

Original Research Article

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Food, Feeding Habits of Mithun (*Bos frontalis*) in Protected Area of Nagaland

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ABSTRACT

The study of food and feeding habits of *Bos frontalis* was aimed at extracting information regarding the conservation of Mithun (*Bos Frontalis*) whose population are declining at fast pace even with the distinct title of State animal of Nagaland and also their feeding habits. The main food preference of *Bos frontalis* were the leaf parts of the plants. The data showed that the leaf part of the plants were preferred by *Bos frontalis* almost 80% of the plant species the whole plant parts which consists of plant species where the leaves twigs and shoots were feed on by *Bos frontalis*. A total of 39 species of plants were found to have been feed on by *Bos frontalis* and the study found that leaf parts of the plants were preferred more by *Bos frontalis* over other parts of the plants. The 'whole plant' preference were the second highest from all the plant species found in protected areas of Nagaland, the rest of the plant parts consisting of twigs and shoots were preferred less by *Bos frontalis*. The data also showed that plant family from *Moraceae*, *Poaceae* and *Fabacea* were preferred by *Bos frontalis* the most, with *Moracea* being the most family of plants consumed by *Bos frontalis*. A total of 60 plants species were recorded from 15 different families during the study. Time spend on feeding was also calculated with *Bos frontalis* spending more than 50% of its time on feeding i.e. more than half a day on feeding.

Keywords

Food, Feeding,
Mithun (*Bos
Frontalis*)

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Introduction

Mithun (*Bos frontalis*) is considered to be the domesticated form of wild gaur (*Bos gaurus*). Gayal (*Bos frontalis*) otherwise known as Mithun (local name) in Nagaland, is the state animal of Nagaland and it represents the symbol of pride is a highly traditional prize unique animal, The main Mithun protected areas in Nagaland are Pulie Badze Wild Life Sanctuary, Intanki National Park and

Dzulekema. Mithun (*Bos frontalis*) in Dzulekema and Pulie Badze Wild Life Sanctuary are allowed to roam freely and are domesticated by the locals. Unlike the other states, Mithun in Nagaland is domesticated, in spite of hardship and difficulties faced by Mithun rearers, the Mithun has been conserved till today by the village and its rearing is also strengthen or supported by ways of the system of shareholders and stack holders since time immemorial. Mithun serves

as rural bank as of anytime money and also serves as barter trade till today in some of the village solely depend on this animal for their economy. Field research on, food, feeding habits of mithun (*Bos frontalis*) and its conservation in protected area of Nagaland, was done from the month of January to May 2018 with the main objective to identify and evaluate the food plant species and feeding habits of Mithun (*Bos frontalis*) by using direct sighting and questioners and to study the behavior of Mithun (*Bos frontalis*).

Materials and Methods

Habitat types of different protected areas that is Intanki National Park, Pulie Badze and Dzuleke protected area, varies in topography therefore there is contrast in climate and condition. Villages located in Intanki National park are mainly Busumpuikam, Manglimukh and Kissingram village, These villages are the main villages where Mithun (*Bos frontalis*) were domesticated and reared, The collection of data's from Pulie Badze Wildlife Sanctuary were mainly done from two villages namely Khonoma and Jotsoma village and with an elevation of about 1800m above sea level Dzuleke village situated on Dzuleke was mainly used for the field study of *Bos frontalis*.

Procedure of identification of *Bos frontalis*

Bos frontalis commonly known and referred to as Mithun by the people of Nagaland were identified by their postures, colors and sorting them out with the habitats where they were seen in. A pair of Horns is present in both the sexes. The hair of *Bos frontalis* is dark reddish brown, with stockings. Adult males are larger the females (Nowak 1999). A characteristic hump of raised muscles can be seen over the shoulders; this is the result of elongated spinal process of vertebrae (Buchholtz 1989).

Direct observation

Data on activity pattern, food plant species and feeding habits of *Bos frontalis* were recorded by direct/ sightings with the help of a pair of Bushnell 10x50 binocular/ and Nikon D3100 Digital DSLR Camera with 75-300 mm Lens using animals were observed from dawn to dusk from 0600-1800 hrs. After direct observation of feeding of animals, on-site inspections of food plant species were identified as per Saxena and Brahmam (1994-1996).

