In tropical and sub-tropical areas, tree plantations are becoming an increasingly common land use system. Plantations are being established for different reasons including shift in timber production from native forests to plantations, restoration of degraded lands, catalysts of forest succession and also as buffer zones for biodiversity conservations (Tian et al. 2000; Sarlo 2006). Raise in forest plantation is the most widely adopted method to recover fragile ecology of forest. Thus, in Tripura, rubber plantation was introduced in 1963 by the Forest Department to check soil degradation due to slash and burn agriculture practised by the local tribal people and also as a part of their rehabilitation programme. Historically most of the rubber plantations of Tripura were derived either from afforestation of ‘waste land’ or ‘fallow’ after repeated slash and burn agriculture. Tripura having a tropical climate occupies the second position in areas and productivity among the rubber growing states of India with 57,619 hectare of land under rubber cultivation (Source: NRETC, Rubber Board, Agartala, West Tripura, March, 2012). Rubber plantation is an example of low input agricultural system and is characterised by it’s well developed canopy cover. Rubber tree (*Hevea brasiliensis*, Family: Euphorbiaceae), a source of natural rubber, is a native of Amazon rain forest. Being deciduous plant with very fast growth rate, it shows maximum litter fall during February – March with annual litter addition to plantation floor amounting to 7 tons ha$^{-1}$ (Jacob 2000). The litter is not generally removed but persists on plantation floor through a large part of the year and shows very slow rate of decomposition due to high lignin and
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polyphenol contents (Stern 1967). Root concentration in rubber plantations occurs in the top 18 cm of soil and the roots spread horizontally up to 2 m from the plant base. Rubber tree, being surface feeder, affords good soil binding and thus soil erosion is considerably reduced (Sethuraj 1996). Thick canopy cover of rubber plantations helps to cut down direct radiation and interrupts rain. Thus soil erosion is prevented. Flow of rubber latex starts at 7 years of age of plantation, becomes maximum at 20 years and typically ceases at 35 years (Zhang et al. 2007). Rubber plantation often faces anthropogenic interferences such as intermittent weeding, tapping, latex harvesting, collection of leaf litter for using as fuel by local tribal people etc. According to Zhang et al. (2007) rubber plantation decreases soil organic carbon which is linked to latex formation followed by its harvesting.

Rubber plantation is monoculture. Any monoculture plantation generally offers less biodiversity than a natural forest. Basically, lack of light inside the plantation due to its thick canopy makes it difficult for other plants to grow under mature rubber plantations. However, shade loving crops are often present in rubber plantations (Jacob 2000). According to Chakraborty et al. (2002), number of plant species was found to be highest (43) in rubber plantation compared to the other monoculture plantations viz. sal, cashew, acacia and teak of Tripura. Besides these, rubber plantations in Tripura are hospitable to a large number of species of nematodes, ants, collembolans, mites etc (Chakraborti and Bhattacharjee 1991).

Earthworms are the most important soil dwelling organisms involved in the process of soil formation and maintenance of soil fertility. They represent a major fraction of the soil invertebrate biomass (>80%) (Fragoso and Lavelle 1992). The role of earthworms in the breakdown of organic matter on the soil surface and in the soil turnover process was first highlighted by Darwin (1881). Since then, it has taken almost a century to appreciate their important contribution in abatement of organic pollution and providing topsoil in
improvised lands (Dash 2012). Earthworms, with their peculiar food, feeding habits and burrowing activities in the soil are considered to be the nature’s best ‘ecosystem engineers’. They convert organic wastes to useful fertilizers and modify the physical, chemical and biological properties of the soil to support above ground vegetation. Soil physical properties affected include aggregation, stability and porosity, while soil biological and chemical properties modified include nutrient cycling (primarily N and P) and decomposition rates, chemical form of nutrients in soil and their availability to plants, pH, organic matter dynamics, microbial activities including enzyme and plant growth regulator produced etc (Lavelle et al. 1998).

India harbours a very high diversity of earthworms mostly concentrated in the Western Ghats, eastern Himalayas and north- east hill regions which are recognized as biological ‘hot spots’. Although it’s area is only 2% of the world’s landmass, it supports about 10.5% of the total known global earthworm diversity, estimated at 4000 species (Julka et al. 2009). High earthworm diversity in this country is primarily due to it’s geographical location with a wide latitudinal range (between 8.4 °N and 37.6° S), complex topography, varied climate and past geographical history (linked to ancient super continent of Gondwana land from which it separated in the late Jurassic and drifted to collide with the Asian mainland in the Eocene).

