3.1. Description of Study Site

The Sundarbans mangrove ecosystem covering about one million ha in the deltaic complex of the Rivers Ganga, Brahmaputra and Meghna is shared between Bangladesh (62%) and India (38%) and is the world’s largest coastal wetland. Enormous load of sediments carried by the Rivers contribute to its expansion and dynamics.

The Indian Sundarbans (21°13' to 22° 40' N and 88° 03' to 89° 07' E) is the largest delta in the estuarine phase of the River Ganges, situated in the low lying, meso-macrotidal, humid and tropical belt. It falls within the geographical limits of the Dampier and Hodges line in the north, Bangladesh in the east, the Hugli River (a continuation of the River Ganga) in the west and the Bay of Bengal in the south (Banerjee et al., 2012). The mighty River Ganga emerges from a glacier at Gangotri, about 7,010 m above mean sea level in the Himalayas and flows down to the Bay of Bengal covering a distance of 2,525 km. The deltaic complex has an area of 9,630 sq. km comprising of 102 Islands, out of which 48 are inhabited and 54 are uninhabited (Mitra et al., 2011). The flow of Ganges (Bhagirathi) River through Hugli estuary in the western sector of Indian Sundarbans to end up at Bay of Bengal has made the geographical situation totally different from the central sector, where five major rivers have lost their root with Ganga – Bhagirathi system due to heavy siltation (Mitra et al., 2009). The Sundarbans harbors the world’s largest continuous tract of mangrove forest together with associated flora and fauna. 34 true mangrove species and 62 mangrove associate species have been documented in Indian Sundarbans (Mitra, 2000). The total estuarine phase of this ecosystem is very irregular and criss-crossed by several tributary rivers, creeks and waterways. Seven major Rivers system in Indian Sundarbans are Hugli, Muriganga, Saptamukhi, Thakuran, Matla, Gosaba and Harinbhanga (Banerjee, 2013). The rivers are the live matrix of deltaic complex, on which the unique
spectrum of biological diversity is embedded. In Indian Sundarbans, approximately 2069 sq. km area is occupied by tidal river system or estuaries, which finally end up in the Bay of Bengal. It was observed that tidal range along the Sundarbans estuaries vary from place to place within the estuary. Tide in the study area is semidiurnal with tidal amplitude, i.e. 2.5 to 4.8 m and during storm surges the waves actually raise upto 7 m. Current speed within Sundarbans was found to be varying between 140 to 180 cm/sec. The current direction is also controlled by the geomorphology of the creeks (Mukhopadhyay et al., 2006). The temperature is moderate due to its proximity to the Bay of Bengal in the south. Average annual maximum temperature is around 35°C. The summer (pre-monsoon) extends from the middle of March to mid-June and the winter (post-monsoon) from mid-November to February. The monsoon usually sets in around the middle of June and lasts up to the middle of October. Rough weather with frequent cyclonic depressions occurs during mid-March to mid-September. Average annual rainfall is 1920 mm. Average humidity is about 82% and is more or less uniform throughout the year (Banerjee et al., 2012). Turbidity in the coastal and estuarine water is the effect of suspended particulate matters, which are basically contributed by land drainage and turbulence within the aquatic ecosystem that churns the bottom sediments and transfer them in suspension. As a result of turbidity, the reduction of light intensity in the vertical column of water occurs. Turbidity of water in the Indian Sundarbans is mainly attributed to run-off process that brings huge load of silt particles from the adjacent landmasses and mangrove bed. This contributes considerable amount of colloidal and finely divided suspended matter in the aquatic subsystem. Maximum aquatic turbidity, witnessed during the monsoon season in the coastal waters may be due to the presence of high-suspended load as a consequence of increased land run-off and resuspension of bottom sediments due to turbulence (Mitra and Banerjee, 2005).
3.2. Selection of Sampling Stations

Eight sampling stations were selected, depending of the variability of geo-physical environment, tidal condition, salinity, flux of wave energy, mangrove floral richness and anthropogenic pressure (Table 1 and Figure 1a-b). The stations were categorized into two major sectors as follows mainly based on the salinity regime and anthropogenic pressure: (i) western sector [Chemaguri (S1), Lothian Island (S2), Prentice Island (S3) and Harinbari (S4)] and (ii) central sector [Chulkathi (S5), Dhulibasani (S6), Jharkhali (S7) and Bonnie Camp (S8)] (as demonstrated in Figure 2a-h). The stations in the western Sector (S1 to S4) lie at the confluence of the River Hugli (a continuation of Ganga-Bhagirathi system) and Bay of Bengal. In the central sector, the sampling stations (S5 to S8) were selected adjacent to the tide dominated River Matla. Study was undertaken in both these sector through three seasons (pre-monsoon, monsoon and post-monsoon) during March, 2012 to December, 2014.
Table 1: Detailed geographical characteristics of 8 sampling stations (S1 - S8) in Indian Sundarbans

