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Bats in Folklore and Culture: A Review of Historical Perceptions around the World

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Abstract

Belief systems of people have always been closely related to animals, which are symbolized in traditional narratives. Sociocultural definitions of animals as “good or evil” have persisted throughout the history of human beings. In the West, bats are often perceived as evil spirits, Vampires, and harbingers of death, while some cultures across the Asia-Pacific region associate bats with good fortune. Here, we review documented narratives and surveys from around the world and our ethnographic observations from Europe to analyze beliefs associated with bats. We explore the role that bats play in traditional narratives and the likely reasons for their salience, including their connections with the extraordinary and supernatural. Finally, we discuss shortly the need of education to change attitudes toward bats. In North America, education has had some effect as more people have started to understand how useful bats truly are and how few cases of bat-born rabies transmission to humans there have been in the United States and Canada. It remains to be seen, however, how effectively the further education efforts could halt or even reverse the decline of the bats around the world. It is also noted that bat tourism has a potential to conserve bat populations while providing social and economic benefits to local people in host communities.

Keywords: bats, folklore, culture, literature, myths, disease, need of education

1. Introduction

Bats are truly remarkable creatures, and fossil records indicate that they first appeared in the Eocene, some 50–55 million years ago [1]. They belong to the Order *Chiroptera*. This Order name means “hand-wing” as the bats can hold food between their forearms. Despite this primate-like gesture, it took quite some time for people to understand that bats are mammals and not birds. In the third book of Moses in the Old Testament, bats were identified as birds, while the world-famous Swedish taxonomist, Carl von Linné (or Linnaeus), only reclassified bats as mammals and not birds as late as 1758 in the 10th Edition of his “Systema Naturae” [2]. Because of the resemblance in dentition and such external phenomena as the thoracic position of the mammae, etc., the great Linnaeus himself ended to place the bat along with man in the order Primates [3].

Contemporarily the bats were divided based upon morphology and behavior into two suborders, Microchiroptera (Microbats) and Megachiroptera (Flying Foxes and Old World Fruit Bats) [4]. New molecular biology findings indicate that there

are two new Suborders, Yinpterochiroptera and Yangochiroptera, not coinciding with the earlier subordinate classification [5].

There are more than 1400 bat species worldwide, and they make up roughly 20% of the world's extant mammals [6]. They are hugely beneficial to man and play a major role in the well-being of the world's ecosystems. Not only do they prey upon insects that are harmful to agriculture, but they also prey upon mosquitoes and other virus-carrying insects and play a major role in pollinating and spreading the seeds of many of the fruits we enjoy. In some parts of the world, they are a valuable food source, and their body parts are used in traditional medicine, while their guano is collected and used as agricultural fertilizer [7]. Why is it then that while in some parts of the world this beneficial creature is seen as a symbol of good luck and good fortune, in many societies it is viewed with fear and loathing? Here, using documented narratives, surveys, popular literature, and cinema, we will explore the various myths, legends, and attitudes to bats from around the world.

2. Europe

In the Bible, the bat is seen to be “unclean” [8], while its nocturnal activities ally it to malevolent spirits that roam the land when darkness has fallen. It is no real surprise that in a Christian Europe throughout history, the bat has been associated with the Devil, evil spirits, and witches [9]. Bats also have wings. Tertullian, an early Christian author from Carthage (155–220), claimed that the Devil and his angels had wings [10], and around 1314, Dante wrote that the Devil's wings had no feathers, “but was in form and texture like a bat's” [11]. In 1332, a French noblewoman, Lady Jacaume of Bayonne [12], “was publicly burned to death as a witch because ‘crowds of bats’ were seen about her house and garden.”

William Shakespeare (1564–1616) also equated bats with witches, spells, and curses. In *Macbeth* (1605), there is the incantation of the three witches: “Eye of newt, and toe of frog, wool of bat, and tongue of dog,” while there is Caliban's curse on Prospero in *The Tempest* (1610–1611): “All the charms of Sycorax, toads, beetles and bats, light on you.”