The scientific exploration of earthworm diversity in India dates back to the nineteenth century. The credit for naming the first earthworm species in the Indian subcontinent goes to Templeton (1844) when he discovered Megascolex caeruleus from Sri Lanka. However, Perrier (1872) was the first to describe earthworm species from the Indian mainland. Subsequently noteworthy contributions on the Indian earthworms are those of Beddard (1902), Michaelsen (1910), Stephenson (1930), Gates (1972), Kale and Krishnamoorthy (1978), Senapati and Dash (1983), Jamieson (1988), Julka (1988), Ismail (1997), Kale (1998), Paliwal and Julka (2005), Chaudhuri and Bhattacharjee (2005),
The Indian earthworm fauna is predominantly represented by native species, which constitute about 89% of the total earthworm diversity in the country (Julka and Paliwal 2005). Changes in the land use pattern have directly affected the composition and population structure of earthworm species in different agroclimatic regions of the country (Blanchart and Julka 1997; Behera et al. 1999; Bhadauria et al. 2000).

Direct effect of plant species on soil and litter biota are caused by the plant’s input of organic matter above and below the ground, while indirect effects of plants on biota include shading provided by thick canopy, soil protection and uptake of water and nutrients by roots (Neher 1999). According to Sarlo (2006), individual tree species rather than monoculture or polyculture have a significant effect on earthworm biomass. Gonzalez et al. (1999) and Tian et al. (2000) reported that tree plantation may influence earthworm abundance by altering the physico-chemical properties of soils viz. temperature, moisture regime, pH, soil organic matter content and litter inputs. Moreover, native tree plantations generally allow the establishment of population of native earthworm species (Zou and Gonzalez 2001). Several authors suggest that the chemical composition of plants, especially nitrogen, lignin contents and phenolic compounds play a vital role in the abundance of soil and litter fauna through their effects on palatability and rate of decomposition (Edwards and Bohlen 1996, Tian et al. 2000; Sarlo 2006). The quality of food material influences not only the size but also the species composition, growth rate, fecundity of earthworm population (Chaudhuri et al. 2003).

In recent years, there has been an increasing interest in biodiversity due to the dramatic loss of species and ecological interactions leading to biodiversity crisis. This is mainly due to large scale destruction of natural forests, urbanization etc. North- eastern region of India has been regarded as biodiversity

Earthworms belonging to the class Oligochaeta under the phylum Annelida, are found in the soils of forest, grassland, pasture, agricultural lands and also in the organic wastes. Since earthworms represent a major fraction (> 80%) of the soil invertebrate biomass (Fragoso and Lavelle 1992), they are involved in the process of soil formation and maintenance of soil fertility, ecosystem function and production. Due to their peculiar mode of feeding, burrowing and casting activities, they make the soil fertile and support the above ground vegetation. For their unique activities, they have variously been called as “intestine of earth”, “nature’s ploughman”, “farmer’s friend”, “Cinderella of organic farming”, “ecosystem engineer” etc. With their soft and unprotected bodies which remain in full contact of the soil, they are considered as ideal bio-indicator of soil.

Reynolds (1994) reported worldwide occurrence of 3627 terrestrial earthworm species, with an average annual addition of 63 species. In the Indian subcontinent (including Andaman and Nicober islands) earthworms are represented by 509 species in 67 genera under 10 families. (Acanthodrilidae – 34 species, Almidae – 4 species,Criodrilidae – 1 species, Eudrilidae – 1 species, Glossoscolecidae – 1 species, Lumbricidae – 16 species, Megascolecidae – 193 species, Octochaetidae – 145 species, Moniligastridae – 98 species, Ocnerodrilidae – 16 species), indicating a high degree of diversity in this region compared to other areas (Julka 1993). According to Julka (1993) majority of them are endemic and belong to 47 genera and the remaining 20 genera are peregrine, being passively introduced by men. In a country like India, which was under colonization for several centuries, exotic species of both plants and
animals had been transported either intentionally or unintentionally. Michaelsen (1903) first used the word ‘peregrine’ to describe the distribution of some earthworm species that are dispersed over a wide range of geographically remote localities. The Glossoscolecidae, *Pontoscolex corethrurus* originally from South America is now widely distributed in tropical and in some warmer temperate regions eg. Florida. There are reports on the distribution, density and diversity of earthworms in India (Michaelsen 1903; Stephenson 1930; Gates 1972; Julka and Senapati 1987, 2007; Julka 1988, 1993b.; Krishnamoorthy and Ramachandra 1988; Ismail *et al.* 1990; Bano and Kale 1991; Blanchart and Julka 1997; Kale 1997; Bhadauria *et al.* 2000; Karmegam and Daniel 2000, 2001; Chaudhuri and Bhattacharjee 2005; Chaudhuri *et al.* 2008a; Bhadauria *et al.* 2012; Dash and Saxena 2012; Shyleshchandran *et al.* 2012; Mohan *et al.* 2013 and Dey and Chaudhuri 2014)

