Figs as a global spiritual and material resource for humans

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Introduction

The figs (*Ficus*: Moraceae) contain about 750 species spread throughout the tropics and subtropics worldwide, with approximately 500 of these in the Asian-Australasian area, 130 in the Neotropics and 110 in Africa (Berg 1989; Janzen 1979). Ecological scientists have long been fascinated by the diversity of this genus (Janzen 1979), recognizing the interplay between figs and animals as a dynamic mutualism. This perspective has been driven by the remarkable reproductive strategy of figs, whose fruit (syconium) is the site of an obligate mutualism with pollinating fig wasps of the family Agaonidae (Herre *et al.* 2008). Due to this mutualism, figs have evolved to produce very large crops of fruit at short intervals that favor the continuous development of their wasp mutualists (Janzen 1979). This combination of large fruit crops and regular fruiting makes fig trees important resources for many frugivores (Shanahan *et al.* 2001; Terborgh 1986), and it has been suggested that figs are an ecological keystone resource at a continental scale (Herre *et al.* 2008).

Although the role of figs as a vital resource is well established, humans are remarkably absent from these discussions. In a global review of figs and their vertebrate frugivores covering 260 fig species and over 1280 species of vertebrates, the only mention of humans is a note that ‘wild figs were eaten by humans in Borneo, Papua New Guinea and Africa,’ (Shanahan *et al.* 2001: pg 548). In the most comprehensive and recent ecological review of figs and their associates (Herre *et al.* 2008), humans are not mentioned even once. Given that humans are acknowledged as an important part of ecosystems (e.g. McDonnell and Picket 1993) the omission of humans from this discussion appears a particular oversight.

In this paper we demonstrate that figs are a keystone resource for humans throughout the area in which they co-occur. As with other vertebrate frugivores (Shanahan *et al.* 2001), figs are a vital food source to humans, however figs are also used by human in a variety of other ways. We show that for humans, some fig species are considered sacred, provide

fodder for domestic animals, are used as an ethnomedicine or are fashioned into useful objects. This paper is not intended as a thorough review of all the ways in which humans use figs, rather through examples we seek to highlight the importance of figs to humans worldwide. The uses we highlight occur repeatedly throughout the world, and each use can involve different fig species and human cultures in different areas of the world. We hope to emphasize the global nature of the relationship that exists between humans and figs, and stimulate further research into the relationship that exists between figs and humans.

Figs as sacred

The most compelling ‘use’ by humans of figs, which is not shared by any other group of animals, is the view of figs as sacred by people worldwide. The tree as a sacred object or metaphysical construct is not a new concept, however the prevalence of figs among these is quite striking. Many religions talk of ‘cosmic’ trees; while some have no worldly equivalent others are identified with specific species; e.g. the Indian ‘sky tree’ with *Ficus religiosa*, the Egyptian ‘tree of life’ with the date or sycamore *F. sycomorus* and the mythic world tree of the Hindus with *F. benghalensis* (Forlong 1883; Frese and Gray 1995; Hamilton 2002).

Ficus religiosa and *F. benghalensis* are considered sacred to Buddhists and Hindus respectively, worldwide. *Ficus religiosa* is considered the ‘Bodhi’ tree – under which Gautama meditated and received light, thereby emerging as Buddha, ‘the enlightened one’. According to Hindu mythology, Brahma was transformed into a banyan tree *F. benghalensis*, which is viewed as the male partner of the female *F. religiosa* (Bhatla *et al.* 1984). In the Hindu treatises one who plants both *F. religiosa* and *F. benghalensis* (among other species) saves himself from being sent to hell (Jain and Kapoor 2007). As these species are the abodes of the Lords, they are associated with many beliefs and taboos. It is thought that male offspring are ensured if pious women circle the trunk of *F. religiosa* 108 times while Hindi women are exhorted to worship *F. benghalensis* so that they may attain one of the heavens, Sivaloka (Bhatla *et al.* 1984). The *Mikhir* of the

Assam region believe that cutting or damaging *F. religiosa* or *F. benghalensis* is as sinful as killing a saint (Jain and Kapoor 2007), while all figs are considered sacred by all Hindu castes and never felled (Gadgil 1987).

