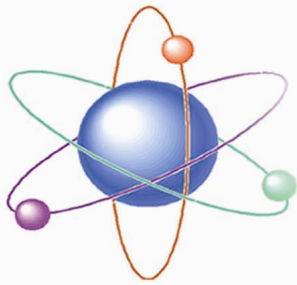


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A multidisciplinary research journal

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Editorial

North East Journal of Contemporary Research (NeJCR) is the outcome of putting the academic pursuits of this institution for a wider spectrum. It is to take a responsibility of encouraging research and to give a platform to publish the outcome, so that new researchers and the young minds will be encouraged and given an opportunity for wider acceptance and recognition .

It was a long felt need that an institution like Darrang College having a standing of more than six decades (established in 1945), should have a research journal as its faculties are involved continuously in serious research and have publications in various reputed journals worldwide. Naturally that footing demands an involvement in the works of publication so that experiences gained will strengthen the institutional strive for excellence in all areas of teaching and research .

The multi faculty nature of this institution and the potentiality and diversity of North East India naturally binds this journal to focus in the areas of science, social sciences and humanities. The hitherto unexplored, unexplained, unsearched areas of our northeast need special emphasis so that the potentials are explored, complexes which makes diversities more complicated are revisited for exploring the beauty and strength of this region in both areas of sciences and social sciences. However, the winds of the mainstream are also to welcome so that the bonds of greater and holistic parameters are integrated. The NeJCR is based on such premises .

The responses to this first volume is very encouraging. We wish that new researchers will accept our this humble but determined beginning! The honorable members of the Advisory Board, Reviewers and the members of the Editorial board deserve sincere thanks for their serious involvement in publishing this journal. We will ever remain grateful to the college Governing Body for encouraging our this novel academic venture. Wish that the motto of the journal for publishing works which strive for quality and excellence will always prevail.

Joysankar Hazarika
Editor in chief & Principal
Darrang College
Tezpur, 22.5.14

Science Section

Effect of light and dark phase on dorsum colour and pattern in *Hemidactylus* sp. of Assam

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ABSTRACT

The effects of exposure to dark and light conditions on dorsal colour and pattern were studied in five species of *Hemidactylus* from Assam. Marked changes were observed in the patterns as well as ground colour in all the species. House geckoes of the genus *Hemidactylus* inhabit outer walls of homes as well as forest fringes and as such are more likely to face anthropogenic stress. They rely on colour change as an adaptive measure. Most of them, away from light are extremely dark in their ground dorsum colouration. But, on being exposed to light their ground colour turns pale. There have been marked differences in pattern both dorsum and tail observed in light and dark condition. In the dark phase they mostly show dark pattern and markings. Such studies involving geckoes are important for identification of species as they may be misidentified otherwise.

INTRODUCTION

Colour change in lizards is a phenomenon that has attracted attention since time immemorial, particularly in chameleons (Parker, 1937).

Most of the 1461 species of currently recognized geckos (Uetz, 2013) are nocturnal and cryptically coloured.

Although the phenomenon of colour change is very common, especially in reptiles, the adaptive significance of color change that is not directly related to reproduction has received very little attention. Conspicuous colors in juvenile tails that fade during maturation are widespread and are a clear example of ontogenetic color change among amphibians, reptiles, and fish

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(Caldwell, 1982; Cooper, 1998; Kynard *et al.*, 2002).

House geckos of the genus *Hemidactylus* are among the most successful of all gecko species judging by their establishment and naturalisation all over the world (Bauer & Baker, 2012). They are successful not only due to their ability to spread across the globe by anthropogenic dispersal (Meshaka *et al.*, 2006; Newberry & Jones, 2007; Petren, 1996; Das *et al.*, 2011) but also due to their inherent physiological mechanisms such as food dynamics, camouflage etc. that allow them to adjust to their surrounding and avoid predators (Parker, 1937).

The house lizards of the genus *Hemidactylus* can lighten or darken their skin tones depending on exposure to light (Zug *et al.*, 2007). Usually, adults when exposed to dark (dark phase) show dark colouration in dorsum as opposed to light ground colouration in light phase (Zug *et al.*, 2007).

It has been almost universally maintained by those who have worked on lizards, that reptiles such as *Phrynosoma* sp. control their colour changes through nerves as well as through hormonal control (Bagnara & Hadley, 1973; Parker, 1937; Rohrlach & Porter, 1972). Experiments suggest that temperature, either general or local, also effects the colouration in lizards. Cold has been generally reported to induce a darkening of the reptilian skin (Hogben, 1924; Parker, 1937). However, the effects of physical factors such as temperature and

biochemical ones such as hormones have not been studied extensively in *Hemidactylus* geckos.

In this paper we present a preliminary study on the dorsum pattern and colouration change in the geckos of genus *Hemidactylus* of Assam in dark and light phase condition.

MATERIALS AND METHODS

Visual Encounter Surveys (Crump & Scott, 1994) using time-constrained randomised walks (Lambert, 1984) were performed for specimen collection. Equal effort was given to the surveys, each of which covered a distance of 1000 sq. m. A steady speed was maintained for each survey. A total of three surveys of two hours duration each were conducted in each of the areas with a total of twelve man hours spent on the entire survey.

The lizards were captured for study and kept in a terrarium of dimension 1.5 ft x 1.5 ft x 1 ft (length, breadth and depth respectively). Lizards were kept one at a time for observation. The terrarium was kept covered with a black velvet cloth for a time period of 7-8 hours after which the cloth was removed and the lizards were exposed to natural daylight for 3-4 hours. In both the cases photographs were taken with Nikon DSLR 3200 to study the effect of light and dark exposure on the colouration and pattern formation on the dorsal surface of the lizards. The lizards were released after study.

In certain cases photographs were

also taken in their natural habitat at night and captured, photographed in the daytime and released thereafter.

RESULTS AND DISCUSSION

The pattern of the dorsum in the species of the genus *Hemidactylus* acts as an important parameter for the study of morphological variation between and within species. The species of *Hemidactylus* are unique in their dorsal ground colour, markings as well as presence or absence of tubercles. The colour and pattern of markings especially plays a very important role in species identification. During this study five species of *Hemidactylus* of Assam namely: *H. frenatus* Schlegel, 1836, *H. brookii* Gray, 1845, *H. flaviviridis* Rüppell, 1835, *H. platyurus* (Schneider, 1792) and *H. aquilonius* McMahan and Zug, 2007, were subjected to light and dark exposure and the variation in their pattern and colour was observed.

The results obtained were :

H. frenatus Schlegel, 1836:

Dark phase: The basic ground colour in this species was observed to be dark blackish brown. In the dark phase the pattern marking was very clear. The species shows an array of dorsal patterns. In some cases longitudinal dark lines, three in number on the dorsum and blotch marks on the head can be seen, some have five dark, thick, irregular, longitudinal lines running parallel to each other on the dorsum. The extreme two of these lines start from

nostril, passes the eye and extend up to groin. The mid dorsal line stops at the base of the tail. Dark, thick transverse bands are also found on tail and limbs

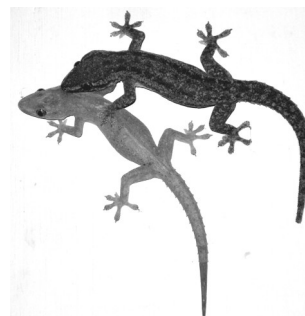


Figure 1. *H. frenatus* light and dark

alternating with cream coloured blotches while in others there are only three dark parallel lines on the dorsum.

Light phase: All specimens in the light phase show paleness in the ground colour. The colour turns a very pale brownish yellow. The markings and patterns are very light and in some cases disappear altogether and the specimen appears a uniform yellowish brown in colour.

H. brookii Gray, 1845:

Dark phase: The ground colour of the specimen is dark to lighter greyish brown. Irregular dark brown spots or bands are found all over the dorsum. Head shows variation in markings from “W” shaped

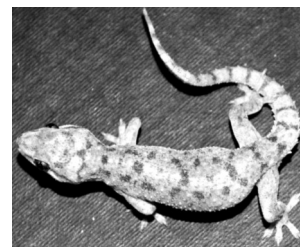


Figure 2. *H. brookii* dark

markings in some specimen to blotch marks in others. Tail shows alternating transverse bands of dark and light. Mid dorsal irregular white line can also be seen in certain cases. Tubercles are of the same

ground colour.

Light phase: In this phase, the basic ground colour in all specimens turns to yellowish cream with tubercles turning lighter in colour. The markings on the tail disappear completely and the dorsal markings fade or almost disappear. Faint markings can be seen from the nostril to the ear opening dorsolaterally.



Figure 3. *H. brooki* light

***H. flaviviridis* Rüppell, 1835:**

Dark phase: The dorsum is blackish brown in colour. The pattern on the dorsal surface contains a series of blackish brown undulating lines bordered by white. The mid-dorsal position has a series of faint whitish bands almost perpendicular to the undulating lines. The lines continue in the tail and limbs where they appear as transverse bands. The head contains mottled dark patches.

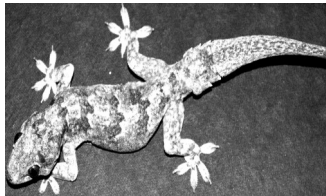


Figure 4. *H. flaviviridis* dark phase

Light phase: While the basic ground colour remains same, the shade becomes pale brown to almost greyish green. The

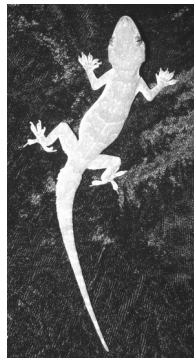


Figure 5. *H. flaviviridis* light

dark markings are not visible but their white borders can be seen. The dark bands on the limbs as well as tail is pale and the white borders are more prominent.

***H. platyurus* (Schneider, 1792):**

Dark phase: This species shows dark brown dorsum with underlying yellowish brown patches in the dark phase. The dorsum is covered by transverse dark brownish black bands bordered by lighter shade of yellowish brown. The pattern continues on to the tail as well as on the limbs



Figure 6. *H. platyurus* dark

and digits. Dorsolaterally a dark streak runs from the nostril, behind the eye up to the groin. The head exhibits a faint “V” mark between the eyes in some specimen.

Light phase: In the light phase, this species turns pinkish grey in colour. The patterns on the dorsum are very faint to nil. The “V” shaped marking on the head is visible, though faint. The bands on the limbs

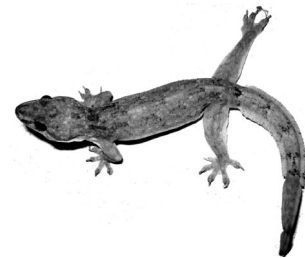


Figure 7. *H. platyurus* light

disappear almost completely and the marking on the tail remains as pale brown irregular blotches. The dorsolateral streak is also pale.

***H. aquilonius* McMahan and Zug, 2007:**

Dark phase: The dorsum is greyish brown in colour. In its dark phase, the lizard exhibits one pair of interrupted, brown dorsolateral stripes from the occiput to the sacrum, paralleling an irregular cream vertebral stripe. Across the mid-dorsum and extending laterally to the dorsolateral stripes are a series of 7–8 narrow, brown, posteriorly-directed chevrons. On original tails, a series of small dark brown cross markings alternate with much larger, irregularly-defined areas of cream colour. A whitish to cream stripe, often interrupted, runs from the naris, through the eye, to the insertion of the hind limb.



Figure 7. *H. aquilonius* dark

Light phase: In the light phase, the ground colour becomes pale grey to almost pinkish grey. The markings on the dorsum are lighter, and in some cases disappear completely in the anterior portion. The chevron markings on the dorsum and cross markings on the tail appear as light brown dots.



Figure 8. *H. aquilonius* light

Among reptiles, physiological color change is well known in lizards (Bagnara & Hadley, 1973) and has been reported in

turtles and snakes (Woolley, 1957; Hedges *et al.*, 1989). It usually occurs due to the rapid movement of melanosomes into (darkening) or out of (lightening) dermal melanophore processes. Morphological color change is a longer process and involves increase in melanosomes and melanophores (Bagnara & Hadley, 1973; Moll *et al.*, 1981).

Colour darkens when the melanosomes migrate up the melanophore processes and are brought closer to the epidermis while partially blocking the xanthophores and iridophores (Bagnara & Hadley, 1973). This can also be controlled by hormones as seen in *Anolis* lizards (Rohrlich & Porter, 1972). Hormonal control of melanosome dispersion in dermal melanophores has also been suggested for snakes (Rahn, 1941). Colour change in lizards is also affected by temperature although it does not have as much profound effect as illumination (Zaidan & Wiebusch, 2007).

House geckoes of the genus *Hemidactylus* are commonly found inhabiting residential houses, outer walls of home as well as forest fringe areas. These species are perhaps more prone to anthropogenic stress other than natural predators. They therefore show adaptive colour changes. They are nocturnal in behavior and thus occupy cracks and crevices and dark corners during daytime to avoid prying eyes. Therefore, away from light they are extremely dark in their ground dorsum colouration. However, on

being exposed to light their ground colour turns pale.

House geckoes play an important role in the ecosystem by preying on insects etc. and thus their conservation is important. The differences in their colouration and pattern due to exposure to darkness or light therefore act in their favour as they are able to protect themselves by sometimes blending with their surroundings. Apart from this, the colour and pattern in *Hemidactylus* are also important parameters for identification of species as they may be misidentified if their actual pattern and colour is not known in both dark and light phases.

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Impact of Developmental Activities on Urban Wetlands in Guwahati City, Assam

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ABSTRACT

Being a transitional zone between terrestrial and aquatic ecosystem, wetlands are by far the most productive ecosystem, scattered all over the globe. Assam being gifted with abundant rain and rivers too facilitates numerous wetlands, locally known as *Beels*. One among them is the Deepor Beel, situated in Guwahati city. It is the only Ramsar site in Assam. Deepor Beel plays a very vital role by supporting a rich biodiversity and also plays an important role in maintaining the ecological balance of the entire area on the south west of the Guwahati city. It is also the major storm water retention basin of the city. However, unchecked urbanization leading to increased water pollution, encroachment, reclamation and fragmentation has been gradually pushing this very wetland into extinction. This study has tried to look into this very aspect of wetland loss due to dynamics of urban Land Use Land Cover in the wetland area by using satellite imageries of the area from 1977 till 2006. Use of geospatial technology has helped in quantifying the wetland loss very effectively. The study shows that there has been loss of wetland areas and fragmentation which in turn plays a negative role in maintaining sustainability of the environment in that area.

Key Words: Wetlands, Land Use Land Cover Change, Remote Sensing, GIS, Urbanization

INTRODUCTION

Wetlands have been defined in a

variety of ways. Several factors such as personal perspective, position in the landscape, wetland diversity and function

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contribute to the traceable nature of the definition. In its simplest form, wetlands may be defined as the interface or transitional zone between land and water. Two of the most commonly used definitions are as under:

i) US Fish and Wildlife Service (Cowardin *et al.*, 1979)

“Wetlands are lands transitional between terrestrial and an aquatic system where the water table is usually at or near the surface or the land is covered by shallow water level. For purposes of this classification, wetlands must have one or more of the following three attributes: 1) at least periodically, the land supports predominantly hydrophytes; 2) the substrate is predominantly undrained hydric soil; and 3) the substrate is nonsoil and is saturated with water or covered by shallow water level at some time during the growing season of each year”.

ii) Ramsar Convention (1971)

“Submerged or water saturated lands, both natural and manmade, permanent or temporary, with water that is static or flowing, fresh, brackish or salt, including areas of marine water the depth of which at low tide does not exceed 6 meters”.

Article 2.1 further provides that wetlands ‘may incorporate riparian and coastal zones adjacent to the wetlands, and islands or bodies of marine water deeper

than six meters at low tide lying within the wetlands’.

Wetlands cover approximately 5% - 8% of the world’s land surface (7-10 million km²), and contain 10%-20% of the global terrestrial carbon (Mitsch and Gosselink, 2007). Wetlands play an important role in the global carbon cycle (Sahagian and Melack, 1998; IPCC, 2007; Prigent *et al.*, 2001), thus, they must be conserved for carbon cycling as well as for their importance as natural habitats (IPCC, 2007; Rebelo *et al.*, 2009). Wetland ecosystems are associated with a diverse and complex array of direct and indirect uses. Direct uses include water supply source and harvesting of wetland products such as fish and plant resources. Indirect benefits are derived from environmental functions such as floodwater retention, groundwater recharge/discharge, climate mitigation, and nutrient abatement (IPCC, 2007). They have been described as the “kidneys” of the landscape as they filter sediments and nutrients from surface water. Wetlands are also often referred to as “biological supermarkets” because they support all life forms through extensive food webs and biodiversity (Mitsch and Gosselink, 2007).

However, Wetlands are one of the most threatened habitats of the world. They are often termed as waste lands, transformation of which through draining, dredging and infilling seemed a fitting fate

for them. Studies have shown that human activities in wetlands may cause alterations of wetlands (Song *et al.*, 2012). Changes in wetland areas may significantly affect ecosystem processes (Barducci *et al.*, 2009). Changes in Land Use Land Cover have important consequences on natural resources (Houghton, 1994; Houghton *et al.*, 1999; Liu *et al.*, 2005; USDA, 2009; Garg *et al.*, 2013), and are regarded as a primary source of land degradation (Tolba and El-Kholy, 1992; Wang *et al.*, 2009). The loss of inland wetlands mainly results from drainage for agriculture, forestry, and mosquito control; and filling for residential, commercial, and industrial development (Ralph *et al.*, 1998). The transformation from wetlands to croplands is a result of the pressure to supply more food and provide more economic income for the rapidly increasing population and to meet economic demands (Mitsch and Gosselink, 2007; Rebelo *et al.*, 2009; Wang *et al.*, 2011). Hence, identifying, delineating, and mapping of wetlands on a temporal scale provide an opportunity to monitor the changes, which is important for natural resource management and planning activities (Prasad *et al.*, 2002). Remote sensing is a very cost efficient means for delineating

wetlands over time and space and can provide useful information on wetland characteristics (Ozesmi and Bauer 2002; Wolter *et al.*, 2004).

STUDY AREA

The Deepor Beel has been considered as the target wetland of study in this paper. It is worth mentioning that the Deepor is not an isolated wetland but a network of various small adjoining wetlands and swampy areas, drained by two most important streams i.e. Basistha and Kalmoni. Hence, to make the study more effective in terms of impact on the wetland ecosystem, the whole water shed of Deepor Beel has been delineated and considered as

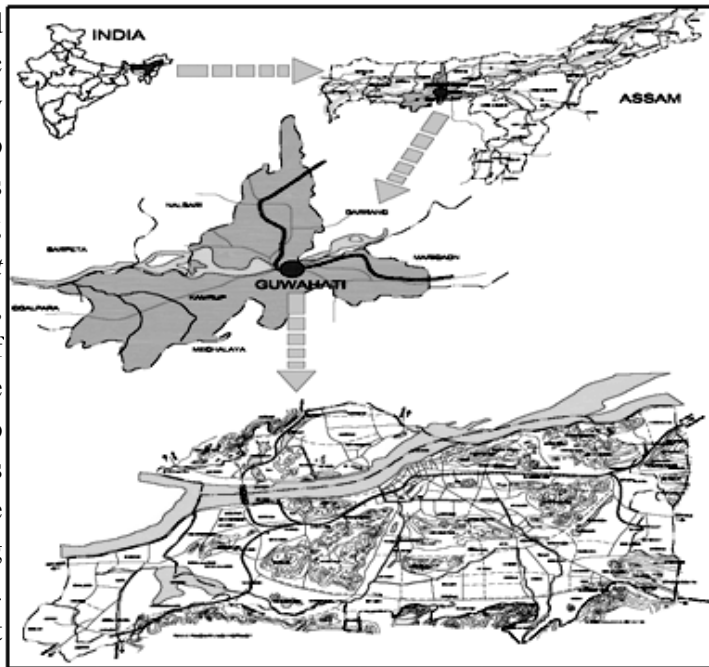


Figure 1. Location of Deepor Beel (Map not to Scale)

the study area (Figure 1 and Figure 2). The Deepor Beel catchment covers approximately 211 sq. km area with Basistha and Kalmoni as two major streams and Khanajan through which Deepor drains its water into Brahmaputra river. Deepor Beel is located between, $91^{\circ} 37' 6.46''$ E to $91^{\circ} 40' 48.82''$ E and $26^{\circ} 5' 40.02''$ N to $26^{\circ} 9' 5.18''$ N, south of Brahmaputra River in Kamrup District, 18 km south west of Guwahati city in Assam .It lies at an altitude of 53 meter above MSL and covers an area of about 4,000 ha. The wetland is surrounded by the Bharalu basin on the east, Basistha basin in the south East, Kalmani River on the west, Jhalukbari Beel on the north and Rani and Garbhanga Reserve forests on the south. The national Highway (NH-37) passes a little distance away from the eastern boundary of the lake. The main wetland is subdivided into three major parts, the Barbeel, Kharbari and the Chanabeel. Moreover there are certain dendretic extension at the northern part of the Beel (Bhuyan, 2008).

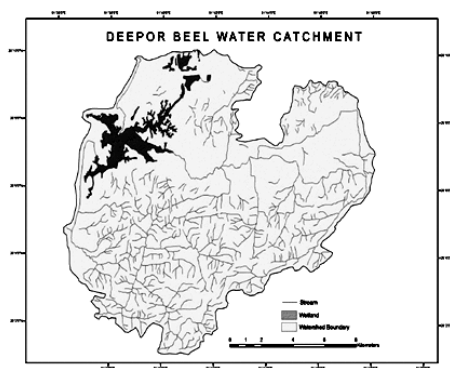


Figure 2. Deepor Beel watershed

Data:

To carry out the impact of urbanization on wetlands, Land Use Land Cover maps of the study area have been prepared for different time periods using the Survey of India Topographical sheets (No. 78 N/12 and 78 N/16) and satellite imageries with the following description:

Sl No.	Sensor	Resolution (m)	Date of Acquisition
1	MSS	70	28-02-1977
2	LandSat TM	30	26-11-1991
3	LandSat ETM+	30	17-02-2002
4	LandSat ETM+	30	26-10-2006

METHODOLOGY

Geospatial technology has been found to be of immense useful in analysis of LULC over time. This study involves analysis of satellite imageries over different time periods since 1977 till 2006 for cloud free seasons of the study area. For this purpose, first of all the topographical sheets have been geocoded using ArcGIS 9.2 software. Then from the geo-rectified toposheets, the Deepor Beel water shed has been delineated. After that the satellite imageries of different time periods have been geo-referred using the watershed map of the study area. Then from the images, the study area has been sub sated out. They are then subjected to supervised classification to arrive at the detailed LULC maps of the study area. Supervised or unsupervised classification methodologies were widely accepted for LULC dataset development (Jensen *et al.*, 1995; Niu *et al.*, 2009;

Klemas, 2011). Various statistical techniques have been utilized to arrive at the various LULC statistics for the studied period. The data thus derived are then compared to access the impact of urbanization and consequent land use dynamics and its impact on the wetland ecosystem.

RESULTS AND DISCUSSION

Wetlands, particularly in the rapidly expanding urban areas, faces tremendous pressure in terms of pollution, encroachment etc. The City of Guwahati is one of the rapidly expanding city in entire Ne India. Various studies have shown that the city has expanded at the cost of once extensive network of wetlands and swamps, locally called Beels.. During the last two decades, the Deepor Beel and its adjoining area has undergone considerable transformation in terms of ecological and social character . It has been observed that natural and anthropogenic problems i.e., (i) disturbance from transport artery i.e. construction of railway line along the southern boundary; (ii) industrial development within the periphery; (iii) large scale encroachment within the wetland; (iv) allotting government vacant land to private party; (v) brick making factory and soil cutting and erosion; (vi) hunting, trapping and killing of wild birds and mammals; (vii) commercial scale forest exploitation (viii) unplanned fishing

practice without controlling mesh size and using water pump, etc. are dominant in Deepor Beel area

Thus to quantify this changes, a detailed LULC maps for the Deepor Beel catchment has been attempted. Here to be noted is that this study is limited only to the change in LULC only. The LULC of the Deepor Beel watershed has been categorized into 6 major LULC types (Table1).

Table 1. Land Use Land Cover of Deepor Beel Catchment

Land Cover Category/Area (ha)	1977	1991	2002	2006
Dense Forest	10209	10241	10711	11176
Open Forest	4549.6	4039.7	4173.3	3926
Agriculture Land	835.32	491.33	1468.4	332.82
Fallow Land	2456.9	1981.2	1297.6	2240.4
Water Spread Area	475.98	687.05	485.73	450.54
Swampy Land	1849.3	2528.4	1418.9	1045.6
Built Up Land	866.87	1273.8	1688.5	2071.2
total	21243	21243	21243	21243

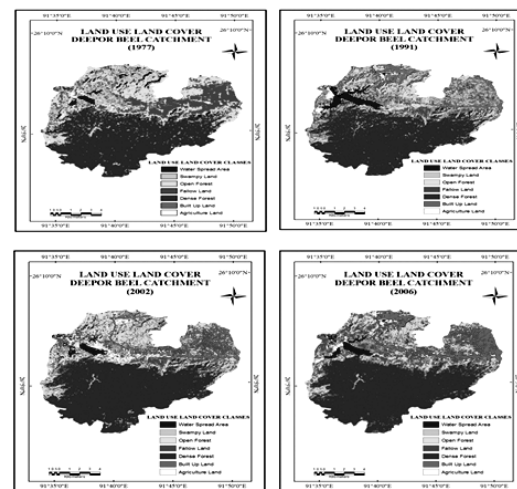


Figure 3. Land Use Land Cover Maps of Deepor Beel Catchment

The analysis of the LULC of the area shows that there has been noticeable change across all the categories. The data shows there is shrinkage of wetland area (basically the water spread area) over the studied period. It has reduced by 5.34 % from 1977 to 2006 (Figure 3). At the same time, there has been fragmentation of the water body. On the other hand, the city area i.e., the built-up land or the impervious layer of the city has registered a whopping 138.93% increase over the studied time period (Figure 4). This surge in built up area can easily be interpreted from the fact that all other categories of LULC except Dense forest registered negative growth over the studied time period (Table 2).

Table 2. Percentage Area Change

Land Cover Category/pc change in area	(1977-1991)	(1991-2002)	(2002-2006)	(1977-2006)
Dense Forest	0.32	4.58	4.35	9.48
Open Forest	-11.21	3.31	-5.93	-13.71
Agriculture Land	-41.18	198.85	-77.33	-60.16
Fallow Land	-19.36	-34.50	72.65	-8.81
Water Spread Area	44.34	-29.30	-7.24	-5.34
Swampy Land	36.72	-43.88	-26.31	-43.46
Built Up Land	46.94	32.56	22.66	138.93

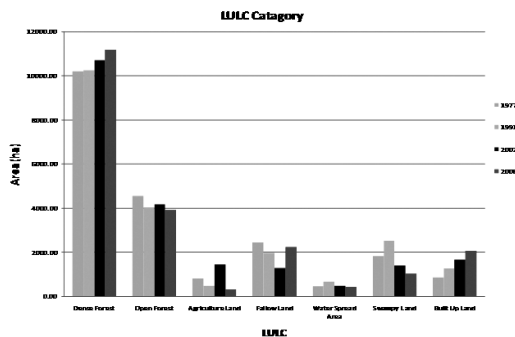


Figure 4. LULC Categories

Thus, it has been observed that Deepor Beel has been shrinking and got fragmented over the studied period. Emergences of various aquatic weeds such as water hyacinth etc are also observed in subsequent years. Rapid urbanization, Illegal settlements and industries establishment around the wetland are found to be accelerating the waste and pollution problems of the ecosystem. Construction of railway line in the eastern part of this wetland is yet another major reason for fragmentation. Altogether these threats have resulted not only in shrinking of the lake area but also deteriorated the natural environment for the survival of different flora and fauna within the wetland. Thus, decrease in beel area due to encroachment, heavy deposits results in reduction of water retention capacity and creation of dry surface areas.

CONCLUSION

India has a long history and tradition of conservation of natural resources. As part of religious ritual, people revere and worship many rivers and wetlands throughout the country. Similar kind of practices also prevails in Assam and its adjoining areas. It has been reported that the fisherman living and practicing fishing activities in and around Deepor Beel also performs many rituals and pujas namely Ganga Puja etc. However, Deepor Beel has been bearing the brunt of the city's

unplanned development. Perhaps foremost among the problems is the dumping of municipal solid wastes, including toxic disposals, which are increasingly finding their way into the very core of the wetland. Continued discharge of the city's untreated sewerage through the Bahini and Bharalu Rivers virtually turned Deepor Beel into a stinking tank. The problem has got aggravated during the monsoons, with rainwater sweeping large amounts of garbage from the dumping site into the beel. It has thus been observed that encroachment, pollution, sedimentation etc has caused a great injury to the ecosystem health. Thus the above study highlights the urgent need to formulate sustainable conservation and management plan for the Deepor Beel catchment as a whole. Use of remote sensing and GIS technology is found to be very useful in this regard.

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Studies on life history of the butterfly *Papilio memnon* (Linnaeus) Papilionidae: Lepidoptera on its host plant *Citrus medica* in Assam

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ABSTRACT

Papilio memnon (Linnaeus), the Great mormon butterfly belonging to the family Papilionidae: Lepidoptera is a common, strong flier butterfly, seen in forests, near human habitation areas. Females are often seen near flowers and larval host plants while males are found roaming restlessly or mudpuddling. Very limited works are available on biology of butterfly species in the world. Butterfly populations in India have declined (Grewal, 1996), and it is often suggested that captive rearing/breeding and releasing of butterflies in the wild will help restock at-risk populations and serve as a means of conservation. Life cycle of butterflies in North-east region have not been documented properly. Knowing the important aspect of butterflies for conservation of Biodiversity, it is important to know the interaction of butterflies with their host plant. Therefore an attempt was initiated to study the life cycle of *Papilio memnon* (Linnaeus), the Great mormon butterfly (Linnaeus) (Papilionidae; Lepidoptera) and its interaction with its host plant *Citrus medica* during the month of August, September 2012 and November, December 2012. It was seen that the female laid eggs singly on the underside the newly emerged leaves. The eggs were spherical in shape and yellow in colour. The incubation period were 2.75 ± 0.25 days (Summer season) and 6.0 ± 0.40 days (Winter season). The butterfly was reared in the laboratory condition after taking out the leaves twigs of the host plant laid with eggs for determining the life cycle parameters. The emerged Caterpillar is blackish brown in colour. The duration of each instar and stages were determined. The Butterfly has been reared for both summer and winter season.

Keywords: Butterflies, Biodiversity, conservation, host plant, biology, life cycle

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INTRODUCTION

Among insects, butterflies provide economic and ecological benefits to the human society by virtue of their incontestable beauty and their ability to accomplish pollination, a key ecological process in natural sustainability throughout the world (Venkata Ramana *et al.*, 2003; Lomov *et al.*, 2006). As adults, they require a succession of adequate nectar resources and as larvae, they are typically host specific (Venkata Ramana *et al.*, 2003; Lomov *et al.*, 2006). However, due to large scale loss, fragmentation and degradation of natural habitats, many species are in the verge of extinction (Schultz & Chang, 1998) and urgent measures are required for conserving them from extinction. In the past few decades, butterfly populations in India have declined and it is often suggested that captive rearing/breeding and releasing of butterflies in the wild will help restock at-risk populations and serve as a means of conservation (Varshney, 1986; Nicholls & Pullin, 2000; Mathew, 2001; Crone *et al.*, 2007; Schultz *et al.*, 2008). Science museum situated at Khanapara currently engaged in captive rearing programs for protecting butterfly species.

