Human – Sloth bear Conflict in Tumkur District

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***Abstract*: Human –Sloth bear conflict is one of the major environmental issues which come under the concept of wildlife conservation. Tumkur district located in Karnataka state is one among the affected district. Tumkur district holds second highest number of human-sloth bear conflict cases next to Bellary district in Karnataka. All the 10 forest ranges of Tumkur division are homes for considerable population of sloth bears and experiencing intense human-sloth bear conflicts which resulting in several human life loss, injury, crop loss, death of sloth bears and their injuries as well. In the recent past, the incidences of human – sloth bear conflict is increasing in a significant manner which results in the problems affecting both human and sloth bears. The habitats of sloth bears in Tumkur district are shrinking, degrading and isolation because of human pressure. Mining, quarrying, during the past decade posing a serious threat to sloth bear population in the district.**

***Keywords*: wildlife conservation, conflict, habitat.**

INTRODUCTION:

A. Sloth bear:

The sloth bear (Melursusursinus) is one of the large mammals found in India, endemic to the Indian subcontinentcompletely tropical and subtropical in distribution[7] [12] [32].Perhaps evolved within its limits and possesses several morphological, physiological and behavioural adaptation to the tropical habitat and the myrmecophagus (feeding on ants and termites) [32].Out of 8 bear species in the world [15] [19], India is a home for 4 species [4] [19]. They are 1. Himalayan Brown bear [Ursuearctose] [4]

2. Himalayan Black bear [SclenarectorTibetanus] [4]
3. Malayan sun bear [Helarciousmalayanees] [4]
4. Sloth bear [Melursusursinus] [4]

Amongst the 4 bear species found in India,the Sloth bear is most widely spread bear specie in India [5] [12] and 90% of the slothbear range occur in India[11].

The tropical forests of Indian states have sloth bear commonly, but their distribution is Patchy corresponding with the Present forest cover[30] and their population size is estimated between6000 and 11000 [4] [25] [27] [30]. The population density is divided into several fragmented, isolated, discontinued densities across India [12] [27] [31].

1.Range and Distribution: Sloth bear occupy a wide range of habitats on the Indian mainland including wet and dry tropical forests, scrublands, grass lands, and moist evergreen forests [3] [12] [31][32].

In terms of forest types, dry and moist deciduous forests together hold the major proportion of the sloth bear population (about 90%) [27] [31]

About 30% of the forest remaining in India is of dry deciduous type and these forests holds about 50% of sloth bear population [27] [31].but it seems that the moist deciduous forests have higher densities of sloth bears when compared to other forest types [27] [31].

In India the two strong holds of sloth bears are the forest of Western Ghats and forests of Central Indian highland [27] [30] [31], where in terms of population abundance and habitat viability, the Western Ghat forests have strong hold of the sloth bear population [25]. The sloth bears are reported to exist in 174 protected areas in India [25].The occurrence of sloth bears is not limited to protected areas and are found widely distributed even in unprotected multi use forest also [1] [2] [3], while almost 50% of subsisting populations live outside the protected areas. The sloth bear population which is living outside the protected areas is declining steadily [9] [11] [31] [32] and recently becoming locally extirpated in some areas [8] [30].

Long ago the sloth bears were abundantly seen and distributed throughout the subcontinent which were largely spread habitats,currently their ranges are same as past. But their present ranges are shrunken along their periphery and fragmented over all [30]. During the 1950's forest cover declined by about 40%of the geographical area of Indiaand during 1980's it reduced to less than 20% of geographical area.

However, now only about 10% of good quality of sloth bear habitat is left in India [9] [25][30]. The potential sloth bear distribution in Indiawas estimated 200,000 sqkms [11],according to National Bear Conservation and Welfare Action plan 2012 the occupied range is 400,000 sqkms and a recent survey suggests that sloth bear occupy 52% of the Land area of India [11] [21].

The sloth bear range has shrunken and population densities were reduced due to continuous habitat loss [32] due to human pressure and is confined to mainly five distinct regions namely Northern, North-Eastern, Central, South-Eastern and South-Western [11].The South-Western area fallows the Western Ghats and principally falls within the states of Maharashtra,Goa,Karnataka,Kerala and Tamilnadu [11].

In Karnataka state we can find sloth bear species only.

In Karnataka state sloth bears are living in dense forests of Western Ghats [27][30][31]andalso found in dry districts of Kolar, Dharwad, Bellary, Chitradurga, Tumkur, Hassan, Biligiriranganabettaand dry deciduous forests of Nagarahole, Bandipura as well.