Elsewhere in Asia the Karbi of north-eastern India consider figs to be the symbol of demons and devils, and they especially avoid large *F. benghalensis* groves where these spirits are believed to live (Teron 2009). The Dai ethnic groups of south-west China hold both *F. religiosa* and *F. altissima* sacred, and individual trees are the location for the performance of rituals and traditional sacrificial ceremonies. *Ficus religiosa* is usually planted as a sacred tree for family cult activities near the village and worshipped in individual ritual acts. Wild figs can also be sacred and these become the sites of more collective rituals (Huabin 2003). The Jinuo of southern China also have *F. altissima* as their holy tree and the cutting of large figs is taboo (Long and Zhou 2001). In Kalimantan, the Iban prohibit the cutting of parasitic figs as they are the habitation of spirits or demons (Horowitz 1998), while large figs are equally respected by the Bina tribesmen of West Papua. They will not cut them down, for they may be the haunt of some evil spirit (Lyons 1921).

In Africa, *F. thonningii*¹ is the sacred tree of the A-Kikuyu of Kenya and is the medium through which prayers ascend to God; thus the tree is the ‘child of God’ (Beech 1913). While all *F. thonningii* have the potential to be sacred, only those at which prayers are answered are considered such. To ensure pregnancy women smear themselves with the milky juice of the tree, while men also gather the leaves of the tree and sleep upon them, the fertility apparently passing from the leaves to themselves (Beech 1913). In Tanzania, figs are widely valued for their spiritual and sacred properties and as a focal point for resolving conflicts: these species are never cut down (Hines and Eckman 1993). In Arusha, people place grass or flowers at the base of *F. sycomorus* as an offering and in return ask God to bless them and bring them good luck. The same species is revered by

¹ Since Beech’s paper *Ficus thonningii* has been split into six species, and the species referred to here as *F. thonningii* is most likely *F. roko*, but could also be *F. burkei* or *F. petersii* – all three occur in east Africa, while *F. thonningii* as currently designated is restricted to west Africa. Burrows, J., and Burrows, S. (2003). *Figs of Southern & South-Central Africa*. Umdaus Press, Hatfield.

the Dodoma as a provider of water, and in the rural areas of Moshi, every chief must have the shade of a *F. thonningii* to sit, pray, and think under (Hines and Eckman 1993) while the Lushoto also consider figs to be sacred (German *et al.* 2006). In the Bamileke region of Cameroon, figs embody important symbols and beliefs and are the site for family worship. *Ficus artocarpoides* is used by chiefs while *F. thonningii*, or *F. chlamydocarpa*, shelter the gods who protect the land of common people (Gaultier 1996). The presence of figs guarantee the sacred right of use for successive heirs of the ancestors' land, while the gift of farmland or of a plot is confirmed by the planting of a fig cutting (Gaultier 1996). In Burundi and Rwanda, figs were important in the worship of ancestral spirits and were planted at burial sites of former kings (Niyonkuru 1995).

Elsewhere in the world, the fig (either *F. sycomorus* or *F. carica*) is the first fruit tree mentioned in the Bible and the Torah, "And the eyes of [Adam and Eve] both were opened, and they knew that they were naked; and they sewed fig leaves together, and made themselves aprons" (Genesis 3:7). Islamic and Jewish traditions commonly understand the forbidden fruit in the garden of eden to be a fig rather than the apple, and Byzantine and Italian artists have tended to follow this lead (Michelangelo's painting of the Sistine Chapel ceiling (circa 1510) depicts the tree of knowledge as a fig). Figs are commonly referenced in both the Bible and Torah, while in contrast the fig appears only once in the Qur'án; in the first verse of Surat at-Tin '[I swear] by the fig and the olive' (Qur'an,95:1). In Jewish traditions, King Shlomo (Solomon) compared the Torah to the fig tree (*Mishlei* 27:18) because 'Just as one constantly finds ripe figs on a fig tree, so too will one always find a new taste in the Torah he is studying,' (*Eruvin* 54a). The fig tree is also one of the seven species which God spoke to the Israelites about being in the Promised Land of Israel (Deuteronomy 8:8), and has been considered by some as a symbol for the nation Israel. There is also an ancient Egyptian myth that *F. sycomorus* grew out of the dead body of Osiris (Budge 1973). The Tacana of the Bolivian Amazon believe that malevolent spirits, which can steal your soul, dwell in canopy trees such as figs and walking by these trees or cutting them down may cause illnesses (Bourdy *et al.* 2000). In eastern Guatemala, the Ch'orti' believe that angels prefer to reside in the *amate* tree – an unidentified species of fig (Kufer *et al.* 2006). In Australia *F. brachypoda* was