Immature stages of butterflies are increasing importance as sources of systematic characters, and often give important clues as to the placement of species in major groups (DeVries, *et al.*, 1985; Freitas *et al.*, 2002). Haribal (1992)

noted that such information is lacking for 70% of the Indian butterflies. The present study furnished the necessary information about immature stages, larval performance on its host plant, *Citrus medica* and the length of life cycle from egg to adult eclosion for the Great Mormon butterfly, *Papilio memnon* (Linnaeus). The present work aimed to study the 'Life Cycle' with reference to the host-plant, '*Citrus medica*' specificity, oviposition, hatching, larval development, pupation and adult emergence for both summer and winter seasons.

Papilio memnon, the Great Mormon butterfly is a large butterfly with wingspan of 120 to 150 mm belonging to the Papilionidae family and commonly found in open, cultivated areas, scrub and deciduous forests. Status- Locally common and not threatened. Its distribution from India (West Bengal, Sikkim to Arunachal Pradesh, Andaman and Nicobar Islands), Nepal, Bhutan, Myanmar, Bangladesh (Kehimkar, 2008). This is closely related to Blue Mormon butterfly, *Papilio polymnestor* (Cramer). The females are more often seen near nectad plants and food plants and males are seen performing mud-puddling. Highly mimetic and polymorphic, with four male and nine female forms (Kehimkar, 2008). Out of four forms of male, only two forms described i.e, Typical form of **male agenor** – large, tailless, black, with blue dusting, and with or without a red basal streak in

FW cell. Bluish streak between veins, Undersidehindwing (UNH) usually has red crescents at tornus and male polymnestoroides is tailless with short blue discal stripes on UPH and UPF. Female agenor tailless. Uppersideforewing (UPF) ground colour sepia, streaked with greyish white. The basal third part of the cell is red and is touched outwardly with white. Upper hindwing (UPH) is blue-black with 5 to 7 white or discal patches. Female form butlerianus tailless, resembles male agenor form with both wings dark sepia. The forewing has white area on inner margin. The hind wing is scaled with blue. Female form alcanor tailed. UPF is greyish brown with veins and streaks between them black. Cell is red at base. Velvety black patch at base of spaces 1 and 2. UPH is black, cell partly white with broad white streaks around it. The tornus is red with a large black spot. A row of terminal spots between veins. Sides of the abdomen are yellow. Female form of Polymnestoroides is tailless with pale grey vein streaks on sepia UPF. UPH is velvety brown with discal area and black spots as in Blue Mormon. Out of 9 forms, only 4 female forms described (Kehimkar 2008). The males are much commoner than females. Larval food plants are *citrus spp.*, *Paramigyna scandens* (Rutaceae).

The larval host plant *Citrus medica* or citron given by Linnaeus is derived from its ancient name, "Median or Persian apple". The citron used to combat

seasickness, pulmonary troubles, intestinal ailments. The butterfly is often seen laying eggs on the fresh leaves or newly emerged leaves. Earlier, the life cycle of this butterfly on its host plant, *citrus medica* is not known from Assam. Therefore, an attempt was taken to conduct experiments in the laboratory to determine the duration and other morphological parameters of different life stages of the butterfly on one of its larval host plants *Citrus medica*.

METHODOLOGY

The life cycle of Great Mormon, butterfly was studied for both summer and winter season. The host plant, *Citrus medica* was surveyed and planted in 3 numbers of earthen pots outside the Gauhati University Entomological laboratory. The adult butterfly *Papilio memnon* (form alcanor) was seen laying singly eggs on the underside of the fresh leaves of its host plant *Citrus medica*. The egg diameter was measured using slide calipers. After hatching, the larval length, morphological characters and moulting behaviours from 1st to 5th instars were recorded after every 24 hours. For measuring the length, breadth and duration of larval instars, 4 numbers of larvae of the butterfly, were isolated & kept enclosed within a covered box individually as one set. Five such sets were considered. During the experiment period, duration was recorded.

Table 1. Measurements of length, breadth, headcapsule (in mm) in life cycle stages of Great mormonbutterfly studied during 2010-2012

Measurement in mm	Egg	Length of larva(mm)					Pupa(mm)
		1 instar	2 nd instar	3 rd instar	4 th instar	5 th instar	
Mean	1.775	6.375	9.458	17.916	25.416	39.125	41.5
./- Standard Error	0.086	0.523	0.8058	1.239	1.422	1.886	2.723
Standard Deviation	0.171	1.81	2.791	4.294	4.925	7.544	5.447
Range	2-1.6	10-- 4	15--7	25--10	34--18	55--30	48-37
Head capsule		1.125	1.425	2.25	3.375	5	
N	4	4	4	4	4	4	
		Width of larva(mm)					Pupa(mm)
		1 instar	2 nd instar	3 rd instar	4 th instar	5 th instar	
Mean		2.191	3.63	5.358	7.016	9.71	13.500
./- Standard Error		0.201	0.209	0.36	0.27	0.39	1.323
Standard Deviation		0.697	0.724	1.248	0.935	1.591	2.646
Range		3--1	5--2.8	7-3.5	9--6	13--7	17-25

Table 2. Duration (in days) for different developmental stages of Great Mormon Butterfly in two seasons (Monsoon & Winter)

Stages	Durations in Days (Monsoon)	Durations in Days (Winter)
Egg	2.75±0.25	6.0±0.40
1st Instar	2.0±0.0	6.0±0.0
2nd Instar	2.0±0.0	5.75±0.47
3rd Instar	3.0±0.0	5.0±0.0
4th instar	3.0±0.0	5.0±0.0
5th instar	3.75±0.25	6.5±0.28
Total larval	13.75±0.25	28.25±0.75
pupal	13.25±0.47	28.75±0.47
Total days from hatching to adult	29.75±0.47	62.5±1.5

RESULTS

Life cycle stages from egg hatching to adult were completed within 29.75±0.47 days (Summer season) and 62.5±1.5 days (Winter season). Measurements of length, breadth, head capsule of the Great Mormon butterfly is presented in Table 1 and duration of different stages of the butterfly for both summer and winter season is given in Table 2.

Life cycle stages:

Oviposition: The Gravid female searched

many plant species to find out the proper host plant. After heavy and light showers of rain, the female laid eggs on the tender leaves. The presence of water droplets in the tender & young leaves was observed during regular ovipositing time. During searching the host plant, female repeatedly moved around the plants by showing circling flight. The eggs were found laid singly on the tip of the leaves or underside of the leaves of the host plant. Egg laying occurs in between morning and afternoon. The host plants for egg laying were *Citrus medica*,

Citrus aurantifolia and *Ageles marmelos*. During oviposition half eaten leaves were found to be rejected.

Eggs: The eggs measured 1.6-2 mm in diameter. The eggs were laid singly on the underside of leaves of the host plant. The eggs were spherical in shape and yellow in colour. The incubation period were 2.75 ± 0.25 days (Summer season) and 6.0 ± 0.40 days (Winter season).

Larva: The freshly emerged larvae were transparent pale red in colour with faint blackish markings on the body. It took 4-7 minutes to come out from the shell. After hatching, the length, breadth and head capsule of each larva of each instars were measured and presented in Table 1. Duration of each larva of each instars (Summer as well as winter) was presented in Table 2. The 1st Instar larvae were blackish brown in colour measuring 4-10 mm in length and breadth 1-3 mm. The 2nd Instar looked like a fresh bird dropping measuring 7-15 mm in length and breadth 2.8-5 mm. In 3rd Instar larvae, the colour was changed to olive green and pale white bands are present on the abdominal region. The dorsal tubercles become quite distinct. The larvae measures 10-25 mm in length and 3.5-7 mm in breadth. The 4th Instar larval colour changed to green. Two black eye spots appeared on the dorsal surface in the thoracic region & connected with a helical black line, which gives them a snake like

appearance. The head becomes light brown in colour. The 4th instar measures 18-34 mm in length and 6-9 mm in breadth. The 5th Instar larvae was larger in size and looked similar with that of 4th instar larvae. From behind the head of the larva, a bright orange forked organ i.e., 'osmetrium' which emits a strong odour emerged out. It is more prominently green in colour with a prominent whitish band on its abdominal segments and slow in movements measuring 30-55 mm in length and 7-13 mm in breadth. Larval periods were lasts for $13.25.0 \pm 0.25$ days in Summer and 28.25 ± 0.75 days in Winter.

Moulting Behaviour: The moulting time required by each instar larvae was more than 15 mins. After completion of casting or moulting of the original skin, the larva took rest for 30-40 minutes and fed upon its own casted skin except the head case.

Pupa: Before the formation of pupa (chrysalis), the larvae stopped eating, excreted heavily, trying to find a suitable place for pupation. The larvae first fixes cremaster (abdominal tip) then hanged itself. It was grass green when in the lush settings and grey-brown with darker grey, brown and black streaks when situated in dried vegetation. The pupa was brownish and held at an angle to the support (stick) by means of a body band. The pupa measured 37-48 mm in length and 17-25 mm in breadth. The pupal duration were

13.25±0.47 days (Summer) and 28.75±0.47 days (Winter).

Adults: The adults were observed to emerge from the pupa by splitting open the case vertically on the dorsal side. Though they are highly mimetic and polymorphic, with four male and nine females forms, in the observations only two sexes of form

agenor (male) and form alcanor (female) were found. Male form agenor large, tailless, black, with blue dusting and with or without a red basal streak in forewing cell. Bluish streaks between veins, underside usually has red crescents at tornus. Female form alcanor tailed with upperside of forewings is greyish brown with veins and streaks between them black. Cell is red at

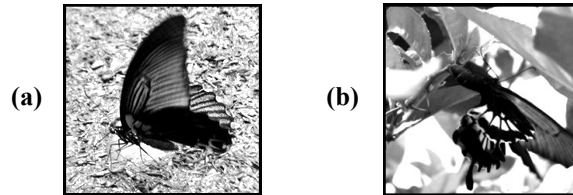


Figure 1. (a) Mudpuddling process of Great Mormon male butterfly and (b) female butterfly form alcanor egg laying

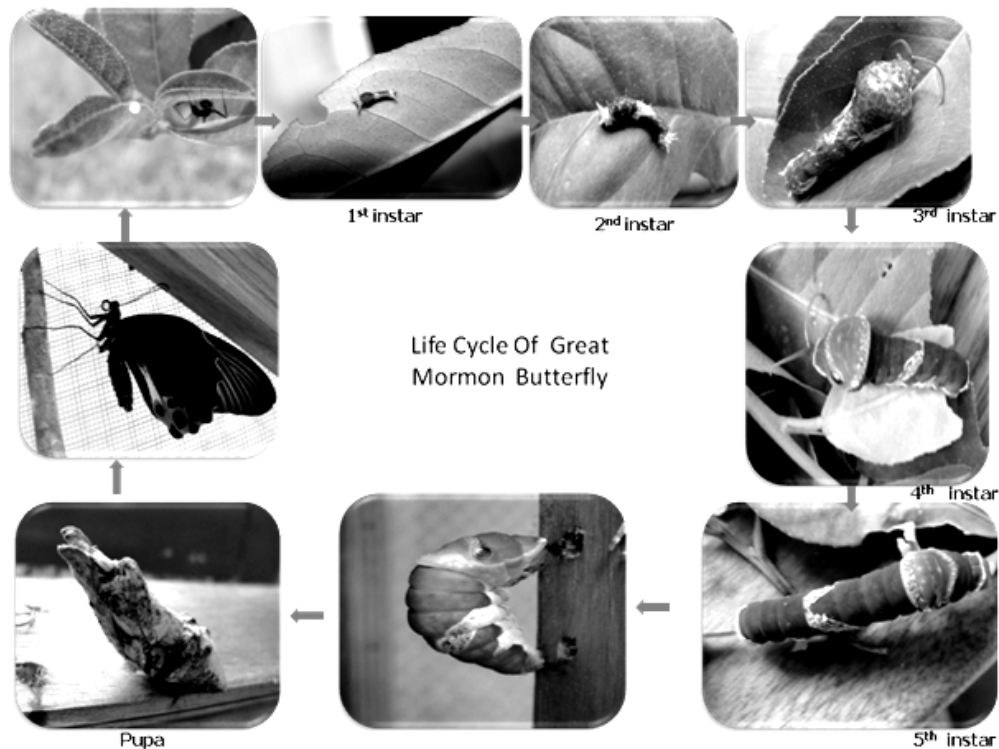


Figure 2. Life Cycle of Great Mormon Butterfly

base. Velvety black patch at base of spaces 1 and 2. Upperside of hindwings is black, cell partly white with broad white streaks around it.

DISCUSSION

Butterflies are an important group for the study of natural history than any other groups of insects (Ackery, 1984). The study of natural history of butterfly is very essential to know the host plant relationship, habitat preference and life history information. According to Ackery (1984), the study of the biology of butterfly is necessary for fulfillment of the part of systematic and faunistic studies. The Great Mormon butterfly as a wide range species move long distance within a day, hence it flies away after laying egg. Baker (1984) also supported this view that, the butterfly species that is common in surrounding habitats will never be seen to fly away, but the real travelers are frequently crosses the sites and not found anywhere nearby. The gravid female searched many plant species to find out the proper host plant. After heavy or light showers of rain, the females are seen to lay eggs on the tender leaves. The presence of water droplets in the tender & young leaves was observed during regular ovipositing time. Watanabe (1976) and Kakati (2002) suggested that, the egg laying females of some swallowtail butterfly also select the leaves of food plants considering the water content of

leaves. The Great Mormon eggs are hatched after average of 2.75 ± 0.25 days in Monsoon season and 6.0 ± 0.40 days in Winter season. After hatching, young 1st instar larvae consume the eggshell and take rest for few minutes then move for feeding. Kakati (2002) also observed consumption of eggshell by *Graphium doson axion* & *Chilasa clytia dissimilis*. The species completed their life cycle through 5 different larval stages. The total duration of life cycle from egg laying to adult emergence was also varies significantly during monsoon & winter season. During monsoon season the mean total duration of life cycle was 29.75 ± 0.47 days, whereas it was 62.5 ± 1.5 days in winter. During winter season, due to ceasation of sprouting of tender leaves the larvae have to depend on the leaves available on the host plants. Due to the less availability of the food during winter season, the larvae consumed inadequate amount of food, which may be the cause of lengthening the duration of life cycle stages, but maintain the adult butterfly size. Singer (1984) in his study also suggested that, the host plant quality may also effect the length of the life cycle duration and suggested that the larvae which finds itself on a poor host may either lengthen its generation time to become an normal sized adult or conserve its larval duration and become a smaller adult or one with fewr reserves.

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Depleting Butterfly Diversity and Conservation in Karimganj Area of Assam in Northeast India

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ABSTRACT

The present work deals with the butterfly fauna in a remote part of northeast India. This work for the first time describes the butterfly diversity of a disturbed habitat of Karimganj district in Barak Valley of Assam using the method of “Checklist Survey” in the early spring season, from January till March, 2013. A total of 135 individuals were observed in the diversity study which recorded 37 species of butterfly belonging to 27 genera and five families. Nymphalidae was dominant followed by the Pieridae, Papilionidae, Lycaenidae and Hesperidae. Three species viz. *Papilio memnon*, *Castalius rosimon* and *Lethe europa* are listed in the Indian Wildlife Protection Act of 1972 as under Schedule I (Part IV). The biggest threats to butterfly communities in the area are habitat destruction, land reclamation, leveling of forested hillocks, human settlement and crop cultivation.

Key words: Butterfly diversity, disturbed habitat, threat, conservation, Karimganj

INTRODUCTION

In recent years, man driven climate change has been particularly responsible for extinctions of many species especially with low range of tolerance towards fluctuations in weather and temperature variations.

Butterfly population decline in last few decades has been attributed to high adult mortality due to limited adult flight times and restricted female nectar feeding and even high larval mortality with reasons accounting to low host plant quality, premature plant senescence caused by

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drying or frost, stunted larval growth due to low temperatures, among others (Simon *et al.*, 2010). In the humid tropics, due to deforestation of primary forests, secondary forests and plantations are becoming increasingly widespread land-use systems in human dominated areas (Barlow *et al.*, 2007). Despite their quick expansion and potential importance, the biodiversity conservation values of secondary and plantation forests remain poorly understood, especially in relation to butterfly diversity (Hartley, 2002; Dunn, 2004). Along with the availability of larval and adult food plants, habitat quality appeared to be one of the most important parameters that are used to determine butterfly community structure (Barlow *et al.*, 2007).

Several researchers have discussed the potential of butterfly diversity in secondary forests, but diversity and species richness of butterflies across different secondary vegetation gradients remains poorly understood (Bowman *et al.*, 1990; Lawton *et al.*, 1998; Ramos, 2000). Among insects, butterflies are ideal subject for ecological studies of landscapes (Thomas & Malorie, 1985), and their value as indicators of biotope quality is being increasingly recognized because of their sensitivity to minor changes in micro-habitat, in particular, light levels. To a large extent, butterflies being a pollinating agent contribute to the growth,

maintenance and expansion of flora in the tropical regions where these insects show high abundance and species diversity (Bonebrake *et al.*, 2010).

The northeastern region of India is home to a rich diversity of butterflies and other insects, due to vegetative richness and it is also globally recognized as one of the biodiversity hotspots (Gogoi, 2012; Ali & Basistha, 2000; Borang, 2008). In the present study, an attempt has been made to estimate the diversity and unique species richness of butterflies inhabiting a secondary habitat type in Ayalabari area of Karimganj District of Barak Valley in Assam.

STUDY SITE

The present study was conducted in Ayalabari Tea Estate which is about 5km from Karimganj town. The total area of the tea estate is 522 hectare out of which 121 hectare is under tea plantation. The population is 1090 persons living in around 243 households. The altitude gradient of the place is 40-120 feet above sea level. The tea estate is very close to the Longai river and is surrounded by hillocks. The village Karnamadhu lies to its north, Bedrong and Krishna Nagar villages towards west, Krishna Nagar village in south while the Longai river in the east. Small streams flow through the bamboo forests into the open areas. The area has open scrub deciduous vegetation with secondary forests. The site

is a composite matrix of different variables such as human habitation, agricultural fields, tea plantations, citrus grove, fallow land, bamboo thickets, etc. (Figure 1)

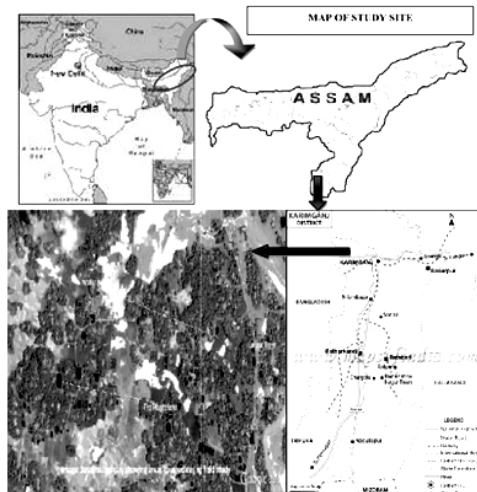


Figure 1. Map of the study site

Karimganj district is located in Barak valley in the Southern tip of Assam, situated in the North-eastern corner of India. Together with two other neighbouring districts - Cachar and Hailakandi - it constitutes the Barak valley zone in Assam. Total area of the district is 1809 km², which comprises varied geographical features like agricultural plains, shallow wetlands, hilly terrains and forests. The total forest cover in the district is more than 54000 hectares accounting for about 30% of total geographical area. The geographical location of Karimganj district is between longitudes 92°15' and 92°35' East and latitudes 24°15' and 25°55' North. The altitude of the district varies from

about 50 feet to more than 2000 feet. The district has a tropical climate with summer temperatures ranging between 33°C-36°C and winter temperatures between 12°C-15°C. The climate is characterized by heavy rainfall, average 215 mm and high humidity, average 67% during summer and dry winter (KDP, 2014).

METHODOLOGY

To determine the butterfly diversity in the present study area “Checklist Survey” (Royer *et al*, 1998) was conducted on sunny days from January till March, 2013. The site was subjected to a comprehensive search aimed at identification and confirmation of all species occurring on the site. In rare instances where identification was impossible without handling, an example was collected with an insect-net and then released after observation and identification. Visual search and photography were conducted on a regular basis during the day. Searches were conducted near water sources, damp patches in the forest, open sunny areas, blossoming flowers and bird droppings. Searches were also conducted on hill tops, especially in the catchment areas of hill streams, as well as from top to bottom of hill streams to record the maximum number of species. Butterflies were photographed from different angles as often as possible to obtain sufficient photographs to enable

positive identification of species. Butterfly species were identified using the identification keys of Evans (1932), Haribal (1992), Kunte (2000) and photographic guides of Kehimkar (2008), Basu Roy *et al.* (2007).

RESULTS

During the systematic survey, a total of 135 individuals comprising 37 species of butterfly belonging to 27 genera and five families were recorded from the habitat (Table 1). Among the families, Nymphalidae was dominant with 20 species followed by the Pieridae (6 species), Papilionidae (4 species), Lycaenidae (4 species) and Hesperidae (3 species) (Figure 2). Members of the Nymphalidae were always dominant in the area. A high proportion of Nymphalid species indicates high host plant richness in the area. However, of the varieties observed, 3 species: viz. *Papilio memnon*, *Castalius*

rosimon and *Lethe europa* are listed in the Indian Wildlife Protection Act of 1972 as under Schedule I (Part IV).

DISCUSSION

The present study has resulted in an annotated checklist of butterflies from Karimganj district, and a preliminary analysis of butterfly diversity of this neglected but notably bio-diverse region. The study showed that the region supports a substantial number of butterfly species including 3 legally protected species, viz. *Papilio memnon*, *Castalius rosimon* and *Lethe europa* and hence the findings underscore the importance of the region as an area of tremendous national and international conservation significance, especially with reference to butterflies. Moreover, the total numbers of butterfly species are likely to increase significantly in more systematic and long-term surveys.

There has always been a lack of well-planned and serious research studies concerning Lepidopterans in the present study region i.e. Barak Valley. The study site falls under one of the three 'Hot-spots' found in India (Karmakar *et al.*, 2010). In Western Ghats, appropriate methodology (Kunte, 2008) has been devised to evaluate conservation values of butterflies. The usefulness of long term butterfly community studies lies in the fact that it acts as a powerful tool in measuring changes in biodiversity in relation to

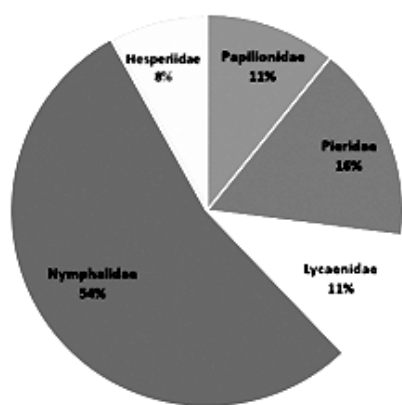


Figure 2. Family-wise representation of butterfly species observed

various unwanted changes and pressure such as anthropogenic pressure, grazing pressure, etc. It also aids in formulating and defining sound conservation and management plans. Thus butterflies act as important indicators of environmental health and changes can be easily detected in a long term study.

The major forest ranges of North-Eastern India have faced enormous habitat destruction in the past years due to extensive logging, coal mining and agriculture expansion. As a result, forests of this region have been jeopardized. But, due to the remoteness of the study site, it remains as a stronghold of biodiversity in the Indian part of the Indo-Myanmar Biodiversity Hotspot. Unfortunately,

anthropogenic pressure in the form of monoculture plantations, rampant deforestation, soil mining, hunting and poaching leading to habitat destruction and faunal depletion now threaten the flora and fauna of the Karimganj district on a large scale.

The local populace is completely naive on the concept of biodiversity and conservation due to lack of basic education and poverty. Mass awareness programmes in the region can generate a holistic and positive approach towards butterflies and environment. Therefore, it is important to undertake intensive, long-term butterfly surveys in Karimganj district in order to record the butterfly fauna while forests still exist in large tracts.

Table 1. Annotated list of butterfly species recorded

Family	Scientific Name	Common Name	Habitat
Papilionidae	<i>Papilio clytia</i>	Common Mime	Open and Wooded Areas
	<i>Papilio polytes</i>	Common Mormon	Flowers, open places
	<i>Papilio demoleus</i>	Lime Butterfly	Open places and flowers
	<i>Papilio memnon</i>	Great Mormon	Flowers, open places
Pieridae	<i>Catopsilia pomona</i>	Common Emigrant	Wetland, bright open places
	<i>Pieris brassicae</i>	Large Cabbage White	Open, sunny and flowers
	<i>Delias descombesi</i>	Red Spot Jezebel	Open places, wetland
	<i>Leptosia nina</i>	Psyche	Grassland and wetland
	<i>Pareronia avatar</i>	Pale Wanderer	Bright open places
	<i>Eurema hecabe</i>	Common Grass Yellow	
Lycaenidae	<i>Castalius rosimon</i>	Common Pierrot	Open areas
	<i>Tarucus wasterstardi</i>	Assam Pierrot	Grassy areas
	<i>Arhopala centaurus</i>	Centaur Oakblue	Near water and open places
	<i>Nacaduba hermus</i>	Pale Four-line Blue	Wooded areas
Nymphalidae	<i>Euploea sylvestris</i>	Double Branded Crow	Open places
	<i>Lethe europa</i>	Bamboo Tree Brown	Wooded Areas
	<i>Elymnias pealii</i>	Peal's Palmfly	Shady and dark places
	<i>Mycalesis perseus</i>	Common Bushbrown	Shady forest
	<i>Orsotrioena medus</i>	Nigger	Open and forested areas
	<i>Ypthima asterope</i>	Common Threering	Near water, sunny forest

	<i>Ypthima huebneri</i>	Common Fourring	Open areas
	<i>Ypthima baldus</i>	Common Fivering	Open areas
	<i>Cethosia cyane</i>	Leopard Lacewing	Shady Places
	<i>Athyma asura</i>	Studded Sergeant	Flowery places
	<i>Tanaecia lepidea</i>	Grey Count	Near water, sunny forest
	<i>Labadea martha</i>	Thai Knight	Shady and dark places
	<i>Neptis hylas</i>	Common Sailer	Open and forest areas
	<i>Neptis clinia</i>	Sullied Sailer	Open forest areas
	<i>Symbrenthia lilaea</i>	Common Jester	Shady forest
	<i>Junonia iphita</i>	Chocolate Pansy	Open grassy places
	<i>Junonia atlites</i>	Grey Pansy	Open places
	<i>Junonia almana</i>	Peacock Pansy	Open places
	<i>Junonia lemonias</i>	Lemon Pansy	Flowery and open place
	<i>Junonia hierta</i>	Yellow Pansy	Sunny grasslands
Hesperiidae	<i>Potanthus zatilla</i>	Common Dart	Sunny grassland
	<i>Taractrocera maevius</i>	Common Grass Dart	Open areas, near water
	<i>Sancus fuligo</i>	Coon	Open and sunny places



Figure 3. Some of the observed butterflies (top-left: *Potanthus zatilla*, top-right: *Papilio clytia*, middle-left: *Neptis hylas*, middle-right: *Labadea martha*, bottom-left: *Cethosia cyane*, bottom-right: *Athyma asura*)

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An epidemiological study on the risk assessment of Gutkha chewing habit in certain districts of Assam

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ABSTRACT

Gutkha is a form of smokeless tobacco, available in market as commercial preparation containing many unhealthy additives. The ingredients of gutkha are well documented to have toxic potential and thereby creating major risk to human health. The chewing habit is spreading at an alarming rate in the society, which becomes a matter of great concern. Therefore, the present project was undertaken with an objective to study the risks associated with gutkha chewing habit and to create awareness among people. The study was executed through the survey of retail stores in certain districts of Assam along with case studies of the chewers by using standard questionnaire. The data obtained from surveys depicted that the age group II (16-25 years) and group III (26-40 years) used gutkha in a regular basis. Out of 426 studied cases of Gutkha chewers, 270 cases were recorded as affected. The affected individuals developed several clinical symptoms viz. Stomach pain, burning sensation in mouth, buccal cavity ulceration, stimulant effect etc. The age group II (16-25 years) was found to be more prone to develop those symptoms depending upon the duration of chewing habit. Owing to the importance of this challenging situation caused due to gutkha uses, a thorough investigation in experimentation and detailed survey works are essentially required in this regard.

Keywords: Gutkha, Smokeless tobacco, Health hazards, toxicity, Assam

INTRODUCTION

In recent time, the tobacco and other intoxicating drugs have posed a serious threat to human health. A large number of tobacco products are available in the market and about 35-40% of the tobacco consumption in India is in smokeless form, mostly of the species *Nicotiana rustica* (Gupta & Ray, 2003). Among the large variety of smokeless tobacco, Gutkha become more popular and are extensively used by all kinds of people in the society. Different manufacturing companies commonly advertised these narcotic products in a lucrative form through media for earning profit and thereby make it easily available to the people. On account of its easy access and low price, these products are consumed by all age groups irrespective of male and female. Indian moral values do not permit smoking for the women or young groups. However, there is no such limitation for using smokeless tobacco. As a result, it is now commonly prevalent among the women and teenagers as a regular habit. The chewing habit of tobacco in any form generally begins at an early age and gradually people become addicted with attainment of adulthood. Therefore, it causes a high risk to human health.

Recent studies had indicated that India is facing a serious public health challenge due to increased trend of oral cancer caused by consumption of Gutkha and Pan Masala. Pan Masala is basically a preparation of areca nut, catechu, cardamon, lime and a number of natural

and artificial perfuming and flavoring materials. Gutkha is a variant of pan masala, in which in addition to these ingredients flavored chewing tobacco is added. People often referred it as mouth freshener as well as a stress-diverting, pleasure producing product, which being poisonous victimizes the people irrespective of caste, class, age, gender and social status. It has been estimated that about 5 million young Indians are suffering from Oral Submucous Fibrosis (a disease which is precursor of oral cancer) as a result of increased popularity of habits of chewing Gutkha and pan masala (Nair *et al.*, 2004). Tobacco, the most harmful ingredient present in *gutkha* contains more than 4000 chemicals in it like nicotine which is always a risk-factor for oral cancer (Nayak, 2011). The physical consequences of using gutkha on the oral cavity ranges from initial tobacco stains on tooth and periodontal diseases to life threatening oral cancer (Mathur *et al.*, 2009) preceded by Pre-malignant red and white lesions. (Aruna *et al.*, 2010). Gutkha chewing may also cause cardiovascular diseases, disease of respiratory tracts and cancer of lung, oral cavity, liver, kidney, bone marrow and so on (Lopez *et. al.*, 2006).