There is also, of course, the European connection with bats to vampirism. Vampires had been part of Slavic folklore in Eastern Europe since the seventeenth and eighteenth centuries, but it was not until the nineteenth century that popular fictional literature, predominantly through Bram Stoker's “Dracula” in 1897, would forever tie bats and vampires together, with the protagonist, Count Dracula, being able to transform himself into a huge bat [13]. While the three species of true vampire bats (common vampire bat *Desmodus rotundus*, hairy-legged vampire bat *Diphylla ecaudata*, and white-winged vampire bat *Diaemus youngi*) are microbats, measuring just a few centimeters in length, it was the exaggerated reports from early explorers and adventurers that gave the public the image of these huge blood-sucking creatures. In 1796, John Stedman wrote of being bitten by a vampire in Guiana, describing it as “a bat of monstrous size, that sucks the blood from men and cattle when they are fast asleep, even sometimes till they die.” [14]. This association between giant bats and vampires continues to the present day through popular fiction and cinema (**Figure 1**).

As with that other iconic nocturnal creature, the owl, the bat has a myriad of very strange old wives' tales and superstitions surrounding it [15]. Here are just a few:

If a bat flies into your house, look out for bedbugs.

A bat flying into a building means that it is going to rain.

It's unlucky to see a bat in the daytime.

Figure 1.
 An old engraving of vampire bats described by early explorers such as John Stedman. Public domain. Courtesy of “creative commons”—Wikimedia.

Killing a bat shortens your life.

Bats in a church during a wedding ceremony is a bad omen.

Bats in the house mean a death in the house or is a sign that the occupants will soon be leaving.

Bats flying vertically upwards and then dropping back to earth means that the Witches Hour has come.

Bats are symbolic of bad luck, especially when they call while flying early in the evening.

If a bat flies into a house and then escapes, there will be a death in the family. Kill the bat before it escapes, and everyone will be safe.

If a bat flies into a kitchen and at once hangs on to the ceiling, it is a lucky omen, but if it circles the room twice before alighting, it is a bad omen.

One of the most enduring old wives’ tales from Europe is that bats will get tangled in women’s hair and would have to be removed with a pair of scissors. Between 1958 and 1961, Gathorne-Hardy, Fifth Earl of Cranbrook, a renowned conservationist and a founding member and former President of the Mammal Society, decided to put this old superstition to the test [16]. Using two willing female teenagers, *one with “relatively short curly hair” and one with “longer wavy hair was done up behind in a bun,”* Cranbrook took turns in placing four different species of bat on their heads. A noctule bat *Nyctalus noctula*, a long-eared bat *Plecotus auritus*, a Natters bat *Myotis nattereri* and a Daubenton’s bat *Myotis daubentonii*. In all four cases, the bats each walked about the volunteers’ hair without becoming entangled in any way and finally took flight without any difficulty. The experiment was repeated several times with the same results [16].

3. Africa

Bats have fascinated humans for millennia, and this cultural and spiritual relevance is reflected in the presence of bat symbols in Egyptian tombs from 2000 BC [7]. In Africa, “house bats” occur in distinct colors and sizes, but they are usually hard to identify. Although they live near humans and are common, it appears that some of the species have not been described and given scientific names [17]. To date, ethnobiological information regarding bats in Africa has mainly focused on utilitarian aspects of bats as food and medicine, whereas knowledge concerning symbolism and beliefs surrounding bats in that continent has not been assembled, apart from ancient Africa [18], Ghana [19, 20], Kenya [21], and Madagascar [22].

Among the Ibibio people of southern Nigeria, bats are associated with witchcraft, and for any bat to fly into a house and touch a person is a sure sign that this person is thereafter bewitched and will soon perish because his or her heart is eaten at night while he or she sleeps. Also, in Nilotic Sudan, witchcraft was usually performed at night, and therefore, owls and bats were associated with it. In the Anglo-Egyptian Sudan, spirits, devils, and witches had their general name “Bitaboh,” wood-goblins being specially called “Ronga.” All the bats were comprehended under the same name, especially the Yellow-winged Bat *Lavia frons*, formerly *Megaderma frons*, which flutters about from tree to tree in broad daylight [18].

