
ENDANGERED TRADITIONAL BELIEFS IN JAPAN: INFLUENCES ON SNAKE CONSERVATION

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ABSTRACT.—Religious beliefs and practices attached to the environment and specific organisms are increasingly recognized to play a critical role for successful conservation. We herein document a case study in Japan with a focus on the beliefs associated with snakes. In Japan, snakes have traditionally been revered as a god, a messenger of a god, or a creature that brings a divine curse when a snake is harmed or a particular natural site is disturbed. These strong beliefs have discouraged people from harming snakes and disturbing certain habitats associated with a snake god. Thus, traditional beliefs and cultural mores are often aligned with today's conservation ethics, and with their loss wise conservation of species and their habitats may fall by the wayside. The erosion of tradition is extensive in modern Japan, which coincides with increased snake exploitation, killing, and reduction of habitat. We recommend that conservation efforts of snakes (and other biodiversity) of Japan should include immediate, cooperative efforts to preserve and revive traditional beliefs, to collect ecological and geographical data necessary for effective conservation and management activities, and to involve the government to make traditional taboos formal institutions.

Key Words.—Conservation; Japan; snakes; taboo; traditional beliefs

INTRODUCTION

Humans have extensively modified the Earth's land areas that are most valuable for agriculture and other human activities (Tilman et al. 2001; Green et al. 2005; Ellis and Ramankutty 2008). As a result, the area available to most other non-human species has declined, reducing biodiversity at the global scale (Sala et al. 2000; Lenzen et al. 2009). Biodiversity is further threatened by overexploitation of species (including indiscriminate killing or recreational hunting), which is a primary threat for as much as one third of species worldwide (Groombridge 1992).

Certain natural areas and wild species, however, have escaped the destructive influences of humanity, even within areas of high social or economic value and without government involvement (Bernard 2003; Barrow and Pathak 2005; Oviedo and Jeanrenaud 2006; Jones et al. 2008). These are areas dedicated to species associated with ancestral or natural spirits, or deities. In such areas, local people refrain from cutting down trees, killing animals, harvesting useful plants within such sites, or even entering or passing nearby, believing that the spirits or deities would be offended and bring harm to the persons, families, or even whole villages if the sites are disturbed. Similarly, specific species of plants and animals, independent of the area they inhabit, are not exploited at all, or only in a restricted manner. Thus, these traditional institutions strongly influence people's

interactions with natural resources and their attitudes to wild species.

Although officially protected areas such as national parks are an essential part of any conservation strategy, most experts acknowledge that conservation reserves alone are not sufficient to safeguard critical habitat and ecosystem services (Bengtsson et al. 2003; Rodrigues et al. 2004). There is a growing consensus that traditional institutions provide considerable protection of ecosystems and biodiversity without governmental juridical restrictions, and that these traditions should be included in conservation and management strategies (Berkes et al. 2000; Bhagwat et al. 2005; Tengö et al. 2007; Jones et al. 2008; Dudley et al. 2009). For example, Colding and Folke (2001) systematically examined a large number of taboos associated with resource use (resource and habitat taboos) mostly in Africa, Southeast Asia, and South America and found that many of these taboos have functions similar to those of formal conservation measures in contemporary society. However, traditional beliefs are rapidly eroding worldwide and the resulting breakdown of informal, self-imposed restrictions on land and resource use is threatening species and habitats that were once afforded protection by traditions (Anoliefo et al. 2003; Lingard et al. 2003; Chandrakanth et al. 2004; Nomoto 2004; Bhagwat and Rutte 2006).

In Japan, more than two-thirds of the land is unsuitable for human habitation, creating extremely high

population density in habitable areas. Much of this accessible land has been converted to agriculture, residential areas, and other forms of human use during the more than 2,000 years of Japan's modern civilization (Diamond 2005). Remaining natural or semi-natural areas are rapidly being developed in ways that are incompatible with use by most other species. This has come at a significant cost to the biodiversity of Japan, including snake biodiversity. Japan harbors 33 species of land and sea snakes. Nearly one third of these species are threatened (Ministry of the Environment Government of Japan. 2006. The 3rd Version of the Japanese Red List on Birds, Reptiles, Amphibians, and Invertebrates. Available from http://www.env.go.jp/press/file_view.php?serial=8930&hou_id=7849 [Accessed 8 February 2010]). Many snake populations are also threatened and have become conservation concerns in a number of prefectures. The expansion of human activities, especially in formerly species-rich rural areas, has significant impact on Japanese snakes (e.g., Sasaki et al. 2005).

Many scholars have previously documented links between sacred natural sites of Japan and associated traditional beliefs (e.g., Nomoto 2004; Motonaka 2006; Ohsawa 2006). Although beliefs associated with snakes have previously been discussed (e.g., Kojima 1991), no literature, to our knowledge, has compiled taboos against harming snakes or considered conservation implications of snake beliefs. Herein, we describe traditional beliefs about nature, with a focus on snake beliefs, held by the people of Japan. Our objective was not to provide an exhaustive inventory of beliefs about nature or snakes of all the communities in Japan, as each community often has its own unique beliefs, but to: (1) introduce the general beliefs that seem to underlie the respective attitudes and actions expressed toward snakes; (2) show how these beliefs influence people's interactions with snakes and their habitats; and (3) provide recommendations for conservation of snakes and traditionally protected natural sites, and biodiversity in general, in Japan.

MATERIALS AND METHODS

Information presented here is based on published accounts, our own beliefs, as well as our experiences and observations, including informal conversations with people in various Japanese communities. We surveyed the literature for relevant examples of beliefs and associated actions toward snakes. Literature we used included peer-reviewed and non peer-reviewed journal articles, books, including those dealing with history and culture of each municipality, and booklets published by local governments or by individuals.

