

Biocultural conflicts: understanding complex interconnections between a traditional ceremony and threatened carnivores in north Kenya

MIQUEL TORRENTS-TICÓ, ÁLVARO FERNÁNDEZ-LLAMAZARES
DANIEL BURGAS, JOB GUOL NASAK and MAR CABEZA

Abstract Biological and cultural diversity are inextricably linked and rapidly eroding worldwide. As a response, many conservation efforts foster synergies between cultural and biological diversity agendas through biocultural approaches. However, such approaches do not always address biocultural conflicts, where certain cultural practices can lead to biodiversity loss and, in turn, threaten the continuance of such practices. In this study, we examined a biocultural conflict in the Dimi ceremony, the most important rite of passage of the Daasanach agro-pastoralists of north Kenya, in which skins from threatened carnivore species are used extensively as traditional ornaments. We quantified the current use of skins in Dimi as well as changes in the cultural ceremony that exacerbate its impacts on wildlife. We collected field-based data on the context of the use of skins through structured interviews, focus-group discussions, participant observation and counts of skins in two Dimi ceremonies. We counted a total of 121 skins of four carnivore species being used in a single ceremony. We also found that Dimi has become environmentally unsustainable, threatening distant cheetah *Acinonyx jubatus* and leopard *Panthera pardus* populations and local species with spotted skins (African civet *Civettictis civetta*, common genet *Genetta genetta* and serval *Leptailurus serval*). The young Daasanach are deeply concerned about the lack of availability of skins in their area, as well as the prohibitive prices, and they are calling for alternatives to the use of skins in Dimi. Overall, our study shows that acknowledging biocultural conflicts and opening space for dialogue with local communities are

essential for the maintenance of both biological and cultural diversity.

Keywords Biocultural diversity, conservation conflicts, Daasanach, Dimi, Indigenous peoples and local communities, Kenya, social-ecological systems, traditional ceremony

Supplementary material for this article is available at doi.org/10.1017/S0030605322000035

Introduction

There is increasing recognition both in policy and scholarship that biocultural approaches to conservation offer effective and just models for addressing biological and cultural diversity losses simultaneously (Sterling et al., 2017; Hill et al., 2019; Hanspach et al., 2020). Biocultural approaches have been defined as ‘conservation actions made in the service of sustaining the biophysical and sociocultural components of dynamic, interacting and interdependent social-ecological systems’ (Gavin et al., 2015, p. 140). These approaches build on the idea that biological and cultural diversity are intricately intertwined, have possibly coevolved and are threatened by the same pressures (Maffi, 2005; Rozzi, 2012; Fernández-Llamazares et al., 2020a).

Indigenous peoples and local communities (i.e. ‘ethnic groups who are descended from, and identify with, the original inhabitants of a given region, in contrast to groups that have settled, occupied or colonized the area more recently’; Lyver et al., 2019a, p. 771) have traditionally stewarded large areas with high levels of biological and cultural diversity (Brondizio & Le Tourneau, 2016; Garnett et al., 2018), both of which are largely dependent on Indigenous and local knowledge systems, stewardship practices, customary institutions and cultural ties to land (Jones et al., 2008; Cámara-Leret et al., 2019). For instance, there is increasing evidence that many wildlife species benefit from the cultural practices of Indigenous peoples and local communities (e.g. Infield et al., 2018), such as customary taboos (e.g. Baker et al., 2018; Yuliani et al., 2018), spiritual beliefs (e.g. Sommer, 2002; Holmes et al., 2018) or rules regulating access to sacred natural sites (e.g. Gupta et al., 2016; Fernández-Llamazares et al., 2018).

Although biocultural approaches to conservation have traditionally focused on those cultural practices of Indigenous peoples and local communities that effectively

MIQUEL TORRENTS-TICÓ* (Corresponding author, orcid.org/0000-0002-6580-5016, miquel.torrents-tico@helsinki.fi), ÁLVARO FERNÁNDEZ-LLAMAZARES* (orcid.org/0000-0002-7813-0222) and MAR CABEZA* (orcid.org/0000-0002-7410-7631) Global Change and Conservation, Organismal and Evolutionary Biology Research Programme, Faculty of Biological and Environmental Sciences, University of Helsinki, PO Box 65, 00014, Helsinki, Finland

DANIEL BURGAS† (orcid.org/0000-0003-3512-8365) Department of Biological and Environmental Sciences, University of Jyväskylä, Jyväskylä, Finland

JOB GUOL NASAK Member of the Daasanach Community, Ileret Ward, Marsabit County, Kenya

*Also at: Helsinki Institute of Sustainability Science, Faculty of Biological and Environmental Sciences, University of Helsinki, Helsinki, Finland

†Also at: School of Resource Wisdom, University of Jyväskylä, Jyväskylä, Finland

Received 23 July 2021. Revision requested 3 November 2021.

Accepted 20 January 2022. First published online 20 June 2022.

This is an Open Access article, distributed under the terms of the Creative Commons Attribution licence (<https://creativecommons.org/licenses/by/4.0/>), which permits unrestricted re-use, distribution, and reproduction in any medium, provided the original work is properly cited.

Oryx, 2023, 57(4), 435–444 © The Author(s), 2022. Published by Cambridge University Press on behalf of Fauna & Flora International doi:10.1017/S0030605322000035

<https://doi.org/10.1017/S0030605322000035> Published online by Cambridge University Press

support biological diversity, there are also examples in which certain cultural practices can lead to biodiversity loss (Dold & Cocks, 2002; Dickman et al., 2015). Although the environmental impacts of the cultural practices of Indigenous peoples and local communities are not comparable to the devastating environmental effects of large-scale industrial development and resource extraction (Díaz et al., 2019), there are nevertheless examples of cultural practices that have exacerbated declines of wildlife species. For instance, the use of wildlife species is deeply entrenched in many traditional ceremonies, where such species are largely used as offerings (e.g. Moazami, 2005), parts of musical instruments (e.g. Sakakibara, 2009; Ryan, 2015), food (e.g. Peres & Nascimento, 2006; Fausto, 2007; Sirén, 2012), for decoration and ornamental purposes (e.g. Oldfield, 2001; Pedersen, 2004; Bagniewska & MacDonald, 2010) or for traditional clothing (e.g. Hunter et al., 2013).