In Cameroon, the superstition of the vampire is attached to bats. Among the Ndop people, bats, owls, and bush-cats are said to be witch shapes. Should a bat or an owl come near the house, or a bush-cat defecate in the compound, the owner must go at once to diviner to discover what remedies must be taken to ward off the evil. A witch shape is believed to be capable to suck out the life of a sleeping man or woman [18].

From Sierra Leone comes an account of the gruesome habits of the Hammer-headed Fruit Bat *Hypsignathus monstrosus*. It is the largest bat found in continental Africa and was believed to suck the blood of sleeping children until they die. It was called “Boman,” and it was able to turn into a stone or a snake at will. Interestingly, blood sucking has been attributed to bats both in Cameroon and Sierra Leone despite the countries being widely separated and when no such type of bat is found in Africa [19].

Although the bats roost in the sacred forest in Ghana, they are not regarded as sacred animals. Bat hunting is illegal, but hunters readily admitted to having hunted bats and even directed the research people to other hunters. Bat meat is widely consumed because it is considered more delicious than other types of meat. However, consumption was influenced by religious beliefs, food taboos, and some myths about bats. Muslims and Seventh Day Adventists did not consume bat meat. Men hunt and consume bats more often than women who have fears that consuming bat meat would give them strange or deformed children. Bats are not associated with any diseases, and it was felt to be safe to eat bat meat, but both studies were conducted before the 2013 Ebola outbreak (**Figure 2**) [19, 20].

In Kenya, a bat attitude questionnaire was presented to 394 people living around the Arabuko-Sokoke forest. Belief in myths seemed to prevail among those surveyed. Just over one-third of the respondents (36%) did not see any benefits of bats to humans. Nearly another third reported actively killing bats or destroying bat roosts, and most respondents associated bats with the destruction of farmers’ fruits, especially mangoes. Female respondents in this study showed more negative attitudes and a stronger belief in myths about bats than males. Only older and somewhat educated people reported more positive attitudes toward bats than others [21].

In Madagascar, the exploitation of bats for bush meat regularly takes place during periods of food shortage, especially fruit bats, which are heavily hunted. The study estimated that in the karstic Mahafaly Plateau some 50–100 caves are exploited for bats and that between 70,000 and 140,000 *Microchiroptera* bats

Figure 2.
*Large-bodied old-world fruit bats, like this Egyptian fruit bat *Rousettus aegyptiacus*, are disproportionately targeted to be hunted for bushmeat. Photo credit to “creative commons” <https://creativecommons.org/licenses/by-sa/4.0/legalcode>.*

may be collected annually in the region. This is bound to threaten the continued existence of local bat populations. Thus, more famine relief food aid is desperately needed to reduce the bush meat use during the food crises, which are nearly annual in the region [22].

In Malawi, negative bat superstitions caused recently quite disproportionate behavior when rural people in southern parts of the country killed nine people accusing them to be “vampire bats” [23]. The police arrested 200 vigilante youth suspected of involvement in gangs that attacked persons allegedly engaged in vampirism. Medics said there is no truth or clinical evidence that blood suckers or vampires exist in Malawi, and the United Nations mission withdrew its personnel from the riots-affected areas [24].

4. Southwest Asia

In southwest Asia, bat folklore has been documented between Iran, India, and Myanmar [25–27]. In southwest Asia, the bat is predominantly perceived as a strange,

negative, and demonic animal that should be avoided. Usually, it is regarded as a bad omen even if seen in a dream. The bat is a devil who flies only in the night because it would die if flying in the daytime [25].

