

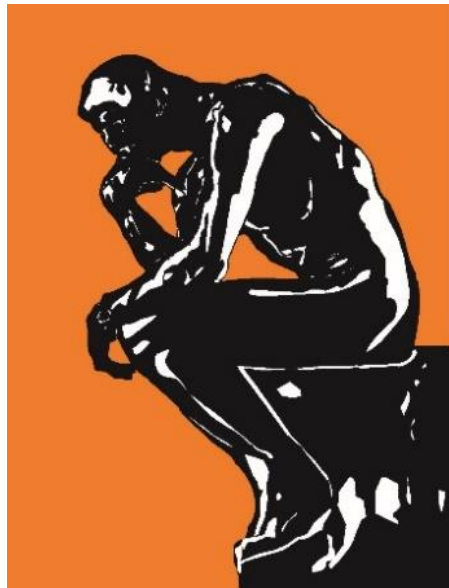
# Call them “*cheo cheo*” and let the humanities save them from extinction

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Allow me to make a wild guess: The glands of love for nature must bear a similar shape to the digestive system!

In “Glands of Love”; *Meandering Sobriety* (2023)

## Abstract

The rediscovery of the silver-backed chevrotain, an endemic species to Vietnam, in 2019, after almost 30 years of being lost to science, is a remarkable outcome for the global conservation agenda. However, along with the happiness, there is a tremendous concern for the conservation of the species as eating wildmeat, including chevrotain, is deeply rooted in the socio-cultural values of Vietnamese. Meanwhile, conservation plans face multiple obstacles since the species has not been listed in the list of endangered, precious, and rare wildlife prioritized for protection and is still classified by the IUCN as lacking data. Given the limited effectiveness of conservation measures, this essay discusses the determining roles of local actions, community cooperation, and humanistic values oriented toward eco-surplus culture in addressing the global biodiversity conservation agenda, specifically the conservation of the silver-backed chevrotain. Local actions and community cooperation for conservation can be actualized to achieve conservation goals through citizen and community sciences, integration of modern technologies (e.g., Internet, crowdfunding platforms, social media, AI, etc.), and the bonding capability of humanistic values that prioritize environmental healing. Communicating conservation information to the community, especially the children, has to stimulate their thinking and imagination about nature, develop their curiosity and desire to protect wildlife, and eventually build eco-surplus core values in their mindsets. To successfully awaken the humanistic values within the community and incorporate them into conservation endeavors, the conservation message with the name “mouse-deer”, “chevrotain”, or scientific name (*Tragulus versicolor*) is largely insufficient as they show an unfamiliar feeling. Therefore, we suggest calling the mouse-deer “*cheo cheo*”, a local name that can create familiarity and closeness, awaken the environmental conscience and humanistic values, and stimulate thinking and imagination. All these factors are essential for conservationists, scientists, and the government to support the community in building the eco-surplus culture.

**Keywords:** biodiversity loss; bushmeat consumption; eco-deficit culture; conspicuous consumption; social class

### 1. Silver-backed chevrotain: From seeming extinction to the happy rediscovery

This article is a collaborative reflection on the conservation of a unique species of chevrotain in Vietnam, i.e., the silver-backed chevrotain, between two authors belonging to two generations separated by a quarter of a century. The senior author first learned of the name of this chevrotain species, “*cheo cheo*”, in 1979, in a children’s storybook published in Vietnamese, titled *Animals of the Central Highlands Forests*, when the junior author had not yet been born. However, it took this senior author exactly 40 years to see an image of the silver-backed chevrotain in the wild for the first time through an article in *Nature Ecology & Evolution*. At that time, he was conducting a study at the request of IUCN to develop a collaborative program with Vietnamese businesses serving the cause of environmental

protection and ecosystem conservation. The younger author (MHN) also heard the name “*cheo cheo*” for the first time in 2019 while working with the senior author. Geographically, the distance is also something to tell. The senior was born and raised in Hanoi, and the younger was in Ho Chi Minh City, roughly 1700km away.

Why can two authors from distant generations living far away work together? It is because of a common connection: the humanistic values that the work brings, with love for nature, life, and a habitable habitat for humanity. Thus, the journey of completing many research manuscripts together has taken on the shape of a long-term dialogue, with much data, logic, calculations, and scientific information, but never lacking the essence of the humanities.

In short, this article is a conversation about conservation with the nuances of human values.

On November 11 2019, *Nature Ecology & Evolution* published a brief communication by Nguyen et al. (2019) on the evidence of the ongoing existence of the silver-backed chevrotain in the wild. This diminutive ungulate species, known only from Vietnam, had not been recorded in science for nearly three decades until the evidence of Nguyen et al. (2019). The species was one of 25 on the Global Wildlife Conservation’s Search for Lost Species list, including species that had been lost to science for at least ten years. The former recorded silver-backed chevrotain was a hunter-killed specimen obtained near Dak Rong and Buon Luoi in 1990 during a joint Vietnamese–Russian expedition in the Gia Lai Province (Kuznetsov & Borissenko, 2004). The only other scientific specimens were collected in the vicinity of Nha Trang city and described by British zoologist Oldfield Thomas in 1910 (Thomas, 1910). Due to the limited information regarding this diminutive species and the anthropogenic pressures it faced (e.g., habitat loss and intensive hunting), it had been thought to be extinct before the finding on *Nature Ecology & Evolution*.

The silver-backed chevrotain (*Tragulus versicolor*) belongs to the *Tragulus* genus of *Tragulidae*, a family of diminutive, even-toed ungulates. The genus also consists of Javan chevrotain (*Tragulus javanicus*), lesser chevrotain (*Tragulus kanchil*), greater chevrotain (*Tragulus napu*), Balabac chevrotain (*Tragulus nigricans*), and Williamson’s chevrotain (*Tragulus williamsoni*). Javan chevrotain and lesser chevrotain are also found in Vietnam, specifically Middle and Lower Mekong River, Kien Giang Biosphere Reserve, Tam Dao National Park, Ba Na Nui Chua Nature Reserve, Ea So Nature Reserve, and Xuan Lien Nature Reserve (Đặng, 2009; Đặng et al., 2009; Hà, 2005; Huỳnh, 2008; Phương, 2013; Thiên Nhiên Đà Nẵng, n.d.), besides the endemic silver-backed chevrotain. The silver-backed chevrotain’s most distinguishing external feature from other species in the same genus is its remarkable two-tone pelage coloration, with an ochreous-buff front and a silver or grey posterior. Its grey hairs are also mixed with white, creating a posterior with a silver appearance (Kuznetsov & Borissenko, 2004; Meijaard & Groves, 2004; Thomas, 1910).

Nguyen et al. (2019) conducted two separate camera-trapping periods to capture the images of the silver-backed chevrotain. In the first period, they interviewed the locals in three

Vietnamese provinces: Ninh Thuan, Khanh Hoa, and Phu Yen. Khanh Hoa is the province of Nha Trang City, near which the first four specimens of the species were collected, while Ninh Thuan and Phu Yen are adjacent provinces. The interview was to gain information about where silver-backed chevrotains were likely to appear and their current status. Then, three camera traps were deliberately set up in the most potentially dry lowland forest based on the information reported by the interviewees. The silver-backed chevrotains were photographed at all three stations, with a total of 72 independent occurrences (multiple images over an hour are considered a single occurrence). The second camera-trapping was conducted in the same area from April to July 2018 to collect more evidence of the species occurrence. The second period was more intensive, with 29 stations set up, resulting in 1,881 photographs of silver-backed chevrotain, comprising 208 independent occurrences.

