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## Cockroach is Good for Asthma: Zootherapeutic Practices in Northeastern Brazil

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### Abstract

*This paper deals with the use of 34 animals that are prescribed as folk medicines, cosmetics, and charms in the county of Tanquinho, Northeastern of the State of Bahia, Brazil. Data were obtained by performing semi-structured interviews with local residents from Tanquinho community. The animal-based medicines come from insects, arachnids, amphibians, reptiles, birds, and mammals. These resources provide 46 raw materials that are recommended to treat a wide range of common illnesses and injuries. The results show how important this ethnozoological phenomenon is, and indicate that traditional knowledge on zotherapy is to be studied in order to lead to the discovery of new sources of drugs.*

**Keywords:** ethnozoology, folk medicine, zotherapy, sustainability, Brazil

### Introduction

*"Potions that call for toadstools plucked from a graveyard or the blood of a black rooster may indeed have some scientific basis beyond superstition." (McGirk 1998:24-25)*

Human beings have been using animal resources for therapeutic purposes since ancient times (Weiss 1947; Rosner 1992; Souza-Dias 1995; Unnikrishnan 1998), where folk remedies were elaborated from parts of the animal body, from products of its metabolism, such as corporal secretions and excrements, or from non-animal materials such as nests and cocoons. This ethnozoological interaction has been recorded both in indigenous and Western societies throughout the world (Gudger 1925; Branch and Silva 1983; Conconi and Pino 1988; Begossi and Braga 1992; Antonio 1994; van Huis

1996). Both wild and domesticated animals are useful for therapeutic purposes. The latter are used especially through pet therapies, such as the employment of dogs, cats, and horses for the treatment and improvement of different kinds of pathological conditions, as for example mental deficiencies (Silveira 1998). The ample geographical distribution of zotherapy has been such that Marques (1994) states that all human cultures that show a developed medical system will utilize animals as medicines. Such a statement forms the basis of what he has called a 'zootherapeutic universality hypothesis.' In this regard, this paper corroborates the hypothesis by recording medicinal animals in northeastern Brazil.

Although surveys centered on medicinal plants are still on the top, the phenomenon of zotherapy has aroused the interest of many researchers from different branches of science who have recorded folk medical systems and sought compounds with pharmacological action (Werner 1970; But, Tam and Lung 1991; Bisset 1991; Amato 1992; Lazarus and Atilla 1993; Chen and Akre 1994; Rodrigues and West 1995). But this interest goes farther when one takes into consideration the benefits that animal-derived compounds give in terms of monetary value and human welfare. In 1995 the estimated market value of pharmaceutical derivatives from biological resources was US \$43 billion worldwide (Blakeney 1999). For example angiotensin I, an antihypertensive derived from the Brazilian arrowhead viper *Bothrops jararaca*, brings the Squibb Company US \$1.3 billion a year in sales and contributes to the well-being and longevity of millions of peoples (Lovejoy 1997). Today from 252 essential chemicals that have been selected by the World Health Organization, 11.1% have plant origins, while 8.7% come from animals (Marques 1997). According to Oldfield (1989), more than 41% of all 1973 over-the-counter prescriptions in the United States contained an active ingredient derived from wild or cultivated fauna and flora. As she points out, traditional knowledge of medicinal compounds from biota is still one of the most

important means for discovery of unknown natural drug resources.

In Brazil, animal species have been medicinally used by indigenous society for millennia and by descendants of the European settlers for the last four centuries. An amazing number of about 300 species have been recorded and these can be easily found as commercial items sold by herbalists and healers in market places all over the country (Marques, personal communication 1996). Considering the State of Bahia, knowledge of medicinal animals and their uses has persisted in many areas today. Bandeira (1972) has recorded the use of 13 animals by the Kiriri Indians from Mirandela county; Rêgo (1994) has found the use of six marine species by the fishermen from Velha Boipeba Island; Pacheco (1998) has recorded six medicinal species in the city of Correntina; Costa-Neto has recorded the use of 22 species in the area of the Chapada Diamantina National Park (1996), 49 species in the county of Glória (1999a), 16 species in the city of Feira de Santana (1999b), and 55 species in the county of Conde (1998); Costa-Neto and Melo (1998) have recorded the use of 16 insect folk species in the county of Matinha dos Pretos; Melo (1999) has found the use of 15 animal species in the city of Feira de Santana; Pereira and Souto (1999) have found the use of 36 species by the fishermen from Acupe; and Souto, Andrade and Souza (1999) have recorded 50 animals in the city of Andaraí. We could attest that Bahia's usage of medicinal animals has been facilitated over many generations because of the fostered wisdom within the communities as part of the local cultures.

