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Of Rarity and Symbolism: Understanding Human Perceptions of Charismatic Color Morphs

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Abstract
Coloration in wildlife serves numerous biological purposes, including sexual selection signaling, thermoregulation, and camouflage. However, the physical appearance of wildlife also influences the ways in which humans interact with them. Wildlife conservation has largely revolved around humans' propensity to favor charismatic megafauna, but human perceptions of wildlife species extend beyond conservation measures into our everyday interactions with individual wildlife. Our aesthetic appreciation for different species interplays with culture, lore, and the economic interest they carry. As such, one characteristic that may underpin and interact with social drivers of perception is the coloration of a particular individual. We provide case studies illustrating the dynamism in interactions people have with conspicuously colored wildlife – i.e., individuals that vary from their species-typical coloration. We focus on melanism, leucism, and albinism across four species commonly thought of as pests in the United States: coyotes (*Canis latrans*), eastern gray squirrels (*Sciurus carolinensis*), white-tailed deer (*Odocoileus virginianus)*, and black-tailed deer (*O. hemionus*).

Keywords Melanism · Leucism · Albinism · Coloration · Human Perception · Human-wildlife Interactions

Introduction

Human-wildlife interactions have been documented throughout history and across cultures via wildlife-centric art, lore, superstitions, and stories. For example, the oldest known drawing of wildlife is 45,000 years old and depicts social interactions among Sulawesi warty pigs (*Sus celebensis*) (Brumm et al., 2021). Furthermore, the value people place on different species, which can be mediated by past experiences, folklore, media, utility, and psychological perceptions, informs the ways we interact with wildlife (Linnell et al., 2003; Dickman, 2010; Frank, 2016; Wilkinson, 2023). For instance, the reestablishment of wolves (*Canis lupus*) in Southern Scandinavia has incited public concern despite the infrequency of fatal attacks in the last 300 years (Linnell et al., 2003). Thus, our interactions with wildlife deeply influence our appreciation of and attitudes towards different species (Dickman, 2010; Wilkinson, 2023).

The connection humans have with wildlife can manifest into powerful reactions, both positive and negative. For instance, previous studies have shown that animals considered 'attractive' or 'charismatic' are often favored in conservation policies and practices compared to those considered unappealing (Stokes, 2007; Marešová & Frynta, 2008; Marešová et al., 2009; Frynta et al., 2010, 2011; Landová et al., 2012; Lišková & Frynta, 2013; Lišková et al., 2015;). Moreover, Wilkinson (2023) recently highlighted the powerful role human connection to species or individuals can have for the conservation of wildlife and ecosystems. These studies have provided pieces of a framework for understanding public attitudes towards wildlife species and their potential for shaping the interactions between humans and

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wildlife. Consequently, the species we ignore, consider a nuisance, attempt to domesticate, protect, and overexploit to extinction reflect our perceptions of their utility, appeal, or threat, among others (Perry et al., 2020; Schell et al., 2020; Basak et al., 2022). Yet, how individual coloration, which is vast and varied, may mediate our perceptions and appreciation of value of animals has rarely been examined.

As a visual species, one of the first characteristics that humans perceive about a species is its physical appearance, including its color (Messmer, 2000; Courchamp et al., 2006). Implications of color vary across cultures in folkloric stories featuring both wildlife and domestic animals (de Farias, 2020). In European folklore, domestic black cats (*Felis catus*) are perceived as omens of misfortune (Jones & Hart, 2020). Similarly, jaguars (*Panthera onca*) in Shipibo lore take on a variety of connotations based on coloration. Yellow jaguars are sometimes viewed as masculine, protective, diurnal, and/or more than human, whereas black jaguars are viewed as feminine, nocturnal, evil, associated with sorcery, and/or less than human (Saunders, 1998). Such perceptions frequently reflect a society's worldviews, for example, in the case of jaguars, on gender roles, and strongly influence our responses towards wildlife (Linnell et al., 2003; Dickman, 2010; Frank, 2016; Estien, 2023; Wilkinson, 2023).