Folk beliefs (and associated actions toward nature) often exist in oral traditions and most of them are not

recorded in written form. Therefore, we collected additional information through informal conversations through either direct meetings or electronically via e-mails or blogs. All direct meetings occurred opportunistically in southwestern Hokkaido, mostly during fieldwork conducted during 1999-2002 (see Sasaki et al. 2009). When we located potential informants by searching the internet using the keyword "snakes" in Japanese, we contacted them through blogs or e-mails. Approximate ages of the informants were mostly 50–60 years old (ranging from 30–90). Occupations of informants varied, and included construction workers, farmers, fishermen, local government officials, school teachers, and shrine priests, among others.

GENERAL BELIEFS ASSOCIATED WITH NATURE

The religious beliefs of most Japanese people are complex and diverse, with most people practicing not only both Shinto and Buddhism at different points in their lives, but also folk religions often unique to regions. Nonetheless, most beliefs seem to have animism and ancestral worship at their foundation. Japanese people tend to revere or respect anything that is awe-inspiring, most often associated with nature or the deceased. Such awe-inspiring entities are generally called *kami* (no accurate English term for *kami* exists, but the term is often translated as god, deity, or spirit). It is believed that *kami* often visit or reside in natural areas and that disturbing these areas will call forth *kami*'s retribution, while respectful attitudes and acts can bring *kami*'s protection and blessing.

Because of such beliefs, people have refrained from disturbing certain natural areas, leaving them free from destructive human interventions for hundreds of years despite their easy accessibility or exploitability (Kondo 1991; Senda 1992; Nomoto 2004; Omura 2004; Iwatsuki et al. 2005). For example, the 300 ha Kasugayama Primeval Forest of Mt. Kasugayama, Nara Prefecture, has been protected from logging and hunting as a sacred place of Kasuga-Taisha (Kasuga Great Shrine) for more than 1,100 years. It is believed that *kami* reside in the forested area and are offended if trees are cut down. In the case of Futaojima Island, four forest stands have long been protected from cutting as a place for forest *kami*; even entry to these forests is considered taboo by the islanders. Another example is Okinoshima Island, where the entire island has long been revered as an island of *kami*. Munakata-Taisha (Munakata Great Shrine) is dedicated to this island, and public access is confined to only once a year, the day of the annual shrine festival.



FIGURE 1. A shrine called “snake-*kami*” on Mt. Rokushosan, Toyota City, Aichi Prefecture, Japan. Note that an egg is being offered to the snake-*kami*. (Photographed by Noriyasu Honda)

SNAKE BELIEFS AND TABOOS AGAINST HARMING SNAKES

The earliest evidence of snake beliefs in Japan can be traced back to the middle Jomon Period (ca. 4,000–300 BC). Yoshino (2000, 2001) argued that the snake was believed to be a powerful, omnipotent ancestor-*kami*, not a lower-level *kami* like the *kami* of water. In historic documents written in the 700s (e.g., *Kojiki*, *Hitachi no*

Kuni Fudoki), *kami* is often portrayed as a snake (Tsugita 1971; Arakawa 1996). A mythology of Miyako Island, Okinawa Prefecture, portrays a giant snake as the creator of the island (Yoshino 2000). Although snake beliefs have diversified and the importance of the snake as *kami* has diminished in the minds of people over the course of Japan’s long history, largely due to the arrival of foreign immigrants and religions such as Buddhism and Daoism, snake beliefs have persisted to this day.

Snakes are one of the creatures most frequently perceived as *kami*, *kami*’s messenger, or *nushi* (powerful creatures that have long been living and have control over areas). If offended or harmed, snakes are believed to bring misfortune or harm to people, families, or whole villages. Because of this belief, the people of Japan generally hold snakes in great awe and endeavor to avoid harming snakes or disturbing the areas they inhabit (Getty 1940; Daniels 1960; Ashkenazi 2003; Matsutani 2003). A large number of shrines and pagodas in Japan are dedicated to snake-*kami*. For example in Tono, Iwate Prefecture, many places enshrine *Horyou kami*, which is believed to have the body of a snake. It is said that killing snakes around such areas is taboo (Yanagita 1941). Residents of Nishinogami, Hyogo Prefecture, perceive snakes as water-*kami*, to which the local Suwa Shrine is dedicated. It is said that snakes are not to be harmed in this area. On Mt. Rokushosan at Toyota City, Aichi Prefecture, there is a small shrine dedicated to snake-*kami*, which is respected by the villagers of Miyaguchi (Fig. 1). The villagers generally refrain from harming snakes, including the venomous Japanese Mamushi (*Gloydius blomhoffii*; Fig. 2), particularly in the neighborhood of the shrine.

Snakes are often believed to be associated with health, prosperity, and protection, and are one of the most common *kami* enshrined. For example, many people visit Kanahebisui shrine (shrine of iron snake and water)



FIGURE 2. The Japanese Mamushi (*Gloydius blomhoffii*), Teuri Island, Japan. (Photographed by Kiyoshi Sasaki)



FIGURE 3. Stones with snake figures in Kanahebisui shrine, Iwanuma City, Miyagi Prefecture, Japan. These stones are believed to bring wealth to people who touch them. (Photographed by Toshiro Oikawa)

at Iwanuma City, Miyagi Prefecture, and touch stones with snake figures in the belief that touching these stones will bring prosperity (Fig. 3). Albino snakes (so-called white snakes in Japanese) are especially the target of worship or respect (Opler 1945; Choate 1963). An example is the “naturally” occurring population of albino Japanese Rat Snakes (*Elaphe climacophora*) in Iwakuni City. Local people avoid harming these snakes (Choate 1963; Sengoku 1996). The Japanese government designated the localities inhabited by these albino snakes, and the snakes themselves, as natural monuments in 1924 and 1972, respectively. There are a number of shrines in Japan that are dedicated to white snakes. Additionally, in the Umatate District of Shiraoka City, Saitama Prefecture, white snakes are believed to be the messenger of Benzaiten, a member of popular Shichi-fuku-jin (seven gods of good fortunes). Accordingly, it is taboo to harm snakes.