In order to reduce the hazards associated with the consumption of gutkha and other tobacco products, the Govt. of India had enacted the "Cigarette and other tobacco products [Prohibition of advertisement and Regulation of Trade and Commerce, Production, supply and

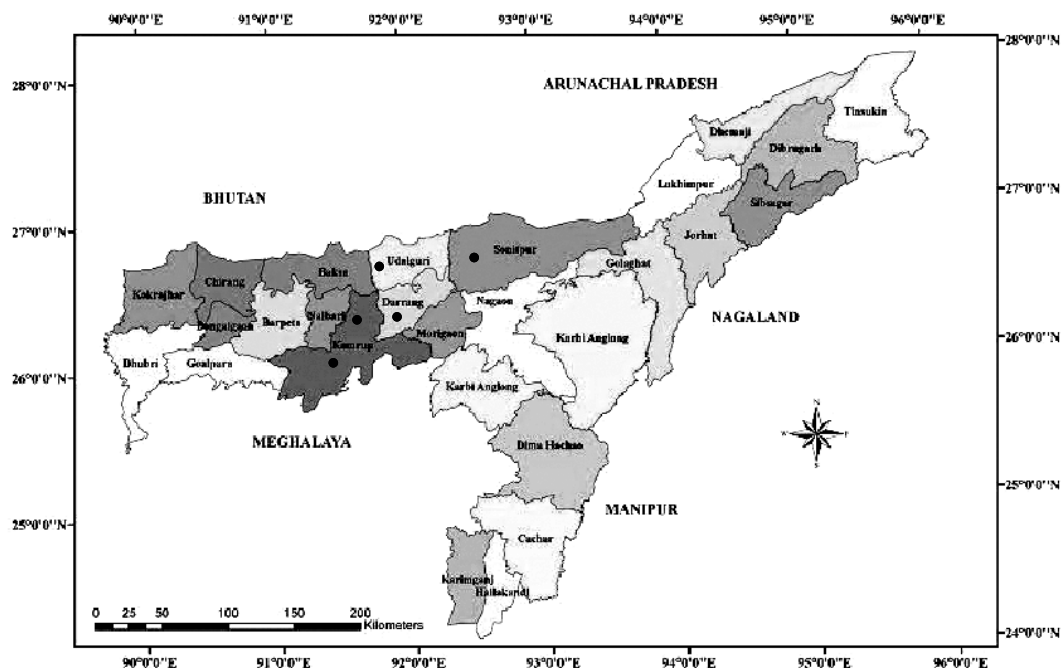


Figure 1. Location map of study areas (the dotted area indicates the districts where the study had conducted)

distribution] Act” (COPTA) as a multi measure law in 2003 (Ministry of law and justice, Govt. of India, 2003). Recently, the State Health and Family welfare department of Government of Assam has also enacted "Assam Health (Prohibition of Manufacturing, Advertisement, Trade, Storage, Distribution, Sale and Consumption of Zarda, Guthka, Pan masala etc., containing Tobacco and/or Nicotine) Act, 2013. But, in actual practice, these regulations are unable to tackle the problem due to lack of proper execution and awareness of people. As a result, a large scale human exposure is going on through consumer route which may bring severe

hazards to mankind. It will also cause deterioration of social values and instability in economic development in the society.

Keeping in view the above scenario, there is a strong need of thorough study that focuses on the overall problem dimension associated with gutkha chewing habit. Although, a few epidemiological studies have been conducted in some areas of India, but a detailed study in Assam has not been conducted so far. Therefore, the present study was undertaken with an aim to survey the level at which Gutkha and related products are being consumed by the people in certain districts of Assam. It was also aimed to study the development of

physical ailments by the chewers, if any.

METHODOLOGY

A survey study was performed among the people in certain districts of Assam viz. Darrang, Kamrup (Metro), Kamrup (Rural), Sonitpur and Udalguri district. The survey study was carried out in two phases. The first phase of study was conducted through a survey of different available sample of gutkha from sellers and retailers of selected area. It was carried on 550 numbers of retailers and sellers of chewing tobacco products by using standard bilingual questionnaire (English and Assamese). The questionnaire emphasized some important questions like the age group of customers, whether he/she is a regular or occasional customer, different available brands of smokeless tobacco, name of the largest selling brand, whether there is any significant difference between the previous and current market scenario etc. The location of the retail stores and its distance from the nearby educational institute was also noted down.

In second phase of survey, randomized case studies were carried out from the consumers of Gutkha and related products to know the presence or absence of any physical ailments. The study was conducted from May 2012 to June 2013 through standard bilingual questionnaire followed by personal interview. A total of 426 numbers of cases were studied during that period of time and emphasis was given

on both male and female. Prior to investigation the details of the questionnaire and objective of the study was clearly explained to the people in each cases who have voluntarily participated in this programme. The investigation was conducted on the basis of different duration of exposure and various age groups of both sexes. Three different terms of exposure were taken into consideration as-Immediate exposure (within 15 days), short term (1-3 years) and long term exposure (3-10 years and above). During the period of survey work, the consumers were divided into four age groups that includes Group-I (10-15 years), Group II (16-25 years), Group-III (26-40 years) and Group-IV (above 40 years) respectively.

The questionnaire used in this study contained a set of questions enquiring about the frequency of consumption of gutkha and pan masala product on daily basis, whether having any habit of taking alcohol or other narcotics, types of smokeless tobacco brand used, whether consumed for short term or long term period, health condition before and after consumption, any kind of health effect observed after short term and long term consumption, whether the habit is withdrawn or not, development of withdrawal symptom if any and so on. Cases were evaluated on the basis of presence of different physical ailments and their intensity in relation to different age group and exposure of gutkha.

RESULTS

Market Survey:

A total of 550 numbers of retail shops were visited during the survey study. Among these studied cases, 'Sikhor' was found to be the largest selling brand of gutkha in 478 retail shops. It was found that the age group –II (16-25 years) and group-III (26-40 years) were the most regular customers. The details of total number of studied retail stores in different districts with age group wise distribution of regular customers and their percentage are given in table 1. No significant difference had found in case of male and female consumer.

It was also found that lower income and middle income group people used these products most frequently. However, the higher income group of people also purchased it. A large number of school/

college going students were found to be the regular consumer of gutkha and other pan masala products. It had also found that some of the retail stores were located within an area of 200 meter from its nearby educational institution by violating government rule. It may be considered as a major risk factor for the students. The sellers and retailers regularly purchased those chewing products from different places within the state. At present, in Guwahati city, many companies are involving in manufacturing and distribution of Gutkha and pan masala products. The Government laws remain vague. According to the sellers and retailers, a significant difference has seen between the previous and present market scenario regarding sell of these products. Their sell and profit increases manifold with the increasing popularity of gutkha and related products.

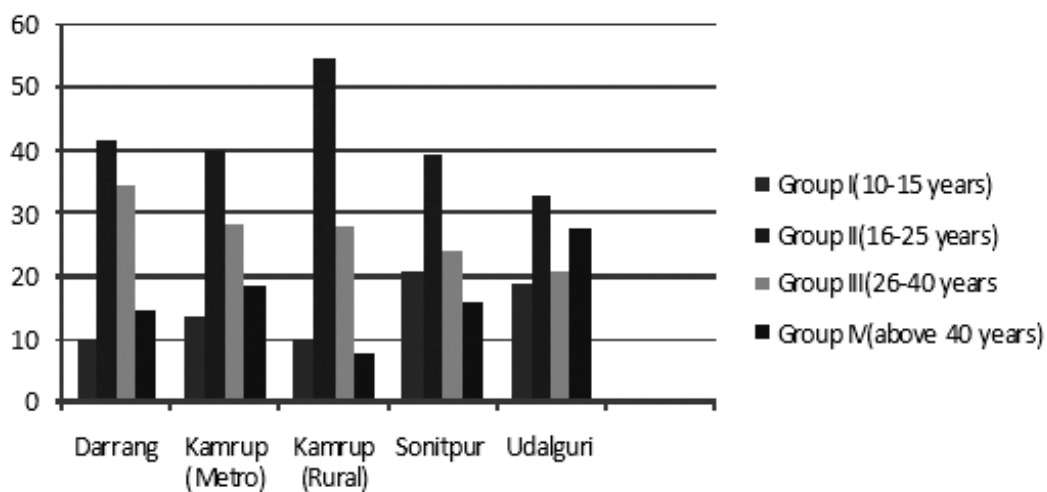


Figure 2. shows age group wise distribution of regular consumers of gutkha in different districts

Table 1. shows district wise distribution of studied retail stores and group wise percentage of regular consumers

Name of the district where the survey conducted	Total no. of retail stores studied	Name of largest selling brand	Regular consumer group (in percentage)			
			Group I (10-15 yrs)	Group II (16-25 yrs)	Group III (26-40 yrs)	Group IV (Above 40 yrs)
Darrang	163	Sikhor , Tulsi, Rajnigandha	16(9.8%)	68(41.7%)	56(34.3%)	23(14.1%)
Kamrup (Metro)	148	Sikhar, Wiz, Rajnigandha	20(13.5%)	59(39.8%)	42(28.3)	27(18.2%)
Kamrup (Rural)	93	Sikhar, Tulsi, Ranjnigandha	9(9.6%)	51(54.8%)	26(27.9%)	7(7.5%)
Sonitpur	88	Sikhar	18(20.4%)	35((39.7%)	21(23.8%)	14(15.9%)
Udalguri	58	Rajnigandha, Sikhar	11(18.9%)	19(32.7%)	12(20.6%)	16(27.5%)

Result of Case Studies:

A total of 426 cases were personally interviewed, out of which 318 cases were Gutkha chewers. Among those cases, 188 cases were recorded as affected and 130 cases were recorded as normal unaffected cases with chewing habit of gutkha. The details of affected and non affected cases with their different age group and percentage are given in the table 3. During the study, emphasis was also given in some of the risk habits, which may affect the consumer individually or in combination. The details of the risk habits according to the gender and age are represented in table 2. Among those cases 67.6% cases represent male and 32.3% cases are females. It is obvious that combination of two or more risk habits is more harmful for the consumers.

During the period of study, cases were evaluated for presence or absence of any physical ailments or any health effects, the details of which are incorporated in table 4. Persons with gutkha chewing habit were

taken into consideration. An average of 2-12 sachets were recorded to chewed daily in different cases. Maximum percentage of affected cases were recorded in age group II (16-25 years) and group III (26-40 years) showing 60.1% and 63.2% respectively. Again, mostly affected cases were found in the cases having exposure duration of 3-15 years. Health effects mostly reported were nausea, vomiting, gastrointestinal problems, burning sensation in mouth, loss of appetite, stomach pain etc. Some cases were also recorded to have effect on nervous system viz., stimulant effect, impaired coordination, tremors of hands and legs, slurred speech and giddiness in both short term and long term exposure duration. Most of the individuals became addicted to these chewing products. Besides, many of them reported about the development of withdrawal symptoms when the habit was withdrawn.

The gutkha chewers were assessed according to the type of risk habits viz. A) gutkha only, B) gutkha with betel quid C)

gutkha with pan masala, betel quid and tobacco, D) gutkha with Smoking habit, E) gutkha with Alcohol , and F) Gutkha with both smoking and alcohol habit. Factorial scores were given in a graded manner from group A to group F on the basis of different factors relative to the no. of affected cases (Table 5). Out of those studied cases, the highest percentage of affected individuals were recorded in group F (68.1%) having most of the factors. Despite of having minimal factors, the group A showed 65% affected cases , which indicated the high risk associated with gutkha chewing habit. The group E obtained greater factorial

score but comparatively lower percentage of affected individual. The table 5 represented that the chewing habit of Gutkha singly or with other chewing products and narcotics is strongly associated with several health effects. Among the affected cases, group A, B and C individuals were found to develop certain clinical symptoms as shown in the table 4. The other groups ie, Group D, E and F individuals developed problems in digestion, stomachache, Liver infection, heart burning, oral cavity ulceration, Tremors of hand and legs etc.

Table 2. shows details of the risk habit according to gender and age

Risk habits		Male	Female	Age group			
				10-15	16-25	26-40	Above 40
Chewing	Betel quid	31	29	12	15	11	22
	Pan masala	93	64	21	57	46	33
	Gutkha	149	76	44	89	62	30
	Tobacco	88	23	09	23	37	42
	Betel quid + Pan masala	19	16	06	08	09	12
	Betel quid + Gutkha	42	19	04	16	29	12
	Pan masala + Betel quid +	23	09	02	10	13	07
Smoking		42	11	08	11	27	07
Alcohol		56	18	10	15	21	28
Chewing + Smoking		27	06	03	13	05	12
Chewing + Alcohol		37	08	04	16	12	13
Smoking + Alcohol		28	05	02	09	08	14
Chewing + Smoking + Alcohol		19	03	--	07	06	09

Table 3. shows details of individuals with Gutkha chewing habit

Age group	Total no. of	Total no. of	% of affected	Total no. of	% of unaffected
Group-I (10-15 years)	56	33	58.9	23	41.07
Group-II (16-25 years)	118	71	60.1	47	39.8
Group-III (26-40 years)	98	62	63.2	36	36.7
Group-IV (Above	46	22	47.8	24	52.17
Total	318	188		130	

Table 4. shows the details of duration of Gutkha chewing habit and physical ailments according to age groups

						Health effects		
Age group (In years)	Total no. of studied cases of people	Total no. of affected cases	No. of sachets of Gutkha chewed per day	Duration of habit	After initial exposure (within 15 days)	After short term exposure (1-3 years)	After long term exposure (3-10 years and above)	
Group I (10-15)	56	33	05	2-5	0-15 days	Nausea, Vomiting, Dysentery, Stimulant effect	Increased appetite, Stomach pain, Abnor- mality in work	Stomach pain, Burning sensation in mouth after meal, Trem- ors of hands and legs, mood swings
			12	3-10	1-3 years			
			16	3-15	3-15 years			
Group-II (16-25)	118	71	08	2-6	0-15 days	Vomiting, confusion during work, stimulant effect	Gastritis, Indigestion, Ulceration in buccal cavity (a few case), hyperactivity	Increased appetite, Giddiness, Burning sensation in mouth, ulcer in buccal cavity,
			26	2-12	1-3 years			
			37	3-16	3-15 years			
Group-III (26-40)	98	62	07	2-8	0-15 days	stimulant effect, vomiting, constipation	Decreased body weight, Gastritis, stomach pain, Abnormality in work	Burning sensation inside mouth, ulceration, decreased appetite, giddiness, gastrointestin al problems
			28	2-10	1-3 years			
			27	2-20	3-15 years			
Group-IV (Above 40)	46	22	04	1-5	0-15 days	Stimulant effect on body, confusion, giddiness	Stomach pain, burning sensation in mouth after food, Abnormality in work	Ulceration in buccal cavity, Hallucination. Slurred speech, Burning sensation in mouth after food, tremors of legs and hands
			08	2-12	1-3 years			
			10	2-16	3-15 years			
Total= 318		Total= 188						

Table 5. Affecting factors, scores and no. of affected cases percentage wise

Groups	Factors	Scores	Total no. of studied cases	No. of affected cases	Percentage of Affected cases
A	Gutkha Only	2	225	148	65.0%
B	Gutkha+ betel quid	4	61	22	36.06%
C	Gutkha+pan masala+Betel quid+ tobacco	6	32	18	56.25%
D	With gutkha chewing habit+ Smoking habit	8	33	19	57.5%
E	Gutkha Chewing habit + Alcohol	10	45	23	51.1%
F	With Gutkha Chewing+ smoking+ Alcohol habit	12	22	15	68.1%

DISCUSSION

In the modern age, people are exposed to a number of harmful products as part of their lifestyle. Presently, Gutkha and pan masala products are used by all kinds of people in our society and its popularity and uses are on increasing trend due to easy availability and low price of it. Despite the pictorial health warnings and Governments restriction against it, people are unaware of the health risks associated with these chewing products. The present project was undertaken to study the epidemiology of gutkha chewing and to evaluate the health hazards caused by it. The analysis of the case studies revealed the occurrence of various physical ailments like gastrointestinal diseases, stomachache, vomiting etc., which may be due to the presence of harmful ingredients present in the swallowed juice of gutkha or pan masala by the chewer. According to Nigam *et al.* (2001), unlike the tobacco chewers who spit out the juice, pan masala users often swallow the saliva extract and thereby increasing possibility of carcinogenic effect at sites other than oral cavity. Besides,

various types of fungi, including *Aspergillus* sp. were isolated from pan masala which in turn produce aflatoxin that may cause liver carcinogenicity (Mishra & Nigam, 1991).

Other health effects on chewers as recorded in this study were giddiness, tremors of legs and hands, slurred speech, impaired coordination, mood swing and confusion. These may be result of the action of neurological interfering factors present in these chewing products. In some cases of short and long term exposure duration, it was seen that burning sensation and ulceration in buccal cavity had developed. The carcinogenic substances present in gutkha and pan masala may responsible for such changes. The major carcinogens in gutkha are derived from their ingredients – areca nut, catechu, lime, tobacco and flavorings (Nair *et al.*, 2004). The mutagenic, clastogenic and carcinogenic properties of areca nut have been extensively studied in a variety of experimental systems (Jyoti *et al.*, 2012). It contains arecoline and a number of phenolic compounds that are responsible

for the development of proliferative lesions and carcinogenicity. Catechu contains tannin and polyphenols which have mutagenic property and Clastogenecity (Giri *et al.*, 1988). Lime is another component of gutkha that is mainly responsible for generation of Reactive Oxygen Species (ROS) in mouth cavity. The ROS concentration may increase in oral cavity as soon as the areca nut and catechu polyphenols together with slaked lime dissolve in the saliva (Jyoti *et al.*, 2011). The tobacco of gutkha has been found to leaches out various Tobacco Specific Nitrosamines (TSN) in higher concentration, when kept in mouth. These TSN may undergo metabolic activation by cytochrome P450 and may lead to the formation of N-nitrosornicotine (NNK), a major carcinogen (Jyoti *et al.*, 2011). Its further activation leads to DNA damage and may cause cancer of respective organs. Pan masala has all other ingredients except tobacco and therefore, it has the potential to cause such effects on human health.

The result of the study also revealed that there was minor difference between male and female consumers. More males (67.6%) than females (32.3%) use these chewing products. The males are generally under stress due to their jobs and other problems use gutkha more than the females to find relief from the stress. The ingredients of gutkha may affect the reproductive system of male and female

and may lead to infertility problem. A study on reproductive toxic potential of pan masala by Kumari *et al.* (2011) supported this as it revealed about testicular damage, decreased sperm count and decreased 17 α -hydroxysteroid dehydrogenase activity, when tested in swiss albino mice. Epidemiological studies also showed that gutkha induces a very high risk of still birth when used by pregnant women.

Use of Gutkha and pan masala represents a complex phenomenon which has various socio-cultural, biological, economic and environmental aspects. These smokeless tobacco products are often referred as mouth freshener and its use has increased rapidly throughout the world in recent years especially among teenagers and young people. Because of vigorous efforts toward increasing awareness of the adverse effects of the tobacco, smoking has declined paradoxically and the use of SLT (Smokeless tobacco products) has greatly increased. Smokeless tobacco is now considered as safe alternative of smoking and Betel quid chewing (Pramanik, 2012). As the trend of betel quid chewing is now replaced rapidly by these new chewing substitutes ie. Gutkha and 'Pan Masala', there is possibility of oral cancer epidemic in near future due to absence of betal leaf and the much higher dry weight of Gutkha and Pan masala ingredients (Yadav and Chadha, 2002).

CONCLUSION

The consumption of tobacco products are responsible for about 5 million deaths annually mostly in our country. The toll will be doubled in 20 years unless available and effective interventions are urgently and widely adopted. On the other hand, it is one of the preventable causes of death by creating awareness among people. It is high time to save the individual in particular and the society in general for a healthy and a wealthy society. The present study was conducted not only to study overall problem dimension regarding Gutkha and related products but also to create consciousness among the general people. It can be concluded that active awareness among the people is inevitable to save the situation and society as a whole.

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Icthyofaunal diversity in a floodplain Wetland of Darrang district, Assam

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ABSTRACT

The present study was undertaken from Jan 2009 to December 2010 in Rowmari beel of Sipajhar revenue circle of Darrang district of Assam. Rowmari beel is one of the most important beel of the district among which is rich in Icthyofaunal diversity. A total of 54 species including exotic species belonging to 40 genera, 21 families and 9 orders were recorded. Among these according to IUCN (2013), 4 species are Near threatened (NT) which are *Chitala chitala*, *Wallago attu*, *Ailia coila*, *Parambassis lala*; status of 4 species are not evaluated (NE); 1 species remain data deficient (DD), which is *Anabas testudineus* and the rest 45 species are in the status of least concern (LC.) The taxonomic composition of the fish fauna suggests, 20 species are recorded from Cyprinidae family followed by Bagridae having 4 species, Channidae, Ambassidae, and Mastacembelidae with 3 species each, Notopteridae, Cobitidae, Schilbeidae, Nandidae, Osphronemidae with 2 species each and the rest Clupeidae, Balitoridae, Siluridae, Sisoridae, Clariidae, Heteropneustidae, Belonidae, Aplocheilidae, Gobiidae, Anabantidae and Tetraodontidae have single species. Cyprinidae is the most dominant family among others. However the beel is in continuous state of exploitation and facing degradation due to uneconomic use of fishing gears, over growth of macrophytes, agricultural practices in marginal areas during winter season.

Keywords: Fish diversity, IUCN status, Rowmari beel, Darrang.

INTRODUCTION

Assam is the second largest state of

the North Eastern region of India endowed with 1.03 lakhs ha natural lentic water

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bodies including swamps, associated with the river Brahmaputra and Barak and their tributaries. The mighty Brahmaputra with its numerous tributaries, wetlands and hill streams provides the main source of Ichthyofauna in the state. The North Eastern part of India is hence considered as 'global hotspot' for fresh water fish diversity. Wetlands form a major component of the hydrologic regime in Assam where they are popularly known as 'Beels' (Sharma & Goswami, 1993). The beels are not only important source of fishery but also a part of folk culture and has immense impact on socio-economic aspects of people living around the beel. Darrang district is gifted with vast wetland resources comprising of beels, ponds, ox-bow lakes, dead river courses, low lying swamp and marshes and tributaries. The total area of registered beels in the district during 2009-2010 is 388.50 ha and Unregistered beels is 173 ha. (District Fishery Office, Darrang, 2010) There are 31 number of beels of which 17 are registered beels (CICFRI, 2000). Though many workers have undertaken studies on the Ichthyofauna of this region, no references regarding inventory on fish biodiversity are available on Rowmari beel of the Brahmaputra river system. Realising the need for Ichthyological investigation in *Rowmari beel*, the present study was initiated to understand the beel values and detailed morphometric examination, identification and classification of fishes with their conservation status.

MATERIALS AND METHODS STUDY AREA

Rowmari beel falls in the flood plain area of the river Brahmaputra, located between $26^{\circ} 19' 0.7'' \text{N}$ - $26^{\circ} 19' 58'' \text{N}$ latitude to $91^{\circ} 55' 50'' \text{E}$ - $91^{\circ} 56' 46'' \text{E}$ longitude at 44 MSL. It is located towards southwest direction at about 35 kms from district headquarter Mangaldai. The National highway 52 is at about 25 kms north from the beel. Toward north eastern side of *Rowmari beel* lies *Arimari beel* at a position $26^{\circ} 19' \text{N}$ - $26^{\circ} 19' 45'' \text{N}$ latitude to $91^{\circ} 55' 19'' \text{E}$ - $91^{\circ} 56' 17'' \text{E}$ longitude. It is shallow having length of 2.21 kms and breadth 26 m with total area 0.18 sq kms. It connects to Tuldhung at $26^{\circ} 19' 0.8'' \text{N}$ latitude to $91^{\circ} 55' 41'' \text{E}$ longitude through a canal of 134 m long. Tuldhung which lies near the outlet of *Rowmari beel* measures 508.77 m in length and 138.01 m in breadth. It covers an area of 0.05 sq kms and extends geographically $26^{\circ} 18' 59'' \text{N}$ - $26^{\circ} 19' 0.8'' \text{N}$ latitude to $91^{\circ} 55' 29'' \text{E}$ - $91^{\circ} 55' 44'' \text{E}$ longitude. It connects to *Rowmari beel* by a canal of width 50 m at centre and 229 m long. Area of Rowmari beel is 50 hectares as per government records

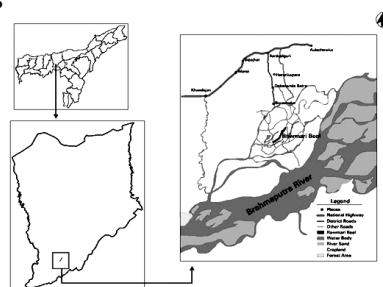


Figure 1. Location map of Rowmari beel

DATA COLLECTION

Data is collected from fish landing sites on weekly basis from January 2009-December 2010. Secondary data were also collected through observation and interview with fishers through questionnaire. Identification of fishes was done following after Talwar & Jhingran (1991) and Vishwanath (2002). Conservation status of all the fishes was compiled as per CAMP (1998) and IUCN (2013).

RESULTS AND DISCUSSION

The present study on Ichthyofaunal diversity of Rowmari beel has revealed occurrence 54 species of fishes belonging to 40 genera, 21 families and 9 orders which indicates rich Ichthyofaunal diversity. The fishes belong to following orders-

Osteoglossiformes, Clupeiformes, Cypriniformes, Siluriformes, Beloniformes, Cyprinodontiformes, Synbranchiformes, Perciformes and Tetraodontiformes. The rich ichthyofaunal diversity in the wetland of Assam has been reported by a number of previous workers (Dey, 1981; Lahon, 1983; Goswami, 1985; Deka *et al.*, 2013) from their studies in a number of wetlands. Their studies indicate the presence of 57 fishes in Chandubi (Goswami, 1985); 62 in Dora (Lahon, 1983); and 63 species in Tamranga wetland (Agarwala, 1994), 44 in Barbila wetland (Deka *et al.*, 2013). The 54 fishes recorded during present investigation belongs to 40 genera, 21 families and 9 orders. A detailed systematic list of the available species of fishes along with local names and relative status has been incorporated (Table 1).

Table 1. List of fishes recorded in Rowmari beel during study period

Order	Family	Name of Fish Species	Vernacular Name	IUCN Status	CAMP status
Osteoglossiformes	Notopteridae	<i>Chitala chitala</i> (Hamilton,1822)	Chital	NT	EN
		<i>Notopterus notopterus</i> (Pallas,1769)	Kandhulee	LC	LRnt
Clupeiformes	Clupeidae	<i>Gudusia chapra</i> (Hamilton,1822)	Korati	LC	LRlc
		<i>Amblypharyngodon mola</i>	Moa	LC	LRlc
Cypriniformes	Cyprinidae	<i>Cabdio morar</i> (Hamilton ,1822)	Boriala	LC	LRnt
		<i>Chela cachius</i> (Hamilton,1822)	Chela	LC	NE
		<i>Cirrhinus mrigala</i> (Hamilton,1822)	Mirika	LC	LRnt
		<i>Cirrhinus reba</i> (Hamilton,1822)	Lasim	LC	VU
		<i>Esomus danricus</i> (Hamilton,1822)	Darikana	LC	LRlc
		<i>Salmophasia bacaila</i> (Hamilton,1822)	Chelekona	LC	LRlc
		<i>Salmophasia phulo</i> (Hamilton,1822)	Chelekona	LC	NE
		<i>Catla catla</i> (Hamilton,1822)	Bhakua	NE	VU
		<i>Labeo bata</i> (Hamilton,1822)	Bhangon	LC	LRnt
		<i>Labeo rohita</i> (Hamilton,1822)	Rou	LC	LRnt
		<i>Labeo calbasu</i> (Hamilton,1822)	Mahler,Mali	LC	LRnt
		<i>Labeo gonius</i> (Hamilton,1822)	Kurhi	LC	LRnt
		<i>Cyprinus carpio</i>	Common carp	NE	NE

Order	Family	Name of Fish Species	Vernacular Name	IUCN Status	CAMP status
Cypriniformes		<i>Ctenopharyngodon idella</i>	Grass carp	NE	NE
		<i>Puntius chola</i> (Hamilton,1822)	Puthi	LC	VU
		<i>Puntius sophore</i> (Hamilton,1822)	Sendori puthi	LC	LRnt
		<i>Pethia conchonius</i> (Hamilton,1822)	Chokori puthi	LC	VU
		<i>Pethia ticto</i> (Hamilton,1822)	Chokori puthi	LC	LRnt
		<i>Rasbora daniconius</i> (Hamilton,1822)	Darikana	LC	LRnt
	Balitoridae	<i>Acanthocobitis botia</i> (Hamilton,1822)	Bali botia	LC	LRnt
	Cobitidae	<i>Botia dario</i> (Hamilton,1822)	Bagh botia/ Rani	LC	NE
		<i>Lepidocephalichthys guntea</i> (Hamilton,1822)	Bakhar botia	LC	NE
	Siluriformes		<i>Mystus cavasius</i> (Hamilton,1822)	Barsingarah	LC
		<i>Mystus tengara</i> (Hamilton, 1822)	Koli tengara	LC	NE
Bagridae		<i>Mystus vittatus</i> (Bloch, 1794)	Tengra	LC	VU
Siluridae		<i>Sperata seenghala</i> (Sykes, 1839)	Ari	LC	NE
		<i>Wallago attu</i> (Bloch & Schneider, 1801)	Borali	NT	LRnt
		<i>Ailia coila</i> (Hamilton, 1822)	Bapati/ Kadali	NT	VU
Schilbeidae		<i>Neotropius atherinoides</i> (Bloch, 1794)	Bardia	LC	EN
Sisoridae		<i>Gagata cenia</i> (Hamilton, 1822)	Ngarang, Keyakatta	LC	NE
Heteropneustidae		<i>Heteropneustes fossilis</i> (Bloch, 1794)	Singhi	LC	VU
Clariidae		<i>Clarias batrachus</i>	Magur	LC	VU
Beloniformes	Belonidae	<i>Xenentodon cancila</i> (Hamilton, 1822)	Kakila	LC	LRnt
Cyprinodontiformes	Aplocheilidae	<i>Aplocheilus panchax</i> (Hamilton, 1822)	Kanpona	LC	DD
		<i>Macrognathus aral</i> (Bloch & Schneider, 1801)	Tora	LC	LRnt
Synbranchiformes	Mastacembelid	<i>Macrognathus pancalus</i> Hamilton, 1822	Turi	LC	LRnt
		<i>Mastacembelus armatus</i> (Lacepède, 1800)	Bami	LC	LRnt

Order	Family	Name of Fish Species	Vernacular Name	IUCN Status	CAMP status
Perciformes	Ambassidae	<i>Chanda nama</i> Hamilton, 1822	Sonda	LC	NE
		<i>Parambassis lala</i> (Hamilton, 1822)	Chanda	NT	NE
		<i>Parambassis ranga</i> (Hamilton, 1822)	Senduri chanda	LC	NE
	Nandidae	<i>Badis badis</i> (Hamilton, 1822)	Randolnee	LC	NE
		<i>Nandus nandus</i> (Hamilton, 1822)	Gedgedi	LC	LRnt
	Gobiidae	<i>Glossogobius giuris</i> (Hamilton, 1822)	Pani mutura	LC	LRnt
	Anabantidae	<i>Anabas testudineus</i> (Bloch, 1792)	Kawoi	DD	VU
	Osphronemidae	<i>Trichogaster lalius</i> (Hamilton, 1822)	Lolkholisha	LC	NE
		<i>Trichogaster chuna</i> (Hamilton,1822)	Bhasaylee	LC	NE
	Channidae	<i>Channa punctata</i> (Bloch, 1793)	Goroi	LC	LRnt
		<i>Channa striata</i> (Bloch, 1793)	Sol	LC	LRlc
		<i>Channa orientalis</i> (Bloch & Schneider, 1801)	Chengali	NE	VU
Tetraodontiformes	Tetraodontidae	<i>Tetraodon cutcutia</i> Hamilton, 1822	Gangatope	LC	LRnt