While the coloration of wildlife may have important implications for humans such as facilitating spiritual/mystical connections, or aid in species identification, it also serves many important ecological roles (Mendoza et al., 2011; Legge & Robinson, 2017; Castillo-Huitrón et al., 2020). Coloration in wildlife evolved as a form of inter- and intraspecific communication, thermoregulation, and camouflage from predators or prey (Caro, 2005). While many species, especially mammals, often have a finite range of colors (Caro, 2005), individuals with rarer coloration can sometimes appear because of random mutations (Caro, 2005; Fertl & Rosel, 2009; McCardle, 2012; Kreling, 2023). Humans may value conspicuous colors differently based on a combination of biases and social paradigms (Duckitt et al., 1999). For example, individual animals with favorable color morphs (henceforth "charismatic coloration") may be both trophy-hunted (Johnson et al., 2010) and/or protected (Tarrant et al., 1997; de Pinho et al., 2014). Kreling (2023) speculated that in cities, charismatic coloration may be more prevalent due to higher exposure to mutagens and lower predation risk. While we understand many of the genetic and physiological factors that lead to variation in wildlife coloration, there has been little research into the underlying human preference for rare colorations how this may impact human-wildlife interactions.

We first discuss the social drivers that can influence how humans perceive of wildlife due to coloration, focusing on the psychology of scarcity, symbolism and lore, and individualism. We then briefly discuss melanin-based colorations, focusing on melanism, albinism, and leucism; three rare colorations that potentially influence how people interact with wildlife. Finally, we examine how human-wildlife interactions with charismatically colored individuals vary from those with default colorations (i.e., wildtype) through three case studies on four species with different ecosystem roles that humans commonly interact with: (1) coyotes (*Canis latrans*), a highly plastic carnivore that holds a contentious relationship with human society due to instances of human-wildlife conflict, but also in their charismatic profile as urban carnivores, (2) eastern gray squirrels (*Sciurus carolinensis*), a ubiquitously urban mammal in many North American and European cities that are sometimes beloved, but also capable of causing damage that contributes to their perception as a nuisance, and (3, 4) white and black-tailed deer (*Odocoileus* sp.), a herbivore that often considered a pest in urban and suburban areas due to property damage via garden grazing and cause of vehicle collisions.

Perceptions of Charismatic Coloration

Psychology of Scarcity

Scarcity may be one reason that humans find some wildlife color morphs more appealing. Humans may place value on rare commodities due to an innate need for self-distinction (i.e., uniqueness theory (Fromkin & Snyder, 1980). Acquisition of scarce objects often promotes social status (Veblen, 1899; Fromkin & Snyder, 1980; Lynn & Harris, 1997; Heffetz, 2012).

For example, rare species are generally considered to have greater value than abundant species (Leong, 2009), which often results in greater tolerance, positive attitudes, and conservation support from the public (e.g., Kontsiotis et al., 2021). Rareness may also result in an increased demand for certain species (e.g., pet trade), resulting in removal of individuals from the wild (Hall et al., 2008). However, the value of abundant species or those perceived as "overabundant" by humans is typically reduced. This phenomenon, termed "the tragedy of becoming common," can lead to public disinterest and even intolerance (Leong, 2009). For instance, species once considered a valuable resource, such as Canada geese (*Branta canadensis*) and white-tailed deer (*Odocoileus virginianus*), have been redefined as pests as their numbers and interactions with humans have increased (Zinn et al., 2000; Leong, 2009). Similarly, perceptions of large carnivores, which often encompass both admiration and fear, can rapidly change as a function of population size (Zimmermann et al., 2001; Treves et al., 2013; Eriksson et al., 2015).

The perceived rarity of some wildlife promotes their conservation, protection, and preferential treatment by humans, including legal protections (Flather & Sieg, 2007). The naming of animals to reflect the novelty of their features, such as charismatic coloration, further allows them to be easily distinguished and remembered, building a collective sense of ownership or responsibility toward these individuals (Borkfelt, 2011; Milstein, 2011; Wilkinson, 2023). In other instances, the perceived rarity of an individual's appearance may promote their removal from wild populations (Courchamp et al., 2006; Hall et al., 2008; Palazy et al., 2012). In the same way that more ornate or larger-bodied individuals are preferentially targeted by trophy-hunters, charismatically colored individuals may be perceived as more valuable and thus also targeted (Johnson et al., 2010; Darimont & Child, 2014).

Symbolism and Lore

In Western culture the etymology of the color words 'white' and 'black' has often symbolically been in opposition (Curta, 2004; Cirlot, 2006; Hunt, 2006; Selnick, 2012), with 'white' carrying more positive connotations than the color 'black' (Smith–McLallen et al., 2006). Additionally, it is argued that the basis of these differential associations between these colors stem from early tribal fears of the night, the dark, the unknown, and the unseen, all of which are dispelled by the light of fire, the moon, or the sun (Smith–McLallen et al., 2006). In regions colonized by Europeans, perceptions of light and dark have also come to take on racialized connotations (Hunter, 2007, 2013; Keith & Monroe, 2016; Dixon & Telles, 2017). In the United States, where systemic racism abounds, the perception of people with darker versus lighter skin may also influence the ways in which people view wildlife with darker or lighter pelages (Hunter, 2007; Pellow, 2016; Keith & Monroe, 2016).