The role of earthworm in the process of decomposition, building and maintenance of soil structure has been well documented for soils of temperate regions (Lee 1985; Edwards and Bohlen 1996; Hendrix and Bohlen 2002). In tropics, studies on diversity, ecology and role of earthworms have been carried out in Savanna (Lavelle 1974, 1978; Martin *et al.* 1990; Blanchart *et al.* 1991;), pasture (Dash and Patra 1977, 1979; Lavelle *et al.* 1981; Chaudhuri and Bhattacharjee 2005), tropical rain forest (Fragoso and Lavelle 1987,1992; Atkin and Proctor 1988; Lavelle and Pashanasi 1989), agricultural lands (Sathianarayanan and Khan 2006), plantation crops (Chaudhuri *et al.* 2008a, b; Dey and Chaudhuri 2012) and agroecosystems (Feijoo *et al.* 2011).

There are different ecological categories of earthworms on the basis of their food habit and habitat. Bouche (1971, 1977) recognized three major categories of earthworms:

1. **Epigeic** : These are litter dwellers, small to medium sized, darkly pigmented and very active earthworms living on the organic matters
above the ground. They are good bio-degraders, feeding mainly on leaf litter and animal excreta. Rapid growth rate, very high fecundity and good regeneration capacity etc are some of the important features e.g, *Perionyx excavatus, Eisenia fetida, Eudrilus eugeniae* etc. The main role of epigeic earthworms are comminution and fragmentation of the leaf litter and transformation of these into stabilized organic matter (Lavelle 1988, Dash 2012).

2. **Anecic**: These are deep soil dwellers, moderately pigmented medium to large sized and less active earthworms living in subsurface soil in deep vertical burrows the walls of which are covered by their excreta and mucous. They feed mainly on leaf litter mixed with soil from the upper strata. They are commonly found in forest and grasslands e.g, *Lumbricus terrestris, Drawida grandis, Drawida papillifer papillifer* etc. the main role of anecic earthworms is to modify soil structure through construction of burrows and to enhance the decomposition of plant debris (Lavelle 1988).

3. **Endogeic**: These are shallow soil dwellers, weakly pigmented and small to large sized earthworms living in horizontal burrows. They feed on more mineral soil than epigeic and anecic worms e.g *Pontoscolex corethrurus, Drawida assamensis, Octochaetona beatrix* etc. Endogeic earthworms have an important impact on the soil structure and have mutualistic relationship with soil microflora (Barois and Lavelle 1986).

Bouche (1977) described these three major groups as being evolutionary extremes on three corners of a triangle with many species occupying intermediary position with respect to these extremes. According to Kale and Krishnamoorthy (1978) and Lavelle (1979), demarcation of such three ecological categories could not be made with respect to the earthworms of the tropics, because majority of them are geophagous i.e the endogeics and only a few are detrivorous.
Hendrix and Bohlen (2002) have made further subcategory of epigeic into epigeic and epi - anecic/ epi - endogeic and endogeic into oligohumic, mesohumic, polyhumic and endo- anecic.

