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Studies on Ethno-Medicinal Aspects and Zoo-Therapy in Tribal Communities in Arunachal Pradesh, India

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ABSTRACT

Arunachal Pradesh is culturally and biodiversity rich tribal state of India; 26 major tribes inhabits there. Tribes in remote areas depend on the natural resources for treatment of various body ailments. Tribal communities of Arunachal Pradesh used 48% mammalian species and 28% avian species as ethno-medicine. 38% carnivores, 21% ungulates, 15% rodents and 13% primates among mammals, and 30% Passeriformes, 24% Ciconoformes constituted their ethno-medicine system. Seven body parts namely meat, bone, fat, gall bladder, alimentary canal, penis and horn of the mammals and five body parts viz, meat, fat, feather, bone and leg of the birds used in traditional medicinal system. Different tribal groups adopted different mode of use of the body parts. It was in the form of raw meat, extract of fat, ash of bones and horns, aqueous extraction of certain dried body organs and decoction in different body ailments. Threatened category of animals including the tiger, bear, deer, hornbill were the animals used in therapeutic practices. The tribal peoples collected all the resources from forest through capturing, hunting, killing, fishing including manual collection.

Key Words: Ethno-medicine, Faunal Therapy, Tribal Groups- Apatani, Nyishi and Monpa, Arunachal Pradesh.

INTRODUCTION

Ethno-medicine is a branch of traditional medicine which deals with plants, animals and minerals *etc.* and their use in the treatment of various diseases and ailments (Werner 1971). Traditional medicines and their practitioners reflects cultural expressions (Janes 1999) through indigenous beliefs, concepts, knowledge and practices prevailing among the ethnic people for preventing, lessening or curing disease or ailment (Young 1983). Traditional knowledge systems in ethno medicine play a key role in health care around the world and provide health care to more than the 80 % of the world's population (WHO 1998).

Animals and the products derived from different organs of their bodies have constituted a part of the inventory of medicinal/therapeutic substances that have been in use in various culture since ancient times (Weiss 1947, Adeola, 1992, Anageletti et al. 1992, Rosner 1992, Lev 2003). The healing of human ailments by using therapeutics based of medicines obtained from the animals and their body parts is called Zoo-therapy (Cosat-Neto 2005).The use of animals and animal body parts in traditional medicine is not new. Different ethnic group has been using across the world. World Health Organization has selected 252 essential chemicals for therapeutic purposes; of which 11.1% are of plant origin and 8.7% come from animals (Marques 1997).

The use of traditional medicine derived from different categorizes animals is not uncommon in India. Tiger bone, horn of rhinoceros and wild buffalo are commonly used in traditional Chinese medicine (Jackson 1998, Barua 1998). The animal resources in therapeutic activities has been studied by various authors in African and Latin American countries

(Adeola 1992, Costa-Neto 1996, 2002, 2004, Costa-Neto and Oliveria 2000).

North Eastern Region of India predominates with many tribal groups that use animal body parts as traditional medicine (Harit 2000, 2001, 2002, Anon. 2003, Solanki 2002, Solanki and Chutia 2004, Solanki et al. 2004, 2005).Such zoo-therapeutic application has not been studied in north eastern region in general and Arunachal Pradesh in particular, in a systematic manner. The animal resources for therapeutic application are being extracted from natural habitat, thus ecosystems are being degraded. Here, we record the use of animals and animal parts in traditional medicine, mode of use, percentage use of different animal groups and status of the animals being used. Efforts are made to correlate the therapeutic use pattern of animal with cultural background of the tribal groups. The knowledge on utilization of faunal species, methods of utilization and sustainability of use pattern will be useful for developing a strategy and action plan for conservation and utilization of animal resources in a sustainable manner.