Although all cultural practices of Indigenous peoples and local communities are important constituents of our rich cultural tapestry, some practices can become unsustainable through complex and mutually reinforcing pathways, including external drivers leading to the fracturing of traditional values and stewardship systems (Fernández-Llamazares et al., 2021) and internal drivers changing the demand for and procurement of wildlife for such practices (Dickman et al., 2015). These pressures can be exacerbated by the erosion of traditional knowledge systems and a growing disconnection between people and nature, as well as changes in the symbolic meanings of the practices themselves (Lyver et al., 2019a).

Here, we introduce the term 'biocultural conflicts' to describe those social-ecological contexts where certain cultural practices of Indigenous peoples and local communities are in direct conflict with wildlife conservation and where the risk of losing certain wildlife species threatens, in turn, the cultural continuity of such practices (e.g. Bennett et al., 1997). Such conflicts are largely contingent upon complex compromises between different stake-, knowledge- and rights-holders with diverse worldviews (Manfredo, 2008). Top-down conservation approaches have often marginalized Indigenous peoples and local communities and criminalized their cultural practices, thereby putting pressure on their long-term and intimate relationships with their local ecologies and undermining the social legitimacy of conservation action (Lyver et al., 2019b; Fernández-Llamazares et al., 2020b). In other contexts, certain cultural practices of Indigenous peoples and local communities have been protected as part of cultural preservation plans despite the fact that they sometimes impinge negatively on biological diversity (see Dickman et al., 2015, for a discussion). These separate conservation agendas are inefficient, spreading limited resources thinly, potentially opposing each other and creating conflicts that perpetuate losses of diversity (Lyver et al., 2019a; Fernández-Llamazares et al., 2021).

Here, we bring into focus the existence of a biocultural conflict in a traditional coming-of-age ceremony, the Dimi



FIG. 1 Location of the study area in north Kenya, adjacent to Sibiloi National Park.

ceremony, practised by the Daasanach agro-pastoralists of north Kenya, in which the ceremonial use of skins of threatened carnivore species plays a fundamental cultural role. Our research has three objectives: (1) to quantify the current use of carnivore skins in this traditional rite of passage, (2) to explore changes in this ceremony that could exacerbate biocultural conflicts, and (3) to identify local concerns regarding such conflicts and opportunities to support biological and cultural diversity simultaneously in the context of this ceremony.

Study area

We conducted our study in the northern area of Sibiloi National Park (hereinafter 'Sibiloi'), in Marsabit District, north Kenya (Fig. 1). Sibiloi covers 1,570 km² and was established as a National Park in 1973 to protect its renowned palaeontological sites and its wildlife, including two carnivore species threatened worldwide: cheetah *Acinonyx jubatus* (Plate 1c) and leopard *Panthera pardus*. A recent study combining scientific and Indigenous and local knowledge showed that occurrences of the cheetah and leopard in Sibiloi are alarmingly low, with decreasing population trends (Torrents-Ticó et al., 2021). CITES lists these species in Appendix I, which includes species threatened with extinction and for which trade is permitted only in exceptional circumstances (CITES, 2021).

Since 1977 there has been a nationwide ban on wildlife hunting across Kenya, and any ownership of wildlife products without a licence or documentation is strictly prohibited by law (Republic of Kenya, 1977). However, the last report from the IUCN Conservation Outlook Assessment

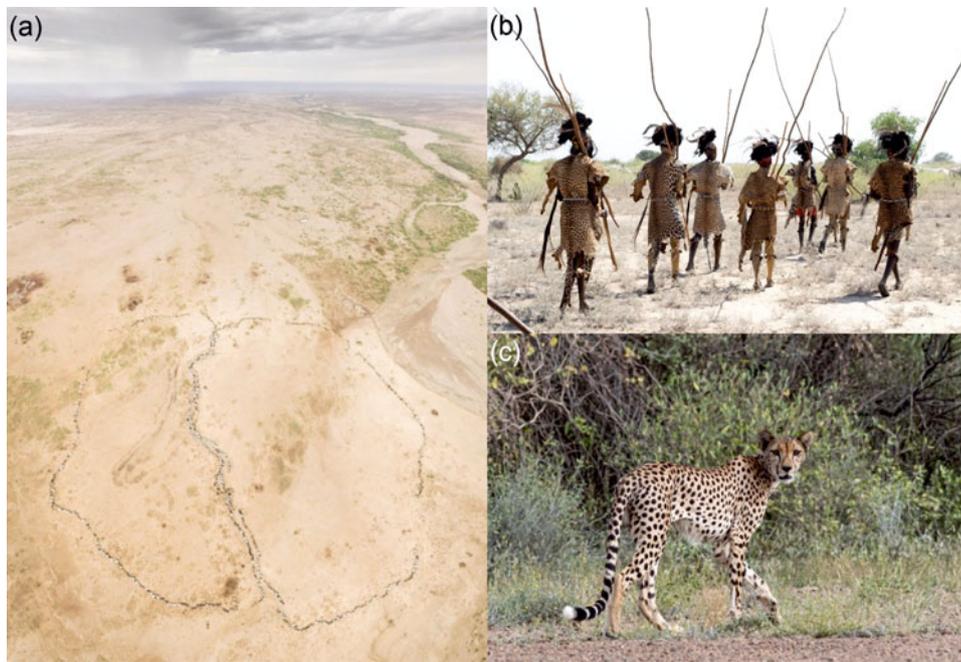


PLATE 1 (a) Aerial image of a Dimi ceremony in February 2018, with huts forming two circular dispositions. (b) Example of men wearing headdresses of black ostrich feathers, giraffe or oryx tails, and carnivore skins (either of cheetahs or leopards) tied at the waist with a wide belt of beads. (c) Cheetah photographed in Sibiloi National Park (February 2020). Photos: D. Burgas.

suggested that poaching is a serious threat to the ecosystems in Sibiloi and is responsible for the decline and local extirpation of prominent wildlife species (IUCN, 2020).