These photographs are firm evidence of the continuous existence of the endemic species after decades of being thought to be extinct. They are also the first ever taken photos of the silver-backed chevrotain in the wild. The joy of the rediscovery of the species that “has seemingly existed as part of our imagination”, as the biologist An Nguyen stated (Hunt, 2019), is apparent not only to conservationists but also to those that have and will have sympathy with and love for nature.

## **2. Meaning for biodiversity conservation agenda and challenges in the conservation journey of the silver-backed chevrotain**

Thanks to the collaboration between scientists, local authorities, and people, as well as the integration of technology, the rediscovery of the silver-backed chevrotain populace has been actualized. However, along with the joy is the concern for species conservation. Without sufficient conservation, there are risks we have to replicate the rediscovery after decades of waiting again, or even worse, that we could lose them forever.

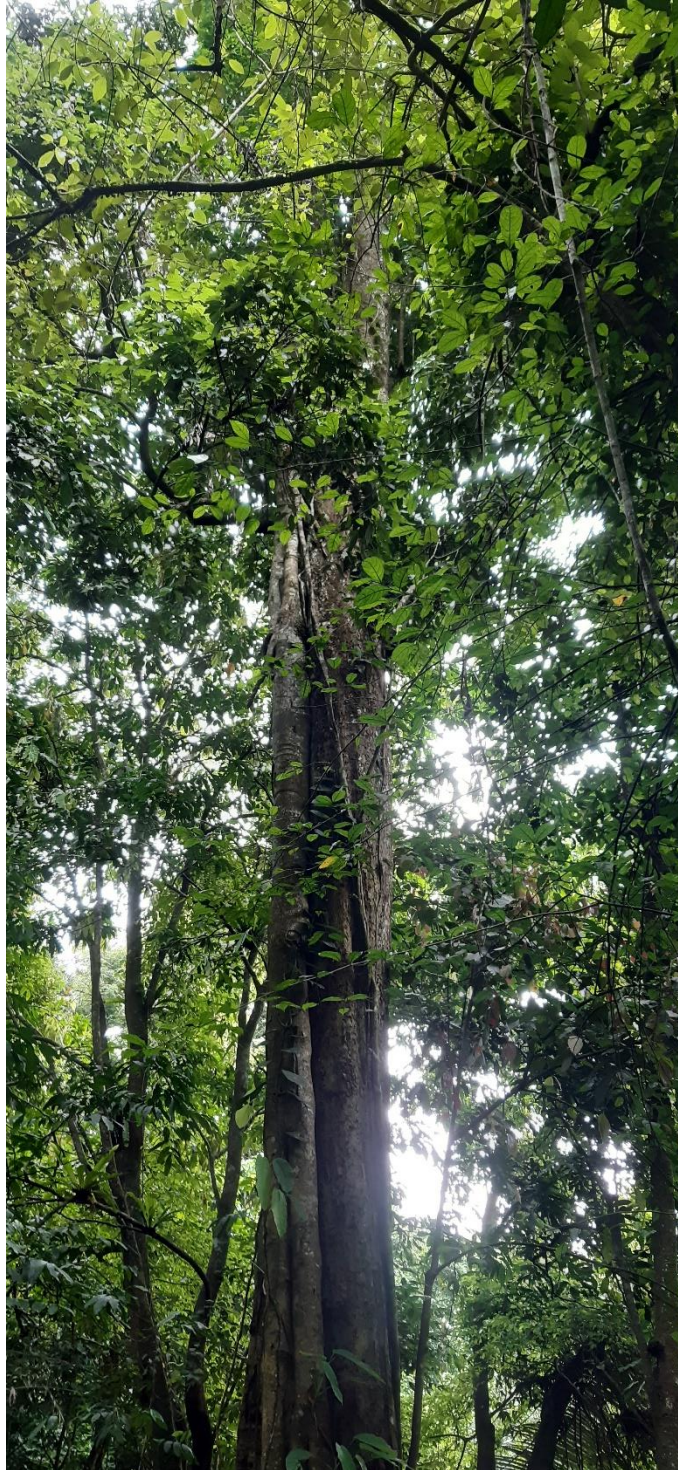
The rediscovery has implicated various meanings for conservation in particular and environmental protection and healing in general. First, the finding provides a robust confirmation for the survival of an endemic species that has been lost for decades, facilitating the subsequent on-the-ground actions. Its details also serve as valuable reference points for subsequent assessments implemented to examine the species' populations, distributions, behaviors, and major threats the species face. The information is essential to tailor the species' evidence-based conservation strategies and plans. For conservationist society, the rediscovery of the silver-backed chevrotain not only brings hope but also demonstrates an effective strategy incorporating local knowledge and advanced technology to rediscover other species that have been lost to science (Nguyen et al., 2019), like Togo mouse (*Leimacomys buettneri*), Dwarf Hutia (*Mesocapromys nanus*), South Island Kōkako (*Callaeas cinereus*), Blanco Blind Salamander (*Eurycea robusta*), Ilin Island Cloudrunner (*Crateromys paulus*), etc.

Persuading someone to support the conservation of the species that “has seemingly existed as part of our imagination” is undoubtedly difficult, especially for urban people who are largely perceptually disconnected from the natural world (Nguyen et al., 2023; Vuong & Nguyen, 2023). Fortunately, the rediscovery of a long-lost species, like the silver-backed chevrotain, has provided a valuable “bridge” that connects humans and the natural world and fosters their love for wildlife and nature. The facts that the rediscovery was covered by major international and Vietnam media outlets (e.g., CNN, National Geographic, The Guardian, Tuoi Tre, Thanh Nien, etc.) and later used as an encouraging message have been a tremendous success of conservation endeavors to increase public awareness and maintain hope. This awareness and hope are prerequisites for raising public curiosity and building love for wildlife and nature, which supports the long-term biodiversity conservation agenda (Nguyen & Vuong, 2021).

Apart from its scientific values, the remaining existence of silver-backed chevrotain provides not only us but also our future generations the opportunities to explore nature, find a connection with it, and appreciate its beauty and diversity. People’s imagination of silver-backed chevrotains was mostly based on the description and demonstration of their appearances through books, writings, and paintings. Before the rediscovery, the description of Oldfield Thomas in 1910 and the killed chevrotain specimen obtained in 1990 are seemingly two sole sources for scientists to study and generate knowledge. What could happen if the silver-backed chevrotain was extinct and no evidence had been obtained after the camera traps of Nguyen et al. (2019)?

In that case, the silver-backed chevrotain would be like the dodo (*Raphus cucullatus*), the flightless bird endemic to Mauritius island. The bird went extinct in the 17<sup>th</sup> century due to human activities like hunting and the introduction of invasive species (Cheke, 2015). Until now, the dodo’s appearance has only been evidenced by drawings, paintings, writings, and fossils from the 17<sup>th</sup> century, leaving a huge gap in human’s understanding and imagination of the bird. The regret of not being able to save a species from extinction and the desire to see the dodo in reality might affect us so much that some scientists are trying to resurrect the birds with advanced genetic technologies and hundreds of millions of dollars of investment (Hunt, 2023).