Snakes are typically believed to be associated with mountains, forests, rivers, and other water bodies (Czaja 1974). Villagers around Mt. Akagunayama believe that the *kami* of the mountain is a giant snake who protects the mountain, village, and water sources. In villages in Shikoku, snakes are considered a *kami* of mountains and cultivated fields, and the villagers are said to chant before burning for slash-and-burn agriculture: “Mountain-*kami*, giant snake, beg your pardon, beg your pardon” (Kojima 1991; Sasaki 2006). Hebi Jinja (snake shrine) in Tochigi Prefecture reveres snakes as a water-*kami*. In Yunosawa District, Murayama City, Yamagata Prefecture, snakes found outside of agricultural land or residential areas are believed to be associated with wind/rain-*kami* and it is said to be taboo to kill snakes.

Snakes are also believed to be the reincarnation of the deceased, especially those people who had a strong

presence. On Mt. Odaniyama at Kohoku Town, Shiga Prefecture, where the ruins of the Odani Castle remain, it is said that numerous warriors who died when the Odani Castle was besieged were reincarnated as Japanese Mamushi and continue to guard the castle. It is still believed that if a person kills a Japanese Mamushi, all Japanese Mamushi living on the mountain will come to kill that person. Accordingly, people do not kill Japanese Mamushi on the mountain. Yanagita (1999) documents another case in which a person killed a Yamakagashi (*Rhabdophis tigrinus*) and his child became terribly ill. According to a medium, the snake he killed was the reincarnation of his family’s ancestor and was watching over the family.

Snakes found in or near houses are commonly regarded as *kami* or *nushi* that protect families and bring forth divine curses if the snakes are not treated appropriately (Ouweland 1958-1959; Bérczi et al. 2001; Kawanabe 2003; Ooba 2006). Matsutani (2003) documents a family that reveres snake-*kami*. Every time a snake is found around the house, the grandmother of the family makes offerings of rice and sake to the snake and prays for the welfare of the family. Matsutani (2003) also documents other cases where snakes in and around the houses are protected and where unfortunate incidents (death and other undesirable events) were attributed to harming and killing of such snakes.

ARE VENOMOUS SNAKES AN EXCEPTION?

A general taboo against killing and harming snakes seems to be more commonly applied to non-venomous snakes (Daniels 1960). It is common that farmers leave non-venomous snakes alone, but always kill venomous ones. Nonetheless, given existing evidence, we consider



Figure 4. A shrine (left) and a snake god or *ryujin* (dragon god; right) on Mt Futagoyama, Iwate Prefecture, Japan. (Photographed by Minoru Miyata)

that a taboo against killing venomous snakes was probably common in the past. For example, a legend, “The Snake that Returns a Favor,” told in the area of Taihakuku, Miyagi Prefecture, relates that the venomous Japanese Mamushi is a *nushi* of Mt. Taihакusan and that a family involved in this story quit hunting Japanese Mamushi for medicinal use on this mountain (Aihara, T., S. Ito, S. Saito, T. Takahashi, K. Takamoto, and M. Yabuki. 1997. *Taihaku no Densetsu*. [Unpublished booklet]. Atarashiimori no Miyakozukuri Taihaku Kyogikai, Sendai, Miyagi, Japan). The legend of “The Shed Skin of Snakes,” also told in the same area, explains that the Japanese Mamushi is a messenger of *kami* and a guardian of this mountain who punishes people who disturb the mountain, and that Japanese Mamushi’s shed skin is a good medicine for verruca warts (Aihara et al. 1997. *op. cit.*). In Suttu, Hokkaido, a folktale, “The Dragon God of Suttu,” says that Japanese Mamushi that appear near fishermen’s boats are the dragon *kami*, and killing of such snakes will invite curses and is therefore taboo (International Digital EHON Association, The Dragon God of Suttu. Available from <http://www.e-hon.jp/suttu/sute0.htm> [Accessed 1 April 2010]).

The following authors document cases of taboos against killing venomous snakes. According to Yoshida (1980, 1998), on the Ryukyu Islands, the Habu (*Protobothrops flavoviridis*), now commonly killed or hunted under bounty, used to be considered a messenger of *kami* or ancestors. On Mt. Tonochigoyama and around a part of Mt. Inokawadake on the Tokunoshima Island, local people used to refrain from killing the Habu, believing that such an act will bring a curse to the person involved (Yoshida 1980, 1998; Matsuyama 1998). Nakamura (1998) reported that when the Habu were found in gardens, the islanders neither tried to kill the snakes nor physically remove them from the gardens. Instead, they chanted special words and offered prayer so that the snakes would leave the gardens of their own

accord. Takara (1998) reported that he was prevented by Bise villagers from catching a Habu in the Gusukuyama prayer forest because the villagers believed that killing Habu in this forest would bring a curse not only to the person who killed the snake, but also to fellow villagers.

Indeed, there are several cases of the practice of refraining from killing venomous snakes in some areas today, at least up until recently. For example, a small shrine erected near a mineral spring on Mt. Futagoyama, Iwate Prefecture, is devoted to a Japanese Mamushi-*kami* or *ryujin* (dragon *kami*; Naito 1978; Fig. 4). Japanese Mamushi are common in the area, but locals believe that the snakes living around the shrine never bite people. It is also believed that if one kills a Japanese Mamushi, the snakes will attack people in great numbers (Naito 1978). Because of these beliefs, even today local people do not kill this species, although how commonly these beliefs are still held has not been investigated.

In the case of Samukawa hamlet in Hokkaido (abandoned in the 1950s due to severe typhoon damage), people worshiped *kuroki-hachidai-ryujin*, one of the *kami* of the sea (Nakamura and Furushou 2004). Japanese Mamushi were believed to be the manifestation of the *kami*, and, accordingly, were not killed (pers. comm. from a former resident). In Kumanogawa, Wakayama Prefecture, villagers of Koguchi refrain from harming snakes, including Japanese Mamushi, though their motivation to do so is rather habitual. The original reason appears to be forgotten among the villagers.