The Daasanach people are considered to be an agro-pastoral society (Almagor, 1978), herding cattle, sheep and goats and opportunistically growing maize and sorghum in flooded plains. They extend between South Sudan, south Ethiopia and north Kenya, occupying the northern shores of Lake Turkana and the lower stretch of the Omo River valley and its delta. In this study, we focused on the Kenyan Daasanach (locally known as *Gál urru*, ‘people from the south’), who number c. 17,000 people (KNBS, 2019). They live in the area around Ileret (Fig. 1) and have received much less scholarly attention than the Ethiopian Daasanach (*Gál meles*, ‘people from the north’). Wildlife holds strong socio-cultural values among the Daasanach community, as exemplified by their traditional ceremonies, in which customary uses of several wildlife species are prominent (Torrents-Ticó et al., 2021).

The Dimi ceremony (hereinafter Dimi) is the main traditional coming-of-age ceremony of the Daasanach community (Hazel, 2000; Houtteman, 2011). According to customary law, every Daasanach man who fathers a daughter should undergo Dimi before his first-born daughter reaches puberty (i.e. 8–10 years old), blessing in this way her fertility and future marriage. The blessing is extended to all of his daughters, even those still to be born. Dimi is a non-negotiable precondition for the marriage of a Daasanach man’s daughters. Moreover, in the Daasanach culture, fathering a daughter and afterwards participating in Dimi is the only way in which a man can acquire the status of an elder and become a true and respected member of the Daasanach community.

The ceremony lasts several weeks and takes place in a temporary village arranged in two circular dispositions that follow the generational division of the Daasanach community (Plate 1a; Houtteman, 2011). Dimi is a time of singing, dancing and feasting (Almagor, 1983). Each man contributes varying numbers of livestock including goats, sheep and bulls (Almagor, 1978). During chants and slaughtering events, Dimi participants must exhibit several traditional ornaments of wildlife origin. When the chants and slaughtering events conclude, such ornaments must be hung visibly on standing poles that are placed in front of the hut of each Dimi participant. Men are required to wear black ostrich *Struthio molybdophanes* feathers as headdresses, giraffe *Giraffa camelopardalis* or oryx *Oryx beisa* tails as arm ornaments and, in particular, spotted skins from cheetahs or leopards as capes (Plate 1b). In the Daasanach language, both cheetahs and leopards are collectively referred to as *muor* (although specific names also exist for each species), a term that has a strong association with strength and prosperity (Houtteman, 2011). A traditional saying in the Daasanach language, *Áiy hé muor hí ‘jie* (the leopard has entered into your goats and sheep), associates the leopard’s reported behaviour of killing goats and sheep with a Dimi participant’s obligation to slaughter livestock and wear a leopard skin.

Methods

Data collection

This research uses 6 years of in-depth field-based ethnographic engagement with the Kenyan Daasanach community (February 2016–April 2021). We used data and insights

derived from different research methods: skin counts, structured interviews, participant observation and focus-group discussions. With explicit permission from the Daasanach Council of Elders, we participated in two Dimi ceremonies (February 2018 and April 2021).

Skin counts

In each ceremony, we walked slowly following the two circular dispositions of the huts (Plate 1a), counting the total number of skins hanging on poles, identifying the species and characterizing each skin's age. For each skin, at least two observers and one of them a member of the Daasanach community (AF-LL, MC, MT-T and JGN) independently identified the species and the skin's age. We classified skin age as fresh (< 1 year old) or old (> 1 year old) based on each skin's rigidity, the extent of its discolouration and the presence of rips, holes or patches. Those skins that have been used in at least one Dimi are often in poor condition (damaged by extensive exposure to sun, strong winds and dust) and are relatively easy to differentiate visually from those that are being used for the first time. We found no inter-observer variation and a full consensus was reached for all skins.

Structured interviews

In February 2019 and March 2020 we (JGN and MT-T) carried out 131 short, structured face-to-face interviews with men who celebrated Dimi in three villages of the Ileret Ward bordering the north of Sibilo. The interviews lasted < 10 min and comprised four sections (Supplementary Material 1): (1) year and location of Dimi, (2) species of skin used (i.e. cheetah, leopard), (3) estimated age of the skin (i.e. old or fresh) as reported by the informants, and (4) origin and cost of the skin (i.e. bought or rented, hunted, borrowed or inherited). We acknowledge that asking directly about skins could introduce a bias, with either under-reporting of hunting (because of its illegal nature) or over-reporting of hunting (as a traditional sign of strength and bravery). However, we are confident in our results, which stem from a strong, genuine and long-lasting relationship of trust with the community. Under-reporting is unlikely as the Daasanach people all spoke openly and proudly showed their skins to us. Over-reporting is probably dismissible as the Daasanach people openly explained the difficulties of hunting cheetahs and leopards in the area. Furthermore, it is difficult to misreport such a rare and culturally significant act in front of a community member. We categorized a skin as 'being inherited or borrowed' when it was received or obtained from close relatives and there was no direct payment or fee involved. We grouped skins as 'being rented or bought' when there was a monetary

transaction involved. Daasanach informants were free to indicate they 'did not know', 'did not remember' or 'did not want to answer' in response to any question.

Participant observation

We carried out informal conversations to explore local concerns about the future of Dimi and to use the participants' own words as the basis for learning about their culture and how they rationalize the traditional ceremony and its inherent impacts on wildlife. In each ceremony, we collected substantial qualitative observations on the cultural practices and social dynamics of the celebration.

Focus-group discussions

We (JGN and MT-T) carried out two focus-group discussions, in March 2020 and April 2021. A total of 20–30 adults (men and women) of different ages (17–70 years) attended the discussions. The focus-group discussions were in Daasanach language, lasted c. 1 h and focused on how participants perceive Dimi. We obtained qualitative narratives from the open discussions, allowing us to complement and contextualize our data collected through structured interviews.