Distribution and abundance of earthworms are governed by several ecological factors viz. temperature, moisture, pH and available organic matter. Earthworm activity depends on the moisture contents of the soil as water constitutes 75- 90% of the body weight of earthworms (Kale and Karmegam 2010). They apparently lack a mechanism to maintain constant internal water content so that their water content is influenced greatly by the water potential of the soil, which directly depends on the adequate availability of the soil moisture. Not all earthworm species have the same moisture requirement. Certain peregrine earthworm species are capable of adapting to a wide range of moisture conditions. Soil moisture can influence the density and biomass of earthworms at any given location. Soils containing 12- 30% moisture content supports largest number of earthworms (Olson 1928). Most earthworms are most active in moist soils than dry ones. When moisture is inadequate, these earthworms go into dormancy and even die under extreme draught conditions. When the soil moisture content rises to 8- 10%, surviving worm becomes active again (Lavelle et al. 1974).

Temperature has a great influence on the activity, metabolism, respiration, growth and reproduction of earthworm. Temperature and moisture are usually inversely related and high surface temperature and dry soils are much more limiting to earthworms than low temperature and water logged soils (Nordström and Rundgren 1974). Fecundity is affected very much by different temperatures (Butt 1991). The growth period from hatching to sexual maturity is also dependent on temperature (Evans and Guild 1948; Graff 1953; Mikon 1954). Interestingly tropical earthworm species tend to have higher temperature optima than species from temperate regions.
Soil pH is a factor that limits the species, number and distribution of earthworm that live in any particular soil. Some species are intolerant of acid soil conditions, whereas others thrive under acid conditions and many species can tolerate a wide range of pH (Lee 1985). Staaf (1987) reported that pH and factors related to pH had important influences on the distribution and abundance of earthworms in acid beech forest soil in Sweden. The number of earthworms that go into diapause are also influenced by soil pH. In fact soil is neutralized by secretion from the intestine and by excretion of ammonia from earthworms. For this reason, earthworm casts are usually more neutral than the soil in which the worms live (Sharpley and Syers 1976; Reddy 1983).

The distribution of earthworm is also influenced by the amount of organic matter in soil. Soils that are poor in organic matter do not usually support large number of earthworms. Large amounts of dead roots and other organic matter in pastures usually support large number of earthworms, but when pasture is ploughed, gradual decrease in organic matter probably leads to a corresponding decrease in earthworm population. Some epigeic species of earthworm are attracted readily to animal droppings and dung on the soil surface. There is generally a positive correlation between earthworm density and biomass and the organic matter content of the soil up to certain limit. Increase in organic carbon content of semi-arid agricultural soils in Egypt was associated with increased number and biomass of earthworm (Ghabbour and Shakir 1982). Hendrix et al. (1992) reported a positive correlation between earthworm population density and soil organic content.

The number of earthworm and their degree of activity vary greatly during the annual cycle. The earthworm activity is limited to a short period (generally in monsoon and post monsoon) in tropical country like India. Gates (1961) reported that earthworms are active mainly in the 4-6 months of rainy season between May and October. In grasslands in Japan the greatest number of earthworms occurred in autumn, especially in October and the numbers were very low in
winter, particularly during January and February (Nakamura 1968 a, b). According to Lalthanzara et al. (2011) in agroforestry system of Mizoram, India, population dynamics of earthworm was significantly correlated with rainfall, moisture content and physical characters of soil. Scanty and scattered sources of information show how much earthworms help in annual soil turnover in tropics by their selective feeding and casting activities even during their restricted period of activity (Nath 2012). Worm casts are produced in large quantities on soil surface during rainy season (Gates 1961; Dash and Patra 1979). Earthworms contribute to cycling and accumulation of nutrients by casting at the soil surface. Earthworm casts consists of mixed inorganic and organic materials from the soil that are voided after passing through the intestine. The nature of cast produced by the earthworms is unique and the crumb structure and the aggregates formed by the various inorganic and organic components held together by mucous, is an ideal structure for plant growth. Surface casting is an essential function within earthworm communities which maintain their living space. According to Spain et al. (1992), Pashanasi et al. (1996), Aswalam and Hauser (2001) and Bisht et al. (2006), earthworm casts can positively affect plant growth in the tropics, most likely due to higher concentration of plant available nutrients in casts than the surrounding soil (Brown et al. 2004). With decreasing concentration of nutrients in the surrounding soil, earthworm enriches the casts indicating the increasing importance of earthworm surface casting with decreasing soil fertility (Hauser and Aswalam 1998; Norgrove and Hauser 2000). Thus a high surface casting activity of earthworms is desirable in low input agricultural systems to concentrate nutrients at the soil surface. In India, casting activities of the earthworm were recorded in pasture (Roy 1957; Dash and Patra 1979; Chaudhuri and Bhattacharjee 2005), natural forests, coffee plantations, cardamom plantations, paddy fields, rubber plantations, Acacia plantation and grass lands (Chaudhuri et al. 2009a, Kale and Karmegam 2010). Inter-seasonal variation in cast production by Metaphire posthuma under laboratory conditions
has been discussed by Singh and Dev (1995). Total cast production is an indicator of burrowing and soil turnover, because 99.9% of ingested material is egested as casts (Lavelle 1974). Although earthworm produce casts both at surface as well as beneath the soil in their burrows or in other soil spaces (Lee 1985), surface castings alone often serve as a direct indicator of earthworm activity (Roy 1957).