Fortunately, our future generation can still have the chance to learn about and appreciate the beauty of the wild, tiny deer-like chevrotains through photographs and, perhaps, documentary movies. For the current generation, the rediscovery offers us a chance to conserve such opportunities for future generations in an “economical way” (Vuong & Nguyen, 2023). Otherwise, they might need to spend a tremendous amount of money with all the time, effort, technological advances, and regret just to see the chevrotains in reality.



**Figure 1:** 200-year-old Cà Lồ tree (*Caryodaphnopsis tonkinensis*) in the primary forest of Hoa Binh province

However, along with the opportunity is the challenge of conservation. Habitat loss due to deforestation and hunting have been the main factors threatening the species for decades. Vietnam faced a substantial decline in forest cover from around 43% in 1943 to 16-27% in



1993, significantly destroying and damaging the habitats of residing species (Cochard et al., 2017). The areas around Dak Rong and Buon Luoi, where the first chevrotain was acquired in the Vietnamese–Russian expedition, had undergone severe deforestation since the mid-1990s, as noted by Kuznetsov and Borissenko (2004). Since then, Vietnam has implemented and revised multiple laws, policies, and initiatives to protect, restore, and plant forests, resulting in positive changes in forest cover. Specifically, the national forest cover in 2022 reached 42.02%, with more than 10.13 million ha of natural forest and approximately 4.66 million ha of planted forest (see Figure 1) (Hương, 2023).

However, many concerns remain regarding its effectiveness for conservation. Although the forest cover increases, it does not necessarily reflect the quality and ability to provide ecosystem services. Since 2012, the Ministry of Agriculture and Rural Development has started to consider the areas of rubber plantations in forestry lands a part of forest cover (Dang, 2022). More than 2500 km<sup>2</sup> of natural forest of protected areas was converted to rubber plantations during 2005-2010 (Ahrends et al., 2015). The lands converted to monoculture plantations were often in areas that had high values of biodiversity conservation and ecological functions, adversely affecting species' habitats (Ahrends et al., 2015; Warren-Thomas et al., 2015). In addition to rubber plantations, natural forest lands are also converted to land use for other purposes (e.g., infrastructure construction, mineral exploitation, agricultural production) and compensated by afforestation (Dang, 2022; PanNature, 2016). While afforestation and reforestation are effective alternatives for growing forest cover, they cannot replace the benefits provided by the primary forests for biodiversity conservation. For a reforested area to reach a biodiversity level similar to adjacent primary forests, it would take 100 years or more (Wang et al., 2022). Moreover, despite many interventions and initiatives to protect forests, illegal deforestation in Khanh Hoa province has been continuously reported (Lam, 2023; Lương, 2022; Nhóm PV, 2023). Even the protected area of Nui Chua National Park, where the silver-backed chevrotain was detected, faces the risk of being converted to land for building resort (Kha, 2023; Nhân, 2023).

Apart from the risk of habitat loss, widespread and intensive hunting is another severe problem challenging the conservation endeavors of the chevrotain. According to Harrison et al. (2016), hunting is the most urgent threat to the survival of most of Southeast Asia's endangered animals. Enhanced access to forests and markets, improved hunting equipment, and rising demand for wild meat, wildlife-derived medical products, and wild animals as pets all contribute to the overhunting trend. Home-made wire snares, which are made of wire or cable at low cost, are used predominantly by hunters, especially in Vietnam, where gun-control legislation is strictly enforced (Harrison et al., 2016). Snaring is an entirely indiscriminate hunting method, leading to capturing or non-targeting females, young, and large-range mammals, including endangered species (Gray et al., 2017). Removing snares by patrol teams is the main way to deal with the snaring problem. Between 2010 and 2015,

more than 200,000 snares were taken down in just five of Southeast Asia's protected areas. Nevertheless, removal alone is ineffective as replacing new snare traps is very cheap (Gray et al., 2018). In Vietnam, snares and many wild animal traps are publicly sold in the market near areas with high biodiversity values (Hiếu, 2021).

Furthermore, the supply-side and transactional interventions in Vietnam are not effective and sufficient for tackling wildlife hunting and trading activities for several reasons. Wildlife protection measures are implemented and enforced slowly and insufficiently owing to a lack of resources for monitoring and law enforcement (e.g., people, funding, equipment) as well as deficiencies in the governmental system (e.g., corruption, bureaucracy) (Van Song, 2008). Coordination across agencies, organizations, and countries is lacking (Challender & MacMillan, 2014), while the illicit wildlife trade network has been more intricately structured, such as via the use of social media to circumvent enforcement surveillance and inspection (Ngoc, 2020).

In the case of the silver-backed chevrotain, publicizing the rediscovery of the chevrotain can help boost conservation awareness, but it also risks exposing the location of the species to illegal wildlife hunters and traders. Especially, the study by Pham et al. (2022) reported that the Javan chevrotain, a species in the same genus as the silver-backed chevrotain, is being farmed and sold for meat consumption in Binh Duong and Ba Ria Vung Tau provinces. In other words, the market and demand for consuming chevrotains exist, which can pose significant threats to the existence of the rediscovered species (Công, 2012; Tuấn, 2018). As also noted by Nguyen et al. (2019), "all of the interviewees noted that chevrotain populations have declined precipitously in recent years as a result of intensive hunting pressure". Even though international organizations, local government, conservationists, and scientists quickly collaborate to devise conservation strategies and plans (Anh, 2019), many challenges have arisen because the species is not listed in the list of endangered, precious, and rare wildlife prioritized for protection and classified by the IUCN as lacking data (Ngọc, 2023; Quốc, 2023). Given the deficiencies of legal standards to protect the species, conservation of the chevrotain requires something more than actions from people in charge of protecting the species: local actions, local community cooperation, and the humanistic values bonding the community efforts for conservation objectives.

### **3. The determining roles of humanistic values and community cooperation in chevrotain conservation**

Half of Vietnam's wildlife trade, including bushmeat, is for domestic consumption, mostly in urban areas (Ngoc & Wyatt, 2013). The main driver for such demand is eating: the eating phobia!

It was not until recently that Vietnamese started to consume bushmeat, including the chevrotain, but they have a long tradition of doing so. I (the first author) first learned about the chevrotain when I was in elementary school. At that time, I only knew two things about



this species. First, the creature was even-hoofed, small, gentle, and shy. The second information was: its meat was very delicious. All information about how “delicious” the chevrotain meat was was obtained from the children’s storybook titled *Animals of the Central Highlands Forests* (Luong, 1986). The book’s third edition is still now sold in Vietnam by Kim Đồng Publishing House, the largest book producer and publisher for Vietnamese children. Indeed, thinking the bushmeat “delicious” is also the most common reason stated by bushmeat consumers (Sandalj et al., 2016).

