

ISSN: 0976-3031

*International Journal of Recent Scientific
Research*

Impact factor: 5.114

**COASTAL FLORAL SPECIES COLONIZATION AND
DIVERSITY ESTIMATION THROUGH QUADRATE
METHOD AT LOW-LYING TALSARI COASTALTRACT,
ODISHA, INDIA**



**Nilay Kanti Barman., Ashis Kumar Paul., Soumendu Chatterjee
and Mihir Kumar Pradhan**

Volume: 6

Issue: 9

**THE PUBLICATION OF
INTERNATIONAL JOURNAL OF RECENT SCIENTIFIC RESEARCH**

<http://www.recentscientific.com>

E-mail: recentscientific@gmail.com



ISSN: 0976-3031

Available Online at <http://www.recentscientific.com>

International Journal of Recent Scientific Research
Vol. 6, Issue, 9, pp.6237-6242, September, 2015

**International Journal
of Recent Scientific
Research**

RESEARCH ARTICLE

COASTAL FLORAL SPECIES COLONIZATION AND DIVERSITY ESTIMATION THROUGH QUADRATE METHOD AT LOW-LYING TALSARI COASTAL TRACT, ODISHA, INDIA

Nilay Kanti Barman*¹, Ashis Kumar Paul², Soumendu Chatterjee³ and Mihir Kumar Pradhan⁴

¹Department of Geography, Hijli College, Kharagpur, India

^{2,4}Department of Geography and Environment Management, Vidyasagar University, Midnapore, India

³Department of Geography, Presidency University, Kolkata, India

ARTICLE INFO

Article History:

Received 06th June, 2015

Received in revised form 14th July, 2015

Accepted 23rd August, 2015

Published online 28st September, 2015

Key words:

Coastal Ecosystem; Quadrate Method; Coastal Ecology; Biological Processes; Ecological Diversity

ABSTRACT

The present attempt is to discover how any floral species lives on, developed colonization and succession, reproduces and interrelates with other floral species at different coastal settings in response with human alteration of the coastal land use pattern and rapid global climatic change. Present study conducted in a flaxen bit of land to study systematically the variation in diversity of floral species, succession, colonization and the rest components associating with it. Field observation was the prime base of these all methodologies which were implemented during the study. Present study has been incorporated through quadrat method to complete the floral diversity study. Being in coastal part, it was quite assorted while few fauna contributing it to the rest. Floral diversity and well balanced flow of abiotic apparatus make the ecosystem vigorous for supporting life unless anthropogenic disturbances may take over in recent times.

Copyright © Nilay Kanti Barman. et al 2015, This is an open-access article distributed under the terms of the Creative Commons Attribution License, which permits unrestricted use, distribution and reproduction in any medium, provided the original work is properly cited.

INTRODUCTION

Coastal ecosystems found along continental margins are regions of remarkable biological productivity and high accessibility. This has made them centers of human activity for millennia. Coastal ecosystems provide a wide array of goods and services: they host the world's primary ports of commerce; they are the primary producers of fish, shellfish, and seaweed for both human and animal consumption. Encompassing a broad range of habitat types and harboring a wealth of species and genetic diversity, coastal ecosystems store and cycle nutrients filter pollutants from inland freshwater systems and help to protect shorelines from erosion and storms. On the other side of shorelines, oceans play a vital role in regulating global hydrology and climate and they are a major carbon sink and oxygen source because of the high productivity of phytoplankton.

The coastal areas are exposed to variety of geomorphic driving force as these are the zones of interaction between marine and terrestrial systems and hazardous processes that originate from

both land and sea of coastal areas. Diversity makes them very sensitive to those processes and responses are highly complex also. In the context of growing importance of the coastal zones because of high productivity of the ecosystem, increasing concentration of population, industrial development, more intensive resource exploitation, expanding recreational activities etc. - concern about coastal hazards has increased. Coastal processes are not only depends on physical environment it also depends on ecological and cultural system (Carter, R.W.G., 1988). In the Holocene period Bengal Basin was highly covered by the floral species and then the diversity of floral species gradually decreased due to rapid sea level rise (Banerjee, M., and Sen, P.K., 1987). The Bengal Basin as well as adjacent Odisha coast is experienced with frequent natural calamities like tropical cyclone instead of that the floral species are also presents in this region due to only their adaptive capacity to the tropical extreme events (Barui, N.C., et al., 1986). On the other hand it is also revealed that the propagation of wave on beach or marshy land can also provide the nutrients to the existing species and accentuate the progression of the floral species of that particular area (Moeller, I., et al., 1996).