MATERIALS

Arunachal Pradesh is the part of Eastern Himalayan range (situated between 26°28′ to 29°30′ N. and 91°51′ to 97°30′ E) in northeastern India. It is a part of Hotspot region, rich in biodiversity, and culturally & ethnically as well. Arunachal Pradesh witnesses a diversity and b-diversity pattern at ethnic level (Solanki 2002). 26 major tribes and 110 sub-tribes inhabits in different part of Arunachal Pradesh, constituting an indigenous population (Pandey *et al*. 1999). The present study is focused on three major tribes, namely Nyishi, Apatani and Monpa. These three tribes observe different socio-cultural and religious practices. These tribes are Mongolian race. The Nyishis are Tibeto-Burman origin, originally forest dwellers and undertake shifting cultivating. The Apatanis are Tibeto-mongloid origin, settled agriculturist within the forest and known for unique agriculture pattern, paddy cum fish culture. The Monpas are Tibeto-Chinese origin, believe in budhism, and traditionally depends on nature and natural products.

METHODS

Questionnaire based information were collected over the period of 3 years (2003-2005) about the animal based traditional medicine system and therapeutic activities prevailing among Apatani, Nyishi and Monpa tribe. 100 (70 men and 30 women) persons from each ethnic group were interviewed. The people interviewed were mostly local healers, herbalists, elders, farmers and midwives. Special attention was given on the animal species and its body parts used in zoo-therapy, methods of processing, mode of application and administration. The number of animal species utilizes for therapeutic purposes were categorized as insects, mollusk, fishes, reptiles, birds and mammals. The species utilizes in therapeutic purposes were identified personally and cross-checked with the vernacular names given by local folk and reconfirmed with the help of reference book, guide, manuals, and locally available literature.

RESULTS

Animal Groups and Therapeutic Use

The animals used in therapeutic activities were: the mini-faunas that include annelids, arthropods (mainly insects) and other invertebrate like mollusk, and lower vertebrates like fishes and amphibians. The higher vertebrate including reptiles, birds and mammals were also utilized. The faunal species extracted for the therapeutic activities have been quantified and expressed in Figure 1. Mammals (48%) and birds (28%) were the major faunal categories.

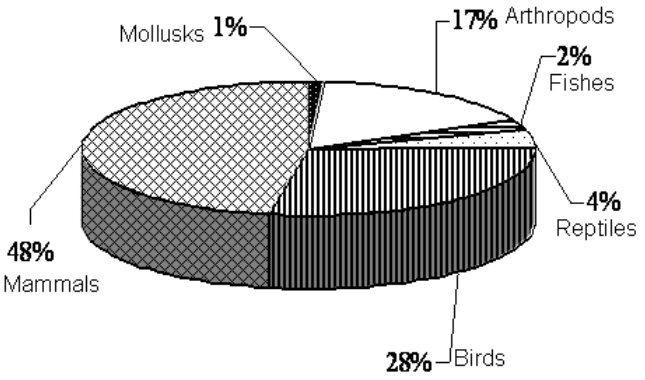

Figure 1. Animal groups utilized for therapeutic purposes

The mammalian groups harvested for therapeutic uses by different tribal groups are given in Table 1. The carnivores were harvested the most (37%) followed by

ungulates (22%), rodents (17%) and primates (11). The pattern of extraction of mammalian groups is similar among the tribal groups. However, Apatani extracted carnivores and primates, and Monpa extracted ungulates more than the other two tribal groups. Other mammalian groups were harvested nearly equally by all the tribal groups. 35 mammalian species were harvested and used in traditional medicine system by Nyishi tribe. The Apatani tribe and Monpa harvested 39 and 38 mammalian species and utilized 35 and 29 mammalian species, respectively.

Table 1. Mammalian groups harvested (%) by different tribal groups

Animal categories	Nyishi	Apatani	Monpa	Average
Carnivores	36	40	35	37
Ungulates	23	19	25	22
Rodentia	17	16	17	17
Primate	9	14	10	11
Bear	6	3	3	4
Pholiodota	3	3	3	3
Chiroptera	6	5	7	6

The data on the uses of various avian species by different tribes (Table 2) indicate that the Passeriformes were used intensively (29-31%) by all the tribes followed by Ciconiformes (21-28%). The use of Strigiformes, Buceriformes, Pisciformes and Psittaciformes varied from 6 to 17% in different tribal groups. Galliformes were used by Nyishi (5%) and Apatani (3%) but no species in this group was utilized by Monpa tribe for therapeutic purposes. Details of use pattern of avian groups by the three tribal groups are given in Figures 2, 3 and 4. Like mammals, all bird species extracted were not used for therapeutic purposes. Out of the 53 bird species extracted, Nyishi utilized 39 species, the Apatani utilized 38 species and the Monpa utilized 29 species.