CAMP Abbreviation: EN-Endangered; VU-Vulnerable; LRnt-Lower risk near threatened; LRlc-Lower risk least concern IUCN Abbreviation: NT-Near threatened; LC-Least concern; DD-Data deficient; NE-Not evaluated (Nomenclature as per www.fishbase.org (accessed on 22.01.2014) and IUCN-2013.2, <http://www.iucnredlist.org> (accessed on 22.01.2014))

It was observed that, out of 54 fish species, Cyprinidae was the single largest group which recorded with 20 species, followed by Bagridae with 4 species, Channidae, Ambassidae, and Mastacembelidae with 3 species each, Notopteridae, Cobitidae, Schilbeidae, Nandidae, Osphronemidae with 2 species

each and the rest Clupeidae, Balitoridae, Siluridae, Sisoridae, Clariidae, Heteropneustidae, Belonidae, Aplocheilidae, Gobiidae, Anabantidae, Tetraodontidae had single species each in Rowmari beel during the period of study. (Table 1 and Figure 2 and 3)

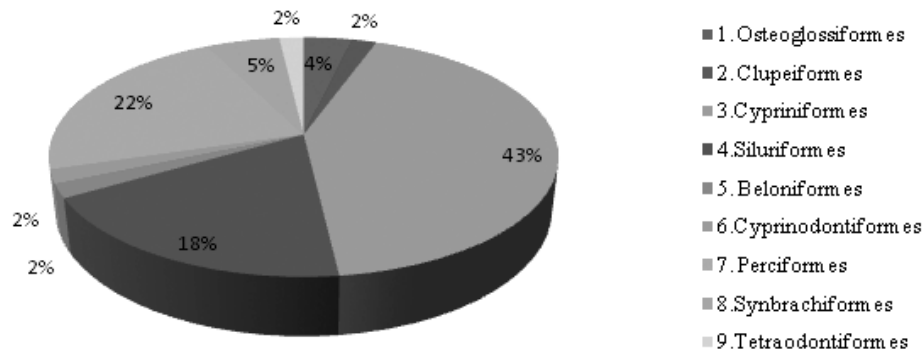


Figure 2. Percentage contribution of different orders of fishes found in Rowmari beel during 2009 - 2010

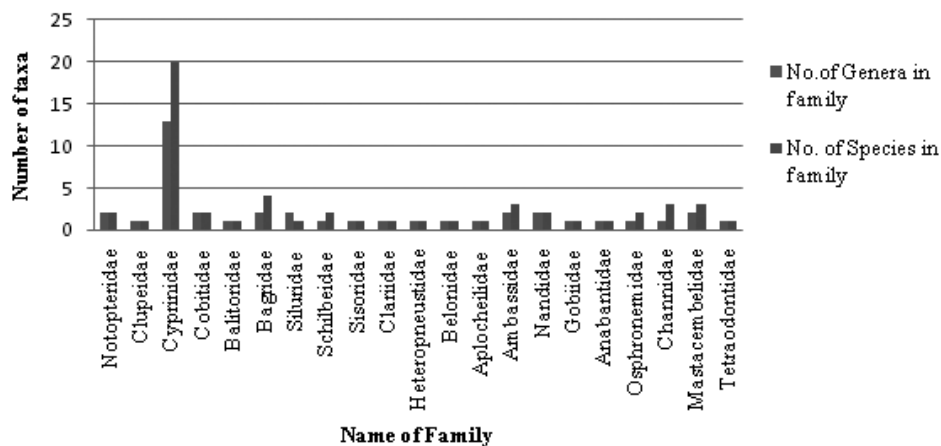


Figure 3. Total number of genera and species in a family found in Rowmari beel during 2009 - 2010

Table 2. Percentage occurrence of fishes of Rowmari beel under conservation status CAMP(1998) and IUCN (2013)

Rowmari beel: 2009-2011		EN	VU	NT	LRnt	LRlc	LC	DD	NE
CAMP(1998)	No. of Fish species	2	10		21	4	..	1	15
	% contribution	4%	19%	..	39%	7%	..	2%	28%
IUCN(2013)	No. of Fish species	..	0	4	...	...	45	1	4
	% contribution	...	..	7%		...	83%	2%	7%

In the present study, out of total collected fishes – 4 species are Near threatened (NT) as per IUCN which are *Chitala chitala*, *Wallago attu*, *Ailia coila*, *Parambassis lala*; status of 4 species not evaluated (NE) which are *Cyprinus carpio*, *Ctenopharyngodon idella*, *Catla catla*, *Channa orientalis*; 1 species remain data deficient (DD) which is *Anabas testudineus* and the rest 45 species are in the status of least concern as per IUCN. However, as per CAMP (1998), 4 species are in low risk least concern (LRlc) and they are *Gudusia chapra*, *Amblypharyngodon mola*, *Salmophasia bacaila*, *Channa striata*; 10 species are Vulnerable (VU). Species *Ailia coila* which has been given the status of NT (as per IUCN) is also VU as per CAMP. The other VU species are - *Cirrhinus reba*, *Puntius chola*, *Pethia conchonius*, *Mystus vittatus*, *Heteropneustes fossilis*, *Clarias batrachus*, *Anabas testudineus*, *Ailia coila*, *Channa orientalis*, *Catla catla*. *Anabas testudineus* has been given status of data deficient as per IUCN; 15 species are not evaluated (NE). *Cyprinus carpio*, *Ctenopharyngodon idella* remains NE in both CAMP and IUCN status. *Parambassis lala* was NE according to CAMP but in IUCN (2013) it has been regarded as Near threatened. 2 species are EN (CAMP) and they are *Chitala chitala*, *Neotropius atherinoides*. The *Neotropius atherinoides* has been regarded as of least concern according to IUCN. Only 1 species

Aplocheilichthys panchax remains DD (data deficient).

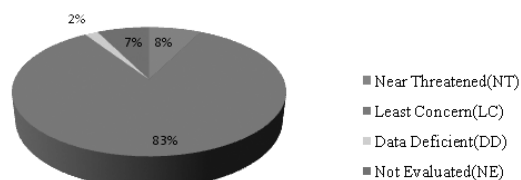


Figure 4. Conservation status of fishes fauna of Rowmari beel as per IUCN (2013)

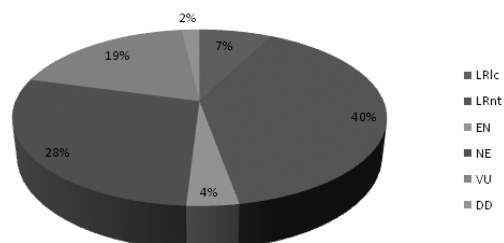


Figure 5. CAMP status for fishes recorded in Rowmari beel

CAMP Abbreviation: LRlc-Lower risk least concern; LRnt-Lower risk near threatened; EN-Endangered; NE-Near threatened; VU-Vulnerable; DD-Data deficient



Plate 1. A panoramic view of Rowmari Beel in different seasons

CONCLUSION

The present study is an effort to document ichthyofaunal of Rowmari beel with conservation status of fishes found there. But there are many factors affecting the beel like excessive fishing, uneconomic use of fishing gears and cultivation of crops in

peripheral region during winter season. The natural stock is losing ground due to paddy and jute cultivation along the catchment area of the beel. Thus the study of Rowmari beel provides crucial information about the status of the fish diversity in the beel and thus gets the emphasis for conservation and awareness.



Plate 2a & b. Khaloi, Jakoi , Polo & Thela jhaal



Plate 3. Fish catch at landing site



Plate 4a. *Chela cachius*



Place 4c. *Ailia coila*



Plate 4b. *Xenentodon cancila*



Plate 4d. *Pethia conchonius*

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*Humanities
&
Social Science Section*

Production of Central Vowels and Centering Diphthongs by Assamese Speakers of English

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ABSTRACT

Segmental as well as prosodic features have been the focus of much of the studies on second language phonology. Still most of the studies on non-native speech are found to be focusing heavily on vowels. This is because vowels form the most difficult part of perception and production of non-native speech. Due to difficulties faced while pronouncing some vowels, the L2 speakers may use native sounds in the place of difficult L2 sounds. This pattern is followed in the speech of Assamese speakers of English. While both Assamese and English have front and back vowels, the presence of central vowels in English makes the English vowel inventory quite different from Assamese. In addition to this, the presence of centering diphthongs pose a different level of problem for Assamese speakers pronouncing words involving centering diphthongs. Replacement and simplification are the two strategies that Assamese speakers of English employ to tackle this problem.

The results of this production experiment reveal that the English central vowel [ə] is replaced by the Assamese vowels [e], [o], [u] and [a]. The process of substitution of English [ɜ:] by Assamese [a] is also found to be a ubiquitous feature. The centering diphthongs in English are realized sometimes as monophthongs and sometimes as a sequence of two vowels in Assamese speakers' pronunciation of English. This study tries to make a detailed analysis of this kind of replacements based on acoustic comparisons between English central vowels and centering diphthongs, and their realizations in Assamese speakers' English speech.

Keywords: Acoustic phonetics, Formant analysis, Second language phonology.

INTRODUCTION

The speech of non-native English speakers may exhibit pronunciation characteristics that result from such speakers imperfectly learning the pronunciation of English, either by transferring the phonological rules from their mother tongue into their English speech or through implementing strategies similar to those used in primary language acquisition. The age at which speakers begin to immerse themselves into a language (such as English) is linked to the degree in which native speakers are able to detect a non-native accent; the exact nature of the link is disputed amongst scholars and may be affected by neurological plasticity, cognitive development, motivation, psychosocial states, formal instruction, language learning aptitude. Speaking English with a pronunciation pattern that is dramatically different may lead to speech that is difficult to understand. More transparently, differing phonological distinctions between a speaker's first language and English create a tendency to neutralize such distinctions in English, and differences in the inventory or distribution of sounds may cause substitutions of native sounds in the place of difficult English ones. This is more common when the distinction is subtle between English sounds or between a sound of English and of a speaker's primary language. While there is no evidence to suggest that a simple absence of a sound or sequence in one

language's phonological inventory makes it difficult to learn, several theoretical models have presumed that non-native speech perceptions reflect both the abstract phonological properties and phonetic details of the native language.

The Assamese language is the easternmost member of the Indo-European family. It is spoken by most of the natives of the state of Assam. This language grew out of Sanskrit, the ancient language of the Indian sub-continent. However, its vocabulary, phonology and grammar have substantially been influenced by the original inhabitants of Assam, such as the Bodos and the Kacharis. Assamese speakers of English display the tendency of substituting English sounds by Assamese ones while pronouncing some sounds of English which they are not familiar with as these sounds are not selected by the Assamese sound system. This phenomenon gets manifested in a more prominent way when it comes to the pronunciation of central vowels. A study on the way Assamese speakers of English pronounce words involving central vowels and centering diphthongs would certainly reveal interesting facts about human language behaviour.

Assamese speakers of English face a lot of problem when it comes to the pronunciation. A word like 'Chaucer' is often pronounced as 'Saucer' or the word 'chance' is pronounced as 'sans' as the Assamese speakers of English tend to replace the [tʃ] consonant with the [s]

sound. The complicity becomes more emphatic while pronouncing English vowels as the vowel system of both these languages differ greatly. While English has Front, Central and Back vowels and also Front, Central and Back diphthongs, Assamese does not have Central vowels or centering diphthongs. This makes the Assamese speakers of English replace central vowels and centering diphthongs of the English language with other front or back vowels which they are familiar with. This results in ‘curd’ being pronounced as ‘card’ or ‘about’ being pronounced as ‘ebb out’. Such replacement of central vowels like [ə], [ɜ:], [ʌ] and centering diphthongs like [eɪ], [uə] and [ɪə] by the available vowels and diphthongs in the Assamese language may be presumed to follow certain pattern since language is a scientific system and all operations in a language adhere to certain rules. The origin of the present study is related to this particular language behaviour shown by the Assamese speakers of English.

PREVIOUS STUDIES

Assamese phonemic inventory has been the focus of many studies and the earliest one of them is by Kakati (1972) which describe the Assamese vowel inventory in Table 1. A wide array of diphthongs is attested (fifteen in total) and as many as five vowels (comprising three syllables) may appear in succession. On the other hand there are 12 single vowels in English, including 5 long vowels and 6

short vowels. Vowels in English are classified as long and short, depending on the length of the vowels. Long vowels include [ɑ:], [ɔ:], [ɜ:], [u:], [i:].

Table 1. Assamese vowels (Kakoti, 1972)

	Front	Central	Back
High	i		u
High Mid	e		o
Low Mid	ɛ		ɔ
Low		a	

Short vowels include [i], [e], [æ], [ʌ], [ɒ], [ʊ] and [ə]. Although Assamese English has grown as a sub-category of Indian English, there hasn’t been found any attempt to describe the phonology of this variety. However, there can be found a huge literature on the studies carried out to understand the hurdles that the non-native speakers of English encounter. Atechi (2006) finds that vowels constitute the bulk of deviations of non-native forms from Native English. This deviation comes as a result of a tendency in non-native Englishes to restructure the sounds of native English to suit their purpose. Compared to consonants, vowels exhibit a very high degree of restructuring. Li (2004) makes a comparison between the Chinese subjects’ productions of English vowels and Chinese vowels, and indicates that the problem of inaccurate pronunciation results from mother tongue interference. Based on the findings of this acoustic study, some pedagogical implications are suggested. Li’s analysis and explanation takes into consideration acoustic measurements of the

Chinese subjects' pronunciation of English vowels and Chinese vowels. The study takes into account the proposal made by Singh and Singh (1982 as in Li (2004)) that the differences between the vowels in English can be examined in terms of articulatory location and the formant frequencies and explains that the sound spectrogram of the vowels can be observed based on the distance of F1, F2 and F3. Barboza (2007) makes an analysis of the production of English Front vowels by Brazilian EFL teachers in Western Rio Grande do Norte and designs three experiments for the study. The result shows that majority of the speakers of English as a second language realizes smaller differences between vowels like [ɛ, æ] that the native speakers can produce as quite different. Leemann (2007) puts focus on an acoustic phonetic observation on the vowel quality of Swiss English as a foreign language speakers. The study attempts to highlight how the monophthong vowels as spoken by Swiss English speakers deviate from the vowels as represented in Received Pronunciation (RP) and General American (GA). The results reveal that Swiss English [ɛ], [ɜ] and [ʌ] are similar to GA. In contrast to RP, the Swiss speakers articulated [ɑ:], [ʌ], [ɜ] [u:], [i:], [æ], [ʊ], [ɪ] significantly higher, whereas the vowels [ɛ] and [ɔ] were pronounced significantly lower in Swiss English. Kadenge (2009) examines the vowels of the variety of English that is spoken as a second language

in Zimbabwe. Kadenge (2009) observed that all English complex vowels such as diphthongs and triphthongs are simplified in the English speech of L1 Shona speakers. For this they use the phonological processes such as glide epenthesis, monophthongization and substitution of diphthongs with monophthongs. It is also observed that some of the native English central vowels that do not have equivalent values in Shona are substituted with Shona monophthongs that are articulatorily close to them.

METHODOLOGY

The subjects in the study at hand were screened according to their L2 experience, which is English. One of the most suitable ways to control such variables is in the school/college context. Colleges situated in the lower Assam districts of Dhubri, was chosen as recording location because students studying in under graduate courses were chosen as informants. In each recording location, which is the college premises in Dhubri District of Assam, from a pool of potential 15 subjects, 5 male subjects studying in degree courses were recorded whose data served as the basis for the corpus of the present study. The students were asked to perform word list reading tasks. Each subject was asked to read out the word list twice, clearly and in their normal way of speaking. Data was collected from five colleges and thus a total number of 50 tokens were collected for each word in the word list.

Formant frequencies of F1 and F2 have been extracted from the midpoint of vowels with the help of a PRAAT script. The sound spectrogram of vowels can be observed based on the distance of F1, F2 and F3. Acoustic analysis of vowels has shown that vowel height is reflected in F1, tongue advancement is reflected in F2 and lip rounding is related to F3. An acoustic analysis of vowels highlights the different formant configurations that are characteristics of each vowel. The relationship among the vowels can be examined by comparing their formant values. The high-low and front-back distinctions are represented by the first and second formants on the spectrogram. The first formant inversely reflects the high-low distinction. That is, lower the formant value, the higher the vowel. The second formant reflects the front-back distinction. If the formant value is high, the vowel is closer to the front position. The F1 and F2 of the target vowels and diphthongs in the English spoken by Assamese speakers is compared with the F1 and F2 of the English vowels presented in Deterding's study "The formants of monophthong vowels in Standard Southern British English pronunciation" (1997). Deterding (1997) does not describe the central vowel schwa with much vigour. As the present study is also concerned with the pronunciation of this vowel by the Assamese speakers of English, it is felt that the acoustic details of

the schwa vowel are also important to describe its realization in Assamese English. For this reason the present experiment also refers to Adriana Marusso and Thaïs Cristófaró Silva's study "A Contrastive Analysis of Schwa in English and Portuguese" (2007). The average F1 and F2 Bark values of the target vowels has also been plotted in a vowel diagram to show their location in the vowel space of Assamese speakers of English. The word list given in Appendix I is used for the present experiment.

Recordings and measurement

Two iterations of each word by 5 speakers from each college were recorded in a computer using an Audio Technica 2020 USB microphone. The recordings of the sounds were then analyzed in PRAAT at 44.1 kHz and 32 bit resolution. The sounds were first labelled at the level of vowels and diphthongs as is important depending on the word. Labelling in Praat was done using a see-listen-label method, visually evaluating the spectrogram of the sound files and listening. For all the target vowels and diphthongs, hertz value in the three formant frequencies, their bark value in first and second formants were extracted in an MS-Excel sheet using a PRAAT script. Formant values for the vowels were counted at the mid point of the vowels and for the diphthongs the mid point of the target segment was taken into account.

RESULTS

A detailed consideration of all the 40 words in Appendix I has revealed the following acoustic information about the realization of the central vowels and centering diphthongs in Assamese English.

Realizations of [ə] (schwa)

The word list contains 12 tokens with the central vowel [ə] (schwa) occurring in them, in initial, medial or final positions of the word. The results show that the pronunciation of [ə] (schwa) in Assamese English differs greatly from its pronunciation in the British English and General American English. Adriana Marusso and Thaïs Cristófaró Silva (2007) in their study “A Contrastive Analysis of Schwa in English and Portuguese” finds that the mean value for all the schwa they have analyzed for British English is 619hz for F1 and 1585hz for F2. The values for the word-final [ə] (schwa) has been considered here as reference point. Figure 1 presents a scatter graph which describes the location of the schwa in British English compared to the way this vowel is produced in Assamese English. This graph has been configured such that the horizontal axis is presents F2 values and the vertical axis presents F1 values. In addition, the graph axis has been configured such that formant values increase with the horizontal axis moving from right to left, and the vertical axis moving from top to bottom. The

reference point, that is the position of the schwa vowel in the pronunciation of the British speakers, has been shown with a *larger square mark*. Figure 1 shows that the central vowel schwa is realized in Assamese English as four different vowels as suggested for different clusters of realizations. The clusters of realizations of schwa in Assamese English can be described as the front vowel [e] and the back vowels [a], [o] and [u]. Thus, auditory evaluation of the spectrogram has given the impression that ‘apply’ is pronounced as [eplai] instead of [əplai]. ‘Occur’ is pronounced as [okar] instead of [əkɜː]. ‘Today’ is pronounced as [tude] instead of [tədeɪ]. ‘Curious’ is produced as [kjurɪəs] instead of [kjʊːrɪəs]. Thus it can be concluded that the central vowel schwa is replaced by the realization of some of the existing vowels in Assamese by the Assamese speakers of English.

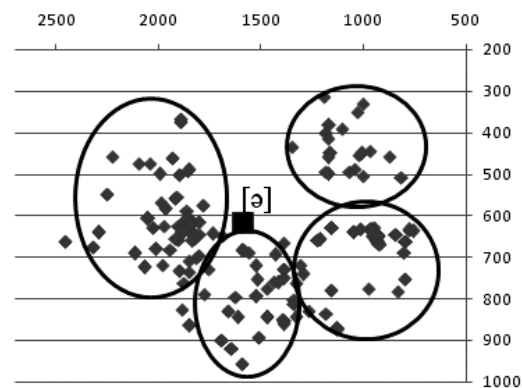


Figure 1. Vowel plot showing the realization of [ə] in word initial, medial and final positions in Assamese English

Realizations of [ɜ:]

This section discusses the realizations of the unrounded central vowel [ɜ:] in Assamese speakers' pronunciation of English words involving this vowel. The word list used for this experiment includes 4 words with this vowel occurring in initial, medial or final positions: 'occur, early, dear and year.' After auditory impression of the spectrograms of the iterations of these words it is found that 'occur' [əkɜ:] is pronounced as [okar], 'early' [ɜ:li] as [arli], 'sir' [sɜ:] as [sar] and 'year' [jɜ:] as [iar]. Figure 2 presents the F1 and F2 Bark values of all these occurrences and also compares them with the F1 and F2 Bark value of the vowel quoted from Deterding (1997), the reference point in this study. Bark average values of F1 and F2 of the pronunciation of the central vowel [ɜ:] by male British speakers mentioned in Deterding (1997) is compared with the same values of the way this vowel is pronounced by the Assamese speakers of English.

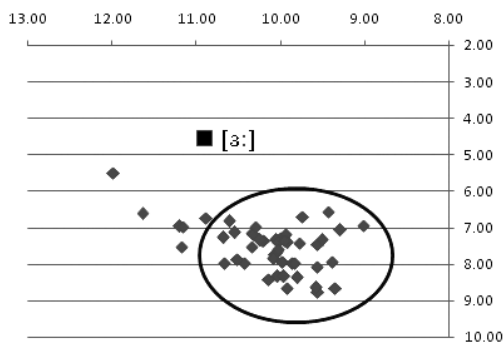


Figure 2. Vowel plot showing the realization of [ɜ:] in word initial, medial and final position in Assamese English

Figure 2 shows that the central vowel [ɜ:] is realized in Assamese English as a back open vowel like [a].

Realizations of [ʌ]

The unrounded central vowel just below the half-close position [ʌ] occurs mostly in the word initial and word medial positions in English. For this reason the present experiment included words where the vowel [ʌ] occurs only in the word initial and word medial positions. While listening to the pronunciation of these words in segmenting the vowels in PRAAT, it was noticed that the vowel [ʌ] is pronounced in the same way in Assamese English, irrespective of its occurrence in word initial or word medial position. Figure 3 presents the F1 and F2 Bark values of all these occurrences and also compares them with the F1 and F2 Bark value of the vowel quoted from the reference point in this study, that is, Deterding (1997).

It is seen in Figure 3 that most of the occurrences of the central vowel [ʌ] have been realized as a central open vowel in the Assamese speakers' pronunciation of English words involving this vowel and the aural examination of the spectrogram suggested that the vowel is pronounced like [a] in Assamese English.

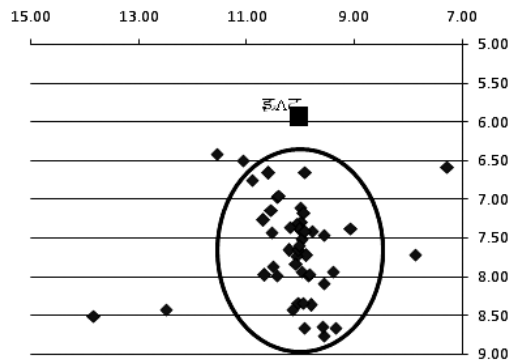


Figure 3. Vowel plot showing the realization of [ʌ] in word initial and medial position in Assamese English

Realization of the Centering Diphthongs

Diphthongs are different from pure vowels or monophthongs. The main point of their difference is that during the production of the diphthongs the tongue smoothly glides from one shape to another. English diphthongs exist as autonomous sound units. To analyse the production of the English centering diphthongs by Assamese speakers of English, the first two formants (F1, F2) of the off-glide, measured by hand and visually at the middle of the off-glide formant contour, has been calculated. This formant values are compared with the formant values for English vowels found by Deterding (1997) and Adriana Marusso and Thaïs Cristófaró Silva (2007). This comparison helps in describing the realization of the end points or targets of the glides during the pronunciation of the centering diphthongs in Assamese English. Figure 4 presents one of the windows displaying the visible

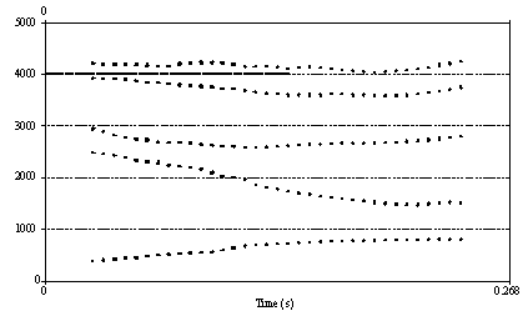


Figure 4. Formant contour of the diphthong [iə] as pronounced by the participants in this experiment

formant contour of the diphthong [iə] in one of the iterations of “dear” recorded for this experiment. A calculation of the F1 and F2 of the target of the glides in the way mentioned above shows that the Assamese speakers of English pronounce the diphthong [iə] as vowel glide starting from [i] and moving towards a back vowel near about at a much lower height than the target of [iə]. Auditory impression of the spectrogram showed that the diphthong is realized as the vowel sequence [iə] in Assamese English. ‘Dear’ [diə] is pronounced as [diar].

However, in case of some other words like ‘onion’, the diphthong [iə] is realized as the vowel sequence [io] in Assamese English. ‘Onion’ [ʌniən] is pronounced as [onion]. Examination of the pronunciation of the words like ‘chair’ suggested that the target of the diphthong [eə] is realized in a much lower and reared position in Assamese English. Auditory impression of the spectrogram showed that the diphthong is realized as the vowel

sequence [ɪa] in Assamese English. Thus 'chair' [tʃeə] is pronounced as [sɪar]. The centering diphthong [ʊə] is realized in three different ways in Assamese English. It is pronounced as a monophthong in words like 'poor'. In some words like 'cure' the diphthong [ʊə] is realized as the vowel sequence [ʊə] in Assamese English. Auditory evaluation of the spectrogram confirms this. Still in some other words like 'spiritual' the diphthong [ʊə] is pronounced as [ʊə].

CONCLUSION

The spread of English across cultures has led to the emergence of new varieties of English which deviates from the native standards at all levels. The new form of English gets coloured by some of the local conditions. One of the factors that influences greatly the pronunciation of central vowels and centering diphthongs by Assamese speakers of English is Orthography. In Assamese there is some sort of one to one relationship between the orthographic vowels and the vowel phonemes. Therefore, each of the letters used for writing represents the vowels that are pronounced by speakers. Assamese speakers of English central vowels show a tendency of assimilating these sounds to existing phonetic category. One of the main sources of learning pronunciation of English words for Assamese speakers of English is Dictionary. Most of the English learners refer to the Anglo-Assamese

Dictionaries available for learning the pronunciation of English words. Assamese alphabets are used to mark the pronunciation of English words in Anglo-Assamese Dictionaries. As sounds in the Assamese phonemic inventory have corresponding letters in Assamese alphabet system, the same system of writing is used to indicate the pronunciation of English words. Consequently the Assamese speakers of English use the sounds available in Assamese sound inventory while pronouncing the English words. This manifests mostly in the case of central vowels and centering diphthongs as Assamese alphabet system does not have any alphabet which would correspond to these vowels and diphthongs. Another reason behind the substitution of central vowels and centering diphthongs by Assamese vowels is the way English words are written by Assamese alphabets in public addressing system like advertisements, banners, posters, signboards etc. Development of awareness among the learners through pedagogical processes would certainly help in minimizing such deviations.

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Appendix I: Word List used in the experiment

Apply	Occur	Menial	Poor	Official	But	Hero	Pure
Attempt	Early	Mediate	Sure	Banana	Delicious	Serious	Curious
Today	Sir	Orient	Chair	Cinema	Conscious	Year	Spiritual
Second	Ultimate	Onion	Area	Momentous	Composition	Dear	Millionaire

Role of NGOs in Developing Rural Economy through Rubber Plantation in Goalpara District in Assam

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ABSTRACT

Rubber plantation has been the most attractive and focal non-traditional economic activities today on Goalpara district. The demand for natural rubber is increasing day by day and it has been a good sources of income. Hence, social changes are visible in Goalpara district with the increase in wealth out of rubber revolution. One of the factors behind for growing ground of the revolution may be recognised as the NGOs, which are responsible for performing a variety of service and humanitarian functions, including alleviating rural poverty. In Goalpara, a few NGOs are working in the field of rubber promotional activities. Thus the NGOs have been playing a major role in developing rural economy through rubber pantation in Goalpara district.

Keywords: Rubber plantation, Goalpara, NGOs, rural economy, ASC, Agia.

INTRODUCTION

Creating success stories, the rubber plantation has been one of the prime interests of the farmers of the district of Goalpara. Rubber, an important raw material obtained from rubber tree (*hevea brasiliensis*), demand for which is

increasing day by day and it has been a good sources of income. ‘Social changes are visible in Goalpara district of Assam with the increase in wealth. There are lots of success stories, all of them from the rubber plantations here’ (Nath and Bezbaruah, 2002). Within the Northeast region, Tripura had stood first in rubber

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production as a significant economic activity. But in more recent times, it has been gaining grounds Goalpara districts, along with Cachar and KarbiAnglong in the State of Assam.

NGOs have some primary roles in advancing modern societies, i.e., to preserve a unique and essential space between the for-profit sector and government and finally, to enable experimentation and social change by taking on challenges that the public and private sectors and so on. NGOS and CSOs (Civil society organizations) are able to take risks that are economically unacceptable to business and politically unacceptable to government. There are some areas where government mechanism need NGO sector in preparing and implementing development plans and programmes in one side, and some areas need only NGOs to work on the other. The role of NGOs have increased to upgrade the economy by doing on their part in one side and assisting/collaborating the government's efforts in implementing various plans and programmes on the other. As a vast country, India often confronted by many socio-economic problems. More than a half of population in India lack basic amenities of life. So, NGOs are best suited and a viable options for a country like India and other third world countries. Extension of rubber plantation to non-traditional areas like the northeast region has contributed in no small measure in India securing a larger share in world production of natural rubber.

Objectives-

The paper intends -

- a) to find out the growth trends of rubber plantation and production in the district of Goalpara.
- b) to assess the contribution of rubber sector in developing rural economy in the district.
- b) to examine the role of the NGOs in the progress of rubber plantation and developing rural economy in the district of Goalpara.
- d) to find out the problems as well as to give suggestions for Govt, NGOs and the planters for their future course of action.

