



Identification and Areal Assessment of Mangrove and Mangrove Associate Species in Kasheli Creek

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Abstract:

The Konkan region is renowned for its diverse aspects, including natural beauty, aquatic resources, mango farming, and mangrove forests. Mangroves are a vital natural resource, providing numerous benefits to local communities and contributing significantly to the regional economy. They provide habitat for aquatic life, mammals, and serve as breeding grounds and nurseries, and offer protection against natural disasters like tsunamis. Additionally, they help mitigate coastal erosion and stabilize the shoreline. However, in recent years, anthropogenic activities have increased in the ecosystem. Consequently, mangrove ecosystems have become increasingly vulnerable. Thus, conservation of these ecosystems is crucial. Therefore, the aim of the article is to identify the mangrove species and assess the mangrove-covered area with respect to understanding its present status in the study region. The study area is home to seven typical mangrove species, including *Rizophora apiculata*, *Avicennia alba*, *Lumnitzera racemosa*, *Excoecaria agallocha*, *Kandelia obovata*, *Sonneratia alba*, *Rhizophora mucronata* and seven mangrove associates, namely *Caesalpinia crista*, *Canavalia cathartica*, *Acanthus ilicifolius*, *Derris trifoliata*, *Clerodendrum inerme*, *Ipomoea pes-caprae* and *Derris scandens*. The mangrove covered area has decreased due to the reduced supply of creek water by the Kharland bund.

Keywords: Mangrove, Creek, Kharland bund, Aquaculture, Kasheli, Konkan

Introduction:

India is one of the most important countries in the world. Out of the states from India, Maharashtra is agriculturally and industrially developed state in India. Maharashtra is divided into three important physiographic divisions. These are Konkan coast, Deccan plateau and Western Ghat etc. (A.B.Saouadi, 2020). The coastal belt between Damanganga river in the north and Terekhol river in the south is known as Konkan. It consists of Palghar, Thane, Raigad, Ratnagiri, Sindhudurg and Mumbai. (Karlekar and Thakurdesai, 2017). The coastal sector, characterized by plains, shoreline terraces, sand dunes, cliffs,

numerous sandy pocket beaches, tidal inlets, creeks and estuaries, shows a great amount of variability from north to south. The estuaries and creeks on this coast are special character of the konkan coast. (Karlekar, 1996). Kalbadevi Creek, Bhatye Creek, Purnagad Creek, Rajapur Creek, Vaghotan Creek, Arjuna Creek, Achara Creek, Kalavali Creek, Kolamb Creek, Karli Creek these are the major creeks of Konkan (Karlekar and Thakurdesai, 2017). On the basis of lithology, geomorphic configuration, nature of hinterland and climate, Konkan has been divided into the three divisions the North Konkan, Middle Konkan and South Konkan (Dikshit, 1986).

South Konkan is the longest stretch. It has deeply entrenched stream channels and the piedmont plains. (Karlekar, 1981). The estuaries of Middle Konkan and South Konkan occur as narrow, elongated inlets with relatively little human interference. (Karlekar, 2001).

Importance of Mangrove:

The state of Maharashtra has a coastline of approximately 720 km, running in the five districts in the Konkan region, where mangroves are found in estuaries, deltas, and mudflat areas. Mangroves are defined as tropical and subtropical forests with a diverse floristic composition, located along the sea on muddy or peaty lowlands that are periodically submerged or influenced by tides. Mangrove ecosystem is particularly significant, from both the ecological and economical points of view. The word 'Mangrove' is considered to be a combination of the Portuguese word 'Mangue' and the English word 'grove'. Mangroves are a typical group of plants which are adopted for survival in sheltered brackish water habitats along coasts of tropical and sub-tropical regions. They provide good shelter and protection to brackish water habitats. Mangroves maintain the quality and productivity of coastal waters. Mangroves are known as primary producers, shoreline protectors. They provide nursery grounds and habitats for a variety of animals. They provide nursery grounds and habitats for a variety of animals, serving as bridging components and unique biological resources. They help control shoreline erosion and stabilize the coastline. Mangroves can provide protection against natural disasters such as tsunamis. Globally, mangroves are one of the most productive and threatened ecosystems which are situated within the intertidal zones of tropics and subtropics. Mangrove ecosystems provide numerous employment opportunities to the local communities. They provide a range of products, including food, tannins, fuel, construction materials, timber,

and medicines. In many countries, including India, subsistence fisheries activities largely depend on healthy mangrove forests. A diverse range of marine animals, including invertebrates, fish, reptiles, birds, and mammals like tigers, seek shelter in mangrove forests. They help purify the air and water by absorbing impurities and harmful heavy metals so they are known as the kidneys of the environment.