In reality, eating bushmeat in Vietnam is not simply a matter of being delicious, but it involves the long tradition of hunting and eating wild animals that can be traced back to ancient people who lived from approximately 20,000 to 7,000 years ago. According to Sủ, the main economic activities of Hoabinhian, the culture that existed from 20,000 years BP to 7,000 years BP, were hunting and gathering. In the Northwest of Vietnam, the chevrotain was one of many hunted animals by Hoabinhian inhabitants (Sủ, 2023). The recent exvacation of the archaeological site in Dak Nong, Central Highlands, suggested that the culture of inhabitants in the area, dating from 7,000 to 4,500 years BP, originated from Hoabinhian and also frequently hunted the chevrotain for food like Hoabinhian (Sủ et al., 2020). Even nowadays, Vietnam is no longer a hunter-gatherer society and is one of the top exporters of agricultural products, but chevrotain poaching is still conducted as a way to generate income (see Figure 2) (Nhóm PV BVR&MT, 2021; Pham et al., 2022).



**Figure 2:** Four Javan chevrotains rescued from the restaurant in Quy Nhon City. Retrieved from (Công, 2012)

Unlike ancient societies, hunting animals to survive in nature, bushmeat in modern Vietnam is considered an alternative to keep them surviving and thriving in the social context. Vietnam has a culture that is deeply affected by Confucianism, of which core values significantly drive the people's value systems, beliefs, thinking, and behaviors, including their eating decisions and behaviors. Face-saving (preserving one's reputation, credibility, or dignity) is an important sociopsychological feature of Vietnamese culture, which can be deemed as both an individual and collective property as well as a subjective value based on social judgment (Nhung, 2014). This feature, influenced by Confucianist values (Hwang & Han, 2010), is a major driver of Vietnamese perceptions, decision-making, and behaviors related to eating bushmeat.

Studies in Ho Chi Minh and Hanoi, in particular, reveal that high-income, high-status residents intentionally choose rarer, wild-sourced, and more costly bushmeat to gain social advantages, for example, obtaining business opportunities or creating social advantage with other people (Drury, 2009, 2011; Nguyen & Jones, 2022b; Shairp et al., 2016). In these contexts, serving rare bushmeat can be thought of as a strategy to manage other people's evaluation, either for gaining others' attention/admiration ("make face") or covering up weakness passively ("keep face") (Hwang & Han, 2010). The higher the value of the bushmeat, the higher the face value the person might receive or expect to receive, subsequently reflecting their social status and prestige (Drury, 2011; Nguyen & Jones, 2022b; Shairp et al., 2016). Moreover, the rising price of bushmeat can subsequently turn the consumers habits into conspicuous consumption, which continues to reinforce the bushmeat consumption behaviors to attain or maintain social status. This dual effect can creates substantial threats to wildlife, especially the endangered ones.

Publicizing the information about the silver-backed chevrotain and its rarity can promote conservation awareness among those who care and will care for nature. However, for those perceiving bushmeat as a way to gain social advantage, the chevrotain's rarity might be capitalized on to gain advantages in communicating prestige and social leverage. Or, what if the declining "supply" triggers someone's curiosity and somehow makes them equate rarity to "deliciousness" and want to experience eating the silver-backed chevrotain, the seemingly rarest of its kind? Those people might be willing to pay much higher to receive the silver-backed chevrotain on the table. Then, not only hunters but also people struggling with their livelihood will be motivated to hunt down the chevrotain. Eventually, it might lead to a downward spiral of biodiversity deficits, straight to the bottom of extinction.

The question is:

- Can these scenarios happen?

We think all scenarios mentioned above can occur if the eco-deficit culture still dominates and the humanistic values are largely missing in the community. After the public announcement of the silver-backed chevrotain rediscovery, it was expected that the number

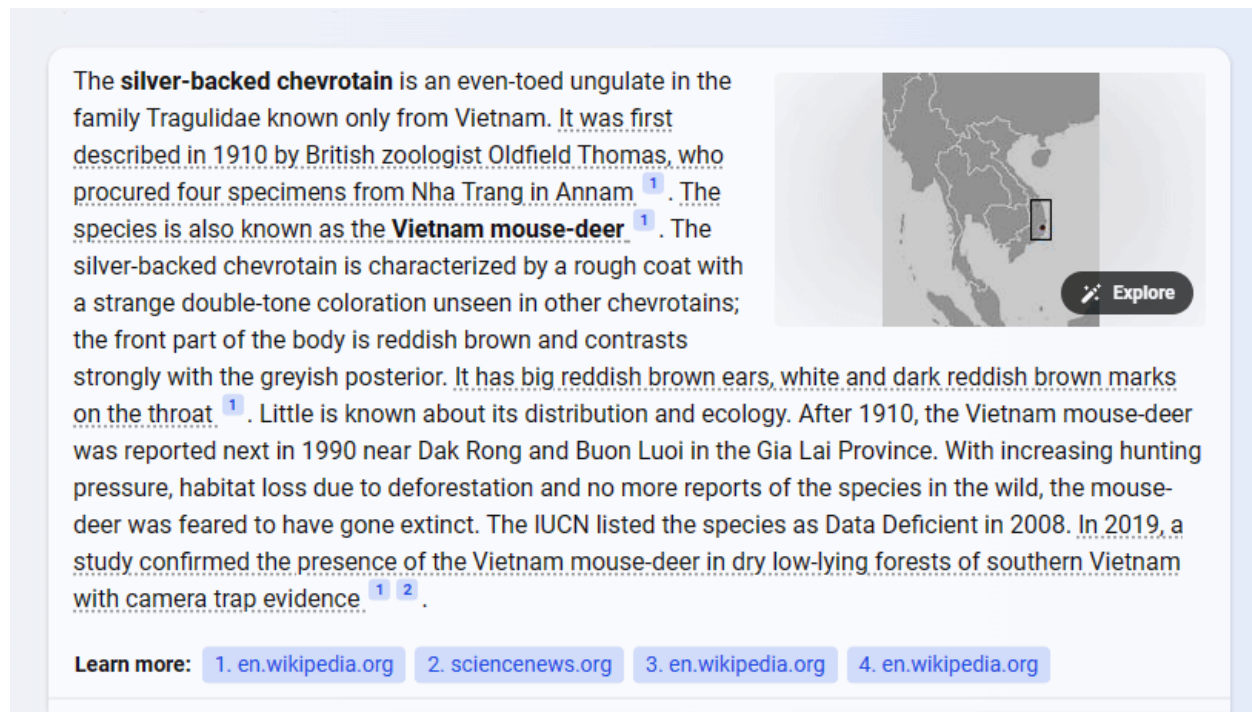
of chevrotains from the same genus would decline substantially due to the increasing conservation awareness of the species among the residents (or consumers). However, in reality, the media has continuously reported the occurrences of chevrotains (i.e., Javan chevrotain and lesser chevrotain) being hunted and trafficked that were confiscated by the police officers and the authority since the release of information related to the silver-backed chevrotain (Hiền, 2020; Lâm, 2021; Lịch, 2023; Liêm, 2020; Nhóm PV BVR&MT, 2021; Viên, 2020).