*Corresponding author: **Nilay Kanti Barman**

Department of Geography, Hijli College, Kharagpur, India

Salt marshes are prospective sources of organic nutrients for coastal ecosystems through primary production and the recharge of the salt marsh with nutrients has been occurred through the tidal interaction during the time of astronomical phase of coastal tide (Mclvor, A., et al., 1997). Coastal sand dune is also treated as the prime habitat of floral and faunal species (Mclachlan, A., 1991) among which the interrelation is always going on in this way coastal sand dune also provides the place and opportunity to develop the coastal ecosystem (Mclusky, D.S., 1989). The another part of the coastal ecosystem is mangrove ecosystem which has an immense role to built up the coastal ecosystem as well as to protect the coastal ecosystem from diverse type of natural calamities (Thom, B.G., 1982); (Paul, A.K., 1985). The work entitled 'On the occurrence of mangrove biota and some faunal remains from the sediments of Haldia by Hait, A.K., et al., (1994) mate the expense of the relation between existing mangrove and its past environment. Every ecological unit has an exact kind of flora present according to its abiotic apparatus i.e. temperature, rainfall, sunlight, air etc. This constructs a unique bionetwork from others if the fauna are not considered. Plants demonstrate an extensive range difference within an ecological unit or outside making them such assorted and inconsistent to other environments. From the geographical aspects, topographical aspects and physiological outlook, present researchers implicit that Talsari has a good profusion of floral species in the shoreline and its growing affluence while moving to the estuarine sector.

The Study Area

The area under study, Talsari beach is constituted a part of the alluvium coast of the Subarnarekha delta plain located at north-eastern side of Balasore district of Odisha and hardly 10-15 km away from Digha (Fig. 1). Geographical co-ordination of Talsari is bounded in between 21°35'48" Northern Latitude and 87°27'17" Eastern Longitude. Talsari's beach is renowned for its fishing village and wide beach.

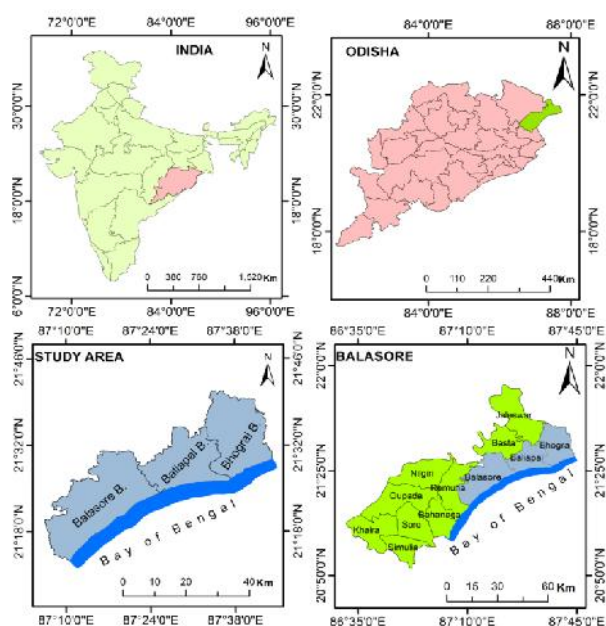


Fig. 1 The physical location of the Study Area.

The area is a coastal alluvial tract with unconsolidated substrates and this stretch of the coastline is geomorphologically dynamic, rich in habitat diversity and prone to hazards such as tropical cyclone-induced tidal waves, storm surges and consequent coastal flooding.

The estuary of the river Subarnarekha is 0.5km to 1.5km wide. Almost nine sand bars and one island are situated here. All the sand banks are linear by nature. The mouth of the estuary has turned towards south in the last 30 to 40 years due to excessive bar deposition and seaward progress of the delta. Consequently the basins which are covered by the beach ridges, mangrove swamps and marshy lands have been built up by this change of river course. Most of these marshy land, island and swampy terrain are dissected by tidal creeks. The vegetated tidal flats are mostly covered by the mud flats of land ward side and the bars or linear tidal shoals are occupied by extensive sand flat. These regions are very much victims of human alteration.