Human perceptions of wildlife and coloration are further complicated by myths and folklore that suggest complex spiritual and symbolic interpretations of coloration (Prokop & Fančovičová, 2013). For example, there are negative superstitions surrounding black cats in Western traditions, such as a black cat crossing your path representing an omen of future danger, or black cats as the familiars of witches, which are reflected in lower adoption rates (Jones and Hart 2010, 2020). Indigenous cultures across the world invest animals with spiritual roles, often as messengers (Green, 2009; Legge & Robinson, 2017). Among the Tsimshian and other Northwest Coast indigenous communities, 'spirit bears' are messengers between the spirit world and humans also known colloquially as 'Kermode bears'(*Moksgm'ol*).[1] The reverence for and cultural significance of this color polymorphism to the Kitasoo/Xai'Xais and Gitga'at First Nations resulted in the legal establishment of the ~1,000 km^2 'Kitasoo Bear Conservancy,' protecting Kermode bears while promoting greater conservation of black bears within the Great Bear Rainforest (Langlois, 2017; Service et al., 2020).

Charismatic Colorations: Melanism, Leucism, and Albinism

Melanism

Melanism, the hyper production of melanin, occurs throughout the animal kingdom. This trait is controlled by the melanocortin 1 receptor (*MC1R*) and Agouti (*ASIP*) genes (Lamoreux et al., 2010), but similar colorations among individuals may also be conferred by different mutations within these genes (van Grouw, 2013; Grouw, 2017). The level of melanin production varies depending on the specific mutations occurring, conferring a slight to extreme darkening in pelage compared to unaffected individuals (Fig. 1).

Leucism & Albinism

The loss of melanin-based coloration is found throughout the animal and plant kingdoms and comes in two forms: leucism and albinism. Leucism is the hypo-production of melanin, causing a lightening of coloration (Fig. 1, Brito et al., 2016). Piebald is a form of leucism, wherein areas of pelage affected by leucism are lighter than the rest creating a mottled appearance (Oiso et al., 2013). Albinism is the absence of melanin production (Fertl & Rosel, 2009). Albinistic wildlife shows no trace of pigmentation in fur, feathers, scales, and even iris coloration (Fertl & Rosel, 2009).

Case Studies

We examine how a combination of scarcity, symbolism, lore, and individualism interacts to influence the ways people respond to wildlife with charismatic coloration. We focus on four taxa (coyotes, eastern gray squirrels, and black-tailed and white-tailed deer) to identify whether treatment of

[1] 'Spirit bears' are leucistic black bears (*Ursus americanus kermodei*) in the Great Bear Rainforest of British Columbia, Canada, where, according to the Kitasoo/Xai'Xais people, Raven, the trickster (*Wee'get*) and creator of all living things made the Kermode bear as a physical reminder of the ice and snow that once covered the land during the ice age (Service et al., 2020; Clark et al., 2021; Henson et al., 2022).