<table>
<thead>
<tr>
<th>Sectors</th>
<th>Stations</th>
<th>Longitude &amp; Latitude</th>
<th>Tidal environment</th>
<th>Wave action</th>
<th>Description of study site</th>
</tr>
</thead>
<tbody>
<tr>
<td>Western Sector</td>
<td>Chemaguri (S1)</td>
<td>88°08'53.55&quot; E 21°38'25.86&quot;N</td>
<td>Semi diurnal Macro (&gt;4m)</td>
<td>Medium</td>
<td>The sampling station is the junction where the Muriganga River meets with the macro tidal Chemaguri creek, situated 9 km upstream from the mouth of the estuary, on the south-eastern side of Sagar Island.</td>
</tr>
<tr>
<td></td>
<td>Lothian Island (S2)</td>
<td>88°20'29.32&quot;E 21°38'21.20&quot;N</td>
<td>Semi diurnal Macro (&gt;4m)</td>
<td>Very high</td>
<td>Situated east of Bakkhali island; Wildlife sanctuary; lies at the mouth of the River Saptamukhi and Bay of Bengal and covering an area of about 38 sq.km.</td>
</tr>
<tr>
<td></td>
<td>Prentice Island (S3)</td>
<td>88°17'55.05&quot;E 21°42'47.88&quot;N</td>
<td>Semi diurnal Macro (&gt;4m)</td>
<td>Very high</td>
<td>Situated north of Lothian island and surrounded by River Saptamukhi.</td>
</tr>
<tr>
<td></td>
<td>Harinbari (S4)</td>
<td>88°04'10.83&quot;E 21°44'22.16&quot;N</td>
<td>Semi diurnal Macro (&gt;4m)</td>
<td>Medium</td>
<td>Situated in the western sector of Sundarbans almost in the middle of the Sagar Island, Receives the water of the Hugli River.</td>
</tr>
<tr>
<td>Central Sector</td>
<td>Chulkathi (S5)</td>
<td>88°34'10.31&quot;E 21°41'53.62&quot;N</td>
<td>Semi diurnal Macro (&gt;4m)</td>
<td>Very high</td>
<td>Situated in the central sector of Indian Sundarbans, Reserve forest area and receives the water of the River Thakuran.</td>
</tr>
<tr>
<td></td>
<td>Dhulibasani (S6)</td>
<td>88°33'48.20&quot;E 21°47'06.62&quot;N</td>
<td>Semi diurnal Macro (&gt;4m)</td>
<td>Very high</td>
<td>Situated between two mighty rivers Matla on the east and Thakuran on the west respectively, Reserve forest.</td>
</tr>
<tr>
<td></td>
<td>Jharkhali (S7)</td>
<td>88°38'56.22&quot;E 21°59'40.88&quot;N</td>
<td>Semi diurnal Macro (&gt;4m)</td>
<td>Very high</td>
<td>Situated between two mighty rivers, Matla (on the west) and Bidya (on the east) covering an area of about 161 sq.km.</td>
</tr>
<tr>
<td></td>
<td>Bonnie Camp (S8)</td>
<td>88°37'21.50&quot;E 21°49'48.80&quot;N</td>
<td>Semi diurnal Macro (&gt;4m)</td>
<td>Very high</td>
<td>Situated almost 30 km downstream from Jharkhali; lies at the lower stretch of Matla estuary.</td>
</tr>
</tbody>
</table>
Figure 1a: Location of 8 sampling stations (S₁ - S₈) in Indian Sundarbans showing 2 distinct sectors based on salinity regime and anthropogenic pressure
Figure 1b: Map showing the intricate river network and position of the multifarious industries on the bank of Hugli River Estuary
Figure 2a-h: Images of 8 sampling stations (S₁- S₈) in Indian Sundarbans

Figure 2a: Chemaguri (S₁)

Figure 2b: Lothian Island (S₂)
2c: Prentice Island ($S_3$)

2d: Harinbari ($S_4$)
2e: Chulkathi (S₅)

2f: Dhulibasani (S₆)
2g: Jharkali (S\textsubscript{7})

2h: Bonnie Camp (S\textsubscript{8})
3.3. Selection of Mangrove Species

On the basis of relative abundance *Avicennia alba*, *Avicennia officinalis*, *Avicennia marina*, *Excoecaria agallocha* and *Sonneratia apetala* dominated mangrove forests of the Sundarbans estuary where all mangrove sampling took place. The salient features of each of the studied mangrove species are presented here with diagram.