so important to the early summer diet of the Walpiri people that it was regarded as sacred (Anon 2006).

For the Shambaa people of the Usambara Mountains, Tanzania, figs have three features which make them sacred: they attract ancestral shades (*nasimu*) who can still actively intervene in the affairs of the living, as well as other supernatural beings such as *jini* which are implicated in the causation of disease; they radiate heat which people can sense and by which they can be guided, particularly in the dark; and they are an infallible indicator of the presence of water (Fleurent 1980). Globally however, sacred species do not appear to be united by any physical features: they have a variety of growth forms and each one may be sacred in only one area, or throughout its distribution. This lack of unifying features suggests that the connection between humans and sacred fig trees is an extremely complex one. Importantly, sacredness appears to have developed independently of a species' material usefulness. Nevertheless, figs do have a range of attributes which are important in human culture: these are discussed below.

Figs as food

Many of the attributes that make figs so attractive as a food source to 'animals' (Shanahan *et al.* 2001) apply equally to humans, and figs are eaten either fresh, or more typically, dried, throughout the world. Over 1 million tons of fig fruits (*F. carica*) are produced annually worldwide, with Egypt and Turkey comprising over half of the world's supply (FAO 2011b). Figs as a source of food are singled out as a blessing from god in the bible (Deuteronomy 8:8) and are mentioned in Egyptian documents from the days of Snefrou of the Fourth Dynasty (~2700 B.C.) as a tree on whose fruit the people live (Goor 1965). The most widely cultivated form is *F. carica* which is closely related, both genetically and morphologically to a number of wild *Ficus* which occur widely through the mediterranean basin (Zohary and Hopf 1988). Domestication is thought to have occurred in a number of regions within the Mediterranean basin starting in the Early Neolithic period (Kislev *et al.* 2006). From this region, cultivated figs spread worldwide throughout suitable climates - reaching England before 1548, China by 1550, Mexico in

1560 and finally the USA in 1769 (Morton 1987). While reproduction in the wild is via pollination and the germination of viable seed, under domestication fig varieties are a clone of female tree propagated through cuttings. Some fig varieties require pollination for successful fruit set while other varieties may produce seedless fig fruits without pollination; a change that has only arisen since domestication (Zohary and Hopf 1988).

Figs have several characteristics which make them particularly appealing as a food source.

Both the fruit and young shoots can be eaten and are often available fresh year-round in most areas, or can be stored for later consumption. In north-eastern India fruits of at least 14 species of fig are eaten either raw or pickled, while leaf buds and stipules of some species are also eaten as a vegetable or pickle (Chhetri 2010). Similarly, in Nepal young shoots of *F. lacor* are eaten as a vegetable while fruit of *F. racemosa* and *F. sarmentosa* are eaten (Shrestha 1988; Uprety *et al.* 2010). In Tanzania, the Batemi people eat fruits of *F. populifolia*, *F. sur* and *F. wakefieldii* (Smith *et al.* 1996), while fruits from 11 species of fig are eaten in Uganda (Ipulet 2007; Katende *et al.* 1999). In Australia, fruits of *F. aspera*, *F. racemosa* and *F. platypoda* are eaten (Cane 1987; Palmer 1884). Fig trees are renowned for the tendency to provide food out of synchrony with the rest of the forest (Janzen 1979), and in places with large numbers of fig species there is often fruit available throughout the year (McPherson 2005; Spencer *et al.* 1996). This year-round availability has been shown to be important for non-human primates (Felton *et al.* 2008; Shanahan *et al.* 2001) and was presumably as important for early hominids. While individual fresh figs have a short, post-harvest life of only a week or two, drying prolongs their storability considerably. This ability to store dried figs was known as early as the 3rd and 2nd centuries B.C, where the Papyrus of Zenon lists dried figs as one of the commodities brought from 'Syria' (Goor 1965). Among the Jbala in northern Morocco an average family consumes 200–300 kg of dry figs per year while the Walpiri and other tribes of central Australia prepare cakes from dried, pulverized figs (Hmimsa *et al.* 2012; O'Connell *et al.* 1983 and references therein).