Another example is the Shimonita Konnyaku (Konjac) Tourist Center that was built on a former agricultural field in Gunma Prefecture. Before construction in 1986, a soothsayer informed the center owner that the land was the home for Japanese Mamushi, and that driving Japanese Mamushi away from the land would upset the snakes. As recommended by the soothsayer, the tourist center erected a pagoda used for praying for the repose of souls of dragon *kami* to calm the anger of Japanese



FIGURE 5. A pagoda dedicated to the spirit of dragon *kami*, which was created to calm the anger of the Japanese Mamushi that used to occupy the land before the Shimonita Konnyaku Tourist Center, Gunma Prefecture, Japan, was built there. (Photographed by Moteki Keiko)

Mamushi. To this day, albino Japanese Mamushi (which are believed to live in the area) are worshiped as the *kami* of the premises (Fig. 5). Japanese Mamushi, albino or otherwise, are not killed around the center.

There are a few other examples of the avoidance of killing venomous snakes. A shrine priest at Katsuragi Mitoshi Shrine, Nara Prefecture, considers Japanese Mamushi (and other snakes) to be a messenger of *kami* and does not kill these snakes. In the town of Kaminokuni, Hokkaido, a fisherman told us that he regards sea snakes as a *ryujin*, a *kami* who controls the catch of fish and the safety of the fishermen. Whenever a sea snake (most likely *Pelamis platura*, possibly *Hydrophis melanocephalus*) is accidentally caught in a fishing net, the fisherman offers *sake* (Japanese rice wine) before releasing the snake. His house has an altar where his family makes offerings such as eggs to the *ryujin*.

TABOO AGAINST DISTURBING CERTAIN NATURAL SITES

As noted earlier, people refrain from disturbing areas where *kami* or *kami*'s messengers visit or reside. For example, broad-leaved evergreen forests have been lost from most of their historical range, but about 2 ha of this forest type remain in the forest of Iwagami Shrine located on Gogoshima Island, Ehime Prefecture. Locals have refrained from cutting trees in the area, believing that logging will bring curses by a white snake living on a huge rock revered by the local people. The forest is now designated as a natural monument of Matsuyama City on Gogoshi Island. In Bise hamlet on Okinawa Island, the Gusukuyama prayer forest is still composed of relatively ancient vegetation. According to an elder, people believe that the *nushi* of the forest is a giant, guardian Habu and that a reckless entrance into this

forest will bring a divine curse (Takara 1998). Mt. Miwayama, Nara Prefecture, is associated with snake-*kami* and has restricted access (Arakawa 1996; Yoshino 2000). It is taboo to harm or remove animals and plants from the mountain (Antoni 1995). In the case of Mt. Nonogamidake, a giant white snake is believed to be *kami*'s messenger and to reside on the mountain and bring forth curses on people who enter the mountain. Entrance to this mountain is still taboo today.

In some cases, entire islands are protected. For example, Kashima Island (3 ha), just offshore of Wakayama Prefecture, is covered by broad-leaved evergreen forest. It was designated as a natural monument by the government in the early 1900s. Although the original meaning for the reverence of this island is uncertain, the following passage suggests a link to snake beliefs: "This island has not been inhabited by people since ancient times because people feared snake-*kami* residing on the island." (Sato 1952; Association of Minakata Kumagusu Archives 2006).

CHANGES IN BELIEFS

Snake beliefs, as well as nature beliefs in general, have declined throughout Japan. Although immigration from other parts of Asia has eroded Japan's indigenous nature and snake beliefs, the Meiji Restoration (1868-1912), a radical modernization and westernization project by the Japanese government with invited foreign advisers, was perhaps the most influential of events in these tendencies. The Meiji Restoration project changed virtually all areas of Japanese life, including the way people perceive nature, and has brought about substantial environmental changes. These changes include, among many others, the extinction of the Hokkaido Wolf (*Canis lupus hattai*), brought about by an extermination program that aimed to establish a modern livestock industry (lead by Edwin Dun, an Ohio rancher; Knight 1997; Walker 2004); conversion of much old growth forest into American-style agricultural land in Hokkaido (guided by Dr. William Smith Clark, a former President of the Massachusetts Agricultural College, now at the University of Massachusetts, Amherst; McClain 2001; Dudden 2005); demolition of numerous local shrines and their sacred groves and natural areas as a result of the ordinance of shrine consolidation (Kato 1999); and abandonment of agricultural and silvicultural practices that created sustainable rural ecosystems comprised of a mosaic of natural and moderately manipulated landscape elements (termed *satoyama*; Kato 2001; Takeuchi et al. 2003). In a religious reform, the government prohibited the practice of locally unique beliefs and traditions that are different from those of the State Shinto, including phallic beliefs and worship of local ancestral *kami*, some of which were associated with snake beliefs.

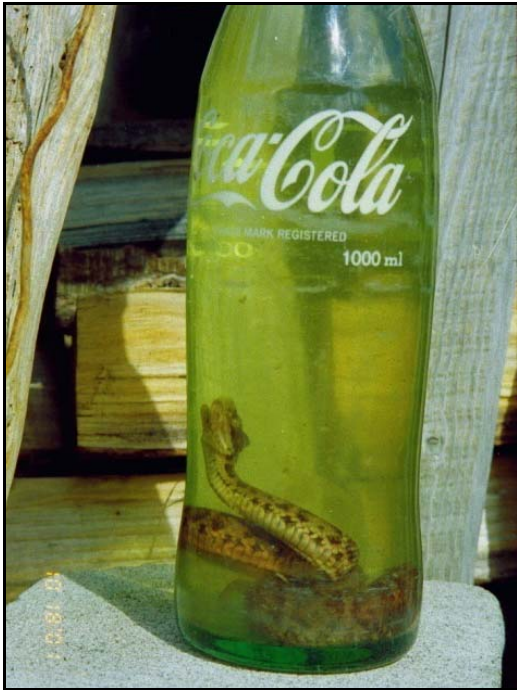


FIGURE 6. Homemade, medicinal whiskey containing the Japanese Mamushi (*Gloydius blomhoffii*). (Photographed by Kiyoshi Sasaki)

The erosion of beliefs about snakes and nature is now pervasive. Many areas that people used to avoid entering or disturbing are now commonly accessed. For example, Mt. Futagoyama is supposed to be a mountain where local people refrain from entering. However, only a handful of local elders are said to still practice this tradition. In the case of Tono, Iwate Prefecture, Yanagita (1935) documented that there were many “taboo forests” in villages. In these forests, it was taboo to take anything living, including plants and snakes, and people avoided entering or even getting close to these areas. However, most, or perhaps all, of these forests have been destroyed (Nomoto 2004).