Although biodiversity conservation of the silver-backed chevrotain in particular, and other endangered species in general, is a global agenda, it needs local actions and cooperation (Reihana et al., 2023). For these actions and cooperation to be successful, orienting, updating, and reinforcing the humanistic values toward the eco-surplus culture is vital, as it will help nurture the environmental-healing values among the community (Vuong, 2021a). The community here is not limited to those residing near the conservation sites but also includes people in other regions of the country, like urban areas. When the eco-surplus culture is successfully introduced and built, the eco-deficit culture of eating bushmeat for the sake of personal pleasure or social gains will be replaced by values, beliefs, and behaviors that promote biodiversity conservation and restoration (Vuong, 2021a, 2021b). The eco-surplus cultural values not only help lower wildlife consumption demand and reduce the size of wildlife trade and poaching, but also potentially provide additional finance for conservation initiatives. Evidently, the greater the eco-surplus cultural value the Vietnamese urban residents obtain, the more willing they are to contribute financially to the conservation in protected areas (Nguyen & Jones, 2022a).

Conservationists, scientists, and the government need to collaborate with the community to improve conservation effectiveness and build the community's eco-surplus culture. Citizen and community sciences are crucial in achieving this objective. Communication and collaboration with local people and consumers, especially with the assistance of modern technologies, can provide scientists and conservationists with important information for locating the species, rescuing captives, and preventing wildlife trafficking. The rediscovery of the silver-backed chevrotain is a typical practice of community science, in which the authors incorporate the local knowledge system (through interviewing local people) with the technology to identify the location of the species and capture its photographs (Nguyen et al., 2019). Conservation endeavors will receive more benefits from the expansion and strengthening of citizen and community sciences through interdisciplinary collaboration. Through collaboration, the citizens and community will subsequently understand more about the humanistic values of conservation works, helping the seed of eco-surplus culture germinate within them.

Modern technologies are vital for building an eco-surplus culture in the community and utilizing the community's power for conservation. Many tools and technologies of the digital environment are beneficial for quickly disseminating conservation information and its

humanistic values, as well as accumulating financial resources for conservation, like crowdfunding platforms, AI, and social media. According to Gallo-Cajiao et al. (2018), 577 conservation-focused projects across 80 countries have been crowdfunded on 72 platforms since 2009, accumulating a total of \$4,790,634. If the eco-surplus culture is widely built and the crowdfunding platform is more widely known, the finance generated from this channel will increase significantly (Nguyen & Jones, 2022a). Besides that, by letting artificial intelligence (AI) learn about conservation information and humanistic values, we can open interesting and reliable information channels with authenticated sources for the local community and people from around the globe. Below is an encouraging answer to our question of Microsoft's ChatGPT AI integrated into Bing: What is the silver-backed chevrotain? (see Figure 3). When more people are aware of the conservation issues through the wide and rapid dissemination of modern technologies, there will be more people worldwide likely to obtain the humanistic values of conservation and financially support protecting the endangered species.



The **silver-backed chevrotain** is an even-toed ungulate in the family Tragulidae known only from Vietnam. It was first described in 1910 by British zoologist Oldfield Thomas, who procured four specimens from Nha Trang in Annam<sup>1</sup>. The species is also known as the **Vietnam mouse-deer**<sup>1</sup>. The silver-backed chevrotain is characterized by a rough coat with a strange double-tone coloration unseen in other chevrotains; the front part of the body is reddish brown and contrasts strongly with the greyish posterior. It has big reddish brown ears, white and dark reddish brown marks on the throat<sup>1</sup>. Little is known about its distribution and ecology. After 1910, the Vietnam mouse-deer was reported next in 1990 near Dak Rong and Buon Luoi in the Gia Lai Province. With increasing hunting pressure, habitat loss due to deforestation and no more reports of the species in the wild, the mouse-deer was feared to have gone extinct. The IUCN listed the species as Data Deficient in 2008. In 2019, a study confirmed the presence of the Vietnam mouse-deer in dry low-lying forests of southern Vietnam with camera trap evidence<sup>1 2</sup>.

Learn more: [1. en.wikipedia.org](https://en.wikipedia.org) [2. sciencenews.org](https://www.sciencenews.org) [3. en.wikipedia.org](https://en.wikipedia.org) [4. en.wikipedia.org](https://en.wikipedia.org)

The image shows a screenshot of a ChatGPT AI response. On the right side, there is a map of Vietnam with a small red box highlighting the location of the silver-backed chevrotain. Below the map is a button labeled 'Explore'.

**Figure 3:** Answer of Microsoft's ChatGPT AI to the question: What is the silver-backed chevrotain? (Accessed on 5-12-2023)

Besides technologies, the media can also play an information channel that can direct public attention, raise awareness, and convey the humanistic values of conservation. For example, much valuable information regarding its appearance, conservation importance, and challenges has been provided by the Vietnamese media. Some useful articles can help awaken the humanistic values inside people toward wildlife and nature through narratives and visual images (Bách, 2023). Nevertheless, the number of such articles remains very

limited. In addition, with the assistance of the Internet and social media, the effects of information dissemination are accelerated, widespread, and more economical. Through media and social media, direct and indirect communication between scientists, conservationists, government, and the community can be enhanced in quantity and quality, significantly improving the public education of conservation and facilitating citizen and community sciences.

Children, who will become decision-makers and the foundation of society, must have access to the knowledge and humanistic values of conservation. Such information and values, aided by visual images and graphical videos, will help stimulate children's thinking and imagination about nature, develop their curiosity and desire to protect wildlife, and eventually build eco-surplus core values in their mindsets (Chen et al., 2020; Hill & Nelson, 2011; Vuong, 2020, 2022). Being able to read or hear stories about nature and animals is how I (the first author) got curious and started to develop a passion for nature 40 years ago. However, the information disseminated on the children's environmental media (e.g., books, videos, etc.) should be selective to avoid communicating the narratives that endorse and reinforce values prioritizing natural and wildlife exploitation, like describing how delicious the chevrotain is.

The media, social media, and other information communication technologies are powerful tools for conservation. However, "with great power comes great responsibility". Without considering the humanistic values of this era, the environmental protection and healing values, such powerful tools can cause disastrous consequences on the conservation efforts by spreading the eco-deficit culture among the community. For instance, in 2007, Philip Kotler, widely known as the father of modern marketing, suggested that Vietnam could become "the world's kitchen". For more than 15 years, that message has been still repeated over and over again to develop Vietnamese cuisine culture into a national brand (Dan Tri Newspaper, 2023; Đông & Tô, 2022; Thuận, 2023). For Vietnamese cuisine culture to be a national brand, it must be distinctive and have a competitive advantage that no other countries can surpass. So, what could be more distinctive than the long-tradition cuisine meticulously and heartily cooked from the endemic species: the silver-backed chevrotain? If this was true, it would lead to an ironic, paradoxical situation: In a country that is a member of the Asia-Pacific Economic Cooperation, situated in the Pacific region, and always calls itself a peace-loving country, people would hunt endangered species for their personal pleasure, social gains, and even "national pride".

#### **4. Let's call mouse-deer "*cheo cheo*"**

In this era, the biggest threat to the survival of humankind is the climate and environmental crises. Biodiversity loss is a global problem that can intensify and exacerbate the crises. Biodiversity conservation of endangered species, like the silver-backed chevrotain, has become a global agenda. However, local actions and community cooperation are needed to

actualize and accomplish the agenda. Without community involvement, conservation endeavors will be ineffective and significantly costly, especially for the endangered species that still have not received sufficient legal standards for protection. Disseminating and reinforcing the humanistic values oriented toward eco-surplus culture will improve the bonding within the community for conservation in particular and environmental healing endeavors in general.