Unfortunately, the Brazilian Institute for the Environment and Renewable Natural Resources (IBAMA 1989) records that many of the zootherapeutic resources include threatened species. In addition to hunting and deforestation of their habitats, some ordinary species, such as giant anteater (*Myrmecophaga tridactyla*), tapir (*Tapirus terrestris*), and giant armadillo (*Priodontes maximus*) are now rare or under risk of extinction. Hence, studies aimed towards traditional knowledge on animal use and its significance to human beings should be undertaken in order to lead to better ways of exploiting the natural resources, thus, their conservation, so that future generations may know and manage them.

In order to increase the number of ethnoscientific studies dealing with a human/animal connection of a medicinal type, this paper discusses the folk use of 34 ethnospecies in the county of Tanquinho, Northeastern of Bahia State, Brazil. This is the first time that such a survey has been done in this area. Farther studies are requested not only to confirm the presence of bioactive compounds in these traditional remedies, but also to lead to a more sustainable use of these resources. In addition, it is important to record this vanishing knowledge before it is eroded by the western culture.

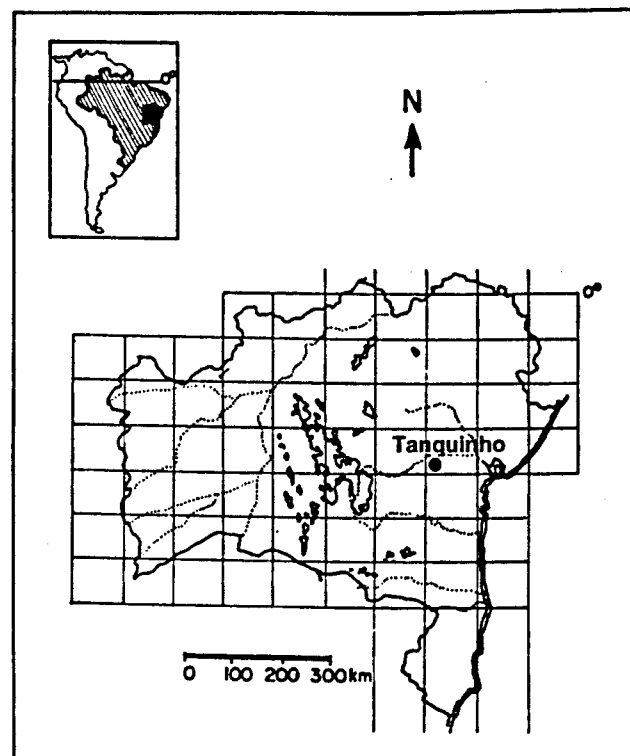


Figure 1. Map showing the location of the county of Tanquinho within the state of Bahia, Brazil.

### The Studied Community

Bahia State has a territorial extension of 567.295.3 km<sup>2</sup>. This Brazilian region presents both a biological and cultural diversity. A varied number of ethnic groups ranging from indigenous to Afro-Brazilian societies, peasant communities, and fishing villages live there. These groups have developed a wide range of interactions with their environment.

The county of Tanquinho has an area of 93 km<sup>2</sup> and is located in the Northeastern of the state of Bahia. It lies between 11° 58' South latitude and 39° 06' West longitude (Figure 1). This Brazilian region is mainly characterized by a semi-arid climate with deciduous, woody vegetation dominated by thorny phanerogamous, leafless cacti and bromeliad species comprising what is traditionally called "caatinga" ('white forest' in the Tupi indigenous language). In general terms, the Brazilian semi-arid has very poorly soils which tends to the salinization and intermittent rivers (Mendes 1997). In this geographical area human populations have adapted to very severe drought periods ranging from five to nine months annually. Drought years are common and severe droughts lasting three to five years have occurred every three to four decades (Sampaio 1995).

Tanquinho is totally included in the "caatinga" dominion, where the mean annual temperature is about 24.6°C and rainfall about 600 to 1000 mm per year (Centro de Estatística e Informação 1994). Most of its 7,465 inhabitants correspond to the typical Brazilian racial profile of composite people of European and African descent, Indians, and various mixtures of these groups, living integrated with the other members of the society of which it is a part. In contrast to other parts of the state, illiteracy is relatively low, while the mean life span and migration rate are high. Both men and women make their living by planting and raising cattle. The main crops are maize, bean, and manioc, cultivated both for home consumption and for market exchange. Due to their limited access to official medicines and proper medical care, most of the Tanquinho's people hold a traditional knowledge related to the use of natural resources as medicines (Costa-Neto and Oliveira 2000). This knowledge has been transmitted from generation to generation mainly through the oral tradition.

### Methodology

Tanquinho, which is a rural community, has been chosen for this study because the author is from there and because "caatinga" woods are still present in this region.

Data were obtained through fieldwork conducted from March to June 1998 by performing semi-structured interviews with nine men and five women, whose ages ranged from 26 to 74 years old. These were local healers, herbalists, elders, farmers, and midwives, who were all from Afro-Brazilian ancestry living both in rural and urban areas of the community. They were selected as informants because they were identified by local people as experts, knowledgeable members concerning folk medicine. According to them, their knowledge of medicinal animals was acquired mainly through parental heritage, or because they have experienced folk medicines to heal their kin or themselves.