METHODOLOGY

Area of study:

The district of Goalpara, situated in the west part of the state and located in between latitude 25°59/ N to 26°43/ N longitude 90°46/ E to 91°18/E. Total area is 1824 Sq Km. Total population is 8, 22,035 as per 2001 Census, A decadal growth of 23.03 percent during 1991-2001. The density of population 451 per sq. km (higher than the state average of 340 per sq. km)

Data source:

The study is basically analytical and descriptive. Moreover, it is prepared mostly with secondary data as well as primary data, and it is also depended on personal observation. The techniques of synthesis have been applied to analyze the data and as such, the findings and

suggestions have been sorted out.

RESULTS AND DISCUSSION

Rubber (History):

The natural rubber plantation was said to be started in the year 1985-86 in Goalpara. So far as the information is concerned, Ramdas Rabha and Paramananda Rajbanshi was the pioneer of that. During late 80's, it got momentum for further advancement. According to a reliable source, during 1986 to 2011, the expanded area of rubber plantation has been reached to 7,045 hectares. Out of that more than 1,040 hectare area is found with matured rubber trees ready for tapping latex. The district has 12,000 small permit holders, which definitely means that over 12,000 families are dependent on rubber cultivation for their livelihood today.

producing only 2,500 MT of rubber and the number of families involved in the field is 3,784. At the same time, total area under rubber in the district at the end of 2006-07 was 3550 hectares, which constituted 6% of the rubber acreage of northeast India. Of the total rubber plantation of the district, 36% had attained maturity in which tapping of latex was done. The total production of rubber in the district in the year 2006-07 was 1814MT. As per an estimate, 87% of individual rubber holdings and 94% of group holdings have been set up on degraded forest or barren land. By the end of 2006-07, about 3160 hectares of barren land and degraded forest area were converted to rubber plantations in Goalpara district (Nath & Bezbaruah, 2010).

In the year 2004, India's average yield of natural rubber was 1,705 kg per hectare, which was the highest in the world.

Table 1. Areas, Pattern of Holdings, Numbers of families invoved and production of Rubber in Goalpara district

Sl. No.	Particulars	Years			
		2001-02	2006-07	2009-10	2010-11
1	Area of rubber plantation	2,640 Hec	3,550.38 Hec	2,900 Hec	7,045 Hec*
2	Nos of holdings	--	5,199	7,000	--
3	Families involved in rubber cultivation	3,784	--	--	12,000 **
4	Row rubber produced	2,500 MT	1,814 MT	--	--

* The O/o Ajagar Social Circle (NGO), Agia.

** Small permit holders (Rubber Board, W/Island, Kochi)

Source: Field Office of Rubber Board at Agia, Goalpara & O/o the Secretary, Ajagar Social Circle, Agia, Goalpara.

In the year 2001-02, 2,640 hectares of land was occupied by rubber plantation,

Thailand came second with 1,418 kg a hectare, while Vietnam followed with 1,412

kg (Nair 2005). So far as the productivity is concerned, upto 1,892 kg per hectare per day has been recorded to be tapped on experimental basis; which is proved to be more than the record of national average.

Another feature of the growers is that none of them is exclusively dependent on rubber production for their livelihood. Rubber growing has resulted in diversification and enhancement of their livelihood from their respective pre-existing occupations. Indeed it has transpired in the field investigation that having a side occupation has helped the growers in coping with the risk associated with a commercial activity like rubber production.

Developing Rural Economy:

It is already said that in more recent times, rubber plantation has been gaining grounds in Goalpara districts. It has been one of the prime interests of the farmers of the district. Rubber, an important raw material obtained from rubber tree (*hevea brasiliensis*), demand for which is increasing day by day and it has been a good sources of income. Social changes are visible in Goalpara district of Assam with the increase in wealth.

These days, Goalpara has been credited to be the pioneer in this non-traditional productive plantation. So far as the productivity is concerned, upto 1,892 kg per hectare per day has been recorded to be tapped on experimental basis; which is proved to be more than the record of

national average.

But average holding of each rubber growers is not much big one; a few holdings are found in 500 hectares. The tribal people have been addicted much more than other communities of the district.

So far as the employment opportunity is concerned, it has vast prospects. It is already assessed that one hectare rubber plantation needs at least four person in two ways; firstly, as employed and secondly, as worker/labour. Accordingly within 4/5 years, it would need almost another 2,800 working rubber tappers in the industry in the district.

NGOs:

There is no unique definition for a non-governmental organization (NGO). However, the main characteristic is to be actors legally independent from the State, founded by private initiative (nongovernmental) and non-profit (defined by the non distribution constraint on profits); they are often considered to be public good providers. (Murdie and Davis, 2012).

Morris-Suzuki (2000: 68) notes that “NGOs may pursue change, but they can equally work to maintain existing social and political systems.” For Bebbington *et al.* (2008), the strength of development NGOs remains their potential role in constructing and demonstrating “‘alternatives’” to the status quo, which remains a pressing need.

NGOs are useful actors because they can provide cost-effective services in

flexible ways, while for others they are campaigners fighting for change or generating new ideas and approaches to development problems.

Role of NGOs:

Tasks before NGOs are enumerable. The role of NGOs in developing rural economy through rubber plantation in Goalpara district has not been highlighted so far.

Initially, NGOs including CBOs are found active in case of plantation of rubber. But it seems lesser roles shall have to play by the NGOs today. It is due to the appearance of the Rubber Board by establishing its Field Office at Agia, Goalpara, which are advancing sufficient support to the rubber growers in the form of financial credit-cum-subsidy. It is also true that the Rubber Board has some limitations like field level activities, obviously due to its deficiency in staff.

The role of NGOs is generally noticed mainly in case of rubber processing. It is worth mentioning that it widely needs financial support once again and processing equipments (machanisation).

It may be noted here that an NGO movement has not been gaining ground in Lower Assam and especially in Goalpara. Among the active NGOs working properly in the region, the name of Agia (Goalpara) based NGO 'Ajagar Social Circle' appears first. So far as the rubber plantation and production is concerned, the only and one

NGO 'Ajagar Social Circle' is found inseparably involved. Here a little contribution may be noticed from a few purposefully formed Community-based Committees (CBCs).

In Goalpara, the NGOs are advancing credit facilities through Joint Liabilities Groups (JLGs) or User Groups of rubber growers in the district. Ajagar Social Circle has been providing training facilities for the rubber growers, tappers and other associates.

Table 2. Ajagar Social Circle's programme for rubber promotional interventions.

Years	Rubber Competition	Rubber Growers Workshop/Meet	Individuals/ Groups Felicitated
	Nos of competitors	Nos of participants	
2002-03	65	120	--
2003-04	60	--	--
2004-05	35	200	2 (Individuals)
20-5-06	45	--	3 (Individuals)
2006-07	--	350	4 (Groups)

Source: The O/o Ajagar Social Circle (NGO), Agia.

Ajagar Social Circle has implemented some important and successful programme for promotional interventions in the line of rubber plantation and production. ASC organized skill development trainings on natural rubber (latex) tapping and processing for the tappers and processors under Rural Entrepreneurship Development Programme (REDP) in assistance of NABARD. With the help of UCo Bank, some other training

had been organized under the aegis of Rural Self Employment Training Institute. Similarly, ASC with the help of Centre for Practical Livelihood for NEDFi organized some other training.

The rubber growers are still scattered as an unorganized sector. With a view to give a organizational shape, ASC had a noble endeavour to organize the Rubber Growers' Meet in 2002-03 and finally, a long-awaited 'Lower Assam Rubber Growers' Meet' in the year 2006-07. Of course, it has still an appeal creating environment for making it an organized sector. These are also similar to leadership training. Leadership is supposed to be important in its further development. That is why; the district has Goalpara District Rubber Growers' Association now.

They also organized a popular talk on the topic "Vision 2020: The Prospect of Rubber Plantation in Lower Assam." ASC imparted awareness-cum-trainings to more than 500 unemployed youths including women associated with rubber cultivation. For a promotional activity, ASC also organized Rubber Sheet Competition among the rubber tappers and growers. One of the important things done by ASC is its liaisoning among various stakeholders like Rubber Board, NABARD, NEDFi and intellectuals concerned.

NGOs have also their own rubber cultivation. ASC is also credited with that. Some CBOs or Village Committees have

also their rubber cultivation in their community reserve or grazing fields. Some of the prominent such groups are Ghengamari Rubber Growers' Society, Ghengamari, Janakalyan Rubber Growers' Society, Bhalukdubi; Lempara Rubber Growers' Society, Lempara; Lakhimi Mahila Samity, Bhoiskhuli and so on. Of course, this type of cultivated area is estimated to be 35 per cent of the total.

With a view to creating an environment and motivating the individual youngsters and the Group Rubber Plantation Approaches, Ajar Social Circle took up idea of felicitating the best individuals and groups involved in the rubber plantation and production activities. They felicitated 2 and 3 persons and 4 groups in the years 2004-05, 2005-06 and 2006-07 respectively (See the table 2).

For NGO, marketing has been one of the most attractive and thrust area. Rubber Board procured rubber sheets initially in a large scale. But in course of time, due to its laziness and clumsy work style, the growers are being slopping down towards NGOs and other business dealers for selling their products. In Goalpara it is reportedly practiced the procurement price maintained at Kattayam (Kerala). Due to which no intermediaries could dig their nails here in Goalpara district and by and large the real growers are getting legal prices.

As a bonafide license holder, ASC,

in the title of Ajar Rubber, Agia has been purchasing around a limit of 500 MT of rubber sheets; which is estimated to be 1/5th of the total production in the district. The other license holders as 05.07.2013 are M. Das, Agia, R. Kachari, Lela, and Sushma Rubbers House, Darangiri. The rubber sheet purchases are also done by other small business parties in the district.

ASC has been arranging nursery of rubber and quality saplings are being supplied to the both old and new growers at their doorstep. But it depends on growers demand as well as the collection of seeds. Till today, ASC could arrange more than 2 lakh quality saplings for supply.

NGOs have still command over the supply of various equipments to the rubber processors at their doorsteps at reasonable prices. The equipments are being imported from Kerala only.

Problems:

The rubber growing suit in Goalpara are facing some serious problems.

a) First of all, a substantial part of the group plantations of rubber in the district have come up in some state owned and scheduled forest land. Both the department of forest and the planters are in the risk of holding and possession. There is an every chance for further encroachment of other government and forest land.

b) Rubber plantation requires large amount of capital in the very initial stage. The new entrepreneurs find it very difficult in

generating the same. Institutional credit facility is a must for growing a new economic venture. But it is found to be very short in rubber sector here.

c) Gradation of rubber production is also one of the major problems here. But there is no systematic procedure of grading the rubber produced in Goalpara. Traders usually grade all the rubber produced in the district as RSS-5, which fetches the lowest price (Nath and Bezbaruah, 2010).

d) There is only a few NGOs, including rubber growers' groups are working in the field of natural rubber.

e) Percentage of growers belonging to Scheduled Tribe/Caste communities is almost 85 per cent. The other castes not coming forward is also recognized as a big problem. Because, in comparison to ST and SC, the number of other caste people are major in the district.

f) The sizes of the rubber holdings are too small to be fruitful both in economic and feasibility point of view. Average size of rubber plantation is found to be less than 2 hectares.

g) Rubber sector in the district are lacking more trainings for awareness generation, land preparation for plantation, selection and collection of quality saplings, breeding and rearing, use of fertilizers and pesticides, proper methods of latex collection and preservation, rubber sheet preparation, use of machines, technical knowhow, mechanization, marketing

management etc.

h) Rubber sector is still lagging behind in cases of technical knowhow and mechanization.

i) Marketing management of rubber production is still a farce in the district.

Policy Suggestions:

Suitable policy interventions are needed to address these regards.

As a serious issue, a timely and critical step on the part of the government is needed for settlement of the land used for plantations. For example, a process was initiated in case of waste land. So, as a solution, the land may be transferred to the planters on some conditions, like - offering the land on long term lease.

Rubber has already been a viable economic activity for a considerable portion of people of the district. So, there should be an initiative on the part of government to encourage financial institutions such as banks and micro finance institutions (MFIs) to come forward and offer credit to the rubber growers. In this regard, NGOs should be encouraged through the financial agencies in order to ensure availability of finance in rubber plantation and productions.

To serve better interest of the producers, it is necessary to establish the procedure for objective grading of rubber sheets (Nath and Bezbaruah, 2010).

There is a wide debate whether

environmental implications of rubber plantation are favourable. This issue should be treated as urgent matter and both in Govt and NGOs should come forward to take up studies and researches to have earlier results for having future course of action.

CONCLUSION

The robust growth trends in area and production of rubber in Goalpara implies that rubber production has steadily emerged as an important economic activity in the district. The yield attainment by farmers in the district is impressive by national and international comparison. A large majority of the growers being from the socio-economically disadvantaged sections of the population, this new activity has served the cause of economic empowerment at the grassroots. By and large, it may be said that the rubber sector in the district virtually has already received the trickledown effect.

Rubber production in Goalpara has been remained economically viable and sustainable for long. The plantations have come up mostly on degraded forests and barren land. Food production in the district is unlikely to be affected by rubber sector.

Driven by necessity, Citizens across the globe have developed organizations of civil society, NGOs to address a wide variety of social needs. So far as the role is concerned, NGOs have to enable experimentation and social change

by taking on challenges that the public and private sectors simply can't or won't be so. NGOs are able to take risks that are economically unacceptable to business and politically unacceptable to government.

NGOs are prominently engaged in the change of the socio-economic conditions of the society. Having some serious limitations, NGOs can be hoped that they continue playing the role of savior of society and lead the country to sustainable economic growth and development. From their grassroots experiences, the NGOs can complement the government efforts to improve the condition of the people.

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Study of the Aesthetics of the East and the West

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ABSTRACT

Aesthetics is a branch of philosophy dealing with the nature of art, beauty and taste, with the creation and appreciation of beauty. The word ‘Aesthetics’ in the Indian context, means “science and philosophy of fine art”. Aesthetics, therefore, as philosophy of fine art, has to deal with the philosophic views of these arts, known as Rasa-Brahma Vāda, Nāda-Brahma Vāda and Vastu-Brahma Vāda. Hegel recognizes architecture, music, poetry, sculpture and painting to be fine arts. But Indian authorities admit the first three only to be fine arts. Ancient art was largely, but not entirely, based on the nine great ancient civilizations viz. Egypt, Mesopotamia, Persia, Greece, China, Rome, India, the Celtic peoples, and Maya. Each of these centres of early civilization developed a unique and characteristic style in its art. Aestheticians in both the East and the West have recognized emotion to be an essential element in the aesthetic experience, aroused by poetry or drama. In India, it is the theory of Rasa, as the basic emotion, harmoniously united with transient emotions, the mimetic changes and the situation, as incorporated in the famous definition of Rasa that has been followed by all the subsequent aestheticians. In the West also, the theory of Aesthetics has been discussed generally in reference to the emotions, which the works of the poetic or the dramatic art arouse. In this paper, an attempt has been made to study what Aesthetics is all about, the Indian Aesthetics right from Bharata upto Abhinavagupta, Ancient Greek Aesthetics of Plato and Aristotle, Western Medieval Aesthetics as well as Modern Aesthetics.

Key words: Aesthetics, beauty, rasa, east, west, ancient, modern

INTRODUCTION

Aesthetics is a branch of philosophy dealing with the nature of art, beauty and taste, with the creation and appreciation of beauty. It is more scientifically defined as the study of sensory or sensori-emotional values, sometimes called judgments of sentiment and taste. More broadly, scholars in this field define aesthetics as critical reflection on art, culture and nature. More specific aesthetic theory, often with practical implications, relating to a particular branch of arts is divided into areas of aesthetics such as art theory, literary theory, film theory and music theory. An example from art theory is aesthetic theory as a set of principles underlying the work of a particular artist or artistic movement, such as the Cubist Aesthetic. Any aesthetic doctrine that guided the production and interpretation of prehistoric art, are mostly unknown. Ancient art was largely, but not entirely, based on the nine great ancient civilizations viz. Egypt, Mesopotamia, Persia, Greece, China, Rome, India, the Celtic peoples, and Maya. Each of these centres of early civilization developed a unique and characteristic style in its art.

Aesthetics was regarded earlier, as to be, exclusively a subject of the West. In the *Histories of Aesthetics*, written by Bernard Bosanquet, Benedetto Croce and Gilbert and Kuhn, they confined themselves

to the presentation of aesthetic currents in the West only. Therein, they completely ignored oriental aesthetics; the reason may be that, probably they thought that such subject does not exist in the East. It is not so today, rather, it is a world –wide subject now. The UNESCO has also sponsored a plan to bring out twenty volumes presenting different aesthetic currents including Russian, Japanese, Chinese, Indian etc., in the common title “*Sources of Aesthetics*” under the editorship of Prof. Jan Aler of the University of Amsterdam. The Aesthetics, as a branch of study is very much important as well as interesting. It may be well understood from the modern western theory which considers aesthetic education as an integral part of liberal education and maintains that all round development of the child is not possible without this education. The cultivation of the aesthetic and particularly of the arts is a process by which man can discover a new meaning in life and become conscious of his integrated personality.

Indian Aesthetics:

The word ‘Aesthetics’ in the context of Indian Aesthetics means “science and philosophy of fine art”. Hegel recognizes architecture, music, poetry, sculpture and painting to be fine arts. But Indian authorities admit the first three only to be fine arts. For, they alone have independent being. To painting and

sculpture, they give a subordinate position to architecture. Thus Indian Aesthetics is primarily concerned with three arts i.e. poetry, music and architecture. Aesthetics, therefore, as philosophy of fine art, has to deal with the philosophic views of these arts, known as Rasa-Brahma Vāda, Nāda-Brahma Vāda and Vastu-Brahma Vāda (Pandey 1959). Indian art evolved with an emphasis on inducing special, spiritual or philosophical states in the audience, or with representing them symbolically. In the Pan Indian philosophic thought, the term ‘*satyam śivam sundaram*’ is another name for the concept of the Supreme. ‘*Sat*’ is the truth value, ‘*śiva*’ is the good value and ‘*sundaram*’ is the beauty value. This concept of ‘*satyam-śivam-sundaram*’, a kind of Value Theory is the cornerstone of Indian Aesthetics. Of particular concern to Indian drama and literature are the term ‘*Bhāva*’ or the state of mind and *Rasa* referring generally to the emotional flavours or essence crafted into the work by the writer and relished by a ‘sensitive spectator’ or *sahṛdaya*. Poets like Kālidāsa were attentive to *Rasa*, which blossomed into a fully developed aesthetic system.

Rasa theory blossoms, beginning with the Sanskrit text *Nāṭyaśāstra* (Sarma, 2008) (*nāṭya* meaning ‘drama’ and *śāstra* meaning ‘science of’), a work attributed to Bharata Muni, where the Gods declared that drama is the ‘Fifth *Veda*’ because it is suitable for the degenerate age, as the best

form of religious instruction. Bharata presents Brahmā to be the founder of dramaturgy on the basis of the material borrowed from the *Vedas* and the *Upavedas* and imparted its knowledge to him (Pandey op. cit., 1959). Bharata’s *Nāṭyaśāstra* (*NS*) is divided into thirty six chapters variously said to be thirty seven. The *Nāṭyaśāstra* presents the aesthetic concepts of *Rasas* and their associated *bhāvas* in Chapters VI and VII respectively, which appear to be independent of the work, as a whole. Eight *Rasas* and associated *bhāvas* are named and their enjoyment is likened to savouring a meal, *Rasa* is the enjoyment of flavours that arise from the proper preparation of ingredients and the quality of ingredients. The word *bhāva*, in dramaturgy is used in the sense of mental state only, which is of forty-nine types (Ibid., 1959). Bharata’s famous *Rasa-sūtra* runs as follows - *vibhāvānubhāvavyabhicārisam yogādrasa-nispattiḥ*. *NS*, VI. 32

The Aesthetic object i.e. *Rasa*, according to Bhatta Lollata (Singh, 2003), is nothing but the unity of a basic mental state in the midst of multiplicity of i) emotive situation, ii) mimetic changes and transient emotions. However, this is the traditional view of *Rasa* (Pandey op. cit., 1959). There is nothing original of Bhatta Lollata in it. According to Śrīśaṅkuka (Singh op. cit., 2003), the scenic arrangements together with skilful acting

give rise to the consciousness of identity of the actor with the hero, he impersonates. Aesthetic experience is due to the objective perception of the aesthetic object and that; this theory is maintained by some western aestheticians also (Pandey op. cit., 1959). It may be further noted that Śrīśaṅkuka has criticised the theory of Bhaṭṭa Lollaṭa. Bhaṭṭa Nāyaka (Singh op. cit., 2003), unlike his predecessors maintains that both the cognizing self and the cognized object, are free from all limitations, which give individuality. He is of the opinion that the poetic language has three powers e.g. *Abhidhā*, *Bhāvakatva* and *Bhojaktva*.

The theory of the *Rasa* develops significantly with the Kashmiri aesthetician Āṇandavardhana's classic on poetics, the *Dhvanyāloka*, which introduces the ninth *Rasa*, *Śānta-rasa* as a specifically religious feeling of peace (*Śānta*) which arises from its *bhāva*, weariness of the pleasures of the world. The primary purpose of this text is to refine the literary concept *dhvani* or poetic suggestion, by arguing for the existence of *Rasa-dhvani*, primarily in forms of Sanskrit including a word, sentence or whole work 'suggests' a real-world emotional state or *bhāva*, but thanks to aesthetic distance, the sensitive spectator relishes the *Rasa*, the aesthetic *flavour* of tragedy, heroism or romance. The 9th-10th century master of the religious system known as 'the non-dual Śaivism of Kashmir' (or 'Kashmir Śaivism') and aesthetician, Abhinavagupta

(Ibid., 2003) brought *Rasa* theory to its pinnacle, in his separate commentaries on the *Dhvanyāloka*, the *Dhvanyāloka-locana* and the *Abhinavabhāratī*, his commentary on the *Nāṭyaśāstra*, Abhinavagupta offers for the first time a technical definition of *Rasa*, which is the universal bliss of the Self or Ātman coloured by the emotional tone of a drama. The *Śānta-rasa* functions as an equal member of the set of *Rasas*, but, is simultaneously distinct being the clearest form of aesthetic bliss. Abhinavagupta likens it to the string of a jewelled necklace; while it may not be the most appealing for most people, it is the string that gives form to the necklace, allowing the jewels of the other eight *Rasas* to be relished. Relishing the *Rasas* and particularly the *Śānta-rasa* is hinted as being as good as but never equal to the bliss of self-realization, experienced by *yogis*. The realization of *Rasa*, Abhinavagupta maintains, being dependent on comprehension of *Vibhāvas*, *Anubhāvas* and *Vyabhicāribhāvas* lasts so long as cognition of these factors lasts and ceases to exist when the latter vanishes (Mukherji, n.d.).

Ancient Greek Aesthetics:

Greece had the most influence on the development of aesthetics in the West. This period of Greek art saw a veneration of the human physical form and the development of corresponding skills to show musculature, poise, beauty and

anatomically correct proportions. Furthermore, in many Western and Eastern cultures alike, traits such as body hair are rarely depicted in art that addresses physical beauty. Plato (427-347 B.C.) is important for Comparative Aesthetics, because of his theory of reflection in the context of both, Metaphysics and Aesthetics. The objective world, according to him, is nothing but reflection of the world of ideas on matter and a product of art is but a reflection of a natural object (Pandey, 1972). Plato's theory is known as Rigoristic Hedonism. Greek philosophers initially felt that aesthetically appealing objects were beautiful in and of themselves. Plato believed that for us to have a perception of beauty there must be a transcendent form for beauty in which beautiful objects partake and which causes them to be beautiful also. He felt that beautiful objects incorporated proportion, harmony, and unity among their parts. Similarly, in the Metaphysics, Aristotle found that the universal elements of beauty were order, symmetry, and definiteness. In his Aesthetics, Aristotle is an exponent of the moral purpose of art, the view that the end of art is to improve its lover morality. His theory is technically called Pedagogism (Ibid., 1972).

Western Medieval Aesthetics:

Surviving medieval art is primarily religious in focus and funded largely by the State, Roman Catholic or Orthodox Church,

powerful ecclesiastical individuals, or wealthy secular patrons. These art pieces often served a liturgical function, whether as chalices or even as church buildings themselves. Objects of fine art from this period were frequently made from rare and valuable materials, such as gold and lapis, the cost of which commonly exceeded the wages of the artist.

Medieval aesthetics in the realm of philosophy built upon classical thought, continuing the practice of Plotinus by employing theological terminology in its explications. St. Bonaventure's "*Retracing the Arts to Theology*", is a primary example of this method. Saint Thomas Aquinas's aesthetic is probably the most famous and influential theory among medieval authors, having been the subject of much scrutiny in the wake of the neo-Scholastic revival of the late 19th and early 20th centuries and even having received the approbation of the celebrated Modernist writer, James Joyce. Thomas, like many other medievals, never gives a systematic account of beauty itself, but several scholars have conventionally arranged his thought- though not always with uniform conclusions- using relevant observations spanning the entire corpus of his work. While Aquinas's theory follows generally the model of Aristotle, he develops a singular aesthetics which incorporates elements unique to his thought. Umberto Eco's "*The Aesthetics of Thomas Aquinas*" identifies the three main

characteristics of beauty in Aquinas's philosophy- *integritas sive perfectio*, *consonantia sive debita proportio*, and *claritas sive splendor formae*. While Aristotle likewise identifies the first two characteristics, St. Thomas conceives of the third as an appropriation from principles developed by neo-Platonic and Augustinian thinkers. With the shift from the Middle Ages to the Renaissance, art likewise changed its focus, as much in its content as in its mode of expression.

Modern Aesthetics:

From the late 17th to the early 20th century, Western Aesthetics underwent a slow revolution into what is often called modernism. German and British thinkers emphasized beauty as the key component of art and of the aesthetic experience, and saw art as necessarily aiming at absolute beauty. For Alexander Gottlieb Baumgarten, aesthetics is the science of the sense experiences, a younger sister of logic and beauty, is thus the most perfect kind of knowledge that sense experience can have. For Immanuel Kant, the aesthetic experience of beauty is a judgment of a subjective but similar human truth, since all people should agree that "this rose is beautiful" if, it in fact is. Kant is transcendentalist in his philosophy. He deals with three types of experience-i) theoretical, ii) practical and iii) aesthetic, in his three critiques, i) Critique of Pure

Reason ii) Critique of Practical Reason and iii) Critique of Judgement, respectively (Ibid., 1972). For Friedrich Schiller, aesthetic appreciation of beauty is the most perfect reconciliation of the sensual and rational parts of human nature. For Friedrich Wilhelm Joseph Schelling, the philosophy of art is the 'organon' of philosophy concerning the relation between man and nature. So aesthetics began now to be the name for the "*philosophy of art*". Friedrich von Schlegel, August Wilhelm Schlegel, Friedrich Schleiermacher and Georg Wilhelm Friedrich Hegel have also given lectures on aesthetics as "*philosophy of art*" after 1800. For Hegel, all culture is a matter of "*absolute spirit*" coming to be manifested to itself, stage by stage, changing to a perfection that only philosophy can approach. Art is the first stage in which the absolute spirit is manifested immediately to sense-perception, and is thus an objective rather than subjective revelation of beauty. Hegel is the first western aesthetic thinker, whose works contain references to Indian art (Ibid., 1972). For Arthur Schopenhauer, aesthetic contemplation of beauty is the most free that the pure intellect can be from the dictates of will; here we contemplate perfection of form without any kind of worldly agenda, and thus any intrusion of utility or politics would ruin the point of the beauty. It is thus for Schopenhauer, one way to fight the suffering. Aesthetic

experience, according to Schopenhauer, is the experience of idea, the immediate manifestation of will, free from all relations (Ibid., 1972). The British were largely divided into intuitionist and analytic camps. The intuitionists believed that aesthetic experience was disclosed by a single mental faculty of some kind. For Anthony Ashley Cooper, 3rd Earl of Shaftesbury, this was identical to the moral sense; beauty just is the sensory version of moral goodness. For Ludwig Wittgenstein, aesthetics consisted in the description of a whole culture which is a linguistic impossibility. That which constitutes aesthetics lies outside the realm of the language game. For Oscar Wilde, the contemplation of beauty for beauty's sake, augmented by John Ruskin's search for moral grounding, was not only the foundation for much of his literary career but was quoted as saying "*Aestheticism is a search after the signs of the beautiful. It is the science of the beautiful through which men seek the correlation of the arts. It is, to speak more exactly, the search after the secret of life*".

Wilde famously toured the United States in 1882. He travelled across the United States spreading the idea of Aesthetics in a speech called "*The English Renaissance*". In his speech, he proposed that beauty and aesthetics were not languid but energetic. By beautifying the outward aspects of life, one would beautify the inner ones. For Francis Hutcheson, beauty is

disclosed by an inner mental sense, but is a subjective fact rather than an objective one. Analytic theorists like Henry Home, Lord Kames, William Hogarth, and Edmund Burke hoped to reduce beauty to some list of attributes. Later analytic aestheticians strove to link beauty to some scientific theory of psychology (such as James Mill) or biology (such as Herbert Spencer).

CONCLUSION

The Poetics started as an empirical and normative study; and despite its later search for fundamental aesthetic principles, it hardly ever succeeded in breaking down its scholastic barriers (De, S.K. 1963). If we turn to the word *alam'kāra*, which originally was applied to name the discipline itself as well as to designate the rhetorical figures, we find that it signified pure and simple embellishment, this forms the main topic of analysis in the earliest extant works from Bhāmaha to Rudrata. They approach the subject as a scientist approaches a physical fact. It also appears that Sanskrit Poetics reached the rank of an independent discipline at a time when Sanskrit poetry, in the hands of less imaginative writers, was becoming more and more a highly factitious product of verbal specialists. The divine creator in the Hebrew and Christian scriptures expressed satisfaction and wonders over the mystery of what he had created. Likewise, the Âdi-kavi in the interrogation *kim' idam' vyāhṛdam' mayā* gave expression to the

eternal wonder and curiosity of human mind with regard to his own creation (Ibid., 1963). Going to the comparative aspects of the East and West aesthetics, it is observed that Hegel seems to improve upon the ancient Indian classification of arts in so far as he draws a distinction between the objective art and the absolute, which was not drawn in ancient India; but he agrees with the Indian classification into *Svatantra* and *Upayogini* (Pandey op. cit., 1972). Aestheticians, in both the East and the West have recognized emotion to be an essential element in the aesthetic experience, aroused by poetry or drama. In India, it is the theory of *Rasa*, as the basic emotion, harmoniously united with transient emotions, the mimetic changes and the situation, as incorporated in the famous definition of *Rasa* that has been followed by all the subsequent aestheticians. They have recognized the basic or persistent emotion, the *sthāyin*, to be the central fact in aesthetic experience. In the west also, the theory of aesthetics has been discussed generally in reference to the emotions, which the works of the poetic or the dramatic art arouse (Ibid. 1972). From wonder to enquiry, there is only a step, and when the restless human mind sets itself to solve the mystery, his curiosity leads him to open up new vistas of thought and thereby flourishes both the East and West Aesthetics.

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i) *pranamya śirasā devau*

pitāmahamaheśvarau/nātyaśāstam

pravakṣyāmi brahmanā yadudahrtaṃ//

NS I. 1. Sarma, Satyaprakasa. 2008.