Figs are often also available in large quantities and are highly nutritious. They are a convenient source of fiber, minerals and nutrients; by weight figs provide more calcium and fiber than any other readily available fresh fruit, and these values increase significantly in dried compared to fresh figs (Vinson 1999; Vinson *et al.* 2005). *Ficus palmata* is known to be rich in carbohydrates by the Bischarin and Khushmaan tribes of eastern Sahara desert of Egypt (Goodman and Hobbs 1988). In central Australia *F. platypoda*, containing some protein and fat as well as very high levels of magnesium, is eaten (Brand-Miller and Holt 1998; Sweeney 1947) and individual fig trees may bear tens of thousands of fruit in a good season (O'Connell *et al.* 1983). In Borneo crop size varied from 300 to 250,000 fruit per tree, with an average of 26,000 figs, for 14 species of fig which may fruit twice in a year (Lambert and Marshall 1991).

Figs as fodder

While figs are important as a direct source of food for humans, they also provide fodder for domestic animals. In north-eastern India leaves and twigs of all 14 species of fig present are used as supplementary fodder for cattle, some throughout the year and others only during lean times (Chhetri 2010). Shoots from two of these species (*F. hispida* and *F. auriculata*) are also used by indigenous people in Nepal as animal fodder, along with *F. racemosa* and *F. clavata* (Shrestha 1988; Uprety *et al.* 2010). In some areas of Nepal figs provide 40-50% of all animal feed (Pandey 1982). Similar uses of *Ficus* leaves as fodder are reported from Cameroon, where *F. chlamydocarpa*, *F. vogelii* and *F. elastica* are all used to feed livestock (Focho *et al.* 2009), while *F. carica* is used in the same way in Morocco (Ennabili *et al.* 2000). Additionally, the FAO lists eight species of fig as suitable for fodder crops (FAO 2011a). Thus figs may allow humans to maintain domestic animals, and hence potentially agricultural production, through times of food shortage.

Figs as provider

In addition to being a food source for both humans and their domesticated animals, figs also provide resources for other uses. One prominent example is the use of the outer layer

of the fig's trunk to make 'barkcloth'; this technology exists in at least three separate areas of the world. Barkcloth has been important to Mexican culture for at least 1400 years, and has involved approximately six species: *F. petiolaris*, *F. padifolia*, *F. tecolutensis*, *F. cotinifolia*, *F. involuta* and *F. elastica* (Christensen 1963; Peters *et al.* 1987). Its importance was such that over 480,000 bark sheets were sent as annual tribute to the royal house of Motecuhzoma II in Tenochtitlan, while more recently the bark paper has been used in agricultural rites, folk medicine and witchcraft. Images of spirits or deities cut from bark paper are used in various ceremonies, to assure a good harvest, exorcise evil spirits, or to cast spells (Peters *et al.* 1987). Bark cloth made from *F. natalensis*, *F. thonningii* and *F. ovata* is also central in the culture of the Baganda of Uganda where it is used to make a variety of handicrafts and in the burying of the dead (Ipulet 2007). Bark cloth made from *F. thonningii* and others has also been reported from the Azande of southern Sudan (Evans-Pritchard 1960). In central Sulawesi, *F. infectoria*, *F. annulata* and *F. variegata* are similarly used to make barkcloth by the indigenous peoples of the area (Aragon 1990), and it is thought that barkcloth was the original clothing material for the whole Indonesian archipelago (Adriani and Kruyt 1905). Elsewhere, the buttress roots of some fig species (e.g. *F. albipila*, *F. variegata*, *F. opposita* and *F. virens*) were carved into shield by the Australian aborigines (summary in Kamminga 2002), while the buttresses roots of *F. sycomorus* are used as doors by the Batemi of Tanzania (Smith *et al.* 1996). In India, sections from the trunk of *F. racemosa* are made into small slit-drums (Kaufmann 1961) while trunks of *F. exasperata* and *F. mucoso* are used to make drums in central Uganda (Omeja *et al.* 2004). In Fundong, Cameroon, *F. chlamydocarpa* and *F. vogelii* are used as live fences while *F. natalensis* is used for building. Land ownership disputes are common in Fundong and figs are used traditionally to demarcate boundaries (Focho *et al.* 2009).