Population dynamics, diversity and distribution of earthworms in natural ecosystems of the tropics have received considerable attention in recent years (Fragoso and Lavelle 1992; Blanchart and Julka 1997; Zou and Gonzalez 1997; Bhadauria et al. 2000; Sinha et al. 2003; Chaudhuri and Bhattacharjee 2005; Julka and Paliwal 2005; Gonzalez et al. 2007, Chaudhuri et al. 2008a, b; Dash and Dash 2008; Feijoo et al. 2011; Najar and Khan 2011). Studies on anthropogenic influences on earthworm communities due to afforestation in tropics are scarce (Fragoso et al. 1999; Nath and Chaudhuri 2010). Such studies are necessary to evaluate the impact of afforestation on the earthworm communities of Tripura.

Populations of earthworm are extremely variable in size ranging from only a few individuals to more than 1000 no.m$^{-2}$ (Nath 2012). In the tropical rain forest of Mexico, density and biomass of earthworm were recorded to be 80-121 no.m$^{-2}$ and 34.2-42.4 g m$^{-2}$ (Fragoso and Lavelle 1987). Comparatively larger population size of earthworm were recorded in the rubber plantations in Cote d Ivoire (density 150.4 no.m$^{-2}$, biomass 59.5 g m$^{-2}$) and the mixed forest of Central Himalaya in India (density 149 no.m$^{-2}$, biomass 4.1 g m$^{-2}$) (Gillot et al. 1995; Bhadauria et al. 2000). The relative abundance and biomass of earthworms appears to decrease with decrease in soil moisture, soil acidity and palatability of food resources (Tripathy and Bhardwaj 2004). In Acacia plantation of Western Ghats (India) Blanchart and Julka (1997) reported a density of 200 no.m$^{-2}$ and biomass of 9.67 g m$^{-2}$ of earthworms. On the other hand the same authors (Blanchart and Julka 1997) reported density and biomass of earthworms as 160.5
no. m$^{-2}$ and 27.92 g m$^{-2}$ respectively in the natural forests of Western Ghats. Strikingly a very high density of 320 no. m$^{-2}$ and biomass 58.74 g m$^{-2}$ of earthworm was reported by Krishnamoorthy (1985) in the plain grasslands of Karnataka.

The number of species in a given earthworm community, which is simplest measure of species diversity, ranges from 1-15 species (Edwards and Bohlen 1996). Most earthworm communities including those of tropical rain forests contain around 3-6 species, with a remarkable degree of consistency among different habitats and different geographical regions (Fragoso and Lavelle 1992). At a given locality the diversity of earthworm community is influenced by the characteristics of soil, climate and organic resources of the locality as well as it’s history of land use and soil disturbance. The species poor communities are characterized by extreme soil conditions such as low pH or poor fertility, low quality litter or a high degree of soil disturbance.

Recent research on in-situ earthworm-based technology for soil amelioration has led to breeding trials involving cocoon production from adults in soil environment (Lavelle et al. 1998; Bhattacharjee and Chaudhuri 2002; Butt 2002; Chaudhuri and Bhattacharjee 2011). Higher fecundity, low incubation period, high hatching success and quick maturation are some of the special features of earthworms useful for this technology. Endogeic and anecic earthworms are the most important biological agents which influence the physico-chemical status of the soil to a great extent. However, very few studies have been done on their biology in the tropical conditions as compared to the temperate climate (Edwards and Bohlen 1996). Studies on the lifecycles of earthworms are also necessary for effective vermiculture.