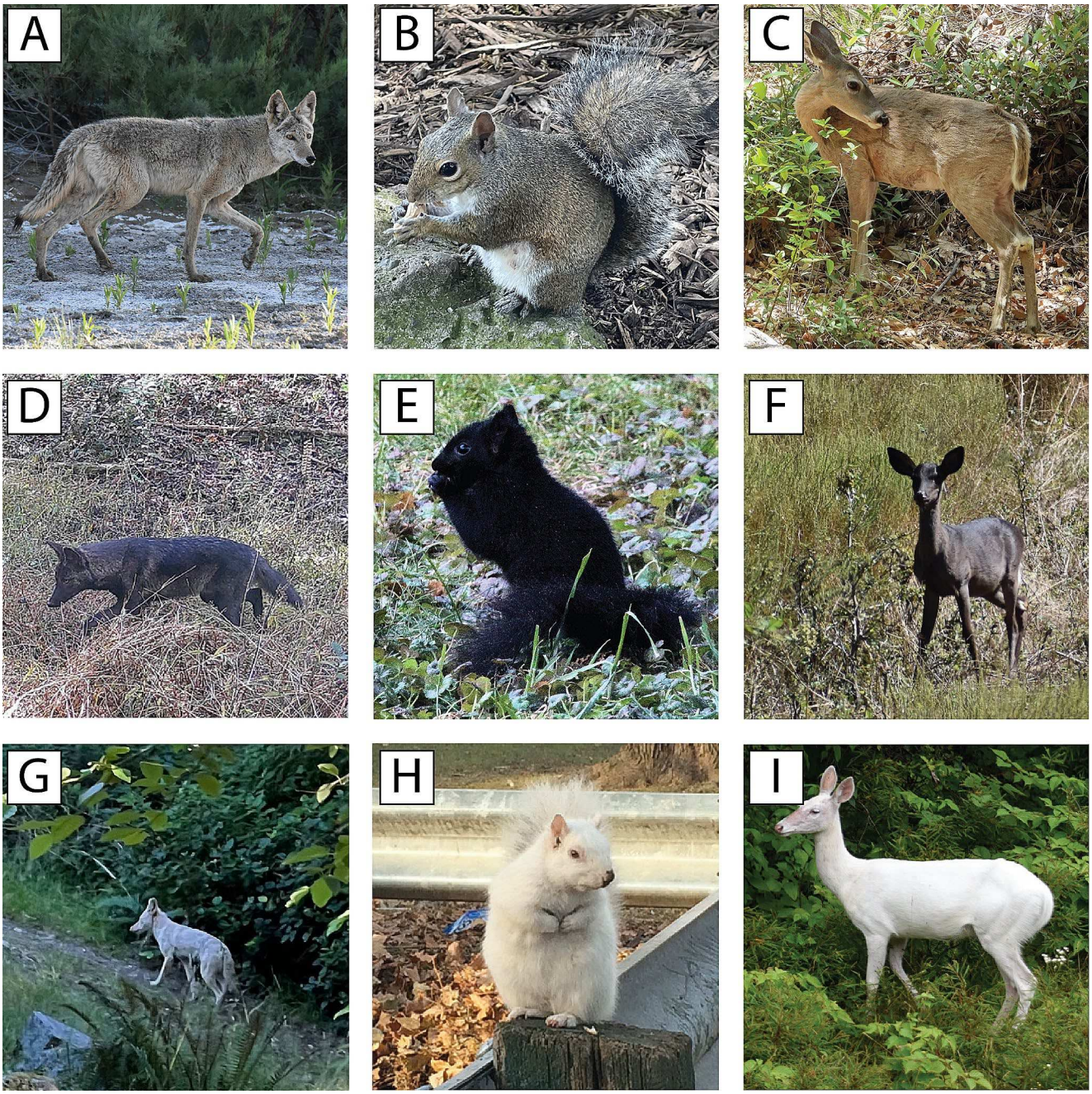

Fig. 1 Wildtype (**A-C**), melanistic (**D-F**) and albino/leucistic (**G-I**) images of coyotes (**A**, **D**, **G**), eastern gray squirrels (**B**, **E**, **H**), and white-tailed deer (**C**, **F**, **I**). Images by (**A**) Cody Stricker, (**B**) Cricket Raspet (**C**) James M. Male (**D**) dwhite62 (**E**) Yannick Lamontagne (**F**) Blake Hendon (**G**) Emma Shuparski (**H**) common merganser (**I**) rk_mining. Image licensing: CC BY 4.0 (**A**, **B**, **C**, **E**) CC BY-NC 4.0 (**D**, **F**, **G**, **H**, **I**)

charismatically colored individuals differs from treatment of the wildtype individuals across predators and prey. These four taxa are often considered nuisance species in North America and Europe due to their ubiquity. Yet all four taxa have melanistic and leucistic forms, providing an opportunity to explore how charismatic coloration impacts human perceptions of wildlife.

Coyotes

Melanistic

Social perceptions of coyotes have historically been contentious due to anti-predator campaigns and ongoing conflicts with livestock and pets and are today more polarized than ever, especially in urban and suburban areas where some

residents celebrate their establishment and others are fearful for their pets and children (Oleyar, 2010; Alexander & Quinn, 2011; Flores, 2016). While coyotes are found in nearly all ecosystems in North America (Mowry & Edge, 2014; Caudill & Caudill, 2015; Hody & Kays, 2018), observations of melanistic coyotes are uncommon. In the Eastern United States, melanistic coyotes are estimated to comprise 5–9% of the population (Gipson, 1976; Caudill & Caudill, 2015). This may be due to the increased hybridization of coyotes on the East coast with domestic dogs (*Canis familiaris*) and wolves (*Canis lupus*) promoting a variation in pelage coloration (Gipson, 1976; Anderson et al., 2009; Mowry & Edge, 2014; Caudill & Caudill, 2015; Hody & Kays, 2018). Residents of rural areas tend to show less polarization and a greater consensus on negative connotations, sometimes even engaging in coyote killing competitions (Merskin, 2022).