Figs in medicine

While consuming figs is widely known to be good for human health, other parts of fig trees are used by humans worldwide to treat a variety of symptoms and ailments. The method employed and the parts of the tree used differ between regions, and figs play a

vital role in traditional ethnomedicine. For example, the white latex from *F. insipida* and *F. maxima* is used to treat intestinal parasites in Peru, and the related species *F. doliaria* and *F. clusiifolia* are similarly used in Brazil (Bourdy *et al.* 2000; Mors and Rizzini 1966). Also in Brazil, the latex from *F. obtusifolia* and *F. paraensis* are used in osteomuscular and gastrointestinal problems, while in Vanuatu the latex sap of *F. adenosperma* is used to treat menorrhagia (Bourdy and Walter 1992; Rodrigues 2006).

In Zaire, people use the bark from four fig species to treat constipation and mixed with other plants to treat ‘illness of the heart’ (Yamada 1999). In Ghana leaves and seeds of *F. sur* are boiled and drunk for the production of abundant breast milk (Addo-Fordjour *et al.* 2008), and, similarly, though far away, in Vanuatu, softened leaves of *F. septica* are placed on nipples to aid lactation (Bourdy and Walter 1992). In Madagascar a decoction of the leaf and bark of *F. polita* is drunk to relieve malarial symptoms, and the roots of *F. sycomorus* and leaves, stems and bark of *F. platyphylla* are used in a similar fashion in Ghana (Asase *et al.* 2005; Randrianarivelojosia *et al.* 2003). People in both Bangladesh and Ethiopia use figs to treat dysentery and ease vomiting and diarrhea: in Bangladesh, the roots and juice from young buds of *F. benghalensis* are used (Anisuzzaman *et al.* 2007) and in Ethiopia the root of *F. thonningii* is chewed (Teklehaymanot and Giday 2007). For a thorough review of figs in ethnomedicine see Lansky *et al.* (2008), while detailed traditional medicinal uses and phytopharmacology can be found for at least one species (*F. racemosa*; Ahmed and Urooj (2010)).

Conclusion

Here we have described in detail some of the ways that humans use figs, highlighting both the importance and diversity of this interaction. Despite our examples spanning the global distribution of figs and a wide range of different fig species, the same views and uses of figs occur repeatedly. While figs are undoubtedly important as a food source, they also provide vital spiritual, health and functional roles to humans throughout their distribution.

Although humans use figs in a multitude of ways, there is little current evidence that humans are beneficial to figs in any way. Thus the current perception of the human – fig relationship is primarily one of resource use, rather than as a mutualism, as recognised between figs and other frugivores (Janzen 1979). In fact, despite their importance to humans, figs appear to gain little from the relationship. Two notable exceptions are *F. carica*, which, due to its edible fruit, has been actively spread by humans throughout the world from the eastern mediterranean (Zohary and Hopf 1988), and the sacred *Ficus* groves of Africa and India, which have been spared during clearing of native forests.

Given the immense importance, both sacred and otherwise, of figs to humans, we believe that future research will reveal a multitude of ways in which humans affect figs and *vice versa*. For example, Kosambi (2005) suggested that the distribution of *F. religiosa* paralleled that of Buddhism, and that due to the sacredness of this species and its role in Buddhism, it was taken with Buddhists as they moved east from India into southeast Asia and southern China. while all *Ficus* species used in Fundong, Cameroon have been introduced by humans into the area from elsewhere (Focho *et al.* 2009). These ideas offer a tantalizing glimpse that figs may have used humans as a dispersal agent and one aspect of the human-fig relationship awaiting detailed investigation.

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