In India, a total of 3059 high school students from 36 schools were questioned on their bat perceptions. Most students (56%) reported seeing bats in their locality. Half of the students knew that bats are mammals, but 26% believed them to be birds, some thought of them being amphibians (12%) or reptiles (11%); 37% disliked the bats, and 27% liked them remaining seeing them as indifferent. A substantial proportion (53%) thought that bats have medicinal value, but 35% saw them only as harmful creatures. They were believed to destroy trees and damage fruits in gardens. Over half of the students (57%) did not know anybody in their neighborhood who would hunt bats. The felling of roosting trees was mentioned as bat death reason by 29% and hunting by 18%. Most students wanted to participate in bat conservation activities, including some students who disliked bats. The study concluded that conservation-related education should be included in the school curriculum to ensure that students would appreciate not only the importance of bats but of all wildlife [26].

Bats are also revered throughout India. In Madurai, worshippers of the Muni god regard Indian Flying Fox *Pteropus medius*, formerly *Pteropus giganteus*, as sacred and protect colonies for fear of heavy punishment. However, after offering prayers, dead bats found on the ground can be eaten. In Pudukkottai, roosting *P. medius* is seen as the guardian of the sacred groves, and in Bihar, that bat brings wealth. Orchard owners in Myanmar believe that allowing bats to roost and feed in the garden ensures prosperity and well-being. Flying fox's emergence time is believed in Myanmar to indicate the weather: an early or no emergence foretells a coming storm. Bats are also used as allegories to denote romantic or parental love in the poetry of Tamil Sangam literature in India [27–29].

In Hunza, Pakistan, a witch appears in the shape of a bat, and it plays a role in magical practice in southwest Asia. In the Punjab, northern India, magicians use bat bones to prepare their concoctions, and with the bat blood, they write amulets for malevolent and antisocial magic. Between Iran and Rajasthan, north-western India, there is the widespread public belief that if a bat lives somewhere in the house or hangs on the roof, this would mean bad luck for the owner [25]. In Pakistan, one belief is that if a bat enters one's ear, it can never be removed and contact with bat urine is thought to cause eczema. On the other hand, the body fat of Indian Flying Fox is used to make massage oil to cure rheumatic pains, while drinking water from a bat's wing is said to sharpen one's memory [30]. In Sri Lanka, it is believed that one may be reincarnated as a bat for denying another person drinking water [31].

Pre-Islamic magical belief in Hunza said that “if the lady would once offer the cooked meat of bat to her guests, hiding it behind her back while serving” her family would never be without meat for their whole life [25]. Interestingly, Islamic taboo, considers bat as *harām* meaning that it is forbidden as food. The official Islamic view is exempting bats from being killed because it would carry bad luck to kill a bat [32]. One reason not to kill bats is that “female bats have breasts and are mothers like human females” [25].

Bats are also seen as useful in Iran, India, and Pakistan because people are collecting bat guano as a natural fertilizer.

5. Southeast Asia

Throughout Southeast Asia, bats are associated with luck and good fortune and used as spiritual totems [6, 27]. Since the fourteenth century, Chinese culture has regarded bats as lucky animals, and these blessing bat symbols have been prevalent in

Chinese arts over the centuries [33]. In Indonesia, farmers in South Sulawesi believe that flying foxes roosting near their rice fields guarantee a good harvest [27]. Similarly, fishermen in the Philippines consider mangrove roosting flying foxes to be guardians of their fishing grounds and to increase fish and shellfish catch [27]. In Malaysian Borneo, people consider it taboo to disturb a fruit bat. If a man whose wife is nearing childbirth unthinkingly does so, some harm may befall the unborn baby [34].

In Malaysia, a face-to-face survey was conducted in Penang Island to assess knowledge and awareness level toward bat conservation efforts. The bat populations in Malaysia are decreasing in 26% of species and only 15% are still stable. Bats are shot for sport or to eradicate them from fruit plantations. Bats are also considered as wild exotic meat, which is widely consumed in urban areas. Besides hunting, the primary threats to bat species include habitat loss and degradation through logging. Most respondents were less likely to value the importance of bats in the ecosystem, so creating a conservation education to connect people with nature is not easy. The oldest age group (51–70 years old) of 150 respondents were mostly aware of the bat conservation efforts. The higher level of education was not always reflected in the positive attitudes toward environment and wildlife issues. Participation by local people is vital to achieving successful conservation programs [35].