We asked the informants whether they knew about remedies made from animals and whether they used them in their healing practices. We also asked them questions about what those animal remedies were prescribed for and how the medicines were administered. Special attention was paid to the modes of preparation, since this kind of information indicates how a given folk medicine can be therapeutically efficient in terms of the right ingredients, the proper dose, and the right length of preparation. It is interesting to note that zootherapy, except for the herbalists and healers, is not the informants' primary occupation. Herbalists only commercialize medicinal materials other than animal products, and healers are remunerated for their therapeutic services.

An emic approach has guided our research since we wanted to record the informants' utilitarian knowledge

(Toledo 1991) regarding faunistic resources used locally as medicines. By using this kind of approach, ethnobiologists record the native's knowledge in just the way the local culture organizes, perceives, and uses its universe, not by imposing a Western understanding (Posey 1986).

Medicinal raw materials were purchased when and where possible. They were catalogued and are deposited at Feira de Santana State University together with other ethnobiology collections. Specimens were identified by one of the authors by using zoological references (Pough, Heiser and McFarland 1993; Sick 1997), since these were species known in this part of the country.

### The Zootherapeutics

The first survey on medicinal animals in Tanquinho revealed 34 ethnospecies referred to as having medicinal properties for a variety of purposes. The faunistic resources come from both vertebrates and invertebrates, and they are represented by five scientific taxonomic categories. These are mammals (32%), birds (24%), insects (24%), reptiles (11%), arachnids (6%), and amphibians (3%). According to their habitat, these resources can be divided into three major categories. The first category, domiciliar, is comprised of those animals which are found living inside human habitations, such as cockroaches, flies, and dogs. Those animals reared as livestock or that can be found near human settlements comprise the second category, which we might call the "peri-domiciliar." Examples of these are crickets, leaf-cutting ants, bird-eating spiders, scorpions, toads, chicken, sheep, pig, ox, and donkey. The third category or wild species is comprised by those animals living in the woods, such as stingless bees, turtles, lizards, snakes, greater rhea, peccaries, giant anteater, fox, brocket deer, ground-dove, red-winged tinamou, southern lapwing, tinamou, white-bellied nothura, yellow-legged tinamou, and porcupine.

The zootherapeutic species provide 46 raw materials, which are turned into medicines<sup>2</sup> and prescribed for treating locally diagnosed ailments (see Table 1). These raw materials range from parts of the bodies, such as leg, hair, hide, fat, feather, penis, blood, bones, meat, and heart to products of their metabolism, such as honey, milk, egg, and feces, and non-animal materials, such as arapua's scutellum.<sup>3</sup> Whole animals are also used. The extraction of these medicinal raw materials occur through manual gathering of small specimens, slaughtering of the livestock, or through hunting of wild species. The modes of preparation and administration of the animal-based remedies are described in Appendix 1, which also provides English and Portuguese animal names as well as their taxonomic identification.

Of 34 ethnospecies cited, eight have multiple uses, that is, the same source provides more than one raw material that

Table 1. Folk medicinal use of animals in the county of Tanquinho, State of Bahia, Brazil. Uses other than medicinal are also included.