The distribution of sloth bears in Karnataka was reported to about 16,582 sqkms in 2010 and a declination of 19% from 2006 [9]. There is no availability of reliable data regarding the population of sloth bears in Karnataka.According to Garshelis, there has been 30-49% of decline in Asiatic black bears and sloth bears in the last 30 years and the rate of decline is predicted to remain the same for the next 30 years [21].

Conservation Status: The sloth bear is listed under schedule I of the Indian wild life protection Act 1972 [2] which provides for legal protection sloth bears. Sloth bear is classified as 'vulnerable' [11] [15]. International trade of the sloth bear is prohibited as it is listed in Appendix-I of the convention on International Trade in Endangered Species [12].

B. Human – Sloth bear conflict:

Human-sloth bear conflict is inevitable, when the human and sloth bears share same space and ecological resources [19],especially in multipurpose, degraded forests. Due to Human-sloth bear conflict the number of people who are the victims of sloth bear attack is escalating severely. The incidences crop loss due to crop depredation by sloth bear are also increasing significantly.

According to expert conservationists, sloth bear can be more dangerous than any conflict animal to human being because it is one of the animals which can attack human without any provocation [7] [19] [23] and cause human death, permanent disability due to loss of organs. The victim generally attacked on face and head which results in terrifying disfiguration of face.

Study area: The study was carried out in Tumkur District of Karnataka state (South India) and is geographically situated between latitudes $12^0 44'$ and $14^0 20'$ North and between $76^0 21$-$77^0 31$ East of Greenwich [22].Tumkur Division is surrounded by Chitradurga district on the North-West. Ananthapuradistruct (A.P) on the North, Kolar district on the North-East.Bangalore district on the east.Ramanagaram district on the South-East and Hassan district on the South-West [22].

The landscape is consists mainly of undulating plains interspersed with a sprinkling of hills.

There are two chains of hill ranges running from North to South across the district [22].

The revenue district of Tumkur is having 10,64,755 hectares of geographical area 52-63%0f land used for cultivation, only 10% of land is under forest coverage, remaining land is either barren or used for human activities[29].

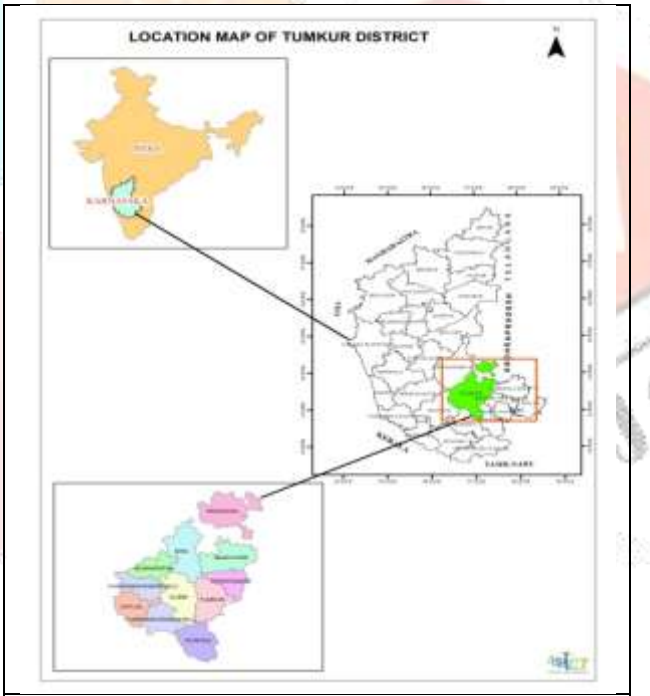

Figure1. Map of the study area chosen

The total perimeter of the Tumkur forest Division is 1092.18Km.The total forest area of Tumkur District is 90465.94 hectares. Area of Reserved forest is 800.76km^2 [22][29].

Limits of Tumkur forest division are same as the of Tumkur revenue district extending over 10 forest ranges, covering the entire district [22].The 10 forest ranges of Tumkur forest division are Tumkur, Gubbi, Kunigal, Tiptur, Chikkanayakanahalli, Bukkapatna, Madhugiri and Sira Range[22][29].

The forests of Tumkur district can be classified as following tropical 4 types. They are [22][29].

1. Southern Tropical Dry mixed Deciduous forest -Type 5A/c3
2. Southern Tropical Dry deciduous scrub forest -Type 5A/d5
3. Southern Tropical Thorn forest -Type 5A/c1 and
4. Southern Thorn scrub -Type 6A/ds1.