For example, rural and suburban residents in Georgia, USA, generally perceive coyotes negatively, with 43% of people surveyed agreeing that coyote populations should always be culled and generally supporting lethal removal if there were coyotes near their house (Billodeaux, 2007). Nevertheless, one coyote in the Atlanta suburb of East Cobb nicknamed "Carmine," garnered the attention of many media outlets for his uncharacteristically dark coat and bold behavior (Fig. 2). Carmine's unique coloration allowed him to be easily identified and naming him allowed for easy communication of his whereabouts and activities within the community. Residents described Carmine as friendly and approachable, even engaging in play with local domestic dogs (Chapman, 2020). Scientists found that 6% of Carmine's genome showed domestic dog ancestry, which may have had some influence on his behavior and coloration (Monzón et al., 2014; Mowry et al., 2021). But after Carmine grabbed a resident's small dog, people became wary of a coyote roaming through their neighborhood (Dillon, 2020). Some residents wanted Carmine killed and threatened to do so themselves, while many others opposed capture at all, even for relocation (Chapman, 2020). However, once Carmine became too friendly with neighborhood dogs and began sneaking into people's houses for food, he was trapped by local wildlife authorities and relocated to a sanctuary. The psychology of scarcity likely contributed to Carmine's relocation because Georgia law mandates euthanizing any trapped coyote, so his rare and distinctive coloration allowed him to evade the law.

Leucistic

The presence of leucistic coyotes is less well documented than melanistic morphs. Leucistic coyotes occasionally appear on camera traps but are rarely included in scientific literature (Young, 1951; López-González, 2011; Brockerville et al., 2013; Arroyo Arce et al., 2019) (Fig. 3). Recently, rare, white-phased animals have been discovered in a new northeastern population of the coyotes in insular Newfoundland and Labrador, Canada, where researchers sequenced the three type-switching genes (*Mc1r, Agouti, CBD103*) in white and dark-phased coyotes to investigate the causative gene and mutation of white coats (Brockerville et al., 2013).

Fig. 2 Carmine, a melanistic coyote (*Canis latrans*) frequently observed throughout the Metro-Atlanta area of Georgia. Carmine displayed uncharacteristically bold behavior, willingly engaging domestic dogs in play, sneaking into houses, and approaching people. Carmine has since been relocated to the Yellow River Wildlife Sanctuary in Lilburn, GA where he continues to be studied by Berry College and the Atlanta Coyote Project. Photo credit: Dr. LA Wilson

Fig. 3 A family group composed of wildtype and leucistic coyotes in Massachusetts. Photo credit: Dr. Chris Whittier and Tufts Center for Conservation Medicine

Out of the >6,000 adult coyotes submitted to the Newfoundland Labrador's Wildlife Division of the Department of Environment and Conservation in collaboration with local hunters and trappers, six white coyotes were identified. In addition, with the extirpation of Newfoundland's original wolf population in the 1930s, coyotes exploited the vacant niche by expanding their distribution to include all regions and habitats of insular Newfoundland, raising concerns about their potential impact on native wildlife. This sparked collaboration with local hunters and trappers to document aspects of diet, condition, and reproduction of the growing population. Genetic analysis of the leucistic coyotes found likely introgression with a golden retriever. Evidence of socializing among a male golden retriever and a group of coyotes further support this hypothesis. Brockerville et al. (2013) suggest that this leucism might provide a selective advantage by allowing the white coyotes to blend in with the snow during winter months. Alternatively, this coloration may make them more susceptible to hunters.

Eastern Gray Squirrels

Melanistic

In Marysville, Kansas, the 'home of the black squirrels,' melanistic squirrels have been the town's official mascot since 1972. They squirrels even received an official anthem in 1987 titled the "Black Squirrel Song." Although there is speculation on the origin of the charismatically colored squirrels, it is rumored they were released from a carnival in 1912 (Immink, 2020). In Marysville, black squirrels are even given the right-of-way at all traffic crossings (Article 1. General Provisions: City Mascot, 1987). The city code states; "The black squirrel is designated as 'Marysville City Mascot' and hereafter shall be accorded all the rights and

privileges inherent to such designation, including the freedom to trespass on all city property, immunity from traffic regulations, and the right of first choice to all black walnuts growing within the city." In addition, anyone who willingly maims or kills, or deliberately entraps black squirrels without authorization within the city are subject to fines and imprisonment (Article 1. General Provisions: Black Squirrel Day, 1987). As the popularity of Marysville's squirrels grew, so did outside interest in them. In 1973, several black squirrels were taken in the attempt to establish a breeding population in Hobbs, Texas, USA, but succumbed to interspecific killings by fox squirrels (*Sciurus niger*). London, Ontario, considers its black squirrel population a prized social commodity, which is celebrated with a song, 'The Black Squirrels of London.' Additionally, Kent State University in Ohio has hosted an annual black squirrel festival for nearly 40 years for their population, which is traced back to 10 from London, Ontario, which were released on the university's campus.