English name	Animal Species	Percentage of citation	Part used	Indications
<b>Insects</b>				
Cockroach	<i>Periplaneta americana</i>	92%	Whole	Asthma
Cricket	<i>Achaeta sp.</i> <sup>1</sup>	36%	Hind legs	Diuretic
House fly	<i>Musca domestica</i>	36%	Whole	Baldness, immature furuncles
Leaf-cutting ant	<i>Atta spp.</i>	72%	Whole	Tendinitis
Stingless bee	<i>Tetragonisca sp.</i>	72%	Honey	Cataract, glaucoma, cough
Stingless bee	<i>Melipona cf. scutellaris</i>	72%	Honey	Fortifier
Stingless bee	<i>Melipona sp.</i>	72%	Honey	Fortifier
Stingless bee	<i>Trigona spinipes</i>	72%	Honey Scutellum	Throat inflammation Acne, influenza, stroke
<b>Arachnids</b>				
Bird-eating spider	<i>Theraphosidae</i>	7%	Hairs	Magic rituals
Scorpion	<i>Tytilus sp.</i>	72%	Whole	To treat its own sting
<b>Amphibians</b>				
Toad	<i>Bufo sp.</i>	72%	Bones Hide Venom <sup>2</sup> Whole	To prevent oral diseases Acne Magic rituals Urinary retention
<b>Reptiles</b>				
Lizard	<i>Tropidurus torquatus</i>	36%	Whole	Chicken pox
Neotropical rattlesnake	<i>Crotalus durissus</i>	72%	Fat	Rheumatism
Toad-headed turtle	<i>Phrynops sp.</i>	36%	Meat	Rheumatism
Tortoise	<i>Geochelone cf. carbonaria</i>	72%	Fat	Rheumatism
			Blood	Erysipelas
			Heart	To stop the sensation of getting thirsty
			Whole	Erysipelas
<b>Birds</b>				
Chicken	<i>Gallus domesticus</i>	72%	Fat	Nasal congestion
Greater rhea	<i>Rhea americana</i>	72%	White of the egg Fat	To stop bleeding, dysentery Rheumatism
Ground-dove	<i>Leptotila sp.</i>	72%	Feathers	Stroke
Red-winged tinamou	<i>Rhynchotus sp.</i>	36%	Feathers	Stroke
Southern lapwing	<i>Vanellus chilensis</i>	36%	Feathers	Stroke
Tinamou	<i>Crypturellus sp.</i>	36%	Heart	To stay awake
White-bellied nothura	<i>Nothura boraquira</i>	36%	Feathers	Stroke
Yellow-legged tinamou	<i>Crypturellus noctivagus zabele</i>	36%	Feathers Feathers	Stroke Stroke
<b>Mammals</b>				
Brocket deer	<i>Mazama cf. americana</i>	36%	Hide	Stroke
Collared peccary	<i>Tayassu tajacu</i>	36%	Femur	To make a child walk sooner
Dog	<i>Canis familiares</i>	72%	Hide	Stroke
Donkey	<i>Equus asinus</i>	36%	Feces	Chicken pox
Fox	<i>Dusicyon sp.</i>	36%	Milk	Whooping cough
Giant anteater	<i>Myrmecophaga tridactyla</i>	72%	Fat	Rheumatism
Ox	<i>Bos taurus</i>	36%	Hide Feces Medulla	Stroke To make mosquitoes go away Baldness
Porcupine	<i>Coendou cf. prehensilis</i>	72%	Penis	Sexual impotence
Pig	<i>Sus scrofa domesticus</i>	36%	Hide	Stroke
Sheep	<i>Ovis aries</i>	36%	Fat	Furuncles, tumors
White-lipped peccary	<i>Tayassu pecari</i>	36%	Fat Hide	Torsion Stroke

<sup>1</sup> "sp." means species after the genus to which it belongs; "cf." is used when a species is to be confirmed

<sup>2</sup> Toad's venom used in magic rituals has been cited by only one informant (7%).

is used for the treatment of two or more diseases (see Table 1). Such is the case with toad (*Bufo* sp.), whose bones of its members are used to pick the teeth and, thus, preventing caries, or when a live toad is opened and then put on the abdomen of patients suffering from urinary retention. Most of the zootherapeutic species, however, provide only one raw material that is used to the elaboration of folk medicines prescribed for the treatment of specific ailments (e.g., dog's sun-dried feces used for chicken pox).

As can be seen in Table 1, medicinal knowledge of cockroaches seems to be very persistent in the community of Tanquinho since 92% (N = 13) of the informants have cited the use of these insects for the treatment of asthma. About 72% (N = 10) of the respondents have mentioned the use of dog, porcupine, giant anteater, greater rhea, tortoise, scorpion, toad, bees, rattlesnake, ground-dove, chicken, and leaf-cutting ant. Thirty-six per cent (N = 5) have mentioned the medicinal use of the other insects, reptiles, mammals, and birds. Only one informant has reported the involvement of animals in magic rituals. In Afro-Brazilian rituals, Umbanda's believers make use of the bird-eating spider (Theraphosidae) whose toasted, powdered hairs are mixed with chalk in order to make a *pemba*,<sup>4</sup> which is used to make dead people (obsessor spirits) go away or to cause the death of the living. The secretion extracted from a toad's parotid glands has the same use. Although these resources are used in a magical way they can be considered as medicines since they alleviate people's mental health condition.

It was observed that stroke was the most cited disease, followed by rheumatism and dermatological problems. The application of animal-based medicines varies according both to the nature of the ailment and the ingredients that are used during their preparation. Many of the medicines are administered as teas, which are made using mostly the powder produced by grinding the toasted parts of the body of the animals (e.g., crickets) or the whole toasted animal (e.g., cockroaches). Such teas are prescribed and drunk for the treatment of asthma, stroke, bronchitis, urinary retention, and sexual impotence. Drinking the water in which whole animals or their parts have been cooked is also recommended for curing some illnesses. For example, the water in which a lizard (*Tropidurus torquatus*) has been cooked is drunk for curing chicken pox in its beginning stages, while the water in which the penis of an ox (*Bos taurus*) has been cooked is recommended to treat male impotence. Honey of the stingless bee (*meliponins*) is eaten both as food and as a fortifier, or it is used as an eyedropper to treat sight problems. Such is the case with "jataí" (*Tetragonisca* sp.), whose honey is used for the treatment of glaucoma and cataracts. Informants have also cited the use of living animals, such as tortoise (*Geochelone* cf. *carbonaria*). This reptile is reared as a pet in

order to prevent people from developing erysipelas. In the county of Conde, northeastern Bahia State, traditional fishermen also rear this species as a pet to cure bronchitis (Costa-Neto 1998).