Interpretation and positionality

We collaborated with the Daasanach community throughout the project, to understand Dimi and reflect constructively on its social dynamics. JGN, who participated in data collection, is Daasanach, and helped ensure our interpretations accurately reflect the social-ecological context in which Dimi takes place. However, we do not speak on behalf of the Daasanach community. We acknowledge that most of the authors are non-Indigenous scholars trained in conservation research and we therefore emphasize that this article reflects only a situated and partial interpretation of this traditional practice.

Results

Biocultural conflict: use of carnivore skins

We counted 204 skins across both ceremonies. Although both ceremonies we attended had c. 100 skins each, the larger number of skins in 2021 compared to 2018 (Table 1) is in line with a growing trend in numbers of participants (see Patterns of change section). Species and skin age distributions were consistent across both years. Most of the skins were of cheetahs and leopards (Table 1, Plate 2a,b) but a small per cent were of African civet *Civettictis civetta*,

TABLE 1 Species, with Red List category and population trend (IUCN, 2021), number and age (fresh or old; see Methods section) of carnivore skins observed during two Dimi ceremonies (February 2018 and April 2021).

Species	Daasanach name	Red List		Dimi 2018			Dimi 2021		
		Category ¹	Population trend	n	Fresh (%)	Old (%)	n	Fresh (%)	Old (%)
Leopard <i>Panthera pardus</i>	<i>Mo'r dhatka'</i>	VU	Decreasing	32	9	91	60	37	63
Cheetah <i>Acinonyx jubatus</i>	<i>Gosoch</i>	VU	Decreasing	36	0	100	51	12	88
Serval <i>Leptailurus serval</i>	<i>Kelbet muoriet</i>	LC	Stable	13	46	54	8	75	25
Common genet <i>Genetta genetta</i>	<i>Namerisia</i>	LC	Stable	0	0	0	2	100	0
African civet <i>Civettictis civetta</i>	<i>Naberewosin</i>	LC	Unknown	2	100	0	0	0	0
<i>Total</i>				83	13	87	121	30	70

¹LC, Least Concern; VU, Vulnerable.



PLATE 2 Skins of species used in Dimi ceremonies: (a) cheetah *Acinonyx jubatus*, (b) leopard *Panthera pardus*, (c) serval *Leptailurus serval*, (d) African civet *Civettictis civetta*, and (e) common genet *Genetta genetta*, with ostrich *Struthio molybdophanes* feather headdresses (a–d). Photos: D. Burgas.

common genet *Genetta genetta* and serval *Leptailurus serval* (Table 1, Plate 2c–e). Most (83%) of the cheetah and leopard skins were old, whereas most (64%) of the civet, genet and serval skins were fresh (Table 1).

The majority of the 131 informants (96%) reported having used cheetah or leopard skins exclusively during their participation in Dimi (Table 2), none of them reported having used civet, genet or serval skins, and 74% reported having used fresh skins, 24% reported having used old skins and 2% did not know the age of the skins (Table 2). Additionally, although 60% of the 131 informants reported having bought or rented the skins, 27% reported having borrowed or inherited them from a relative and 13% reported having hunted the animals themselves (Table 2).

Patterns of change

All informants unanimously agreed that the traditional Dimi has significantly changed over time (Table 3). Although for this study we focused specifically on changes concerning the use of carnivore skins, we note two broader changes that could exacerbate the biocultural conflict of the ceremony: the increasing frequency of Dimi ceremonies and the rising number of participants in a single ceremony (Table 3; see Supplementary Material 2 for a detailed ethnographic account of other changes taking place).

Many informants reported that historically Dimi took place exclusively in Ethiopia every 5–6 years, but there has been an increase in the frequency of Dimi ceremonies, with them taking place every year or every second year in Kenya

TABLE 2 Summary of the origins of the skins used by Daasanach informants during their participation in the Dimi ceremony (see Methods for details) and ages of the skins used, as estimated by the informants (see Methods for details).

Species	n	Origin			Age		
		Borrowed or inherited (%)	Bought or rented (%)	Hunted (%)	Fresh (%)	Old (%)	Unknown (%)
Cheetah	39	15	70	15	85	13	2
Leopard	87	33	55	12	71	28	1
Unspecified	5	20	60	20	40	40	20
<i>Total</i>	131	27	60	13	74	24	2

TABLE 3 Summary of changes in the Dimi ceremony as perceived by the Kenyan Daasanach community (see Supplementary Material 2 for a detailed ethnographic account of other changes to the Dimi ceremony).

	Before the 21st century	21st century
Changes in wildlife-based products		
Skins used by men	Only cheetahs & leopards	Cheetahs, leopards & other spotted animals (civets, genets, servals)
Origin	Hunted or inherited	Rented or bought
Sourcing	Daasanach from Ethiopia & Kenya	Daasanach community & other neighbouring ethnic groups (Turkana, Gabra) & in distant markets (Loiyangalani, Marsabit, Moyale)
Skin rent prices	KES 400	KES 3,000–5,000
Other wildlife ornaments	Giraffe or oryx tails & ostrich feathers	Mostly horse tails & ostrich feathers
Symbolic meaning of skins	Bravery & livestock prosperity	Largely unknown by the Daasanach youth
Other changes¹		
Frequency	5–6 years	1–2 years
Number of participants	Small	Large (> 100)
Duration	60–90 days	> 90 days
Location	Only Ethiopia	Ethiopia & Kenya
Timing	Dry season	All year
Goats & sheep slaughtered	Before 2000: 15–20	2021: > 32
Bulls slaughtered	6–7 big bulls	6–7 small bulls

¹These changes are discussed in more detail in Supplementary Material 2.

and Ethiopia, and with an increasing number of participants (Table 3). We observed that during 2016–2021 at least five Dimi ceremonies took place in Kenya and five in Ethiopia. Such increases in the frequency of Dimi ceremonies and in the number of Dimi participants (paralleling rapid population growth in the area) are at the core of the rising demand for skins.