However, communicating with the residents using the name “mouse-deer”, “chevrotain”, or scientific name (*Tragulus versicolor*) shows an unfamiliar feeling, which can substantially hinder the interactions between conservationists, scientists, the government, and the local community. I (the first author) started to be curious and sympathize with the species when I read its funny name, “*cheo cheo*”, but not the information related to the conservation of its biological characteristics. Unfamiliar names make it difficult to awaken the sympathy of residents, the government's main partner, scientists, and conservationists in conservation. “*Cheo cheo*” is the name capable of resolving such a deficiency because the species is living “here and now”. Dwelling here and dwelling now is a Buddhist idea of mindful thought and action through experience. For effective conservation, this idea is not only applicable to “*cheo cheo*” but also to the residents.

Although the proposal to call chevrotain “*cheo cheo*” seems to be a language issue, it has multiple layers of meaning. First, because language generates familiarity, closeness, and ease of affection, calling the species “*cheo cheo*”, for Vietnamese is to awaken their environmental conscience and humanistic values. It also helps create local, cultural, and humanistic feelings for conservation efforts. Such feelings will smoothen the processes of incorporating the local community into citizen and community sciences and enhance the collaboration effectiveness for conservation endeavors. More importantly, the name “*cheo cheo*” can stimulate thinking and imagination about nature, develop curiosity and desire to protect wildlife, and eventually build an eco-surplus culture among the community, especially children (Vuong, 2020, 2021a). Besides the humanistic values, the silver-backed chevrotain is an endemic species in Vietnam, and scientific information regarding chevrotain species in Vietnam is rich and diverse, so it is plausible to have the silver-backed chevrotain called by a Vietnamese name.

Here, we return to the starting point of the paper, with a thought that may be valuable for the conservation of the chevrotain, in particular, and the flora and fauna in general. Ultimately, we two authors are still humans who share common humanistic values. We hope that thanks to the presence of the humanities, as presented in the article, the knowledge, attitudes, and practices of humans can help the chevrotain have suitable natural living conditions.

We believe that if noble human values are nurtured, developed, and transformed into an eco-surplus culture, then the chevrotain (mouse-deer) can escape the fate of extinction. In the

same vein, many other wild animals can also survive the existential risks due, in part, to anthropogenic activities.

To contribute a glimmer of hope, the authors are planning to use a portion of their stock investment dividends, albeit modest in size, to contribute to some conservation fund in supporting the cause of protecting critically endangered silver-backed chevrotain, “*cheo cheo*”. It is hoped that the authors’ efforts will inspire others to take similar actions to protect the environment and its inhabitants.

## References

- Ahrends, A., Hollingsworth, P. M., Ziegler, A. D., Fox, J. M., Chen, H., Su, Y., & Xu, J. (2015). Current trends of rubber plantation expansion may threaten biodiversity and livelihoods. *Global environmental change*, 34, 48-58. <https://doi.org/10.1016/j.gloenvcha.2015.06.002>
- Anh, B. (2019). *Tức tốc bảo vệ cheo cheo lưng bạc sau phát hiện 'phấn khích'*. <https://tuoitre.vn/tuc-toc-bao-ve-cheo-cheo-lung-bac-sau-phat-hien-phan-khich-2019111308180045.htm>
- Bách, S. (2023). *Buôn bán động vật hoang dã: Những hình ảnh đau lòng*. <https://nhandan.vn/buon-ban-dong-vat-hoang-da-nhung-hinh-anh-dau-long-post772153.html>
- Challender, D. W., & MacMillan, D. C. (2014). Poaching is more than an enforcement problem. *Conservation Letters*, 7(5), 484-494. <https://doi.org/10.1111/conl.12082>
- Cheke, A. S. (2015). Speculation, statistics, facts and the Dodo's extinction date. *Historical Biology*, 27(5), 624-633. <https://doi.org/10.1080/08912963.2014.904301>
- Chen, C. W., Chen, C., & Shieh, C.-J. (2020). A Study on Correlations between Computer-Aided Instructions Integrated Environmental Education and Students' Learning Outcome and Environmental Literacy. *EURASIA Journal of Mathematics, Science and Technology Education*, 16(6), em1858.
- Cochard, R., Ngo, D. T., Waeber, P. O., & Kull, C. A. (2017). Extent and causes of forest cover changes in Vietnam's provinces 1993–2013: A review and analysis of official data. *Environmental Reviews*, 25(2), 199-217.
- Công, D. (2012). *Giải cứu 4 cá thể Cheo Cheo trong quán nhậu*. <https://dantri.com.vn/xahoi/giai-cuu-4-ca-the-cheo-cheo-trong-quan-nhau-1349149311.htm>
- Dan Tri Newspaper. (2023). *Vietnam, "culinary elite" or "world kitchen"?* <https://www.vietnam.vn/en/viet-nam-tinh-hoa-am-thuc-hay-bep-an-the-gioi/>
- Đặng, N. X. (2009). *Kết quả khảo sát đánh giá nhanh thực vật và động vật có xương sống ở cận của khu dự trữ sinh quyển Kiên Giang*.



- Đặng, N. X., Cử, N., Tuế, H. V., & Quỳnh, H. Q. (2009). *Báo cáo kết quả xây dựng chương trình giám sát và đánh giá đa dạng sinh học cho vườn quốc gia Tam Đảo*.
- Dang, T. K. P. (2022). The Discourse of Forest Cover in Vietnam and Its Policy Implications. *Sustainability*, 14(17), 10976. <https://doi.org/10.3390/su141710976>
- Đông, N., & Tô, L. (2022). *Việt Nam - bếp ăn của thế giới*. <https://tuoitre.vn/viet-nam-bep-an-cua-the-gioi-20220902190104187.htm>
- Drury, R. (2009). Reducing urban demand for wild animals in Vietnam: examining the potential of wildlife farming as a conservation tool. *Conservation Letters*, 2(6), 263-270.
- Drury, R. (2011). Hungry for success: urban consumer demand for wild animal products in Vietnam. *Conservation and Society*, 9(3), 247-257. <https://doi.org/10.4103/0972-4923.86995>
- Gallo-Cajiao, E., Archibald, C., Friedman, R., Steven, R., Fuller, R. A., Game, E. T., . . . Ritchie, E. G. (2018). Crowdfunding biodiversity conservation. *Conservation Biology*, 32(6), 1426-1435. <https://doi.org/10.1111/cobi.13144>
- Gray, T. N., Hughes, A. C., Laurance, W. F., Long, B., Lynam, A. J., O'Kelly, H., . . . Wilkinson, N. M. (2018). The wildlife snaring crisis: an insidious and pervasive threat to biodiversity in Southeast Asia. *Biodiversity and conservation*, 27, 1031-1037. <https://doi.org/10.1007/s10531-017-1450-5>
- Gray, T. N., Lynam, A. J., Seng, T., Laurance, W. F., Long, B., Scotson, L., & Ripple, W. J. (2017). Wildlife-snaring crisis in Asian forests. *science*, 355(6322), 255-256. <https://doi.org/10.1126/science.aal4463>
- Hà, N. M. (2005). *Kết quả điều tra khu hệ Thú móng guốc ở Khu Bảo tồn Thiên nhiên Ea Sô, tỉnh Đắk Lắk*.
- Harrison, R. D., Sreekar, R., Brodie, J. F., Brook, S., Luskin, M., O'Kelly, H., . . . Velho, N. (2016). Impacts of hunting on tropical forests in Southeast Asia. *Conservation Biology*, 30(5), 972-981. <https://doi.org/10.1111/cobi.12785>
- Hiền, Đ. (2020). *Bắt giữ, mua bán động vật hoang dã, quý hiếm: Vì lợi nhuận bất chấp pháp luật*. <https://tapchitaichinh.vn/bat-giu-mua-ban-dong-vat-hoang-da-quy-hiem-vi-loi-nhuan-bat-chap-phap-luat.html>
- Hiếu, T. (2021). *Bẫy thú rừng bán công khai ở các chợ Tây Nguyên*. <https://laodong.vn/ban-doc/bay-thu-rung-ban-cong-khai-o-cac-cho-tay-nguyen-882795.laod>
- Hill, J. L., & Nelson, A. (2011). New technology, new pedagogy? Employing video podcasts in learning and teaching about exotic ecosystems. *Environmental Education Research*, 17(3), 393-408. <https://doi.org/10.1080/13504622.2010.545873>