Iban people in Sarawak, Borneo, believe that a bat flying into the house indicates a shaman bringing good vibes, conferring protection against any harm, while in Thailand, if a bat enters a house but immediately flies away, it is believed to change bad luck to good. Should the bat stay and eat the fruit in the house, bad luck will befall the owner [27].

In northern Thailand, harming bats incurs a curse because bats are sacred for Buddhists [36]. In Irian Jaya of Indonesia, former head-hunters considered flying foxes to be head-hunters too, as they took the “head” of the tree by consuming its fruit [37].

Despite positive associations toward bats, they are widely consumed as food and medicine throughout Asia, except in Brunei and Singapore. In Malaysia, ethnic Han Chinese, non-Muslim indigenous groups, and ethnic Malays hunt flying foxes and trade them to the Chinese [27]. In Indonesia, Iban people in Kalimantan also hunt

Figure 3.
Bats for eating in the Laos marketplace. Photo credit: Stan Delone “creative common”—Wikimedia. <https://creativecommons.org/licenses/by-sa/2.0/legalcode>.

fruit bats for consumption, and mainly Christian people in North Sulawesi regularly eat flying foxes (Black Flying Fox *Pteropus alecto* and Sulawesi Fruit Bat *Acerodon celebensis*) especially during the Christmas season [38, 39].

There exists a widespread belief in Southeast Asia that eating bat meat cures asthma [27]. In many parts of Indonesia, people specifically consume bats' livers and hearts as medicine [39]. In Thailand, bat meat or blood is eaten for muscle pain, increasing virility and longevity [36]. In Malaysia, older generations prevented thievery by mixing flying fox blood with milky mangrove *Excoecaria agallocha* tree sap to cause violent intestinal inflammation [40].

In Vietnam, many mounted bat species are sold in souvenir shops, and in Laos, bats are traded in several markets (**Figure 3**) [41, 42]. There is a Japanese word for bat, *komori*, which is said to mean “mosquito slaughterer.” In Japanese mythology, very old bats can transform into *nobusuma*, spirit animals resembling flying squirrels that land on their victims' faces at night to feed off blood [43]. Indigenous Ainu people in Japan worshipped the crafty and wise bat god *Kappa kamui*, who kept away demons and diseases [44].

6. Pacific region

A legend tells that in Fiji, a giant white vampire bat acts as a messenger, and one finds bats as gods in both Tikopian and Tongan myths. The Tongan king's Samoan wife was rescued by flying foxes, and she honored her rescuers later by naming her son Tonumaipē'a (= “rescued by flying foxes”) [45]. People in Vanuatu consider Pacific Flying Fox *Pteropus tonganus* as their ancestor and claim to be able to communicate with them [46]. In Makira, Solomon Islands, local people value traditional currency for transactions, such as bride price, and use the canine teeth of flying foxes as a traditional currency [47]. Samoan people prize flying fox meat as a delicacy and as a gift to elders, but commercial hunting and export of the meat are culturally frowned. The general attitude is that the flying fox is part of the forest, and the vast majority support the protection of *Pteropus samoensis* and *P. tonganus* [45]. Samoans said that flying foxes were cheeky and courageous, making it a popular tattoo motif [48].

In New Zealand, Māori people associate bats, *pekapeka*, with the mythical nocturnal bird *hokioi* that foretells death [49]. In 2021, a bat won New Zealand's Bird of the Year competition name of which in Māori language is *Te Manu Rongonui o te Tau*, and the word “*Manu*” means “flying creatures,” including bats. The decision to include the New Zealand long-tailed bat *Chalinolobus tuberculatus* also known as *pekapeka-tou-roa* (Māori) in the 2021 Bird of the Year competition did cause a bit of controversy, some people saying the country had gone “batty.” However, the long-tailed bat got more than 7000 votes, bringing a clear victory to this critically endangered animal, despite not being a bird [50].