The interviewees mentioned the medicinal effects of the fat of some animals. Such is the case with fat of Neotropical rattlesnake (*Crotalus durissus*), which is used for rheumatism, of chicken (*Gallus domesticus*), which is used for nasal congestion, of toad-headed turtle (*Phrynops* sp.), which is also used for rheumatism, of a virgin pig (*Sus scrofa domestica*), which is massaged on furuncles and tumors in order to mature them, and of a castrated sheep (*Ovis aries*), which is recommended for treatment of torsion. Parts of other animals are also employed as therapeutic resources. Such is the case with feathers of greater rhea (*Rhea americana*), which are used against stroke, the hide of giant anteater (*Myrmecophaga tridactyla*), which is recommended to treat stroke, the scutellum of arapuaá (*T. spinipes*), which is toasted and the smoke is breathed for the treatment of stroke. See Appendix 1 for a description of how these medicines are made. Very few treatments require eating specific foodstuffs. For example the rattlesnake (*C. durissus*), which cooked meat is eaten to treat rheumatism, and the southern lapwing (*Vanellus chilensis*), the heart of which is eaten in order to stay awake.

Folk uses other than medicinal and magical were also recorded. As cosmetics, informants have mentioned that rubbing the head with a mass of crushed houseflies (*Musca domestica*), or by using the oil extracted from the medulla of an ox's femur treats baldness. Informants have stated that spines are treated by washing the face with the infusion made from the arapuaá's scutellum as well as by putting a piece of the hide of a toad (*Bufo* sp.) on them.

The persistent use of animal-based medicines means that substances of therapeutic value not yet known by science may be present. Paraphrasing Oldfield (1989), folk knowledge of medicinal resources is still one of the most important means for discovery of unknown biotic drug sources. As stated by Marques (1999), there is scientific evidence for the medicinal use of animals in Brazil. Both Western and traditional medical systems have much to offer medicinally, economically, and culturally. In this way, public health care practitioners should try to integrate them instead of attempting to replace one by another.

### The Importance of Animal-based Medicines

Although considered by many as superstition, the pertinence of traditional medicine based on animals cannot be denied since they have been methodically tested by pharmaceutical companies as sources of drugs to the modern medical

science (Launet 1993). As Kunin and Lawton (1996, 292) argue, "The investigation of folk medicine has proven a valuable tool in the developing art of bioprospecting for pharmaceutical compounds." Many studies have confirmed what people have known and employed for centuries. According to McGirk (1998), Brazilian scientists are studying a type of frog that is used to cure intestinal illnesses by members of the Yawanawa Indian tribes on the banks of the Rio Grande. Indeed, amphibians have provided compounds capable of being turned to therapeutic advantage. Peptides extracted from the scraped secretions of *Phyllomedusa bicolor*, for instance, are used in the treatment of depression, stroke, seizures and cognitive loss in ailments such as Alzheimer's disease (Amato 1992). Some of these compounds are important tools for biochemical research or as new leads for the development of anticancer or antiviral drugs (Lazarus and Attila 1993).

Several other animal-derived compounds of proven efficacy have also been found as observed by Zhang, Guo and Wang (1992), who have studied therapeutic uses of earthworms and found that these animals possess antipyretic, antispasmodic, diuretic, detoxic, antiasthmatic, antihypertensive, and antiallergenic effects. From the plasma of the European hedgehog, Mebs, Omori-Satoh, Yamakawa and Nagaoka (1996) have isolated erinacin, which is an antihemorrhagic factor. In addition to this, Oldfield (1989) records that about 4% of the extracts evaluated in the 1970s from 800 species of terrestrial arthropods (insects, crustaceans, spiders, millipedes, and centipedes) showed some anticancer activity.

Even lethal, natural substances can become medicines. The study of viperid, crotalid and elapid venoms has shown the presence of analgesic activity, which, in the case of serpent venoms, is stronger than morphine and, therefore, of use in cases of terminal cancer (Bisset 1991). A more recent development is the introduction of captopril and related substances in the treatment of hypertension (Ferreira 1993).

Regarding fish, several compounds have been extracted and these are employed as remedies in the official medicine (Hamada and Nagai 1995). Finkl (in Cousteau 1984), for example, refers to *Eptatretus stoutii*, *Dasyatis sabina*, and *Taricha* sp. as sources of cardiac stimulants, antitumors, and analgesic, respectively. Oily fish, like cod, herring, salmon, and turbot, have a great medicinal value to human beings due to a polyunsaturated compound known as OMEGA-3. This substance helps the prevention of arthritis (Adeodato 1997). The presence of an anticoagulant system in the plasma of Atlantic salmon (*Salmo salar* L.) and rainbow trout (*Oncorhynchus mykiss* Walbaun) has been confirmed, what supports similarities with the protein C anticoagulant system in mammals (Salte, Norberg and Odegaard 1996).

