horn/38386/> (quoting CEO Markus as explaining that, after engineering yeast "to produce the same keratins found in rhino horn[,] [t]hese keratins are then amalgamated with the other natural components of rhino horn, such as trace elements and rhino DNA" to produce a powder that can "be used as an 'ink' in a 3D printing process to make solid objects, including horns").

<sup>154</sup> This Week in Start-Ups Podcast (2015), at 8:30; Biohack ATX Chat with Matt Markus of Pembient (3D Printed Rhinoceros Horns) (Aug. 31, 2015), at 30:15. Available at: <https://www.youtube.com/watch?v=Y6R-uUhL410> (CEO Markus stating that "forensically, if you look at [an early horn prototype] in a number of ways," including genetic and spectrograph tests, "it would basically appear to be rhinoceros horn"); Coxworth (2015) (quoting Markus: "Our goal is that there be no discernible difference between our product and the

According to reports, Pembient is currently working with the already-sequenced genome of a southern white rhino to produce its horn keratin, but the company is also analyzing an actual sample of black rhino horn.<sup>156</sup> Pembient is purportedly also working in collaboration with Dr. Chuck Murry, co-director of the Institute for Stem Cell and Regenerative Medicine at the University of Washington, to sequence the entire genome of a 6-year-old female black rhino named Ntombi.<sup>157</sup>

Meanwhile, CeratoTech's product, if it can be successfully created and scaled for mass-market consumption, may be even more similar to authentic rhino horn than Pembient's product. In 2013, CeratoTech CEO Garrett Vygantas, who is also a partner in the Chicago-based venture capital firm Jump Capital, reportedly filed a patent on the stem cell technology needed to grow rhino horn cells (keratinocytes) from rhino skin cells.<sup>158</sup> However, we have not been able to locate Vygantas' patent application on the U.S. Patent and Trademark Office's website. It is also unclear whether CeratoTech is still working to create synthetic rhino horn.

### 3. Conservation Concerns with Cultured Rhino Horn

Pembient's and other companies' plans to produce synthetic or cultured rhino horn raise significant conservation concerns. First, because Pembient has claimed that the synthetic product will be visually, genetically, and chemically identical to real rhino horn, it will be extremely difficult for enforcement personnel to distinguish between synthetic horn and illegal, wild-sourced horn. Although the company is purportedly considering adding a DNA watermark to the faux horns, genetic analysis is prohibitively expensive, time consuming, and simply unrealistic for regular use by customs officers and other enforcement agents.

Second, by promoting medicinal products that contain horn, Pembient and other companies incorporating powdered horn into their products are undermining years of work by WildAid and others to educate consumers that rhino horn does not cure cancer, relieve hangovers, or have any other proven medicinal value. Similarly, by promoting rhino horn luxury products like carvings and jewelry, Pembient thwarts efforts to stigmatize the use of rhino horn due to it being an endangered

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genuine article.”); Corbyn (2015) (quoting Markus: “We are working towards a bio-identical product by reverse-engineering rhino horn down to the smallest degree . . . Our goal is that the only way you can tell the difference is that there will be pollutants in the wild horn.”); Ling (2015) (in response to question “are you saying that your 3D printed horn is virtually the same as a real horn in shape, size, structure,” Pembient co-founder George Bonaci answering “Yes, yes, if you took it to a lab and had them test it, it would come back as rhino horn, or if you did a DNA test it would come back as from a rhino.”).

<sup>155</sup> Gizmag (2015).

<sup>156</sup> Corbyn (2015); Reddit “Ask Me Anything,” We’re the Founders of Pembient, a Start-up That’s Bioengineering Rhinoceros Horn to Help Fight Poaching. Reddit.com (July 2015). Available at: [https://www.reddit.com/r/IAmA/comments/3appoo/were\\_the\\_founders\\_of\\_pembient\\_a\\_startup\\_thats/](https://www.reddit.com/r/IAmA/comments/3appoo/were_the_founders_of_pembient_a_startup_thats/) (Markus responding that “[b]y a quirk of fate, the wild horns we have access to are from a black rhinoceros”).

<sup>157</sup> Sequencing the Black Rhinoceros Genome, EXPERIMENT (2015). Available at: <https://experiment.com/projects/sequencing-the-black-rhinoceros-genome> (listing Pembient as proponent and backer of black rhino sequencing project). We are not aware of records for the import/export permits for genetic material sourced from Ntombi, who lives in a South African nature reserve. See also Datar & Markus (2015) (noting Pembient crowd-funded the Black Rhino Genome Project).

<sup>158</sup> See <http://www.ceratotech.com/>; M.R. O’Connor, *Making Rhino Horns Out of Stem Cells*, ATLANTIC (Dec. 24, 2014). Available at: <http://www.theatlantic.com/technology/archive/2014/12/making-rhino-horns-from-stem-cells/384039/>

species product. Finally, because Pembient intends to sell its product for an eighth of the price of real rhino horn, the product will be accessible to a broader and less affluent pool of consumers, introducing an entirely new consumer base to rhino horn products and, as the economy grows, making future purchase of real rhino horn aspirational.

Pembient and other nascent synthetic rhino horn producers' plans continue to face near-universal condemnation from conservation groups. While in July 2015, Pembient CEO Markus intimated that African conservation groups have voiced support for the project; "none of these groups [were] prepared to go on the record."<sup>159</sup> No details of pro-synthetic horn support have since been proffered, and no pro-synthetics conservation groups – African or otherwise – have, to our knowledge, been quoted expressing support in the media.