**Species A**

**Scientific Name:** *Avicennia alba*

**Common Name:** Kalo Baen

**Identifying Characters:** Tall tree, often more than 10 m tall; bark grayish, lenticelled; pencil like pneumatophores; leaves simple, lanceolate, usually pointed apically, green above, silvery grey or white beneath; flowers yellow, cross-shaped inflorescence; fruits conical with pronounced beak.
**Ecology:** This species is found along tidal river banks in the downstream estuarine zone and in the lower and middle intertidal region. It is fast-growing and sprouts easily from coppicing. It is a colonizing species on newly formed mudflats.

**Species B**

**Scientific Name:** *Avicennia officinalis*

**Common Name:** Sada Baen

**Identifying Characters:** Large sized tree, up to 5 to 10 m tall, with dense and broad crown; buttress small around the base of the trunk; pneumatophores numerous pencil-like erect roots usually less than 30 cm height, developed from horizontal roots buried in the substrate; bark white; leaves obovata or ovate-oblong with round apex, turn black when dry; inflorescence terminal or axillary; flowers orange yellow; fruits almond-shaped.
Ecology: This species is found in the intermediate estuarine zone in the lower intertidal region. This species is a fast-growing species. It is a colonizing species on newly formed mudflats and has a high tolerance of hypersaline conditions.

**Species C**

![Image](image_url)

**Scientific Name:** *Avicennia marina*

**Common Name:** Piara Baen

**Identifying Characters:** Small tree, up to 5m tall, much branched; bark grayish-black, lenticelled; many aerial roots, pencil like; leaves lanceolate, apex pointed to rounded, white beneath; inflorescence long spicate with flowers; fruits conical with pronounced beak.

**Ecology:** An important mangrove tree, growing in soft mud on banks of estuarine rivers and as a pioneer species on newly formed mud flats near river mouths. It has tolerant to very high salinity.
**Species D**

**Scientific Name:** *Excoecaria agallocha*

**Common Name:** Genwa

**Identifying Characters:** This tree is small to medium sized with extensive cable roots and multiple stems, prominent main root absent; bark grayish, poisonous milky latex highly irritating to eyes; leaves light green with wavy margin; inflorescence terminal or axillary.

**Ecology:** This is a back mangrove species and often exploits open areas and is tolerant of disturbed areas.
Scientific Name: *Sonneratia apetala*

Common Name: Keora

Identifying Characters: Trees are with long, corky, forked pneumatophores and stem light brown in color; leaves thick, coriaceous; flowers are cream colored in auxiliary cymes.

Ecology: This species is found in the upstream estuarine zone in the low to mid intertidal region. This species is fast-growing species and hardy, but the seed viability is low (less than three months).
3.4. Assessment of Water Quality Parameters

3.4.1. Collection of Water Samples

Surface water samples (0 to 5 cm) were collected seasonally during high tide for the analyses of temperature, salinity, pH, dissolved oxygen and nutrients (nitrate-nitrogen, phosphate-phosphorus and silicate). Water samples were taken in pre-cleaned plastic bottles and immediately preserved in 4°C and taken to the laboratory for further analyses. For dissolved oxygen, water samples were taken in BOD bottles (125 ml) and fixed immediately using Winkler’s reagents.

3.4.1.2. Temperature

For measurement of water temperature, 1 liter of sea water on board was taken and a centigrade thermometer of ± 0°C accuracy was dipped into the water immediately after their collections and the water temperature was recorded after five minutes, when the mercury level stood constant. Temperature values are expressed in °C.