- Hunt, K. (2019). *Tiny deer-like animal thought lost to science photographed for first time in 30 years*. <https://edition.cnn.com/2019/11/11/asia/mouse-deer-vietnam-chevrotain-rediscovered-scn/index.html>
- Hunt, K. (2023). *Scientists plot the resurrection of a bird that's been extinct since the 17th century*. <https://edition.cnn.com/2023/01/31/world/dodo-bring-back-from-extinction-colossal-scn/index.html>
- Huong, Đ. (2023). *Công bố hiện trạng rừng toàn quốc năm 2022*. <https://baochinhphu.vn/cong-bo-hien-trang-rung-toan-quoc-nam-2022-102230621065546313.htm>
- Huỳnh, Đ. H. (2008). *Bảo tồn và sử dụng bền vững đa dạng sinh học động vật trong các hệ sinh thái vùng trung và hạ lưu sông Mê Kông*.
- Hwang, K.-K., & Han, K.-H. (2010). Face and morality in Confucian society. In M. H. Bond (Ed.), *Oxford Handbook of Chinese Psychology*. Oxford University Press.
- Kha, T. (2023). *Dự án nghỉ dưỡng cao cấp "lấy" gần 12ha rừng của Vườn quốc gia Núi Chúa*. <https://dantri.com.vn/xa-hoi/du-an-nghi-duong-cao-cap-lay-gan-12ha-rung-cua-vuon-quoc-gia-nui-chua-20230912203206445.htm>
- Kuznetsov, G. V., & Borissenko, A. V. (2004). A new record of *Tragulus versicolor* (Artiodactyla, Tragulidae) from Vietnam, and its sympatric occurrence with *T. kanchil*. *Russian Journal of Theriology*, 3(1), 9-13.
- Lâm, B. (2021). *Đắc Nông nhức nhối tình trạng buôn bán động vật trái phép*. <https://laodong.vn/phap-luat/dak-nong-nhuc-nhoi-tinh-trang-buon-ban-dong-vat-trai-phep-929764.ldo>
- Lam, K. (2023). *Khởi tố vụ mở đường, phá rừng ở Khánh Hòa*. <https://nld.com.vn/phap-luat/khoi-to-vu-mo-duong-pha-rung-o-khanh-hoa-20230322161158647.htm>
- Lịch, K. (2023). *Thả 18 con cheo cheo Nam Dương về Vườn Quốc gia Cát Tiên*. <https://antgct.cand.com.vn/doi-song/tha-18-con-cheo-cheo-nam-duong-ve-vuon-quoc-gia-cat-tien-i715621/>
- Liên, B. (2020). *Bắt quả tang người dùng súng tự chế bắn 7 con cheo quý hiếm*. <https://tuoitre.vn/bat-qua-tang-nguoi-dung-sung-tu-che-ban-7-con-cheo-quy-hiem-20200902124745173.htm>
- Lương, H. (2022). *Tái diễn tình trạng phá rừng, san ủi đồi núi ở Nha Trang*. <https://thanhnien.vn/tai-dien-tinh-trang-pha-rung-san-ui-doi-nui-o-nha-trang-1851485176.htm>
- Lương, T. (1986). *Thú Rừng Tây Nguyên*. Sở VH TT Daklak.

- Meijaard, E., & Groves, C. (2004). Recent study identifies the possible existence of a forgotten species. *Oryx*, 38, 132-133.
- Ngoc, A. C., & Wyatt, T. (2013). A green criminological exploration of illegal wildlife trade in Vietnam. *Asian Journal of Criminology*, 8(2), 129-142.
- Ngọc, D. (2023). *Không thuộc danh mục động vật nguy cấp, cheo cheo lưng bạc được bảo vệ ra sao?* <https://tuoitre.vn/khong-thuoc-danh-muc-dong-vat-nguy-cap-cheo-cheo-lung-bac-duoc-bao-ve-ra-sao-20231019105623459.htm>
- Ngoc, T. (2020). *Alarming problems of wildlife trade*. Công An Thành Phố Hồ Chí Minh. <https://congan.com.vn/vu-an/phong-su/bao-dong-nan-buon-ban-dong-vat-hoang-da-102668.html>
- Nguyen, A., Tran, V. B., Hoang, D. M., Nguyen, T. A. M., Nguyen, D. T., Tran, V. T., . . . Wilting, A. (2019). Camera-trap evidence that the silver-backed chevrotain *Tragulus versicolor* remains in the wild in Vietnam. *Nature Ecology and Evolution*, 3(12), 1650-1654.
- Nguyen, M.-H., & Jones, T. E. (2022a). Building eco-surplus culture among urban residents as a novel strategy to improve finance for conservation in protected areas. *Humanities & Social Sciences Communications*, 9, 426. <https://doi.org/10.1057/s41599-022-01441-9>
- Nguyen, M.-H., & Jones, T. E. (2022b). Predictors of support for biodiversity loss countermeasures and bushmeat consumption among Vietnamese urban residents. *Conservation Science and Practice*, 4(12), e12822. <https://doi.org/10.1111/csp2.12822>
- Nguyen, M.-H., Nguyen, M.-H. T., Jin, R., Nguyen, Q.-L., La, V.-P., Le, T.-T., & Vuong, Q.-H. (2023). Preventing the separation of urban humans from nature: The impact of pet and plant diversity on biodiversity loss belief. *Urban Science*, 7(2), 46. <https://doi.org/10.3390/urbansci7020046>
- Nguyen, M.-H., & Vuong, Q.-H. (2021). Evaluation of the Aichi Biodiversity Targets: The international collaboration trilemma in interdisciplinary research. *Pacific Conservation Biology*, 28(6), 517-531. <https://doi.org/10.1071/PC21026>
- Nhân, T. (2023). *Hội thảo quốc tế thúc đẩy công tác bảo tồn loài cheo cheo lưng bạc quý hiếm*. <https://thanhnien.vn/hoi-thao-quoc-te-thuc-day-cong-tac-bao-ton-loai-cheo-cheo-lung-bac-quy-hiem-185231018123440806.htm>
- Nhóm PV. (2023). *Ngang nhiên phá rừng, ủi đường lên đỉnh Đá Đen*. <https://baovephapluat.vn/kinh-te/do-thi-xay-dung/ngang-nhien-pha-rung-ui-duong-len-dinh-da-den-135001.html>