## II. Legal Argument

As detailed below, the commercial import, export, and interstate sale of cultured rhino horn is already banned under the ESA, CITES, and the RTCA, and any other cultured product of an endangered- or CITES Appendix I-listed species is banned by the ESA and CITES. We therefore urge the Service to exercise its authority and obligations under these laws to immediately prohibit import, export, and sale of these cultured products and to timely promulgate regulations affirmatively banning such trade.

### A. The ESA and CITES Ban Export, Import, and Trade in Cultured Rhino Horn

#### 1. Endangered Species Act

In 1973, Congress enacted the Endangered Species Act ("ESA"), seeking to conserve imperiled species and implement several of the United States' wildlife treaty obligations.<sup>160</sup> Under the ESA, the Service must list species as threatened or endangered if they face extinction, including due to "overutilization for commercial . . . purposes."<sup>161</sup> The ESA then generally prohibits the taking, import, export, and sale of any endangered species.<sup>162</sup> The Service's regulations automatically apply the same prohibitions to threatened-listed species, unless otherwise specified.<sup>163</sup> The ESA defines "species" to include "any subspecies of fish or wildlife" and defines "fish or wildlife" to mean "any member of the animal kingdom . . . includ[ing] any part, product, egg, or offspring thereof, or the dead body or parts thereof."<sup>164</sup> While some ESA provisions parallel the CITES treaty requirements, the ESA can be and often is more stringent than the treaty.<sup>165</sup>

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<sup>159</sup> Reddit "Ask Me Anything" (2015).

<sup>160</sup> 16 U.S.C. §§ 1531 *et seq.*

<sup>161</sup> *Id.* § 1533(a)(1)(A).

<sup>162</sup> *Id.* § 1538(a)(1)(A), (B), (F). The statute also prohibits the violation of any ESA regulation, which includes the Service's CITES regulations. *Id.* § 1538(a)(1)(G).

<sup>163</sup> 50 C.F.R. § 17.31(a); *see also id.* § 17.21(b) (prohibiting the import and export of "any endangered wildlife"), (e) (prohibiting the sale or offer for sale of "any endangered wildlife" in interstate or foreign commerce).

<sup>164</sup> 16 U.S.C. § 1532(16), (8). Similarly, the Service's regulations addressing endangered and threatened wildlife (Part 17) defines "specimen" as "any animal or plant, or any part, product, egg, seed, or root of animal or plant." 50 C.F.R. § 17.3.

<sup>165</sup> CITES, Art. XIV (allowing Parties to adopt "stricter domestic measures regarding the conditions for trade, taking, possession or transport of specimens," including "the complete prohibition thereof").

## 2. Convention on International Trade in Endangered Species

In 1973, 21 nations adopted the Convention on International Trade in Endangered Species of Wild Fauna and Flora (“CITES”).<sup>166</sup> Now with 182 signatories, CITES regulates the trade of approximately 35,000 species. Species can be included on one of several CITES Appendices. Appendix I includes species that are “threatened with extinction which are or may be affected by trade.”<sup>167</sup> In general, commercial international trade in Appendix I specimens is prohibited.<sup>168</sup> Appendix II includes species that are not currently threatened with extinction but “may become so unless trade” in the species “is subject to strict regulation.”<sup>169</sup> Commercial trade in Appendix II specimens is generally permitted, if the exporting nation can find that the export is not “detrimental” to the species’ survival.<sup>170</sup> However, some Appendix II species are listed with an annotation that limits the purposes for which trade is permitted, often prohibiting commercial trade altogether.<sup>171</sup> CITES defines “specimen” as “any animal or plant, whether alive or dead” and “in the case of an animal . . . any readily recognizable part or derivative thereof.”<sup>172</sup>

The United States’ CITES obligations are implemented through the ESA.<sup>173</sup> Specifically, as required by CITES, both the ESA and the Service’s CITES regulations ban any person from “[i]mport[ing], export[ing], . . . or engag[ing] in international trade with any specimen of a species listed in” any of the CITES Appendices, except as specifically provided by regulation.<sup>174</sup> All trade in Appendix I specimens is either banned or requires a CITES permit demonstrating that the specimen falls under one of the express exemptions.<sup>175</sup>

In its CITES regulations, the Service defines “specimen” similar to the CITES treaty: “any wildlife or plant, whether live or dead. This term includes any readily recognizable part, product, or derivative unless otherwise annotated in the Appendices.”<sup>176</sup> The Service further defines “readily recognizable” as “any specimen that appears from a visual, physical, scientific, or forensic examination or test; an accompanying document, packaging, mark, or label; or any other circumstances to be a part, product, or derivative of any CITES wildlife or plant.”<sup>177</sup>

## 3. The ESA and CITES Regulate and Prohibit the Export, Import, and Sale of Cultured Rhino Horn.

As detailed below, exportation, importation, interstate sale, and foreign commerce in cultured rhino horn is banned under both the ESA and CITES. Specifically, cultured horn is both a

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<sup>166</sup> Convention on International Trade in Endangered Species of Fauna and Flora, March 3, 1973, 27 U.S.T. 1087, 993 U.N.T.S. 243 (entered into force July 1, 1975).

<sup>167</sup> CITES, Art. II(1).

<sup>168</sup> *Id.* at Art. III(3).

<sup>169</sup> *Id.* at Art. II(2).

<sup>170</sup> *Id.* at Art. IV(2).

<sup>171</sup> See 50 C.F.R. § 23.55(b).

<sup>172</sup> CITES, Art. I(b).

<sup>173</sup> 16 U.S.C. § 1537a.

<sup>174</sup> 50 C.F.R. § 23.13(a); 16 U.S.C. § 1538(c) (banning any person from “trade in any specimens contrary to the provisions of” CITES).

<sup>175</sup> 50 C.F.R. § 23.20(c), (d).

<sup>176</sup> *Id.* § 23.5.