The feeding behaviors of *Bos frontalis* were studied for a period of four months (January to May, 2018) in the field. The group was followed for four days a week, each day from dawn to dusk (total 448 contact hours; range 06-08 hours, mean = 07 hours per day). The help of a local guide having versatile knowledge of forest patches was taken for locating the *Bos frontalis* groups. The groups were located by their morning calls. On sighting the group, it was followed for that day. Selected behaviors have been continuously recorded every sixty seconds on a ½ hour scan data sheet.

Each individual animal of the group was followed for half an hour alternately for entire active period. Binocular was also used when it was difficult to observe the animal with naked eyes. A 'scan' refers to a single recording of the behavior of an individual within 15 minutes intervals, which provided data on different activities, broadly classified into feeding, resting, foraging and other activities (playing, territorial, travel, grooming, aggression). Percent time spent in feeding was estimated by the following formula. $T = (nf \times 100) / N$, Where, T = % daytime spent feeding, nf = number of records that included feeding, and N = total number of records for the day.

Questionnaire

The questioners for Intanki National park included long hikes to the study site starting from January 14- Feb 12. The questioners for Pulie Badze wildlife sanctuary was done on the month of March. Questioners were collected from different villagers and the forest guards that were stationed. The questioners from Dzuleke protected area were collected on the month of May starting from morning 9:00am – afternoon 2:00 pm from 14th of May to 20th of May. We asked the address of the site, village, district, and province and additionally recorded each location by GPS (Global Positioning System). whilst trying not to lead or coax answers, we verbally asked about the morphological and behavioral traits to specify species, for example, body color pattern, neonatal body color, vocal sounds, behavioral patterns, and so on. The questionnaires to the villagers consisted of the following simple questions. Main source of profit from Domesticated Mithun, *Bos frontalis*, Aggressiveness towards humans, Main plants used for feeding *Bos frontalis*, Pattern of Movement for *Bos frontalis* from village to the feeding place.

Results and Discussion

During the study it was found that *Bos frontalis* were prevalent and most of the villagers present around the protected areas mildly or mainly used *Bos frontalis* as a food source as a result a series of questionnaires were asked concerning the food and feeding habits of *Bos frontalis*, Hamada *et al.*, (2007) in protected areas of Nagaland namely, Pulie Badze, Dzulekema village & Intanki National park (Table 1). Some villages which were located along the borders of the NP were Beisumpuikam Village Manglumukh village and Kissingram village and where the questionnaires were been asked. Beisumpuikam village which is 8.34sq km houses roughly 25 families located at

25°31'18 ''N 93°40'50'', Manglumukh Village located at 25°32'27''N 93°39'56''E with size of about 5.25sqkm, Kissingram village located approximately at about 25°31'39''N 93°40'14''E & the Forest colony which was occupied by the Forest stuffs was located approximately at around 25°31'12''N 93°40'14''E. Dzulekema village is located at Dzuleke where no less than 30 household reside, it is located at 25°65'23''N 29°42'36''E around 30 km away from the capital town Kohima with size of 7sq km and Jotsoma is located near Pulie Badze located at 25°65'23''N 94°34'5''E, both villages have similar conditions with temperature ranging from 14- 20°C during winter, *Bos frontalis* are reared domestically by the people of this villages (Fig. 1).

During the questionnaire it was found that villages from Intanki National Park mainly used *Bos frontalis* as livestock for their meat and dairy products, whereas Jotsoma Village located near Pulie Badze and Dzulekema village mainly used other live stocks such as cow, goats& fowls apart from *Bos frontalis*. The largest populations of *Bos frontalis* are found in India, which is restricted to Arunachal Pradesh, Manipur, Mizoram and Nagaland *Taba et al.*, (2015), Wild and domestic livestock that forage in the same habitat may have potential for competition *Chetri* (2003), no damages on crops were reported from the questioners. The *Bos frontalis* from all the villages were mainly domesticated and reared for their meat and dairy which is known to be highly nutritious. No deaths or injuries were recorded from any villages. There were total five villages where questionnaires were implemented; villages situated in Intanki National park namely Beisumpuikam, Kissingram, Manglumukh villages, villages from Dzuleke, namely Dzulekema village, and village from Pulie Badze Wildlife Sanctuary namely Jotsoma village. The Questionnaire also found that *Bos frontalis* were used as a meat source by

villages from Intanki National Park and Dzuleke except Pulie Badze Wildlife Sanctuary where no meat consumption from locals were recorded, the main reason for this might be due to the fact that Pulie Badze Wildlife sanctuary has strict rules laid where *Bos frontalis* are protected and the location of the villages namely Jotsoma village have less domesticated *Bos frontalis* and mainly prefer other livestock like cows and goats as their main food source.