Today, many Japanese people exhibit beliefs and attitudes toward snakes that are generally similar to those exhibited in many other societies worldwide (Sasaki et al. 2008). Malicious, indiscriminate, or seemingly irrational or unnecessary killing of snakes, venomous species in particular, have become commonplace (Sasaki et al. 2009). The Habu of Tokunoshima Island, formerly respected (at least in some regions), are now hunted under the bounty system offered by Kagoshima Prefecture since 1880 (Yoshida 1980; Hattori 2002). Japanese Mamushi are also killed not only around residential and agricultural areas, but also in formally protected areas. For example, on Teuri Island, a quasi-national park of Hokkaido, the municipal government has been enforcing a “control program” by employing a local resident to kill Japanese Mamushi to

“protect” tourists (Haboro Municipal Government, pers. comm.).

Today there is unregulated exploitation of some species for commercial purposes or individual use (Fig. 6), although some levels of exploitation for medicine or food have existed in the past. Richard Goris (pers. comm. 2001, 2006; see also Gloyd and Conant 1990; Conant 1992), a herpetologist who used to work for the Tohtohshu Honpo company, one of the largest wholesalers that exploit Japanese Mamushi, describes their use of the snake as follows:

“30 some years ago snake whiskey companies like Tohtohshu collected at least 40,000 Japanese Mamushis per year... In the early 70's they were unable to get enough to keep up their production of whiskey, so they took to importing other species of *Gloydius* from Korea and China, and continue to do so today. Other heavy users of Japanese Mamushis are the Chinese medicine places. They rely heavily on imports also, mostly from Fukien Province in China. They are able to obtain only a few hundred local specimens in the summer. Tohtohshu recently ceased operating because of bankruptcy. Ultimately, the cause of the bankruptcy was their rapacious overcollection of Japanese Mamushi, and the defection of the farmers who used to do the collection. The farmers could no longer collect enough snakes to make it worth their while to collect for the pittance they were being paid...”

CONSERVATION AND MANAGEMENT ISSUES

However superstitious traditional Japanese snake or nature beliefs may appear to outsiders, they certainly discouraged people from killing or exploiting snakes and from destroying certain natural areas in the past. There is now growing consensus that such traditional beliefs and cultures can play an important role in biodiversity conservation (Bhagwat and Rutte 2006). Because belief system-based behavioral restrictions proceed voluntarily without governmental juridical involvement, and because many of these areas are often situated in places with potentially high economic value, continued existence of such beliefs can significantly contribute to conservation of biodiversity. As suggested for other species in other societies (Liu et al. 2002; Lingard et al. 2003; Rai 2007), we recommend that efforts to revive traditional beliefs should be included in snake (and other biodiversity) conservation strategies in Japan. In particular, snake conservation will be significantly enhanced by the continued existence of snake beliefs because snake conservation is often impeded by the widespread aversion toward snakes (Dodd 1993; Sasaki et al. 2008).

Revival of traditional snake beliefs will surely not be an easy task. Nonetheless, we believe that it is feasible if immediate, cooperative efforts are made because many Japanese people are still quite superstitious and show

some form of respect and reverence toward snakes. For example, many people possess shed skins of snakes or snake charms in the belief that these bring good fortune, health, or prosperity. It is still common for Japanese people to attribute a person's death or misfortune to the killing of a snake. Refraining from harming snakes is still quite widespread. For example, we heard from a man (in Shizuoka City, Shizuoka Prefecture) who had captured a Japanese Mamushi that was found inside a factory, and he made an offering of sake before releasing the snake outside. He offered sake because he felt bad about capturing the snake and placing it in a bag as he believed snakes to be dragon-*kami*. Numerous customs practiced by many Japanese people are associated with snake beliefs, though their original or traditional meanings have largely been forgotten or modified in the course of Japan's long history (Yoshino 1982). Informing young people about the cultural and ecological value of snakes and sacred natural sites may help to revive or reinvent the tradition of protective attitudes toward snakes and their habitats.

However, beliefs alone will not safeguard snakes and their habitat, because beliefs cannot compete with strong, contemporary social and economic drivers. For example, a waterfall called Akataki (Red Falls) in Akita Prefecture, which was believed to be the abode of dragon/snake-*kami*, is now threatened by construction of the Naruse Dam. In the case of the old growth forest of Mt. Tonochigoyama on Tokunoshima Island, which has been protected by a belief that cutting trees on the mountain will bring a curse in the form of a bite by the Habu, the size of the forest has been reduced to a mere 0.7 ha due to conversion to agricultural fields (Matsuyama 1998). To build capacity to cope with changes and for buffering the effects of strong social and economic drivers, a bylaw that makes it illegal to harm or significantly limit the exploitation of traditionally protected areas and species would be beneficial. Such a bylaw has been passed in Ghana to protect two species of primates (*Colobus vellerosus* and *Cercopithecus campbelli lowei*) that were traditionally protected by taboo (Saj et al. 2006).

A handful of traditionally protected sites are currently under some type of formal protection. Nevertheless, these areas are still facing various threats. First, laws and regulations protecting these areas are not effective or are not strictly enforced; consequently, these areas receive little actual protection against development. For example, areas of good habitat for albino Japanese Rat Snake populations designated as a natural monument in Iwakuni City have nevertheless been developed or degraded, triggering severe declines in these populations. Second, the size of many of these sites is small and continues to diminish due to expanding development. Third, most of these sites are completely isolated from any protected areas such as national parks

or other traditionally protected areas. Finally, most, if not all, do not have buffer zones that minimize outside destructive human activities. For example, streams and ponds, which are important religious components of shrines, are now dry in many shrine lands, probably due to development upstream of the shrine boundaries (Yoneyama 2004).