3.4.1.3. Salinity

Salinity was recorded by means of an optical refractometer (Atago, Japan) and cross checked in laboratory by Mohr-Knudsen titration (Strickland and Parsons, 1972). Immediately after collection of the water samples, the instrument was rinsed with distilled water for 2 or 3 times and it was standardized at zero. Then sample water was added to it drop by drop and the reading was taken. It is worthwhile to mention that, salinity is a ratio and does not require any unit. However, in recent times no unit is being practice while expression in salinity as supported by Baohong et al. (2016) and Feng et al. (2015).
3.4.1.4. pH

The pH of the water samples was recorded with the help of Systronics water analyser (model No. SYS 371) considering three replicate samples of each station studied.

3.4.1.5. Dissolved Oxygen (DO)

The dissolved oxygen content was estimated adopting Winkler’s titrimetric method (1988). The water samples were taken carefully into 125 ml BOD bottles and treated with 1 ml each of the Winkler’s I and Winkler’s II solution. The bottles were re-stoppered and well shaken. This was done in the field immediately after the collections are over and was transported to the laboratory for further analysis. The brownish white precipitates of manganous hydroxide were dissolved by adding 1 ml of concentrated H₂SO₄, which liberated iodine equivalent to the original dissolved oxygen. The brown color solution was qualitatively transferred to a 250 ml conical flask and was titrated against standard sodium thiosulphate solution of 0.01 N (W/V). 2% starch solution (W/V) was used as the indicator. Change of blue color, developed due to the reaction between iodine and starch, to colorless was taken as the end point. From the amount of thiosulphate consumed in the titration, the dissolved oxygen content in each sample was calculated employing the formula below. The values of oxygen are presented as mg l⁻¹.

Calculations:

\[
\text{Dissolved oxygen (mg l}^{-1}\text{)} = \frac{\text{CD} \times \text{N} \times \text{E} \times 1000}{4 \times (V - 2)}
\]

\[\text{CD} = \text{Burette reading for thiosulphate titration}\]

\[\text{N} = \text{Normality of thiosulphate (0.01N)}\]
E = Equivalent weight of oxygen (32,000)

V = Volume of the BOD bottle (125 ml)

3.4.1.6. Inorganic Nutrients (Nitrate-nitrogen, Phosphate-phosphorus and Silicate)

Surface water (0 to 5 cm) was collected for inorganic nutrient analyses in cleaned TARSON bottles and transported to the laboratory in ice-frozen condition. Triplicate samples were collected from same collection stations to maintain the quality of the data. The standard spectrophotometric method of Strickland and Parsons (1972) was adopted to determine the nutrients concentration in surface water.

Nitrate-Nitrogen

All nitrates present in the sample water were converted to nitrite by reduction. A glass column packed with copper coated cadmium cheeps was used for reduction. Method was based on the formation of azo dye. 100 ml of water sample was mixed with ammonium chloride solution (2 ml of 25%) and passed through the amalgamated cadmium reduction column with a speed of 2 drops s⁻¹. The effluent (50 ml) was collected from the column and then treated with 1 ml solution of sulphanilamide. The resultant diazonium ion was coupled with 1 ml of NEDA (1-naphthyethylene diamine dihydrochloride) to give an intensely pink dye. The absorbance of the resultant pink solution was measured spectrophotometrically at 543 nm against a reagent blank and the concentration of nitrate-nitrogen was computed from calibration curve.
**Phosphate-phosphorus**

Phosphate-phosphorus of sample water was determined using acidified molybdate solution and ascorbic acid. 35 ml of sample water was treated with 1 ml mixed reagent (mixture of 0.073 M ammonium molybdate and 9.1 N H₂SO₄ and a small portion of potassium antimonyl tartrate) followed by the addition of 1 ml 0.4 M ascorbic acid solution. Dissolved inorganic phosphate present in seawater was converted to the formation of phosphomolybdate complex with acidified molybdate reagent, which on reduction with ascorbic acid formed a highly colored molybdenum blue compound. The absorbance of the resultant molybdenum blue was measured spectrophotometrically at 880 nm against reagent blank. Samples and standards were subjected to identical treatment in each batch. Turbidity blank was used whenever it was necessary. The concentration PO₄³⁻-P was then computed from calibration curve.