Most of our informants reported significant shifts in the use of skins (Table 3). Elders explained that historically participants mostly inherited the skins from their relatives or hunted cheetahs or leopards to obtain the skins. Such killings represented an important means for young Daasanach to attain manhood and gain social status (i.e. by demonstrating strength and bravery). Today, most Daasanach noted that human population growth and wildlife decreases have forced them to acquire skins in novel ways (Table 3). The majority of our informants reported having bought or rented their skins within the Daasanach community but some also reported having acquired them from neighbouring ethnic groups (e.g. Gabra, Turkana) and in distant markets such as Loiyangalani and Marsabit in Kenya and

Moyale in Ethiopia (Table 3, Fig. 1). Elders conceded that rental prices have risen from KES 400 for cheetah and leopard skins before 2000 to KES 3,000–5,000 in 2021 (exchange rate USD 1 ≈ KES 107 in 2021), which represents a considerable increase, even when taking inflation into account over this period. The increasing monetary value of the skins is illustrated in the following quote from a Daasanach man: ‘Nowadays having a skin is like having a bank account, because you can rent it every year.’ Skins can be bought at c. KES 10,000–15,000 or by trading a bull. Only a few Daasanach still hunted for skins locally or borrowed or inherited them from close relatives at no cost (Table 2).

According to our informants, Dimi participants used to wear cheetah and leopard skins exclusively (Table 3). Cheetah and leopard skins are still the most widely used (Table 1) and most appreciated skins, but participants who cannot find or cannot afford to pay for these high-rank skins can, as a last resort, use skins from other, less valued, spotted species (Plate 2c–e). However, these are not openly accepted by the community and most elders view them with disdain. Less valued skins (i.e. civet, genet, serval) are cheaper

(rented at c. KES 1,500) but we suspect that in most cases they are sold or rented misleadingly as leopard or cheetah skins.

The majority of our informants admitted that they wear cheetah and leopard skins in Dimi because their fathers and grandfathers did but that they did not know the cultural meaning of this practice. A few informants explained that wearing a carnivore skin is associated with the public display of bravery of a man capable of killing an adversary and protecting his daughters (Table 3). The elder leader (*Karsich*) of the 2021 Dimi provided an extended explanation in which the high number of spots on the cheetah and leopard capes is meant to invoke a large cattle herd in the future (i.e. blessing the man's future livestock).

Daasanach concerns regarding use of skins

Overall, we found that young Daasanach were generally more concerned about the availability and affordability of skins than their elders. 'Do you want to stop Dimi?' an elder asked a young man in one of our focus-group discussions. The young man replied, 'No, but I do not know how I am going to find a skin. Now there are less cheetahs and leopards, and every friend I have needs the skin for Dimi, and even if I can buy it, it is too expensive. What am I going to do when my daughter is old enough? Without the skin, I cannot do Dimi.' This quote illustrates the reality faced by a large number of young Daasanach who cannot afford the escalating costs of skins (Table 3). Elders pressure younger generations by insisting that every man must wear a cheetah or leopard skin for Dimi and highlighting that without such skins men cannot become elders, their daughters cannot get married and both could eventually be outcast.

Regarding the future of Dimi, two innovations were discussed to perpetuate the ceremony without impinging negatively on wildlife. Firstly, some community members proposed the creation of a wildlife skin storage facility where carnivore skins could be registered, stored, restored (if necessary) and loaned for Dimi. However, in our focus groups, some elders expressed scepticism regarding this initiative, noting that the skins were now safe in the hands of Daasanach people and that placing them in a storage centre could eventually mean the loss of their control over these skins. 'Now I know who has the skins, so I just need to ask people when I need them. If skins are in a storage room, who should I ask then?' an elder said in one of the focus groups. In general, elders expressed mistrust regarding such initiatives given the illegal nature of skin ownership and the probable involvement of national organizations.

Secondly, young community members who regularly work with NGOs and research institutions operating in the area raised the idea of progressively transitioning from real carnivore skins to synthetic replicas. Although some elders expressed resistance to such an initiative, others

asserted that this could help to solve some of the current issues regarding the availability and affordability of wildlife skins. According to some, this transition could parallel other changes already taking place in the community. For instance, giraffe and oryx tails have been gradually replaced by horse tails because both species have become extinct locally (Table 3). Similarly, although not openly accepted by the community, other local species with spotted skins, which had not been previously used (Table 1, Plate 2c–e), are now being used instead of cheetah and leopard skins. According to our informants, if such changes are to some extent tolerated by the community, others could follow suit.

Discussion

Our study explores the existence of a biocultural conflict in the social setting of the Dimi ceremony of the Daasanach community of north Kenya, where the ceremonial use of carnivore skins as ornaments poses major challenges to wildlife conservation and jeopardizes the continuation of this cultural festivity. We found up to 121 carnivore skins being used in a single Dimi and that the use of such skins remains an essential condition for the celebration of this ceremony. We also documented how the Dimi celebration is a hallmark of the Daasanach cultural identity and community belonging and plays a crucial role in the transmission of the cultural heritage of the Daasanach people (Supplementary Material 2) despite the fact that it impinges negatively on threatened wildlife.

Significant changes related to the use of skins are acknowledged by the Daasanach community. These changes are driven by multifaceted social-ecological pressures such as human population growth (Houtteman, 2011) and defaunation (Torrents-Ticó et al., 2021), which threaten the celebration of Dimi as currently practised. Additionally, risks in relation to the ownership and trade of wildlife-based products, both of which are illegal in Kenya (Republic of Kenya, 2013), also limit the perpetuation of this rite of passage. Killing of threatened species such as the cheetah and leopard is punishable with penalties of KES > 20 million (minimum), life imprisonment or both (Section 92, Republic of Kenya, 2013). Similarly, any trading, importing or exporting of wildlife in Kenya is subject to a minimum penalty of KES 1 million or at least 2 years in prison (Section 99, Republic of Kenya, 2013). Yet despite the severity of these penalties, to the best of our knowledge, no member of the Daasanach community has ever been fined or prosecuted for hunting cheetahs and leopards or for owning their skins.