Food and feeding habits

A list of all the plants species and the plant parts which were eaten by *Bos frontalis* were

made by observation from all the protected areas in Nagaland. The lists are given in Table 2–4.

Figure 2 represents the percentage of plant parts eaten by *Bos frontalis* in all the protected areas of Nagaland, the study found that 70% of plant parts which were eaten by *Bos frontalis* were leave parts represented by blue color, 8% of plant parts which were eaten by *Bos frontalis* were twigs, 20% were whole plant twig part represented by green coloration. The main food preference for *Bos frontalis* were found to be the leaf parts of the plants and the least preference of the plant parts eaten by *Bos frontalis* shoot parts.

Table.1 The number of households and ethnicity of residents in each village, if damage to crops by Mithun was observed, and whether the villagers hunt or consume *Bos frontalis*, Hamada *et al.*, (2007)

Protected Areas	Intanki National Park			Dzuleke	Pulie Badze	
	Beisum puikam Village	Manglumukh village	Kissingram village		Khonoma village	Jotsoma Village
Are Mithun meat consumed?	YES	YES	YES	YES	YES	NO
Damage to the crops due to over grazing?	NO	NO	NO	NO	NO	NO
Are People hurt or attacked by Mithun?	NO	NO	NO	NO	NO	NO
Dependent only on Mithun or other live stocks as well?	YES	YES	YES	NO	YES	YES

Table.2 List of food plant species which was feed on by *Bos mithun* in Dzuleke

Family	Species.	Local name	Plant parts eaten
Arecaceae	<i>Livistona jenkinsiana</i>	Took patta	Leaves
	<i>Wallichia densiflora</i>	Fish tail palm	Leaves
Fabaceae	<i>Mimosa himata</i>	Alay	Leaves
	<i>Pueraria tuberosa</i>	Indian kudzu	Whole plant
	<i>Pueraria thunbergiana</i>	Japanese arrow root	Whole plant
Moraceae	<i>Ficus hirta</i>	Fig tree	Leaves
	<i>Ficus hispida</i>	Hairy fig	Leaves
	<i>Ficus semicaudata</i>	Drooping fig	Leaves
	<i>Artocarpus heterophyllus</i>	Jack fruits tree	Leaves
	<i>Ficus insipida</i>	Red fig	Leaves
Euphorbiaceae	<i>Mallotus philippensis</i>	Kamala tree	twigs
	<i>Mallottus tetracoccus</i>	Rusty kamala	Leaves

Table.3 List of food plant species feed on by Mithun in Intanki National Park

Family	Species	Local name	Plant Parts eaten
Moraceae	<i>Ficus hirta</i> Vahl.	Fig tree	Leaves
	<i>Ficus hispida</i> L.f	Hairy fig	Leaves
	<i>Ficus semicaudata</i>	Drooping fig	Leaves
	<i>Ficus palmeri</i>	Rocky fig	Leaves
	<i>Ficus lamponga</i>	Dimoru	Leaves
	<i>Artocarpus heterophyllus</i>	Jack fruits	Leaves
	<i>Ficus insipida</i>	Red fig	Leaves
	Euphorbiaceae	<i>Macaranga denticulate</i>	Blistry macaranga
	<i>Mallotus philippensis</i>	Kamala tree	Twigs
	<i>Mallottus tetracoccus</i>	Rusty kamala	Leaves
	<i>Bischofia javanica</i>	Bishop wood	Leaves
Utricaceae	<i>Sarcochlamys pulcherrima</i>	Ombe tree	Twigs
	<i>Debregeasia valutina</i>	Nilgiri nettle	Leaves
Poaceae	<i>Themada caudata</i>	Grader grass	Leaves
	<i>Seteria palmifolia</i>	Palm grass	Leaves
Sterculiaceae	<i>Sterculia coccinea</i>	Sterculia shurbs	Leaves
Arecaceae	<i>Livistona jenkinsiana</i>	Took patta	Leaves
	<i>Wallichia densiflora</i>	Fishtail palm	Leaves
Cannabaceae	<i>Trema orientalis</i>	Charcoal tree	Leaves
Fabaceae	<i>Bauhinia purpurea</i>	Hawwaiin orchid tree	Leaves
	<i>Pueraria tuberosa</i>	Indian kudzu	Whole plant
	<i>Pueraria thunbergiana</i>	Japanese arrowroot	Whole plant
	<i>Pueraria wallichii</i>	Kudzu	Whole plant
Verbanaceae	<i>Callicarpa arborea</i>	Beauty berry	Leaves
Rosaceae	<i>Rubus hexagynus</i>	Cane fruit tree	Shoot part