<sup>177</sup> *Id.*

“wildlife” “product” and a “specimen” under the laws and thus commercial trade in cultured horn is prohibited.

**a. Cultured rhino horn is a wildlife “product” of ESA- and CITES-listed rhino**

First, cultured rhino horn is a “product” of ESA-listed and CITES-listed rhinoceros, and thus export, import, and sale of cultured rhino horn is prohibited. Specifically, as noted above, the ESA defines “fish and wildlife” as “any member of the animal kingdom . . . includ[ing] *any* part, *product*, egg, or offspring thereof.”<sup>178</sup> Similarly, in the ESA’s legislative history, Congress stated that the ESA covers “products . . . from” endangered species.<sup>179</sup> While “product” is not defined in the ESA or in the Service’s regulations, the meaning of “product” is plain: the dictionary defines “product” as “something produced; *especially*: commodity.”<sup>180</sup> Accordingly, the ESA covers any commodity produced from endangered wildlife.

Further, the ESA specifies that “any” wildlife product is covered.<sup>181</sup> As the Supreme Court has held on numerous occasions, the term “any” is “broad and unambiguous,” is intended to be “comprehensive,” and “admits of no exception.”<sup>182</sup> Similarly, Congress clarified that “fish and wildlife” was intended to be extremely broad, including “*any* parts or products” of any “wild animal, whether or not raised in captivity.”<sup>183</sup> Because the ESA’s application is comprehensive, the Act clearly covers *all* variations of products from ESA-listed animals.

Additionally, while CITES does not refer to a wildlife “product” in the Convention’s text, the Service has defined a CITES “specimen” to mean “any wildlife . . . includ[ing] any readily recognizable part, *product*, or derivative.”<sup>184</sup> Neither the Service’s CITES regulations nor CITES itself formally defines “product,” but the plain meaning of the word is the same: an item *produced from* wildlife.<sup>185</sup> Accordingly, both the ESA and CITES control trade in all “products” of (i.e., items produced from) ESA- and CITES-listed species.

Pembient’s cultured rhino horn is a “product” of ESA-listed and CITES-listed rhinoceros. As described in Section IE2 above, rhinoceros genetic code is a necessary component in Pembient’s process to create its horn. Specifically, to produce its cultured horn, Pembient will insert the rhinoceros gene sequence that codes for rhino keratin into yeast, which then multiples to produce

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<sup>178</sup> 16 U.S.C. § 1532(16), (8).

<sup>179</sup> H.R. CONF. REP. NO. 740, 93rd Cong., 1st Sess. 1973, 1973 U.S.C.C.A.N. 3001. Additionally, the Senate version of the ESA expressly prohibited sale of any “specimen or products processed or manufactured in whole or in part from specimens of any such species.” S. REP. NO. 93-307 (1973).

<sup>180</sup> Merriam-Webster Dictionary, Definition of Product. Available at: <http://www.merriam-webster.com/dictionary/product>.

<sup>181</sup> 16 U.S.C. § 1532(16), (8).

<sup>182</sup> *United States v. Monsanto*, 491 U.S. 600, 609 (1989); *Brogan v. United States*, 522 U.S. 398, 408 (1998).

<sup>183</sup> H. REP. 93-412 (1973).

<sup>184</sup> *Id.* § 23.5 (emphasis added).

<sup>185</sup> Merriam-Webster Dictionary, Definition of Product. Available at: <http://www.merriam-webster.com/dictionary/product>.

the keratin composing the product.<sup>186</sup> Additionally, Pembient will add rhino horn DNA either directly extracted from rhino or produced synthetically into the cultured keratin to create a rhino DNA signature.<sup>187</sup> Accordingly, because Pembient’s synthetic rhino horn both is “produced from” the rhinoceros genetic code and includes rhinoceros genetic material, and because the ESA prohibits the import, export, or sale of “*any . . . product*” from an endangered animal, trade in cultured rhino horn is prohibited.<sup>188</sup>

Similarly, pursuant to the Service’s CITES regulations, a CITES “specimen” includes “any readily recognizable . . . *product*” of a rhino, and thus cultured rhino horn is a CITES specimen.<sup>189</sup> Trade in “products” of Appendix I species is generally banned,<sup>190</sup> and commercial trade in certain Appendix II species products may also be banned, if the species is listed with an annotation.<sup>191</sup> Because all rhinos are Appendix I-listed or Appendix II-listed with an annotation banning commercial horn trade, commercial trade in cultured rhino “products” is banned by CITES.<sup>192</sup>

#### **b. Cultured rhino horn is a “specimen” of CITES-listed rhinos.**

Similarly, cultured rhino horn, whether in powdered form or whole, is also a “derivative” and “readily recognizable” “specimen” of rhino under CITES, and thus the export, import, and international trade of the horn is prohibited without a CITES permit. However, because no existing CITES exemption applies to cultured rhino horn, no permit can be issued, and the export, import, and trade in cultured rhino horn is banned.

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<sup>186</sup> This Week in Start-Ups Podcast, *Pembient’s Matthew Markus creates synthetic rhino horns to stop illegal \$750m trade and endangerment* (Nov. 17, 2015), at 19:10, 25:55. Available at: [https://www.youtube.com/watch?v=JKfVn\\_IfrKo](https://www.youtube.com/watch?v=JKfVn_IfrKo).

<sup>187</sup> Paul (2015).