Many Daasanach argue that Dimi has become untenable at the socio-cultural level given the low availability of skins and their prohibitive prices. Increasing disagreements between elders and youth regarding this celebration also

reflect cultural tensions regarding its sustainability (or lack thereof). In ecological terms, Dimi has become unsustainable, with cheetah and leopard populations being locally depleted and a consequent spatial displacement of threats to cheetah and leopard populations elsewhere to meet the increasing demand for skins (Tables 1 & 3). The transition to non-traditionally used spotted species that are more common locally (Tables 1 & 3) could also be another symptom of the unsustainability of Dimi.

We found two points of mismatch between skin counts and informants' responses. On the one hand, pastoralists and researchers could have different perceptions regarding which skins are old or fresh. Thus, although cheetah and leopard skins were mostly categorized as old during the skin counts (Table 1), most Daasanach informants said they used fresh skins (Table 2). On the other hand, despite the use of skins of species such as civets, genets and servals (Table 1, Plate 2c–e), no Daasanach openly recognized their use during interviews (Table 2). The extended erosion of the symbolic meaning of the traditional use of skins in Dimi (Table 3), as reported in many of our conversations, could explain this mismatch. Firstly, decreasing contact with wildlife, particularly with carnivores because of their low abundance (Torrents-Ticó et al., 2021), could reduce local knowledge of wildlife, and thus some pastoralists might not be able to differentiate between species with similar skin patterns (e.g. cheetahs, leopards, servals). Secondly, as some of these skins were reportedly purchased from elsewhere, it is plausible that any skin with a spotted pattern could be sold or rented misleadingly as the more expensive and more appreciated cheetah and leopard skins. Thirdly, some Daasanach could be ashamed or unwilling to accept publicly that they are wearing skins considered to be of inferior quality.

The need to align Daasanach cultural practices and the ecological context that supports them is unquestionable. Under Kenyan legislation, specifically the Protection of Traditional Knowledge and Cultural Expressions Act (No. 33 of 2016), communities are entitled to rights to conserve their cultural heritage if it is properly registered, recorded and regularized. Some community members are hopeful that such a legal framework could eventually facilitate the regularization of skin ownership. Although elders were reluctant to change their cultural practices regarding the use of wildlife skins, younger generations, especially highly educated community members, were aware that the loss of wildlife alters the foundations of Dimi in terms of how it has been traditionally practised. They proposed several initiatives that could simultaneously support the continuance of their cultural practices and wildlife conservation. The organization and coordination of a system of storage, preservation and loan of skins for ceremonial uses could reduce both demand and market prices for skins, yet we recognize the existence of potential challenges regarding the

administration of such a facility and the possible obstacles that could appear with its creation (e.g. confiscation, disenfranchisement).

In relation to calls to transition from authentic wildlife skins to synthetic skins, a project undertaken by the conservation group Panthera has helped replace leopard fur capes worn by members of the Nazareth Baptist (Shembe) Church in South Africa with synthetic fur capes (France-Pressé, 2014; Naude et al., 2020). However, the promotion and use of synthetic wildlife products is a complex topic (e.g. Chen, 2017). Although some technological companies defend the idea of using synthetic wildlife products as an anti-poaching measure (e.g. Corbyn, 2015), some conservation groups have asserted that such initiatives could promote poaching by driving demand for real wildlife products (e.g. Save the Rhino International & International Rhino Foundation, 2016).

In this biocultural conflict in north Kenya the protection of local carnivore populations clashes with the celebration of a ceremony that is key to the cultural identity of an agropastoralist group. However, many young community members acknowledged that without protecting the carnivore species that are used in the ceremony or without adaptations to the ceremony's requirements, the practice itself could be threatened. Young community members are receptive to alternatives, yet the solutions discussed are not straightforward and will require the involvement of many different actors and the opening of space for communication and trust across different organizational levels and amongst the Daasanach.

Our study highlights the importance of adopting biocultural approaches to conservation and of recognizing explicitly that conflicts between cultural and biological diversity agendas can arise and merit both scholarly and policy attention. Understanding the social-ecological dimensions of such conflicts is fundamental to supporting the conservation of biocultural heritage. Although our study is specific to its context, it yields insights that are potentially applicable to similar social-ecological contexts elsewhere. Conservation practitioners need to consider biocultural conflicts and find solutions that can maintain cultural practices in ways that do not undermine the ecological fabric on which they are based.

Acknowledgements This research received funding from the Finnish National Agency for Education (EDUFI fellowship) and the Doctoral Programme in Interdisciplinary Environmental Sciences of the University of Helsinki, Finland. We thank the Daasanach community for sharing their time and knowledge; the Daasanach Council of Elders and the Ileret Ward for allowing us to carry out this research; the National Commission for Science, Technology and Innovation and Kenya Wildlife Service for granting access to the area; Turkana Basin Institute for their logistical support; A. Brias-Guinart, I. Härmä and V. Koiso-Kanttila for insightful discussions and ideas; and two anonymous reviewers for helpful comments. The open access publication fee for this research was covered by the Helsinki University Library.

Author contributions Study conception and design: MT-T, AF-LL, DB, MC; input on local context: JGN; fieldwork: MT-T, AF-LL, DB, JGN, MC; data analysis, writing: MT-T, AF-LL; revision and editing: MT-T, AF-LL, DB, JGN, MC.

Conflicts of interest None.

Ethical standards This research was authorized by the Kenya Wildlife Service (KWS/BRM/5001) and Kenya's National Commission for Science, Technology and Innovation (NACOSTI/P/18/21446/20296), adhered to the Code of Ethics of the Society for Conservation Biology and abided by the *Oryx* guidelines on ethical standards. We obtained written permission to develop this project from the Ileret Ward (the main administrative authority in the area) and the Chief of Ileret, obtained free, prior and informed consent from each individual involved in the study, guaranteed anonymity, confidentiality and data protection through all phases of this project and discussed the results with the community. Our research design complies with the guidelines of the Ethical Review Board in the Humanities and Social and Behavioural Sciences of the University of Helsinki.