The forests with in Tumkur district are home for considerable number of sloth bears as these forests are suitable habitat for sloth bear because in India sloth bears prefer to occupy tropical deciduous forests whichare considered to be the optimal habitat for them [25].
It is evident according to previous studies carried out in South India [In Madhumalai wild life sanctuary in southern India] that, Sloth bear signs were more frequently occurringin dry deciduous forests [32].
Climate: Climate of the district free from extremes, except for Pavagada taluk where it is relatively hot. April is the hottest month registering a maximum day temperature of 41^0C at times, while December is the coldest month when temperature dips down to 9^0C.The winter is short and the summer is long [22].
Rainfall: The rainfall and its distribution pattern vary considerably. The average rain fall in the district is 687.9 mm [22].

Human –Sloth bear conflict in Tumkur District:
There is a long history of human sloth bear conflict in some parts of Tumkur District and crop loss due to depredation was also common but occasional incidents of human injuries or death of human due to sloth bear attacks were reported throughout the district in last decade.

Unfortunately in recent years the incidences of sloth bear attack which resulting in human injury, permanent disability also human death are significantly increasing in an alarming rate though out the district. Maximum cases of human sloth bear conflict cases were reported from Tumkur district in Karnataka state when compared to other districts [19].

All 10 forest ranges of Tumkur division are home for sloth bears. But major population density of them is in Madhugiri range, Chikkanayakanahalli range, Pavagada range and in Koratagere range.
The forest of Tumkur district is scattered in 417 patches of forests and are surrounded by agricultural land, human settlement and other lands. So we can classify them as multi use forest area. Unfortunately these forests are under immense human pressure. This results in an escalation of chances for encountering of Human and sloth bears [29].

Human the villagers living hear proximity of forests enters forest for collecting fire-wood, fruits; honey and other products. They take their cattle into the forest for grazing. These activities increase the chance of encounter of sloth bears with human. It also causes degradation of habit of sloth bears.

According to statistics from forest department, during the end of October 2012.The forest area of 154-248hectares was under encroachment by 286 families in Tumkur District [29][22].

AdoptedMethod:
Collection of data:-The data of compensation amount given during the period of 2010-15, which was given towards human injured cases due to sloth bear attack, is collected from Forest department of Karnataka.

Data analysis:-The data collected is compiled in the form of spread sheets and analysed using the analysing tool MS Excel.

Maps:-The maps of human sloth bear affected villages are generated sing software Arc Map-10.

Table 1-Table showing number of human injury cases occurred during 2010-15 in Tumkur Forest Division.
(Source: Data collected from Forest department of Karnataka).

Range Name	2010-11	2011-12	2012-13	2013-14	2014-15	Total No of Cases
1.Tumkur	0	1	0	3	2	**6**
2. Gubbi	0	0	1	1	0	**2**
3.Kunigal	0	0	0	0	1	**1**
4. Tiptur	2	0	2	0	0	**4**
5.Chikkanayakanahalli	4	0	4	6	2	**16**
6.Bukkapatna	4	2	0	0	8	**14**
7.Madhugiri	0	1	5	2	3	**11**
8.Sira	2	0	3	0	3	**8**
9. Koratagere	1	0	4	0	1	**6**
10.Pavagada	3	3	3	0	7	**16**
Total	**16**	**7**	**22**	**12**	**27**	**84**

Table 2- Table showing payment of Compensation during 2010-15 for cases of human injury by sloth bear attack (source: Data collected from forest department of Karnataka).

SL.no	Range Name	Total amount of compensation paid
1	Tumkur Range	249,167.00
2	Gubbi range	22,000.00
3	Kunigal Range	14,240.00
4	Tiptur Range	102,080.00
5	Chikkanayakana halli Range	137,705.00
6	Bukkapatna Range	709,268.00
7	Madhugiri Range	123,460.00
8	Sira Range	77,950.00
9	Koratagere	136,500.00
10	Pavagada Range	132,865.00
	Total	**1,705,235.00**

Table 3- Table showing details of mining in Tumkur District during year 2001-2010 (Source: A study report on Ecology, Forest and Biodiversity of Tumkur District 2012)

SI No.	Year	Active means	Mining area (hectares)	Production (tonnes)
1	2001-02	9	419.89	0.075
2	2002-03	13	634.16	0.174
3	2003.04	14	638.21	1.113
4	2004-05	15	757.21	2.117
5	2005-06	18	883.87	1.945
6	2006-07	17	918.07	3.023
7	2007-08	18	857.07	2.645
8	2008-09	16	806.11	2.531
9	2009-10	15	802.06	2.585