Eastern gray squirrels are extremely common across the United States and are currently expanding their range (Benson, 2013; Creley et al., 2019). They are also regionally considered to be pests (Benson, 2013). While the ubiquity of Eastern gray squirrels reduces their novelty, the emergence of a variation in their pelage coloration may change the way they are generally regarded by communities (Chardonnet et al., 2002; Pearce et al., 2017). Capitalizing on the idea of rarity associated with these traits, communities have made these locally prolific melanistic squirrels into tourist attractions and they have become an important source of revenue (Skavronskaya et al., 2020a, b).

Leucistic

The Albino Squirrel Preservation Society was founded at the University of Texas, Austin, in 2001 to bring attention to the dwindling numbers of albino and leucistic Eastern gray squirrels (The Albino Squirrel Preservation Society, 2001), and its popularity led to chapters around the world. Though founded with an air of humor, the creed of the club states, 'I pledge to uphold the objects of the Albino Squirrel Preservation Society, to foster compassion and goodwill towards albino squirrels, and to dedicate myself to the protection of all squirrels, especially those that are albino,' (ibid.). In addition to pledging allegiance to albino squirrels, club members are encouraged to feed and give them preferential treatment. Though the club and international chapters closed their doors in 2003, the creation of such an organization highlights the intrinsic interest that people show for wildlife of alternative coloration and a willingness to give these individuals special treatment.

Five towns in the United States and Canada claim to be the 'Home of the White Squirrels.' In celebration of its leucistic squirrels Brevard, North Carolina hosts an annual 'White Squirrel Weekend' (Heart of Brevard, 2023). The town boasts the White Squirrel Shoppe selling leucistic squirrel-related paraphernalia and gifts. In 1986, Brevard declared the city a sanctuary for all squirrels, prohibiting people from killing or harassing squirrels within city limits (City Designated Squirrel Sanctuary, 1980). The original pair of leucistic squirrels were rumored to have been introduced from a carnival in 1949. It is possible that the collective protection of all squirrels is an attempt to ensure the repeatability of the recessive trait responsible for the leucistic phase coloration in squirrels. The town of Olney, Illinois, also provides protections for its squirrel population to protect the high frequency of leucistic squirrels. For example, failure to yield to albino squirrels crossing busy roads leading to either their harm or death can result in a $750 fine (City of Olney, Illinois, 2002). Similarly, Marionville, Missouri, also protects leucistic squirrels and fines anyone who tries to capture one. In the town of Kenton, Tennessee, The White Squirrel Committee hosts an annual Squirrel Homecoming, Christmas parade, and White Squirrel Festival (City of Kenton, 2023). Exeter, Ontario, also hosts a White Squirrel Festival, and the squirrel has served as the town's mascot since 1986. Tallahassee, Florida, a population of leucistic squirrels on the Florida State University Campus and at the Tallahassee Museum of History and Natural Science provide tourist attractions (Florida State University 2020) that have multiple positive reviews on TripAdvisor.

White-tailed & Black-tailed Deer

Melanistic

Melanistic white-tailed deer are exceptionally rare in the United States with the exception of central Texas (Baccus & Posey, 1999) where the hunting of melanistic deer is common and they are prized as trophies due their rarity (Traweek and Welch 1992, Smith, 2011)./// While multiple state laws exist to protect albinistic or leucistic white-tailed deer (Wisconsin Admin, 1940, Illinois General Assembly, 1983, Iowa General Assembly, 1987) and other leucistic wildlife (Stencel & Ghent, 1987) no such ordinances or statutes exist for melanistic deer. There are no state or local laws concerning melanistic deer, which may be the result of multiple and likely intertwining social phenomena: their rarity may promote trophy hunting while at the same time their rarity may prevent perceptions of them as either a pest or a possible marketing asset for attracting tourists and thus no public pressure is generated to either control population size or to protect them.