<sup>188</sup> 16 U.S.C. § 1532(16), (8). As the Service is aware, four of the five rhino species (black, greater one-horned, Javan, and Sumatran) are currently listed as endangered under the ESA, as is the northern white rhinoceros subspecies (*Ceratotherium simum cottoni*). 50 C.F.R. § 17.11. The southern white rhino subspecies (*Ceratotherium simum simum*) is listed as “threatened” due to its similarity of appearance to other rhino species. *Id.* § 17.11(h); 79 Fed. Reg. 28,847 (May 20, 2014). Pursuant to regulation, to export or sell southern white rhino products, a person must apply for a permit and demonstrate the product is indeed southern white rhino in origin. 50 C.F.R. § 17.52(a).

As described above, according to reports, Pembient is currently working with both the already-sequenced genome of a southern white rhino, as well as a sample of black rhino horn to produce its horn keratin. Corbyn (2015); Reddit (2015). Additionally, Pembient is apparently working with the University of Washington to sequence the black rhino genome. Accordingly, if the gene used in the process or the DNA added to the keratin is from an endangered black rhino, the resulting rhino horn product is clearly banned. If the gene used in the process is from a southern white rhino, Pembient must at least apply for an ESA permit.

<sup>189</sup> 50 C.F.R. §§ 23.5 (emphasis added).

<sup>190</sup> *Id.* §§ 23.18; 23.20(c), (d).

<sup>191</sup> *Id.* § 23.55(b).

<sup>192</sup> *Id.* §§ 23.18; 23.20(c), (d); 23.55. As noted above, four rhinoceros species (black, greater one-horned, Javan, and Sumatran) are listed on Appendix I of CITES. Additionally, the northern white rhino subspecies and all southern white rhinos in populations outside of South Africa and Swaziland are Appendix I listed. While the South African and Swaziland populations of southern white rhino are Appendix II listed, an annotation to that listing only allows trade in live animals and hunting trophies. Accordingly, trade in any rhino “product” is generally banned under CITES.

Specifically, as noted above, the CITES treaty defines “specimen” as “any animal or plant, whether alive or dead” and “in the case of an animal . . . any readily recognizable part or derivative thereof.”<sup>193</sup> Similarly, the Service has defined a CITES “specimen” to mean “any wildlife . . . includ[ing] any readily recognizable part, product, or derivative.”<sup>194</sup> Because all rhinos are listed either on CITES Appendix I or on Appendix II with an annotation that effectively prohibits commercial trade in horn,<sup>195</sup> commercial trade in rhino horn specimens is generally banned.<sup>196</sup>

Cultured rhino horn clearly qualifies as a “specimen” under CITES for three reasons. As detailed in the previous section, the Service’s CITES regulations define a CITES “specimen” to include “any . . . product” of CITES-listed wildlife, and cultured rhino horn is a “product” of rhino.<sup>197</sup> In addition and as described below, cultured horn is a “derivative” of rhino, and cultured horn is “readily-recognizable” as coming from rhino.

### 1. Cultured Horn Is a “Derivative” of Rhino and Is Thus Regulated by CITES

First, cultured horn is a “derivative” of rhino. CITES and the Service define “specimen” as “any animal” including “*any . . . derivative*” of that animal.<sup>198</sup> While neither CITES nor the Service has formally adopted a definition of “derivative,” applying the plain meaning of the word, “to derive” means “to take, receive, or obtain especially from a specified source” and “to obtain (a chemical substance) actually or theoretically from a parent substance.”<sup>199</sup>

Pembient’s cultured horn is “derived” from rhinoceros. Again, as described above, to produce its cultured horn, Pembient will insert the rhinoceros gene sequence that codes for rhino keratin into yeast, which then produce the keratin composing the product.<sup>200</sup> Additionally, Pembient will add either rhino horn DNA directly extracted from rhino or produced synthetically into the cultured keratin to create a rhino DNA signature.<sup>201</sup> Accordingly, because the rhinoceros genetic code is a necessary building block and “parent substance” in the production process, the cultured rhino horn is “derived from” rhinoceros. In fact, Pembient CEO Matthew Markus stated in an interview that, while Pembient was initially using sheep wool keratins to formulate its prototypes, it had begun “swap[ping] out the keratin we derived from sheep’s wool with keratin *derived from* rhinoceros.”<sup>202</sup> Trade in cultured rhino horn is clearly prohibited as a “derivative” of a CITES-regulated species.<sup>203</sup>

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<sup>193</sup> CITES, Art. I(b) (emphasis added).

<sup>194</sup> 50 C.F.R. § 23.5 (emphasis added).

<sup>195</sup> See *supra* section 1A regarding CITES listing status of the various rhino populations.

<sup>196</sup> 50 C.F.R. §§ 23.18; 23.20(c); 23.55(b).

<sup>197</sup> *Id.* § 23.5.

<sup>198</sup> CITES, Art. I(b) (emphasis added).

<sup>199</sup> <http://www.merriam-webster.com/dictionary/derive>.

<sup>200</sup> This Week in Start-Ups Podcast (2015).

<sup>201</sup> Paul (2015)

<sup>202</sup> This Week in Start-Ups Podcast (2015), at 25:55.