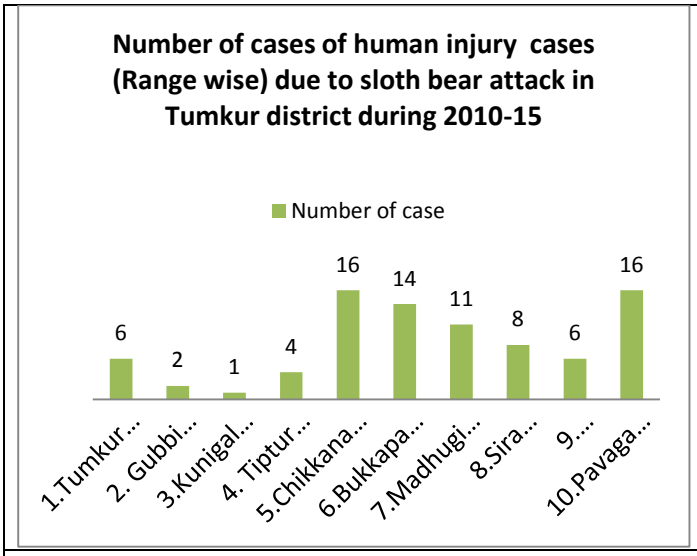

Figure 2: Graph showing number of cases of human injured in different ranges of Tumkur District during 2010-2015.

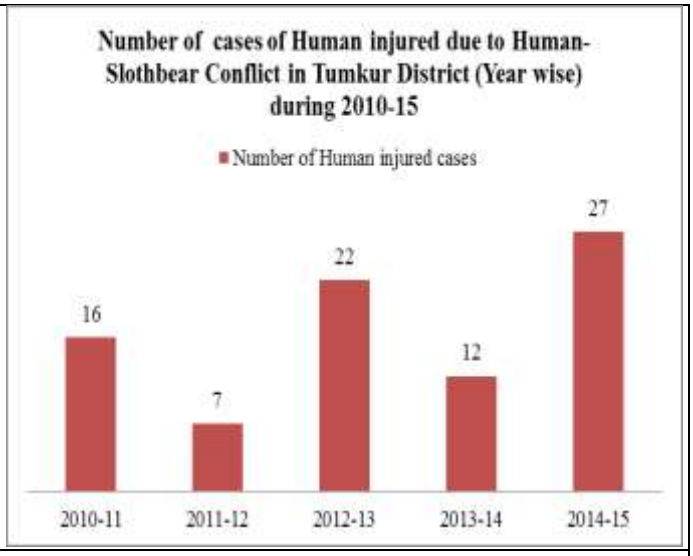

Figure 3: Graph showing number of cases of human injured (year wise) in Tumkur District during 2010-2015.

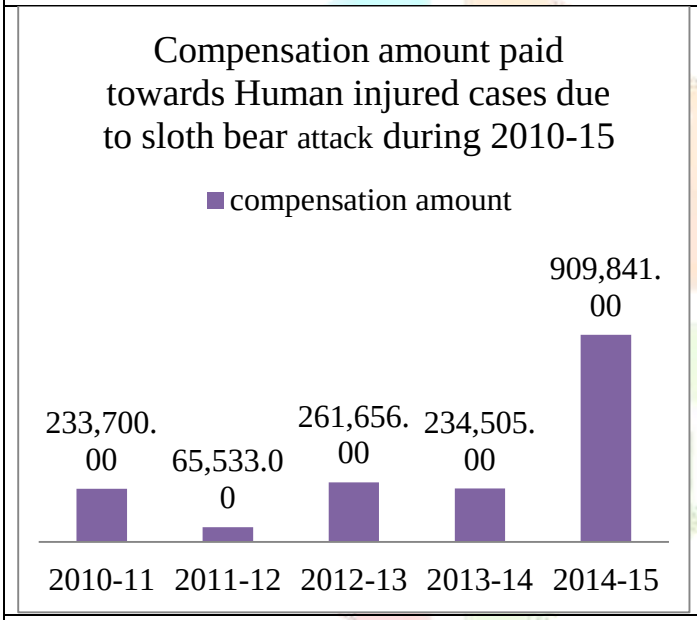

Figure 4: Graph showing the amount of compensation paid towards human injured cases (year wise) in Tumkur District during 2010-2015.