**Silicate**

Silicate was determined by using acidified molybdate solution and ascorbic acid solution. Oxalic acid was added to avoid interference of phosphate in samples. 25 ml of sample and a set of standards were mixed with 1 ml of mixed reagent (mixture of equal volume of 0.16 M ammonium heptamolybdate solution and 7.3 N H₂SO₄ acid solution) followed by the addition of 1 ml oxalic acid solution (0.7 M) and 1 ml 0.1 M ascorbic acid solution. Dissolved silicate was determined based on the formation of a yellow silicomolybdic complex when an acidified sample was treated with ammonium molybdate solution. This on reduction with ascorbic acid yields intensely colored molybdenum blue complex. The blue silicomolybdic complex is formed within 30 minutes and stable for hours. The absorbance of the blue complex was measured
photometrically at 810 nm against reagent blank and the concentration of silicate was computed from calibration curve.

3.5. Assessment of Sediment Quality Parameters

Sediment samples were collected seasonally (pre-monsoon, monsoon and post-monsoon) during low tide period in 5m x 5m quadrate. In the laboratory, the collected samples were carefully sieved and homogenized to remove roots and other plant and animal debris prior to oven-drying to constant weight at 105°C.

3.5.1. Salinity

Salinity was determined in supernatant of 1:10 soil-double distilled water mixtures using refractometer.

3.5.2. pH

The measurement of pH was done in the field with a micro pH meter (Systronics, Model No, 362) with glass – calomel electrode (sensitivity ± 0.01) and standardized with buffer 7.0.

3.5.3. Organic Carbon (C_{org})

Organic carbon of sediment was determined by rapid dichromate oxidation method of Walkley and Black (1934). Organic carbon in dried sediment sample was oxidized by dichromate-sulfuric acid and amount of remaining dichromate was determined by titration with a standard ferrous solution. 1 gram sediment sample was taken into a clean, dry 500 ml conical flask. Exactly 10 ml 1 N K_{2}CR_{2}O_{7} and 20 ml concentrated H_{2}SO_{4} was added and mixed by gentle swirling at first and
then vigorously for a total time of 1 minute. The flask was kept to react the mixture for about 30 minutes.

After the titration, the content was diluted with 200 ml distilled water and then 10 ml concentrated H\textsubscript{3}PO\textsubscript{4} was added, mixed and let it cool. 1 ml Diphénylamine as oxidation-reduction indicator was added and titrated with 0.4 N Ferrous ammonium sulfate [Fe(NH\textsubscript{4})\textsubscript{2}(SO\textsubscript{4})\textsubscript{2} solution]. At the end point color changes from dull green through turbid blue to a brilliant green. A blank was run with the same quantity of chemicals but without sediment. Calculation was done by the following expression:

Organic Carbon (%) = \( \frac{B - R}{B} \times 3.896 \)

B = Blank reading

R = Sample reading

3.5.4. Inorganic Nutrients (Nitrate-nitrogen, Phosphate-phosphorus and Potassium)

Nitrate-nitrogen and Phosphate-phosphorus

Sediment samples were placed in a screw capped centrifuge tube with septum and pore water was separated avoiding air contact by means of centrifugation (30 min, 5000 rpm). For inorganic nitrate-nitrogen and phosphate-phosphorus, 30 gm of sediment was extracted in 75 ml of 2 M potassium chloride (KCl). The mixture was shaken until well mixed and allowed to stand overnight. After 24 h, 4 ml of the supernatant was collected for the estimation of nitrate-nitrogen and phosphate-phosphorus content by standard spectrophotometric method of Strickland and Parsons (1972).
**Potassium**

Potassium content was analysed by flame photometry as per the standard procedure outlined by APHA (1995). 5 gm sediment sample was taken in a 100 ml volumetric flask and the volume was made up to 100 ml with double distilled water. The mixture was shaken until well mixed and filtered through Whatman filter paper (No. 44). Stock solution was prepared by dissolving 1.907 gm (dried at 110⁰C) potassium chloride (KCl) in 1000 ml double distilled water. The flame photometer was calibrated by using standard solution of potassium. Then the sediment extract was fed into the flame photometer and the concentration of potassium was computed from calibration curve.

**3.5.5. Texture (Percentage of Sand, Silt and Clay)**

Sand, silt and clay percentage were computed from a combination of sieving and pipetting procedures (Krumbein and pettijohn, 1938). 25 g of dried sediment sample was treated with 0.67 g sodium hexametaphosphate solution in order to facilitated deflocculation. The disaggregated sample was then washed through a 230 mesh ASTM (American system for Testing Material) sieve (mesh opening = 0.063 mm) until Clear water passed through and care was taken during washing, so that the amount of water for washing did not exceed 1000 ml. The portion of the sample retained on the sieve was dried and weighed and weight of the sample obtained.