Earthworms are semi-continuous or continuous breeders, producing ova at most times of the year (Olive and Clarke 1978). Ova of earthworms are contained in cocoons (oothecae) which differ in shape with species which most earthworms deposit near or close to the soil surface. According to Edwards and
Bohlen (1996), earthworms deposit their cocoons near the surface if the soil is very moist, placing them much deeper in the soil when it is much dry. Most earthworm species produce cocoons when the temperature, soil moisture, food supplies and other environmental factors are suitable. In northern hemisphere, however, there is good evidence that peak cocoon production occurs in the spring or early summer (Edwards and Bohlen 1996). It has been demonstrated clearly in cultures (Evans and Guild 1948) and in the field (Gerard1967) that seasonal fluctuations of the soil climate can cause the number of cocoons produced by different species of earthworm to vary from year to year.

Since cocoons are produced from the clitellum, it is probable that size of the cocoon is correlated with the size of the earthworm. Lavelle (1981) plotted cocoon size against fresh weight of adults for eleven European lumbricid species and tropical species of several families and reported a strong correlation.

Dash and Senapati (1980), Senapati and Dash (1979a, b) studied the morphology of cocoons of four tropical earthworms Lampito mauritii, Drawida willsi, Octochaetona surensis and Drawida calibi and also the effects of soil moisture and temperature on the cocoon hatching success and emergence patterns of juveniles under field and laboratory conditions. Kaushal et al. (1995,1999) observed the effect of different food substrates on cocoon production, incubation period and hatching success in Drawida nepalensis and Metaphire houlleti respectively. Bhattacharjee and Chaudhuri 2002 studied the breeding strategies of seven Indian species of earthworm, viz Perionyx excavatus, Lampito mauritii, Polypheretima elongata, Pontoscolex corethrurus, Eutyphoeus gammiei, Dichogaster modiglianii and Drawida nepalensis. In their studies Bhattacharjee and Chaudhuri (2002) reported a dramatic increase in cocoon production by most earthworm species of Tripura in the summer and monsoon with corresponding peak during April and July. They further reiterated that incubation period of cocoon increased in the endogeic worms, Pontoscolex corethrurus, Polypheretima elongata and Drawida nepalensis and decreased in
epigeic worms *Perionyx excavatus* and *Dichogaster modiglianii*, within a temperature range between 28-32 °C under laboratory conditions. There was also a significant positive correlation between number of hatchlings per cocoon and incubation period in *Lampito mauritii* (Bhattacharjee and Chaudhuri 2002). Recently Chaudhuri and Bhattacharjee (2011) studied the reproductive biology of eight tropical species of earthworms of rubber plantations viz, *Pontoscolex corethrurus*, *Drawida assamensis*, *Drawida papillifer papillifer*, *Eutyphoeus comillaenus*, *Metaphire houleti*, *Dichogaster affinis*, *Octochaetona beatrix*, *Lennogaster chittagongensis*. On the basis of reproductive strategies of earthworms Chaudhuri and Bhattacharjee (2011) justified the possible usefulness of *Pontoscolex corethrurus*, *Octochaetona beatrix*, *Dichogaster affinis* and *Metaphire houleti* in vermiculture based technology.

Capacity for regeneration of injured or lost parts of the bodies of earthworm varies very much and ranges from a very poor capacity for regrowth in *Lumbricus terristris* to species that seem to be able to regenerate almost any organ, such as those belonging to the genera *Criodrilus* and *Perionyx* (Edwards and Bohlen 1996). Although there have been numerous records of regeneration of different earthworm species, the extent to which this occurs is still only known for a very few species. Gates (1974) stated that fewer than ten species of earthworms were known to have regenerative capacity, but in his book (Gates 1972) he gives details of regeneration occurring quite commonly in twenty nine species of earthworms from Burma.

*Pontoscolex corethrurus* is the most widely distributed earthworm species of the world with it’s spectacular occurrence in the soils under rubber plantations of Malaysia, Burma, South and North- east India (Gates 1972; Julka and Paliwal 2005; Chaudhuri *et al.* 2008a, b). It is possible that large scale introduction of para rubber in the 19th century into the Southeast Asia might have accelerated the expansion of it’s range (Shen and Yeo 2005). Environmentlal plasticity, perthenogenetic mode of reproduction, anthropogenic
influences, efficient assimilation of low quality soil, organic matter and outstanding ability to colonize due to it’s demographic profile could explain the invasion of exotic earthworm, \textit{Pontoscolex corethrurus} in the tropics (Fragoso \textit{et al.} 1999). This species has an advantage over many native species which are difficult to collect from the field and culture under laboratory conditions. Lavelle \textit{et al.} (1987) suggested that this worm might also be utilized as a source of protein, since it is able to convert low quality soil organic matter to fresh tissue with 60- 70\% protein content with great efficiency.