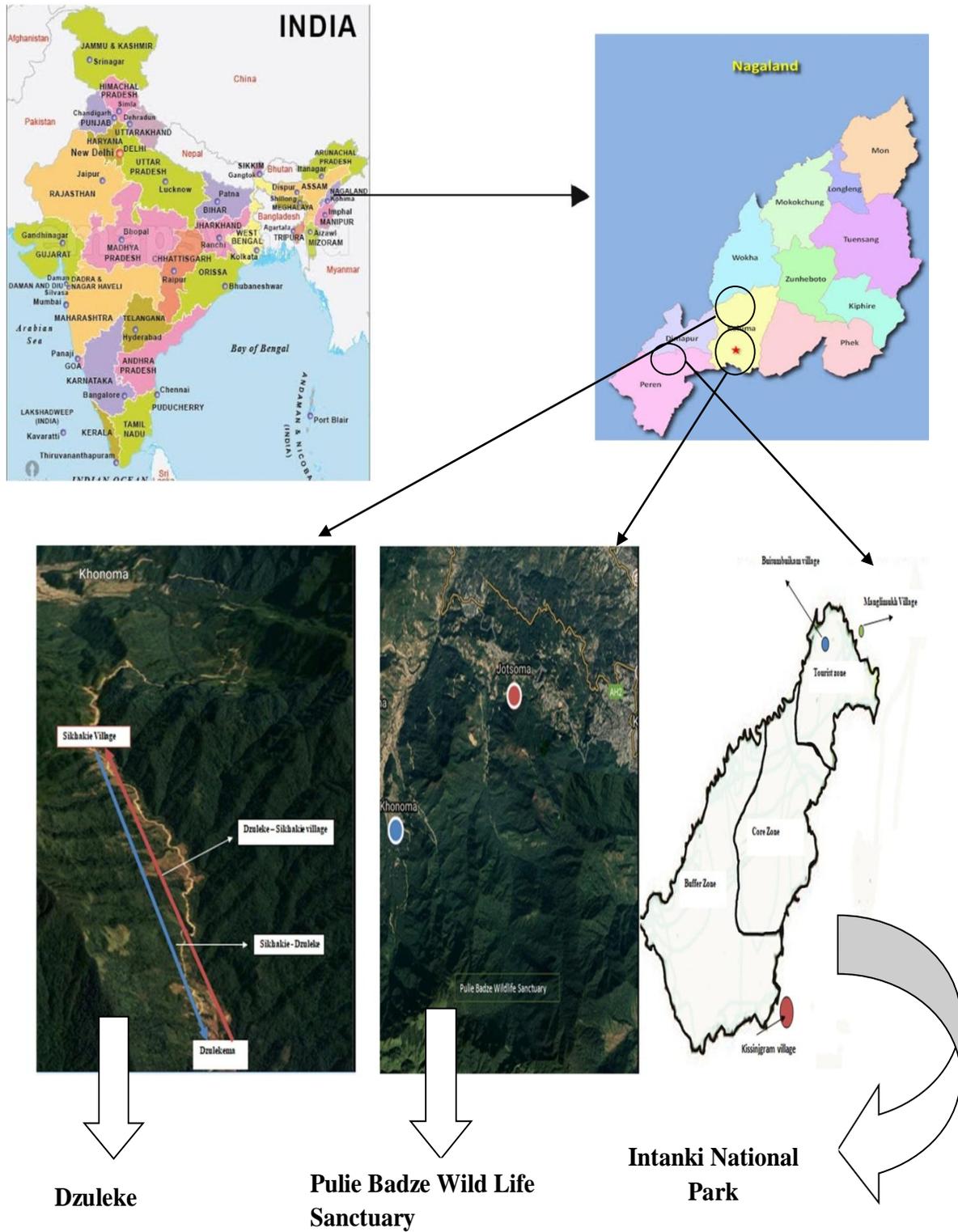
Table.4 List of food plant species feed on by Mithun in Pulie Badze Wildlife Sanctuary