MATERIALS AND METHODS OF THE FIELD STUDY

Floral ecological study is the only approach to discover how any floral species lives on, reproduces, developed colonization, succession and interrelates with other floral species. This formulates the ecology as a practical science. There are three main approaches to the study of ecology.

The simplest technique is to observe and record the floral species in its innate setting. This is occasionally portrayed as observation 'in the field' or fieldwork, even though the expression can be perplexing as 'field' suggests open grasslands or the place of human agriculture.

A subsequent type of study is to accomplish in the form of experiments in the field to observe how the floral species responds to the certain revolutionizes in the environment.

The third approach usually rivets bringing organisms into a proscribed environment in a laboratory or greenhouse. This scheme is very helpful as it often easier to trace under controlled circumstances. However it must be memorized that the species may react in a different way because they have been unconcerned from their usual home.

Quadrates Method to Estimate the Floral Species

Quadrates method has been adopted for the floral diversity study. Quadrates method incorporated with the technique of selecting a particular quarter of interest where adequate floral species can be seen. The selecting quarter can be bounded by a string/rope which dimension is being a suitable slot of area as required by the researcher. The following steps have been taken to complete the floral diversity study through quadrates method.

1. A wide quarter is first determined by best choosing method where adequate floral species can be seen.
2. It is then made prominent with the help of rope and placed accordingly to the present survey with an area of 204m×24m.

3. Now the selected quarter are formed of 12m×12m quadrate by extending the other points of the quadrate.
4. The number of total quadrates is 34.
5. The different plants diminishing under the quadrates are then noted down.

It is to be reminded that when a 12m×12m dimension is reached and if no new species intrusion takes place then that is considered as the least quadrate. After detection of a least quadrate, 5m×5m dimension is also created just to check saturation and ensure confirmation of no new species intrusion.

Now if again new species is detected not similar to the set of quadrates in the previous setup, then another setup is established by dividing the existent quadrate dimension into small one (Basu, R., 2014). This was followed till the study had reached the estuarine end.

RESULT AND DISCUSSION

Floral Species of Subarnarekha Delta

Flora forms a very significant and essential constituent in a particular ecological unit because floral species are the primary producers which produce food in the form of intricate carbohydrates with the help of solar energy. After producing by the floral species, the primary production then goes upward in the form of energy flow by eating and eaten process from one tropic level to another (Basu, R., 2014).

From the Present study area diverse mangroves species near about fifty seven species and their allied plants from the intertidal, supra-littoral and backshore zones under 32 families, 28 species of benthic algae under 4 families and phytoplankton species under 3 families from the intertidal zone, supra-littoral brackish zone and from the sub tidal open estuarine marine zones of different habitats of contrasting ecological features have been recorded (Annon, 2005) (Fig. 2). *Avicennia officinalis*, *Elipsa alba*, *Exococaria agallocha*, *acanthus ilicifolius* *Sueda maritime*, *Salicornia bravhiata*, *Rizophora mucronata* and *Ipomea pes-caprae*, symbolize the foremost mangrove species. Dune growing plants such as *Ipomea*, *Spinifex*, *Pandanus*, etc. plays a significant role to stabilize the dune like fore dunes and back dunes. These species once become habitual then they stabilize the shoreline and act as a cushion against erosion. It is observed that the gradual and orderly sequences of plant development from sea ward to land wars side are (1) *Spinifex littoreus* formation on the beach front seashore, (2) *Ipomoea pes-caprae* development on the mobile dunes and (3) *Casuarina-Ipomoea-Pandanus* association on the fixed (stabilised) dunes. In highly unstable condition only low growing *Spinifex littoreus* with deeply penetrating root system survives (Bhakat, R.K., 2000); (Bhakat, R.K., 2001).

Floral Checklist along with their critical characteristics

The different floral species which have been found during the present study ranging from coastline to the marshy land area are enlisted below (Table 1 & 2)



Fig. 2 Floral Species abundance at open estuarine marine zones of the Balasore coast.

In the present study area floral species distribution pattern is quite uneven with response to movement from coastline to marshy area. The chlorophyll content of grasses significantly increases towards the marshy land. This might be the fact that some circumstances such as extra salinity or lack of nutrition boost chlorophyll production to produce energy. Patches of *Casuarina sp.* were first found to be developing in the form of isolated bushes in the coastline, gradually while moving towards the marshy land, these bounded a tree and then they are growing. This might be because of a symbiotic activity or change in survival modes. Surprisingly, one new species of plants were observed in the mid-coastline and two new species were observed in the marshy land because of a transitional zone between the terrestrial and aquatic.