- Nhóm PV BVR&MT. (2021). *Bài 3: “Hàng rừng” bày bán công khai ngoài đường quốc lộ.* <https://baovemoitruong.org.vn/bai-3-hang-rung-bay-ban-cong-khai-ngoai-duong-quoc-lo/>
- Nhung, P. T. H. (2014). How do the Vietnamese lose face? Understanding the concept of face through self-reported, face loss incidents. *International Journal of Language and Linguistics*, 2(3), 223-231.
- PanNature. (2016). *Hội thảo: Thực thi chính sách trồng rừng thay thế từ thực tiễn địa phương.* <https://nature.org.vn/vn/2016/07/hoi-thao-thuc-thi-chinh-sach-trong-rung-thay-the-tu-thuc-tien-dia-phuong/>
- Pham, T. T., Tang, H. T. K., Nguyen, N. T. K., Dang, P. H., Van Nguyen, A. T., Nguyen, A. T. T., . . . Nguyen, Q. N. (2022). COVID-19 impacts, opportunities and challenges for wildlife farms in Binh Duong and Ba Ria Vung Tau, Vietnam. *Global Ecology and Conservation*, 40, e02314. <https://doi.org/10.1016/j.gecco.2022.e02314>
- Phuong, Đ. H. (2013). Các loài thú ghi nhận ở khu bảo tồn thiên nhiên Xuân Liên, tỉnh Thanh Hóa. *Tạp chí Sinh học*, 35, 26-33.
- Quốc, V. (2023). *Thiếu căn cứ pháp lý để bảo vệ loài cheo cheo lưng bạc.* <https://vnexpress.net/thieu-can-cu-phap-ly-de-bao-ve-loai-cheo-cheo-lung-bac-4666295.html>
- Reihana, K. R., Lyver, P. O. B., Gormley, A., Younger, M., Harcourt, N., Cox, M., . . . Innes, J. (2023). Me ora te Ngāhere: visioning forest health through an Indigenous biocultural lens. *Pacific Conservation Biology*. <https://doi.org/10.1071/PC22028>
- Sandalj, M., Treydte, A. C., & Ziegler, S. (2016). Is wild meat luxury? Quantifying wild meat demand and availability in Hue, Vietnam. *Biological Conservation*, 194, 105-112.
- Shairp, R., Veríssimo, D., Fraser, I., Challender, D., & MacMillan, D. (2016). Understanding urban demand for wild meat in Vietnam: implications for conservation actions. *PLOS ONE*, 11(1), e0134787. <https://doi.org/10.1371/journal.pone.0134787>
- Sử, N. K. (2023). *Các hoạt động kinh tế của cư dân Văn hóa Hòa Bình từ 20.000 đến 7.000 năm BP.* <https://baotanglichsu.vn/DataFiles/2023/09/News/Tieng%20Viet/20.9.2023/Thong%20bao%20khoa%20h%E1%BB%8Dc%20s%C3%B3%201%20nam%202023/008.pdf>
- Sử, N. K., Hung, L. X., Thảo, P. m. T. P., & Minh, N. n. T. (2020). Diễn trình văn hóa tiền sử hang C6-1 qua tư liệu khảo cổ học. *Tạp chí Khoa học và Công nghệ Việt Nam*, 62(10), 56-60. [https://b.vjst.vn/index.php/ban\\_b/article/view/834](https://b.vjst.vn/index.php/ban_b/article/view/834)
- Thiên Nhiên Đà Nẵng. (n.d.). *Đa dạng sinh học tại khu BTTN Bà Nà - Núi Chúa, Đà Nẵng.* [https://thiennhiendanang.vn/categories\\_detail/khu-bttn-ba-na-nui-chua.pdf](https://thiennhiendanang.vn/categories_detail/khu-bttn-ba-na-nui-chua.pdf)

- Thomas, O. (1910). Tree new Asiatic mammals. *The Annals and Magazine of Natural History*, 5, 534-536.
- Thuận, Đ. (2023). *Phát triển Văn hóa Âm thực Việt Nam thành Thương hiệu Quốc gia*. <https://www.vietnamplus.vn/phat-trien-van-hoa-am-thuc-viet-nam-thanh-thuong-hieu-quoc-gia-post899362.vnp>
- Tuấn, P. (2018). *Nhiều thú rừng được giải cứu khỏi quán nhậu ở Đồng Nai*. <https://vnexpress.net/nhieu-thu-rung-duoc-giai-cuu-khoi-quan-nhau-o-dong-nai-3785783.html>
- Van Song, N. (2008). Wildlife trading in Vietnam: situation, causes, and solutions. *The Journal of Environment and Development*, 17(2), 145-165.
- Viên, L. (2020). *Tàng trữ, mua bán động vật rừng bị xử phạt 330 triệu đồng*. <https://thanhnien.vn/tang-tru-mua-ban-dong-vat-rung-bi-xu-phat-330-trieu-dong-185998086.htm>
- Vuong, Q.-H. (2020). From children's literature to sustainability science, and young scientists for a more sustainable Earth. *Journal of Sustainability Education*, 24(3), 1-12. <http://www.susted.com/wordpress/content/from-childrens-literature-to-sustainability-science-and-young-scientists-for-a-more-sustainable-earth-2020-12/>
- Vuong, Q.-H. (2021a). The semiconducting principle of monetary and environmental values exchange. *Economics and Business Letters*, 10(3), 284-290. <https://doi.org/10.17811/ebl.10.3.2021.284-290>
- Vuong, Q.-H. (2021b). Western monopoly of climate science is creating an eco-deficit culture. <https://www.landclimate.org/western-monopoly-of-climate-science-is-creating-an-eco-deficit-culture/>
- Vuong, Q.-H. (2022). *The kingfisher story collection*. <https://www.amazon.com/Kingfisher-Story-Collection-Quan-Hoang-Vuong-ebook/dp/B0BG2NNHY6>
- Vuong, Q.-H. (2023). *Meandering sobriety*. <https://www.amazon.com/dp/B0C2TXNX6L/>
- Vuong, Q.-H., & Nguyen, M.-H. (2023). Kingfisher: Contemplating the connection between nature and humans through science, art, literature, and lived experiences. *Pacific Conservation Biology*.
- Wang, C., Zhang, W., Li, X., & Wu, J. (2022). A global meta-analysis of the impacts of tree plantations on biodiversity. *Global Ecology and Biogeography*, 31(3), 576-587. <https://doi.org/10.1111/geb.13440>
- Warren-Thomas, E., Dolman, P. M., & Edwards, D. P. (2015). Increasing demand for natural rubber necessitates a robust sustainability initiative to mitigate impacts on tropical

biodiversity. *Conservation Letters*, 8(4), 230-241.  
<https://doi.org/10.1111/conl.12170>