Family	Species.	Local name	Plant parts eaten
Poaceae	<i>Thysanachaena maxima</i>	Tiger grass	Leaves
	<i>Themada caudata</i>	Grader grass	Leaves
	<i>Seteria palmifolia</i>	Palm grass	Leaves
	<i>Saccharum spontaneum</i>	Wild sugar cane	Whole plant
	<i>Saccharum officinarum</i>	Sugar cane	Whole plant
	<i>Zea mays</i>	Maize	Whole plant
	<i>Bambusa longispiculate</i>	Mahal bamboo	Leaves/shoot
	<i>Brachiaria mutica</i>	Buffalo grass	Whole plant
Rosaceae	<i>Rubus hexagynus</i>	Cane fruit tree	Shoot part
Verbenaceae	<i>Callicarpa arborea</i>	Beauty berry	Leaves
Utricaceae	<i>Sarcochlamys pulcherrima</i>	Ombe tree	Twigs
	<i>Debregeasia longifolia</i>	Orange wild rhea	Leaves
Rubiaceae	<i>Randia dumetorum</i>	Madanaphala	Leaves
Fabaceae	<i>Bauhinia purpurea</i>	Hawwaiin orchid tree	Leaves
	<i>Pueraria tuberosa</i>	Indian kudzu	Whole plant
	<i>Pueraria wallichii</i>	Kudzu	Whole plant
Moraceae	<i>Ficus palmeri</i>	Rocky fig	Leaves
	<i>Ficus hirta</i>	Fig tree	Leaves
	<i>Artocarpus heterophyllus</i>	Jack fruits tree	Leaves

Table.5 Time spend on feeding

Protected Place	Total number of records that include feeding (nf)	Total no of records for the Day (N)	% of Day spend on Feeding
Intanki National park	34	44	77.27%
Dzuleke	20	59	33.89%
Pulie Badze wildlife sanctuary	57	77	74.02%
Total	111	180	61.66%

Fig.1 Maps of all the protected areas of Mithun *Bos frontalis* in Nagaland and the location of the villages



Dzuleke

Pulie Badze Wild Life Sanctuary

Intanki National Park

Fig.2 Percentage of plant parts eaten by Mithun in all the protected areas of Nagaland

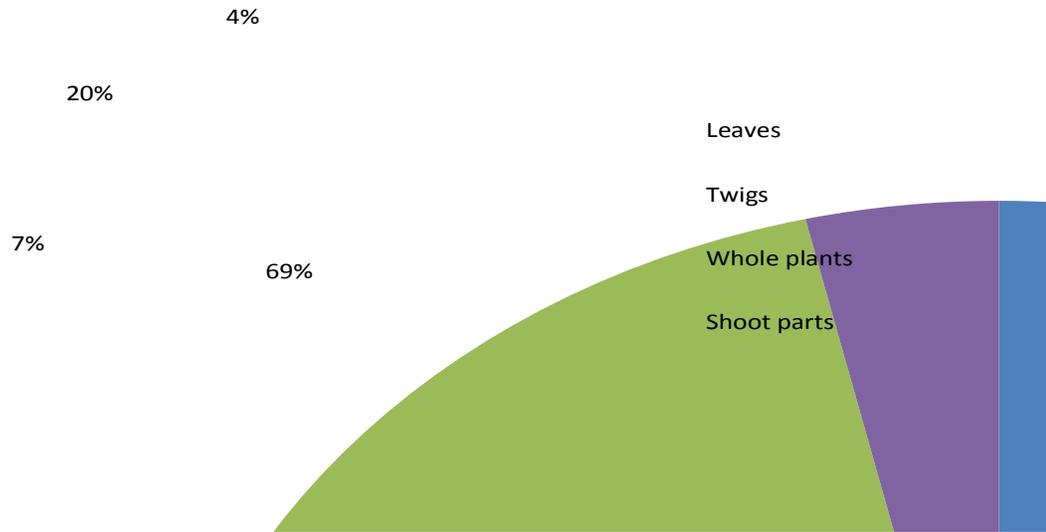
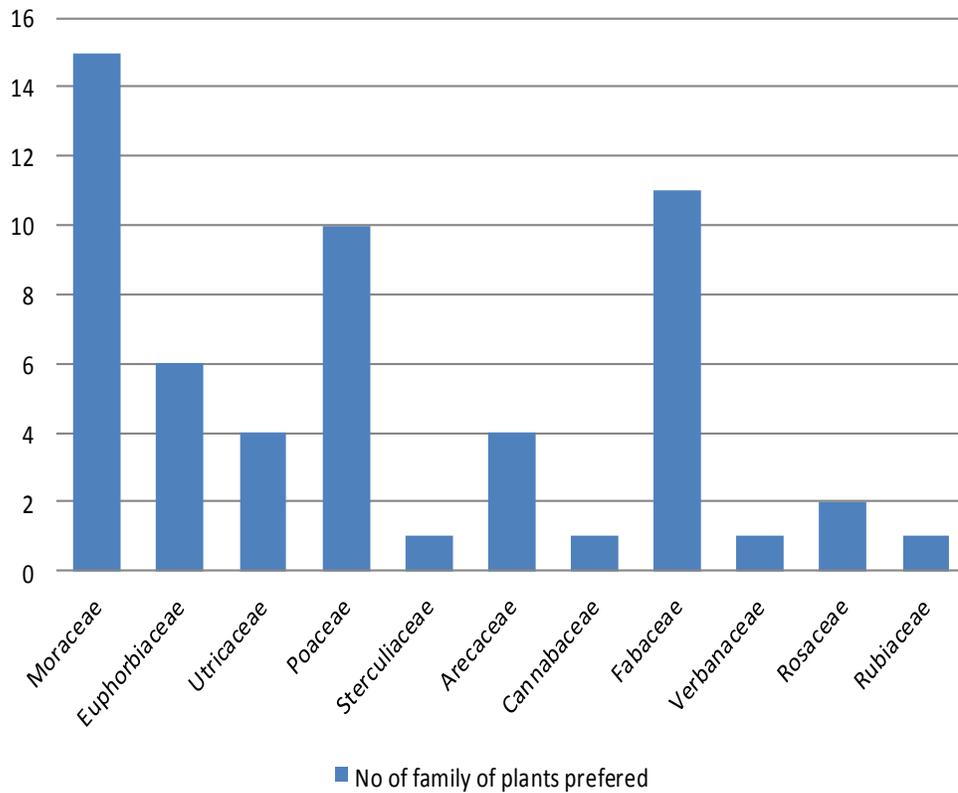