<sup>203</sup> Pursuant to regulation, the Service has decreed that synthetically derived DNA samples are not “specimens” under CITES; however, that does not dictate how cultured rhino horn must be regulated. Specifically, “[a] DNA sample directly derived from wildlife . . . tissue is regulated by CITES,” while “[a] DNA sample synthetically derived that does not contain any part of the original template is exempt.” 50

## 2. Cultured Rhino Horn Is a “Readily Recognizable” Part of a Rhino

Next and perhaps most critically, cultured rhino horn qualifies as a CITES “specimen” because, regardless of the source of the genetic material and other components of the cultured horn product, the *end product* is a “readily recognizable” part of a rhino – its horn. Specifically, the Service defines “readily recognizable” to mean “any specimen that appears from a *visual, physical, scientific, or forensic examination* or test; an accompanying document, packaging, mark, or label; or any other circumstances to be a part, product, or derivative of any CITES wildlife or plant.”<sup>204</sup>

Because cultured rhino horn will be “visual[ly]” and “physical[ly]” identical to real horn, and both genetic and spectrographic tests will identify the cultured horn as rhino horn,<sup>205</sup> the cultured product is a “readily recognizable” rhino horn and regulated pursuant to CITES. In fact, Pembient’s founders have affirmed that cultured horn is “virtually the same as a real horn in shape, size, structure” and that “if you took [the cultured horn] to a lab and had them test it, it would come back as rhino horn, or if you did a DNA test it would come back as from a rhino.”<sup>206</sup> Similarly, CEO Matthew Markus has stated that, if the cultured horn were tested “forensically,” including through genetic and spectrographic analysis, “it would basically appear to be rhinoceros horn.”<sup>207</sup> Pembient’s ultimate goal is create a product with “no discernible difference” from and that is “bio-identical” to real horn.<sup>208</sup> And in order for Pembient and other purveyors of cultured horn product to truly satisfy and thus replace demand for horn, the cultured product must indeed be at least visually indistinguishable. Accordingly, because the cultured horn will “appear[ ]” to be real horn from any number of tests, including visual, physical, forensic, and even genetic analysis, cultured horn is “readily recognizable” as rhino horn and thus falls under CITES’ jurisdiction.

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C.F.R. § 23.16(c). In promulgating the regulation, the Service explained that “trade in synthetically derived DNA samples will not adversely affect the conservation of, or effective regulation of trade in, CITES species and their parts and derivatives.” 65 Fed. Reg. 26,664, 26,886 (May 8, 2000). In contrast, according to the Service, DNA samples extracted directly from blood and tissue samples are “readily recognizable parts or derivatives” of CITES species because “[v]irtually all trade in DNA samples extracted from CITES species involves the use of packaging that identifies the specimen as a part, product, or derivative of that species.” 71 Fed. Reg. 20,168, 20,177 (April 19, 2006). The issue has not been resolved by the CITES Parties as a whole, as several proposals on the issue have been withdrawn. 72 Fed. Reg. 48,402, 48,411 (Aug. 23, 2007). The Service’s regulation clearly does not address cultured rhino horn because it only applies to “DNA samples.” 50 C.F.R. § 23.16(c). While Pembient’s process may *include* the addition of synthetic rhino DNA, the resulting rhino horn is not a “DNA sample.” Further, the Service exempted synthetic DNA, at least in part, on its belief that trade in the DNA would “not adversely affect the conservation of, or effective regulation of trade in, CITES species.” 71 Fed. Reg. at 20,177. In contrast, as detailed above in Section IE3, trade in cultured rhino horn will have a significant, negative impact on wild rhinoceros.

<sup>204</sup> 50 C.F.R. § 23.5. Further, CITES has similarly defined phrase “readily recognizable part or derivative” to include “any specimen which appears from an accompanying document, the packaging or a mark or label, *or from any other circumstances*, to be a part or derivative of an animal.” Resolution Conf. 9.6 (Rev. CoP16) (emphasis added).

<sup>205</sup> This Week in Start-Ups Podcast (2015); Truong (2015).

<sup>206</sup> Ling (2015) (Pembient co-founder George Bonaci responding “yes” to question that “3D printed horn is virtually the same as a real horn in shape, size, structure”).

<sup>207</sup> Biohack ATX Interview, at 30:15 (2015).

<sup>208</sup> Coxworth (2015) (quoting Markus); Corbyn (2015) (quoting Markus).

In sum, cultured horn is a CITES “specimen” because: (1) it is a “product” of a CITES-listed rhino, (2) it is a “derivative” of a CITES-listed rhino, and (3) it is “readily recognizable” as rhino horn. Because the rhino horn qualifies as a “specimen” under CITES, and all rhinos are either CITES Appendix-I listed or CITES Appendix-II listed with an annotation prohibiting commercial trade in horns, commercial export in the cultured horn specimens is banned.<sup>209</sup>

## **B. The RTCA Bans Sale, Import, and Export of Cultured Rhino Horn**

### **1. The Rhinoceros and Tiger Conservation Act**

In 1994, Congress recognized that rhinoceros populations worldwide were threatened with extinction and that the major cause for decline was “the demand for products made from rhinoceros horn,” including for medicinal purposes in Asia.<sup>210</sup> Similarly, Congress recognized that tiger populations also faced extinction due to trade, for medicinal purposes as well as for the fur trade. Accordingly, Congress passed the Rhinoceros and Tiger Conservation Act (“RTCA”) to provide funding for conservation programs for rhinos and tigers.<sup>211</sup> The House Committee considering the bill emphasized the “resolve of the Committee to stop the practice of poaching [and] end illegal trade in rhinoceros . . . parts,” and one bill sponsor specifically called for “the *elimination of the market* for rhinoceros . . . parts.”<sup>212</sup>

In 1998, Congress amended the RTCA to add a provision prohibiting the sale and advertising of rhino products. Under the provision:

A person shall not sell, import, or export, or attempt to sell, import, or export, any product, item, or substance intended for human consumption or application containing or labeled or advertised as containing, any substance derived from any species of rhinoceros . . .<sup>213</sup>

The RTCA defines a “person” as an individual, a corporation, or “any other entity subject to the jurisdiction of the United States.”<sup>214</sup> Any person who violates the ban is subject to civil or criminal penalties, and the product is subject to forfeiture.<sup>215</sup>

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<sup>209</sup> None of the existing CITES exemptions apply. While the Convention treats Appendix I species that are “bred in captivity” as Appendix II species, the CITES Parties define “bred in captivity” to apply “only” to specimens produced from “parents” or “gametes.” CITES Art. VII(4); Res. Conf. 10.16. The Parties clearly did not contemplate applying the exception to specimens cultured or synthetically produced in a laboratory. Additionally, even if cultured horn were considered “captive-bred,” trade in such specimens requires registration of the captive breeding facility and “secure marking” that “identif[ies]” the specimen as captive-bred while “in trade.” Res. Conf. 12.10 (Rev. CoP 15). Such permanent marking would distinguish cultured horn from real horn in the marketplace, making it unlikely consumers will purchase the cultured horn. Finally, the exporter must receive a CITES permit wherein the exporting nation makes a finding that trade in the specimen “will not be detrimental to the survival of that species.” Art. IV(2)(a).