Immediate, coordinated actions must be taken to halt further loss of traditionally protected natural sites and wildlife. We consider the following measures to be important: (1) archiving traditional beliefs and mores associated with snakes and other wildlife, as well as culturally significant natural sites; (2) identifying and mapping natural sites associated with traditions; (3) conducting basic ecological research, including inventories of species within and around these sites; (4) applying appropriate restoration and management measures, including construction of buffer zones around each target site; (5) garnering the participation of local people in restoration and management activities; (6) implementing educational programs to revive traditional beliefs and reinforce traditional mores; (7) involving the government for official recognition of traditional taboos as formal institutions; and (8) increasing awareness of these issues nationally and internationally. Snake beliefs documented here represent our ongoing effort to archive traditional beliefs and associated attitudes and actions toward snakes and nature in general. Most traditional beliefs have persisted only through oral traditions and are not in written format. In a highly modernized and industrialized society, these traditional beliefs and cultures that have lasted for centuries or millennia are at risk of being lost forever without this effort.

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LITERATURE CITED

- Anoliefo, G.O., O.S. Isikhuemhen, and N.R. Ochije. 2003. Environmental implications of the erosion of cultural taboo practices in Awka-south local government area of Anambra state, Nigeria: 1. Forests, trees, and water resource preservation. *Journal of Agricultural & Environmental Ethics* 16:281–296.

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- Antoni, K. 1995. The "separation of gods and buddhas" at Ōmiwa Jinja in Meiji Japan. *Japanese Journal of Religious Studies* 22:139–159.
- Arakawa, H. 1996. *Ryu no Kigen*. Kinokuniya-shoten, Tokyo, Japan.
- Ashkenazi, M. 2003. *Handbook of Japanese Mythology*. ABC-CLIO, Santa Barbara, California, USA.
- Association of Minakata Kumagusu Archives. 2006. *Genpon Honkoku, Minakata Nisho: Matsumura Jinzou ate Minakata Kumagusu Genshokan*. Association of Minakata Kumagusu Archives, Wakayama, Japan.
- Barrow, E., and N. Pathak. 2005. Conserving "unprotected" protected areas – communities can and do conserve landscapes of all sorts. Pp. 65–85 *In The Protected Landscape Approach: Linking Nature, Culture and Community*. Brown, J., N. Mitchell, and M. Beresford (Eds.). The World Conservation Union (IUCN), Gland, Switzerland and Cambridge, UK.
- Bengtsson J, P. Angelstam, T. Elmquist, U. Emanuelsson, C. Folke, M. Ihse, F. Moberg, and M. Nyström. 2003. Reserves, resilience, and dynamic landscapes. *Ambio* 32:389–96.
- Bérczi, S., O. Sano, and R. Takaki. 2001. Snake patterns in Eurasia/Japan and their implications. *Forma* 16:279–287.
- Berkes, F., J. Colding, and C. Folke. 2000. Rediscovery of traditional ecological knowledge as adaptive management. *Ecological Applications* 10:1251–1262.
- Bernard, P.S. 2003. Ecological implications of water spirit beliefs in southern Africa: the needs to protect knowledge, nature, and resource rights. Pp. 148–154 *In Seventh World Wilderness Congress Symposium: Science and Stewardship to Protect and Sustain Wilderness Values*. Watson, A., and J. Sproull (compilers). Proceedings RMRS-P-27. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Ogden, Utah, USA.
- Bhagwat, S., C. Kushalappa, P. Williams, and N. Brown. 2005. The role of informal protected areas in maintaining biodiversity in the Western Ghats of India. *Ecology and Society* 10:8. [online] URL: <http://www.ecologyandsociety.org/vol10/iss1/art8/>
- Bhagwat, S.A., and C. Rutte. 2006. Sacred groves: potential for biodiversity management. *Frontiers in Ecology and Environment* 4:519–524.
- Chandrakanth, M.G., M.G. Bhat, and M.S. Accavva. 2004. Socio-economic changes and sacred groves in south India: protecting a community-based resource management institution. *Natural Resources Forum* 28:102–11.
- Choate, L.D. 1963. An albino population of *Elaphe climacophora* from Iwakuni, Japan. *Herpetologica* 18:260–262.
- Colding, J., and C. Folke. 2001. Social taboos: "invisible" systems of local resource management and biological conservation. *Ecological Applications* 11:584–600.
- Conant, R. 1992. Comments on the survival status of members of the *Agkistrodon* complex. Pp. 29–33 *In Contributions in Herpetology*. Strimple, P.D., and J.L. Strimple (Eds.). Greater Cincinnati Herpetological Society, Cincinnati, Ohio, USA.
- Czaja, M. 1974. *Gods of Myth and Stone: Phallicism in Japanese Folk Religion*. Weatherhill, New York, New York, USA.
- Daniels, F.J. 1960. Snake and dragon lore of Japan. *Folklore* 71:145–164.
- Diamond, J. 2005. *Collapse: How Societies Choose to Fail or Survive*. Penguin Books, London, UK.
- Dodd, Jr., C.K. 1993. Strategies for snake conservation. Pp. 363–388 *In Snakes: Ecology and Behavior*. Seigel, R.A., and J.T. Collins (Eds.). McGraw-Hill, New York, New York, USA.
- Dudden, A. 2005. Japanese colonial control in international terms. *Japanese Studies* 25:1–20.
- Dudley, N., L. Higgins-Zogib, and S. Mansourian. 2009. The links between protected areas, faiths, and sacred natural sites. *Conservation Biology* 23:568–577.
- Ellis, E.C., and N. Ramankutty. 2008. Putting people in the map: anthropogenic biomes of the world. *Frontiers in Ecology and the Environment* 6:439–447.
- Getty, A. 1940. Uga-jin: the coiled-serpent god with a human head. *Artibus Asiae* 8:36–48.
- Gloyd, H.K., and R. Conant. 1990. *Snakes of the Agkistrodon Complex*. Society for the Study of Amphibians and Reptiles, Ithaca, New York, New York, USA.
- Groombridge, B. 1992. *Global Biodiversity: Status of the Earth's Living Resources*. Chapman and Hall, New York, New York, USA.
- Green, R.E., S.J. Cornell, J.P.W. Scharlemann, and A. Balmford. 2005. Farming and the fate of wild nature. *Science* 307:550–555.
- Hattori, S. 2002. Present state and problem of Habu snake (*Trimeresurus flavoviridis*). *South Pacific Studies Occasional Papers (Minami Taiheiyou Kaiiki Chousa Kenkyu Houkoku)* 36:15–21.
- Iwatsuki, K. 2005. Sacred forests connected with the temple shrines of Japan. Pp. 90–92 *In Conserving cultural and biological diversity: the role of sacred natural sites and cultural landscapes*. Schaaf, T., and C. Lee (Eds.). Proceedings of the Tokyo Symposium. UNESCO, Paris. Iwatsuki et al. 2005 – pg.2 last paragraph
- Jones, J.P.G., M.M. Andriamarovololona, and N. Hockley. 2008. The importance of taboos and social norms to conservation in Madagascar. *Conservation Biology* 22:976–986.
- Kato, S. 1999. Three ecologies in Minakata Kumagusu's environmental movement. *Organization & Environment* 12:85–98.