Mammalian Body Parts in Therapeutic Activities

The animal groups, use of their body parts, mode of preparation and their remedial use are given in Table 2. Generally whole body of mini-faunas particularly of beetles, bugs, bees and wasps were used in traditional

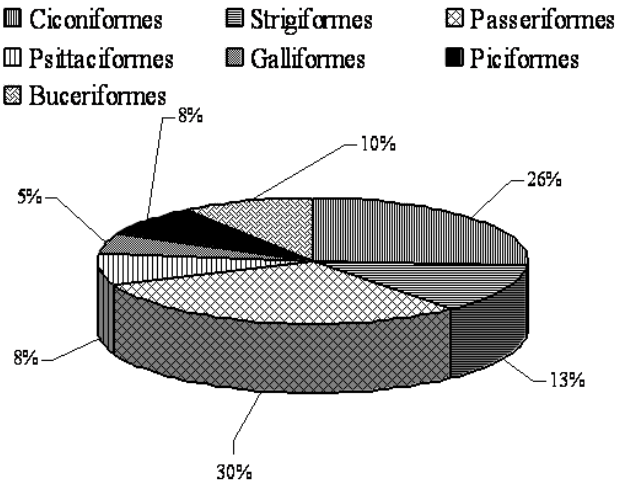

Figure 2. Therapeutic uses of different birds by Nyishis

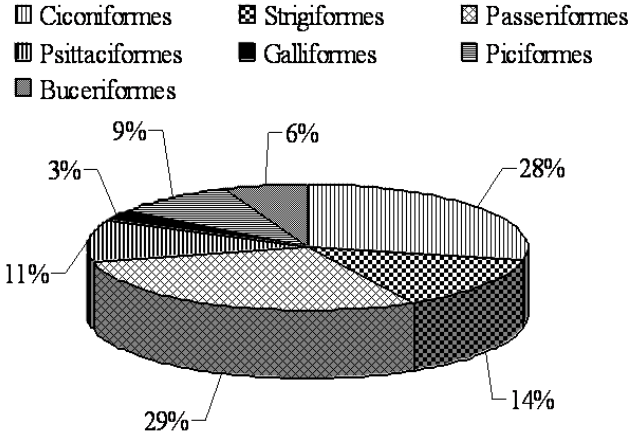

Figure 3. Therapeutic uses of different birds by Apatanis

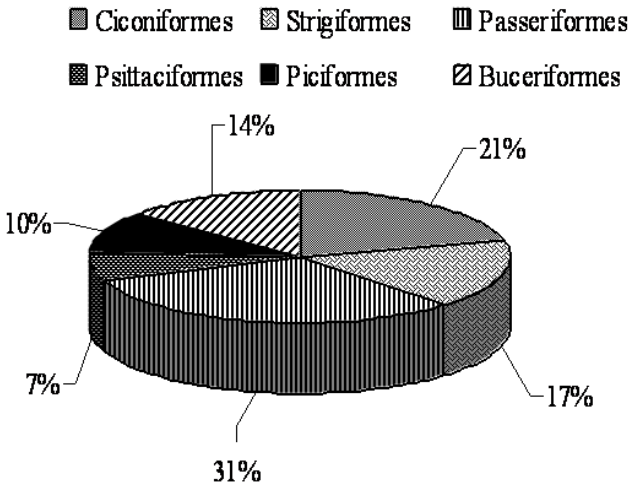

Figure 4. Therapeutic uses of different birds by Monpas

Table 2 Use of animals in therapeutic activities

Animal group	Animal Part	Disease treated	Mode of use
Mollusks			
Pila (*Pila globosa*, Swainson)	Body flesh	Asthma and tuberculosis, stomach disorder and eye irritation.	Cooked or roasted meat is eaten
Arthropods			
Crab (*Cancer pararus*, Linnaeus)	Whole animal	Jaundice, indigestion and other stomach problems	Grinded animal is boiled and the extract is taken.
Cockroach (*Periplanata American*, Linnaeus)	Whole animal	Asthma and tuberculosis	Extract of roasted insect, the water is consumed.
Crickets (*Gryllodes sigillatus*,F.Walker) (*Acheta domestica*, Linnaeus)	Whole animal	Dysentery and asthma	Roasted insect is extracted in water and the water is consumed.
Honey Bee (*Apis indica*, Fabricius) (*Apis florae*,Fabricius) (*Apis mellifera*, Linnaeus)	Whole animal	Boil, snakebite, scorpion bite and cough	Powder of the roasted animal is mix with honey and applied locally
Wasp (*Polistes herbraeus*) (*Vespa orientalis*, Linnaeus)	Whole animal	Boil, stomach problem, headache bronchitis and strokes	The animal powder is mixed with powder of snake head and applied locally or consumed