Fig.3 Plant species preferred *Bos frontalis* from all the protected areas of Nagaland



The above graph represents the number of plant species preferred by *Bos frontalis* in all the protected areas of Nagaland. The above data shows that plant family from *Moraceae*, *Poaceae* and *Fabaceae* were preferred by *Bos frontalis* the most, with *Moraceae* being the most family of plants consumed by *Bos frontalis*, plants from *Moraceae* include *Ficus hirta* Vahl, *Ficus hispida* L.f, *Ficus semicaudata*, *Ficus palmeri*, *Ficus lamponga*, *Artocarpus* and *heterophyllus*. Plants from, *Poaceae* family includes *Thysanachaena maxima*, *Themada caudate*, *Seteria palmifolia*, *Saccharum spontaneum*, *Saccharum officinarum*, *Zea mays*, *Bambusa longispiculate* and *Brachiaria mutica*, Family from *Fabaceae* include, *Bauhinia purpurea*, *Pueraria tuberosa*, *Pueraria*, *thunbergiana*, *Pueraria wallichii* and *Mimosa himata*.

Behavior

The data obtained from calculating time spend on feeding was done village wise where feeding time was observed, villages from Intanki National park has considerably high percentage of day spend on feeding with Manglimukh village, Kissingram village and Pulie badze wildlife sanctuary having 77.27% of the day on feeding and Beisumpuikam and Kissingram with reason may be due to the high vegetation of Intanki national park and area of size which is larger than any protected areas in Nagaland, total time spend on feeding for all the protected areas of Nagaland is 61.66% of day spend on feeding which means *Bos frontalis* will spend more or half of their days on feeding (Table 5). Dzuleke has the lowest of all the feeding percentage with Mithuns from Dzulekema village spending 33.89% of the day on feeding, the *Bos frontalis* from Dzuleke village usually take a rout through Sikhaki village for their food hence the time spend on feeding is considerably lower in this region of the protected areas. The above indicates that more

than half of the day is spend by *Bos frontalis* and the remaining percentage of their time is either spent on grooming or naps.

In the present study entitled “Food and feeding habits of Mithun (*Bos frontalis*) in protected areas of Nagaland and its conservation” The result from the data indicated the difference in feeding time and the amount of day spend on feeding which showed more than half of the day spent on feeding with 61.66%. The study also indicated that the main food preference of *Bos frontalis* are the Leaf parts of the plant with more than 50% of the plant part consumed being the leaf part. The above data also showed that plant family from *Moraceae*, *Poaceae* and *Fabaceae* were preferred by *Bos frontalis* the most, with plant family from *Moraceae* being mostly preferred by *Bos frontalis*, further research can also be conducted on the food contents and the nutritional value of the leaf parts.

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