- Kato, M. 2001. 'Satoyama' and biodiversity conservation: 'satoyama' as important insect habitat. *Global Environmental Research* 5:135–149.
- Kawanabe, H. 2003. Cultural association in an ancient lake: gods of water in Lake Biwa and the River Yodo basin, Japan. *Hydrobiologia* 500:213–216.
- Knight, J. 1997. On the extinction of the Japanese wolf. *Asian Folklore Studies* 56:129–159.
- Kojima, Y. 1991. *Hebi no Uchushi*. Tokyo Bijutsu, Tokyo, Japan.
- Kondo, M. 1991. The formation of sacred places as a factor of the environmental preservation: the case of Setonaikai (Inland Sea) in Japan. *Marine Pollution Bulletin* 23:649–652.
- Lenzen M, A. Lane, A. Widmer-Cooper, and M. Williams. 2008. Effects of land use on threatened species. *Conservation Biology* 23:294–306.
- Lingard, M., N. Raharison, E. Rabakonandrianina, J.A. Rakotoarisoa, and T. Elmqvist. 2003. The role of local taboos in conservation and management of species: the radiated tortoise in southern Madagascar. *Conservation and Society* 1:223–246.
- Liu, H., Z. Xu, Y. Xu, and J. Wang. 2002. Practice of conserving plant diversity through traditional beliefs: a case study in Xishuangbanna, southwest China. *Biodiversity and Conservation* 11:705–713.
- McClain, J.L. 2001. *Japan: A Modern History*. W.W. Norton, New York, New York, USA.
- Matsutani, M. 2003. *Gendai Minwako 9: Kodama, Hebi, Ki no Seirei, Sensou to Ki*. Chikuma Shobo, Tokyo, Japan.
- Matsuyama, M. 1998. Habu koushou ni matsuwaru minzoku to sono minkan ryohou. Pp. 367–404 *In Nihon Minzoku Bunka Shiryō Shussei 20: Habu no Minzoku*. Tanigawa, K. (Ed.). Sanichi Shobo, Tokyo, Japan.
- Motonaka, M. 2006. Sacred sites and pilgrimage routes in the Kii mountain range. Pp. 34–39 *In Conserving Cultural and Biological Diversity: The Role of Sacred Natural Sites and Cultural Landscapes*. Schaaf, T., and C. Lee (Eds.) Proceedings of the Tokyo Symposium. UNESCO, Paris, France.
- Naito, M. 1978. *Kikikaki Tono Monogatari*. Shin-Jinbutsuoraisha, Tokyo, Japan.
- Nakamura, K. 1998. Habu ni kansuru minzokugakuteki ousatsu. Pp. 405–415 *In Nihon Minzoku Bunka Shiryō Shusse 20: Habu no Minzoku*. Tanigawa, K. (Ed.). Sanichi Shobo, Tokyo, Japan.
- Nakamura, M., and N. Furushou. 2004. *Samukawa Shuraku*. Nakamura, M. and Furushou, N., Japan.
- Nomoto, K. 2004. Kinbatsu denshou to irazu no mori. Pp. 45–82 *In Tankyu Chinju no Mori: Shashougaku eno Shoutai*. Ueda, M. (Ed.). Heibonsha, Tokyo, Japan.
- Ohsawa, M. 2006. Sacred mountains and landscape supporting biodiversity and human life: lessons from Mount Fuji and the Himalayas. Pp. 44–51 *In Conserving cultural and biological diversity: the role of sacred natural sites and cultural landscapes*. Schaaf, T., and C. Lee (Eds.). Proceedings of the Tokyo Symposium. UNESCO, Paris, France.
- Omura, H. 2004. Trees, forests and religion in Japan. *Mountain Research and Development* 24:179–182.
- Ooba, Y. 2006. *Ryujin Shinko: Suwashin no Rutsu o Saguru*. Ronsosha, Tokyo, Japan.
- Opler, M.E. 1945. Japanese folk belief concerning the snake. *Southwestern Journal of Anthropology* 1:249–259.
- Oviedo, G., and S. Jeanrenaud. 2006. Protecting sacred natural sites of indigenous and traditional peoples. Pp. 260–266 *In Conserving cultural and biological diversity: the role of sacred natural sites and cultural landscapes*. Schaaf, T., and C. Lee (Eds.). Proceedings of the Tokyo Symposium. UNESCO, Paris, France.
- Rai, S.C. 2007. Traditional ecological knowledge and community-based natural resource management in northeast India. *Journal of Mountain Science* 4:248–258.
- Rodrigues, A.S.L, S.J. Andelman, M.I. Bakarr, L. Boitani, T.M. Brooks, R.M. Cowling, L.D.C. Fishpool, G.A.B. da Fonseca, K.J. Gaston, M. Hoffmann, J.S. Long, P.A. Marquet, J.D. Pilgrim, R.L.J.S. Pressey, W. Sechrest, S.N. Stuart, L.G. Underhill, R.W. Waller, M.E.J. Watts, and X. Yan. 2004. Effectiveness of the global protected area network in representing species diversity. *Nature* 428:640–643.
- Saj, T.L., C. Mather, and P. Sicotte. 2006. Traditional taboos in biological conservation: the case of *Colobus vellerosus* at the Boabeng-Fiema Monkey Sanctuary, Central Ghana. *Social Science Information* 45(2):285–310.
- Sala, O.E., F.S. Chapin, J.J. Armesto, E. Berlow, J. Bloomfield, R. Dirzo, E. Huber-Sanwald, L.F. Huenneke, R.B. Jackson, A. Kinzig, R. Leemans, D.M. Lodge, H.A. Mooney, M. Oesterheld, N.L. Poff, M.T. Sykes, B.H. Walker, M. Walker, and D.H. Wall. 2000. Biodiversity: global biodiversity scenarios for the year 2100. *Science* 287:1770–1774.
- Sasaki, T. 2006. *Yama no Kami to Nihonjin: Yama no Kami Shinko kara Saguru Nihon no Kisobunka*. Yosensha, Tokyo, Japan.
- Sasaki, K., M.W. Palmer, and T. Hayashi. 2005. Influence of climate, elevation, and land use in regional herpetofaunal distribution in Tochigi Prefecture, Japan. *Community Ecology* 6:219–227.
- Sasaki, K., S.F. Fox, and D. Duvall. 2009. Rapid evolution in the wild: changes in body size, life-history traits, and behavior in hunted populations of the Japanese Mamushi snake. *Conservation Biology* 23:93–102.