According to Edwards and Bohlen (1996), earthworms continue to grow through out their lives with enlargement of their body segments following emergence from the cocoons, but the rate of their growth declines following sexual maturity. It is well known that the amount of food material and it’s quality influences not only the size of earthworm populations, but also the species present and their rate of growth and fecundity. Literature is available on the growth and reproduction of composter species of earthworms (Haimi 1990; Elvira \textit{et al.} 1996 a and b; Edwards \textit{et al.} 1998; Dominguez \textit{et al.} 2001; Chaudhuri and Bhattacharjee 2002; Chaudhuri \textit{et al.} 2003; Suthar 2009; Karmegam and Daniel 2009), but information is scanty on growth and reproduction in soil dwelling earthworms (Butt 1997a; Garcia and Fragoso 2003; Monroy et al. 2007; Nath and Chaudhuri 2012) which are called “ecosystem engineers”. According to Nath and Chaudhuri (2012), among the five common earthworm species of rubber plantation (\textit{Pontoscolex corethrurus, Drawida assamensis, Drawida papillifer papillifer, Eutyphoeus comillahuhs, Metaphire houleti}) only \textit{Pontoscolex corethrurus} showed sustainable growth and reproduction in soils with food additives which is linked with it’s adaptive strategies like efficient assimilation, capacity for wide range of diets, continuous breeding with high fecundity, high hatching success etc. Inoculating appropriate species of earthworm to promote soil health is now regarded as an important step towards restoration of degraded soils (Pashanasi \textit{et al.} 1992; Butt \textit{et al.} 1995;
Tapia-coral *et al.* 2006). On the basis of laboratory performance of *Pontoscolex corethrurus* and *Amythus corticis* in Mexican soils degraded by cement industry, Garcia and Fragoso (2002) concluded that both the species have potential for soil rehabilitation. Production of sustainable field populations may be done through mass rearing of the required species under controlled conditions.

Despite various contributions made by a good number of earthworm scientists in vermitechnology (Chaudhuri 2005; Kale 2011; Edwards 2011, Dash 2012), earthworm taxonomy (Julka 1988), distribution, diversity, ecology and role of earthworms in various habitats viz. deciduous forests, tropical rain forests, plain grasslands etc (Dash and Dash 2008; Kale and Karmegam 2010), growth and reproduction in litter feeding earthworms (Chaudhuri and Bhattacharjee 2002; Chaudhuri *et al.* 2003; Parthasarathy 2007; Suthar 2007; Karmegam and Daniel 2009; Nath 2012), scientific literature is almost lacking on distribution, diversity, ecology and population dynamics of tropical earthworms in different age groups of monoculture and exotic plantations like rubber. Besides these, reports are scanty (Butt 2011; Nath and Chaudhuri 2012) on biology of geophagous earthworms. Reports which are available on growth and reproduction in geophagous earthworms comprised of effect of food additive on growth and reproduction of earthworm (Nath and Chaudhuri 2012). As the soil dwelling or endogeic earthworms exclusively feed on mineral soil it is interesting to know the growth and reproduction of endogeic species of earthworms in soils (without food additive) under laboratory conditions.

The proposed investigation is therefore designed to elicit for the first time detailed studies on:
1: Earthworm resources under rubber (*Hevea brasiliensis*) plantations in relation to some physico-chemical parameters.

2 (a): Community characteristics (viz. biomass, density, diversity, dominance, species richness index etc) of earthworms in the soils of different age groups of rubber plantations.

(b): Monthly population dynamics of earthworms under different age groups of rubber plantations.

3: Reproductive strategies (Cocoon structure, incubation period, emergence pattern, fecundity etc) and regenerative abilities of some earthworm species inhabiting soils of different age groups of rubber plantations.

4: Growth and reproduction of *Pontoscolex corethrurus*- a dominant species in the soils of different age groups of rubber plantations under laboratory condition.