<sup>210</sup> H. REP. 103-748 (1994).

<sup>211</sup> 16 U.S.C. §§ 5301 *et seq.*

<sup>212</sup> H. REP. 103-748 (1994) (emphasis added).

<sup>213</sup> 16 U.S.C. § 5305a(a).

<sup>214</sup> *Id.* § 5303(6).

<sup>215</sup> *Id.* § 5305a(b), (c).

## 1. Cultured Horn Is a “Product” “Containing” a “Substance Derived from” a Rhino under the RTCA

The sale, import, and export of cultured rhino horn is clearly prohibited by the RTCA. As noted above, the RTCA prohibits the sale and export of “any product, item, or substance” that is “intended for human consumption or application” if it “contain[s] . . . any substance derived from” any rhino species.<sup>216</sup>

First, cultured rhino horn is “intended for human consumption or application.”<sup>217</sup> As described above in Section IE1, Pembient has already produced prototypes of both a powdered and a carvable horn product. As described in Pembient’s trademark application, the powdered product is undoubtedly intended for various consumer uses, including as an additive to beer, face cream, nutritional supplements, and lotions,<sup>218</sup> and each of these uses is clearly “for human consumption or application” under the RTCA.<sup>219</sup> While Pembient’s carvable horn is intended for the production of durable goods, like jewelry, libation cups, and chopsticks, “[s]craps from the carving process are edible, and may be resold on to secondary markets.”<sup>220</sup> In fact, CEO Matthew Markus has publicly acknowledged that “shavings” of carvable products “end up in the folk belief system,” i.e., the medicinal market.<sup>221</sup> Accordingly, Pembient’s carvable rhino horn product is also, ultimately, “intended” for use both as durable goods *and* for “human consumption or application,” and thus falls within the purview of the RTCA.<sup>222</sup>

Second, cultured rhino horn is a “product, item, or substance . . . containing any substance derived from” a rhino.<sup>223</sup> As detailed above in the ESA and CITES sections, cultured rhino horn can be considered both a “product” (i.e., a commodity produced from rhino) and a substance that “contain[s] [a] substance derived from a rhino.” Pembient’s cultured horn contains keratin “derived from” the rhinoceros genetic code, which is inserted into the yeast to make the product.<sup>224</sup> Additionally, Pembient may add rhino horn DNA directly extracted from a rhino or synthetically produced DNA into the cultured keratin to create a rhino DNA signature.<sup>225</sup> Accordingly, because cultured rhino horn is a “product, item, or substance . . . containing any substance derived from” a rhino species and the horn is “intended for human consumption or application,” the cultured horn falls under the RTCA, and sale, import, and export of the product is prohibited.<sup>226</sup>

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<sup>216</sup> *Id.* § 5305a(a).

<sup>217</sup> *Id.*; *see also* S. REP. 105-282 (1998) (items “intended for human consumption are those than can be ingested internally or applied externally, including pills, drinks, lotions, and ointments”).

<sup>218</sup> Pembient Trademark Application for Essence of Rhino Horn (Jan. 30, 2015); Ferry (2015); Peters (2015); Pembient – Essence of Rhino Horn Commercial. Available at: <https://www.youtube.com/watch?v=BQHnZfW6538>.

<sup>219</sup> 16 U.S.C. § 5305a(a).

<sup>220</sup> Datar & Markus (2015); Pembient Profile on New Harvest: Pembient: rhino horns without poaching. Available at: [http://www.new-harvest.org/pembient\\_rhino\\_horns](http://www.new-harvest.org/pembient_rhino_horns)

<sup>221</sup> This Week in Start-Ups Podcast (2015), at 8:30.

<sup>222</sup> 16 U.S.C. § 5305a(a).

<sup>223</sup> *Id.*

<sup>224</sup> This Week in Start-Ups Podcast (2015).

<sup>225</sup> Paul (2015).

<sup>226</sup> 16 U.S.C. § 5305a(a).

## 2. Cultured Rhino Horn Will Likely Be Advertised and Labeled as “Containing a Substance Derived from Rhino”

In addition to banning the sale, import, and export of products *actually* containing substances derived from rhinos, the RTCA also bans the export, import, and sale of any products “labeled or advertised as containing, any substance derived from any species of rhinoceros.”<sup>227</sup> The legislative history clarifies that the prohibition is broad, as it “is intended to reach products that may not necessarily be labeled or marked as containing rhino parts . . . but that are represented through advertising, orally or in writing, . . . as containing rhino parts. This includes . . . communicating, by any means whatsoever, including any oral, written, or graphic statement, . . . that a product contains rhino parts.”<sup>228</sup>