Herpetological Conservation and Biology

- Sasaki, K., A.J. Place, and K.N. Gaylor. 2008. Attitudes toward rattlesnakes by the peoples of North America and implications for rattlesnake conservation. Pp. 473–484 *In* The Biology of Rattlesnakes. Hayes, W.K., K.R. Beaman, M.D. Cardwell, and S.P. Bush (Eds.). Loma Linda University Press, Loma Linda, California, USA.
- Senda, M. 1992. Japan's traditional view of nature and interpretation of landscape. *GeoJournal* 26:129–134.
- Sengoku, S. 1996. Aodaisho. Pp. 84–86 *In* The Encyclopaedia of Animals in Japan 5: Amphibians, Reptiles, Chondrichthes. Sengoku, S., T. Hikida, M. Matsui, and K. Nakaya (Eds.). Heibonsha, Tokyo, Japan.
- Takara, T. 1998. Habu = Hanbida. Pp. 103–208 *In* Nihon Minzoku Bunka Shiryou Shusse 20: Habu no Minzoku. Tanigawa, K. (Ed.). Sanichi Shobo, Tokyo, Japan.
- Takeuchi, K., R.D. Brown, I. Washitani, A. Tsunekawa, and M. Yokohari. 2003. Satoyama: The Traditional Rural Landscape of Japan. Springer-Verlag, Tokyo, Japan.
- Tengö, M., K. Johansson, F. Rakotondraso, J. Lundberg, J.-A. Andriamaherilala, J.-A. Rakotoarisoa, and T. Elmquist. 2007. Taboos and forest governance: informal protection of hot spot dry forest in Southern Madagascar. *Ambio* 36:683–691.
- Tilman, D., J. Fargione, B. Wolff, C. D'Antonio, A. Dobson, R. Howarth, D. Schindler, W.H. Schlesinger, D. Simberloff, and D. Swackhamer. 2001. Forecasting agriculturally driven global environmental change. *Science* 292:281–284.
- Tsugita, M. 1971. Nihon shinwa ni arawareta rajin to jashin. Pp. 169–190 *In* Nihon Shinwa. Nihon Bungaku Kenkyu Shiryo Kankokai (Ed.). Yuseido, Tokyo, Japan.
- Yanagita, K. 1935. Tono Monogatari Shui. Kyoudo Kenkyusha, Tokyo, Japan.
- Yanagita, K. 1941. Ishigami Mondo. Sogensha, Osaka, Japan.
- Yanagita, K. 1999. Tono Monogatari: Fu Tono Monogatari Shui. Kadokawa Shoten, Tokyo, Japan.
- Yoneyama, L. 2004. Race Religion and Migration in Modern Japan. Routledge Press.
- Yoshida, T. 1998. Gods, ancestors and mediators: A cosmology from the South-western Archipelago of Japan. Pp. 167–181 *In* Interpreting Japanese Society: Anthropological Approaches. 2nd Edition. Hendry, J. (Ed). Routledge, London, UK.
- Yoshida, C. 1980. Habu to Ningen. Ryukyushinpo, Okinawa, Japan.
- Yoshino, H. 1982. Nihonjin no Shiseikan: Hebi Shinkō no Shiza kara. Kodansha, Tokyo, Japan.
- Yoshino, H. 2000. Hebi: Nihon no Hebi Shinkou. Kodansha, Tokyo, Japan.
- Yoshino, H. 2001. The Snake cult in Japan. Pp. 85–92 *In* Forest and Civilisations. Yasuda, Y. (Ed.). Lustre Press and Roli Books, New Delhi, India.



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YOSHINORI SASAKI (father of K. Sasaki), since his retirement from being a teacher, has been actively collecting ethnoecological accounts in Japan. He and K. Sasaki have been collaborating to compile traditional beliefs associated with snakes in Japan in an effort to restore and maintain the cultural and biological integrity of Japan. (Photographed by Anonymous).



STANLEY F. FOX, (left) Regents Professor in the Department of Zoology at Oklahoma State University, was the Co-Advisor of K. Sasaki in the final stages of his dissertation. He is a behavioral and evolutionary ecologist with interests in conservation, and social organization and sexual selection in lizards. (Photographed by Anonymous).