The Study Area:

The study area, Kasheli Creek, is located in the southernmost part of Purnagad Creek which is formed by the mouth of the Muckundi River, between Gaonkhadi and Purnagad. Near the mouth, it has got a crescent shape. The creek is also known as Doka River in the area between Guravwadi and Kasheli villages. It comprises the five villages are located as follows: Gaonkhadi (northwest), Dorle (northeast), Kondsar BK (east), Navedar (south), and Kasheli (west). The total geographical area of the study region is approximately 54, 68,814, square meters which is estimated from the Google earth image of Oct.2023. The study regions latitudinal extent is 16, 44, 9.60 N to 16, 44, 19.20 N and longitudinal extent is 73, 19, 8.40 E to 73, 20, 45.60 E. The region's length is approximately 6,443 meters on the western side and 8,099 meters on the eastern side. Due to its irregular shape, the length varies at different points, with a middle section measuring approximately 2,451 meters. The region's width is approximately 375 meters from west to east on the northern side and 848 meters from west to east on the southern side. The study area is generally located 32 kilometers west of Rajapur tehsil and 32 kilometers south of Ratnagiri city. Out of the total study area, approximately 28.71% (1,569,995, sq.m.) is located in Kasheli village, about 13.69 % (748,617 sq.m.) in Gaonkhadi, 3.90 % (213,608 sq.m.) in Dorle, 36.58 % (2,000,000, sq.m.) in Kondsar BK, and about 3.91% (213,608 sq.m.) in Navedar village.

Methods:

To assess the mangrove covered region, the map is prepared using the Google Earth images of 2013 and 2023. The images were accessed through the internet. The study area was fixed and delineated using Google Earth images. Data for the study were obtained through an analysis of Google Earth images to assess changes in the area covered by mangrove forests in Kasheli Creek. Ground verification has also been conducted to make the classification worthwhile for analysis and interpretation. To record accurate information about the changes in mangrove -covered area, the collected data by conducting questionnaire survey in 2018 were analysed to understand people's perceptions. The study was conducted to assess changes in the mangrove-covered area over a 10-year period (2013-2023).

Mangrove identification:

Mangrove identification began with a visit to the study area in 2017. The creek channel was travelled using the small boats of the fishermen, covering the regions from Guravwadi to Gaonkond bund, Gaonkond bund to Kasheli bandh, and Kasheli band to Kasheli bandhiya. All the mangrove species which are luxuriantly grown along the creek channel was carefully observed. Necessary photographs were taken using a mobile camera. Photographs of fruits, flowers, exposed roots, and leaves of various sizes and shapes were taken at that time. The following day, the intertidal zone of the creek was observed by walking. In this zone, some mangrove species and mangrove associates were identified, and photographs were taken. Some fruit samples were also collected. Seed samples that had failed to germinate were also collected. All the collected photographs and fruit samples were classified according to their location and surrounding environment. A second attempt was made to identify the species by surveying literature on mangroves and

vegetation in the Konkan region and also visited to some websites like www.flowersofindia.net. After that, some efforts were made to identify the species. The collected photographs, fruit samples, seeds, and identified species were then shown to the respected guide. All the essential guidance was taken from the respected guide. The given suggestions were understood and followed. Additional guidance was also taken from the Department of Botany, Gogate-Jogalekar College, Ratnagiri. At each visit, the collected information was classified. Based on morphological characteristics such as color, size, shape, area, season, flowers, leaves, roots, fruits, branches and stems. The study area was revisited multiple times during various phases of the vegetation's life cycle. Some species were observed to be seasonal, while others were present throughout the year. It is observed that Members of family Rhizophoraceae show flowering throughout the year. The species like *R. mucronata*, show early stages in the month of April and May and blooming is observed from September to November. *Avicennia* show flowering from March to July and matured fruits are formed in June – July. The mangroves were classified based on their botanical name, local name, family, habit, and habitat. All collected mangrove species were categorized into five classes. trees, shrubs, climbers, typical mangroves, and associate species. A total of 14 species of mangroves and mangrove associates were identified, including 7 typical mangrove species and 7 mangrove associate species. In the intertidal zone, the mangrove species such as *Rhizophora apiculata*, *Avicennia alba*, *Lumnitzera racemosa*, *Excoecaria agallocha*, *Kandelia obovata*, *Sonneratia alba*, and *Rhizophora mucronata* are found during field visits. Additionally, some mangrove associates are identified along the intertidal zone, including *Caesalpinia crista*, *Canavalia cathartica*, *Acanthus ilicifolius*, *Derris trifoliata*, *Clerodendrum inerme*, *Ipomoea pes-caprae*, and *Derris scandens*.