Stone fly (*Dinocras cephalotes*,Curtis)	Nymph stage	Stomach disturbance and dysentery	Fried or boiled insect is consumed as food
May fly (*Ephemera dancia*,,Muller)	Nymph stage	Stomach disturbance and dysentery	Fried or boiled insect is consumed as food
Caddis fly (*Philopotamus montanus* Donovan)	Nymph stage	Stomach disturbance and dysentery	Fried or boiled insect is consumed
House fly (*Musca domestica* Linnaeus)	Larva	Dysentery and diarrhea	Boiled larva is consumed
Water bugs (*Pentatomidae* sp.)	Whole animal	Hallucination	Fried, cooked or boiled insect is consumed
Fishes			
Bami fish (*Mastacembelus armetus* Lacepede)	Mucus	Wound, pox, anemia and asthma	The mucus is sucked directly from the fish body
Cuchia (*Monomterus cuchia*, Hamilton)	Fresh blood and whole animal	Body weakness, anemia and asthma	The animal is consumed after boiling or the blood is sucked directly
Chaca fish (*Chaca chaca*,Hamilton)	Whole body	Pox, burn wound and skin disease	Dry fish grinded into powder and applied locally
Reptiles			
Monitor lizard (*Varanus bengalensis* Daudin)	Flesh, skin and fat	Asthma, malaria and stomach problems, piles and rheumatic pain	The fat is massaged locally for rheumatic pain. Cooked meat is consumed; Ash of the skin is applied locally on piles and rheumatic pain.
Tortoise (*Geoemyda mouhati*,Gray)	Flesh and shell	Pox, stomach problems, bronchitis, asthma and stroke	Cooked meat is consumed, shell is grinded and the powder is applied locally
Python (*Python mlurus*,Daudin)	Flesh, bile and fat	Snake bite, rheumatic pain, burn wound, bodyache	Meat, bile and fat is applied locally
Cobra (Naja *naja*, Linnaeus)	Flesh, bile and fat	Snake bite, rheumatic pain, burn wound, bodyache	Cooked meat is consumed, bile and fat is applied locally in bone fracture (sometimes used with bees and wasps)