7. Central and South America

The diversity of South American bats is impressive as there are more bats, and more bat species, than in any other part of the world [51, 52]. In pre-Columbian Central and South America, the bat played an important role in the religions and social structures of the various cultures, most notably with the Moche people of Peru and the Maya of Guatemala. In northern Argentina, a Toba story tells of the leader of the very first people—a hero bat or batman who was teaching people all they needed to know as human beings. Similarly, the Ge tribe in Brazil moved through the night following a bat that looked for light toward which to guide the people (**Figure 4**) [51, 52].

Figure 4.
A bat-headed figure from Costa Rica made by pre-Colombian Diquis people sometimes between 700 and 1530 AD. Photo credit: Public domain “creative commons”—Wikimedia.

The bat was central to Maya religion and social structure. One clan of the Cakchiquel Maya, of the highlands of Guatemala, was named the Zotzil (=belonging to the bat), whose deity was a bat. The Tzotzil Maya lived, and continue to live to this day, on the plateau of Chiapas in southern Mexico. They called themselves Zotzil uinic (batmen), claiming that their ancestors discovered a stone bat, which they took as their god, and their chief town was named Zinacantan (=place of the bats) by Nahuatl merchants from Mexico [53]. Generally, the Maya revered a Vampire Bat god, Camazotz, the death bat, which killed dying men on their way to the center of the earth [51, 52].

The north coast of Peru is one of the South American regions where bat iconography is particularly prominent [51]. The Moche people in Peru were aware of the connection between bats and plants. On Mochica pottery, a bat is depicted with the Sweetsop *Annona squamosa*, a common fruit also known as Sugar Apple or Pinha, the seeds of which are dispersed by bats [51, 52]. Some of their ceramic vessels have an anthropomorphic bat that is an agent of human sacrifice, with a knife in one hand and a human head in the other. Sometimes a Mochica bat carries a warclub and a small human captive. The enormous size of the bat and the small human head or body indicate supernatural status for the bat [51].

The widespread sacrificial association derives largely from the habits of the Common Vampire Bat that feeds exclusively on the blood of vertebrates (**Figure 5**).

In many places, blood sacrifice was believed to benefit agriculture, and therefore, bats had agricultural, as well as death, connections for Pre-Columbian peoples and in Oaxaca, Mexico, a bat deity was associated with maize [51]. Surprisingly little folklore exists specifically about Vampire bats, and Pre-Columbian erotic scenes do not involve bats although some folklore portrays female bats as alluring to men.

One Yupa man in northern Colombia started night after night to drink and flirt with a female bat when he was returning from an evening hunt. Finally, his wife realized what he was doing and set fire to the tree and killed her husband and the bats [54]. Sometimes bats are husbands as in a Mataco lore from Argentina. A woman noted that her husband had a round tail and dropped the vessel of water she was bringing to him. The bat husband then cut off her head and those of other

Figure 5.

Common vampire bat *Desmodus rotundus* is the one reason for global Chiroptophobia although it is very small weighing about 55 grams and only occurring in central and South America. Photo credit: Uwe Schmidt. “Creative commons”—Wikimedia. <https://creativecommons.org/licenses/by-sa/4.0/legalcode>.

Indians and put all heads in the tree hole where he was living [55]. Also, a Tacana woman in Bolivia was killing a bat while not realizing that it was her husband [34].

In some folklore, bats often have sexual connotations, which may relate to fertility and agriculture as bats are important seed dispersers and pollinators of many fruit trees. Bat guano provides one reason for the fertility associations [56].