Table 1: Typical Mangrove species in Kasheli creek

Sr. No	Botanical Name	Local name	Family	Habit	Location / Habitat
1	<i>Rizophora apiculata</i>	Kanjil	Rizophoraceae	Mangrove	Tree
2	<i>Avicennia alba</i>	Tivar	Acanthaceae	Mangrove	Tree
3	<i>Lumnitzera racemosa</i>	Kirpa	Combretaceae	Mangrove	Tree
4	<i>Excoecaria agallocha</i>	Huri	Euphorbiaceae	Mangrove	Tree
5	<i>Kandelia obovata</i>	Kanjil	Rhizophoraceae	Mangrove	Tree
6	<i>Sonneratia alba</i>	Pandhari chipi	Lythraceae	Mangrove	Tree
7	<i>Rhizophora mucronata</i>	Kanjil	Rhizophoraceae	Mangrove	Tree

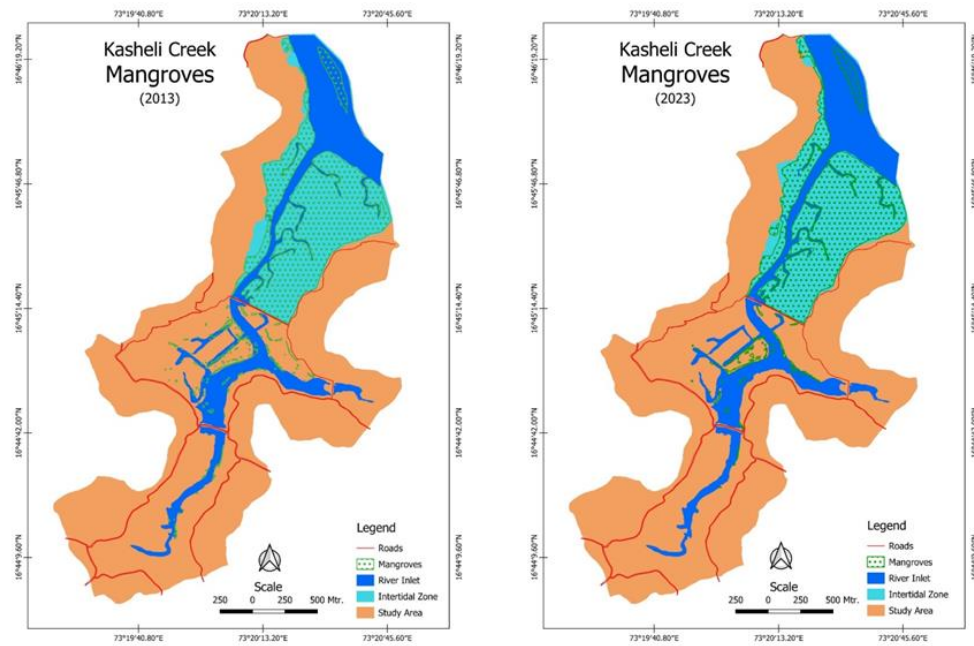
Typical mangrove species in Kasheli creek*1. Rizophora apiculata**2. Avicennia Alba**3. Lumnitzera racemosa**4. Excoecaria agallocha**5. Kandelia obovata**6. Sonneratia Alba**7. Rizophora mucronata**Figure: 1*