Table 1 Different floral species at Coastal Area

Casuarina sp	Cynodon sp	Lantana camera sp	Calatropis gigantia sp
Elipsa alba sp	Agidectrin indica sp	Vernonia cineria sp	Various species of grass sp3
Takphul sp	Joisa sp	Oldenlandia conymbosa sp	

Table 2 Different floral species at Marshy Area

Soida sp	Lania sp	Aluropous logopoides sp	Various species of grass sp1, sp2,
Mollugo spergula sp	Soida2 sp	Sesuvium portulacastrum sp	
Celecornia sp	Dhanidghas sp	Akanthesis sp	

Colonization and Succession of Vegetation at Deltaic Coast

Coastal zone is the transitional zone of land and water; here land meets to the sea so this is the mixing zone of terrestrial and aquatic ecosystem. Four major types of ecosystems are present at the study area. These are shallow brackish water ecosystem, beach and dune ecosystem, wet land ecosystem and the estuarine ecosystem. Which have been clearly discussed in previous portion. Considering the present study area, Talsari beach has been taken as a sample unit an experiment has been made in the 204m long and 24m wide area from the sea water to back barrier dune and a phyto-geomorphological map (Fig. 3) has been developed by dividing the area in 34 grids (Quadrates method - 12m×12m) to understand the zonation, colonization and succession of different types of floral species along with the faunal species. The phyto-geomorphological map shows that marshy land is the most effective zone from the ecosystem point of view. A large number of floral species like *Tak Phul*, *Vernonia Cineria*, *Oldenlandia Conymbosa*, *Ghani Ghas*, *Josia*, *Soada* are found at the lower marsh. At the middle marsh there are so many floral species like *Lania*, *Akanthesia*, *Celecornia* have been presented. On the other hand meadow land and the upper marsh are covered by *Lania*, *Agidectrin Indica*, *Josia* and *Aluropous Logopass*. Similarly marsh mangrove is covered by the *Cynodon*, *Agidectrin Indica*, *Lania* and *Vernonia Cineria*, *Sp3* and *Sp4*. Mosquito, fly, bird and some domestic animal like cow, goat, dog etc. are frequently found at the marshy land. Beach is almost least vegetated with high agglomeration of faunal community like different types of snail, crab, fly and sometimes the dead body of Jelly fish, Oliveridley Tturtle etc. shallow brackish water ecosystem is developed in between the high tide and low tide margin, some phyto plankton and *Dhani Ghas* are the primary producer of this place along with the verities of fish communities. Last of

all the estuarine ecosystem is the most complicated ecosystem of the study area. All the river mouth like Subarnarekha, Dugdugi and Burahbalang with their numerous tributaries are developed the estuarine environment. The sweet water and the brackish water diluted at this place so the environment is very much complicated. Dune is less vegetated than the marshy land and more vegetated than the beach. Dune meadow is covered by the *Cynodoa*, *Sp3*, *Sp4*, *Agidectrin Indica* and *Sp8* where as *Cynodon*, *Sp3*, *Sp4*, *Agidectrin Indica* and *Sp8* also along with the *Elipsa Alba*, *Casuria* and *Sp3* can be found in the dune flat and dune field. Dune ridge with a height of 4.5m to 5m is also very roofed with the colony of *Calastregis Gigantia*, *Cynodoa*, *Lantana Camera*, *Sp1*, *Sp2*, *Sp3* and *Sp4*. Now a day's dune row is used as fish drying ground and also some times the place of fishing huts development, so the habitats of coastal sand dune are extremely degraded at the study area. These types of activities are mostly found at the Talsari dune and the Kasaphal dune. So it is clear that the variation of colonization, zonation and succession depend on the height and the physical parameters of the coastal environment.