In Caribbean South America and the Antilles, bat images are associated with death rites and burials in archeological context [57], and in Cuba, a Taino ball court was bat-shaped, the ballgame being a sacrificial ritual [58]. In Jamaica, the bat and the owl were very important symbols in Taino mythology and death. The bat represented the *opias* (= spirits of the dead people) to the Taino. Fruit-eating bats such as Jamaican fruit bat *Artibeus jamaicensis* loves feeding on guavas, which is also the favorite food of the Taino spirits of the dead. In Jamaican folklore, bats are also perceived as death images [59].

In northern Guiana, Bat Mountain is the home of “killer bats,” and there is also a killer bat in folklore from Venezuela. Decapitating bat demons appears in various myths in Amazonia and to the south in northern Argentina. These myths associate killer bats with fire as the bat burns its victims and is, in turn, thrown into the fire [60–62]. One bat, whose habits may have fostered these tales of decapitating bats, is the false vampire *Vampyrus spectrum*. It is the largest New World bat with a yard wingspan. It is a carnivore, eating birds and other vertebrates, occasionally taking even other species of bats. When capturing its prey, it grabs the neck, sometimes killing the prey with a single powerful bite [51, 52].

8. North America

The artificial bat became a shorthand for horror in 1931, jiggled on a fishing line behind a Hungarian-American actor Béla Ferenc Dezső Blaskó, known professionally as Bela Lugosi in the genre-defining movie *Dracula*. Shockingly, US news media recently reported shortages of Halloween decorations—plastic bats among them, doubtless—due to the world supply crunch [63].

Monstrous beyond imagining, all-consuming, blacker than blackest night, the hideous Satan in the Night on Bald Mountain section of Walt Disney’s animated film *Fantasia* (1940) spreads gigantic bat wings as it turns fiery eyes toward the lost souls about to be engulfed in wrath and flames [64]. This North American bat-like

depiction should come as no surprise; it is merely another manifestation of the fear, horror, and superstition with which bats have been regarded down through ages [64]. Large, often man-eating, bats are found in Hawaiian traditions, and there is even a legend of an eight-eyed bat in Hawaii. Interestingly, giant bat stories have persisted in these “flying-fox-less” societies, which evolved from western Polynesians cultures where flying foxes have been prevalent [45].

Warner Shedd (2000) felt strongly that the level of fear about rabid bats sometimes rises almost paranoid concern in the United States, citing the State of New York as an example [63]. By using a million dollars annually “to educate” the public about the dangers of bat-caused rabies in humans simply exacerbates the already unreasonable fears, which many people have of bats. In its entire history, the state of New York has recorded only one case of bat-transmitted rabies [64]. Between the years 1950 and 2007, only 56 cases of bat-borne rabies transmission to humans occurred in the United States and Canada, which translates to 3.9 cases per billion person-years [65].

The recent introduction of a fungal disease (WNS = White-nose Syndrome) from Eurasia to North America has killed millions of bats in North America in the past decade. Although the exact source of the fungal pathogen, *Pseudogymnoascus destructans*, and its mode of introduction into North America remain unknown, the introduction was most likely mediated by humans, either through direct or indirect transfer of infectious propagules [66]. People can further move the fungus on their clothing and caving gear and spread the disease into an area that does not currently have the fungus [67].

Even worse have been the vandalism and wanton destruction of bats and their habitat in North America. A variety of methods have been used to harass and kill these harmless and beneficial creatures, and some people have even gone so far as to dynamite caves and abandoned mines where bats roost or hibernate [64]. Lately, education seems to have some effect, and more and more people have started to appreciate how useful and amazing bats truly are. It remains to be seen, however, if this could halt or even reverse the decline of the North American bats [64].

9. Fear of bats

An irrational fear of bats—Chiroptophobia—encompasses negative perceptions of bats as disease vectors, pests, or harmful creatures associated with devils and witchcraft, which represents an important barrier to bat conservation globally [27]. Especially Western cultural associations of bats with evil spirits, which have been recorded in Christian tradition as early as the fourteenth century [68] along with current media sensationalizing bats and the COVID-19 pandemic, are major hindrances toward bat conservation [69], although there is no reason why public health messages cannot be consistent with bat conservation.