While no cultured rhino horn products are reportedly ready for market and thus no labeling is available to review, Pembient’s product has likely been “advertised” as “containing substances derived from” rhinos, and thus the product is banned under the RTCA. Specifically, last year, Pembient was apparently marketing a skin cream containing its cultured rhino horn as “Essence of Rhino Horn,” and the company produced a television commercial in Vietnamese advertising the product.<sup>229</sup> It is unclear whether this commercial was actually aired in Vietnam or whether Pembient is currently using the phrase “Essence of Rhino” in its marketing, but the commercial remains readily available on YouTube. This marketing represented that Pembient’s product “contain[s] a [ ] substance derived from” rhino, and thus sale, export, and transport of the product is likely banned under the RTCA.<sup>230</sup>

Specifically, the U.S. Patent and Trademark Office’s (“USPTO”) recent refusal of Pembient’s trademark application strongly suggests Pembient’s advertising represents that the product “contain[s]” rhino. In January 2015, Pembient sought to register the trademark “ESSENCE OF RHINO HORN” for its powdered and whole horn products.<sup>231</sup> In May 2015, the USPTO refused the trademark on several grounds.<sup>232</sup> The USPTO explained that a trademark may only be registered if “the use of the mark in commerce” is lawful. The USPTO found that using the words “RHINO HORN” in the proposed trademark “plainly indicates that applicant’s . . . goods include rhinoceros horn,” and that buying and selling of rhino horn is prohibited under the ESA.<sup>233</sup> Accordingly, the USPTO found that “the goods” identified for sale by Pembient “may comprise or contain rhinoceros horn, and if so, are prohibited by the ESA” and thus Pembient cannot lawfully use the proposed trademark.

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<sup>227</sup> *Id.*

<sup>228</sup> S. REP. 105-282 (1998).

<sup>229</sup> Pembient – Essence of Rhino Horn Commercial (undated). Available at: <https://www.youtube.com/watch?v=BQHnZfW6538>. While the commercial is not dated, according to media articles, it has been available online since at least July 2015. *See* Ferry (2015).

<sup>230</sup> 16 U.S.C. § 5303a(a).

<sup>231</sup> *See* Pembient, Inc., Trademark/Service Mark Application, Serial No. 86519584 (Jan. 30, 2015). Available at: [http://tsdr.uspto.gov/#caseNumber=86519584&caseType=SERIAL\\_NO&searchType=statusSearch](http://tsdr.uspto.gov/#caseNumber=86519584&caseType=SERIAL_NO&searchType=statusSearch).

<sup>232</sup> *See* USPTO Office Action (Official Letter) About Applicant’s Trademark Application for Pembient, Inc. Application No. 86519584 (May 13, 2015).

<sup>233</sup> *Id.* USPTO also noted that, if the goods contain rhino horn, sale and transport is also prohibited under the Lacey Act. 16 U.S.C. §§ 3372(a).

Additionally, the USPTO evaluated the phrase “ESSENCE OF RHINO HORN” and found that “essence” means “an extract that has the fundamental properties of a substance in concentrated form.” Accordingly, USPTO found “the wording . . . immediately describes an ingredient or feature of the goods, i.e., the identified goods consist of or contain a substance derived from the horn of a rhinoceros.”<sup>234</sup>

For the same reasons, it is likely Pembient’s product is or has been “advertised as containing, any substance derived from any species of rhinoceros,”<sup>235</sup> as prohibited by the RTCA. By using the terms “rhino horn” and “essence of rhino horn,” Pembient indicates that the product indeed “consist[s] of or contain[s] a substance derived from” a rhino, just as USPTO concluded. Accordingly, Pembient’s cultured rhino horn product should be banned under the RTCA.

Further, while no labeling of cultured rhino horn products is yet available for evaluation, it is likely such products will be “labeled . . . as containing, any substance derived from any species of rhinoceros,” thus running afoul of the RTCA.<sup>236</sup> Pembient and other companies seeking to develop cultured rhino horn apparently believe that their products can replace real rhino horn, but according to the RTCA, the label cannot indicate – even graphically – that it contains any rhino whatsoever.

### **III. Request for Regulations and Proposed Regulatory Text**

As described above, the ESA, CITES, and the RTCA already ban the sale, import, and export of cultured rhino horn, and the Service should immediately act to implement these bans so as to prohibit cultured horn from being imported, exported, or sold. We specifically urge the Service to issue a Director’s Order, providing the Service’s interpretation of these provisions and directing enforcement officials to prevent the import, export, and sale of cultured products from protected species. However, the trade in cultured wildlife products is a new and emerging issue in endangered species regulation, as well as a new threat to the species themselves. Accordingly, we request that the Service promptly promulgate new, more specific regulations explicitly clarifying that trade in cultured rhino horn and other cultured wildlife products from protected species is banned, as outlined below.

#### **A. ESA and CITES**

The ESA provides the Service with extremely broad authority to issue regulations to protect both endangered and threatened species, as well as implement the CITES treaty. Specifically, the ESA’s purpose is “to provide a program for the conservation of . . . endangered species and threatened species.”<sup>237</sup> Conservation is defined broadly as using “*all* methods and procedures which are necessary to bring any [ESA-listed] species to the point at which” protections are no longer necessary.<sup>238</sup> The ESA then broadly “authorize[s]” the Service “to promulgate such regulations as may be appropriate to enforce this Act.”<sup>239</sup> Further, the Service is separately directed to “seek to

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<sup>234</sup> *Id.*

<sup>235</sup> *Id.*

<sup>236</sup> *Id.*

<sup>237</sup> 16 U.S.C. § 1531(b).

<sup>238</sup> *Id.* (emphasis added).

<sup>239</sup> *Id.* §§ 1540(f); 1537a (providing Service authority to implement CITES).

conserve” threatened and endangered species and “utilize [its] authorities in furtherance of the purposes of” the ESA.<sup>240</sup>

As detailed above, the ESA covers “*any part, product, egg, or offspring*” of a listed species.<sup>241</sup> Accordingly, we propose that the Service adopt a new regulatory definition of “product” at 50 C.F.R. § 17.3:

*Product* means any item or substance produced from wildlife or wildlife parts, including items or substances containing any part of wildlife or items or substances in which wildlife, including any cells, genetic material, or genetic code of that wildlife, was used in its manufacturing or production.