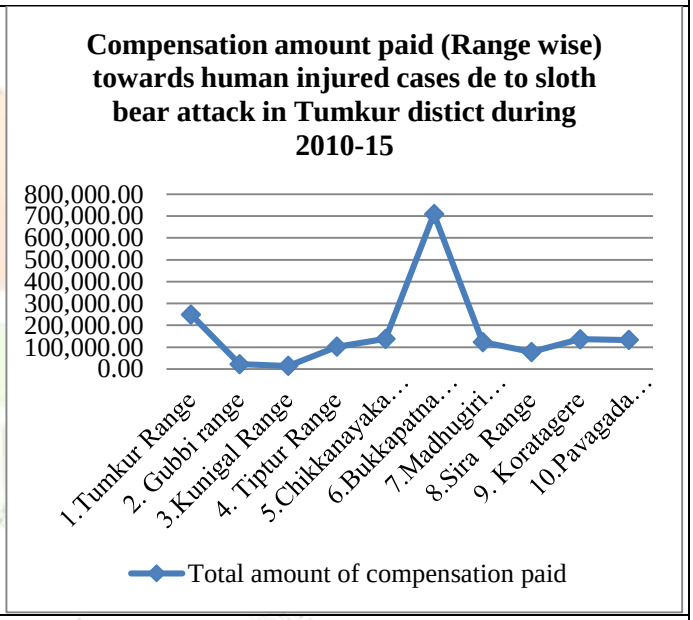

Figure 5: Graph showing compensation amount paid (Range wise) towards human injured cases in Tumkur District, during 2010-15.

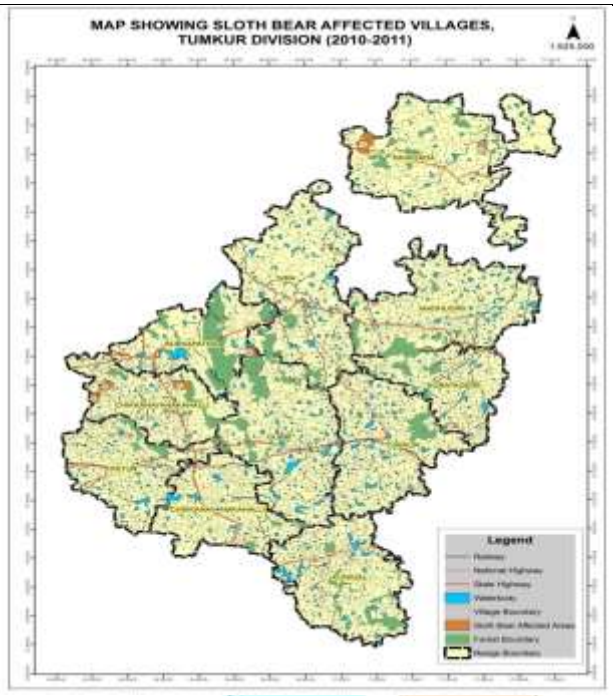

Figure 6: Map showing human sloth bear conflict affected villages in Tumkur District during 2010-11

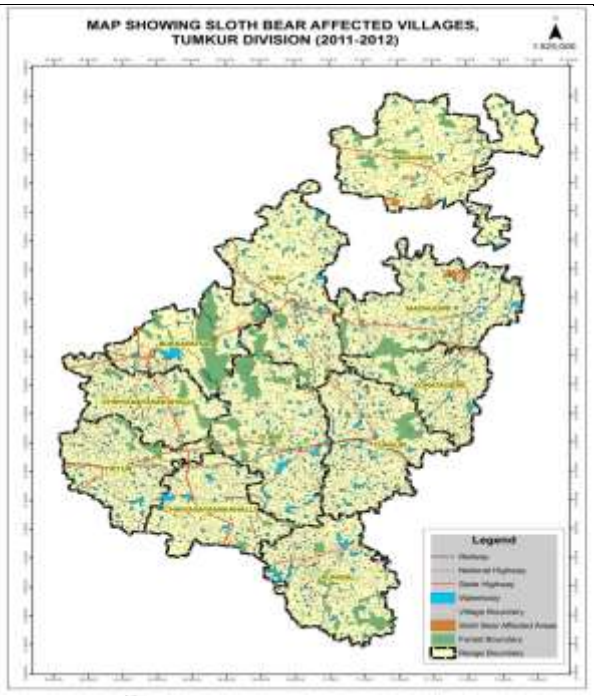

Figure 7: Map showing Human-sloth bear conflict affected villages in Tumkur District during 2011-12