References

- ALMAGOR, U. (1978) *Pastoral Partners: Affinity and Bond Partnership among the Dassanetch of South-West Ethiopia*. Manchester University Press, Manchester, UK.
- ALMAGOR, U. (1983) Charisma fatigue in an East African generation-set system. *American Ethnologist*, 10, 635–649.
- BAGNIEWSKA, J. & MACDONALD, D. (2010) *Executive Summary of the Report Animal Welfare, International Development, Biodiversity Conservation—The Road to Peaceful Coexistence*. Wildlife Conservation Research Unit of the University of Oxford, Oxford, UK.
- BAKER, L., TANIMOLA, A. & OLUBODE, O. (2018) Complexities of local cultural protection in conservation: the case of an Endangered African primate and forest groves protected by social taboos. *Oryx*, 52, 262–270.
- BENNETT, E.L., NYAOI, A.J. & SOMPUD, J. (1997) Hornbills *Buceros* spp. and culture in northern Borneo: can they continue to co-exist? *Biological Conservation*, 82, 41–46.
- BRONDIZIO, E.S. & LE TOURNEAU, F.-M. (2016) Environmental governance for all. *Science*, 352, 1272–1273.
- CÁMARA-LERET, R., FORTUNA, M.A. & BASCOMPTÉ, J. (2019) Indigenous knowledge networks in the face of global change. *Proceedings of the National Academy of Sciences of the United States of America*, 116, 9913–9918.
- CHEN, F. (2017) The economics of synthetic rhino horns. *Ecological Economics*, 141, 180–189.
- CITES (2021) *CITES Appendix I, II and III. Version of 22 June 2021*. [cites.org/sites/default/files/eng/app/2021/E-Appendices-2021-06-22.pdf](https://www.cites.org/sites/default/files/eng/app/2021/E-Appendices-2021-06-22.pdf) [accessed 3 March 2022].
- CORBYN, Z. (2015) Can we save the rhino from poachers with a 3D printer? *The Guardian*, 24 May 2015. [theguardian.com/environment/2015/may/24/artificial-3d-printed-fake-rhino-horn-poaching](https://www.theguardian.com/environment/2015/may/24/artificial-3d-printed-fake-rhino-horn-poaching) [accessed 25 February 2022].
- DÍAZ, S., SETTELE, J., BRONDIZIO, E.S., NGO, H.T., AGARD, J., ARNETH, A. et al. (2019) Pervasive human-driven decline of life on Earth points to the need for transformative change. *Science*, 366, eaax3100.
- DICKMAN, A., JOHNSON, P.J., VAN KESTEREN, F. & MACDONALD, D.W. (2015) The moral basis for conservation: how is it affected by culture? *Frontiers in Ecology and the Environment*, 13, 325–331.
- DOLD, A.P. & COCKS, M.L. (2002) The trade in medicinal plants in the Eastern Cape Province, South Africa. *South African Journal of Science*, 98, 589–597.
- FAUSTO, C. (2007) Feasting on people: eating animals and humans in Amazonia. *Current Anthropology*, 48, 497–530.
- FERNÁNDEZ-LLAMAZARES, Á., BENYEI, P., JUNQUEIRA, A.B. & REYES-GARCÍA, V. (2020a) Participation in biocultural diversity conservation: insights from five Amazonian examples. In *Participatory Biodiversity Conservation* (ed. C. Baldauf), pp. 165–183. Springer, Cham, Switzerland.
- FERNÁNDEZ-LLAMAZARES, Á., LEPOFSKY, D., LERTZMAN, K., ARMSTRONG, C.G., BRONDIZIO, E.S., GAVIN, M.C. et al. (2021) Scientists' warning to humanity on threats to Indigenous and local knowledge systems. *Journal of Ethnobiology*, 41, 144–171.
- FERNÁNDEZ-LLAMAZARES, Á., LÓPEZ-BAUCELLS, A., ROCHA, R., ANDRIAMITANDRINA, S., ANDRIATAFIKA, Z., BURGAS, D. et al. (2018) Are sacred caves still safe havens for the endemic bats of Madagascar? *Oryx*, 52, 271–275.
- FERNÁNDEZ-LLAMAZARES, Á., WESTERN, D., GALVIN, K.A., MCELWEE, P. & CABEZA, M. (2020b) Historical shifts in local attitudes towards wildlife by Maasai pastoralists of the Amboseli Ecosystem (Kenya): insights from three conservation psychology theories. *Journal for Nature Conservation*, 53, 125763.
- FRANCE-PRESSE, A. (2014) Zulu false dawn: Shembe faithful swap leopard skin for faux fur. *The Guardian*, 19 February 2014. [theguardian.com/world/2014/feb/19/zulu-shembe-leopardskin-south-africa](https://www.theguardian.com/world/2014/feb/19/zulu-shembe-leopardskin-south-africa) [accessed 25 February 2022].
- GARNETT, S.T., BURGESS, N.D., FA, J.E., FERNÁNDEZ-LLAMAZARES, Á., MOLNÁR, Z., ROBINSON, C.J. et al. (2018) A spatial overview of the global importance of Indigenous lands for conservation. *Nature Sustainability*, 1, 369–374.
- GAVIN, M.C., MCCARTER, J., MEAD, A., BERKES, F., STEPP, J.R., PETERSON, D. & TANG, R. (2015) Defining biocultural approaches to conservation. *Trends in Ecology & Evolution*, 30, 140–145.
- GUPTA, N., KANAGAVEL, A., DANDEKAR, P., DAHANUKAR, N., SIVAKUMAR, K., MATHUR, V. & RAGHAVAN, R. (2016) God's fishes: religion, culture and freshwater fish conservation in India. *Oryx*, 50, 244–249.
- HANSPACH, J., HAIDE, L.J., OTEROS-ROZAS, E., OLAFSSON, A.S., GULSRUD, N.M., RAYMOND, C.M. et al. (2020) Biocultural approaches to sustainability: a systematic review of the scientific literature. *People and Nature*, 2, 643–659.
- HAZEL, R. (2000) Segregating and timing generations social organization in Cushitic East Africa and beyond. *Zeitschrift für Ethnologie*, 125, 1–37.
- HILL, R., NATES-PARRA, G., QUEZADA-EUÁN, J.J.G., BUCHORI, D., LEBUHN, G., MAUÉS, M.M. et al. (2019) Biocultural approaches to pollinator conservation. *Nature Sustainability*, 2, 214–222.
- HOLMES, G., SMITH, T. & WARD, C. (2018) Fantastic beasts and why to conserve them: animals, magic and biodiversity conservation. *Oryx*, 52, 231–239.
- HOUTTEMAN, Y. (2011) *Living in the Navel of Waag: Ritual Traditions among the Daasanetch of South West Ethiopia*. Ghent University, Ghent, Belgium.
- HUNTER, L., HENSCHL, P. & RAY, J. (2013) *Panthera pardus* leopard. In *The Mammals of Africa (Volume V): Carnivores, Pangolins, Equids and Rhinoceroses* (eds J. Kingdon & M. Hoffman), pp. 159–168. Bloomsbury Publishing, London, UK.
- INFIELD, M., ENTWISTLE, A., ANTHEM, H., MUGISHA, A. & PHILLIPS, K. (2018) Reflections on cultural values approaches to conservation: lessons from 20 years of implementation. *Oryx*, 52, 220–230.
- IUCN (2020) *IUCN World Heritage Outlook 2. Lake Turkana National Parks, Kenya*. [worldheritageoutlook.iucn.org/explore/sites/wdpaid/145586](https://www.worldheritageoutlook.iucn.org/explore/sites/wdpaid/145586) [accessed 25 February 2022].