Nātyaśāstram. The Chaukhamba

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ii) *teṣāṃ tadvacanam śrutvā munīnām*

bharato munih/ pratyuvāca tato vākyam

nātyavedakathām prati// bhavadbhīḥ

śucibhirbhūtvā tathāvahitamānasaiḥ/

śrūyatām nātyavedasya sambhavo

brahmanirmītaḥ// NS. I. 6-7. Ibid. p. 5

iii) *dharmyamarthyaṃ yaśasyaṃ ca*

sopadeśam sasamgraham/

bhaviṣyataṣca lokaṣya

sarvakarmānudarśakam//

sarvaśāstrārthasampannam

sarvaśilpapravartakam/nātyākhyam

pañcamam vedam setihāsam

karomyaham// saṅkalpya bhagavānevam

sarvān vedānanusmaran/ nātyavedam

tataścakre caturvedāṅgasambhavam //

NS. I.

14-16. Ibid. p. 9

Pandey op. cit. Vol. I, p. 7

Ibid. p. 27

In the words of Mammaṭa, the author of the *Kāvyaprakāśa*, Ch. IV, *Utpattivāda*

of Bhaṭṭa Lollaṭa runs as follows-

vibhāvairlalanodyānādibhirālambanoddī

panakāraṇaiḥ ratyādiko bhāvo janitah

anubhāvaiḥ
kaṭākṣabhujaḥkṣepaprabhṛtibhiḥ kāryaiḥ
pratītiyogyaḥ kṛtaḥ
vyabhicāribhīrṇirvedādibhiḥ
saḥakāribhīrupacito mukhyayā vṛtṭyā
rāmādāukārye
tadrūpatānusam' dhānānnarttake 'pi
pratīyamāno rasa iti
bhaṭṭalollaṭaprayatayaḥ// Singh,
 Satyavrata. 2003 (Reprinted).
Kāvyaaprakāśa. Chowkhamba
 Vidyabhawan, Varanasi, p. 66
 Pandey op. cit. Vol. I, p. 41
 The *Anumitivāda* of Śrīśaṅkuka is as
 follows- *rāma evāyam' ayameva rāma iti*
na rāmo 'yamityauttarakālike badhe
rāmo 'yamiti rāmaḥ syādvā na vā 'yamiti
rāmasaḥśo 'yamiti casamyān
mithyāsam' śayasāḥśyapratītibhyo
vilakṣaṇayā citraturagādīnyāyena
rāmo 'yamiti pratipattyā grāhye na'e//
 Singh op. cit. p. 68
 Pandey op. cit. Vol. I, p. 48
 Bhaṭṭanāyaka's *Bhuktivāda* runs as – *na*
tāṭasthyena nātmagatatvena rasaḥ
pratīyate notpadyate nābhivyajyate, api
tu kāvye nātye cābhighāto dvitīyena
vibhāvādisādhāraṇīkaraṇ
ātmanābhāvakatvavyāpāreṇa
bhāvvyamānaḥsthāyī
sattvodrekaprakāśānandamayasaṁvidviś
rāntisatattvena bhogena bhujiyate iti
bhaṭṭanāyakaḥ// Singh op. cit. p. 72
 The *Abhivyaktivāda* of Abhinavagupta
 runs as follows- *loke pramadādibhiḥ*
sthyāyānumāne 'bhyāsapāṭavavatām'
kāvye nātye ca taireva
kāraṇatvādīparihāreṇa

vibhāvanādivyāpāravattvādalaaukikavibh
āvādisābdavyavahāryyairmamaivaite
śatrorevaite na taṭasthasyaivaite, na
mamaivaite śatrorevaite na
taṭasthasyaivaite iti sambandhaviśeṣ
asvīkāraparihāraṇīyamānādhyavasāyāt
sādhāraṇyena pratītaibhivyaktaḥ
sāmājīkānām' vāsanātmatayā sthitaḥ
sthāyī ratyādiko niyatapramātrgatatvena
sthito 'pi sādharāṇopāyabalāt
tatkālavigalītaparimitapramātr
bhāvavaśonmīsitavedyāntarasam'
parkaśūnyāparimitabhāvena pramātrā
sakalasah' dayasaṁ' vādabhaḥjāsādhāraṇ
yena svākāra ivābhinno 'pi gocarīkr
taścarvyamāṇ ataikapraṇo
vibhāvādivīvitāvadhiḥ
pānakarasanyāśena carvyamānaḥ puraḥ
iva parisphuraṇaḥ hṛ dayamiva praviśan
sarvāṅgīṇa amivalīṇa gan anyatsarvamiva
tirodadhad
brahmāsvādamivanubhāvayan
alaaukikacamatkāraḥkārī śṛṅgārādiko
rasaḥ/ sa ca na kāryaḥ
vibhāvādivināśo 'pi tasya
sambhāvaprasaṅgād nāpi jñāpyaḥ
siddhasya tasyāśambhavāt, api tu
vibhāvādivibhīryaṇjitaścarvaṇīyaḥ// Ibid.
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Educational and environmental awareness of the slum dwellers: a study in Guwahati, Assam

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ABSTRACT

Education is a process of developing knowledge, skills and habits in the individuals for their larger social adjustment. Educational awareness means developing awareness towards education. Everything which surrounds us may collectively be termed as the environment. Environmental Awareness is an awareness and subsequent desire to preserve natural resources and the environment. The largest proportion living in slums in the world is in the Asian region. This fast growing slum population has been witnessed in Assam and in Guwahati as well. Guwahati has 90 slum pockets. The slum areas of Guwahati suffer from different educational and environmental problems. Hence, the study will be a small attempt to study the educational and environmental awareness among the slum dwellers of Guwahati, Assam. The educational and environmental problems of the slum areas can be solved by making slum dwellers aware towards education and environment.

Key Words: Education, Educational Awareness, Environment, Environmental Awareness, Slum, Guwahati, Assam.

INTRODUCTION

Education is a process of developing knowledge, skills and habits in the individuals for their larger social

adjustment. It makes an individual civilized, refined, cultured and educated. It is the key to solve the various problems of life. Educational awareness means developing awareness towards education.

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Everything which surrounds us may collectively be termed as the environment. Education can develop the sense of awareness towards environment. Environmental Awareness is an awareness and subsequent desire to preserve natural resources and the environment. Environmental Education refers an education through the environment, about the environment and for the environment. It can develop the sense of awareness, knowledge, understanding and promote new skills in facing the problems of environment.

The slums though an important part of the urban life are yet often neglected by all. Thus, slums suffer from problems of poverty, unemployment, urban decay and illiteracy thereby resulting in social problems of crime, drug addiction, alcoholism, high rates of mental illnesses, child labour and suicide. They exhibit high rate of disease due to unsanitary conditions, malnutrition and lack of basic health care. Low socio-economic status of its residents characterizes the slum population. A solution for meeting the challenges of slums is education. Education is an index of development of a nation and has positive effects on the functioning of a society. Though the government has taken up various schemes for universalisation of education and programmes of creating awareness towards environment in the country, still, the scenario of slums in the

country is quite disheartening.

The people living in slums in Guwahati mostly come from outside the State and start living in slums and near the railway track on the land belonging to the railways. In these slum areas all sorts of services are inadequate and general environmental scenario is hazardous. The dwellers of slum areas suffer from poverty, misery, exploitation, humiliation, insecurity, inequalities, lack of education and environmental degradation. Slum areas lack of adequate and clean water, unsafe waste disposal systems, lack of adequate and nutritious food. Hence, the study will be a small attempt to study the educational and environmental awareness among the slum dwellers of Guwahati, Assam.

NEED AND SIGNIFICANCE OF THE STUDY

Guwahati is the largest commercial, industrial and educational center of the North-East region. In Guwahati slums are increasing. It has 90 slum pockets. These slums do not receive the necessary attention in regards to development. An important factor of development is education but the slums in the study area are educationally backward and lack the necessary educational facilities. The slum areas of Guwahati suffer from different educational and environmental problems. *The problems of slum areas can be tackled through the*

means of education. Therefore the present study is aimed at studying the educational and environmental awareness among the dwellers of slum in Guwahati, Assam.

AREA OF THE STUDY

The population of the world is gradually increasing in an unprecedented manner. With this, gradual increase in the population of the slum has also been noticed. And it has been projected that by 2020, the world's slum population would be about 1.4 billion (UN-HABITAT, 2006). The largest proportion living in slums in the world is in the Asian region, which is also urbanizing at the fastest rate. This fast growing slum population has been witnessed in Assam and in Guwahati as well. The slums that have mushroomed in different parts of the city have not only become eyesores but also a serious cause of concern for urban planners.

Guwahati is a fast growing metropolis and the most important city of the region. Slum areas are growing fast in the metros. Guwahati city comprises many big and small slum areas and pockets, where people are living below poverty line, in unhygienic and insecure conditions. Most of them do not have easy access to schools, hospitals or public places for the community together. There are 90 slum pockets and the approximate population is 1,67,796 as per information provided by Guwahati Development Department,

Dispur, Guwahati. Out of 90 slum pockets of Guwahati city, Assam, 2 slum pockets i.e. Santipur, Bhutnath and Dhirenpara, Ujjal Nagar were selected for the present study.

OBJECTIVES OF THE STUDY

1. To compare the level of awareness among the slum dwellers of Santipur, Bhutnath and Dhirenpara, Ujjal Nagar towards education.
 2. To study and compare the literacy rate of the slum dwellers of both the slums.
 3. To compare the level of awareness among the slum dwellers of Santipur Bhutnath and Dhirenpara, Ujjal Nagar towards environment.
 4. To study and compare the general environmental condition of both the slums.
- A study was conducted by Saikia in June (2012) (Journal of Education and Development, Multi-disciplinary, Peer Reviewed Journal) with the topic "*A study on Educational and Environmental Awareness of the Slum Dwellers of Guwahati City, Assam*". The main objectives of the study were - to study and compare the literacy rate among slum dwellers, to assess the level of awareness towards health and hygiene among slum dwellers and environmental sanitation among women and to find out the rate of child

labours of Paltan Bazar and Madrasi Patti Slum. The major findings of the study were - the child literacy rate, sanitary practices, awareness of women regarding environmental sanitation of Madrasi Patti slum is higher than Paltan Bazar. Also there is no child labour in Madrasi Patti slum as against the opposite picture in Paltan Bazar Slum.

- Borah and Gogoi (2012) (Multidisciplinary International Journal) studied growth of slum areas and changing land use pattern in Guwahati city, India. This paper was an attempt to study the growth of slums in Guwahati, the nodal centre of North East India and its impact on the changing land use pattern of the city.
- A study entitled “*A field study report on Educational Awareness of the Slum Dwellers of Guwahati City with special reference to Paltan Bazar Slum Area*” was conducted by Baruah (2010) as per requirement of M.A. degree under Gauhati University. The objectives of study were – to find out the literacy rate of slum dwellers, work pattern of slum dwellers and rate of child labourers of slum area. The findings of the study were – the literacy rate of parents and children were very poor, the work pattern of slum dwellers belongs to lower level (like sweeper, coolie etc) and the rate of child labour is increasing day by day in Paltan Bazar Slum Area.
- Gogoi (2007) studied about the *social problems of urban poor in Guwahati city*. The main objective of the study was to identify different groups of urban poor in Guwahati city, to find out the cause of their problems and to assess the impact of these problems on cities environment. The study reveals the fact that the number of the slum in the city as recorded by different Government agencies does not tally with each other. Moreover, these authorities enlist only those slums where different slum related schemes can be implemented.
- A study “*Dynamics of Slum formation in selected towns of western Assam*” was conducted by Das (2006) under Gauhati University. The investigator studied about existing slums, the origin of the people, reasons for migration, per capita income along with nature of service, etc.
- Lahkar (1991) is one of the pioneers to study the slums in Guwahati. In his work, *The Slums of Guwahati City: A Geographical Analysis*, he had discussed the status of slum in Guwahati city and attempted to analyze the spatio-temporal aspect of slums with the socio-economic operations of the slum dwellers. He covered all the aspects of slums in Guwahati city like population, income expenditure, housing condition etc.

DELIMITATION OF THE STUDY

The present study is limited in terms of sample, educational and environmental condition and content. Due to the limited period of time it is not possible to make an extension survey of all the slum pockets available in greater Guwahati. Therefore, the present study has the following limitations -

- The study was delimited to Guwahati, Assam.
- Out of 90 slum pockets of Guwahati, only 2 slums were taken for the present study.

OPERATIONAL DEFINITIONS OF THE TERMS

- **Education:** Education is a process of developing knowledge, skills and habits in the individuals for their larger social adjustment.
- **Educational Awareness:** Educational awareness means developing awareness towards education.
- **Environment:** Everything which surrounds us may collectively be termed as the environment.
- **Environmental Awareness:** Environmental Awareness is an awareness and subsequent desire to preserve natural resources and the environment.
- **Slum:** A slum is a run-down area of a city characterized by squalor and lacking in tenure security.

- **Guwahati:** Guwahati is a fast growing metropolis situated on the banks of river Brahmaputra.
- **Assam:** Assam is a northeastern state of India. Its capital is Dispur, located within the municipal area of Guwahati city.

METHODOLOGY

The present study was based on descriptive survey method.

SAMPLE

For the present study, 50 slum dwellers (25 male and 25 female) from Santipur Bhutnath and 50 slum dwellers (25 male and 25 female) from Dhirenpara, Ujjal Nagar has been selected by using purposive sampling technique. The total number of sample taken for the present study was 100.

TOOLS FOR DATA COLLECTION

In this study, following tools were used for collection of data –

- Self-structured Questionnaire.
- Interview Schedule.
- Observation Tool.

STATISTICAL TECHNIQUES

In the present study simple percentage and bar graphs were used.

ANALYSIS AND INTERPRETATION OF DATA

Analysis and interpretation of data has been done on the basis of the objectives of the study.

Objective 1: To compare the level of awareness among the slum dwellers of Santipur, Bhutnath and Dhirenpara, Ujjal Nagar towards education.

Table 1. Level of Awareness among the Slum Dwellers towards Education

Sl. No.	Statements	Santipur, Bhutnath				Dhirenpara, Ujjal Nagar			
		Aware		Not Aware		Aware		Not Aware	
		Total	%	Total	%	Total	%	Total	%
1	Children should be given Education and Child	14	28	36	72	3	6	47	94
2	Girls and Boys should be given Equal Rights to	28	56	22	44	11	22	39	78
3	School should be established	34	68	16	32	19	38	31	62
4	Education should be	6	12	44	88	2	4	48	96

From the study it has been found that regarding the level of awareness towards education the dwellers of Santipur, Bhutnath were more aware in relation to education for children (28%), equal rights to education for girls and boys (56%), establishment of school (68%) and education for adults (12%) in comparison to the dwellers of Dhirenpara, Ujjal Nagar.

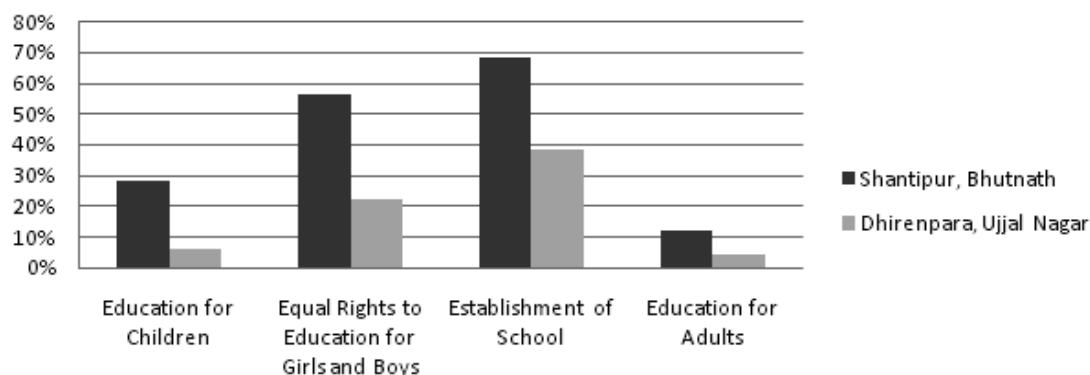


Figure 1. Level of Awareness among the Slum Dwellers towards Education

Objective 2: To study and compare the literacy rate of the slum dwellers of both the slums.

Table 2. Literacy Rate of the Slum Dwellers

Slum Dwellers	Santipur, Bhutnath						Dhirenpara, Ujjal Nagar					
	Total		Literate		Illiterate		Total		Literate		Illiterate	
		%	Total	%	Total	%		%	Total	%	Total	%
Male	25	50	17	34	8	16	25	50	12	24	13	26
Female	25	50	11	22	14	28	25	50	9	18	16	32
Total	50	100	28	56	22	44	50	100	21	42	29	58

From the study it has been found that in Santipur, Bhutnath, 56% dwellers were found to be literate and 44% were illiterate. On the other hand, in Dhirenpara, Ujjal Nagar 42% dwellers were found to be literate and 58% were illiterate.

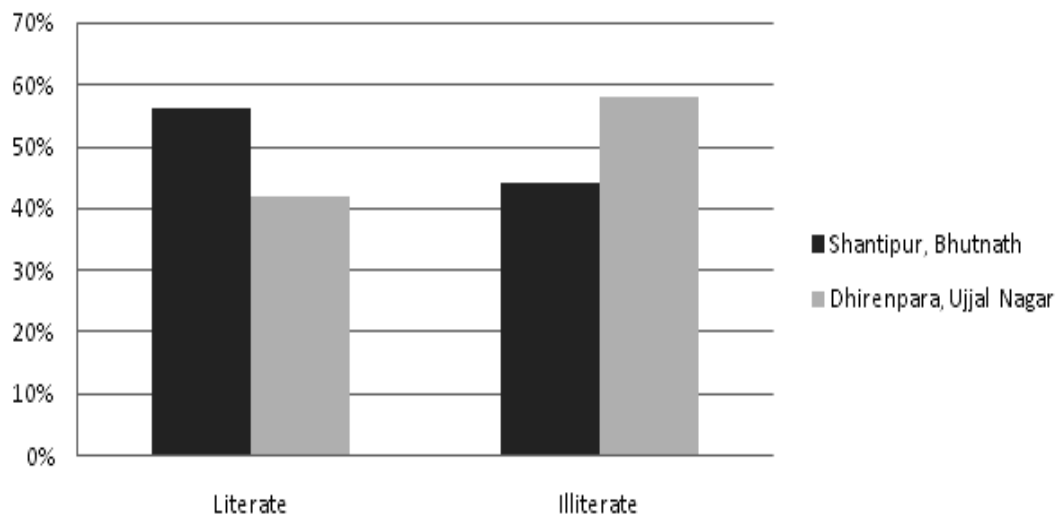


Figure 2. Literacy Rate of the Slum Dwellers

Objective 3. To compare the level of awareness among the slum dwellers of Santipur Bhutnath and Dhirenpara, Ujjal Nagar towards environment.

Table 3. Level of Awareness among the Slum Dwellers towards Environment

Sl No.	Statements	Santipur, Bhutnath				Dhirenpara, Ujjal Nagar			
		Aware		Not Aware		Aware		Not Aware	
		Total	%	Total	%	Total	%	Total	%
1	Home Environment should be cleaned.	21	42	29	58	15	30	35	70
2	Drinking Water should be boiled.	18	36	32	64	13	26	37	74
3	Household Waste should be gathered at one particular place.	7	14	43	86	4	8	46	92
4	Bathrooms and Toilets should be constructed.	30	60	20	40	23	46	27	54
5	Drainage System should be there in every Household.	26	52	24	48	12	24	38	76

From the study it has been found that regarding the level of awareness towards environment the dwellers of Santipur, Bhutnath were more aware in relation to home environment (42%), drinking water (36%), household waste (14%), bathrooms and toilets (60%) and drainage system 52% in comparison to the dwellers of Dhirenpara, Ujjal Nagar.

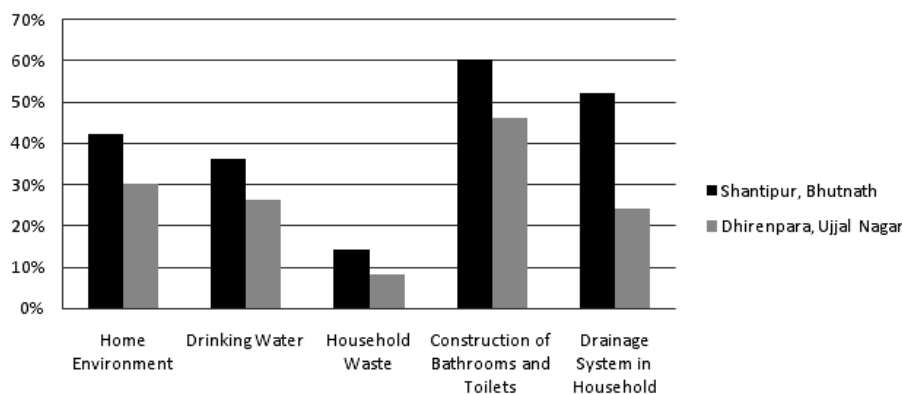


Figure 3. Level of Awareness among the Slum Dwellers towards Environment

Objective 4. To study and compare the general environmental condition of both the slums.

Table 4. Sources of Water

Sources of Water	Santipur, Bhutnath		Dhirenpara, Ujjal Nagar	
	Total	%	Total	%
Well	5	10	-	-
Tube Well	18	36	2	4
Municipal Water Supply	24	48	17	34
Other	3	6	31	62

From the study it has been found that in Santipur, Bhutnath, 10% well, 36% tube well, 48% municipal water supply and 6% dwellers were using water from other sources. But in Dhirenpara, Ujjal Nagar, 4% tube well, 34% municipal water supply and 62% dwellers were using water from other sources.

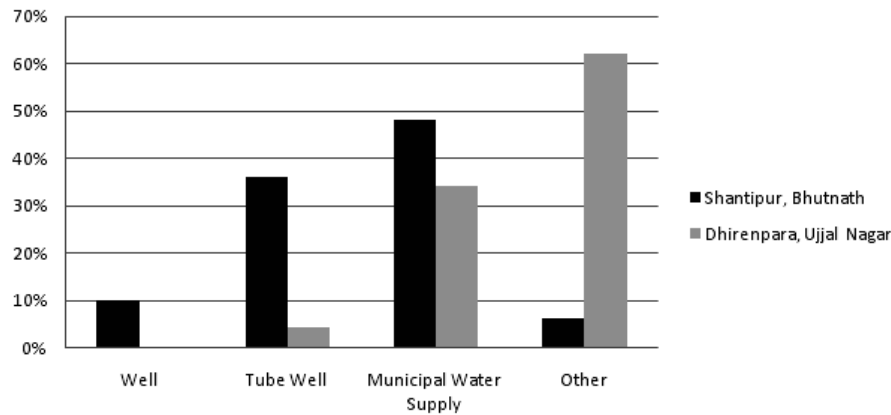


Figure 4. Sources of Water

Table 5. Disposition of Household Waste

Disposition of Household Waste	Santipur, Bhutnath		Dhirenpara, Ujjal Nagar	
	Total	%	Total	%
Dumping Away from Habitation	13	26	-	-
Throwing Here and There	37	74	49	98
Burning	-	-	1	2

From the study it has been found that regarding the disposition of household waste, in Santipur, Bhutnath, 26% dwellers dump away from habitation and 74% throw here and there. On the other hand, in Dhirenpara, Ujjal Nagar, 98% dwellers throw here and there and 2% burn their household waste.

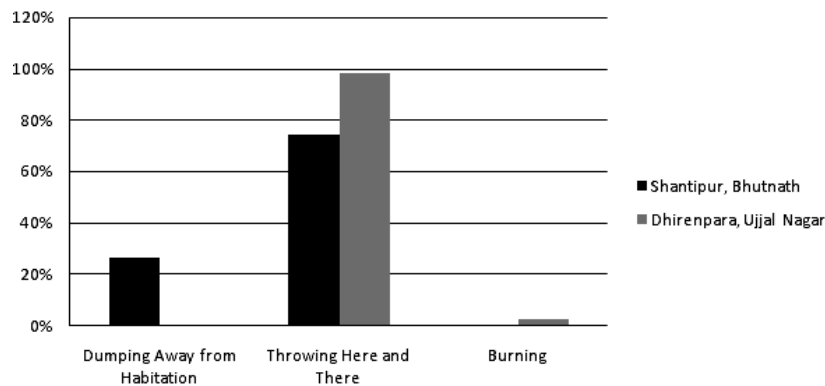
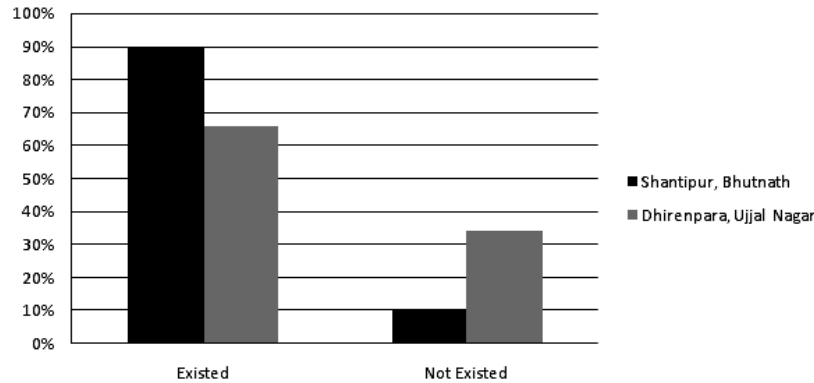


Figure 5. Disposition of Household Waste

Table 6. Drainage System

Drainage System	Santipur, Bhutnath		Dhirenpara, Ujjal Nagar	
	Total	%	Total	%
Existed	45	90	33	66
Not Existed	5	10	17	34

From the study it has been found that in Santipur, Bhutnath, according to 90% dwellers drainage system was existed and according to 10% dwellers drainage system was not existed. But in Dhirenpara, Ujjal Nagar, according to 66% dwellers drainage system was existed and according to 34% dwellers, drainage system was not existed.

**Figure 6. Drainage System****Table 7. Places of Defecation**

Places of Defecation	Santipur Bhutnath		Dhirenpara Ujjal Nagar	
	Total	%	Total	%
Pit latrines	24	48	9	18
Jungle	17	34	26	52
In Open Areas	9	18	15	30

From the study it has been found that regarding the places of defecation, the slum dwellers of Santipur Bhutnath, 48% were using pit latrines, 34% were going to jungle and 18% were using open areas. But on the other hand, the slum dwellers of Dhirenpara, Ujjal Nagar, 18% were using pit latrines, 52% were going to jungle and 30% were using open areas for defecation.

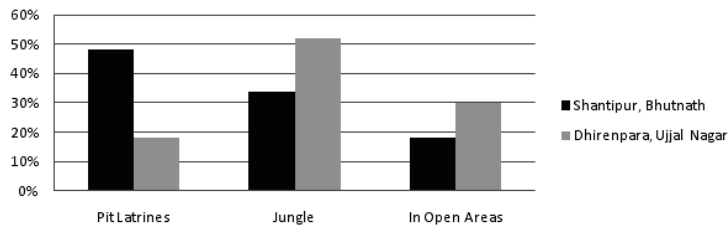
**Figure 7. Places of Defecation**

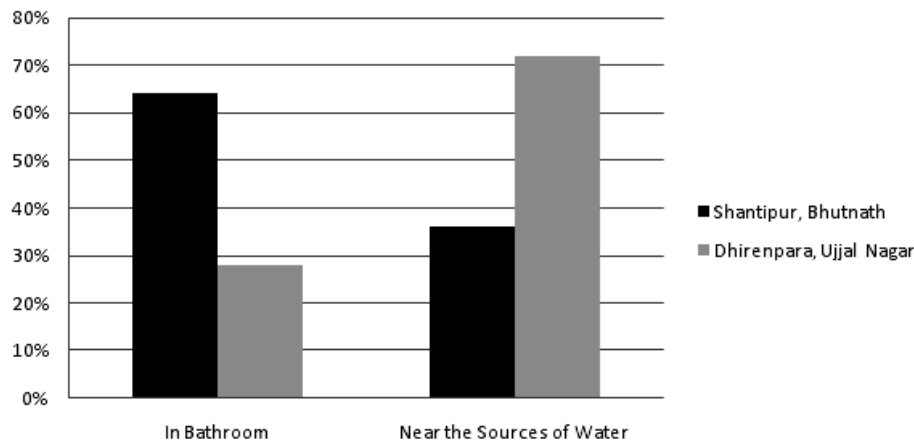
Table 8. Places for Bathing, Washing Clothes and Utensils

Places	Shantipur, Bhutnath		Dhirenpara, Ujjal Nagar	
	Total	%	Total	%
For Bathing				
• In Bathroom	32	64	14	28
• Near the Sources of Water	18	36	36	72
For Washing Clothes				
• Inside the Bathroom	11	22	5	10
• Near the Sources of Water	39	78	45	90
For Washing Utensils				
• Inside the Kitchen	6	12	-	-
• Outside the Kitchen	10	20	14	28
• Near the Sources of Water	34	68	36	72

From the study regarding the places for bathing, it has been found that the slum dwellers of Shantipur, Bhutnath, 64% were taking their bath in bathroom and 36% near the sources of water. On the other hand, the dwellers of Dhirenpara, Ujjal Nagar, 28% were taking their bath in bathroom and 72% near the sources of water.

Regarding the places for washing clothes, the dwellers of Shantipur, Bhutnath, 22% were washing their clothes inside the bathroom and 78% near the sources of water. But the dwellers of Dhirenpara, Ujjal Nagar, 10% were washing their clothes inside the bathroom and 90% near the sources of water.

Regarding the places for washing utensils, the dwellers of Shantipur, Bhutnath, 12% were washing their utensils inside the kitchen, 20% outside the kitchen and 68% near the sources of water. But the dwellers of Dhirenpara, Ujjal Nagar, 28% were washing their clothes outside the kitchen and 72% near the sources of water.