Nevertheless, there are a few examples where melanistic deer have been embraced by communities rather than hunted for their rarity. In December of 2019, a local celebrity black-tailed mule deer named 'Coal' in Moab, Utah, succumbed to chronic wasting disease (Utah Division of Wildlife, 2020). The Department of Wildlife Resources issued an obituary: "This unique deer touched a lot of people's lives in this area. Coal is responsible for putting smiles on a lot of faces during his life. The community will feel his absence." To commemorate his life, the community crowdfunded enough money to commission a taxidermist to mount the Coal's bust, which is now on display at The Division of Wildlife State Building (Fig. 4). The plaque below the mount states that Coal was 'Moab's very own Melanistic Deer,' reflecting a degree of community pride and ownership towards the animal.

Leucistic

White stags feature in much European folklore in a variety of symbolic roles. A common theme throughout British, French, and Breton ballads is white deer that shapeshift into

Fig. 4 Coal, the melanistic deer from Moab, Utah, now on display in the state Department of Resources building. Photo Credit & Taxidermy: Darryl Powell

sisters or the lovers of hunters (Cartmill, 1996). Irish stories include a heroes who are guided to claim their rightful inheritance by a white stag (Cartmill, 1996; Selnick, 2012). Leucistic and albino deer have also historically represented supernatural phenomena. For example, Virginia Dare, who in 1587 was the first child to be born in the English Roanoke Colony in what is now Virginia, which mysteriously entirely disappeared by 1590, is said to haunt Roanoke Island as a white doe (Cartmill, 1996). In many regions the killing of leucistic or albino animals is associated with bad luck (Wiltse, 1900; Cartmill, 1996).

Current regulation from the Department of Natural Resources in Wisconsin prohibits the hunting and harvesting of leucistic and albino white-tailed deer, even with state approved permits and tags for the species (Wisconsin Admin, 1940). However, this ordinance was removed in 2008 to effectively manage chronic wasting disease (Protect the White Deer, 2023) prior to the regulation's permanent ratification in 2015. Subsequently, the discourse surrounding the conservation and protection of these individuals has elicited strong responses among the Wisconsin public. An individual in Verona argued: "These deer are a Wisconsin treasure, and we should feel privileged they have made their home here. Killing them would be no different than killing a bald eagle. Because there are so few, I have to wonder why they are not on an endangered species list" (Protect the White Deer, 2023). Similarly, an individual in DeForest commented: "My friends and I are avid hunters. I want to protect these rare animals. They are rare for a reason. They have disadvantages in life, so we need to keep them protected" (Protect the White Deer, 2023). Wisconsin is not the only state with such protections; several other states, e.g., Oklahoma and Tennessee, also prohibit the harvesting of white-tailed deer with varying levels of piebald, albinistic, or leucistic coloration (Oklahoma General Assembly, 2009; Tennessee General Assembly, 2014).

In addition to state laws protecting leucistic and albinistic deer, many towns have also shown strong community affection for these individuals. For example, the town of Unionville, Tennessee, shared community mourning for a celebrated resident albino deer that was fatally struck by a car in 2011 (Organ, 2013). St. Ansgar, Iowa, coined itself "The Home of the Albino Deer" after an albino deer started to frequently roam around the the area in 1980 until its death in 1988, when it was preserved and has since remained in a glass case as a local attraction at White Deer Park (Fig. 5).

Discussion

As human-wildlife interactions increase due to urbanization and habitat degradation, it is necessary to further investigate how human-wildlife relationships are shaped by human values, attitudes, culture, and previous experiences with

Fig. 5 The taxidermized albino deer displayed at Deer Park, St. Ansgar, Iowa. The plaque reads 'The deer was born in the spring of 1980 in Mitchell County near St. Ansgar, Iowa. She lived 8.5 years within four miles of where she was born. She gave birth to fifteen fawns, all normal color. She died in the winter of 1988 of pneumonia, kidney failure, and old age.' Photo credit: Hank & Kathy Greer

wildlife. Previous research has explored the role of social factors in shaping perceptions, and new research is beginning to merge both social and ecological data to understand how they work together to inform perceptions (e.g., McInturff et al., 2021; Wilkinson et al., 2021). However, there has been little research focused on how the coloration of species or individuals impacts the ways they are perceived or treated by people.