Table 2: Mangrove associate species in Kasheli creek

Sr. No	Name	Local name	Family	Habit	Location/ Habitat
1	Caesalpinia crista	Sagargoti,	Fabaceae	Associate	Climber
2	Canavalia cathartica	Abai	Fabaceae	Associate	Climber
3	Acanthus ilicifolius	Marandi	Acanthaceae	Associate	Shrub
4	Derris trifoliata	Nirgundi	Fabaceae	Associate	Climber
5	Clerodendrum inerme	Vanajai	Lamiaceae	Associate	Shrub
6	Ipomoea pes-caprae	Maryada-vel	Convolvaceae	Associate	Creeper
7	Derris scandens	Garudvel	Fabaceae	Associate	Climber

Figure 2: Mangrove associate species of Kasheli creek*1. Caesalpinia crista**2. Canavalia cathartica**3. Acanthus ilicifolius**4. Derris trifoliata**5. Clerodendrum inerme**6. Ipomoea pes-caprae**7. Derris scandens*

Areal Assessment of Mangrove:

Kasheli creek mangrove 2013 and 2023.

Source: Google earth image from April, 2013 and 2023.

Figure: 3



Figure: 4

Dense mangrove cover at Gaonkond bund



Figure: 5 - Mangrove decreasing area in Kasheli creek

Table 3: Mangrove covered area (Sq. Meter)

Area covered (Sq. Meter)			
2013		2023	
Area in Sq. Mtr	Percentage	Area in Sq. Mtr	Percentage
878299	16.06	828678	15.15

Mangroves occupied approximately 16.06% of the total study area (54, 68,814 Sq. mtr.) in 2013, covering 878,299 square meters of the study region. On the other hand, mangroves occupied around 15.15% of the total study area in 2023, covering 828678 square meters of the study region. This map indicates that mangroves are sparsely distributed in the southern and middle parts of the study area, whereas they are densely spread in the northern part due to an adequate supply of creek water. In the middle and southern parts of the area, mangroves are seen in sparse and isolated clusters, with species growing far apart from each other, resembling a bouquet. Mangrove species are primarily observed in areas where creek water can reach during high tide. The majority of the mangrove forest is concentrated between Gaonkond bund and Guravwadi in the intertidal zone. It was rarely observed in the easternmost part of the creek, likely due to the creeks headward portion. All mangrove plants are located within the intertidal zone of the study area. Mangrove species are seldom found outside the intertidal zone or near its boundaries.

Kharland bunds for Agriculture:

In the coastal regions of Maharashtra, many villagers have lost their agricultural land due to the intrusion of saline seawater through estuaries, creeks, and inlets during high tides. To mitigate this problem of salinity, earthen bunds were constructed across the entrances, following the coastal regulation rules. The objective of the Kharland scheme is to protect agricultural and grazing lands, thereby strengthening the socio-economic status of nearby villages. The bunds help restore the

fertility of the agricultural land over time, increasing yields. By restricting the flow of creek water into agricultural fields, the bunds improve soil fertility and protect agricultural and grazing lands. This provides significant benefits to local people, strengthening their economic conditions. However, the construction of Kharland bunds on creeks has affected mangrove cover on the landward side of the creeks. A report of BNHS on the impact of Kharland Development bunds on mangrove cover, a case study from Ratnagiri, noted that the Kasari bund on Jaigad Creek affected 108 hectares of mangrove cover. Similarly, the Shipole-Veswi bund on Bankot creek impacted 35.5 hectares, and the Shirgaon bund on Sakartar creek affected 75 hectares of mangrove area. This damage occurred due to the area enclosed by the bund, which lacked adequate tidal water.

Aquaculture:

Near the Gaonkond bund, the two new shrimp farming projects are initiated in the intertidal zone. The shrimp farms are enclosed by constructing bunds, effectively isolating them from tidal influences. This is a new emerging occupation in the study region.

Conclusion:

To provide extra land to local farmers, conserve water tables, and protect agricultural and grazing lands from becoming brackish due to tidal water ingress, the Ratnagiri Kharland Department constructed an earthen kharland bund at Gaonkond. As a result of this bund, a reduced supply of creek water has been observed in the southern, western, and

eastern parts (from Gaonkond bund to Kasheli bandhiya) of the creek's intertidal zone, leading to a gradual decline in mangrove forests, as well as fish and other aquatic animals and birds. It is suggested that areas in the intertidal zone, which are not being used for grazing or agriculture and are lying open, should be utilized for mangrove plantation by creating furrows. This mangrove plantation becomes beneficial to increase fish population and other aquatic animals and birds. The local people's needs for fish will be fulfilled by these efforts.

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