**Figure 8.** Places for Bathing

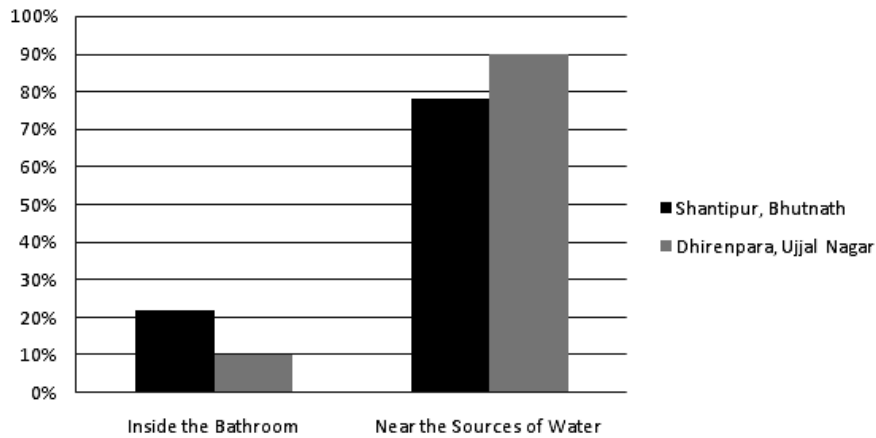


Figure 9. Places for Washing Clothes

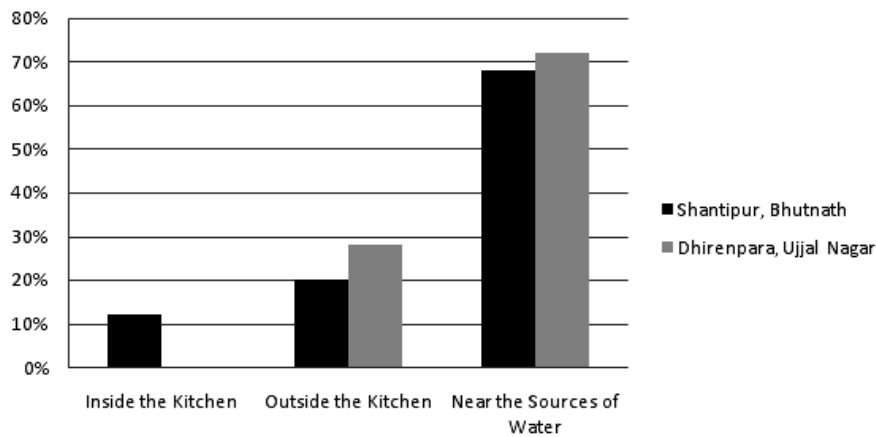


Figure 10. Places for Washing Utensils

MAJOR FINDINGS

The major findings of the present study were -

- From the study it has been found that the slum dwellers of Shantipur, Bhutnath were more aware towards education than the slum dwellers of Dhirenpara, Ujjal Nagar.
- Regarding the literacy rate of slum dwellers, the rate of Shantipur, Bhutnath was higher than Dhirenpara, Ujjal Nagar.
- The study also revealed that the awareness level of the dwellers of Shantipur, Bhutnath was comparatively higher than the

Dhirenpara, Ujjal Nagar.

- From the study it has been found that maximum dwellers of Shantipur, Bhutnath were using municipal supply water. But in Dhirenpara, Ujjal Nagar maximum dwellers were using water from other sources.
- Regarding the disposition of household waste, the dwellers of Shantipur, Bhutnath were found more aware than Dhirenpara, Ujjal Nagar.
- It was also found that regarding the drainage system, the dwellers of Shantipur, Bhutnath were found more aware than Dhirenpara, Ujjal Nagar.
- In Shantipur, Bhutnath maximum dwellers were used pit latrines for defecation. But dwellers of Dhirenpara, Ujjal Nagar were not aware of the pollution related to defecation.
- The study also revealed that regarding the places for bathing, washing clothes and utensils, the dwellers of Shantipur, Bhutnath, were more aware than the dwellers of Dhirenpara, Ujjal Nagar.

OTHER FINDINGS

- Most of the people of these slum areas were found to be unaware about their education as it is the fundamental right of every people.
- As most of the people of the study area were also found to be unaware about the problems associated with the environment and are unwilling victims

of the pollution at their house and at the working sites.

- Generally, these locations are in the area which is unfit for human habitation. Unhygienic conditions, open defecation system, burning of wood inside ill ventilated rooms, ill- habits such as chewing of tobacco, smoking, drinking, least care about health, domiciliary deliveries etc. are the major risk factors to the people of study area.
- In these slum areas all sorts of services are inadequate and general environmental scenario is hazardous.
- There were inadequate infrastructures, lack of proper sanitation and drinking water facilities.
- In the present study, the diseases such as cholera, dysentery, diarrhea Malaria and Viral fever, Respiratory disease, skin diseases and others were common in the slums.

SUGGESTIONS

- Government should provide more and more facilities for education of the slum dwellers.
- Educational awareness programmes must be organized by government as well as NGOs in slum areas.
- Child labour and early marriage should be stopped, they should be given education.
- Government must introduce adult education programme to educate the

adult slum dwellers.

- The promotion of education will help in the overall development of slum dwellers and will also make them aware about their rights and to a greater extent will improve the conditions of the poor and illiterate especially women. Large number of programmes has been launched by the Government
- Environmental awareness programme must also be organized by government as well as NGOs in slum areas.
- Environment related awareness programmes like – cleanliness of surroundings, safe drinking water, etc. should be organized.
- Facilities like water supply, sewerage and drainage, community toilets and bathrooms should be provided for the slum areas by the Government.
- Proper housing provisions, free education, free medical aid etc. should be provided by the government.
- Mass media like radio, television, newspaper, posters etc. can play important roles in making slum dwellers aware towards education and environment.
- Government should improve sanitation facilities, solid waste management, electrification, proper drinking water supply etc.
- Courses such as dairy, farming, weaving and tailoring, candle making, mushroom cultivation, etc. should be started by the Government and Non-

Governmental Organizations (NGOs) so that their economic standard can be uplifted and at the same time their quality of life can be improved.

- Rural and cottage industries such as rice-milling, garment industry, cotton and wool industry need to be upgraded with subsidies and incentives, which will prevent the migration from the native town to other states.
- Government as well as NGOs must take up developmental projects in the slum areas.

CONCLUSION

- The Government should not allow slums to increase in the city; rather the Government should abolish the settlement of people in the slum areas step by step so that in course of time the slums are totally abandoned for healthy growth of the city. The State receives fund from the Union Government should be effectively utilized for upliftment of slum areas which is undertaken for improving the overall living conditions of slum dwellers by constructing low cost houses with proper toilets, drinking water provisions, health care centers, schools, community halls etc. The educational and environmental problems of the slum areas can be solved by making slum dwellers aware towards education and environment.

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Socio-Economic Status of Women in Home-Based Industries (HBIs) in Sonitpur District, Assam

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ABSTRACT

Women constitute about half of the population of the world and therefore no country achieve optimum development as long as women remain depressed and exploited. Women participation in work is an important aspect of their status and empowerment. Because, economic dependence of women on men is one of the main cause of exploitation of women. Home-Based Industries (HBIs) can help women in self-employment and it is more secure than other modes of earning, i.e. earning cum dwelling. The study is based on the socio-economic status of women in Home-Based Industries in Sonitpur District of Assam. The study is exploratory and conducted on 55 HBIs from the four major towns of Sonitpur District viz. Tezpur, Dhekiajuli, Biswanath Charali and Gohpur by using non-probabilistic judgment sampling method. Primary data were collected through personal interviews and schedules. It has been found that the Home-Based Industries can uplift the socio-economic status of women in the district which needs proper policies, guidance and support from varies government and non-government agencies.

Key words: Socio-economic status, Entrepreneurship, Home-based Industries

INTRODUCTION

A country can achieve development to the fullest extent only if all human

resources in it are being utilized to the optimum level. This implies that both men and women must participate equally in the achievement of this goal. Women constitute

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about half of the population and therefore there cannot be happiness and full development as long as women remain depressed and exploited. No society can be free, fair and just until its women enjoy freedom, justice and opportunities for utilizing their full potential.

Women participation in work is important from the point of view of their status and personal advancement. They need to enter the workforce in all societies on an equal footing with men and get integrated into the world of work. One of the main causes for the exploitation of the females is their economic dependence upon men. It is extremely necessary to educate and empower women, as it is a common saying that when you educate a woman, you are not only educating an individual, but also the entire family and the society. Thus enlightenment and empowerment of women will lead to the enlightenment and advancement of the entire society including the younger generation. In the field of employment and other economic activities women are discriminated. Their personhood however is now being recognized and steps are taken to stop such discrimination and exploitation. Their right to participate in economic activities and seek employment equally with men is now legally recognized and to some extent enforced. Their economic independence and security will enhance –their status, position and end exploitation.

Home-based industries play an important role in economic development of a country, most particularly in under-developed or developing countries. The home-based industries are those industries, which are based on the locally available resources more particularly in village areas. These home-based industries are, mostly run by the members of the family for meeting local requirements. Another great advantage of HBIs is Business from dwelling. Women are traditionally homebound in India; they are very much security concerned. The HBIs provide a great opportunity especially to the rural women to earn for their family from the home itself. Thus, it helps in women empowerment.

Census definition of 'Household Industry' (Home-Based Industries) provides that as an industry conducted by the head of the household himself/herself and/or by the members of the household at home or within the village in rural areas, and only within the precincts (campus) of the house where the household is in urban areas. The larger proportion of workers in a household industry should consist of members of the household including the head. The industry should not be run on the scale of a registered factory. The main characteristic of a home-based enterprise is the participation of one or more members of the household. This character applies in urban areas too.

A home-based industries is one that is engaged in production, processing, servicing, repairing or making and selling (but not merely selling) of goods. It does not include professions such as those practiced by a pleader or doctor or barber, musician, dancer, dhobi, astrologer etc. or merely trade or business, even if such professions, trade or services are run at home by members of the household.

A major portion of the population of Assam lives in villages but employment opportunity in villages is low. Under such circumstances home-based industries playing a vital role by exploiting the local resources and local talent, can come to the rescue of the villagers in producing gainful employment. At the same time, development of such industries will stop migration of labour to urban areas.

The main HBIs in Sonitpur District under this study are, food-processing industry, japi industry, cane and bamboo industry, jute based industry & wood works industry.

Food Processing Industry:

The Sonitpur District in Assam is a good place for development of food processing industry. There are various locally produced raw materials available in this District. The prominent processed items are fruit pulps and juices, canned fruits and vegetables, jams, squashes, pickles etc. One of the important food



Plate 1. Nibedita's Food Products of Tezpur processing items is 'ladu & pitha' (Traditional cake). The 'pitha' food processing industry can supply various types of 'ladu' & pitha' not only to local area but also to different places of Assam. This 'pitha' has a very high demand during seasonal festival (Bihu) in particular and in other social functions in general.

'Japi' (Traditional Head-cap) Industry:

A japi is more advantageous to the cultivators and other open-air workers than the conventional umbrella, because the cultivator after putting it on, can tie the strings around his chin leaving his hands



Plate 2. Woman engaged in making japi at 'Japi Xojia Village

free to work in any position-standing, squatting or stooping. 'Japi' can also be called a poor man's umbrella, because of its cheap price. There is a village in the district, which is known as 'Japi Xojia' near Tezpur town where most of the families are engaged in 'Japi' making with huge demand.

Cane and Bamboo Industry:

Sonitpur District is rich in sylvan resources and most of its forests are richly stocked with bamboos and canes of various species. From time immemorial to the present day, cane and bamboo have formed an integral part of the lives of the people in the North Eastern Region, especially in Assam. The women of Sonitpur District use cane and bamboo for making different types of baskets, toys, hand-fans and various domestic and agricultural implements and they sell this product in the local markets. All these articles can be produced on a cottage and small-scale basis with small and cheap machineries.

Jute Based industry:

Sonitpur district is one of the major jute growing areas of the state. There are some cottage and household industries in S.D, which are very much famous for producing jute bags, jute carpet and wall hangings; these goods can capture the local market in this District.

Wood Works:

India has been a traditional

producer of woodcarvings for ages. This craft flourished under royal patronage for several years. In Sonitpur District of Assam the woodwork home-based industry is a popular industry. Many artisans are engaged in the production of woodcarvings, which is developed on a commercial scale. Different types of wood are used for making different items depending on the local availability of raw materials.

The following literatures are reviewed in order to prepare the paper on "Socio-Economic Status of Women in Home-Based Industries (HBIs) in Sonitpur District" and a synoptic outline of the reviewed literature is given below:

In the advanced countries of the world, there is a phenomenal increase in the number of self-employed women after World War II. In the US, women own 25% of all business, even though their sales on an average are less than 2/5th of those small businesses. In Canada, women own 1/3rd of small businesses and in France it is 1/5th. In U.K., since 1980, number of self-employed women has increased three times as fast as the number of self-employed men.

The Government of India has also undertaken some valuable and positive steps in this regard. "Towards Equality" (1974), which rightly seeks to secure fundamental freedoms of woman on an equal basis with men in the spheres of political, economic, social, civil and culture is a milestone in the history of women

emancipation in India. Home based industries or informal sector, which gained prominence in developing countries like Kenya; Ghana to make sample investigation about employment scenario with reference to developing nations has suitably proved to be best alternative to formal sector where employment opportunities are limited. Woman either as “single woman” or as economic partner of spouse joins this sector in order to overcome economic hardship. Woman face extended form of general disparity and further victimized of existing social structure. This reflects that how badly they are mentally and physically harassed.

A research study entitled, “Entrepreneurial Competencies and Gender wise Variation”, discussed the concept of entrepreneurial competencies as determinants of entrepreneurial success and traces the gender wise variation of the Entrepreneurial Competencies. The findings indicate conclusively that on the whole, successful female entrepreneurs are more like the successful male entrepreneurs and are significantly different from unsuccessful female entrepreneurs. Gender may, therefore, not be determinant of competence level and in turn entrepreneurial success.

“Access to financial services will also help foster the entrepreneurial spirit amongst women and promote social and financial inclusion. The achievement of

Grameen Bank is a prominent example. Today more than 90% of the customers of Grameen (Gramin) Bank are women.”

SCOPE OF THE STUDY

The study is based on the socio-economic status of women in Home-based industries (HBIs) in Sonitpur District. Four major towns viz. Tezpur, Dhekiajuli, Biswanath Charali and Gohpur will be covered in the study.

Home based industries run by household members and employing less than fifteen (15) temporary workers will be considered for the study.

Objectives of the study:

The primary objective of the study is to identify social-economic conditions of women in home-based industries of Sonitpur District. To obtain the main objective of the study following secondary objectives have been formulated:

- (i) To examine the number of women involved in Home Base Industries (HBIs) and their earning pattern in Sonitpur District.
- (ii) To analysis the employment opportunity provided by the Home Base Industries (HBIs) run by women in the district.
- (iii) To analyze the role of women as entrepreneur in Home Base Industries (HBIs) in Sonitpur District.

METHODOLOGY

Research Type:

This study is exploratory. The survey has been conducted on Home based industries like food processing industry, cane and bamboo industry, carpet and weaving industry etc. The study is based on primary data and practical observation, although secondary data has been used to establish the authenticity of the study. The primary data were collected through sample survey. The HBIs has been selected after a scrutiny of the information collected from the DIC and other reliable data sources. As a first step, a pilot survey over five (5) HBIs have conducted and a tentative questionnaire has been prepared.

Study locale:

This survey has been conducted on Home-based industries in Sonitpur District. Four major towns are selected for the study. These are Tezpur, Dhekiajuli, Biswanath Charali and Gohpur. The above mentioned three towns can represent the whole population of Sonitpur District, because the density of population is high in these three towns.

Sample Frame:

To achieve the objectives of the study a sample survey was conducted to know the growth of HBIs run by women. Sampling frame (population of the study) is not clear and definite because the study is

based on most unorganised sector of the economy. The identified & viable HBIs in the district will be selected after the scrutiny of information collected from DIC, Tezpur, Lead Bank Sonitpur and other reliable sources.

Sample Size:

55 numbers of HBIs are taken from various parts of Sonitpur District as sample for the study which includes Tezpur, Dhekiajuli, Biswanath Charali and Gohpur.

Table 1. Distribution of Samples

Town	Sample	Percentage
Tezpur	25	46
Dhekiajuli	15	27
Biswanath Charali	10	18
Gohpur	5	9
Total	55	100

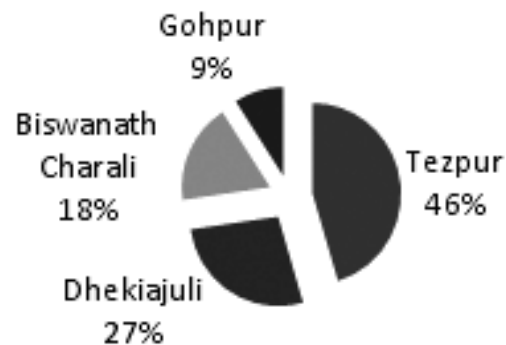


Figure 1. Distribution of Samples No. of HBI

Data Collection Procedure:

As the appropriate sampling frame is not available, probabilistic sampling method cannot be employed. Therefore, non-probabilistic judgment sampling method is used for the convenience of the study. For the purpose of collecting data the respondents have been provided a structured questionnaire. The structured questionnaire has been prepared where variables like, name of the firm, name of the owner, marital status of the owner, firms registration number (if firm is registered), firms registration date, loan amount (if any), name of the bank from where loan has been taken, number of family members involved in the firm, number of workers in the firm, salary structure, availability of raw material etc. has been measured.

Analysis Technique:

After the data collection work is completed, it is tabulated and presented in the form of diagrams such as bar-diagram, pie diagram etc. to know the women involvement in HBIs as well as their socio-economic status. Cross tabulation technique is also adopted for analysis. Chi-square test has been performed to find out existence and degree of relationship between variables. The SPSS package is used for analysis the data.

RESULTS & DISCUSSION**6.1 Gender of the owner of the firms: Out**

of the 55 HBIs studied, it has been found that the 78.2% (43) are female and the rest of 21.8% are male.

Profile of the female owners of HBIs:

Education: While analyzing the education profile of the female respondents, it has been found that most of the owners have education upto 10 or 10+2 level (69.8%). Graduates also comprise a major chunk of the respondents (20.9%)

Marital status: The marital status analysis shows almost equal distribution between married (53.5%) and unmarried (41.9%), while widow comprises a very small part of the respondents (4.7%).

Types of HBIs run by women: While analyzing the type of industries run by women, it has been found that the Food Processing Industry comprises a major portion i.e. 16 (37.2%) HBIs. The Handloom & Weaving Industry also comprises the second larger portion of HBIs in the district, which are 10 (23.3%) HBIs. While Art and Craft (1), Wood Works (1), Jute Goods (2), takes a very small portion i.e. 4 (9.3%) expect Cutting and Tailoring and Doll Making Industries which was 7 (16.2%) and 6 (14%) respectively.

Earning: It has been found that most of the household income of the families belongs to Rs.5000 to Rs.20000 per month i.e. 29 (67.5%) and 6 (14%) families have household income more than Rs.20000 and

above, where 8 (18.6%) families have below Rs.5000.

Loan: By analyzing the amount of loan taken by the HBIs, it has been found that only one (2.3%) HBI has taken highest amount of Rs.75000 as loan. 16 (37.3%) HBIs have taken loan amounting to Rs. 30000 to Rs. 70000. And only 3 (7%) HBIs have taken loan amounting to Rs.20000 to Rs.25000.

Employment: The highest number of employees in a HBI is 8 persons; the general trend of the employment is 4 persons. 5 (11.6%) HBIs have run by single person and only one HBI (2.3%) have employed 8 persons, while 10 (23.3%) HBIs have run by 2 persons.

Female Employment and Earning Pattern: It has been found that in the 55 HBIs surveyed, a total number of 199 are employed out of which 149 are female. Hence, it can be concluded that the HBIs of Sonitpur District are mainly run by female. The break-up of 42 is in managerial level, 22 are in supervisory level and 85 are working as workers in the HBIs surveyed.

Comparison earning and female managerial level: While comparing female engaged at the managerial level and income level, it has been found that 15 firms employing female at the managerial level earned Rs.10, 000-Rs.20, 000 per month and 14 firms employing female at managerial level earned Rs.5,000-

Rs.10,000.

To verify the existence of relationship between earning and female managerial, a chi-square test has been carried out and it has been found that there is relationship between earning and female managerial level at 5% Level of Significance, Karl Pearson Chi-square Value : 8.303, d.f. 3

Suggestions:

- (1) Government's support to HBI: To get the real success of HBI, we need a very powerful support from Government system. For an industry the productivity cannot be the only concern, it needs the right exposure, good market and profit for sustainability. The study covers the HBIs, running by the women and they are not very viable economically, Government policy should be so that they can get financial back-up and assistance for marketing the products. Government can initiate strong channels for export the products and try to produce a good market in the urban areas. The government regulation should be flexible enough to give the opportunities to the producers to build up relationship between either with any non-government organization or any commercial partner.
- (2) Professional training to the Producers: It has been found in the analysis that, in

case of some HBIs, the products are not very fine to compete with in the market. Besides that, they are not efficient enough to deal with financial matters of the product. So it is very much essential for them to go through proper training in preparing the products, financial deals, marketing etc.

- (3) **Large scale production:** It has been noticed that most of the HBIs are run by individuals. As a result the production is very less. It is suggestible if the production be done in group form by making cooperatives or by forming Self-Help Groups (SHG), the productivity will be in large scale and profitability will be high. Besides that in group they will be able to have banks loans easily and take advantage of the schemes of Cooperative bodies, NABARD, and other Govt. Institutions.
- (4) **Guidance:** If any NGO or govt. organization provide guidance to the owners of HBIs, the business will be more sustainable. They can be guided with the new schemes and policies of Government. Besides that they can also have the understanding of marketing and financial matters of HBIs.
- (5) **Developing proper distribution channel for the products of HBIs:** During the observation it has been

found that selling of the products of HBIs is the biggest hurdle for the producers. Hence, importance should be given in establishing a strong distribution and marketing channel for the HBIs.

- (6) **Soft loan:** To start any business the financial back up is very much required. In the social system in Sonitpur, It is noticed that the women have hardly any financial ownership nor any financial support from the counter part to start a business for such women is a big challenge. If they can get financial loan to build up HBI, it will give high success rate to such industry.

CONCLUSION

From the study, it is clear that there are different types of HBIs in Sonitpur District they are food processing industry, cane and bamboo industry, handloom and weaving industry, doll making industry, wood works industry, jute based industry etc. This survey is based on 55 HBIs in Sonitpur District, from which 43 of HBIs are run by women. Out of which more than 60 percent HBIs are food processing more than 70% and handloom and weaving industry. Most of these industries are managed and supervised by women. From 55 HBIs 12 HBIs are run by male, but here women also plays an important role. Most

of the owners of the HBIs are not taken any loan from government and private parties; they invest their own capital. And most of them are not taken any training. Without any loan and any training they managed their HBIs properly. If government offer loan at low interest rate and if they can get proper training then HBIs in Sonitpur District can capture the world market and reduce unemployment. From the above survey it is clear that, the proper development of HBIs can reduce the unemployment problem and it also can help to improve the socio-economic status of women in Sonitpur District. But to attain the above-mentioned destination, proper endeavours must be taken to make women more educated. In this regard, the zeal and attempt of the Govt. must be positive.

Women empowerment has developed in connection with improving the status of women. It is thought that political empowerment or economic empowerment will improve conditions for women and they will be closer to getting justice and equality. The empowerment of woman and education can give economic independence and security, which can improve their socio-economic status, position and reduce exploitation. It can be

concluded that the home-based industries can uplift the socio-economic status of women in the District by improving securing and social status.

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Nature conservation and sustainable ecotourism development with special references to Olive ridley sea turtle along Ganjam coast, Southern-Odisha

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ABSTRACT

Today nature and environmental concern is an integral part of human society which can be traced even in the practices of our older civilizations. In those civilizations it is deemed that the survival of mankind is inseparably linked with the grace of the surrounding environment. This study deals with an ecotourism site set in a coastal area in Ganjam coast, Odisha. The method involved using tourists who had travelled to Ganjam coastal area as respondents to a questionnaire survey. The data was analyzed using SWOT strategies, and a descriptive analysis was carried out as a suitable way to achieve the main goal of the research. The analysis of the results of each group surveyed includes a meaningful correlation between the effects of Olive ridley sea turtle, ecotourism and sustainable development strategy in Ganjam coast for protecting the coastal biodiversity and natural environment. The aim is to highlight those aspects which will increase the levels of tourist knowledge, biodiversity conservation, cultural exchange, public participation, investment, alternate livelihood, employment generation and others. It is also suggested that some solutions are identified in ecotourism which are key elements for environmental protection and sustainable development of the coastal area for long term.

Keywords: Olive ridley, biodiversity, livelihood, ecotourism, Ganjam coast

INTRODUCTION

Now a day, ecotourism as a developing activity in the world, and its

economic role, are often an integral part of the income of many countries, and every development of the industry will have

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effect on society (Estelaji, and Nezhad, 2011). With 6.23% national GDP and 8.78% employment contribution, tourism is the largest service industry in India. Tourism industry is also known as an “Integrated” industry, as it has links with many allied sector which provide adequate service to the tourist. Indian tourism industry ranks 6th in terms of price competitiveness (Jennifer and Thea, 2007; Chakraborty 2012). In this regard, ecotourism, as one of the most significant types of tourism industry, has become involved with development. Now many countries of the world have found that their ability to achieve more income from the tourism industry is a simple way of creating job opportunities (Hashtjien, and Khoshnood, 2007).

Ecotourism is nature welcoming based responsible tourism, which must incorporate with the category of elements of nature based, ecologically, socially, culturally, economically sustainable, educational interpretative and locally participatory. Various promotional activities were conducted to encourage ecotourism in Ganjam coastal area of the twenty eighty villages. It is entirely a new approach in tourism and a preserving travel to natural areas to appreciate the cultural and natural history of the environment, taking care not to disturb the integrity of the ecosystem, while creating economic opportunities that make conservation and protection of natural resources or biodiversity advantageous to the local people. In short, it can be

categorized as tourism programme of nature based, environment and ecologically sustainable, where education and interpretation is a major constituent and local people are benefited with livelihoods and employment generation. Eco-tourism or coastal tourism is a form of tourism that appeals to the biodiversity, livelihood and socially conscious people. It is the travel to places where flora, fauna, natural heritage etc. is the primary attraction. Ecotourism is an alternative form of tourism which will permit the sustainability of the ecosystem. Conscious ecotourism includes programs that lessens the unpleasant effects of traditional tourism on the natural environment, and enhance the cultural integrity of local people. The ambition of eco-tourism is not only for well human being but also to integrate the local culture, volunteers for the wilderness adventures of nature and learn the new way of living. (ICZM Project, 2009).

The endorsement of ecotourism should be compatible with the natural environment, because a successful tourism industry will only happen with environmental conservation of the highest order (Karimi and Makhdum, 2009). For waste arising from the unplanned development of tourism activities has destroyed environmental marine habitats surrounding coastal areas. These facts reveal that the balance between tourism and marine environment is quite susceptible, and to sustain balance between these two we must have develop program with a

adequate knowledge of marine environment that to avoid these circumstances it will be necessary to have suitable planning and sustainable tourism development in coastal areas (Porokhshvari, 2010). This relationship in the southern areas of Odisha, particularly in the coastal areas of Ganjam, was considered because of the great natural attractions, suitable climate, and the forest location. In this way tourists are attracted to Ganjam by the temple, lake and sea as it creates a unique environment which is valued by many tourists for entertainment, relaxation, swimming, and enjoyment of the beautiful view. One of the major reasons for this is the easy and accessible routes in the coastal areas. During recent years the local tourism has been a concern for organizational experts, local communities, NGOs and researchers. The aim of this study is to evaluate and validate the positive and negative impacts of ecotourism on the environment and the sustainable development in the area of Ganjam coast.

One important role in the coastal ecotourism is community-based ecotourism of (Kersten, 1997) which can be defined as a community based coastal ecotourism, containing significant biodiversity values, ecological services, and cultural values, voluntarily conserved by indigenous and local communities, through customary laws or other effective means. The emphasis of this strategy is community development through participation of the marginalized

sector (including indigenous groups) rather than on regional or national development. It also has the following aims:

1. Assessment of coastal conservation, sustainable ecotourism and to help preserve coastal ecology of the area.
2. Community based coastal ecotourism through a revival or preservation of natural environment, traditional practices and cultural techniques.
3. Recommendations for action to realize community based eco-tourism development at this area.

MATERIAL AND METHODS

The district got its name from the word "*Ganj-i-am*" which means the Granary of the World. The district is named after the Old Township and European fort of Ganjam situated on the northern bank of river Rushikulya which was the head quarter of the district. Ganjam district has been blessed with beautiful and mineral rich coast extended over 60 km. It provides unique opportunity for fishing and port facility at Gopalpur for international trade. The rivers like Rushikulya, Dhanei, Bahuda, Ghoda Hada are the source of agriculture and power sectors of the district. The Chilika Lake which attracts international tourist known for its scenic beauty and a marvellous bird's sanctuary is situated in the eastern part of district. A mix of moist peninsular high and low level Sal forests, tropical moist and dry deciduous and tropical deciduous forest types provide

a wide range of forest products and unique lifestyle to wild lives. The district is characterised by an equable temperature all through the year, particularly in the coastal regions and by high humidities. The cold season from December to February is followed by hot season from March to May. The period from June to September marks the South West Monsoon and 70% of annual precipitation is received during this period. The normal rain fall of this district is 1444 mms. May is the hottest month. With the arrival of the monsoon by about the second week of June the day temperature decreases slightly while the night temperature continue as it was in the summer. Towards the end of September, after the withdrawal of south west monsoon, temperature decreases progressively. December is the coldest month. As of 2011 India census, Ganjam had a population of 3,520,151. Males constitute 50.49% of the population and females 49.51%. Ganjam has an average literacy rate of 71.88% male literacy is 81.85%, and female literacy is 61.84%. Total child population age between 0–6 years is 11.30% of the total Ganjam population. Sex ratio is 981 and density of population (persons per km²) is 429 (Annonymus, 2011).

To complete the objectives of the study, before the field visit questionnaire consisting of open and close ended questions. The primary and secondary data has been collected from different categories of fields, people and institutions involved in

promoting ecotourism industries. The primary data has been collected mainly inspection of the field, formal and semi-formal interviews with tourists and local community, use the statistically designed questionnaire to collect the opinions and information from the local residents, tourists and the staff of the department and SWOT analysis for defining the strategies. The secondary data has been collected during different stage of work. Interview questionnaires were translated in Odia/Telgu (local language) and after getting the answers from the villagers they were retranslated into English for further processing. The tourists were also given a separate questionnaire and they were interviewed (n=160) during our study period on April 2012 to October 2013. After collecting the questionnaire the data obtained were analyzed using the computer software.

RESULTS AND DISCUSSIONS

Olive ridley sea turtle sensitization program:-

We were randomly selected those village i.e. New Bauxipalli, Markundi, Ramayapatna and Sunapur village to meeting and discussion with local people and fishery community for Olive ridley sea turtle conservation. The Awareness program was conducted from 21st December to 24th December 2012. We distributed some poster and show a movie “EARTH MATTERS” among the four villages, to talk delivered about how to

conserve this species in locality for long term. Sea turtles have become threatened due to human overexploitation, marine pollution and careless attitudes towards them. Human disturbances, both directly and indirectly are the primary reason for current decline in population of sea turtles worldwide. Therefore, conservation of sea turtle in whatever manner possible is crucial for future survival of their population. Among the various conservation and management strategies, community based conservation is considered to be the most effective approach which not only safeguard the sea turtle population but also provide livelihood options with turtles to the communities through various means of conservation. Children are more interest and involve for olive ridley sea turtle sensitization program. Before mass nesting beach cleaning program were started three villages namely Purnabandha, Gokharkuda and Podampeta. Near about 300 national and international students were participated for essay, quiz and painting competition in relation to marine biodiversity, environment and climate change. Among them 20-30% students were participated for beach cleaning and wildlife competition last year (Plate-1).

Sustainable Coastal Ecotourism Development

Sustainable ecotourism development means developing the tourism industry and conservation on environmental ecosystem,

attracting tourists to an area using the existing resources so that economic, livelihood, cultural, and social rules are followed and the legal expectations of the community are met (Mojtaba *et al.*, 2010).

Coastal ecology

The costal system has extremely important resources, which play a vital role in the economic and social life of nearby people.