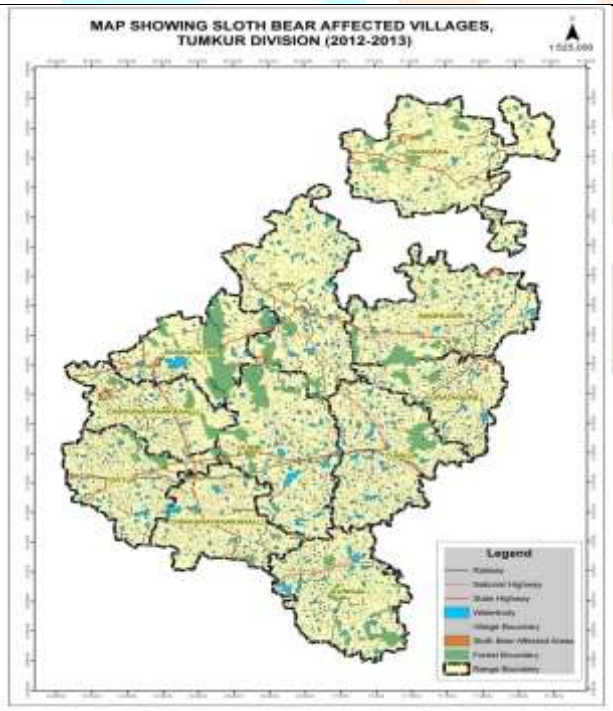

Figure 8: Map showing Human-sloth bear conflict affected villages in Tumkur District during 2012-13.

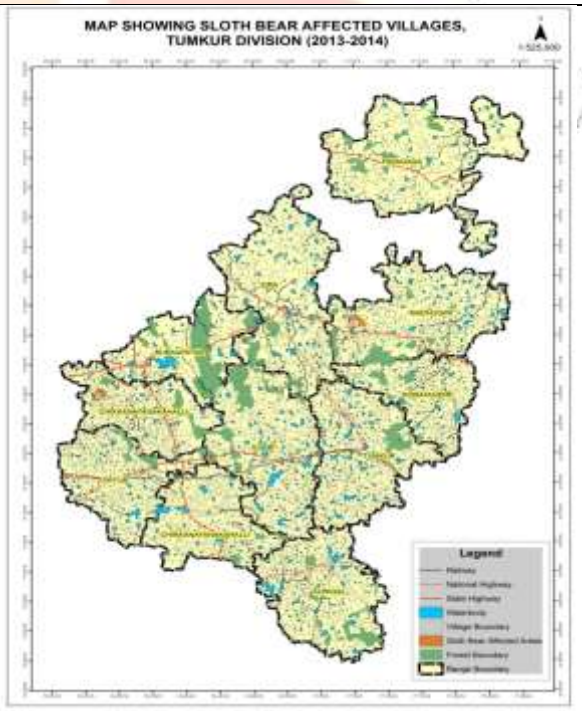

Figure 9: Map showing Human-sloth bear affected villages in Tumkur District during 2013-14.

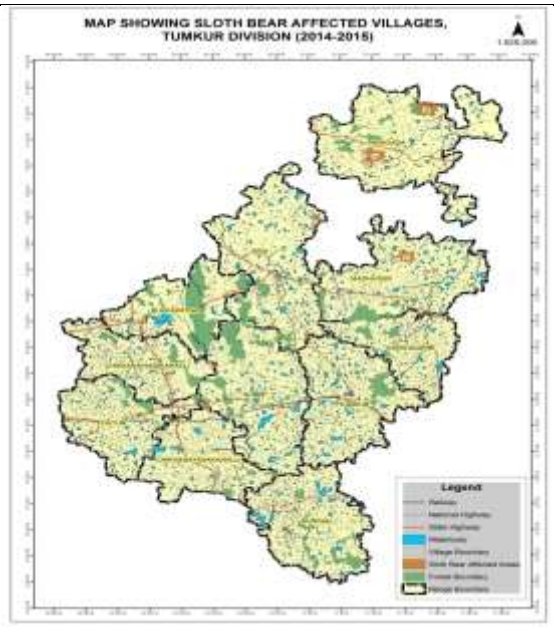

Figure 10: Map showing Human-sloth bear conflict affected villages in Tumkur District during 2014-15

Result:-Our study shows that all the 10 forest ranges of Tumkur division were affected by human sloth bear conflict during the period 2010-15. Among 10 forest ranges of the division Chikkanayakanahalli (16 cases), Pavagada (16 cases), Bukkapatna (14), Madhugiri (11 case) and Sira (8 cases) ranges were experienced severe human sloth bear conflict. Moderately affected ranges are Koratagere (6 cases), Tumkur (6 cases) and Tiptur (4 cases), whereas from Gubbi and Kunigal ranges experienced less number of sloth bear attacks.