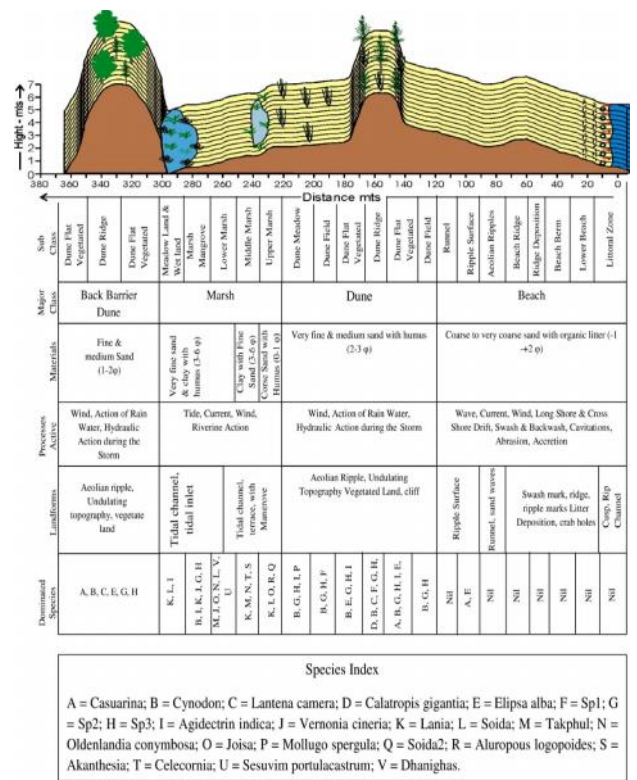


Fig. 3 Phyto-geomorphological zones developed on marsh, dune and beach face with some biogenic and morphological features.

CONCLUSION

The dynamic processes are enclosed within the coastal zones and create various productive ecosystems which have an immense significance historically for human populations.

With the slow and steady development the coastal lands were made to fit for human settlements, agricultural land and the lower areas were treated as the areas for pisciculture. It is also found in the present coast that most of the agricultural lands are situated bellow 4m - 5m. In the past all these places were covered with coastal low land, salt marshes or coastal wet

lands. Due to rising demands of food coastal people changed these coastal morphological features by land polderisation to agricultural land. As a result the original ecosystem of this area is going to face destruction. Removal of a colossal number of mangroves and for increase of agricultural land the natural mangrove swamp is faced to be destructed. In the present situation immense numbers of people are engaged in turning coastal lands to agricultural lands that the faunal community like crabs, fiddler crabs, shells and floral community as well as the salt tolerance coastal indigenous species such as *sesuvium portolacrustum*, *Lania sarmentosa*, *Dhanighas* etc. are awaiting for uncertain future. Another frequently used agricultural land in the studied coast is beach ridge. Betel leaf is cultivated here mostly. In addition to this some fruits trees are also cultivated here. As a result the indigenous ecosystem of the beach ridges are destroying. So, in the starting of the civilization, there was a wild land cover pattern in the coastal region and gradually with the participation of human being it has been changed radically through land reclamation, upstream cultivation, urban development, agriculture and irrigation in the deltaic alluviums and sandy alluviums, modifications of coastal habitats through land use changes by man in the coastal region, modification through shrimp farming, generation of pasture land, tourism industries development and also other development into the coastal region.

The livelihoods of coastal communities on Bichitrapur are being enhanced through the generation of new mangrove as well as afforestation-based livelihoods and the endorsement of small-scale tourism and ecotourism activities. Tourism facilities with tourist amenities centre, which is very eco-sensitive have been developed – including at Talsari Chandaneswar, a significant pilgrimage place at the convergence of the river Subarnarekha and the sea.

In Talsari coastal stretches, the excellence of land, water and air has been deteriorating by various diesel driven fishing boats and the development of fishing harbor activities. Accordingly the escalation of tourism industries at Talsari Beach, a major economic activity, has led to a rise in hotel-building, road transportation and illegal encroachment by small traders (Basu, R., 2014).

The coastal tract near Talsari has been eroded by seawater, resulting in the lowering of the beach and collapse of the bank. The erosion rate has been found to be about 9 m per year in some parts. Moreover, the eminence of surface and ground water is changing due to incursion of salt water, especially in the Talsari area – which may be an indirect effect of shore line shift in this region.

Mangrove ecosystems represent a foremost anticipate for adjustment to some of the inferior effects of climate change. They defend the coast from erosion as well as natural hazards such as cyclones, tsunamis and allied disasters. They also provide key natural services, such as the nursery ground for numerous precious maritime species on which both the health of coral reefs and the livelihood of fishermen depend. With the explanation of Climate change possibilities in its campus the CCRC is intended and developed as a Climate Change Knowledge platform to pull towards the students, researchers,

scientist, nature lovers and tourists as element of a endorsement of ecotourism to the region, providing the local people with yet one more probable source of earnings. This pioneer project has worked out a broader range of subjects including Socio-coastal Economic Development and Ecological sanitation issues to restrain climate change belongings and ICT for Community Schooling on Conservation Education.