Our case studies illustrate that human social perceptions of charismatic color morphs are often in stark contrast to how individual wildlife are treated (Kreling, 2023). We show that key components to the protection or community advocacy of conspicuously colored animals are the ability to differentiate an individual from others in the population and naming them (Birke, 2009; Borkfelt, 2011; Milstein, 2011). Although in scientific research, the naming of animals has been a debated topic, thought to have both benefits and drawbacks (Birke, 2009; Borkfelt, 2011; Wilkinson, 2023), public recognition and naming of individual animals have significant ramifications for conservation and overall persistence of species and even entire ecosystems. For example, although not a charismatic color-morph, the public attachment to and appreciation of P-22, a mountain lion monitored in Los Angeles, California, led to many conservation policies (Wilkinson, 2023). The naming of individuals seems to shift narratives, perceptions, and the overall tolerance for pests and unwanted species. Across North America, coyotes are often persecuted, trapped, and removed even when no actual conflict is occurring (Arthur, 1981; Kellert, 1985; Kitchen et al., 2000; Breck et al., 2019). However, the melanistic coyote named Carmine in Metro-Atlanta was relocated to a wildlife sanctuary when its behavior became unacceptable even though local law mandated any trapped coyotes be euthanized. Similarly, after the melanistic deer, Coal, died, the community of Moab joined together to have him preserved and prominently displayed in a local government building (Birke, 2009; Borkfelt, 2011; Milstein, 2011).

Presentation of charismatic coloration may also change how wildlife is normally perceived as a nuisance or "pest" species. In North America, squirrels and deer cause varying amounts of damage to urban infrastructure, residential housing, and agriculture, requiring costly management (Flyger et al., 1983; Conover, 2001; McCleery et al., 2007). Dense populations of deer in urban and suburban areas result in numerous deer-vehicle collisions, causing severe injuries and potentially death (Conover et al., 1995; Gilbert et al., 2017). Especially in urban and suburban areas, wildlife that become habituated to people may be increasingly seen as pests, losing their "wildness" (Leong, 2009). Yet, we see in multiple cases wildlife with charismatic coloration is not treated as pests but celebrated and often memorialized.

Unlike squirrels and deer, there is an added layer of complexity that may skew the response to coyotes with charismatic coloration. Coyotes are a predatory species and often invoke fear -- whether that be loss of life, livelihood, or economic gain (Knowlton et al., 1999; Elliot et al., 2016). This fear of predators can be overt and explicit, subtly changing our responses to these species (Clinchy et al., 2011; Prokop & Fančovičová, 2013; Mobbs et al., 2015; Nyhus, 2016). With this added layer of contention, we may predict that predators with charismatic coloration may not be as welcomed or celebrated as prey species with charismatic coloration. Indeed, we see that for the melanistic coyote Carmine, some residents expressed concern for themselves, their pets, and their family, and called for Carmine to be euthanized at the same time that others expressed concern for his safety and preferred relocation. While most coyotes with this bold behavior would often be euthanized by management agencies (Timm et al., 2004; Baker & Timm, 2017; Breck et al., 2017), management ultimately circumvented the law and kept Carmine alive, relocating him to a wildlife sanctuary.

Conclusion

We highlight how wildlife with charismatic coloration can be treated differently than their counterparts due to a variety of psychological and social factors – specifically the psychology of scarcity, folklore, and individual interactions. Assuming that wildlife with charismatic coloration is preferentially treated by humans could have potentially significant impacts for wildlife conservation. If charismatic coloration decreases fitness in these individuals and humans artificially inflate the population of these charismatic individuals through preferential treatment, it could decrease the overall fitness of the population by preserving deleterious genes within the population. Alternatively, we highlight how human connections with individual wildlife could potentially increase tolerance of the species as a whole (Wilkinson, 2023). Future research should consider investigating the implicit biases humans have towards colorations of particular wildlife, and how that may change according to ecological niche (e.g., melanistic predator compared to melanistic prey). Finally, with a recent uptick in research in wildlife coloration (Leveau, 2021; Cosentino & Gibbs, 2022; Kreling, 2023), participatory science platforms, such as iNaturalist, may become critical in understanding the spatial distribution, abundance, and presence of these charismatic color morphs. However, we caution the use of community-gathered data as individuals may be more inclined to report individuals with charismatic coloration compared to those of regular coloration (Husby, 2017; Zbyryt et al., 2021; Carlen et al. 2024). While community-gathered data

certainly has value, biases in these observations could lead to misinterpretations of the data (Dickman, 2010; Carlen et al. 2024). Therefore, greater understanding of the reasons why people perceive and respond to novel colorations in wildlife facilitate human-wildlife coexistence and foster stewardship for the animals we collectively share space with.

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Data Availability Quantitative data was not used for the development of this manuscript. Relevant materials can be obtained from the references below, and all images credited are available upon request.

Declarations

Competing Interests The authors declare no competing interests.

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