During the period of 2010-15 the total 84 cases of human injured cases were registered (Table 1) and compensation amount of Rupees 1,705,235was given towards these cases (Table 2). Comparatively year 2014-15 more number of sloth bear attacks wasreported than previous years (Table 1).

During the year 2010-11 the human sloth bear conflict was restricted to six ranges with 16 cases of sloth bear attacks but during the end of 2014-15,allthe ten ranges are under the human-sloth bear conflict and the human injured case are increased significantly with 27 cases.

There were three human death were reported during 2010-15.

Discussion:-

Causes for Human-Sloth bear conflict in Tumkur District:

1.Shrinkage of natural habitat-The major causes for the human – sloth bear conflict in Tumkur district are shrinkage of habitat, fragmentation and loss of habitat, degradation of habitat and profound disturbance in the habit of sloth bears due to human activities like mining, quarrying, jelly crushing, sand mining etc.

Mining: - During 2000-2011, there was an extensive mining activity conducted in Chikkanayakanahalli taluk, TipturTaluk and GubbiTaluk during the period of 2001-2010. In year 2000 there were 9 mines working across 419.89 hectares of mining area and production was 0.075 tons of ore. Where as in year 2005-06 the number of active mines increased to 18 mines.in year, during 2006-07mining area had extended to 918.07 hectares and 3.023 tons of ore was produced .It is evident that there is a considerable increase in mining activity in Tumkur District [29].

Indian council of Forestry Research and Education (ICFRE) has conducted an extensive study in Tumkur district. an Environmental impact report reveals the year wise land use, land cover distribution in Tumkur district using IRS satellite (multi temporal imageries) and the data is as following[32].

Table 4- showing details of Land use in Tumkur District during 2000-2010

SI No.	Land cover	2000	2006	2011
1	Dense forest	80.9	80.9	80.9
2	Open forest	465.3	464.3	461.8
	Forest sub total	**546.2**	**545.2**	**542.7**
3	Scrub	794.7	789.3	790.9
4	Agriculture	8448.2	8452.8	8433.6
5	Mining /over burden	1.4	4.6	5.5
6	Ore dump /process area/ mine access road	0.1	4.8	6.0
	Mine sub total	**1.5**	**9.4**	**11.5**
7	Stone quarries	13.7	17.9	22.7
8	Human settlement	60.9	71.7	77.6
9	Surface water	592.2	570.8	579.5
10	Barren / rocky	139.6	139.9	138.5
	Grand Total	**10597.0**	**10597.0**	**10597.0**

From above statistics (Table 4), it is evident that in Tumkur district significant, quantity there is missuse of forest land, agricultural land, barren rocky land, land holding surface water are misused for the purpose of mining quarrying, human settlements are dumping processing, this definitely has a negative impact on the environment of Tumkur district [29].

a)Quarrying : There was extensive quarrying activities in the district currently quarrying is going on in an extensive manner without any control, this causing a significant change in the ecology of the district resulting in degradation, shrinkage fragmentation disturbance of sloth bear habitats in the district[29]. Sloth bears choose survices of bouldaries which are present in hill locks as their shelter and resting dens and these are very important for survival and reproduction of sloth bears especially in unprotected forest areas [1] and quarrying pose a permanent and serious threat to sloth bear habitats.

b)Jelly crushing: The hilly & rocky terrains of Tumkur district are getting evacuated due to extensive, uncontrolledjelly crushing. As sloth bears live in caves of hilly and rocky terrain, jelly crushing pose a serious threat to their life and habitat[29]
Noise pollution due to use of large crushing machines & use of explosions like Dynamites and movement of large transporting vehicles cause a serious disturbance in the habitats of sloth bear.
This may cause stress & anxiety among sloth bears resulting in conflict with human.

c)Sand mining:-The sand mining in the district has reached to peak. This causes the destruction of water sources and thus the destruction of water sources and thus the degradation of sloth bear habitats [29].
The transportation off sand during days and night causes disturbance in the habitat.
Day & night movement of heavy trucks and lorries for transportation of sand through habitats of sloth bear definitely cause disturbance in the habitat

2.Destruction of Traditional Groves (Gunduthopu) and Grazing lands (Hullugavalu) around villages: In Karnataka there is a tradition of growing locally available useful trees as groves to fulfil the needs (firewood, oilseeds, honey) of villagers and reserving some grass land near villages for grazing purpose of cattle of villages ,so that cattle don't go far away from villages. These places can act as Buffer zones and provide a potential habitat for herbivorous animals and improves biodiversity. In Tumkur district also these places were present near each every village, but these places were disappeared gradually due to encroachment [29].