Tetrodotoxin (TTX), a water-soluble guanidinium derivative, is an example of a bioactive compound produced by marine organisms such as puffer fish "that resembles procaine in its ability to inhibit transmission of nerve cells" (Colwell 1997). When diluted it acts as an extraordinary narcotic and analgesic (Bisset 1991).

## The Sustainable Use of Animal Resources

In Tanquinho, people usually do not know that some of the wild animal resources they regularly use are endangered species.<sup>5</sup> Although their hunting, slaughtering, and trading have been prohibited by Federal law since 1967, wild populations continue to be used both nutritionally and medicinally in a clandestine way. Of the total of species recorded, 24 (71%) are not under extinction risk. On the other hand, *Myrmecophaga tridactyla*, *Coendou* cf. *prehensilis*, *Dusicyon* sp., *Mazama* cf. *americana*, *Rhea americana*, and *Crypturellus noctivagus zabele*, which are officially considered as threatened species by IBAMA (1989), were found among the set of faunistic resources prescribed as medicines at the time of this research. At least three species are insufficiently known and thus they are referred as threatened. These include peccaries (*Tayassu tajacu* and *T. pecari*) and tortoise (*Geochelone* cf. *carbonaria*). Finally, *Phrynos* is a little known genus that is believed to include threatened species. These animals have become charms and remedies used not only in Tanquinho but also throughout the country. Apparently, these species have not become endangered because of their perceived therapeutic value. Instead, "caatinga" woods have experienced much deforestation over the centuries resulting from a disordered exploitation of the natural resources due to wood extraction and itinerant cattle-breeding practices. This has decreased the vegetal covering and also the number of wild populations (Costa-Neto 1999a).

The record of 34 medicinal animals in Tanquinho, along with other studies conducted within the state of Bahia and elsewhere in Brazil, represents strong evidence of the traditional use of wildlife resources. According to Silva and Marques (1996), the phenomenon of zootherapy is relevant because it implies additional pressure over critical wild populations. Oldfield (1989) argues that many animal species have been overexploited as sources of medicines for the folk medicine trade. In addition, she also attests that animal populations have become depleted or endangered as a result of their use as experimental subjects or animal models. For this reason, sustainability is now required as the guiding principle for biological conservation. According to the IUCN draft *Guidelines* (Glowka, Burherme-Guilmin and Synge 1994), the exploitation of a given species is likely to be sustainable if:

- it does not reduce the future use potential of the target population or impair its long-term viability;
- it is compatible with maintenance of the long-term viability of supporting and dependent ecosystems; and
- it does not reduce the future use potential or impair the long-term viability of other species.

Zootherapeutic activity, if properly managed, can be compatible with an environmental conservation program in which the use of natural resources can and must occur in such a way that human needs and protection of biodiversity are guaranteed (Andriguetto-Filho, Krüger and Lange 1998). For this reason, zootherapy should be viewed within its cultural dimension (Costa-Neto 1999b). This cultural perspective includes the way people perceive, use, allocate, transfer, and manage their natural resources (Johannes 1993). Since people have been using animals for a long time, suppression of use will not save them from extinction. In accordance with Kunin and Lawton (1996), those species directly involved in traditional medicines should be among the highest priorities for conservation. These authors argue that some of the species are endangered precisely because they are of value to us. Since a basic principle governing the use of natural resources is that the extraction rate of a renewable resource should not exceed the renovation rate of that same resource, perhaps a suitable alternative for the diminishment of wild resources from overexploitation would be through the localization of natural compounds that have been successfully tested for pharmacological action. Thus, the production of artificial substitutes in the laboratories would displace human dependency on animal medicines (Oldfield 1989). In connection to this, we have to realize that the negative impacts on biological diversity should not be restricted only to the traditional users, but should be extended to the use by the pharmaceutical industries (Marques 1997).

Another alternative for the recovery of endangered species is to turn them into manageable resources in the way of traditional farming systems,<sup>6</sup> where they would be reared using both folk and scientific techniques (Costa-Neto 1999b). Meanwhile, some conservation measures based on the community's reality should be taken, such as: rotational use of hunting; taboos on hunting or harvesting certain species; limitations on *caatinga* clearance; and use of particular agricultural techniques which lower the impact of the use or even increase biological diversity.<sup>7</sup>

When discussing how to conserve the biological resources we face two general antithetical approaches:<sup>8</sup> one that deals with the extrinsic values of species and another that views diversity as having an intrinsic good for its own sake (Buchdahl and Raper 1998). Those who follow the first approach claim that biodiversity must be preserved because

doing otherwise would harm humanity (anthropocentric view). Thus, diversity in nature is of some instrumental value in advancing human interests and well-being, either now or in the future (Costanza and Daly 1995; Kunin and Lawton 1996). The second approach debates the issue of biodiversity from a moral point of view by arguing that diversity of life on Earth is to be protected independent of any utilitarian reasons (ethical view). Ehrlich and Ehrlich (1992) point out that biotic diversity should be valued for four general reasons: ethical, esthetical, direct economic, and indirect economic.