Tropical and subtropical coastlines particularly in areas that are already under stress from human activities are highly susceptible to global warming impacts. Particularly at risk are the large delta regions especially in Asia where vulnerability was recognized more than a decade ago and continues to increase. Coastal areas also include complex ecosystems such as coral reefs, mangrove forests and salt marshes. In such environments the impacts of accelerated sea-level rise will depend on vertical accretion rates and space for horizontal migration which may be limited by the presence of infrastructure. Many mangrove forests are under stress from excessive exploitation and salt marshes are under stress from reclamation. In such situations ecosystem resilience will be greatly reduced in the present study area through human impacts as well as rising sea levels, increasing sea temperatures and other climate related changes, including prevailing wave activity and storm waves and surges.

References

- Carter, R.W.G. (1988). Coastal Environments, *Academic Press*. Pp. 525-557,617.
- Banerjee, M and Sen, P.K., (1987), Palaeobiology in understanding the change of sea level and coastline in Bengal Basin during Holocene period, *Indian Journal of Earth Sci.* 14 (3-4), pp. 307-320.
- Barui, N.C., Chandra, S., and Bhattacharya K.N. (1986). Late Quaternary Vegetational History of the Bengal Basin. *J. Min. Metall. Soc. India*, 54, pp. 197-201.
- Moeller, I., Spencer, T. and French, J.R. (1996). Wind wave attenuation over saltmarsh surfaces: Preliminary results from Norfolk, England. *J. Coastal Res.* 12: 1009-1016.
- Mclvor, A., Moller, I., Spencer, T., and Spalding, M. (2012). Natural Coastal Protection Series: *Report 1, Cambridge Coastal Research Unit Working Paper 40.*
- Mclachlan, A. (1991). Ecology of coastal dune fauna. *Journal of Arid Environments*. Vol. 21. Pp. 229-244.
- Mclusky, D.S. (1989). The Estuarine Ecosystem (Second Edition), *Blackie, Chapman and Hall.*
- Thom, B.G. (1982). Mangrove Ecology: A Geomorphological Perspective. In: *B. Clough (eds.) Mangrove Ecosystem in Australia, structure, Function and Management.* pp. 3-17. Canberra, A.N.U.
- Paul, A.K. (1985). The development of accumulation forms and erosion in the coastal tracts of Balasore, Medinipur and 24-Parganas districts of Orissa and W.B. India. *Jour. Land. Syst. Ecol. Studies.* Cacutta. Pp. 19-325.
- Hait, A.K., Das, H.K., ray, A.K., Chanda, S. (1994), On the occurrence of mangrove biota and some faunal remains from the sediments of Haldia, W.B. in relation to its past environment. *Journal of Palynology:* 30. (Eds. Prof. A.K. Kulkarni). Today and Tomorrow's Printers and Publishers, New delhi, pp. 73-78.

Basu, R. (2014). Report on the Ecological Field Study at Digha, West Bengal, Dept. of Env. Sc., ashutosh College, Kolkata.

Annon. (2005). Studies on bio-resource assessment and management of degraded mangrove ecosystem of Midnapore coast, West Bengal, *Research project report, ministry of Environment and Forest*, govt. Of india. [Sanction No. 3/6/2001-CSC (M) Dated 5th Nov. 2001] pp. 1-99.

Bhakat, R.K. (2000). An ecological study on dune stabilising plants of Digha for appropriate coastal afforestation. *Indian Journal of Geography and Environment*. 5, pp. 87-89.

Bhakat, R.K., (2001). Coastal dunes of Digha, India-A plea for continued protection. *Indian Journal of Geography and Environment*. 6, pp. 54-60.

How to cite this article:

Nilay Kanti Barman *et al.* (2015). Coastal Floral Species Colonization and Diversity Estimation through Quadrata Method at Low-Lying Talsari Coastal Tract, Odisha, India. *Int J Recent Sci Res*, 6(9), 6237-6242.

*International Journal of Recent Scientific
Research*

ISSN 0976-3031



9 770576 303009