Animal group	Animal Part	Disease treated	Mode of use
Birds			
Ciconiformes			
Eagles (*Spizaetus nipalensis,*Hodgson) (*S. cirrhatus,*Gmelin) (*Hieraaetus fasiatus*,Vieillot) (Spilornis cheela, Latham)	Fat, feather and meat	Rheumatic pain, malaria, typhoid, body weakness, pox and burn wounds	Cooked meat is taken, fats and burnt ash of feather are used for massage locally
Galliformes			
Red jungle fowl (*Gallus gallus* Linnaeus)	Flesh and fat	Nasal congestion, boils and dysentery	Apply warm fat in nose; cooked meat taken in dysentery
Passeriformes			
Drongos (*Dicrurus adsimillis,*Bechstein) *(Dicrurus paradiseus,* Linnaeus) *(Dicrurus aencus),* (Dicrurus hottentottus, Linnaeus)	Fat, feather and meat	Malaria, typhoid, dysentery, pox and wounds	Cooked meat eaten; fats and feather ash applied locally
Jungle Crow (*Corvus macrorhynchos,Wagler*)			
Raven (*Corvus corax* Linnaeus)			
House crow (*Corvus splendens,*Vieillot)			
Strigiformes			
Grass owl (*Tyto capensis* A.Smith)	Fat and meat	Dysentery, diarrhoea, night blindness, burn wound, bodyache, and skin disease	Cooked meat is taken, fat is massaged locally
Forest eagle owl (*Bubo nipalensis* Hodgson)			
Brown wood owl (*Strix leptogrammica* Hodgson)			
Barred jungle owlet (*Glaucidium radiatum* Tickell)			
Spotted owlet (*Athens brama* Franklin)			
Buceriformes			
Great hornbill (*Buceros bicornis,* Linnaeus)	Meat, fat, feather	Malaria, dysentery, typhoid, burn wound, pox and rheumatic pain	Cooked meat is eaten or the powdered meat is taken with water; fat is massaged locally
Indian pied hornbill (*Anthracoceros malabaricus,*Gmelin)			
Wreathed hornbill (*Aceros undulatus* Shaw)			
Rufuos necked hornbill (*Aceros nipalensis* Hodgson)			
Pisciformes			
Blue troated barbet (*Megalaimia asiatica* Lathan)	Meat and fat	Malaria, dysentery, typhoid, burn wound, pox and rheumatic pain	Cooked meat is taken or the powdered meat is taken with water; fat is massaged locally
Himalayan great barbet (*Megalaimia virens,*Boddaert)			
Lineated barbet (*Magalaimia lineate,*Vieillot)			

Animal group	Animal Part	Disease treated	Mode of use
Mammalia			
Carnivores			
Tiger (*Panthera tigris,* Linnaeus) Leopard *(Panthera paradus,* Linnaeus) Clouded leopard (*Neofelis nebulosa,*Griffith) Leopard cat (*Felis bengalensis,*Kerr), Marbled cat (*Felis marmorata*,Martin) Large Indian civet *(Veverra zibetha* Linnaeus) Himalayan palm civet *(Paguma larvata*,Hamilton-Smith) Yellow throated marten *(Murtes flavigula,*Boddaert) Yellow bellied weasel *(Mustela kathiah,*Hodsgon) Siberian weasel *(Mustela sibirica,Pallas)* Beak striped weasel *(Mustela strigidorsa,*Gray) Beach marten *(Martes foina,*Erxleben) Common mongoose *(Herpestes Edwardsi,* E.Geoffroy Saint-Hilaire*)* Small Indian mongoose *(Herpestes auropunctatus*, E.Geoffroy Saint-Hilaire*)* Otter *(Lutra lutra,* Linnaeus)	Meat, fat and bone	Malaria, dysentery, typhoid, burn wound, pox and rheumatic pain	Cooked meat is taken; Powdered meat is taken with water, fat is used for massage locally, powdered Bone is applied locally
Ungulates			
Barking deer *(Muntiacus muntjak,* Zimmermann) Sambar *(Cervus unicolor*, Kerr) Hog deer *(Axis porcinus*, Zimmermann*)* Yak *(Bos grunience,* Linnaeus*)*	Meat and testis	Body weakness, male impotency	Cooked meat and testis are taken
Musk deer*(Moschus moschiferus*,Li*)*	Meat and musk	Body weakness, malaria, diarrhea, pox, dysentery, tuberculosis, rheumatic pain	Powdered meat and musk gland are taken
Serow *(Capricornis sumtraensis,* Bechstein*)*	Meat	Body weakness, jaundice, asthma, paralysis and male impotency	Cooked meat and testis are taken
Goral *(Naemorhedus goral,* Hardwicke*)*	Meat	- do -	Cooked meat and testis are taken
Bharal *(Pseudois nayaur* ,Hodgson*)*	Meat	- do -	Cooked meat and testis are taken
Takin *(Budorcas taxicolor* ,Hodgson*)*	Meat	- do -	Cooked meat and testis are taken
Mithun *(Bos frontalis,*Lambert*)*	Meat, testis, hair, gall bladder, horn	Body weakness, male impotency, lactation deficiency, breast pain, wound, pox and menstrual irregularities	Cooked meat and testis are taken; horn is grinded and powered is taken with boil water, hair ash is applied locally
Wild boar *(Sus scrofa,* Linnaeus*)*	Fat	Tumor and furuncles	Fats is used in massage