Additionally or alternatively, we propose that the Service amend the definitions of “specimen” at 50 C.F.R. § 17.3 (ESA regulations) and 50 C.F.R. § 23.5 (CITES regulations):

50 C.F.R. § 17.3: *Specimen* means any animal or plant, or any part, product, egg, seed or root of any animal or plant. Specimen includes any item or substance produced from any animal or animal parts, including items or substances containing any animal part or items or substances in which an animal, including any cell, genetic material, or genetic code of that animal, was used in its manufacturing or production.

50 C.F.R. § 23.5: *Specimen* means any wildlife or plant, whether live or dead. This term includes any readily recognizable part, product, or derivative unless otherwise annotated in the Appendices. This term also includes any item or substance produced from any animal or animal parts, including items or substances containing any animal part or items or substances in which an animal, including any cell, genetic material, or genetic code of that animal, was used in its manufacturing or production.

Again, additionally or alternatively, we propose that the Service directly address cultured products of endangered species at 50 C.F.R. § 17.21:

*Cultured wildlife parts or products.* Except under permits issued pursuant to § 17.22 or 17.23, the import, export, and interstate sale of cultured wildlife parts or products is prohibited. “Cultured” as used in this Part means any parts or products manufactured in a laboratory or other facility through synthetic biology based on wildlife’s genetic code, and the part or product closely resembles, through visual analysis, natural wildlife parts or products produced from wildlife.

Alternatively, we propose that the Service issues regulations addressing the final cultured wildlife product by amending the definitions at 50 C.F.R. § 17.3 (ESA regulations) and 50 C.F.R. § 23.5 (CITES regulations), incorporating language from the ESA’s similarity of appearance provision at 16 U.S.C. § 1533(e):

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<sup>240</sup> *Id.* § 1531(c). Additionally, for species listed as “threatened,” the Service “shall issue such regulations as he deems necessary and advisable to provide for the conservation of such species.” *Id.* § 1533(d).

<sup>241</sup> *Id.* § 1532(16), (8).

50 C.F.R. § 17.3:

*Specimen* means any animal or plant, or any part, product, egg, seed or root of any animal or plant, or any readily recognizable part, product, egg, seed or root of any animal or plant. This includes any item, including any item produced or manufactured through bioengineering, that so closely resembles in appearance a part, product, egg, seed or root of any animal or plant that enforcement personnel would have substantial difficulty determining the item's provenance.

50 C.F.R. § 23.5:

*Readily recognizable* means any specimen that appears from a visual, physical, scientific, or forensic examination or test; an accompanying document, packaging, mark, or label; or any other circumstances to be a part, product, or derivative of any CITES wildlife or plant, unless such part, product, or derivative is specifically exempt from the provisions of CITES or this part. This includes any item, including any item produced or manufactured through bioengineering, that so closely resembles in appearance a part, product, or derivative of any CITES wildlife or plant that enforcement personnel would have substantial difficulty determining the item's provenance.

## **B. RTCA**

Like the ESA, the RTCA provides the Service with broad authority to issue regulations to implement the law's directive, and in fact, the RTCA mandates that the Service do so. Specifically, the RTCA provides that the Service, in consultation with Treasury, Health and Human Services, and the U.S. Trade Representative, "*shall* issue such regulations as are appropriate to carry out this section."<sup>242</sup> The Service has not yet promulgated regulations under the RTCA.

As detailed above, the RTCA prohibits any person from "sell[ing], import[ing], or export[ing] . . . any product, item, or substance . . . containing . . . any substance derived from any species of rhinoceros."<sup>243</sup> Accordingly, we propose that the Service adopt regulations pursuant to its RTCA authority, including a regulatory definition of "derived from":

*Derived from* means formed from any rhinoceros or tiger or parts thereof, including any product, item, or substance in which a rhinoceros or tiger, including any cell, genetic material, or genetic code of that animal, was used in its manufacturing or production. This includes "cultured" parts or products manufactured in a laboratory or other facility through synthetic biology based on rhinoceros or tiger genetic code and where the part or product closely resembles, through visual analysis, natural rhinoceros or tiger parts or products produced from rhinoceros or tiger.

## **IV. Petitioners**

The Center for Biological Diversity ("the Center") is a non-profit, public interest environmental organization dedicated to the protection of imperiled species and their habitats through science, policy, and environmental law. The Center is supported by more than 990,000

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<sup>242</sup> *Id.* § 5305(d) (emphasis added).

<sup>243</sup> *Id.* § 5305a(a).

members and activists throughout the United States and abroad. For more information, visit: [www.biologicaldiversity.org](http://www.biologicaldiversity.org).

WildAid is a non-profit organization whose mission is to end the illegal wildlife trade by reducing global consumption of wildlife products through consumer education and strengthening enforcement. With a portfolio of celebrity ambassadors and a global network of media partners, WildAid's message reaches up to 1 billion people every week. For more information, visit: [www.wildaid.org](http://www.wildaid.org).

## V. Conclusion

As detailed above, the Center and WildAid request that the Service act to implement prohibitions on the import, export, and trade in cultured rhino horn and other cultured protected species products. The ESA, CITES, and the RTCA prohibit trade in these products, and we request that the Service promulgate regulations affirmatively banning cultured products.<sup>244</sup>

Sincerely,



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<sup>244</sup> 16 U.S.C. §§ 1531 *et seq.*; *Id.* §§ 5301 *et seq.*