3. Monoculture plantation of exotic species: During afforestration projects in the Tumkur district in the last few decades exotic plants like Eucalyptus,Casuarinaequisetifolia and Acasia auriculiformis were used extensively. These neither provide any nectar,buds, flower,fruits and insects which are integral part of sloth bear's dietary practices, nor provide any shelter to slothbears. These monoculture plantations of exotic plants can alter the ecology and biodiversity the habitat to considerable extent.

4. Lack of awareness among the public:

In olden days people had the traditional knowledge of behaviour and life style of sloth bears they had higher tolerance towards sloth bears they were successful top much extent in co-existing with sloth bears but in recent years, there is lack of awareness related to sloth bears.
Even among rural people, now a day there is no awareness about sloth bears and the tolerance level decreasing gradually this leads to incidences of even death of sloth bears due to revenge attack is taking place.
In Tumkur district farmers use some locally made traps to protect the Jack fruit tree from depredation of sloth bear. The Jack fruit tree is winded with steel wires or clutch cables, when sloth bear try to climb the tree or get down from the tree its claws will be stuck to steel wires & cables. This definitely causes extreme pain, stress among sloth bears and in turn results in conflict. In most cases villagers pressurise forest personnel to relocate sloth bears.
In agricultural fields also farmers use barbed wire fencing in order to protect their crops. In many incidences while depredation sloth bears are caught in these barbed fence& suffer extreme pain.

5. Encouraging and educating people to use Private toilets: In rural parts of the district most people don't use toilets for their nature calls; instead they go into bushes scrubs or behind rocks. It is evident that many victims of sloth bear attacks are attacked in this circumstance.

6. Changed life style of rural people in conflict affected area: The sloth bear conflict affected areas in Tumkur district are dry and arid in nature, most people here giving up farming activities and are preferring to work nearby Towns and cities as daily wage workers or sellers, they leave villages early in the morning & return at late evenings are more prone to sloth bear attack because sloth bears are actively forage during morning & late evening time. In recent days, network of roads has been increased and this has increased the day and night movement of automobiles and vehicles through the sloth bear habitat.Thismay cause a serious disturbance in the foraging of sloth bears and may create stress among sloth bears especially mother with young ones.

Suggested Controlling measures:

1. Mining, quarrying sand mining, Jelly crushing should be controlled and reduced near thehabitats of sloth bear.
2. Restoration of mining area, quarrying area, sand mining, and jelly crushing area should be done properly.
3. The forest area which in encroached should be evacuated and buffer zones should be created and managed efficiently.
4. Creating awareness among public by educating them regarding the importance of conservation of wildlife especially sloth bear conservation in their surrounding region.
5. During afforestation, locally available plants and trees should be planted instead of exotic species like Acacia; Eucalyptus &Pinus. The local plants ensure the availability of fruits and flowers which supports the dietary habits of sloth bears.These plants also control the degradation of forest & soil as well.Tees like Zizipusspp,Ficusspp,Cassia fistula,Syzygiumcumini, Artocarpusheterophyllus,Aeglemamelos, Madhucaindicaetc
6. Traditional groove plantations and grazing lands should be restored and managed efficiently around the villages. The encroachment of grazing lands should be recovered and maintained efficiently so that they provide grazing area for the cattle's and stop cattle grazing inside the forest. These grooves also provide fire wood, oilseeds also.
7. Compensation payment process should be made simple and quick & the compensation amount should be increased and revised periodically.
8. Suitable insurance schemes should be introduced against human death, injuries and crop depredation due to sloth bear by Government.
9. An extensive study should be conducted in the Tumkur District regarding Population densities and distribution of sloth bears in the district so that reliable data can be obtained and proper conservation strategy can be implemented.

Conclusion: Human-Sloth bear conflict in Tumkur District is significantly increasing over years. The important reason behind this is definitely is deterioration of ecology across the district and another reason is lack of awareness regarding the conservation of Sloth bears among public. So actions should be planned scientifically for the conservation of ecology in the districtand awareness should be developed among public to conserve the natural ecology of the district in order to sustainable co-existence of sloth bears in the district.

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