Animal group	Animal Part	Disease treated	Mode of use
Rodents			
Porcupine *(Hystrix brachyuran,* Linnaeus*)*	Meat, fat and	Body ache, rheumatic pain, burn wound, Stomach	Cooked meat is consumed, fat is applied locally, fracture bone and gastric ulcer dried stomach extract is used as tea
Malayan giant squirrel *(Ratufa bicolor* Sparrman)	Meat, intestine	Curing poisonous infections, like snake bite, insect bite	Meat is cooked with intestine and intestinal components and applied locally
Red-bellied squirrel *(Callosciurus erythraeus,* Pallas*)*			
Giant flying squirrel *(Petaurista petaurista,*Pallas*)*			
Himalayan striped squirrel *(Tamiops macclellandi,* Horsfield*,)*			
Primate			
Assamese maccaque *(Macaca assamensis,* M'clelland)	Meat, gut, gall bladder	Malaria, typhoid, jaundice, diarrhoea, relief from delivery pain	Meat is cooked and eaten, dry meat and gut and gall bladder is dipped in water and the extract is taken
Rhesus macaque *(Macaca mulatta,* Zimmermann*)*			
Stumped tailed macaque *(Macaca arctoides,*Geoffroy*)*			
Capped langur *(Trachypithichus pileatus,*Blyth)			
Hoolock gibbon *(Bunopithicus hoolock,*,Harlan*)*			
Bear			
Himalayan black bear *(Ursus thibetanus*,Cuvier*)*	Meat, gall bladder	Malaria, typhoid, jaundice, diarrhoea, pox, stomach disturbances and wound	Cooked meat is eaten, gut and gall bladder is dipped in water and the extract is taken.
Sloth bear *(Melursus ursinus,*Shaw)			
Pholiodota			
Chinese pangoline *(Manis pentadactyla,* Linnaeus)	Meat, scale and gut	Malaria, typhoid, jaundice, diarrhoea, pox, stomach disturbances and wound	Cooked meat and gut eaten; ash of scale applied locally
Chiroptera			
Flying fox *(Pteropus giganteus,*Briinnich*)*	Meat, wing, gut	Malaria, typhoid, jaundice, diarrhoea, pox and burn wound	Cooked meat and gut are eaten; ash of forelimb is applied locally
Bat *(Cynopterus sphinx,*Vahl*)*			

therapy. The tribal groups used specific body parts of large faunal species for particular body ailments (Table 2). Category of body parts, and their intensity of use (%) of mammals and birds is given in Tables 3 and 4, respectively. Seven different body parts from mammals and five different body parts of birds were used for therapeutic purposes. But other materials like mucous, exoskeleton, mantle, tentacle and fresh blood from selective minifauna were used to treat locally diagnosed ailments, based on belief. The tribals collected all of these resources through hunting, fishing and manual collection.

Table 3. Body parts (%) of mammals used for therapeutic purposes by different tribes

Animal body parts	Nyishi (n=35)	Apatani (n=37)	Monpa (n=29)
Meat	100.0	100.0	100.0
Gall bladder	42.9	48.6	41.3
Bone	37.7	40.5	34.4
Fat	51.4	54.0	41.3
Penis	20.0	18.9	10.3
Alimentary canal	28.6	27.0	27.5
Horn	20.0	18.9	17.2

n=total number of species whose body parts were used

Table 4. Body parts (%) of birds used for therapeutic purposes by different tribes.