One may ask, "Could the zootherapeutics from Tanquinho be viewed from a less anthropocentric perspective and seen as having intrinsic value?" In this regard, we agree with Swanson's statement (in Oksanen 1997, 542) that the protection of biodiversity results from the right use of its resources.

### Concluding Remarks

According to Marques (1999), researchers carrying out studies on zootherapy should pay attention to three ethical issues. The first deals with the intellectual property rights of the primary owners of the folk knowledge. As stated by McGirk (1998), the Convention on Biological Diversity recognizes that indigenous and traditional people should receive some reward if a drug company or an agribusiness firm develops a product based on traditional resources or knowledge. The second issue regards the well-being of the useful animals. And the third one deals with the sustainability of the implied resources. In recent years a growing body of literature recognizes that the cultural perspectives should also be taken into account in every debate focused on sustainable development (Morin-Labatut and Akhtar 1992; Agrawal 1995). These cultural perspectives include the way people perceive, use, allocate, transfer, and manage their environment (Johannes 1993). Thus, discussing zootherapy within the multidimensionality of the sustainable development turns out to be as one of the key elements in order to achieve the sustainability of the medicinal faunistic resources (Celso 1992). Since people constitute an essential component of the landscape and their activities are fundamental for its long-term compatible use, biological conservation policy should be built upon both anthropocentric and nonanthropocentric bases.

### Endnotes

- 1 E-mail: eraldont@uefs.br
- 2 This term is used here in its broad sense and refers to all substances that have the property of helping humans get rid of any physical or mental disturbance. It includes charms and spiritual healing.



- 3 Scutellum refers to the part of a stingless bee's hive locally called as "arapuá" (*Trigona spinipes*). This is a hard mass comprised of resin, dead bees, and other detritus.
- 4 *Pemba* is a kind of chalk of different colors that is used mainly by Umbanda's representatives to draw symbolical, invocatory risks on the floor. Umbanda refers to a kind of Afro-Brazilian religion.
- 5 An anonymous reviewer noted that, "At the individual level of analysis, specific animals, whether they belong to endangered species or not, are themselves endangered and sacrificed as the result of their zootherapeutic utilization."
- 6 Examples of caatinga wild species already farmed are: *Rhea americana americana*, *Kerodon rupestris*, *Dasyprocta agouti*, *Galea spixii spixii*, *Tayassu tajacu*, *Tupinambis teguixin*, and stingless bee of the genera *Melipona* and *Trigona* (according to Mendes 1997).
- 7 Modified from Glowka, Burherme-Guilmin and Syngé 1994.
- 8 We consider these two approaches as complementary.

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Appendix 1. Modes of preparation and administration of animal-based medicines. Uses other than medicinal are also included.

**INSECTS**

**Cockroach** (*Periplaneta americana*), "Barata", one use.

The whole toasted insect is turned into a tea, which is drunk three times a day to treat asthma.

**Cricket** (*Achaeta* sp. ?), "Grilo", one use.

Make a tea from the powdered toasted hind leg, and drink it as a diuretic. This remedy should be taken in the morning. If a child, it should be taken two teaspoon per day. If an adult, he/she should take two tablespoon per day.

**Housefly** (*Musca domestica*), "Mosca", two uses.

Crush a bunch of flies and put the mass on immature furuncles.

Rubbing the head with a mass of crushed houseflies treats baldness.

**Leaf-cutting ant** (*Atta* spp.), "Tanajura", one use.

Put about 100 ants in 100 ml of alcohol, and massage this on tendinitis whenever one wants to.

**Stingless bee** (*Tetragonisca* sp. ?), "Jataí", two uses.

Use honey as an eyedropper to treat cataract and glaucoma. It is just one drop of honey.

It is also eaten to heal cough.

**Stingless bee** (*Melipona* cf. *scutellaris*), "Uruçu", one use.

Eat honey as a fortifier.

**Stingless bee** (*Melipona* sp. ?), "Mandassaia", one use.

Idem

**Stingless bee** (*Trigona spinies*), "Arapuá", four uses.

The scutellum (nest part) in infusion is recommended to treat acne by washing the face with it.

It is also drunk in cases of influenza.

Eat honey for curing throat inflammation.