Conservation and shrewd utilization of the costal wealth is important because they have becoming threatened by over exploitation, clearing of forest for industrialization, rapid urbanization, pisciculture, human settlements, etc. Hence, there is a need for detailed investigations that can help in of utilization can help improving the life of the local people while maintaining ecological balance of costal habitats. (Kar and Majnonian, 2004)..

Sustainable Coastal tourism through marine turtle protection:

The costal system has extremely important resources, which play a vital role in the economic and social life of nearby people. Conservation and shrewd utilization of the costal wealth is important because they have becoming threatened by over exploitation, clearing of forest for industrialization, rapid urbanization, pisciculture, human settlements, etc. Hence, there is a need for detailed investigations that can help in of utilization can help improving the life of the local

Table 1. Using SWOT model to consider the protection of the balancing environment and the sustainable ecotourism development of coastal area Ganjam.

Strengths	Weakness	Opportunities	Threats
Important ecological coastal sites Prayagi light house, Bateswar temple, Rushikulya sea turtle mass nesting ground, Gopalpur beach, Markhundi temple & wide beach, Sunpur river mouth and coastal villages. Endemic, endangered flora and	Poor awareness, Lack of appropriate guide, lack of tourism in coastal markets, lack of sports facilities, efficient management of coastal and Traffic around the tourist areas.	Use of natural resources, research and Preserve endangered species, tourism market and special tours, cultural exchanges, Aqua culture development, massage centre, Yoga Kendra, spiritual huts and alternate livelihood.	Changes in land use, construction, indiscriminate cultural invasion, lack of appropriate investment in the tourism sector in sustainable tourism development and coastal ecotourism.

**Plate 1&2.** Beach cleaning for safe nesting**Plate 3.** Training program of forest officials prior to mass nesting**Plate 4.** Turtle based ecotourism during mass nesting 2013

people while maintaining ecological balance of costal habitats.

Recognizing, marine turtles plays a significant role to the ecology, culture, and economy of Ganjam coast; marine turtles

are severely depleted from their historical abundance. the large majority of marine sea turtles, population recovery will not be possible without greater attention to the conservation of essential nesting and

feeding habitats. So ecotourism is a management tool that will enable to identify and control the environmental impact of its activities, improve its environmental performance continually. Implementing a systematic approach to setting and achieving environmental objectives and targets in this coast can be achieved. In this way, the most significant of the impacts of environmental assessment in relation to sustainable tourism development include:

- encouraging a commitment/SSG for environmental responsibility among employees and guests;
- Sighting of sea turtle protection as an opportunity for public in biodiversity issues;
- Assess environmental impacts of all activities, planned and ongoing, as they relate to the conservation of sea turtles and their habitats;
- Provide employees and contractors with information and instruction to enhance their awareness of relevant environmental issues, and to ensure effective management of environmental impacts, including impacts on sea turtles and their habitats;
- Make continual improvements in operations and management oversight to increase the effectiveness and reliability of our sea turtle conservation program
- Promote setbacks, maintain vegetated buffer zones between buildings and sandy beaches;
- Implement measures to minimize waste, including applying monitoring procedures to ensure that the nesting beach and nearshore waters remain free of debris and pollution;
- Conduct regular (at least annual) lighting assessments to identify sources of light pollution, and strive to eliminate artificial light visible from the beach during nesting season;
- Implement a system that removes potential obstacles to sea turtle nesting, including sun beds and recreational equipment, from the beach each night during the nesting season;
Discourage vehicles on the nesting beach
- Support sea turtle research, including offering financial or in-kind support, as practicable;
- Report all incidents of sea turtle harassment or harm to the proper authorities.

Environmental and employment opportunity

In the Southern Odisha, Ganjam coastline is extends from Praygi to Sunpur over 60 kilometres. These local areas dominated by mainly fishermen community and they are depend on part time or full time on fishing. It has been observed that, the naturalist, ecologist and conservationist have come to recognize the most vital role for rural and coastal communities to play in

conserving marine environment. All this interest in the environment and local cultures has created a dynamic economic engine that can spur healthy economic growth in under-developed areas, but also may result in unsustainable growth followed by rapid downturn to biodiversity. Past history has shown that the biodiversity was very rich and good return to the environment and for the local economy. Now a day the economic cycles are important and the developmental activities of building are healthy and sustainable economy are not much more profit of local people and biodiversity in the long term. Statistics and research confirm that an increasing number of travelers will be reaching remote ecotourism destinations with greater ease, at less cost and faster than ever before, indicating that some ecotourism destinations may become vulnerable. It needs proper management of tourism places and destinations that make no effort to conserve limit growth or benefit local people, and those that do. Consumer education and guidelines for the selection of ecotourism experiences will strengthen the legitimate ecotourism market place and diminish the effectiveness of false claims of environmental and social responsibility. So, ecotourism has proven itself to be an important tool for conservation, and in certain cases it has improved the quality of life of local people, who continue to demand it as a sustainable development option.

In the coastal area of Ganjam, the

sustainable developments of eco-tourism are of immense significant in generating the employment opportunities of many semi-skilled and unskilled people, particularly in remote and underdeveloped areas. A large number of women and young people are engaged in hotel, transport services, travel agencies, making and selling, hand crafts, cultural activities, tourist guide and other tourism-related tasks in the area. In this regard, using the SWOT method, the strengths and weaknesses, threats and opportunities were investigated, and strategies and suggestions are presented (Table1).

CONCLUSION

Today, ecotourism (coastal tourism) is one of the most important types of extremely tourism for the environment, economy and is the most compatible with sustainable development in order to protect the region's ecosystems. In this regard, water ecosystems and land ecosystems are brought together in the coastal area in a destination for many people for business industry, leisure or other activities in the coastal and marine environment. In the southern areas of Odisha, there is a high potential for the utilization of the natural and human resources of the Ganjam coastal area, and this area has advantages for tourism over many other state, regions and countries. Because of other advantages such as access roads and the proximity of the capital city Bhubaneswar and silk city Berhampur, Odisha hosts the annual

holiday for large numbers of travellers. Based on surveys taken, Ganjam coast, with its approximate length of 60km along the north and south coasts of the Bay of Bengal and coastal tourism in the area, has many capabilities. We have studied how sustainable development of ecotourism in coastal areas of Ganjam can be achieved and how environmental protection has been affected, by looking at different coastal areas which are sites of seaside tourism in each area.

For the study we were used to assess the reliability of the questionnaire, and the findings were clear that the positive impact of ecotourism in the area includes:

- Increase awareness of eco-tourists of the coastal area
- Cultural exchanges between tourists and local people
- The employment generation and opportunity
- Alternate livelihood option
- Training of tourism guides for tourists in order to familiarize them with the resources of the coastal environment and the protection of the ecosystem of the Caspian region
- Providing encouraging and punitive policies on environmental issues that can reduce negative environmental effects, such as the creation of coastal nature, in accordance with the needs of each area
- Adequate information to guide tourists, in tourist brochures and advertisements in the mass media and

publications

- Travel companies to invest in and develop coastal tourism
- Prevent irregular construction and land use changes
- Health facilities services and improvements to old sites and to prevent waste

Most of the tourists are interested in travelling to the coastal cities of this area for tourism activities such as sun rise view beach walk, turtle watching, sand art, boating in sea for turtles and dolphins, using other facilities that are in place for their leisure. But the remarkable point is that the educational level is generally medium among the tourists. Considered to be of more significance to the issue of the preservation of coastal ecosystems are demands for further development in the coastal area in order to provide recreational and health amenities. From the field observations and surveys, changing land use in coastal areas is an essential factor in managing the destruction of coastal landscapes and marine ecosystems. So that more research is needed and also proper management strategy can be save both biodiversity and sustainable ecotourism of these regions.

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Policy framework for urban development in north east India on context of solid waste management

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ABSTRACT

As urbanization continues to take place in North East -India, the management of solid waste is becoming a major public health and environmental concern in urban areas of its many developing cities. The rapid pace of urbanization would presuppose an increase in the provision of infrastructure. But this has not been the case as many cities within north east zone are unable to provide the basic infrastructure. The problems are likely to become even more pronounced as the cities continue to grow rapidly causing a strain on municipal infrastructures like water supply, sewage and solid waste disposal causing grave public health problems. Solid waste disposal poses a greater problem because it leads to pollution of various kinds. Land pollution directly if thrown and dumped openly, water pollution if dumped in low-lying area and air pollution if burnt. To elucidate the various processes involved in producing the patterns of socio-economic and environmental health in a city, one needs to concentrate both on the natural as well as built up environment. The environment influences many aspects of human beings, and many diseases can be initiated sustained or exacerbated by environmental factors. Therefore a study was carried out for north east India to find out the different policies that should be regulated and maintained strictly and also understand the challenges and responsibility faced both by the community and the management. In this research paper an attempt has been made to describe the policies those have been issued by the central and state government authorities. Every individual should maintain it strictly to avoid affection on human health especially because of municipal /solid waste and water contamination,

Key Words: urbanization, pollution, disease, sewage and solid waste, water contamination

INTRODUCTION

Urbanization is an index of transformation from traditional rural economic to modern industrial one. It is progressive concentration (Davis, 1965) of population in rural unit. Quantification of urbanization is very difficult. It is a long terms process. Kingsley Davis has explained urbanization as process (Davis, 1962) of switch from spread out pattern of human settlement to one of concentration in urban centres. Therefore, "Cities and towns have been engines of growth and incubators of civilization and have facilitated the evolution of knowledge, culture and tradition as well as industry and commerce. Urban settlements, properly planned and managed, hold the promise for human development and the protection of the world's natural resources through their ability to support large numbers of people while limiting their impact on the natural environment."

To harness the full potential of our north-east urban areas and to address the needs of our growing population, the different policies under management of solid wastes should be regulated with the need under national guidelines for the development of our north east India's urban areas towards the goal of sustainable human settlements. Government accepts that solid waste problem and its management is one of the major issues now a day for the environment.

Different wastes have been reported

in regular basis in variable percentages in both selected urban and rural areas. Street sweeping, grass cutting, drain and public toilet cleaning, removal of dead bodies, garden wastes and bulky wastes also contribute to solid waste those have been mainly observed in urban areas. Components such as paper, plastic, vegetables, wood etc were mostly found in rural areas than urban ones. However different types of wastes found in NE regions that include domestic, industrial, institutional, street wastes which have been again found to be more dominant in urban areas. Different wastages dumped nearby localities or burnt in other places include paper, glass, metals, textile, plastics, wood, food wastes etc.

This study observed that solid wastages are still a major problem in our urban as well as rural areas of north-east India. However, its percentages are decline from earlier years due to its proper managements. Therefore a study was carried out for north east India to find out the different policies that should be regulated and maintained strictly and also understand the challenges and responsibility faced both by the community and the management. In this study , an attempt has been made to describe the policies those have been issued by the central and state government authorities. The main purpose of the present study is to describe the special roles of the management of solid waste.

Objective:

The main objective of the study is given below:

- a. To examine policy framework for Urban Development in North East India on context of solid waste management

METHODOLOGY

Methodology is an important part of social research. The present study is based on secondary sources. For this work we have studied about ten (10) different related research studies and collected other official data from the government authorities. All are the secondary have been collected from books, journals, different internet sources and the other available related existing literatures. All collected data and gathered information are presented in generalized with the help of descriptive research methodology.

RESULTS & DISCUSSION

In accordance with the competencies defined in the Constitution, National Government is responsible for broad policy formulation to set national standards and the funding of various programmes, such as Below Poverty Line (BPL) housing and sanitation facility, Central Rural Sanitation Programme (CRSP), National Urban Sanitation Policy (NUSP), Right to Information Act (RTI), National Water Policy 2012 (Draft), Indira Awas Yojana (IAY), Jawaharlal Nehru National Urban Renewal Mission (JNNURM), Mahatma

Gandhi National Rural Employment Guarantee Act (MGNREGA), National Rural Health Mission (NRHM), Nirmal Bharat Abhiyan (NBA)/Total Sanitation Campaign (TSC), Nirmal Gram Puraskar (NGP), the Municipal Infrastructure Programme and the Urban Transportation Programmes.

Ministry of Environment and Forests drafted the municipal solid wastes (management and handling) rules, 1999 that were published under the notification of the Government of India of the Ministry of Environment and Forests in 1999. Later on these rules may be called the Municipal Solid Wastes (Management & Handling) Policy, 2000. Again these rules shall also apply to every municipal authority responsible for collection, segregation, storage, transportation, processing and disposal of municipal solid wastes in their work areas.

As per Gogoi . L (2013) worked on municipal solid waste disposal on Guwahati city Assam; she has explained that due to rapid population growth within a short period of time, the city faces many problems. One of the major problems of the city is improper disposal of municipal solid waste which has become an acute problem due to enhanced economic activities and rapid urbanization.

SOME STANDARD DEFINITIONS UNDER MSW

Here we have mentioned some

standard keywords and their definitions under management of solid wastes used by government authorities.

1. "**authorization**" means the consent given by the Board or Committee to the "operator of a facility" ;
2. "**biodegradable substance**" means a substance that can be degraded by micro-organisms;
3. "**composting**" means a controlled process involving microbial decomposition of organic matter;
4. "**collection**" means lifting and removal of solid wastes from collection points or any other location ;
5. "**disposal**" means final disposal of municipal solid wastes in terms of the specified measures to prevent contamination of ground-water, surface water and ambient air quality ;
6. "**demolition and construction waste**" means wastes from building materials debris and rubble resulting from construction, re-modeling, repair and demolition operation ;
7. "**generator of wastes**" means persons or establishment generating municipal solid wastes ;
8. "**land filling**" means disposal of residual solid wastes on land in a facility designed with protective measures against pollution of ground water, surface water and air fugitive dust, wind blow litter, bad odour, fire hazard, bird menace, pests or rodents, greenhouse gas emission, slope instability and erosion ;
9. "**municipal authority**" means Municipal Corporation, Municipality, Nagar Palika, Nagar Nigam, Nagar Panchayat, Municipal Council including notified area committee (NAC) or any other local body constituted under the relevant statutes and, where the management and handling of municipal solid waste is entrusted to such agency ;
10. "**municipal solid waste**" includes commercial and residential wastes generated in a municipal or notified areas in either solid or semi-solid form excluding industrial hazardous wastes but including treated bio-medical wastes;
11. "**operator of a facility**" means a person who owns or operates a facility for collection, segregation, storage, transportation, processing and disposal of municipal solid wastes and also includes any other agency appointed as such by the municipal authority for the management and handling of municipal solid wastes in the respective areas;
12. "**processing**" means the process by which solid wastes are transformed into new recycled products;
13. "**recycling**" means the process of transforming segregated solid wastes into raw materials for producing new products, which may or may not be similar to the original products;
14. "**Policy**" means a policy appended to these rules;
15. "**segregation**" means to separate the

municipal solid wastes into the groups of organic, inorganic, recyclables and hazardous wastes;

16. **“State Board or the Committee”** means the State Pollution Control Board of a State, or as the case may be, the Pollution Control Committee of a Union Territory;
17. **“storage”** means the temporary containment of municipal solid wastes in a manner so as to prevent littering, attraction to vectors, stray animals and excessive foul odor;
18. **“transportation”** means conveyance of municipal solid wastes from place to place hygienically through specially designed transport system so as to prevent foul odor, littering, unsightly conditions and accessibility to vectors;

MANAGEMENT OF MUNICIPAL SOLID WASTE (MSW)

Municipal solid waste concept is defined to include refuse from households, non-hazardous solid waste from industrial, commercial and institutional establishments (including hospitals), market waste, yard waste and street sweepings. Semisolid wastes such as sludge and night soil are considered to be the responsibility of liquid waste management systems.

9. The waste processing and disposal facilities to be set up by the municipal authority on their own or through an operator of facility shall meet the specification and standards as specified.

10. Any municipal solid waste generates in a city or a town, shall be managed and handled in accordance with the compliance criteria and the procedure laid down.

A) Policy provision of collection of municipal solid wastes:

All municipal solid wastes can be categorized into two main segments. First one is biodegradable in nature and second segment is non biodegradable in nature. Background of generations different types of municipal solid wastes are like house hold, industrial area, slaughter houses, bio-medical wastes and horticultural and construction and many more. But littering of municipal solid waste shall be prohibited in cities, towns and in urban areas notified by the State Governments. To prohibit littering and facilitate compliance, the following steps shall be taken by the municipal authority as per draft notification for Municipal Waste (Management & Handling) Rules, 1999 vide notification No SO 783(E) dated 27th September, 1999 covering various aspects of SWM.

Different collection methods for picking up solid wastes:

1. Organizing door to door collection of wastes
2. Providing central dustbin or bin in main area.
3. Collection on regular pre-informed timings and
4. Scheduling by using bell ringing of musical vehicle (without exceeding permissible noise levels);

Again different compliance criteria should be noted according to polices as mentioned under governments. Few of them we have mentioned below:

- a. Bio-medical wastes and industrial wastes shall not be mixed with municipal solid wastes
- b. During transportation, hand-driven containerized carts or other small vehicles, with full covered to wastes.
- c. Waste (garbage, dry leaves) shall not be burnt in any means ;
- d. Stray animals shall not be allowed to move
- e. The municipal authority shall notify waste collection policy and the likely to be adopted for public benefit in a city or town.
- f. It shall be the responsibility of generator of wastes to avoid littering and ensure delivery of wastes in accordance with the collection and segregation system to be notified by the municipal authority

B. Policy provision of segregation of municipal solid wastes:

In order to encourage the citizens, municipal authority shall organize awareness programmes for segregation of wastes and shall promote recycling or reuse of segregation materials. The municipal authority shall undertake phased programme to ensure community participation in waste segregation. For this purpose, the municipal authorities with respective local resident welfare

associations and nongovernmental organizations shall arrange regular meetings at quarterly intervals.

C. Policy provision for Storage of municipal solid wastes:

Municipal authorities shall establish and maintain store facilities in such a manner, as they do not create unhygienic and insanitary conditions around it. Following criteria shall be taken into account while establishing and maintaining storage facilities, namely;

- (i) Storage facilities shall be created and established by taking into account quantities of waste generation a given area and the population densities. A storage facility shall be placed which must be accessible to users;
- (ii) Storage facilities to be set up by municipal authorities or any other agency shall be so designed that wastes stored are not exposed to open atmosphere and shall be aesthetically acceptable and user-friendly;
- (iii) Storage facilities or 'bins' shall have 'easy to operate' design for handling, transfer and transportation of waste. Bins for storage of bio-degradable wastes shall painted green, those for storage of recycle wastes shall be painted black;
- (iv) Manual handling of waste shall be prohibited. If unavoidable due to constraints, manual handling shall be carried out under proper precaution with due care for safety of workers.

D. Policy provision for Transportation of municipal solid wastes:

Vehicles used for transportation of wastes shall be covered. Waste should not be visible to public, nor exposed to open environment preventing their scattering. The following criteria shall be met, namely:

- (i) The storage facilities set up by municipal authorities shall be daily attended for clearing of wastes. The bins or containers wherever placed shall be cleaned before they start overflowing;
- (ii) Transportation vehicles shall be so designed that multiple handling of wastes, prior to final disposal, is avoided.

E. Policy provision for Processing of municipal solid wastes:

Municipal authorities shall adopt suitable technology or combination of such technologies to make use of Wastes so as to minimize burden on landfill. Following criteria shall be adopted, namely;

- (i) The biodegradable wastes shall be processed by composting, vermin composting, anaerobic digestion or stabilization of wastes. It shall be ensured that compost or any other end product shall comply with standards as specified.
- (ii) Mixed waste containing recoverable resources shall follow the route of recycling. Incineration with or without energy recovery including pelletisation can also be used for processing wastes

in specific cases. Municipal authority or the operator of a facility wishing to use other state-of-the-art technologies shall approach the Central Pollution Control Board to get the standards laid down before applying for grant of authorization.

F. Policy provision for Disposal of Municipal Solid Waste:

Of all functional elements involved in Solid waste management, Disposal is the most important element as it includes planning, administrative set up, finance, technology support & their interdisciplinary relationships. The crucial aspect of this stage is the selection of proper disposal technology. For disposal of solid waste commonly used methods are open dumps, landfills, sanitary landfills, and incineration plants. One of the important methods of waste treatment is composting. Selection of proper disposal method is necessary & primarily it depends on the 'quantity of MSW generated & type of waste to be disposed'.

i) Open dumps :

The cheapest and the oldest easy method of MSW disposal is 'open dumping' where the waste is dumped in low lying areas on the city outskirts and leveled by bull - dozers from time to time. Open dumping is not a scientific way of waste disposal. Open dumps refer an uncovered site used for disposal of waste without environmental controls. The waste is untreated, uncovered, and not segregated. A

WHO Expert Committee (1967) condemned dumping as “a most unsanitary method that creates public health hazards, a nuisance, and severe pollution of the environment.

ii) Land filling:

It shall be restricted to non-biodegradable, inter waste and other waste that are not suitable either for recycling or for biological processing. Land filling shall also be carried out for residues of waste processing facilities as well as pre-processing rejects from waste processing facilities. Land filling of mixed waste shall be avoided unless the same is found unsuitable for waste processing. Under unavoidable circumstances or till installation of alternate facilities, land-filling shall be done following proper norms. Landfill sites shall meet the specification as per government rules.

POLICY PROVISIONS OF SPECIFICATIONS FOR LANDFILL SITE UNDER MSW

A) SITE SELECTION

9. In areas falling under the jurisdiction of ‘Development Authorities’, it shall be the responsibility of such Development Authorities to identify the landfill sites and hand over the side to the concerned municipal authority for development, operation and maintenance. Elsewhere, this responsibility shall lie with the concerned authority.

2. Selection of landfill sites shall be based on examination of environmental issues. The Department of Urban Development of the State or the Union territory shall co-ordinate with the concern organization for obtaining the necessary approvals and clearance.
3. The landfill site shall be planned and designed with proper documentation of a phased construction plan as well as a closure plan.
4. The landfill site shall be large enough to last to 20-25 years.
5. The landfill site shall be away from habitation clusters, forest areas, water bodies, monuments, National Parks, Wetland and places of important culture, historical or religious interest. A buffer zone of no-development shall be maintained around landfill site and shall be incorporated in the Town Planning Department’s land-use plans.

B) FACILITIES OF THE SITE

Landfill site shall be fenced or hedged and provided with proper gate to monitor incoming vehicles or other modes of transportation.

1. The landfill site shall be well protected to prevent entry of unauthorized persons and stray animals.
2. Approach and other internal roads for free movement of vehicles and other machinery shall exist at the landfill site.

3. The landfill site shall have wastes inspection facility for monitor wastes brought in for landfill, office facility for record keeping and shelter for keeping equipment and machinery including pollution monitoring equipments.
 4. Provisions like weighbridge to measure the quantity of waste brought at landfill site, fire protection equipment and other facilities as may be required shall be provided.
 5. Utilities such as drinking water (preferably bathing facilities for workers) and lighting arrangement for easy landfill operations when carried out in night hours shall be provided.
 6. Safety provisions including health inspections of workers at landfill site shall be periodically made.
3. Prior to the commencement of monsoon season, an intermediate cover of 40-65 cm thickness of soil shall be placed on the landfill with proper compaction and grading to prevent infiltration during monsoon. Proper draining barms shall be constructed to divert run-off away from the active cell of the landfill.
 4. After completion of landfill, a final cover shall be designed to minimize infiltration and erosion. The final cover shall be meet the following specifications, namely;
 - a) The final cover shall be barrier, soil layer comprising 60 cm of clay or amended soil with permeability coefficient less than 1×10^{-7} cm/sec.
 - b) On top of the barrier soil layer, there shall be a drainage layer of 15 cm.
 - c) On top of the drainage layer, there shall be a vegetative layer of 45 cm to support natural plant growth and to minimize erosion.

C) LAND FILLING MONITORING

1. Wastes subjected to land filling shall be compact in thin layers using landfill compactors to achieve high density of the wastes. In high rainfall areas where heavy compactors cannot be used, alternative measures shall be adopted.
2. Wastes shall be covered immediately or at the end of each working day with minimum 10 cm of soil, inert debris or construction material till such time waste processing facilities for composting or recycling or energy recovery are set up as per Policy I.

D) POLLUTION PREVENTION

In order to prevent pollution problems from landfill operations, the following provisions shall be made, namely:--

- a) Diversion of storm water drains to minimized leachate generation and prevent pollution of surface water and also for avoiding flooding and creation of marshy conditions;

- b) Construction of a non-permeable living system at the base and walls of waste disposal area. For landfill receiving residues of waste processing facilities or mixed waste or waste having contamination of hazardous materials (such as aerosols, bleaches, polishes, batteries, waste oils, paint products and pesticides) minimum liner specifications shall be a composite barrier having 1.5 mm high density polyethylene (HDPE) geomembrane, or equivalent, overlying 90 cm of soil (clay or amended soil) having permeability coefficient not greater than 1×10^{-7} cm/sec. The highest level of water table shall be at least two meter below the base of clay or amended soil barrier layer;
- c) Provisions for management of leachate collection and treatment shall be made. The treated leachates shall meet the standards specified in Policy – IV;
- d) Prevention of run-off from landfill area entering any stream, river, lake or pond.

E) WATER QUALITY MONITORING

Before establishing any landfill site, baseline data of ground water quality in the area shall be collected and kept in record for future reference. The ground water quality within 50 meters of the periphery of landfill site shall be

periodically monitored to ensure that the ground water is not contaminated beyond acceptable limit as decided by the Ground Water Board or the State Board or the Committee. Such monitoring shall be carried out to cover different seasons in a year that is summer, monsoon and post-monsoon period.

F) AMBIENT AIR QUALITY MONITORING

- 3. Installation of landfill gas control system including gas collection system shall be made at landfill site to minimize odor generation, prevent off-site migration of gases and to protect vegetation planted on the rehabilitated landfill surface.
- 4. The concentration of methane gas generated at landfill site shall not exceed 25 percent of the lower explosive limit (LEL).

G) CLOSURE OF LANDFILL SITE AND POST CARE

- 1. The post-closure care of landfill site shall be conducted for at least fifteen years and long term monitoring or care plan shall consist of the following, namely:-
 - (a) maintaining the integrity and effectiveness of final cover, making repairs and preventing run-on and run-off from eroding or otherwise damaging the final cover;
 - (b) Monitoring leachate collection system in accordance with the requirement;
 - (c) Monitoring of groundwater in

- accordance with requirements and maintaining groundwater quality;
- (d) Maintaining and operating the landfill gas collection system to meet the standards
2. Use of closed landfill sites after fifteen years of post-closure monitoring can be considered for human settlement or otherwise only after ensuring that gaseous and leachate analysis comply with the specified standards.

H) Special Provisions for Hilly Areas:

Most of the capitals of North-east – India states are covered by hilly areas. So, special attention should be applied for management of solid wastes. Cities and towns located on hills shall have location-specific methods evolved for final disposal of solid wastes by the municipal authority with approval of the concerned State Board or the Committee. The municipal authority shall set up processing facilities for the utilization of biodegradable organic wastes. The inert and non-biodegradable waste shall be used for building roads or filling up appropriate areas on hills. Because of constraints in finding adequate land in hilly areas, wastes not suitable for road lying or filling up shall be disposed of in special designed landfills.

RESPONSIBILITY OF GOVERNMENT AUTHORITIES MUNICIPAL AUTHORITY

Every municipal authority has to

maintain its responsibility towards the cleanliness of the respective areas environment.

3. Every municipal authority shall, within the territorial area of the municipality, be responsible for the implementation of the provisions of these rules and for any infrastructure development for collection, storage, segregation, transportation, processing and disposal of municipal solid wastes.
4. The municipal authority or an operator of a facility shall make an application in prescribed Form for grant of authorization for setting up waste processing and disposal facility including landfills from the State Board or the Committee in order to comply with the implementation programme laid down.
5. The municipal authority shall comply with these rules as per the implementation policy laid down.
6. The municipal authority shall furnish its annual report in prescribed format-
 - a) To the Secretary-in charge of the Department of Urban Development of the concern State or as the case may be of the Union Territory, in case of a metropolitan city; or
 - (b) To the District Magistrate or the Deputy Commissioner concerned in case of all other towns and cities, with a copy to the State Board or the Committee on or before the 30th day of June every year.

Responsibility of the State Government Administrations:

1. The Secretary-in charge of the Department of Urban Development of the concerned State or the Union Territory, as the case may be, shall have the overall responsibility for the enforcement of the provisions of these rules in the metropolitan cities.
2. The District Magistrate or the Deputy Commissioner of the concerned district shall have the overall responsibility for the enforcement of the provisions of these rules within the territorial limits of their jurisdiction.

Responsibility of Central Pollution Control Board, State Board or the Committees:

1. The State Board or the Committee shall monitor the compliance of the standards regarding ground water, ambient air, leach ate quality and the compost quality including incineration standards as specified.
2. The State Board or the Committee, after the receipt of application from the municipal authority or the operator of a facility in prescribed Form, for grant of authorization for setting up waste processing and disposal facility including landfills, shall examine the proposal taking into consideration the views of other agencies like the State Urban Development Department, the town

and Country Planning Department, Air Port or Air Base Authority, the Ground Water board or any such other agency prior to issuing the authorization.

3. The State Board or the Committee shall issue the authorization in prescribed Form to the municipal authority or an operator of a facility within forty-five days stipulating compliance criteria and standards as specified including such other conditions, as may be necessary.
4. The authorization shall be valid for a given period and after the validity is over, a fresh authorization shall be required.
5. The Central Pollution Control Board shall co-ordinate with the State Boards and the Committees with particular reference to implementation and review of standards and guidelines and compilation of monitoring data.

MAJOR OBSERVATIONS

Content analysis and general observation method has been used for this study.

- 1) State-wise response of local bodies for seeking authorizations from State Pollution Control Boards and Pollution Control Committees varies from State to State
- 2) “Setting up of Waste Processing Facilities” State level policies have been formulated for setting up of

compost plants.

- 3) Regarding waste-to-energy projects has been found under construction in north-east, India
- 4) Regional/common landfill facilities are under construction at several locations in north-east, India.
- 5) Overall Implementation Status Unless, Guiding Groups/Cells are set-up at Central, State and District Level to assist local bodies in organizing themselves to comply with the Rules, it will be difficult to achieve satisfactory compliance. There is need to develop good and adequate private entrepreneurship to participate in waste management to cover the country.

CONCLUSION

From the present study it has been found that although North Eastern Region is a small part of the country, a great variation of urban growth and percent of urban population is seen from the reviews of different reports and other relevant sources. It contributed only 2.5 percent to the total population of the India as per census 2011. In regard to both decadal growth rate and average annual exponential growth rate of urban population recorded all time high in NE region as compared to the other regions. The percentage of urban population to the total population is found increasing in NE region over the census year, but still low than the country figures.

It can be concluded that the overall process of urbanization in agro based NE is very slow basically due to its location and infrastructural problems. Development of secondary sectors also not up to the mark in this region is resulted a very dependence on agriculture sector. From the mentioned policies of the present study, the following points can be suggested. Policy should relate to proper urban planning where city planning will consist of operation, developmental of restorative planning. Operational planning should take care of improvement of urban infrastructure, e.g. roads, traffic, transport etc. developmental planning especially urban housing and environmental sanitation should emphasize on development of newly annexed urban areas. Various urban renewal processes can be used.

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