- IUCN (2021) *IUCN Red List of Threatened Species. Version 2021-3*. IUCN Species Survival Commission, Gland, Switzerland. iucnredlist.org [accessed 3 March 2022].
- JONES, J.P., ANDRIAMARVOLOLONA, M.M. & HOCKLEY, N. (2008) The importance of taboos and social norms to conservation in Madagascar. *Conservation Biology*, 22, 976–986.
- KNBS (2019) *Kenya Population and Housing Census Volume IV: Distribution of Population by Socio-Economic Characteristics*. Kenya National Bureau of Statistics, Nairobi, Kenya.
- LYVER, P.B., TIMOTI, P., DAVIS, T. & TYLIANAKIS, J.M. (2019a) Biocultural hysteresis inhibits adaptation to environmental change. *Trends in Ecology & Evolution*, 34, 771–780.
- LYVER, P.O.B., RURU, J., SCOTT, N., TYLIANAKIS, J.M., ARNOLD, J., MALINEN, S.K. et al. (2019b) Building biocultural approaches into Aotearoa–New Zealand’s conservation future. *Journal of the Royal Society of New Zealand*, 49, 394–411.
- MAFFI, L. (2005) Linguistic, cultural, and biological diversity. *Annual Review of Anthropology*, 34, 599–617.
- MANFREDO, M.J. (ed.) (2008) *Who Cares About Wildlife?* Springer, New York, USA.
- MOAZAMI, M. (2005) Evil animals in the Zoroastrian religion. *History of Religions*, 44, 300–317.
- NAUDE, V.N., BALME, G.A., ROGAN, M.S., NEEDHAM, M.D., WHITTINGTON-JONES, G., DICKERSON, T. et al. (2020) Longitudinal assessment of illegal leopard skin use in ceremonial regalia and acceptance of faux alternatives among followers of the Shembe Church, South Africa. *Conservation Science and Practice*, 2, e289.
- OLDFIELD, S. (2001) *The Trade in Wildlife: Regulation for Conservation*. Earthscan Publications Ltd, London, UK.
- PEDERSEN, M.C. (2004) *Gem and Ornamental Materials of Organic Origin*. Elsevier, Amsterdam, The Netherlands.
- PERES, C.A. & NASCIMENTO, H.S. (2006) Impact of game hunting by the Kayapó of south-eastern Amazonia: implications for wildlife conservation in tropical forest Indigenous reserves. *Biodiversity and Conservation*, 15, 2627–2653.
- REPUBLIC OF KENYA (1977) *The Wildlife Conservation and Management Act*. Cap. 376, Nairobi, Kenya.
- REPUBLIC OF KENYA (2013) *The Wildlife Conservation and Management Act 2013*. Kenya Gazette Supplement No. 181, Acts No. 47. Sixth Schedule, Nairobi, Kenya.
- ROZZI, R. (2012) Biocultural ethics: recovering the vital links between the inhabitants, their habits, and habitats. *Environmental Ethics*, 34, 27–50.
- RYAN, R. (2015) No tree—no leaf. In *Current Directions in Ecomusicology: Music, Culture, Nature* (eds A.S. Allen & K. Dawe), pp. 57–68. Routledge, Milton Park, UK.
- SAKAKIBARA, C. (2009) No whale, no music: contemporary Inupiaq drumming and global warming. *Polar Record*, 45, 289–303.
- SAVE THE RHINO INTERNATIONAL & INTERNATIONAL RHINO FOUNDATION (2016) *Synthetic rhino horn: will it save the rhino?* savetherhino.org/thorny-issues/synthetic-bio-fabricated-rhino-horn-will-it-save-the-rhino [accessed 25 February 2022].
- SIRÉN, A. (2012) Festival hunting by the Kichwa people in the Ecuadorian Amazon. *Journal of Ethnobiology*, 32, 30–50.
- SOMMER, V. (2002) In divine company. India’s temple monkeys. *BBC Wildlife*, 20, 50–56.
- STERLING, E.J., FILARDI, C., TOOMEY, A., SIGOUIN, A., BETLEY, E., GAZIT, N. et al. (2017) Biocultural approaches to well-being and sustainability indicators across scales. *Nature Ecology and Evolution*, 1, 1798–1806.
- TORRENTS-TICÓ, M., FERNÁNDEZ-LLAMAZARES, Á., BURGAS, D. & CABEZA, M. (2021) Convergences and divergences between scientific and Indigenous and local knowledge contribute to inform carnivore conservation. *Ambio*, 50, 990–1002.
- YULIANI, E., ADNAN, H., ACHDIAWAN, R., BAKARA, D., HERI, V., SAMMY, J. et al. (2018) The roles of traditional knowledge systems in orang-utan *Pongo* spp. and forest conservation: a case study of Danau Sentarum, West Kalimantan, Indonesia. *Oryx*, 52, 156–165.