Animal body parts	Nyishi (n=39)	Apatani (n=35)	Monpa (n=29)
Meat	100.0	100.0	100.0
Fat	76.9	80.0	68.9
Feather	82.0	71.4	62.0
Bone	64.1	62.8	51.7
Legs	51.2	57.1	62.0

n=total number of bird species whose body parts were used

DISCUSSION

Tribal people stay close to nature and depend upon forest for their daily needs such as food, fuel, medicine, shelter, and etc. Animals have a distinct place in the life of people of Arunachal Pradesh. Their knowledge about the availability and utility of the animals is immense. The concept of health in tribal groups and their folk medicine system are always multi-dimensional, which involve in social, cultural, and religious issues. The diseases are also related with biological and socio-cultural dimensions of the society that has resulted in to convergence of medical and anthropological interest.

The zoo-therapy has its pertinence as traditional medicines because animals are the source of many modern drugs being used in medical science (Launet 1993, Lazarus and Attila 1993, Ferreira 1993, Marques 1997). Several chemical ingredients have been extracting from fish and recommended as modern medicine (Hamada and Nagi 1995, Salte et al. 1996). 'OMEGA -3', a poly saturated compound obtain from oily sea fish like cod, herrings and salmon, have medicinal value and being used as anti-tumor and analgesic (Finkl 1984). The tetra dotoxin (TTX) is a water soluble guaridinium derivative of bioactive compound, 'procanin' that has the ability to inhibit transmission in the nerve cells (Colwell 1997). We also recorded that the fat, mucous and blood of two fish species, *Mastacembelus armetus* and *Monopterous cuchia* was applied for the treatment of nerve disease, burn wounds and body weakness respectively. It may be due to presence of some bio active molecules that needs further investigation. The gall bladder of bear, non-human primates and mithun is used to prepare traditional medicines, which are used for the treatment of severe fever like malaria and typhoid (Table 2). Modes of use vary in different tribes of Arunachal Pradesh (Chutia 2006).

Indigenous people of the region used meat of all the ethno-faunal species in their traditional medicine system (Table 3). Nevertheless, the tribes differ in their religious and socio-cultural practices (Solanki 2002). The Niyshi tribe utilized the body parts of mammalian species in therapeutic activities more than other two tribes (Table 3). To get any one vital organ of a particular species the animal was killed. Thus use of the vital organs takes a heavy toll of animal and thus a heavy loss to the faunal community and ultimately the biodiversity of the region (Solanki 2006). The religion does not make any difference; the need shadowed the religion as far ethno medical system is concern.

The number of avian species and their body parts were utilized differently among the tribes (Table 4). Avian meat is commonly used therapeutic material; the apatani people utilized meat of 28 species of birds,

more than other tribal groups. Monpas utilized legs and Nyishi utilized bones more for the treatment of various body ailments than the other tribes. This may also be due to socio-cultural practices prevailing among the tribes. Irrespective of the body organs and therapeutic use avian species at the stack and population of many of them has drastically reduced and facing threats for survival in natural habitat (Solanki 2006).

The values of animal based medicine are very important in tribal culture. They are the easily available resources for the majority of the tribal populations with limited access to allopathic medicine or other osteopathy in medical care system. Since people have been using animals for a long time, suppression of their practice by imposing strong stringent measure will not be of much help in long run. Researchers should recognize that the sustainable use of natural resources due to their medicinal value is one of the ways by which biodiversity is used (Celso 1992) and richness of biodiversity need to conserve in order to maintain overall environmental values and sustainable development of societies (Kangas 1997). Policies should accommodate the cultural dimensions of the tribal and the conservation of animals to save them from extinction. The cultural aspects of human-nature interaction should be taken into account in all debates related to sustainable development (Morin-Labatut and Akhtar 1992, Agrawal 1995, Zwahlen 1996). This cultural perspective includes the way people perceive, use, allocate, transfer, and manage their natural resources (Johannes 1993).

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