Get the scutellum, toast it, and breathe the smoke for treating stroke ("mal do tempo"). Patients should breathe the smoke seven times during a week.

**ARACHNIDS**

**Bird-eating spider** (*Theraphosidae*), "Caranguejeira", one use.

Its hairs are used in magic rituals such as to make dead people (obsessor spirits) go away or to cause the death of the living. Its toasted, powdered hairs are mixed with chalk in order to make a kind of chalk known as "pemba".

**Scorpion** (*Tytilus* spp.), "Escorpião", one use.

The whole scorpion is crushed, and the mass is put on the area that was stung by it.

**AMPHIBIANS**

**Toad** (*Bufo* sp.), "Sapo", five uses.

Get a piece of its hide and put it on acne.

A live toad is opened and put on the abdomen in cases of urinary retention.

The bones of the members are used to pick the teeth as well as to prevent oral diseases, such as caries.

The secretion of its parotid glands is used in magic rituals such as to make dead people (obsessor spirits) go away or to cause the death of the living. Mix it with a black chalk in order to make a "pemba".

**REPTILES**

**Tortoise** (*Geochelose* cf. *carbonaria*), "Jabuti", three uses.

Massage warmed blood on erysipelas.

This turtle is to be reared as a pet in order to prevent people from developing erysipelas.

The heart is eaten in order to stop the sensation of getting thirsty.

**Toad-headed turtle** (*Phrynops* sp.), "Cágado-d'água", one use.

Massage fat on rheumatism.

**Lizard** (*Tropidurus torquatus*), "Lagartixa-de-lajedo", one use.

Drink the water in which a live lizard has been cooked for curing withdrawn chicken pox. Patients should drink just one glass of water.

**Neotropical rattlesnake** (*Crotalus durissus*), "Cascavel", one use.

Massage fat on rheumatic areas.

Cook the meat and eat it to treat rheumatism.

## BIRDS

Ground-dove (*Leptotila* sp.), "Juriti", one use.

Burn its feathers and breathe the smoke for curing stroke ("mal do tempo").

Yellow-legged tinamou (*Crypturellus noctivagus zabele*), "Zabelê", one use.

Idem

Red-winged tinamou (*Rhynchotus* sp.), "Perdiz", one use.

Idem

White-bellied nothura (*Nothura boraquira*), "Codorna", one use.

Idem

Tinamous (*Crypturellus* sp.), "Nambu", one use.

Idem

Greater rhea (*Rhea americana*), "Ema", two uses.

Massage fat on rheumatism. Burn its feathers and breathe the smoke for curing stroke.

Chicken (*Gallus domesticus*), "Galinha", three uses.

Use warmed fat in cases of nasal congestion.

Put white of egg over scars to stop bleeding. Shake a white of egg very slightly, add sugar and a glass of water, and take this against dysentery.

Southern lapwing (*Vanellus chilensis*), "Quero-quero", one use.

The heart is eaten in order to stay awake.

## MAMMALS

Sheep (*Ovis aries*), "Carneiro", one use.

Massage fat of a castrated sheep on torsion.

Pig (*Sus scrofa domesticus*), "Porco", two uses.

Massage warmed fat of a virgin pig on furuncles and tumors in order to mature them.

Ox (*Bos taurus*), "Boi", three uses.

The water in which its penis has been cooked is drunk as an aphrodisiac in cases of male sexual impotence.

Get the medulla of the femur, cook it, and use the oil as a cosmetic to prevent baldness.

The dried feces are burnt in order to make mosquitoes go away. Maybe this practice prevents people from falling ill with dengue fever (a potentially life-threatening viral illness transmitted by the bite of infective *Aedes aegypti* mosquitoes) as well as other illnesses transmitted by dipterans.

Donkey (*Equus asinus*), "Jumenta", one use.

Drink its milk in cases of weaknesses, especially for curing whooping cough.

Brocket deer (*Mazama cf. americana*), "Veado", two uses.

Burn its hide and breathe the smoke to heal stroke.

Add the powdered femur to the meal or make a tea from it; this is believed to make an infant child walk sooner.

Dog (*Canis familiaris*), "Cachorro", one use.

Get some sun-dried feces, boil them, and then put the mass on chicken pox.

Collared peccary (*Tayassu tajacu*), "Caititu", one use.

Burn its hide and breathe the smoke to heal stroke.

White-lipped peccary (*Tayassu pecari*), "Queixada", one use.

Idem

Giant anteater (*Myrmecophagus tridactyla*), "Tamanduá-bandeira", one use.

Idem

Porcupine (*Coendou cf. prehensilis*), "Ouriço-cacheiro", one use.

Idem

Fox (*Dusicyon* sp.), "Raposa", two uses.

Mix fat with a glass of white rum, and drink it in the morning for treating rheumatism.

Massage fat on rheumatic areas.

Note: "Idem" is substituted for information that is the same as the information immediately prior.