The fine fraction (silt+clay) in the washing was analysed by the pipette method, in accordance with the procedure adopted by Krumbein and Pettijohn (1938) collected in 1 litter graduated measuring cylinder. The individual weights of sand, silt and clay fractions were converted into weight percentages and plotted on a trilinear diagram.
3.6. Estimation of Stem, Branch, Leaf and Above-Ground Biomass (AGB) of Mangroves

In both the sectors, selected forest patches were ~ 14 years old. In each sector, 15 sampling plots (10m × 10m) were established (in the river bank) through random sampling in the various qualitatively classified biomass levels for each sector (n=30). Seasonal sampling in both sectors was taken in the low tide period. Sampling in the restricted stations was carried out with the help of West Bengal Forest Department.

Above-ground biomass (AGB) in mangrove species refers to the sum total of stem, branch and leaf biomass that are exposed above the sediment.

3.6.1. Stem Biomass Estimation

The stem volume of five individuals from each species in each of the 15 plots per station (n =5 individuals × 15 plots = 75 trees/ species/ station) was estimated using the Newton’s formula (Husch et al., 1982).

\[ V = \frac{h}{6} (A_b + 4A_m + A_t) \]

Where \( V \) is the volume (in m\(^3\)), \( h \) the height measured with laser beam (BOSCH DLE 70 Professional model), and \( A_b \), \( A_m \), and \( A_t \) are the areas at base, middle and top respectively. Specific gravity (G) of the wood was estimated taking the stem cores by boring 7.5 cm deep with mechanized corer. This was converted into stem biomass (BS) as per the expression \( BS = GV \).

The stem biomass of individual tree was finally multiplied by the number of trees of each species in 15 plots (per station) in both western and central sectors of the deltaic complex and expressed in t ha\(^{-1}\).
3.6.2. Branch Biomass Estimation

The total numbers of branches irrespective of size were counted on each of the sample trees. These branches were categorized on the basis of basal diameter into three groups, viz. <6 cm, 6–10 cm and >10 cm. Fresh weight of two branches from each size group was recorded separately using the equation of Chidumaya, 1990.

Total branch biomass (dry weight) of individual tree was determined as per the expression:

\[ B_{db} = n_1 b_{w1} + n_2 b_{w2} + n_3 b_{w3} = \Sigma n_i b_{wi} \]

Where, \( B_{db} \) is the dry branch biomass per tree, \( n_i \) the number of branches, \( b_{wi} \) the average weight of branches and \( i = 1, 2, 3, \ldots, n \) are the branch groups. The mean branch biomass of individual tree was finally multiplied with the number of trees of each species in all the 15 sampling plots for each station and expressed in ton.

3.6.3. Leaf Biomass Estimation

For leaf biomass estimation, all leaves from nine branches (three of each size group) of individual trees of each species were removed and oven dried at 70°C and dry weight (species-wise) was estimated (Mitra et al., 2011). The leaf biomass of each tree was then calculated by multiplying the average biomass of the leaves per branch with the number of branches in that tree. Finally, the dry leaf biomass of the selected mangrove species (for each sampling plot) was recorded as per the expression:

\[ L_{db} = n_1 L_{w1} N_1 + n_2 L_{w2} N_2 + \ldots \ldots \ldots \ldots n_i L_{wi} N_i \]

Where, \( L_{db} \) is the dry leaf biomass per tree, \( n_1, \ldots, n_i \) are the number of branches of each tree, \( L_{w1} \ldots \ldots L_{wi} \) are the average dry weight of leaves removed from the branches and \( N_1, \ldots, N_i \) are the
number of trees per species in the sampling plots. This exercise was performed in all the 15 sampling plots in each station and the results were finally expressed in tha⁻¹.

3.7. Statistical Analyses and Interpretation

To assess whether above-ground biomass (AGB) and hydro-edaphic factors were varied significantly between stations and seasons, Analysis of variance (ANOVA) was performed considering the data collected during the study period. Possibilities less than 0.05 (p<0.05) was considered statistically significant. Correlation coefficients (r) were performed to find the inter-relationships between hydro-edaphic variables and AGB for each species in Indian Sundarbans. Scatter plots and correlations were computed to explore the relationships between AGB and DBH (Diameter at Breast Height) vs. stem, branch as well as leaf biomass of five studied species (n = 100 per species). All statistical calculations were performed with the help of SPSS 9.0 for Windows.