In Western culture, bats are also associated with vampires causing hysteria and wrong nomenclature of non-sanguivorous bat species such as Large Flying Fox *Pteropus vampyrus*. Despite its scientific name, it feeds exclusively on fruits, nectar, and flowers and not blood (Figure 6) [70].

Since the fourteenth century, Chinese culture has associated bats with good luck and blessings [33].

Even cultures that value bats positively may have values conflicting with bat conservation. Fruit growers may view fruit bats as crop pests [71]. Han Chinese people attach positive esthetic values to bats but may still hunt bats at unsustainable levels [72]. In India, bats are revered in many areas, but still large bat-harvesting festivals take place. In Nagaland between 7000 and 25,000 cave-dwelling bats (Cave Nectar

Figure 6.

Large flying fox Pteropus vampyrus suffers from its misleading scientific name as it is not blood-eating species but feeds only fruits and flowers. Photo credit: Masteraah. "Creative commons"—Wikimedia. <https://creativecommons.org/licenses/by-sa/2.0/de/legalcode>.

Bat *Eonycteris spelaea*, Great Roundleaf Bat *Hipposideros armiger*, and Leschenault's Rousette *Rousettus leschenaultii*) have been annually harvested until recently [73]. So, using positive symbolism alone to promote bat conservation might be insufficient without accounting for day-to-day relationships of local communities with bats. Conversely, negative symbolism could promote conservation if it prevents unsustainable hunting and consumption [27].

It is imperative to obtain more current ethnobiological data to further our understanding of contemporary attitudes and relationships with bats—and to document other cultural traditions not covered in this review.

10. Conclusion

Cultural traditions and beliefs influence the future of the bats, which is threatened by human exploitation, both directly on bats and indirectly on the environment.

To summarize shortly the various findings: In the West, bats have been seen as animals of ill omen, alongside other nocturnal hunters such as owls and black cats. Around 62% of the Asia-Pacific people had only positive cultural values of bats, 8% had only neutral values, while 10% had only negative values [27]. The remaining cultures had combinations of positive, neutral, and negative values.

This suggests that the Asia-Pacific region and its cultures contain far more positive associations with bats than most European or American societies and, as such, offer promising examples and opportunities to promote human-bat coexistence. For example, a number of these countries are investing in the burgeoning industry of ecotourism by promoting organized visits to bat caves and "bat watching" [74, 75]. In 2005, **the privately owned** Montfort Bat Cave Sanctuary on Mindanao Island, south of the Philippines, opened for tourism. The five-chambered cave hosts the world's largest known colony of the Geoffroy's Rousette Fruit Bat, *Rousettus amplexicaudatus*, with an estimated 1.8–2 million individuals [76]. The tour includes a brief

20-minute conservation education lecture about bats, caves, and the history of the Montford Bat Cave Sanctuary. The cave prohibits hunting and guano harvesting, while income from this ecotourism chiefly flows into local economy and enhances the sustainability and protection of the cave site (**Figures 7 and 8**).

Our collection of global perceptions aims to promote a better biocultural richness for humans and bats as our long-term nocturnal companions. But it became obvious that the public attitude toward bats has still not been investigated extensively enough throughout the world, namely in contemporary Africa, America, Australia, and Europe.

Figure 7.
*Montfort bat cave entrance in the Philippines with the numerous Geoffroy's Rousette fruit bats *Rousettes amplexicaudatus*. Photo credit: [7] Roy Kabanlit "creative commons" —Wikimedia <https://creativecommons.org/licenses/by-sa/4.0/legalcode>.*

Figure 8.
*A close-up photo of the Geoffroy's Rousette fruit bats *Rousettes amplexicaudatus* at the Montfort bat cave entrance. Photo credit: Raniel Jose Castaneda "creative commons" – Wikimedia credit as in Figure 7.*

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